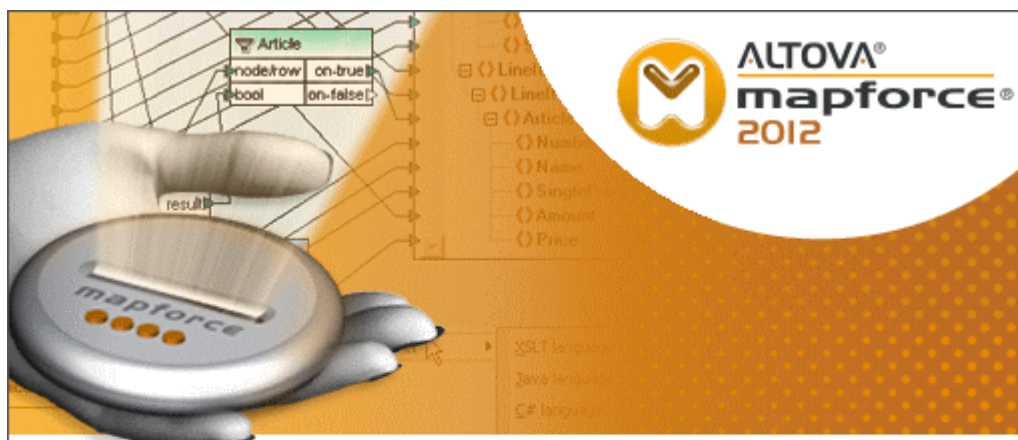


## User and Reference Manual



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# **Altova MapForce 2012 User & Reference Manual**

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# Table of Contents

<b>1</b>	<b>MapForce 2012</b>	<b>3</b>
<b>2</b>	<b>What's new...</b>	<b>6</b>
<b>3</b>	<b>MapForce overview</b>	<b>10</b>
3.1	Terminology .....	12
<b>4</b>	<b>MapForce tutorial</b>	<b>16</b>
4.1	Setting up the mapping environment .....	18
4.1.1	Adding components to the Mapping pane .....	19
4.2	Creating a mapping .....	22
4.2.1	Mapping schema items .....	23
4.2.2	Using functions to map data .....	26
4.2.3	Filtering data .....	30
4.3	Generating XSLT 1.0 and 2.0 code .....	34
4.4	Handling multiple target schemas / documents .....	35
4.4.1	Creating a second target component .....	36
4.4.2	Viewing and generating multiple target schema output .....	39
4.5	Mapping multiple source items, to single target items .....	41
4.5.1	Creating the mappings .....	42
4.5.2	Duplicating input items .....	45
4.6	Multi-file input / output .....	50
4.6.1	Processing multiple files per input/output component .....	51
<b>5</b>	<b>MapForce user interface</b>	<b>56</b>
5.1	Libraries tab .....	58
5.2	Mapping pane .....	60
5.3	XSLT/XSLT2 pane .....	62
5.4	Output pane / BUILTIN execution engine .....	63
5.5	StyleVision-related panes .....	65

5.6	Overview window .....	66
5.7	Messages window .....	67

## 6 Mapping between components 70

6.1	Methods of mapping data (Standard / Mixed Content / Copy Child Items) .....	72
6.1.1	Target-driven / Standard mapping .....	73
6.1.2	Source-driven / mixed content mapping .....	74
	<i>Mapping mixed content</i> .....	74
	<i>Mixed content example</i> .....	79
	<i>Using standard mapping on mixed content items</i> .....	80
6.1.3	Copy-all connections .....	82
6.2	Connection settings .....	85
6.3	Moving connectors .....	87
6.4	Connections and mapping results .....	90
6.5	Missing items .....	91
6.6	Chained mappings / pass-through components .....	95
6.6.1	Chained mappings - Pass-through active .....	97
6.6.2	Chained mappings - Pass-through inactive .....	102
6.6.3	Chained mapping example .....	107
6.7	Using Functions .....	109
6.8	Previewing the transformation result .....	112
6.9	Validating mappings and mapping output .....	114
6.10	Loops, groups and hierarchies .....	117
6.11	Mapping rules and strategies .....	118

## 7 Sequence of processing mapping components 124

## 8 Global Resources 128

8.1	Global Resources - Files .....	129
8.1.1	Defining / Adding global resources .....	130
8.1.2	Assigning a global resource .....	133
8.1.3	Using / activating a global resource .....	135
8.2	Global Resources - Folders .....	137
8.3	Global Resources - Application workflow .....	140
8.3.1	Start application workflow .....	144
8.4	Global Resources - Properties .....	147

---

<b>9</b>	<b>Dynamic input/output files per component</b>	<b>152</b>
9.1	Dynamic file names - input / output .....	154
9.2	Dynamic file names as Input parameters .....	157
9.3	Multiple XML files from single XML source file .....	158
9.4	Relative and absolute file paths .....	160
<b>10</b>	<b>Intermediate variables</b>	<b>166</b>
10.1	Variables - use cases .....	171
<b>11</b>	<b>How To... Filter, Transform, Aggregate</b>	<b>176</b>
11.1	Filter components - Tips .....	178
11.2	Value-Map - transforming input data .....	180
11.2.1	Passing data through a Value-Map unchanged .....	183
11.2.2	Value-Map component properties .....	186
11.3	Aggregate functions: min, max, sum, count, avg .....	188
11.4	Mappings and root element of target documents .....	190
11.5	Boolean comparison of input nodes .....	191
11.6	Priority Context node/item .....	192
11.7	Merging multiple files into one target .....	193
11.8	Command line parameters .....	195
11.9	Command line - defining input/output files .....	197
11.10	Input parameters - default and preview settings .....	199
11.11	Node testing, position and grouping .....	202
11.11.1	Mapping missing nodes - using Not-exists .....	204
11.11.2	Position of context items in a sequence .....	206
11.11.3	Grouping nodes / node content .....	208
11.12	Using DTDs as "schema" components .....	214
11.13	Type conversion checking .....	215
11.14	Catalog files in MapForce .....	216
11.15	Derived XML Schema types - mapping to .....	220
11.16	Recursive user-defined mapping .....	222
11.16.1	Defining a recursive user-defined function .....	224
<b>12</b>	<b>StyleVision Power Stylesheets in Preview</b>	<b>232</b>

---

12.1	Assigning an SPS file to a component .....	234
<b>13</b>	<b>Documenting mapping projects</b>	<b>238</b>
13.1	Supplied SPS stylesheets .....	244
13.2	User-Defined Design .....	247
<b>14</b>	<b>Nil Values / Nillable</b>	<b>250</b>
<b>15</b>	<b>HL7 v3.x to/from XML schema mapping</b>	<b>254</b>
<b>16</b>	<b>Libraries and Functions</b>	<b>256</b>
16.1	Defining User-defined functions .....	257
16.1.1	Function parameters .....	263
16.1.2	Inline and regular user-defined functions .....	266
16.1.3	Creating a simple look-up function .....	268
16.1.4	Complex user-defined function - XML node as input .....	273
	<i>Complex input components - defining</i> .....	274
16.1.5	Complex user-defined function - XML node as output .....	279
	<i>Complex output components - defining</i> .....	279
16.1.6	User-defined function - example .....	284
16.2	Adding custom XSLT and XQuery functions .....	289
16.2.1	Adding custom XSLT 1.0 functions .....	290
16.2.2	Adding custom XSLT 2.0 functions .....	294
16.2.3	Aggregate functions - summing nodes in XSLT1 and 2 .....	295
16.3	Functions Reference .....	298
16.3.1	core .....	299
	<i>aggregates</i> .....	299
	<i>conversion functions</i> .....	302
	<i>file path functions</i> .....	310
	<i>generator functions</i> .....	312
	<i>logical functions</i> .....	314
	<i>math functions</i> .....	316
	<i>node functions</i> .....	318
	<i>sequence functions</i> .....	321
	<i>string functions</i> .....	322
	Tokenize examples.....	326
	Regular expressions.....	329

16.3.2	xpath2 .....	333
	<i>accessors</i> .....	333
	<i>anyURI functions</i> .....	333
	<i>boolean functions</i> .....	334
	<i>constructors</i> .....	334
	<i>context functions</i> .....	335
	<i>durations, date and time functions</i> .....	336
	<i>node functions</i> .....	338
	<i>numeric functions</i> .....	339
	<i>qname-related functions</i> .....	339
	<i>string functions</i> .....	340
16.3.3	xslt .....	343
	<i>xpath functions</i> .....	343
	<i>xslt functions</i> .....	345
<b>17</b>	<b>QName support</b>	<b>350</b>
<b>18</b>	<b>User Reference</b>	<b>354</b>
18.1	File .....	355
18.2	Edit .....	358
18.3	Insert .....	359
18.4	Component .....	361
18.5	Connection .....	365
18.6	Function .....	370
18.7	Output .....	373
18.8	View .....	375
18.9	Tools .....	377
18.10	Window .....	383
18.11	Help Menu .....	384
	18.11.1 Table of Contents, Index, Search .....	385
	18.11.2 Activation, Order Form, Registration, Updates .....	386
	18.11.3 Other Commands .....	387
<b>19</b>	<b>Appendices</b>	<b>390</b>
19.1	Engine information .....	391
	19.1.1 XSLT 1.0 Engine: Implementation Information .....	392
	19.1.2 XSLT 2.0 Engine: Implementation Information .....	394

	<i>General Information</i> .....	394
	<i>XSLT 2.0 Elements and Functions</i> .....	396
19.1.3	Extensions .....	397
	<i>Java Extension Functions</i> .....	397
	User-Defined Class Files.....	398
	User-Defined Jar Files.....	400
	Java: Constructors.....	401
	Java: Static Methods and Static Fields.....	402
	Java: Instance Methods and Instance Fields.....	402
	Datatypes: XPath/XQuery to Java.....	403
	Datatypes: Java to XPath/XQuery.....	404
	<i>.NET Extension Functions</i> .....	404
	.NET: Constructors.....	406
	.NET: Static Methods and Static Fields.....	407
	.NET: Instance Methods and Instance Fields.....	407
	Datatypes: XPath/XQuery to .NET.....	408
	Datatypes: .NET to XPath/XQuery.....	409
	<i>MSXSL Scripts for XSLT</i> .....	409
	<i>Altova Extension Functions</i> .....	411
	General Functions.....	412
19.2	Technical Data .....	416
19.2.1	OS and Memory Requirements .....	417
19.2.2	Altova XML Parser .....	418
19.2.3	Altova XSLT and XQuery Engines .....	419
19.2.4	Unicode Support .....	420
	<i>Windows XP</i> .....	420
	<i>Right-to-Left Writing Systems</i> .....	421
19.2.5	Internet Usage .....	422
19.3	License Information .....	423
19.3.1	Electronic Software Distribution .....	424
19.3.2	Software Activation and License Metering .....	425
19.3.3	Intellectual Property Rights .....	426
19.3.4	Altova End User License Agreement .....	427

## Index

# Chapter 1

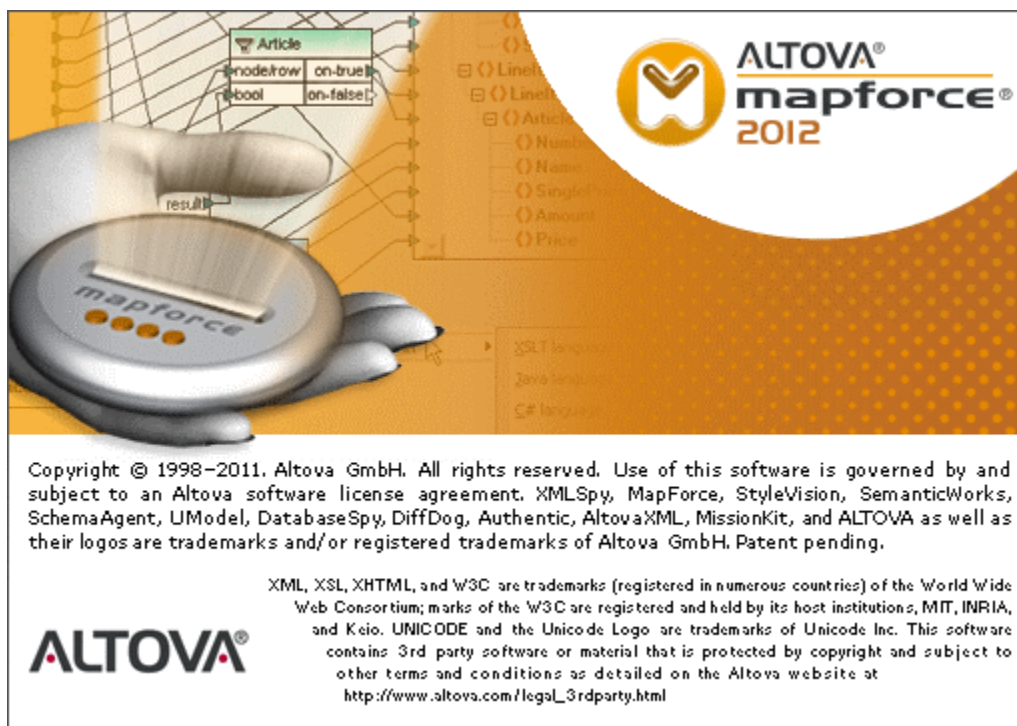
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MapForce 2012



# 1 MapForce 2012

**MapForce® 2012 Basic Edition** is a visual data mapping tool for advanced data integration projects. MapForce® is a 32/64-bit Windows application that runs on Windows 7, Windows Vista, Windows Server 2003/2008, and Windows XP. 64-bit support is available for the Enterprise and Professional editions.



Last updated: 10/07/2011



## Chapter 2

---

What's new...

## 2 What's new...

New features in MapForce Version **2012** include:

- [Auto-alignment](#) of components in the mapping window
- Prompt to connect to [target parent](#) node
- Specific rules governing the [sequence](#) that components are processed in a mapping

New features in MapForce Version **2011R3** include:

- [Intermediate variables](#)

New features in MapForce Version 2011R2 include:

- [Find function](#) capability in Library window
- [Reverse](#) mapping
- Extendable [IF-ELSE](#) function
- [Node Name](#) and [parsing](#) functions in Core Library
- New option of using StyleVision Power Stylesheets when [documenting](#) a mapping

New features in MapForce Version 2011 include:

- Ability to preview target components using [StyleVision](#) Power Stylesheets
- Ability to preview intermediate components in a [mapping chain](#) of two or more components connected to a target component (pass-through preview).
- Formatting functions for [dateTime](#) and [numbers](#) for all supported languages
- Enhancement to [auto-number](#) function
- New timezone functions: remove-timezone and convert-to-utc

New features in MapForce Version 2010 Release 3 include:

- Support for [Nillable values](#), and xsi:nil attribute in XML instance files
- Ability to disable automatic [casting to target](#) types in XML documents

New features in MapForce Version 2010 Release 2 include:

- Automatic connection of identical [child connectors](#) when moving a parent connector
- Ability to [tokenize input](#) strings for further processing

New features in MapForce Version 2010 include:

- [Multiple input/output](#) files per component
- Upgraded [relative path](#) support
- xsi:type support allowing use of [derived types](#)
- New internal data type system
- Improved user-defined [function navigation](#)
- Enhanced handling of [mixed content](#) in XML elements

New features in MapForce Version 2009 SP1 include:

- [Parameter order](#) in user-defined functions can be user-defined
- Ability to process XML files that are [not valid](#) against XML Schema
- [Regular](#) (Standard) user-defined functions now support complex hierarchical parameters

New features in MapForce Version 2009 include:

- EDI [HL7 versions 3.x](#) XML as source and target components
- [Grouping of nodes](#) or node content
- Ability to filter data based on a [nodes position](#) in a sequence
- [QName](#) support
- Item/node [search](#) in components

New features in MapForce Version 2008 Release 2 include:

- Ability to automatically [generate XML Schemas](#) for XML files
- Support for Altova [Global Resources](#)
- Performance optimizations

New features in MapForce Version 2008 include:

- [Aggregate](#) functions
- [Value-Map](#) lookup component
- Enhanced XML output options: [pretty print](#) XML output, omit [XML schema](#) reference and [Encoding settings](#) for individual components
- Various internal updates

New features in MapForce Version 2007 Release 3 include:

-



# Chapter 3

---

## MapForce overview

### 3 MapForce overview

Altova web site:  [Introduction to MapForce](#)

#### What is mapping?

Basically the contents of a component are mapped, or transformed, to another component. An XML, or text document can be mapped to a different target XML document. The transformation is accomplished by an automatically generated XSLT 1.0 or 2.0 Stylesheet.

MapForce also has the ability to have a single component process multiple input files of a directory and output multiple files to a single component as well.

When creating an XSLT transformation, a **source schema** is mapped to a **target schema**. Thus elements/attributes in the source schema are "connected" to other elements/attributes in the target schema. As an XML document instance is associated to, and defined by, a schema file, you actually end up mapping two XML documents to each other.

MapForce® supports:

- Graphical mapping from and to any combination and any number of:
  - XML Schemas as source and target
- **Professional** Edition, additionally:
  - Flat files: delimited (CSV) and fixed-length formats as source and target
  - Relational databases as source and target
- **Enterprise** Edition, additionally:
  - EDI files: UN/EDIFACT, ANSI X12 including HIPAA, HL7 2.x, IATA PADIS, and SAP IDocs as source and target
  - FlexText™ files as source and target
  - Office Open XML Excel 2007 and higher files, as source and target
  - XBRL instance files and taxonomies
- Automatic code generation
  - XSLT 1.0 and 2.0
- **Professional** Edition and **Enterprise** Edition, additionally:
  - XQuery
  - Java, C# and C++
  - 64-bit version support
- On-the-fly transformation and preview of all mappings, without code generation or compilation
- Ability to preview intermediate components in a mapping chain of two or more components connected to a target component (pass-through preview).
- Ability to preview output of target components using StyleVision Power Stylesheets
- Powerful visual function builder for creating user-defined functions
- Accessing MapForce user interface and functions through MapForce API (ActiveX control)
- Definition of custom XSLT 1.0 and 2.0 libraries
- Support for XPath 2.0 functions in XSLT 2.0 and XQuery
- Definition of user-defined functions/components, having complex in/outputs
- Support for source-driven / mixed content mapping and copy-all connections
- Automatic retention of mapping connectors of missing nodes/items
- Support for HL7 version 3.x. as it is XML Schema based

**Professional** Edition, additionally:

- XML data mapping to/from databases - IBM DB2 and others
- Direct querying of databases
- SQL-WHERE filter and SQL statement wizard
- SQL SELECT statements as mapping data sources
- Integration of custom C++, Java and C# functions
- Project management functions to group mappings
- MapForce plug-in for Eclipse 3.4 / 3.5 / 3.6
- MapForce for Microsoft Visual Studio
- Documentation of the mapping design

**Enterprise** Edition, additionally:

- Creation of SOAP 1.1 and SOAP 1.2 Web service projects and mapping of Web service operations from WSDL 1.1 and 2.0 files
- Direct calling of Web service functions
- FlexText™: advanced legacy file processing

All transformations are available in one workspace where multiple sources and multiple targets can be mixed, and a rich and extensible function library provides support for any kind of data manipulation.

## 3.1 Terminology

The terms used in this documentation are defined below.

### Library

A Library is a collection of functions visible in the Libraries window. There are several types of functions, core and language specific, as well as user-defined and custom functions. Please see the section on [functions](#) for more details.

### Component

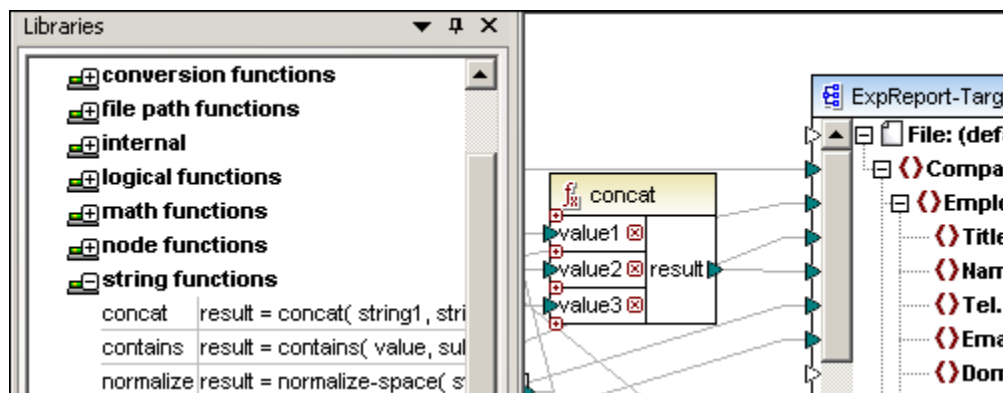
In MapForce many of graphical elements you can insert/import or place in the Mapping tab, become components. Components have small **triangles** which allow you to map data between source and target components by creating connections between them.

The following files become components when placed in the mapping area:

- Schemas and DTDs: Source and target schemas
- 
- Function types: XSLT/XSLT2, as well as Constants, Filters and Conditions

### Function

A function is predefined component that operates on data e.g. **Concat**. Functions have input and/or output **parameters**, where each parameter has its own input/output icon. Functions are available in the Libraries window and are logically grouped; hitting CTRL+F allows you to search for a function. Dragging a function into the Mapping window creates a function component. Please see the section [Functions and Libraries](#) for more details.

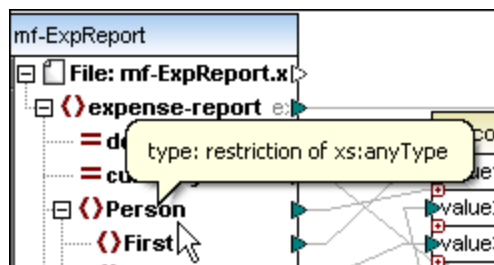


*Java selected*

### Item

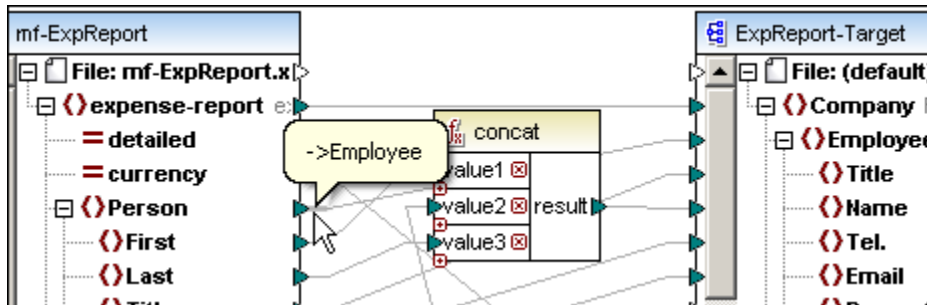
An item represents the data that can be mapped from component to component. An item can be either an **element**, an **attribute**.

Each **item** has an **input** and **output** icon. It is not mandatory that items be of the same type (element or attribute) when you create a mapping between them.



### Input, Output icon

The small triangles visible on components are **input** and **output** icons. Clicking an icon and dragging, creates a **connector** which connects to another icon when you "drop" it there. The connector **represents a mapping** between the two sets of data the icons represent. Please see the section "[Mapping between components](#)" for more information.



### Connector

The connector is the **line** that joins two icons. It represents the **mapping** between the two sets of data the icons represent. Please see the section "[Mapping between components](#)" for more information.

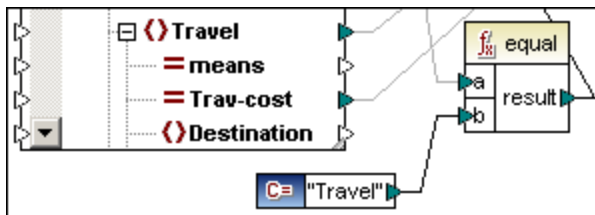
Several types of connector can be defined:

- Target Driven (Standard) connectors, see: "[source-driven / mixed content vs. standard mapping](#)"
- Copy-all connectors, please see "[Copy-all connections](#)"
- Source Driven (mixed content) connectors, see "[source driven and mixed content mapping](#)"



### Constant

A constant is a component that supplies fixed data to an input icon of a function or component. E.g. the string "Travel" is connected to the "b" parameter of the equal function. The data is entered into a dialog box when creating, or double clicking, the component. There is only one output icon on a constant function. You can select from the following types of data: String, Number, and All other (String).



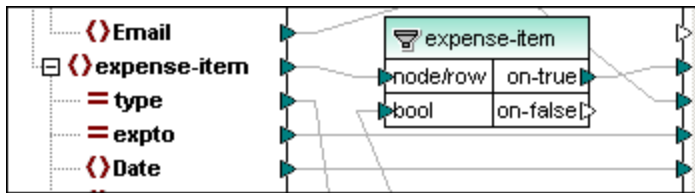
### Variable

Inserts an Intermediate Variable which is equivalent to a regular (non-inline) user-defined function. Variables are structural components, without instance files, and are used to simplify the mapping process.



### Filter: Node/Row

A filter is a component that filters data using two input and output parameters: **node/row** and **bool**, and **on-true**, **on-false**. If the Boolean is true, then the value/content of the node/row parameter is forwarded to the **on-true** parameter.

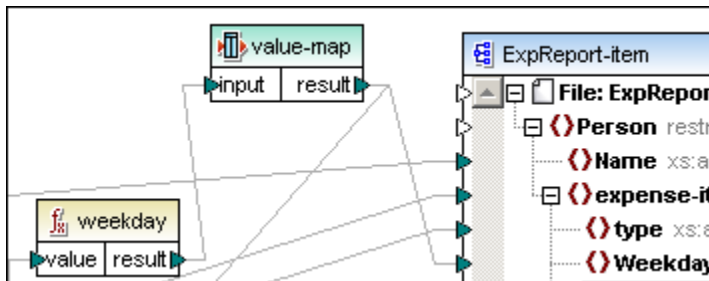


The **on-false** output parameter, outputs the complement node set defined by the mapping, please see [Multiple target schemas / documents](#) for more information.



### Value-Map

The Value-Map component allows you to transform a set of input data, into a different set of output data, using a type of lookup table.

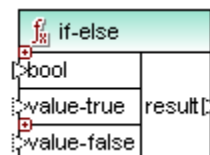


Double clicking the component, opens the value map table. The left column of the table defines the input, while the right column defines the transformed data you want to output.



### IF-Else Condition

A condition is a component which allows you to pass on different sets of data depending on the outcome of a preset condition. The component header displays the text **if-else**. Please see [Condition](#), in the Reference section for an example.



- The first input parameter is a **bool**, which contains the data you are checking against.
- The **value-true** input parameter supplies the data to be passed on, as a result, if the condition is true.
- The **value-false** supplies the data to be passed on if the condition is false.
- The **result** parameter outputs the data supplied by the value-true/false input parameters.

The IF-Else function is now **extendable**. This means that you can check for multiple IF values and use the **otherwise** parameter to output the Else condition/value. Please see [Insert | If-Else](#) for more information.

# Chapter 4

---

## MapForce tutorial

## 4 MapForce tutorial

This tutorial takes you through several tasks which provide an overview of how to use MapForce 2012 to its fullest.

The goal of this tutorial is to map a simple employee travel expense report to a more complex company report. In our tutorial example, each employee fills in the fields of the personal report. This report is mapped to the company report and routed to the Administration department. Extra data now has to be entered in conjunction with the employee, the result being a standardized company expense report.

In this tutorial, you will learn how to:

- [Set up the mapping environment](#)
- Map the source XML file (the personal expense report) to the output target (the company expense travel report)
- Apply filters to the source data
- Generate an XSLT transformation file
- Transform the source data to the output target using the generated XSLT file

### Installation and configuration

This tutorial assumes that you have successfully installed MapForce on your computer and received a free evaluation key-code, or are a registered user of the product. The evaluation version of MapForce is fully functional but limited to a 30-day period. You can request a regular license from our secure web server or through any one of our resellers.

### Tutorial example files

The tutorial makes use of the following components:

- Source and (multiple) target schemas
- Several functions including: concat, filter, equal and constants

All the files used in this tutorial are initially available in the C:\Documents and Settings\All Users\Application Data\Altova folder. When any single user starts the application for the first time, the example files for that user are copied to the [...\MapForceExamples\Tutorial\](#) folder. Therefore do not move, edit, or delete the example files in the initial ...All Users\.... folder.

The XSLT and transformed XML files are also supplied. The following files are used in the tutorial:

Personal expense report:

- Tut-ExpReport.mfd      The expense report mapping (single target)
- Tut-ExpReport-multi.mfd      The multi-schema target expense report mapping
- 
- mf-ExpReport.xml      Personal expense report XML instance document
- mf-ExpReport.xsd      Associated schema file

Company expense report:

- ExpReport-Target.xml Company expense report XML instance document  
Associated schema file
- ExpReport-Target.xsd

## File paths in Windows XP, Windows Vista, and Windows 7

File paths given in this documentation will not be the same for all operating systems. You should note the following correspondences:

- (My) Documents folder: The My Documents folder of Windows XP is the Documents folder of Windows Vista and Windows 7. It is located by default at the following respective locations. Example files are usually located in a sub-folder of the (My) Documents folder.

Windows XP	C:\Documents and Settings\ <username>\My Documents</username>
Windows Vista, Windows 7	C:\Users\ <username>\Documents</username>

- **Application folder:** The Application folder is the folder where your Altova application is located. The path to the Application folder is, by default, the following.

Windows XP	C:\Program Files\Altova
Windows Vista, Windows 7	C:\Program Files\Altova
32 bit Version on 64-bit OS	C:\Program Files (x86)\Altova

## 4.1 Setting up the mapping environment

This section deals with defining the source and target schemas we want to use for the mapping.

### Objective

In this section of the tutorial, you will learn how to [set up the mapping environment](#) in MapForce. Specifically, you will learn how to:

- Create the source and target schema components
- Define the source XML file
- Select the root element of the target schema

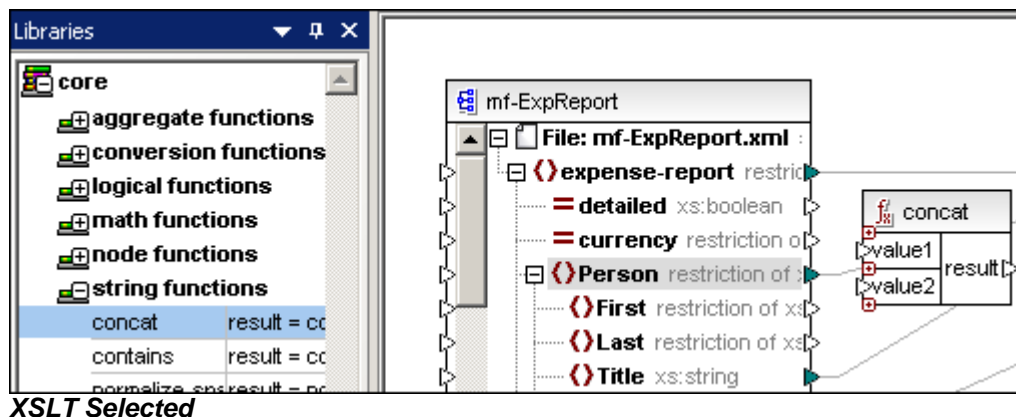
### Commands used in this section



**Insert XML Schema/File:** Click this icon to open the standard Windows **Open** dialog box and select the file from your file system.

Please note:

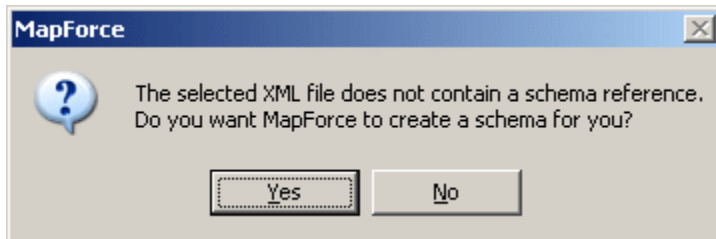
The **XSLT selected** text shown below the Libraries window of every screenshot, shows the currently selected target/output language that is used when you click the Output button to preview the mapping. The selection of the target/output language also determines the functions available in the Libraries window.



### 4.1.1 Adding components to the Mapping pane


After you have started MapForce, you must add the source and target files to a Mapping pane; this can also be done by dragging files from Windows Explorer and dropping them into a Mapping pane.

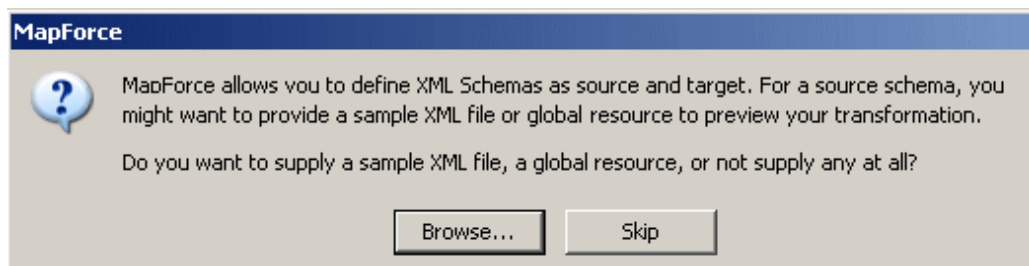
MapForce can automatically generate an XML schema based on an existing XML file if the XML Schema is not available. A dialog box automatically appears, prompting you if an accompanying XML Schema file cannot be found when inserting an XML file using the Insert XML Schema / File menu item.



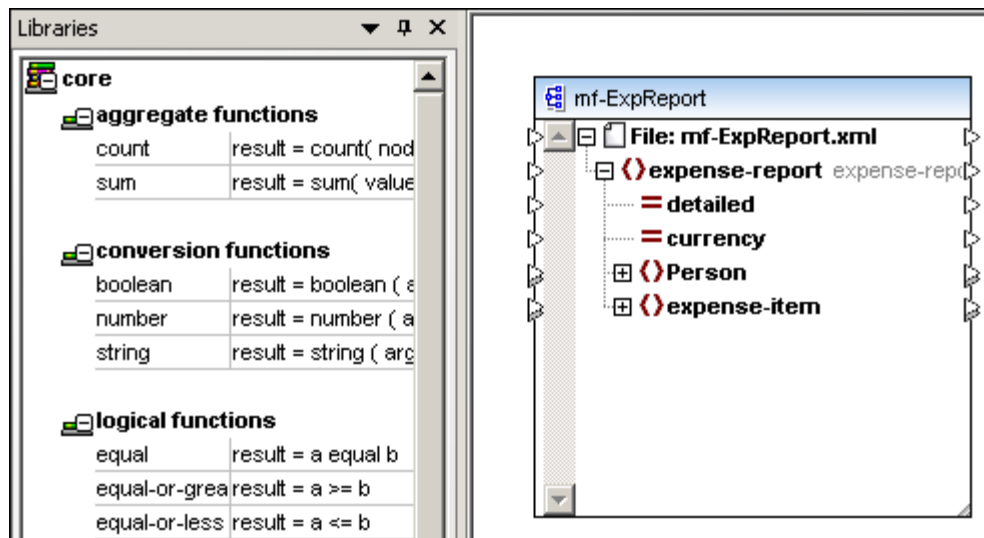
When generating a schema from an XML file, data types for elements/attributes must be inferred from the XML instance document and may not be exactly what you expect. Please check whether the generated schema is an accurate representation of the instance data.

#### To create the source schema component:


1. Click the **Insert XML Schema/File**  icon or select the menu option **Insert | XML Schema/File...**
2. In the **Open** dialog box, browse to the Tutorial subfolder of the ...\\MapForce2012\\MapForceExamples folder and select the **mf-ExpReport.xsd** file.  
You are now prompted for a sample XML file to provide the data for the preview tab.

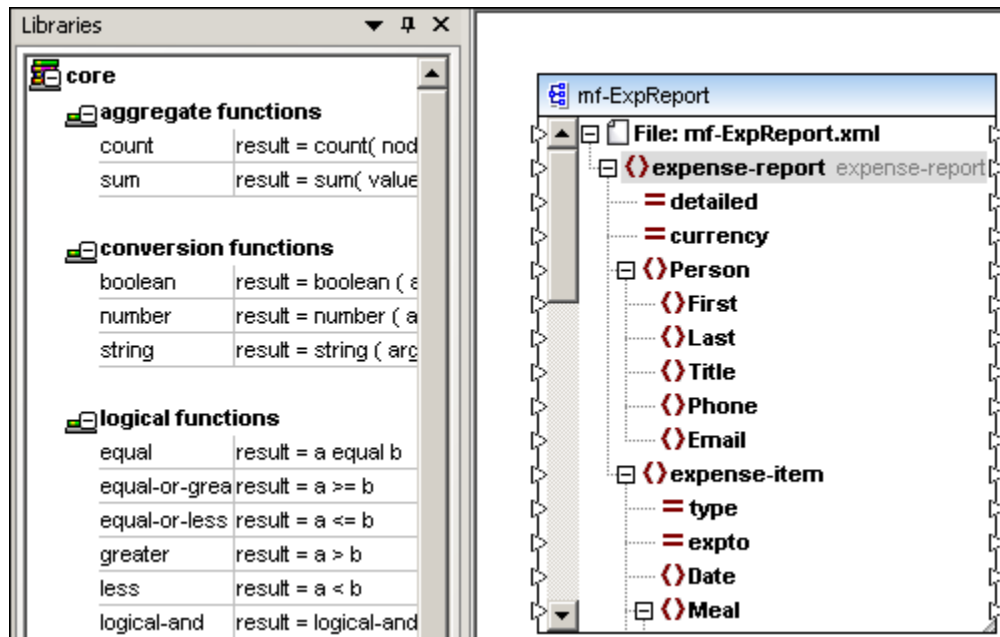


3. Click the **Browse...** button, and select the **mf-ExpReport.xml** file.  
The source schema component now appears in the Mapping pane.



**XSLT selected**

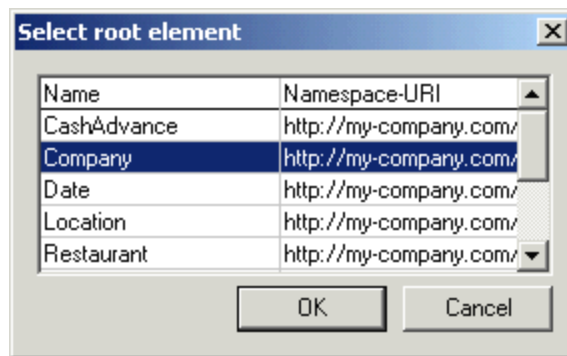
4. Click the **expense-report** item/element (of the component) and hit the \* key, on the numeric keypad, to view all the items.
5. Click the resize corner  at the lower right of the component, and drag to resize it. Note: double clicking the resize corner, resizes the component to a "best fit", encompassing all items.



**XSLT Selected**

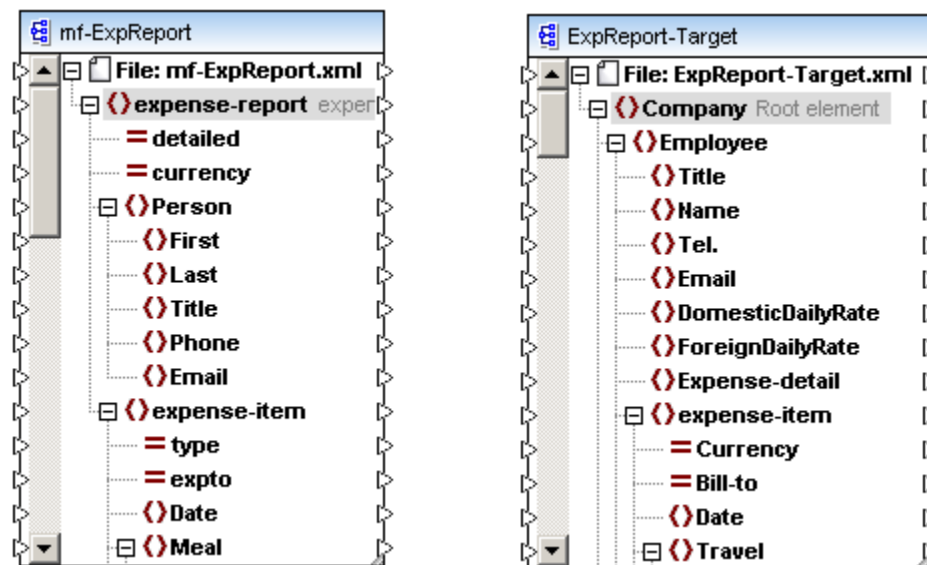
#### To create the target schema component:

1. Click the **Insert XML Schema/File** icon or select the menu option **Insert | XML Schema/File...**
2. Select the **ExpReport-Target.xsd** file from the **Open** dialog box. You are now prompted for a sample XML file for this schema.
3. Click the **Skip** button, and select **Company** as the root element of the target document.



The target schema component now appears in the mapping tab.

4. Click the **Company** entry and hit the \* key on the numeric keypad to view all the items.
5. Double click the resize corner icon to resize the component.



We are now ready to start mapping schema items from the source to the target schema.

Note: when dragging components, [autoalignment](#) guide lines appear allowing easy placement.

## 4.2 Creating a mapping

In the previous section, you [defined the source and target schema components](#) of your mapping. We will now start mapping the actual data.

### Objective

To learn how to map the source and target components and fine-tune your mapping result using functions and filters.

- Using connectors to [map schema items](#)
- [Use a concat function](#) to combine elements of the source data
- [Filter source data](#) to pass on only specific expenses to the target report

### Commands used in this section



**Auto Connect Matching Children:** Click this icon to toggle the automatic connection of matching child nodes, on and off.



**Insert Constant:** Click this icon to add a constant component to the currently active Mapping pane.



**Filter: Nodes/Rows:** Click this icon to add a filter component to the currently active Mapping pane.

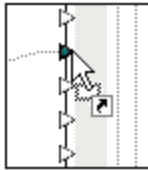
Altova web site:  [Mapping data - data integration](#) and [XML mapping](#)

### 4.2.1 Mapping schema items

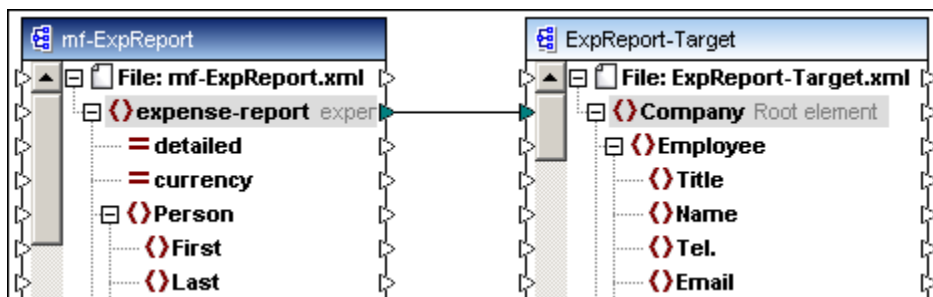
This section deals with defining the mappings between the source and target schema items.

#### To map the mf-ExpReport and ExpReport-Target schemas:

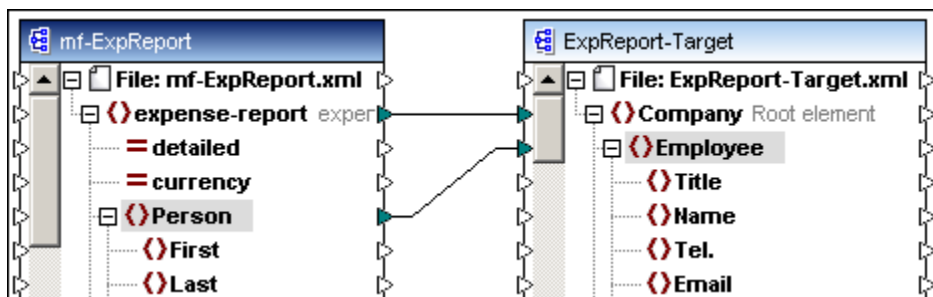
1. Click the **expense-report** item in the mf-ExpReport source schema and drag. A connector line is automatically created from the output icon and is linked to the mouse pointer which has now changed shape.
2. Move the mouse pointer near to the **Company** item in the ExpReport-Target schema, and "drop" the connector the moment the mouse pointer changes back to the arrow shape. A small link icon appears below the mouse pointer, and the input icon and item name in the target component, are highlighted when the drop action is possible.




A connector has now been placed between the source and target schemas. A mapping has now been created from the schema source to the target document.

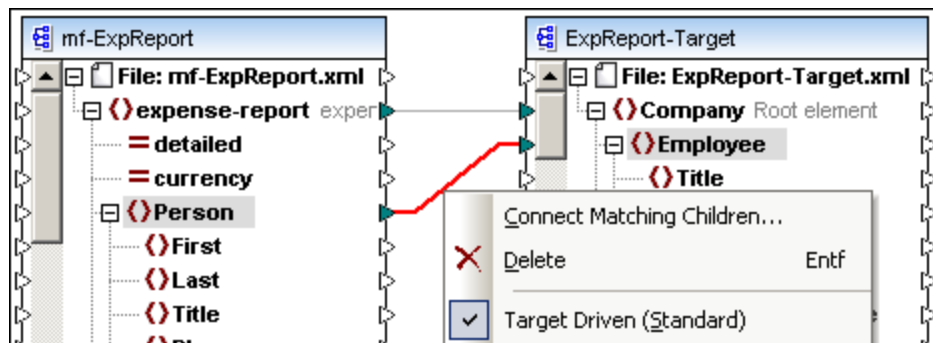


3. Use the above method to create a mapping between the Person and Employee items.

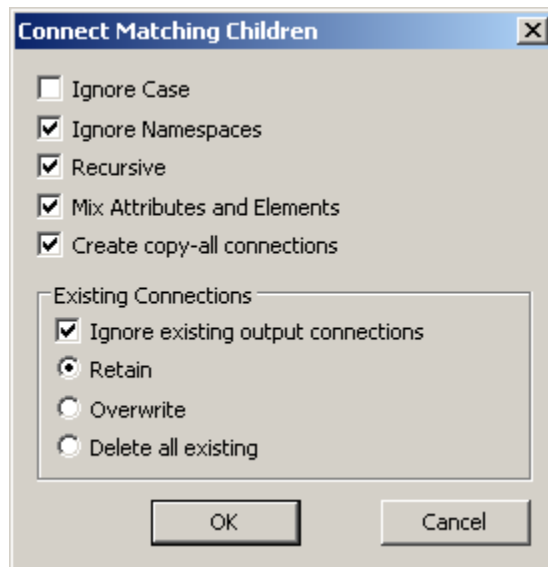


If the **Auto Connect Matching Children**  icon is active, then the Title and Email items will also be connected automatically, if not:

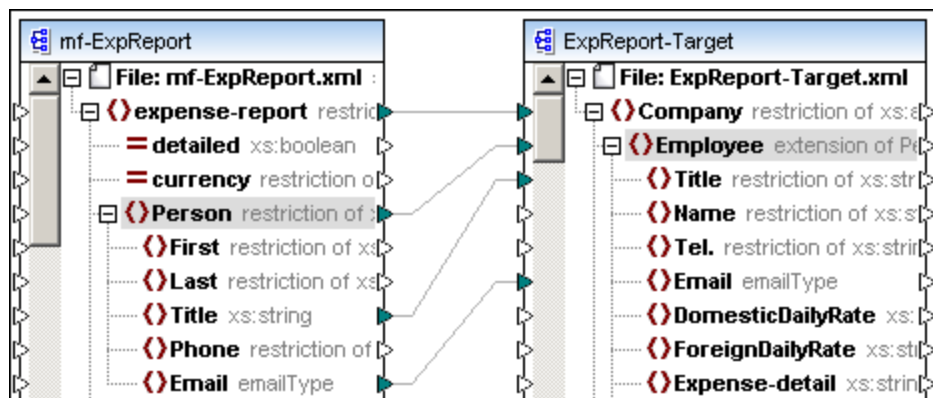
4. Right-click the "Person" connector and select **Connect Matching Children...** from the pop-up menu.



This opens the **Connect Matching Children** dialog box.



5. Activate the check boxes as shown above and click **OK** to confirm. For more information please see the section on [Connector properties](#).



Mappings have been automatically created for the **Title** and **Email** items of both schemas.

6. Click the Output button to see the result in the Output pane.

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <Company xmlns="http://my-company.com/namespace" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
3   <Employee>
4     <Title>Project Manager</Title>
5     <Email>f.landis@nanonull.com</Email>
6   </Employee>
7 </Company>
8
```

You will notice that the Title and Email fields contain data originating from the XML Instance document.

7. Click the Mapping button to return to the Mapping pane and continue mapping.

**Please note:** The settings you select in the **Connect Matching Children** dialog box, are retained until you change them. These settings can be applied to a connection by either: using the context menu, or by clicking the [Auto connect child items](#) icon to activate, or deactivate this option.

## 4.2.2 Using functions to map data

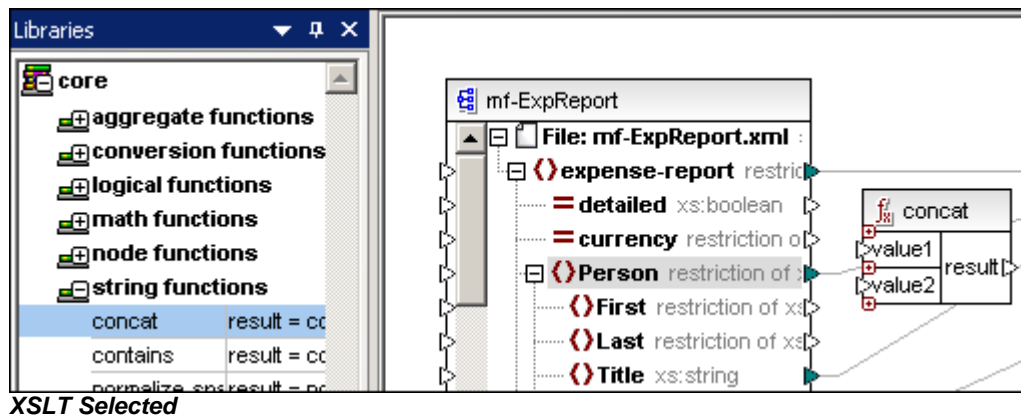
The aim of this section is to combine two sets of data from the source schema, and place the result in a single item in the target document. This will be done by:

- Using the **Concat** string function to combine the **First** and **Last** elements of the source schema
- Using a **Constant** function to supply the space character needed to separate both items
- Placing the result of this process into the **Name** item of the target schema.

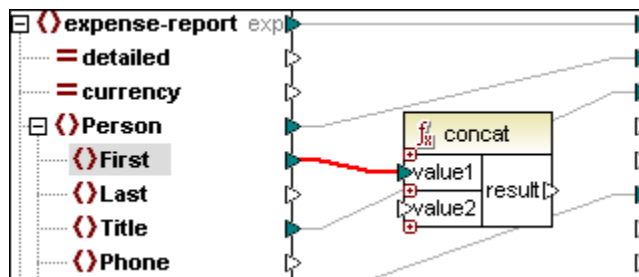
Please note that some of the previously defined mappings are not shown in the following screen shots for the sake of clarity.

### To combine items by using functions:

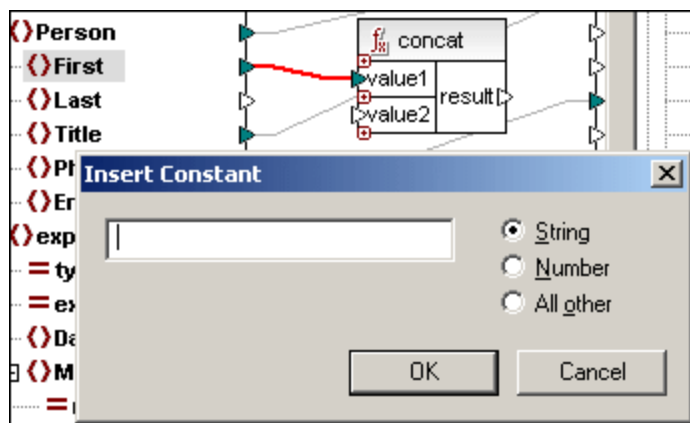
1. In the Libraries tab, expand the **string functions** group in the **core** library, click the **concat** entry, and drag it into the Mapping pane.



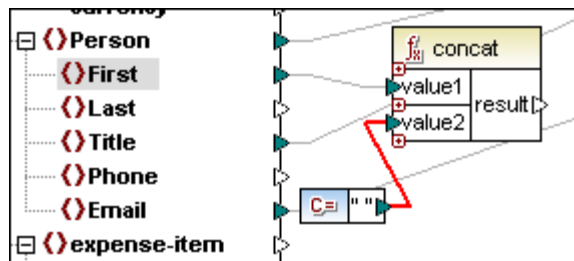
2. In the mf-ExpReport component, select item **First** and, keeping the mouse button pressed, create a connection by dragging the mouse cursor to the **value1** input of the concat component.



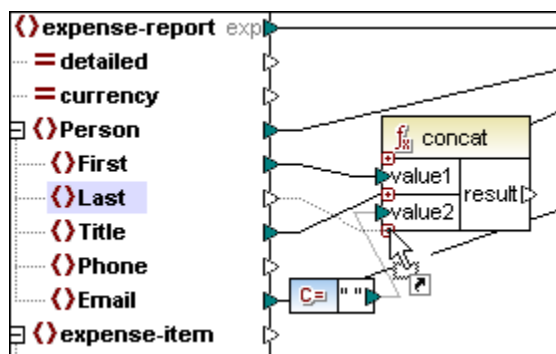
3. Right-click on the background near **value2** and select **Insert Constant** from the context menu, to insert a constant component.



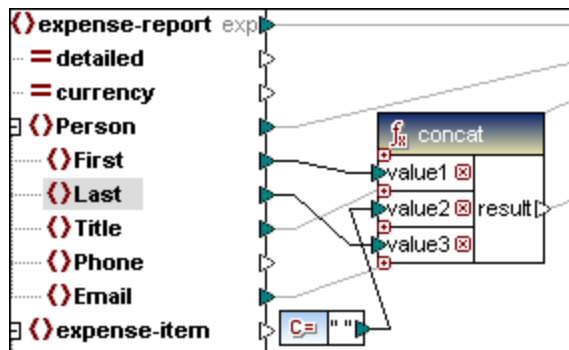
4. Enter a space character in the text box and click **OK**.  
The constant component is now in the working area. Its contents are displayed next to the output icon.
5. Create a connection between the **constant** component and **value2** of the concat component.



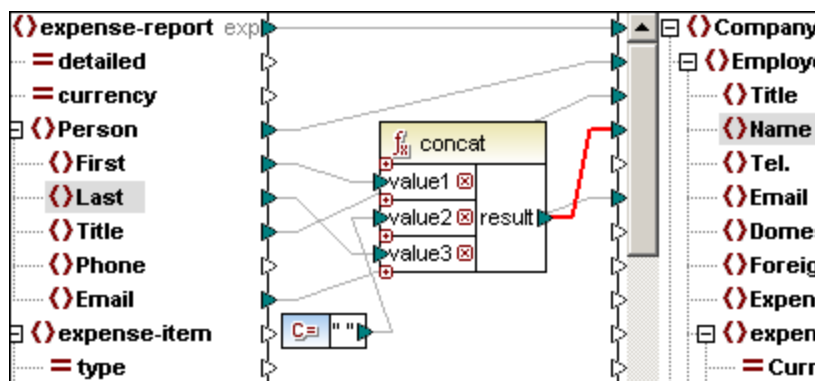
6. In the mf-ExpReport component, click the item **Last** and drop the connector on the "+" icon of the concat function, just below **value2**. The mouse cursor changes to show when you can drop the connector.



This automatically enlarges the concat function by one more item (value), to which the Last item is connected.



7. Connect the **result** icon of the concat component, to the **Name** item in the target schema.



8. Click the **Output** button to see the result of the current mapping in the Output pane.

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <Company xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3  <Employee>
4    <Title>Project Manager</Title>
5    <Name>Fred Landis</Name>
6    <Email>f.landis@nanonull.com</Email>
7  </Employee>
8  </Company>
9

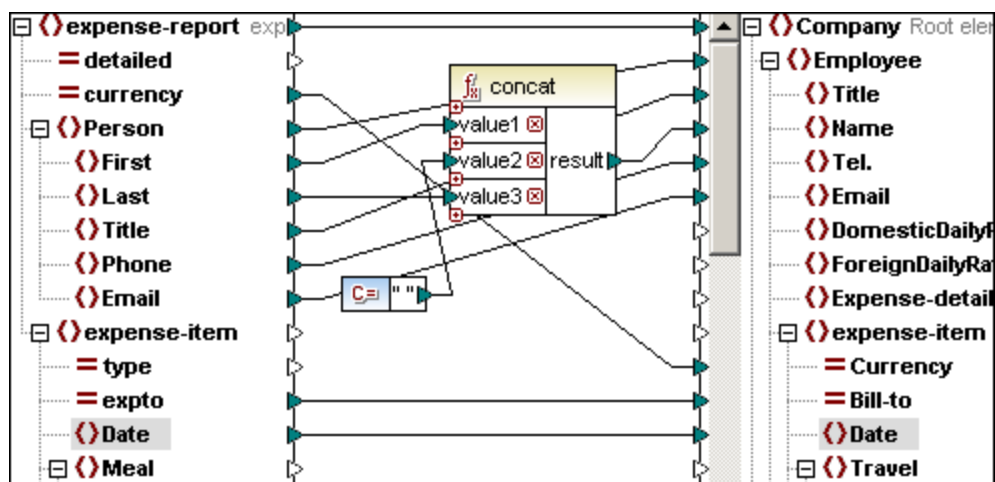
```

You will see that the Person name "Fred Landis" is now contained between the **Name** tags. The first and last name have been separated by a space character as well.

### Mapping the rest of the personal data

Create mappings between the following items:

- currency to Currency
- Phone to Tel.
- expto to Bill-to
- Date to Date



Click the Output button to see the result.

```
<?xml version="1.0" encoding="UTF-8"?>
<Company xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schema
  <Employee>
    <Title>Project Manager</Title>
    <Name>Fred Landis</Name>
    <Tel.>123-456-78</Tel.>
    <Email>f.landis@nanonull.com</Email>
    <expense-item Currency="USD" Bill-to="Sales">
      <Date>2003-01-02</Date>
      <Date>2003-01-01</Date>
      <Date>2003-07-07</Date>
      <Date>2003-02-02</Date>
      <Date>2003-03-03</Date>
    </expense-item>
  </Employee>
</Company>
```

There are currently five items originating from the assigned XML instance file.


Please note: Functions can be grouped into user-defined functions/components to optimize screen usage. Please see the section on [User-defined functions/components](#) for an example on how to combine the concat and constant functions into a single user-defined function/component.

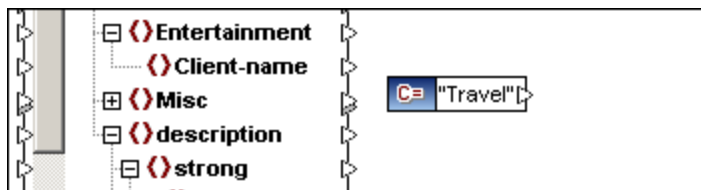
### 4.2.3 Filtering data

The aim of this section is to filter out the Lodging and Meal expenses, and only pass on the Travel expenses to the target schema/document. This will be done by:

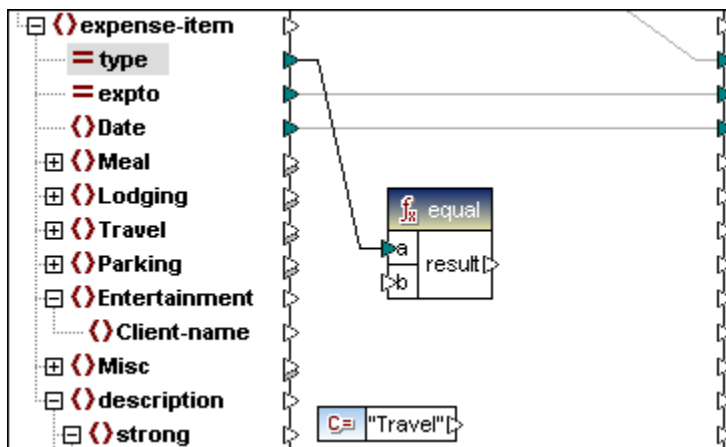
- Using the **Equal** function to test the value of a source item
- Using a **Constant** function to supply the comparison string that is to be tested
- Using the **Filter** component which passes on the Travel data, if the bool input value is true
- Placing the on-true result of this process, into the **expense-item** element of the target schema/document.

To filter data:

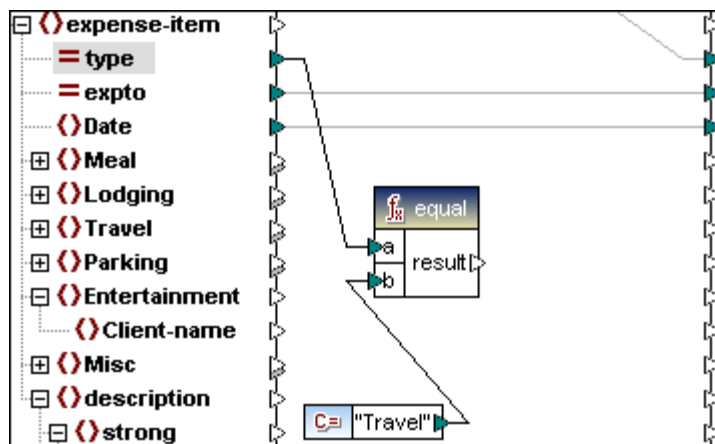
1. Click the **Insert Constant**  button to insert a constant component and enter the string **"Travel"** into the input field.



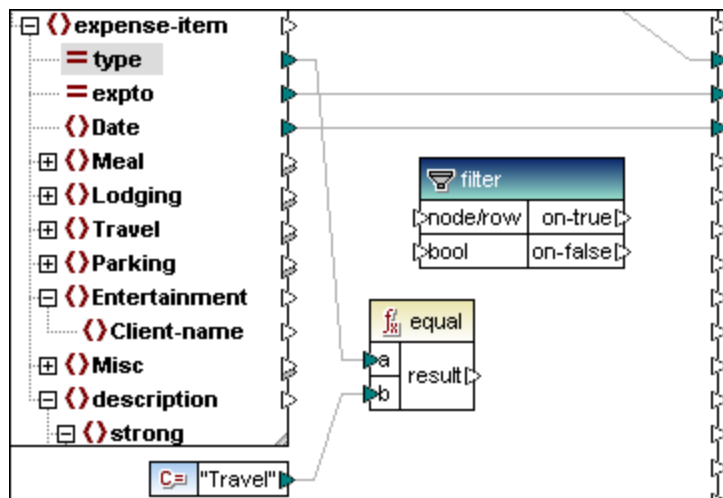
2. In the Libraries tab, expand the **logical functions** group in the **core** library and drag the logical function **equal** into the Mapping pane.
3. Connect the (expense-item) **type** item in the source schema to the **a** parameter of the equal function.



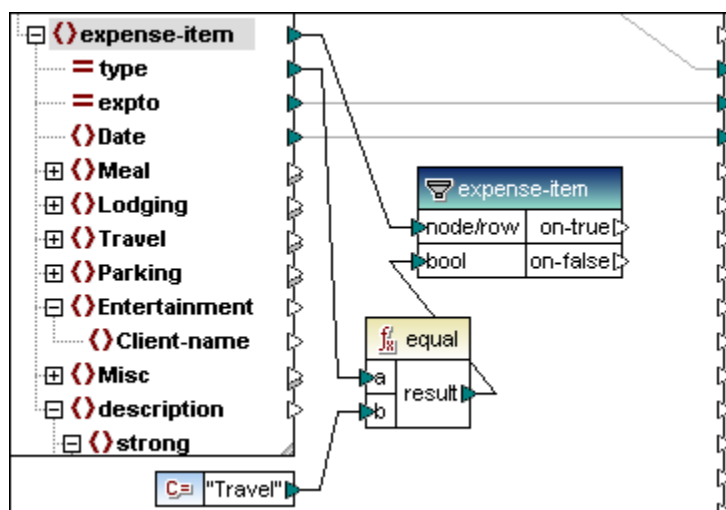
4. Connect the **result** icon of the "Travel" **constant** component, to the **b** parameter of the equal function.



5. Select the menu option **Insert | Filter: Nodes/Rows**.

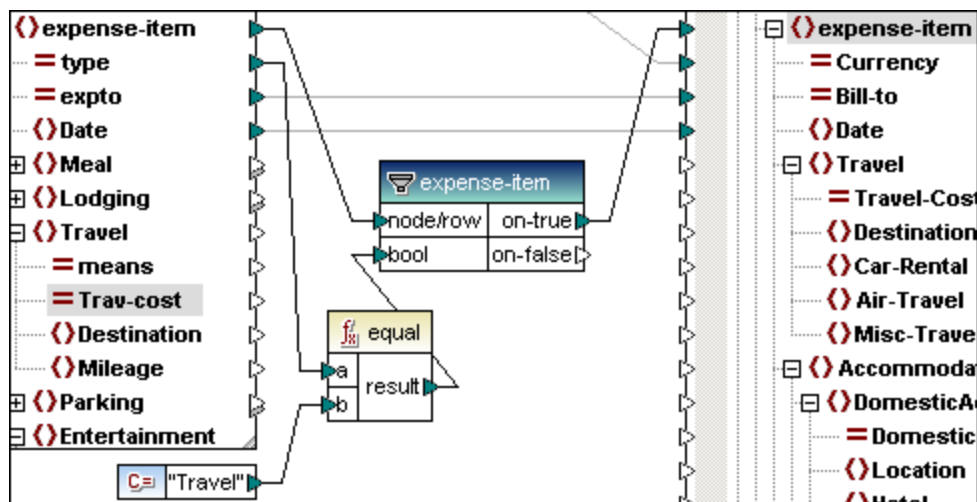


6. Connect the **result** icon of the **equal** component, to the **bool** parameter of the **filter** component.
7. Connect the **expense-item** icon of the source schema with the **node/row** parameter of the filter component.

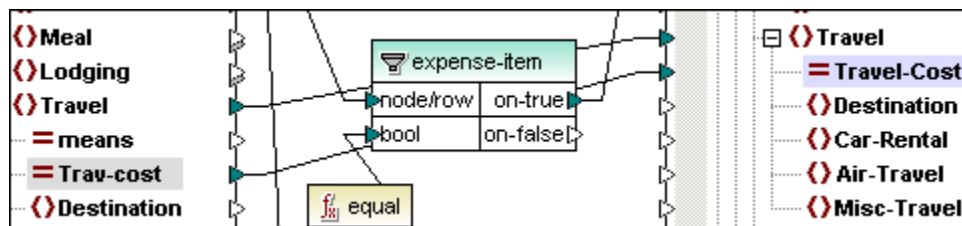


Note that the filter component name, now changes to "expense-item".

8. Connect the **on-true** icon of the **filter** component with the **expense-item** element of the target document.



9. Connect the **Travel** item in the source schema, with the **Travel** item in the target schema/document.
10. Connect the **Trav-cost** item with the **Travel-Cost** item in the target schema/document.



11. Click the **Output** button to see the result in the Output pane.

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <Company xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.w3.org/2001/XMLSchema-instance http://www.w3.org/2001/XMLSchema-instance">
3    <Employee>
4      <Title>Project Manager</Title>
5      <Name>Fred Landis</Name>
6      <Tel.>123-456-78</Tel.>
7      <Email>f.landis@nanonull.com</Email>
8      <expense-item Currency="USD" Bill-to="Development">
9        <Date>2003-01-02</Date>
10       <Travel Travel-Cost="337.88"/>
11     </expense-item>
12     <expense-item Currency="USD" Bill-to="Accounting">
13       <Date>2003-07-07</Date>
14       <Travel Travel-Cost="1014.22"/>
15     </expense-item>
16     <expense-item Currency="USD" Bill-to="Marketing">
17       <Date>2003-02-02</Date>
18       <Travel Travel-Cost="2000"/>
19     </expense-item>
20   </Employee>
21 </Company>
22

```

Please note: The **on-false** parameter of the filter component, outputs the **complement** node set that is mapped by the on-true parameter. In this example it would mean all **non-travel** expense items.

The number of expense-items have been reduced to three. Checking against the supplied **mf-ExpReport.xml** file, reveals that only the Travel records remain, the Lodging and Meal records have been filtered out.

## 4.3 Generating XSLT 1.0 and 2.0 code

Now that you have [created the mapping](#), you can do the actual transformation of the source data. MapForce can generate two flavors of XSLT code: XSLT 1.0 and XSLT 2.0.

### Objective

In this section of the tutorial, you will learn how to [preview](#), generate and save the XSLT code, and how to execute the generated XSLT. Specifically, you will learn how to do the following:

- Generate and save XSLT code in the desired flavor
- Download the AltovaXML engine and execute the transformation batch file

### Commands used in this section

**File | Generate code in:** Select this option to choose the output language (i.e. **XSLT 1.0** or **XSLT 2.0**). The command opens the **Browse For Folder** dialog box where you define folder where the generated XSLT should be saved.

---

#### To generate XSLT code:

1. Select the menu item **File | Generate code in | XSLT 1.0 (or XSLT 2.0)**.
2. Select the folder you want to place the generated XSLT file in, and click **OK**. A message appears showing that the generation was successful.
3. Navigate to the designated folder and you will find the XSLT with the file name **MappingMapToExpReport-Target.xslt** (i.e. in the form: MappingMapTo<TargetSchemaName>).

### Transforming the XML file

The folder in which the XSLT file is placed also contains a batch file called **DoTransform.bat** which uses AltovaXML to transform the XML file. AltovaXML can be downloaded from the Altova website free of charge.

#### To transform the personal expense report to the company expense report:

1. Download and install the free AltovaXML engine from the [AltovaXML download page](#). AltovaXML is installed to C:\Program Files\Altova\AltovaXML2012\ by default.
2. Start the **DoTransform.bat** batch file located in the previously designated output folder.

This generates the output file **ExpReport-Target.xml** in the ...\\Tutorial folder.

Note that you might need to add the AltovaXML installation location to the path variable of the Environment Variables.

## 4.4 Handling multiple target schemas / documents

This section deals with creating a second target schema / document, into which **non-travel** expense records will be placed, and follows on from the current tutorial example **Tut-ExpReport.mfd**.

### Objective

In this section of the tutorial, you will learn how to add a second target and how to generate multiple target schema output. Specifically, you will learn how to:

- [Create a second target schema component](#)
- [Filter out all non-travel output](#) in your example report
- [View specific output](#)
- [Generate XSLT for multiple target schemas](#)

### Commands used in this section



**Insert XML Schema/File:** Click this icon to open the standard Windows **Open** dialog box and select the file from your file system.



**Preview:** Appears in the title bar of components when multiple target files have been defined. Click this icon to select a specific component for the output preview.



**Save generated output:** Located in the **Output** menu/pane. Click this icon to open the Standard Windows **Save As** dialog box and select the location where you want to save the generated output data.



**Validate Output:** Located in the **Output** menu/pane. Click this icon to check whether the generated output is valid. The result of the validation appears in the Messages window.

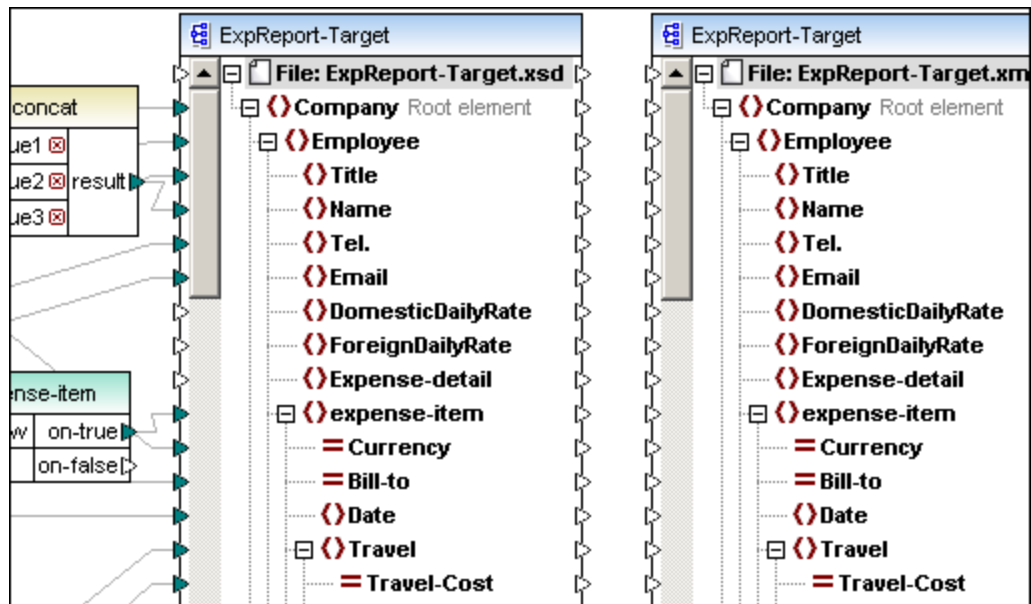
**File | Generate code in:** Select this option to choose the output language (i.e. **XSLT 1.0** or **XSLT 2.0**). The command opens the **Browse For Folder** dialog box where you define folder where the generated XSLT should be saved.

#### 4.4.1 Creating a second target component

In this section of the tutorial you will learn how to create a second target schema component which filters out all the non-travel data.

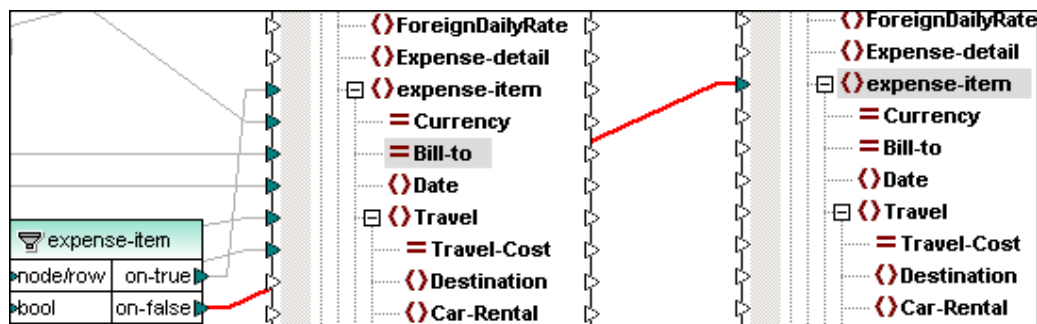
##### To create the second target schema component:

1. Click the **Insert XML Schema/File** icon.
2. Select the **ExpReport-Target.xsd** file from the **Open** dialog box.  
You are now prompted for a sample XML file for this schema.
3. Click **Skip**, and select **Company** as the root element of the target document.  
The target schema component now appears in the Mapping pane.
4. Click the **Company** entry and hit the \* key on the numeric keypad to view all the items.
5. Click the expand window icon and resize the component. Place the schema components so that you can view and work on them easily.  
There is now one source schema, **mf-expReport**, and two target schemas, both **ExpReport-Target**, visible in the Mapping pane.



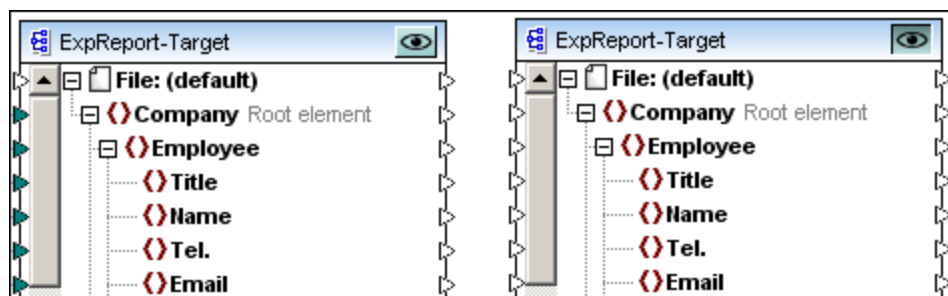
##### To filter out the non-travel data:

1. Connect the **on-false** icon of the **filter** component with the **expense-item** element of the **second** target schema / document.



A message appears stating that you are now working with multiple target schemas / documents.

2. Click **OK** to confirm.



A **Preview** icon is now visible in the title bar of each target schema component.

Clicking the Preview icon defines which of the target schema data is to be displayed, when you subsequently click the XSLT, XSLT2, or Output buttons.

### Creating mappings for the rest of the expense report data

Create the following mappings **between the source schema and second target** schema. You created the same connectors for the first target schema, so there is nothing new here:

- Person to Employee
- Tittle to Title
- Phone to Tel.
- Email to Email
- currency to Currency
- expto to Bill-to
- Date to Date

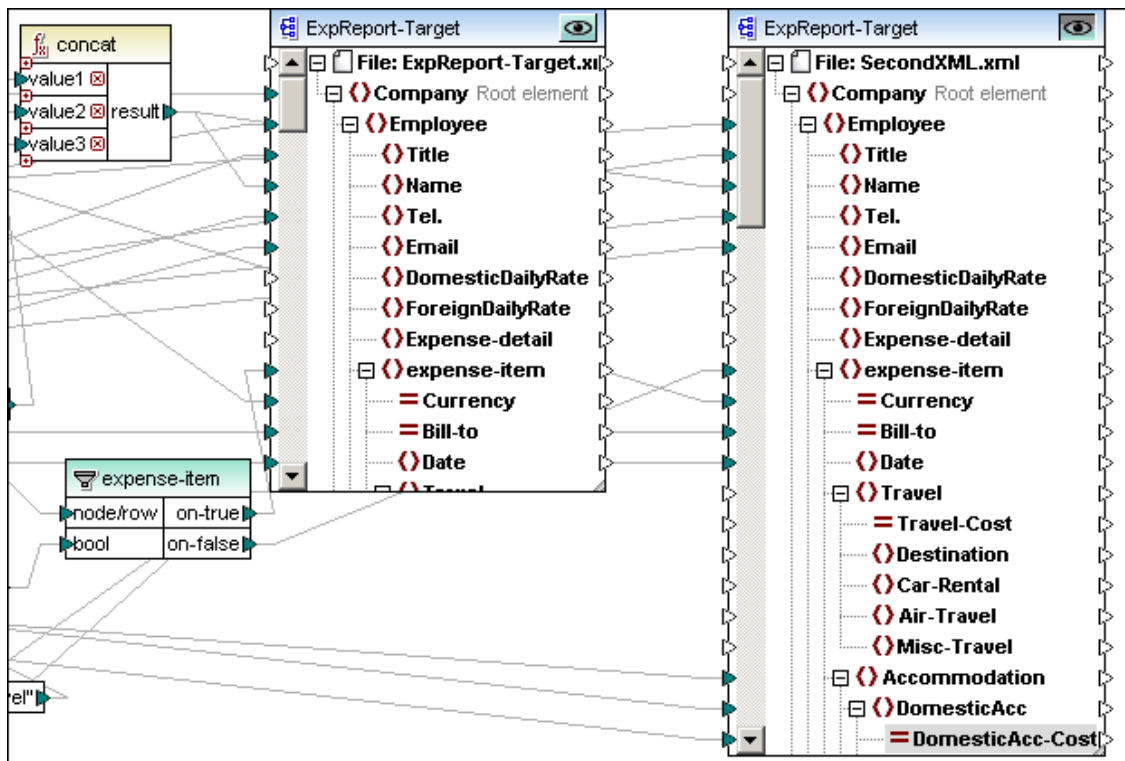
Create the following mapping **between the existing concat function and second target** schema:

- result to Name

### To create the remaining non-travel mappings:

Making sure that the "Autoconnect matching children" option is inactive,


1. Connect the **Lodging** item in the source schema to **Accommodation** in the second target schema.
2. Connect the **Lodging** item to **DomesticAcc**
3. Connect the **Lodge-Cost** item to **DomesicAcc-Cost**

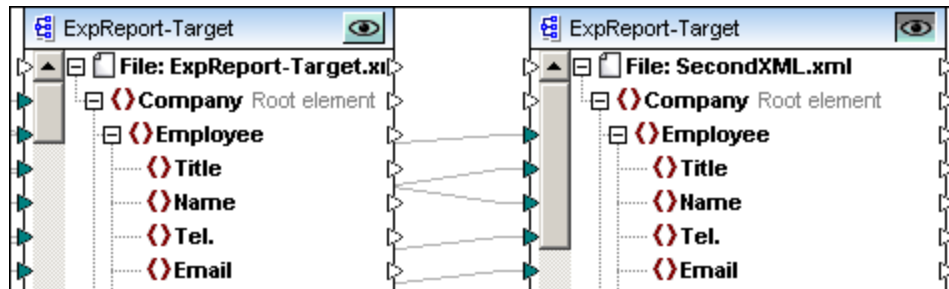


## 4.4.2 Viewing and generating multiple target schema output

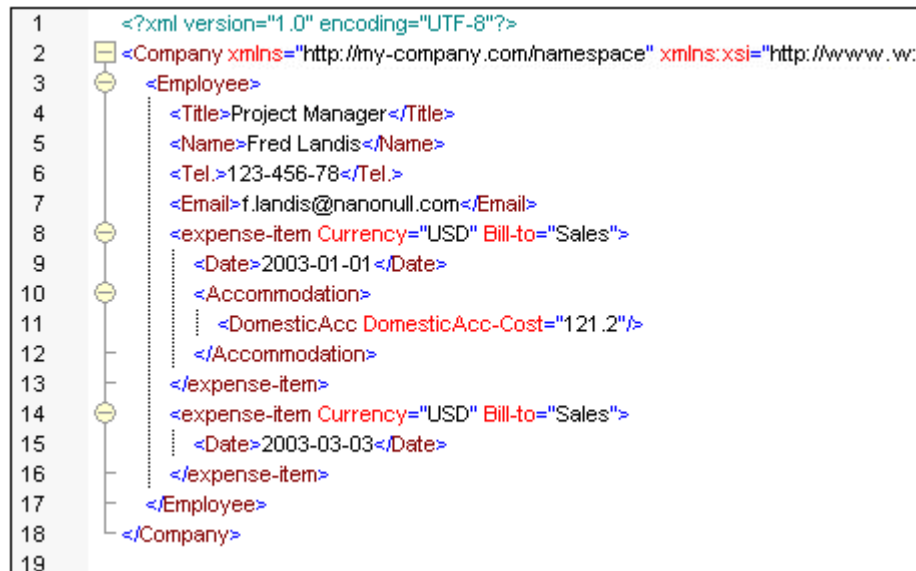
Clicking the Preview icon lets you select which of the schema targets you want to preview.

### To view specific XSLT output:

1. Click the **Preview icon**  in the title bar of the **second** schema component, to make it active (if not already active).




2. Click the **Output** button of the Mapping tab group.



The XML output contains two records both billed to Sales: the Domestic Accommodation cost of \$121.2 and an Expense-item record which only contains a date. This record originates from the expense-item Meal. There is currently no mapping between meal costs and domestic accommodation costs, and even if there were, no cost would appear as the XML instance does not supply one.

**Please note:** You can save this XML data by clicking the **Save generated output** icon, while viewing the XML output in the preview window .

The resulting XML instance file can also be validated against the target schema, by clicking the validate button .

### To generate XSLT 1.0 / XSLT 2.0 code for multiple target schemas:

1. Select the menu item **File | Generate code in | XSLT 1.0 (or XSLT 2.0)**.
2. Select the folder you want to place the generated XSLT files, and click **OK**.  
A message appears showing that the generation was successful.
3. Navigate to the designated folder and you will find two XSLT files with the file names:

**MappingExpReport-Target.xslt and MappingExpReport-Target2.xslt****To transform the personal expense report to the company expense report:**

1. Download and install the free AltovaXML engine from the [AltovaXML download page](#).  
AltovaXML is installed to c:\Program Files\Altova\AltovaXML2012\ per default.
2. Start the **DoTransform.bat** batch file located in the previously designated output folder.

This generates the output file **ExpReport-Target.xml** in the ...\Tutorial folder.

Note: you might need to add the AltovaXML installation location to the path variable of the Environment Variables.

## 4.5 Mapping multiple source items, to single target items

In this section two simple employee travel expense reports will be mapped to a single company report. This example is a simplified version of the mapping you have already worked through in the [Multiple target schemas](#) / documents section of this tutorial.

**Please note:** There is an alternative method to doing this using the [dynamic input/output](#) functionality of components, please see "[Dynamic file names - input / output](#)" for a specific example.

### Objective

In this section of the tutorial, you will learn how to merge two **personal travel expense reports** into a company expense travel report. Specifically, you will learn how to:

- [Map schema components](#) (recapitulation)
- [Duplicate input items](#)
- [Remove duplicated items](#)

### Commands used in this section



**New...:** Click this icon to access the **New File** dialog box where you can create a new Mapping.



**Insert XML Schema/File:** Click this icon to open the standard Windows **Open** dialog box and select the file from your file system.



**Auto Connect Matching Children:** Click this icon to toggle the automatic connection of matching child nodes, on and off.



**Duplicate Input:** Located in the context menu that appears when you right-click an item in a component. Click this command to duplicate the selected item.



**Remove Duplicate:** Located in the context menu that appears when you right-click a duplicated item in a component. Click this command to remove the selected duplicate from the component.

### Example files used in this section

Please note that the files used in this example, have been optimized to show how to map data from two input XML files into a single item in the target schema, this is not meant to be a real-life example.




- |                             |   |
|-----------------------------|---|
| • mf-ExpReport.xml          | Input XML file used in previous section                                   |
| • mf-ExpReport2.xml         | The second input XML file   |
| • mf-ExpReport-combined.xml | The resulting file when the mapping has been successful                   |
| • ExpReport-combined.xsd    | The target schema file into which the two XML source data will be merged. |
| • Tut-ExpReport-msource.mfd | The mapping file for this example   |

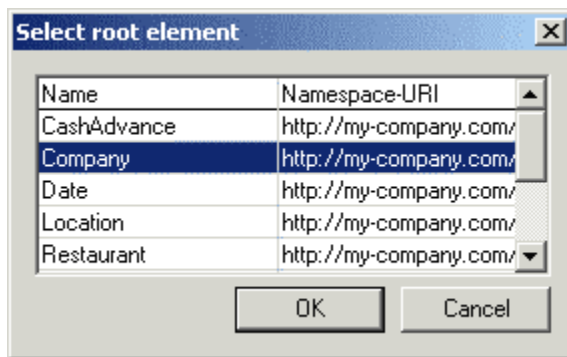
**Please note:** The files used in this section are also available in the [...\MapForceExamples\Tutorial\](#) folder.

### 4.5.1 Creating the mappings

The method described below, is a recapitulation of how to set up the mapping environment. This mapping is available as **Tut-ExpReport-msource.mfd** in the <...\MapForceExamples\Tutorial\>.

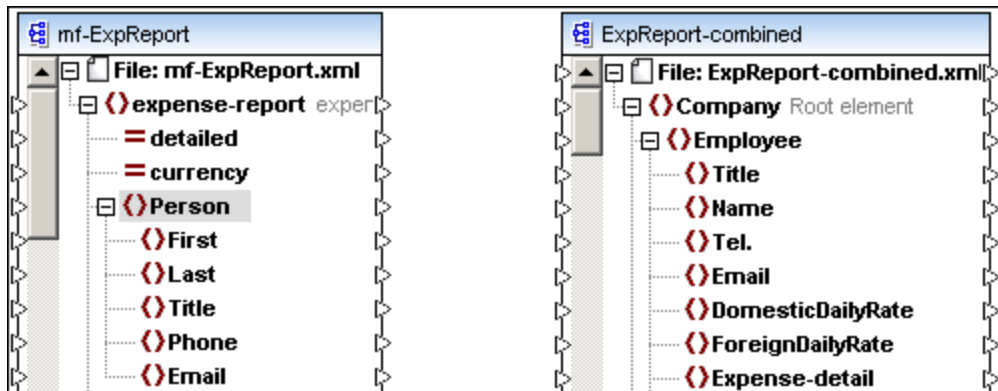
**To create the mapping environment:**

1. Click the **New**  icon in the Standard toolbar to open the **New File** dialog box.
2. Click the **Mapping** icon and click **OK** to create a new Mapping tab.
3. Click the **Insert XML Schema/File**  icon.
4. From the Tutorial sub-folder of the MapForceExamples directory, select the **mf-ExpReport.xsd** file from the **Open** dialog box, click **Browse...** in the message box that pops up, and select the **mf-ExpReport.xml** file as the XML instance file.
5. Click the **expense-report** entry, hit the \* key on the numeric keypad to view all the items; resize the component if necessary.
6. Click the **Insert XML Schema/File**  icon.
7. Select the **ExpReport-combined.xsd** file from the **Open** dialog box. You are now prompted for a sample XML file for this schema.
8. Click **Skip**, and select **Company** as the root element of the target document.



The target schema component now appears in the mapping pane.

9. Click the **Company** entry, hit the \* key on the numeric keypad to view all the items, and resize the window if necessary.

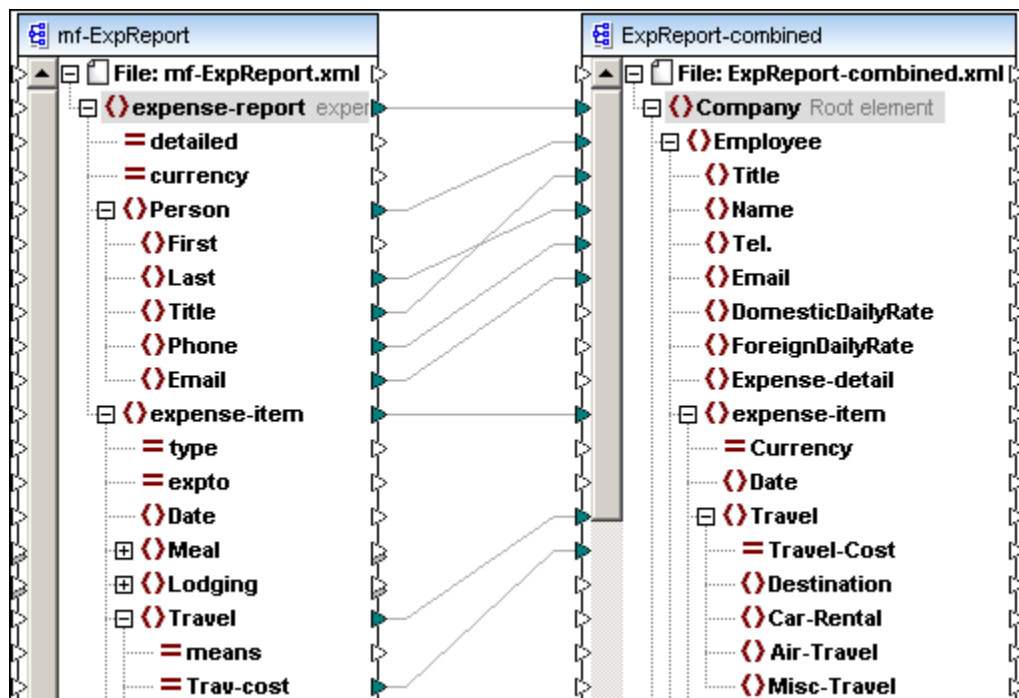


### Mapping the components

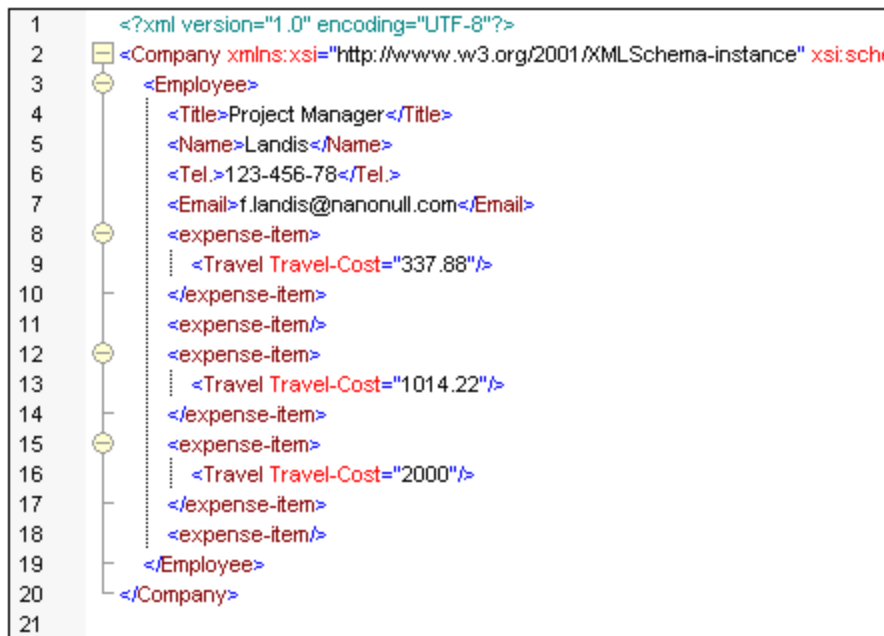
Make sure that the **Auto connect child items**  icon is **deactivated**, before you create the following mappings between the two components:

- Expense-report to Company
- Person to Employee
- Last to Name
- Title to Title
- Phone to Tel.
- Email to Email
- expense-item to expense-item
- Travel to Travel
- Trav-cost to Travel-Cost

The mapping is shown below.



Click the Output button to see the result of the current mapping.



Please note: **Empty** `<expense-item/>` elements/tags are generated when child items of a **mapped parent item**, exist in the source file, which have not been mapped to the target schema. In this case, only the Travel items of the expense-item parent have been mapped. There are however, two other expense items in the list: one lodging and one meal expense item. Each one of these items generates an empty parent expense-item tag.

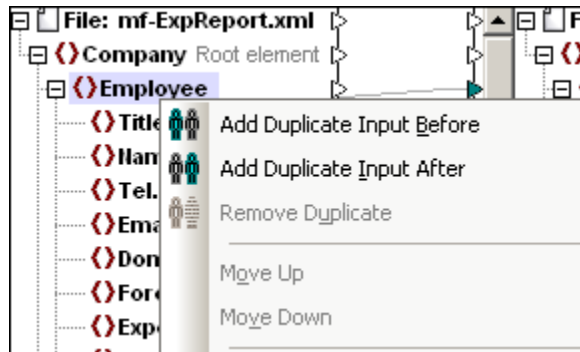
To avoid generating empty tags, create a filter such as the one described previously in the tutorial, under [Filtering data](#), or connect the **Travel** item to the **expense-item**.

### 4.5.2 Duplicating input items

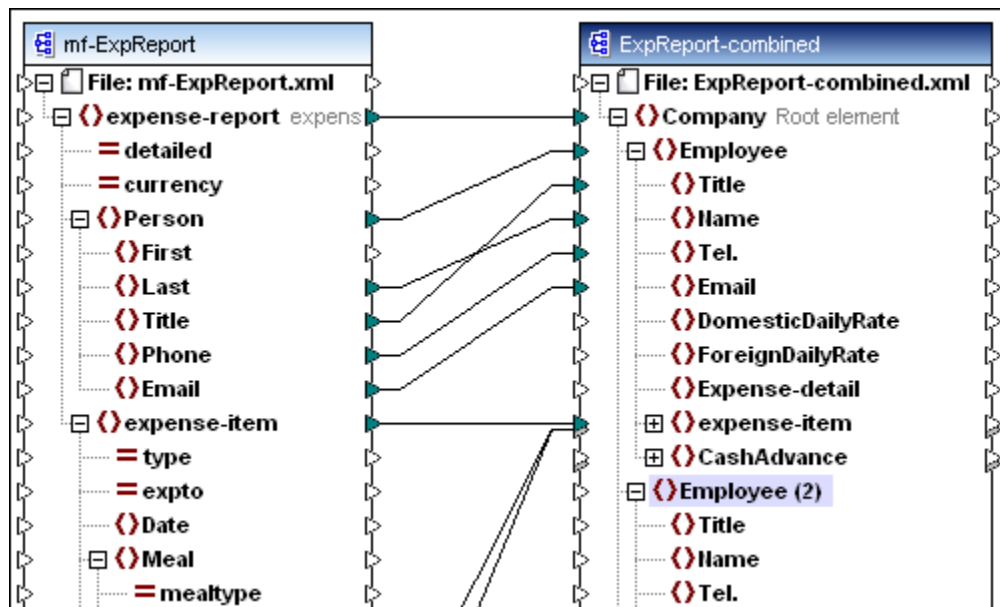
In order to map multiple source items to one and the same target item, we need to duplicate the **input items** of the target component to be able to create mappings from a different source XML file. To achieve this we will add the **second** XML source file, and create mappings from it, to the "same" inputs of the duplicated element/item in the target XML file.

#### Duplicating input items:

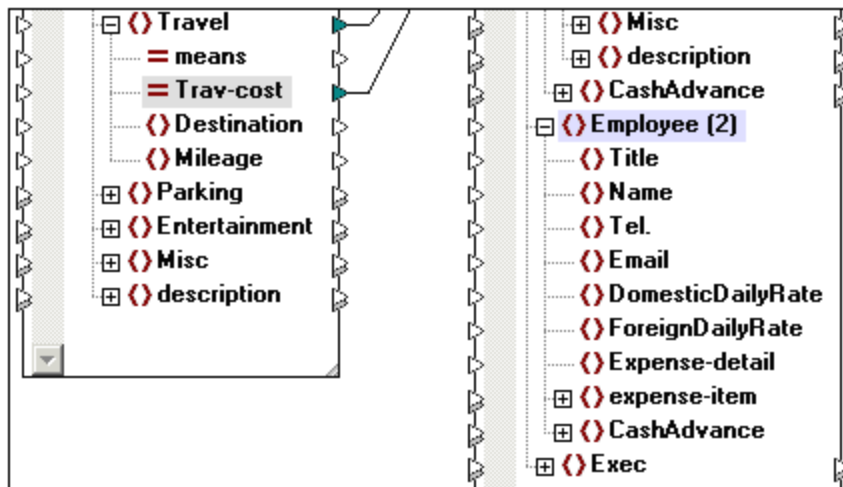
1. Right-click the Employee item in the target XML file.
2. Select the option **Add Duplicate Input After** from the context menu.



A second Employee item has now been added to the component, as **Employee(2)**.



3. Click the expand icon to see the items below it.  
The **structure** of the new Employee item, is an exact copy of the original, except for the fact that there are no output icons for the duplicated items.




You can now use these new duplicate items as the **target** for the **second** source XML data file.

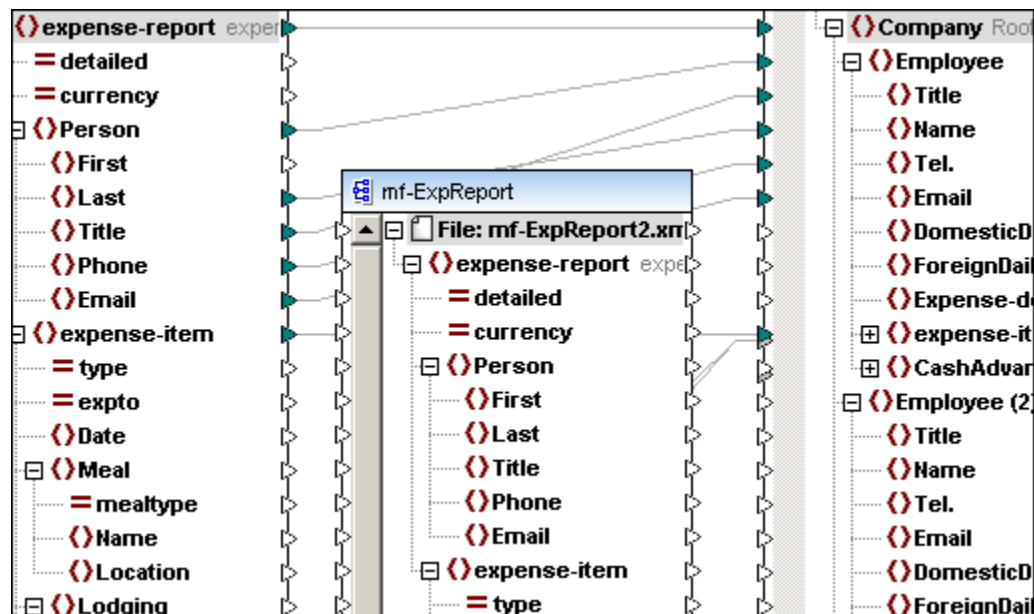
### Inserting the second XML instance file

To insert the second XML instance file, the same method as well as the same XML Schema file is used as before.

#### To insert a second source component:

1. Click the **Insert XML Schema/File**  icon.
2. Select the **mf-ExpReport.xsd** file from the **Open** dialog box, click **Browse...**, and select the **mf-ExpReport2.xml** file as the XML instance file.
3. Click the **expense-report** entry, hit the \* key on the numeric keypad to view all items, and resize the component if necessary.

For the sake of clarity, the new component has been placed between the two existing ones in the following graphics.

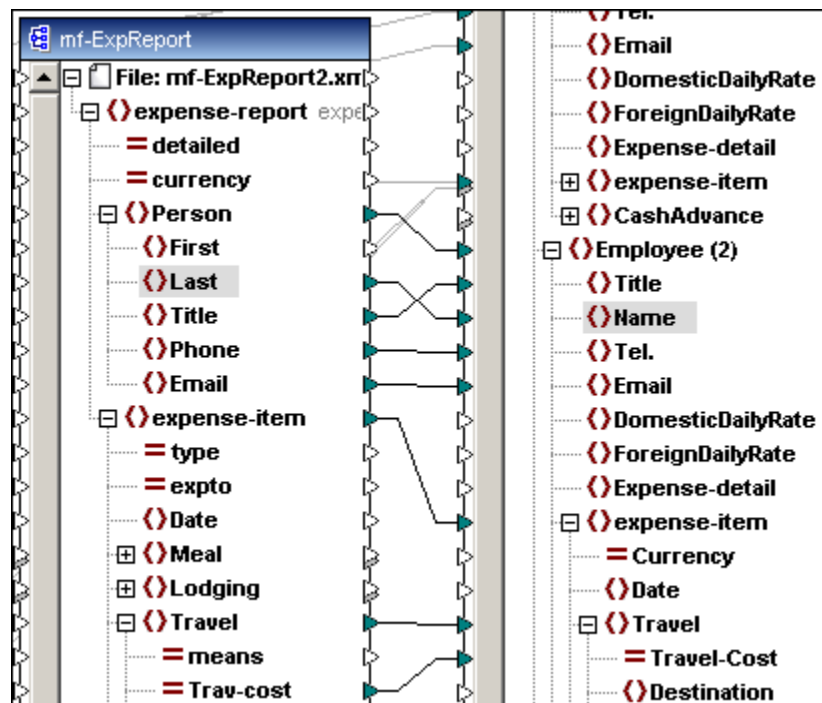


4. Create the same mappings that were defined for the first XML source file:
  - Person to Employee(2)

- Last to Name
- Title to Title
- Phone to Tel.
- Email to Email
- expense-item to expense-item

Scroll down, and map

- Travel to Travel, and
- Trav-cost to Travel-Cost.



5. Click the Output button to see the result of the mapping in the Output pane.

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <Company xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.w3.org/2001/XMLSchema-instance http://www.w3.org/2001/XMLSchema-instance">
3    <Employee>
4      <Title>Project Manager</Title>
5      <Name>Landis</Name>
6      <Tel.>123-456-78</Tel.>
7      <Email>f.landis@nanonull.com</Email>
8      <expense-item>
9        <Travel Travel-Cost="337.88"/>
10     </expense-item>
11     <expense-item/>
12     <expense-item>
13       <Travel Travel-Cost="1014.22"/>
14     </expense-item>
15     <expense-item>
16       <Travel Travel-Cost="2000"/>
17     </expense-item>
18     <expense-item/>
19   </Employee>
20   <Employee>
21     <Title>Manager</Title>
22     <Name>Johnson</Name>
23     <Tel.>456-789-123</Tel.>
24     <Email>j.john@nanonull.com</Email>
25     <expense-item>
26       <Travel Travel-Cost="150.44"/>
27     </expense-item>
28     <expense-item/>
29     <expense-item>
30       <Travel Travel-Cost="1020"/>
31     </expense-item>
32     <expense-item>
33       <Travel Travel-Cost="70"/>
34     </expense-item>
35   </Employee>
36 </Company>
37

```

The data of the second expense report has been added to the output file. Johnson and his travel costs have been added to the expense items of Fred Landis in the company expense report.

#### To save the generated output to a file:

- Click the **Save generated output**  icon which appears in the title bar when the Output pane is active.

The file, mf-ExpReport-combined.xml, is available in the [...MapForceExamples\Tutorial\](#) folder.

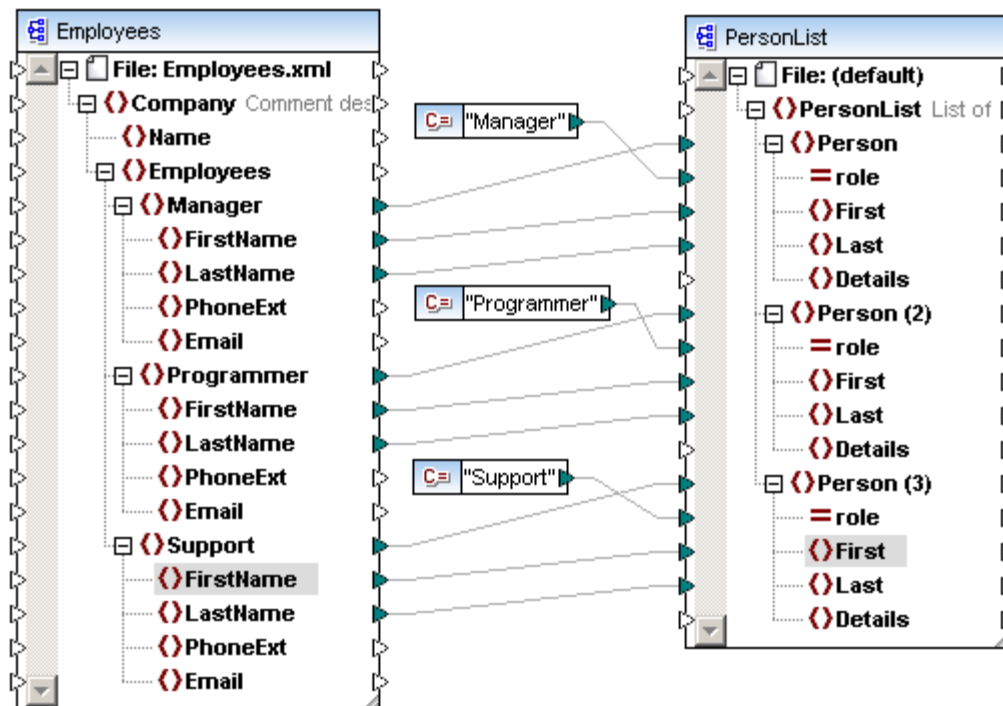
#### To remove duplicated items:

- Right click the duplicate item and select the **Remove Duplicate** entry from the menu.

#### Example

To see a further example involving duplicate items, please see the **PersonList.mfd** sample file available in the [...MapForceExamples](#) folder.

In the **PersonList.mfd** example different elements of the source document are mapped to the "same" element in the target Schema/XML document, and specific elements (Manager etc.) are mapped to a generic one using a "role" attribute.



```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <PersonList xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:noNamespaceSchemaLocation="
   C:/.../Altova/MapForce2011/MapForceExamples/PersonList.xsd">
3    <Person role="Manager">
4      <First>Vernon</First>
5      <Last>Callaby</Last>
6    </Person>
7    <Person role="Programmer">
8      <First>Frank</First>
9      <Last>Further</Last>
10   </Person>
11   <Person role="Support">
12     <First>Loby</First>
13     <Last>Matise</Last>
14   </Person>
15   <Person role="Support">
16     <First>Susi</First>
17     <Last>Sanna</Last>
18   </Person>
19 </PersonList>

```

## 4.6 Multi-file input / output

In this section the new multi-file input/output capabilities of MapForce will be demonstrated. Please note that this functionality is not available for XSLT 1.0.

A single input component will process two source documents, while a single output component will generate two output files. The example used here has been set up in [Filtering data](#), and also been used as the basis in the [Mapping multiple source items, to single target items](#) section.

### Objective

In this section of the tutorial, you will learn how to create a mapping where the source component processes two XML input files and the target component outputs two XML target files.

### Commands used in this section



**Save All Output Files...:** Located in the **Output** menu. Click this command to save all the mapped files from the Preview pane.

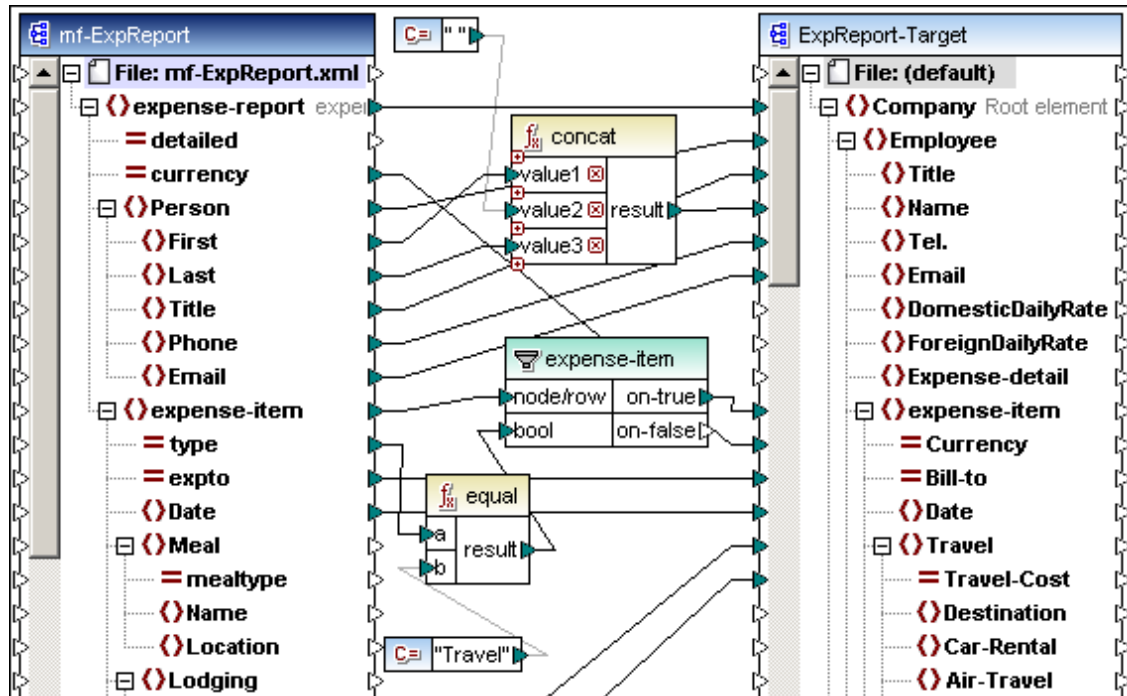
### Example files used in this section

- mf-ExpReport.xml                      Input XML file used in previous section
- mf-ExpReport2.xml                    The second input XML file
- Tut-ExpReport-multi.mfd              The mapping file for this example

**Please note:** The files used in this section are also available in the [...\MapForceExamples\Tutorial\](#) folder.

### 4.6.1 Processing multiple files per input/output component

The **Tut-ExpReport.mfd** file available in the [...MapForceExamples](#) folder will be modified and saved under a different name in this example.



Please take note of the following items at the top of each component:

- The **File:mf-ExpReport.xml** item of mf-ExpReport, displays the Input/Output-XML file entry. One entry is shown if Input and Output files are the same; if not then **Input file name;Output file name** is displayed.

This is automatically filled when you assign an XML instance file to an XML schema file.


- The **File: (default)** item of ExpReport-Target shows that an instance file was not assigned to the XML schema component when it was inserted, i.e. the Output-XML file field is empty. A default value will therefore be used when the mapping executes.

#### Processing multiple files

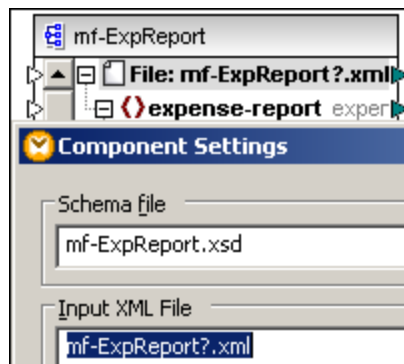
To be able to process multiple files, MapForce uses the wildcard character "?" in the filename of the input XML file. The "?" can be replaced by none, or one character.

#### To process multiple files:

Having opened the Tut-ExpReport file available in the ...Tutorial folder and clicked the XSLT2

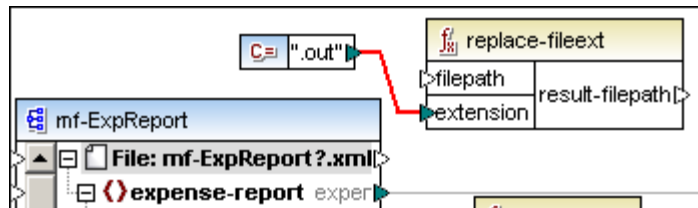
icon  in the icon bar,

1. Double click the **mf-ExpReport** component on the left.
2. Enter mf-expReport?.xml in the Input XML File field.

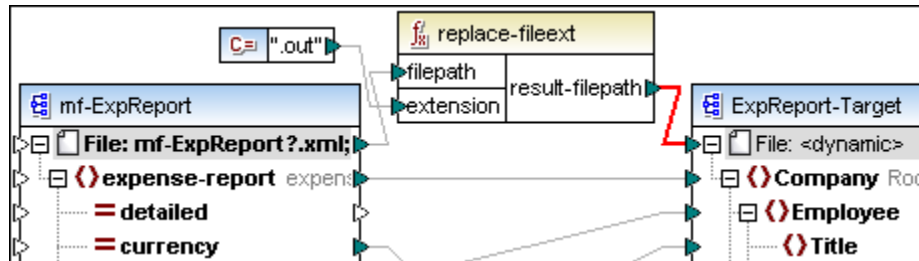


The wildcard characters ? and \* are supported in file names. Note that a relative path was entered here, as the Tut-ExpReport.mfd file is available in the ...Tutorial folder (you can enter an absolute path if you want).

3. Insert the **replace-fileext** function from the **file path functions** library, then insert a constant component.
4. Enter ".out" into the constant component, and connect it to the **extension** parameter of the function.



5. Connect the **File:mf-ExpReport?.xml** item of the component to the **filepath** parameter of the function.
6. Connect the **result-filepath** parameter of the function, to the File "default" item of the target component.



The File: item of the target component has also changed to **File: <dynamic>**.

7. Click the Output button to see the results.  
The Output window now shows the results for each input XML file in the preview window, e.g. Preview 1 of 2 as shown below.

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <Company xmlns="http://my-company.com/namespace" xsi:schemaLocation="http://my-c
   C:/DOCUME~1/MY/MYDOCU~1/Altova/MapForce2010/MapForceExamples/Tutorial/ExpRep
   http://www.w3.org/2001/XMLSchema-instance">
3    <Employee>
4      <Title>Project Manager</Title>
5      <Name>Fred Landis</Name>
6      <Tel>123-456-78</Tel>
7      <Email>f.landis@nanonull.com</Email>
8      <expense-item Currency="USD" Bill-to="Development">
9        <Date>2003-01-02</Date>
10       <Travel Travel-Cost="337.88"/>
11     </expense-item>
12     <expense-item Currency="USD" Bill-to="Accounting">
13       <Date>2003-07-07</Date>
14       <Travel Travel-Cost="1014.22"/>
15     </expense-item>
16     <expense-item Currency="USD" Bill-to="Marketing">
17       <Date>2003-02-02</Date>
18       <Travel Travel-Cost="2000"/>
19     </expense-item>
20   </Employee>
21 </Company>


```

8. Click the scroll arrow to show the result of the second input XML file. Note that the combo box shows the name of each of the source XML files; with the \*.xml extension replaced by the \*.out extension.

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <Company xmlns="http://my-company.com/namespace" xsi:schemaLocation="http://my-c
   C:/DOCUME~1/MY/MYDOCU~1/Altova/MapForce2010/MapForceExamples/Tutorial/ExpRep
   http://www.w3.org/2001/XMLSchema-instance">
3    <Employee>
4      <Title>Manager</Title>
5      <Name>James Johnson</Name>
6      <Tel>456-789-123</Tel>
7      <Email>j.john@nanonull.com</Email>
8      <expense-item Currency="Euro" Bill-to="Sales">
9        <Date>2004-02-03</Date>
10       <Travel Travel-Cost="150.44"/>
11     </expense-item>
12     <expense-item Currency="Euro" Bill-to="Operations">
13       <Date>2004-08-08</Date>
14       <Travel Travel-Cost="1020"/>
15     </expense-item>
16     <expense-item Currency="Euro" Bill-to="Support">
17       <Date>2004-03-03</Date>
18       <Travel Travel-Cost="70"/>
19     </expense-item>
20   </Employee>
21 </Company>

```

Clicking the **Save All**  icon lets you save all the mapped files from the Preview window without having to generate code. A prompt appears if output files at the same location will be overwritten.

9. Save the mapping file under a new name.

Note: please see [Dynamic input/output](#) for more information on multiple input / output files.

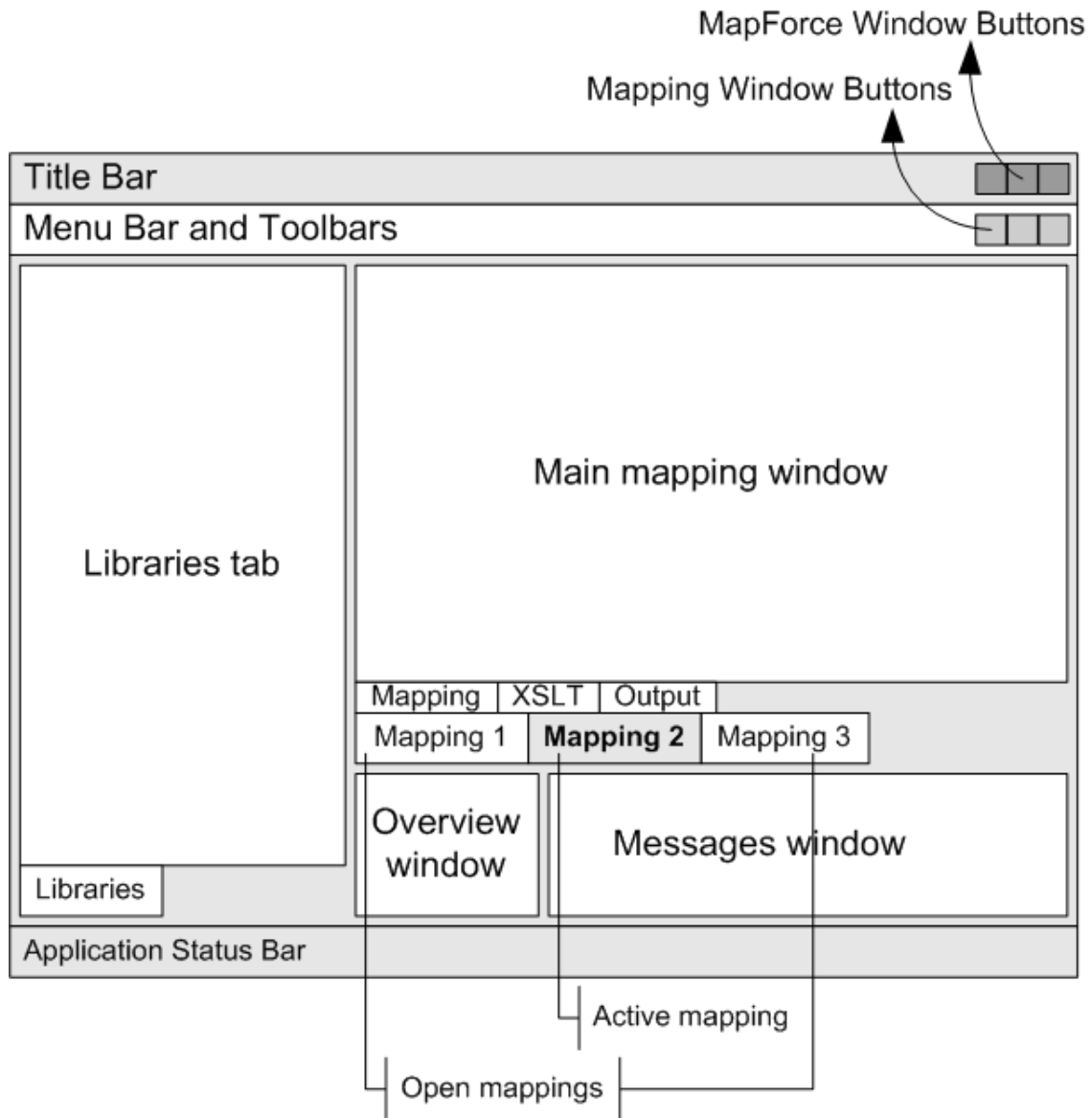
# Chapter 5

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## MapForce user interface

## 5 MapForce user interface

MapForce has four main areas: the [Libraries](#) pane at left, the Mapping window (with [Mapping](#), [XSLT](#), [XSLT2](#), and [Output](#) panes) at right, as well as the [Overview](#) and [Messages](#) windows below.



### Title Bar

The Title Bar displays the application name (i.e., MapForce) followed by the name of the active Mapping Design window. Buttons to control the MapForce application window are at right.

### Menu Bar and Toolbars

The Menu Bar displays the menu items. Each toolbar displays a group of icons representing MapForce commands. You can reposition the menu bar and toolbars by dragging their handles to the desired locations.

### Libraries Tab

The [Libraries](#) tab provides functions that vary according to the selected output language. You can drag a function directly into the mapping window.

### Mapping Window

The [Mapping](#) window displays the graphical elements used to create the [mapping \(transformation\) between the various components](#). The source schema displays the source schema tree and the target schema displays the target schema tree. **Connectors** connect the input and output **icons** of each schema item. Schema **items** can be either elements or attributes.

The following panes can be viewed by clicking the corresponding button at the bottom of the Mapping window:

- The **XSLT** and **XSLT2** panes display a preview of the transformation code depending on the [specific language selected](#).
- The **Output** pane displays a preview of the transformed, or mapped data, in a text view.
- The **HTML, RTF, PDF, and Word 2007+** panes display the target component data as HTML, RTF, PDF, or Word 2007+ documents if a [StyleVision Power Stylesheet \(SPS\) is associated](#) with the target component.

### Overview and Messages Windows

The **Overview** pane displays the mapping area as a red rectangle, which you can drag to navigate your Mapping.

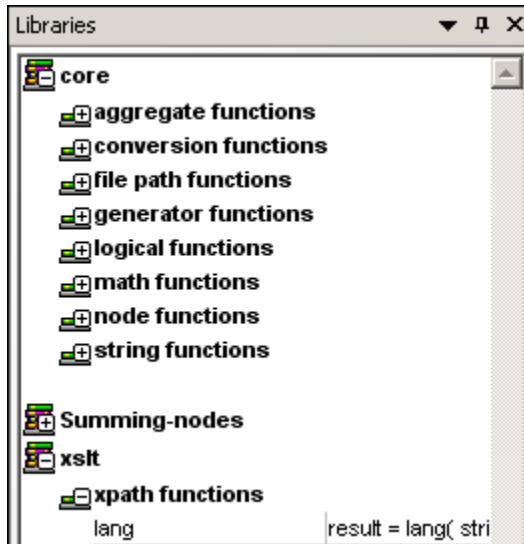
The **Messages** pane displays any validation warnings or error messages that might occur during the mapping process. Clicking a message in this pane, highlights it in the Mapping tab for you to correct.

### Application Status Bar

The application status bar appears at the bottom of the application window, and shows application-level information. The most useful of this information are the tooltips that are displayed here when you mouseover a toolbar icon. If you are using the 64-bit version of MapForce, this is indicated in the status bar with the suffix (x64) after the application name. There is no suffix for the 32-bit version.

## 5.1 Libraries tab

The **Libraries** tab displays the available libraries for the currently selected programming language, as well as the individual **functions** of each library. A brief description of the function is also provided. Functions can be directly dragged into the **Mapping** tab. Once you do this, they become function components.



### *XSLT Selected*

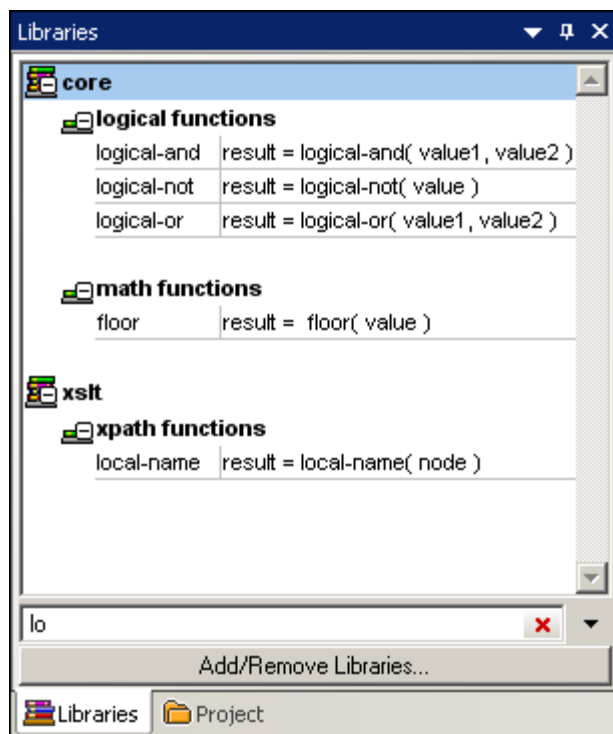
The standard **core** and **xslt** libraries are always loaded when you start MapForce, and do not need to be added by the user. The **Core** library is a collection of functions that can be used to produce all types of output: XSLT. The other libraries (xslt, xslt2, xpath2, lang etc.) contain functions associated with each separate type of output.

Selecting	enables
<b>XSLT</b>	core and XSLT functions (XPath 1.0 and XSLT 1.0 functions)
<b>XSLT2</b>	core, XPath 2.0, and XSLT 2.0 functions

**XPath 2.0 restrictions:** Several XPath 2.0 functions dealing with sequences are currently not available.

### Finding functions in the Library window

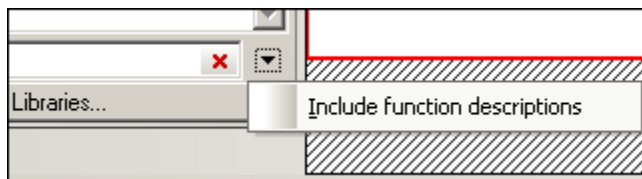
A Find field is located at the bottom of the Libraries tab which allows you to search for function names.

**XSLT Selected**

Pressing the **Esc** key cancels the filtering function in the window. Clicking the "x" icon has the same effect.

**To find a function in the Library window:**

1. Click into the Libraries window to make it active and enter the characters you are looking for, e.g. "lo".  
All functions containing these characters are now shown in the Library window, each within its respective group.
2. Click the down-arrow and select "Include function descriptions", if you want to include the text of the function descriptions in the function search.

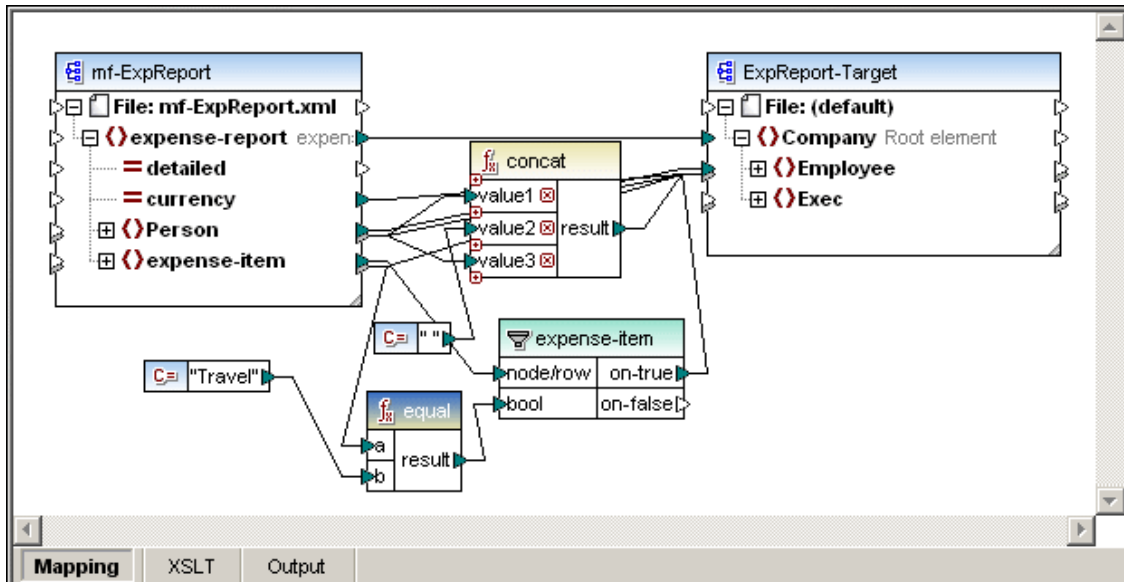
**Adding new function libraries**

MapForce allows you to create and integrate your own function libraries, please see the sections: [Adding custom XSLT 1.0 functions](#), [Adding custom XSLT 2.0 functions](#) and [User-defined functions](#) for more information.

**Please note:** Custom functions/libraries can be defined for XSLT and XSLT 2.

## 5.2 Mapping pane

The Mapping pane is the working area in MapForce where you create your mappings.

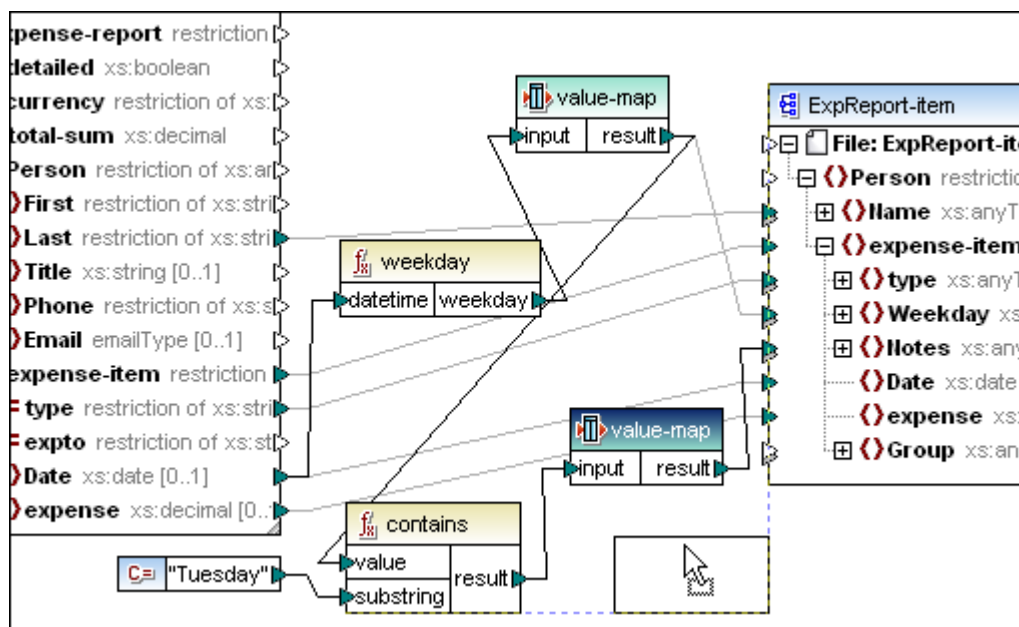


The Mapping pane displays the graphical elements used to create the mapping (transformation) between the two components. Connectors connect the input and output icons of each schema item. Schema items can be either elements or attributes.

### Align components - snap lines

When moving components in the mapping window, auto-alignment guide lines appear allowing you to align the component to any other component in the mapping window. This option can be enabled/disabled using the menu option **Tools | Options | General**.

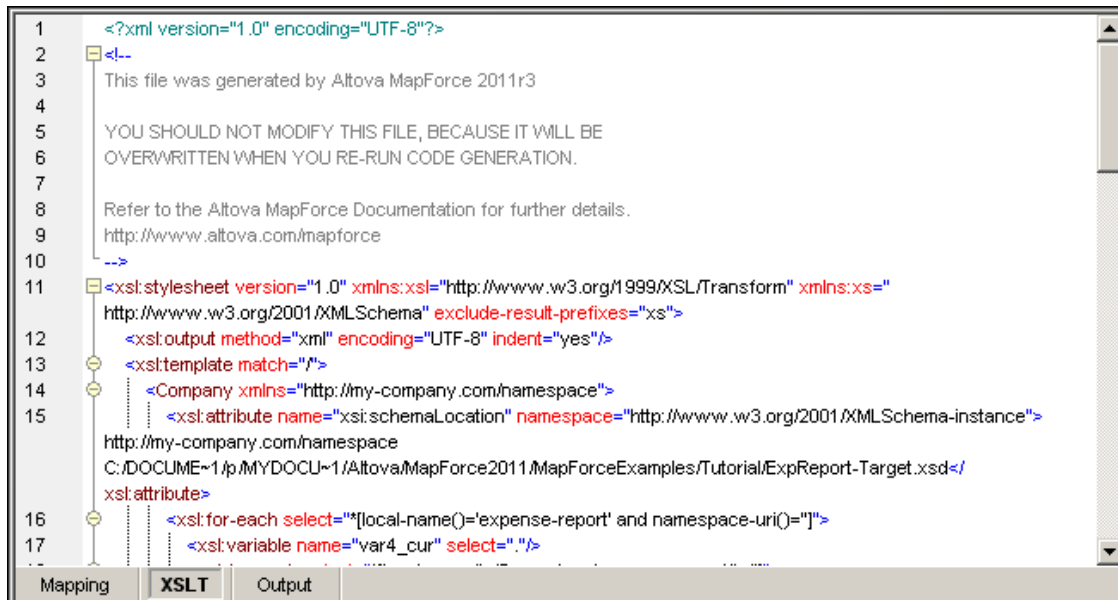
In the screen shot below, the lower value-map component is being moved. The guide lines show that it can be aligned to the "contains" function and to the "ExpReport-item" component.





## 5.3 XSLT/XSLT2 pane

The **XSLT** and **XSLT2** panes display a preview of the transformation depending on the [specific language selected](#)



Note: If you want to change the output language, you have to change back to the Mapping pane to do so. When a certain language tab is active, you cannot change the output language in the **Output** menu or the **Language Selection** toolbar, respectively.

## 5.4 Output pane / BUILTIN execution engine

The result of a mapping is immediately presented in the Output tab, using the Altova XSLT or XQuery engine, depending on the selected language.

If BUILTIN is selected, the built-in execution engine generates the output from source components: XML/Schema files. The result that appears in the Output tab is the same as if the Java, C++, or C# code had been generated, compiled and executed.

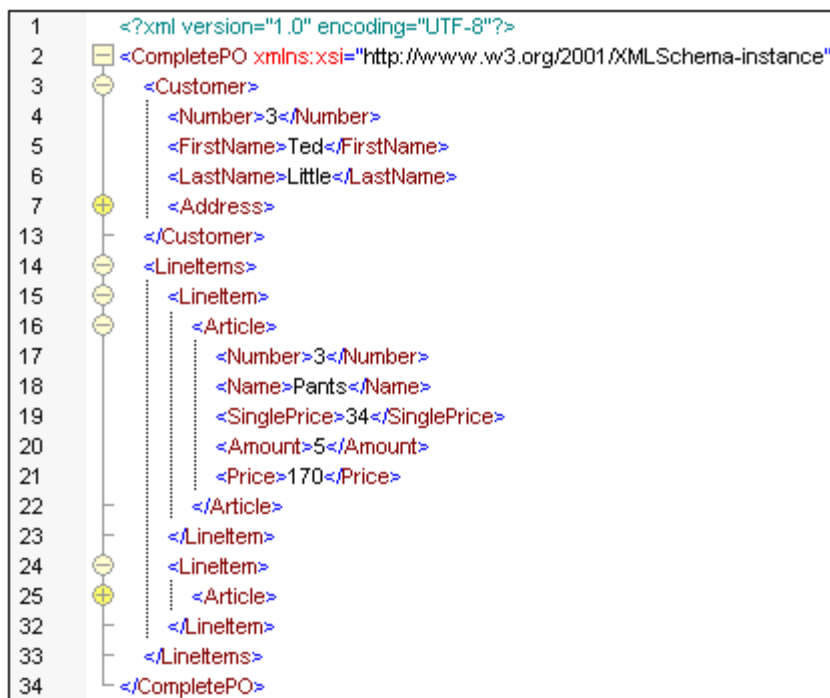




**Please note:** Opening a mapping that contains features available in a higher-level MapForce edition is not possible. Example: A mapping containing Web service features in the Professional version, or database mappings the Basic editions is not possible

Depending on the **target** component of your mapping, the Output pane may show different things:

- **XML Schema/document as target**

The screenshot below shows the output of the **DB\_CompletePO.mfd** mapping available in the [...MapForceExamples](#) folder. An XML Schema/document, as well as a database are used as source components in this mapping.



The resultant XML file can be saved by clicking the **Save generated output**  icon, and validated against the referenced schema by clicking the **Validate Output**  icon in the icon bar.

#### Hotkeys for the Output window (keyboard and numeric key pad)

CTRL and "+" zoom in on the text

CTRL and "-" zoom out of the text

CTRL and "0" resets the zoom factor to standard

CTRL and mouse wheel forward / backward achieve the same zoom in/out effect.

## 5.5 StyleVision-related panes

The **HTML**, **RTF**, **PDF**, and **Word 2007+** tabs display the target component data as HTML, RTF, PDF, or Word 2007+ documents if a [StyleVision Power Stylesheet \(SPS\) is associated](#) with the target component.

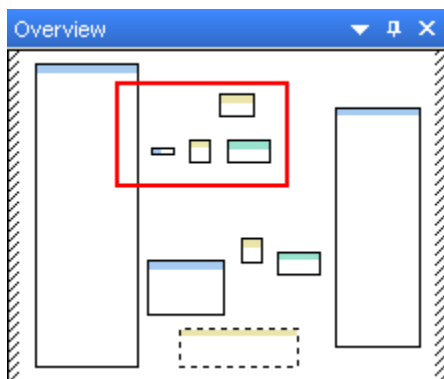
The screenshot displays a web form titled "Personal Expense Report" within a window titled "NanOnull". The form is divided into several sections:

- Header:** "NanOnull" logo.
- Title:** "Personal Expense Report".
- Currency:** Radio buttons for "Dollars", "Euros", and "Yen". A "Currency" label with a "\$" symbol is also present.
- Detailed report:** A checkbox labeled "Detailed report" which is checked.
- Employee Information:** A section with three input fields:
  - First Name:** "Fred"
  - Last Name:** "Landis"
  - Title:** "Project Manager"

At the bottom, there is a navigation bar with the following tabs: "Mapping", "DB Query", "Output", "HTML" (selected), "RTF", "PDF", and "Word 2007+".

## 5.6 Overview window

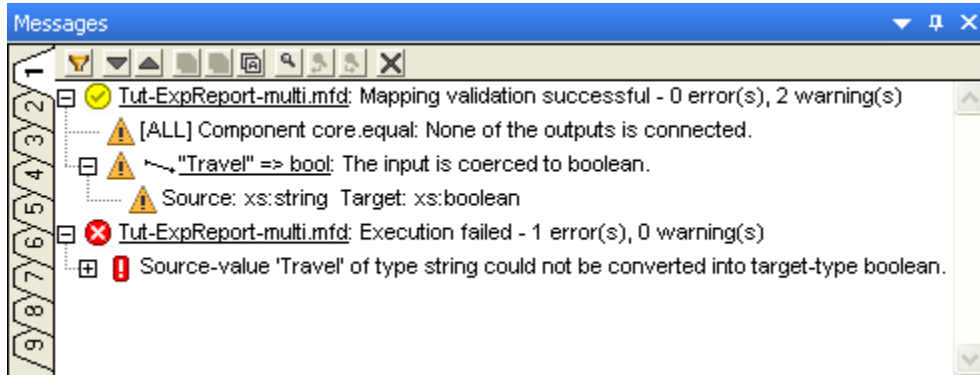
The Overview window serves as a navigator pane for large mappings. A red rectangle shows the currently visible area in the Mapping pane. You can drag the rectangle in the Overview window with your mouse to adjust the visible part of the mapping in the Mapping window.



Clicking into the Overview window will define the center of the display in the Mapping pane.

## 5.7 Messages window

The Messages tab shows messages, errors, and warnings when you click the Output button or perform a mapping validation.





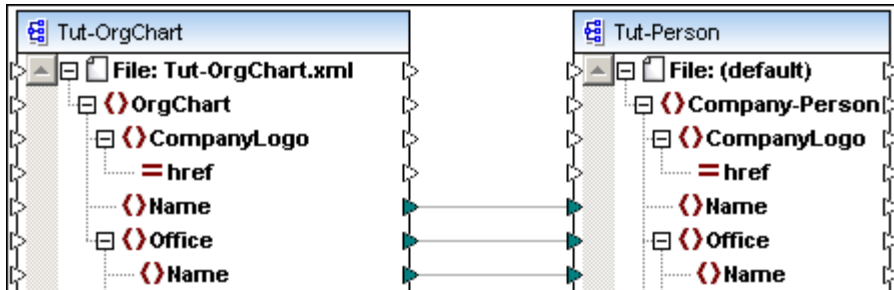
# Chapter 6

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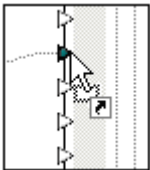
## Mapping between components

## 6 Mapping between components

A **connector** visualizes the **mapping** between the two sets of data and allows the **source** data (value) to appear, or be transformed, into the target component e.g. schema/document etc.



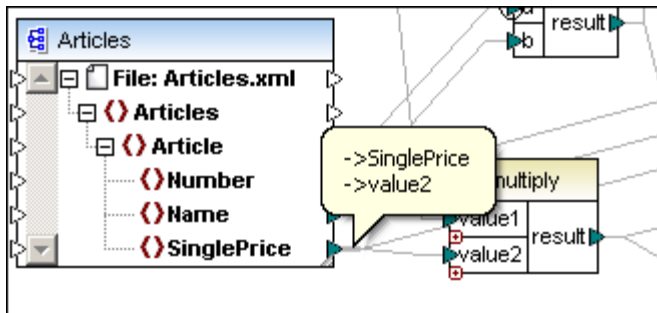
**Components** and **functions** have small "connection" triangles called: **input** or **output** icons. These **icons** are positioned to the left and/or right of all "mappable" **items**. Clicking an icon and dragging, creates the **mapping connector**. You can now drop it on another icon, or item name. A link icon appears next to the text cursor when the drop action is allowed.



Clicking an **item name** (element/attribute) automatically selects the associated source **icon** during the dragging action. Dropping the connector on the target item name also automatically selects the target icon.

An **input icon** can only have one connector. If you try and connect a second connector to it, a prompt appears asking if you want to replace or [duplicate](#) the input icon. An **output icon** can have several connectors, each to a different input icon.

Positioning the mouse pointer over the straight section of a connector (close to the input/output icon) highlights it, and causes a popup to appear. The popup displays the name(s) of the item(s) at the other end of the connector. If multiple connectors have been defined from the same output icon, then a maximum of ten item names will be displayed. The screenshot shows that the two target items are **SinglePrice** and **value2** of the multiply function.



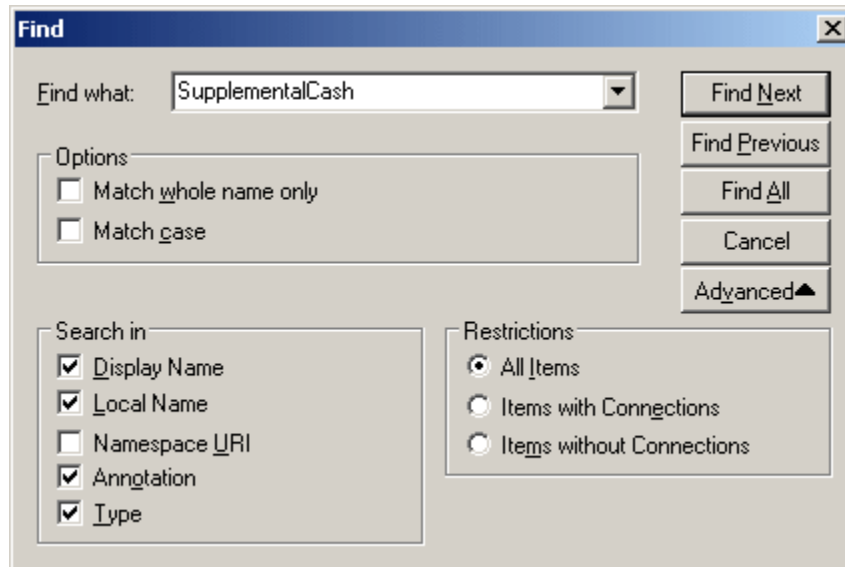
To **move** a connector to a different item, point to the straight section of the connector and drag it elsewhere.

To create a **duplicate connector** from the same source to another target, point to the straight section of the connector near the original target, and drag it to another target while holding down

the CTRL key.


**To search for a specific node/item in a component:**

1. Click the component you want to search in, and press the CTRL+F keys.
2. Enter the search term and click Find Next.



The Advanced options visible in the screenshot above, allow you to define which items/nodes are to be searched, as well as restrict the search options based on the specific connections.

### Auto-connecting items

Activating the Auto Connect child items icon , and creating a connector between two items, automatically connects all child items of the same name under the parent item.

### Number of connectors

Input and output icons appear on most components, there is not, however, a one to one relationship between their numbers.

- Each **schema item** (element/attribute) has an input and output icon.
- Schema components within user-defined functions only have output icons.
- Duplicated items only have input icons. This allows you to map multiple inputs to them. Please see [Duplicating Input items](#) for more information.
- **Functions** can have any number of input and output icons, **one** for each **parameter**. E.g. the Add Function has two (or more) input icons, and one output icon.
- **Special** components, can have any number of icons, e.g. the Constant component only has an output icon.

## 6.1 Methods of mapping data (Standard / Mixed Content / Copy Child Items)

MapForce supports various methods of mapping data: [Target-driven \(Standard\)](#), [Source-driven \(Mixed Content\)](#), and [Copy All \(Copy Child Items\)](#).

### Connectors and their properties

The following actions can be performed on a connector and produce the results described below:

- Clicking a connector highlights it in red.
- Hitting the Del key, while a connector is highlighted, deletes it immediately.
- Right-clicking a connector, opens the connector context menu.
- Double-clicking a connector, opens the [Connection Settings](#) dialog box.

### Viewing connectors

MapForce allows you to selectively view the connectors in the mapping window.



**Show selected component connectors** switches between showing:

- all mapping connectors in black, or
- those connectors relating to the currently selected component in black. Other connectors appear dimmed.



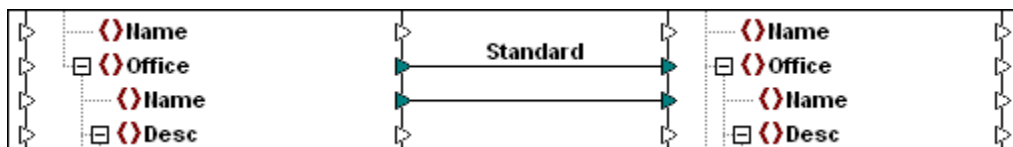
**Show connectors from source to target** switches between showing:

- connectors that are **directly** connected to the currently selected component, or
- connectors linked to the currently selected component, originating from source and terminating at the target components.

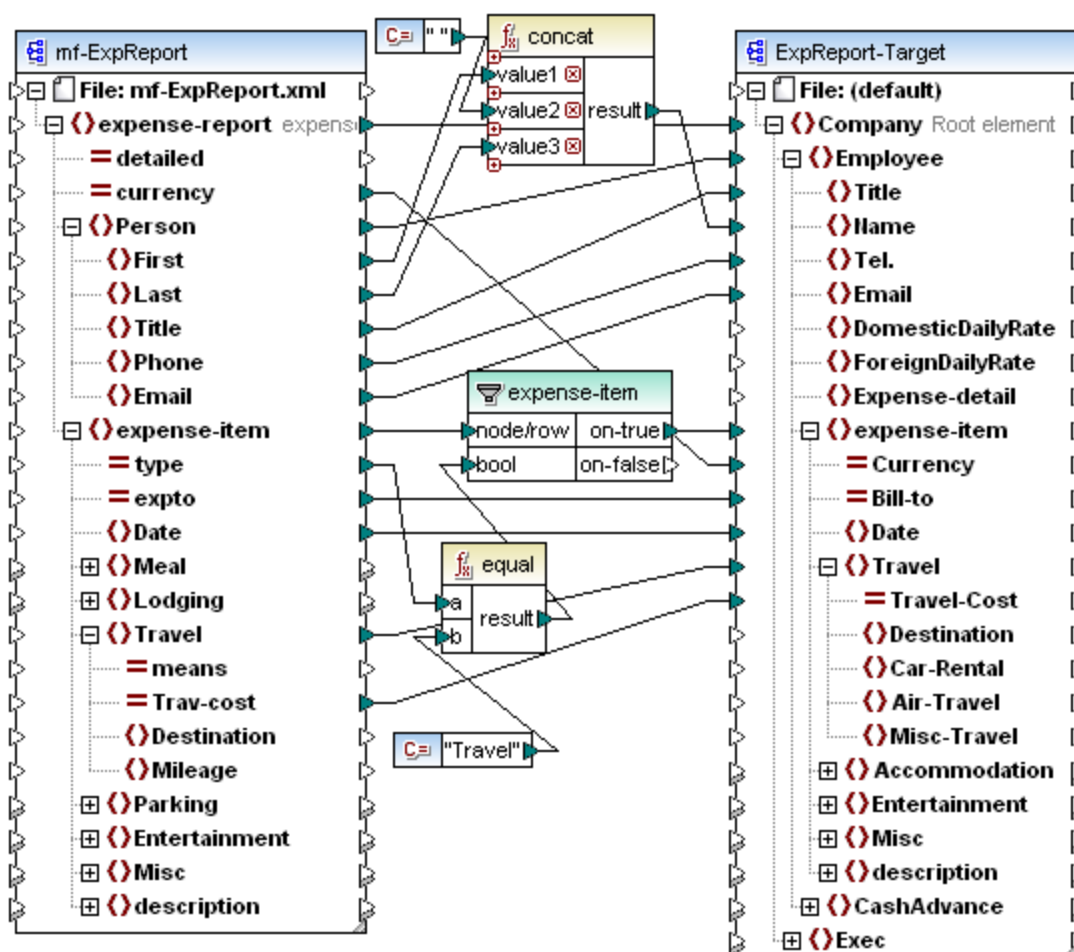
### 6.1.1 Target-driven / Standard mapping

Target-driven (Standard) mapping means the normal method of mapping used in MapForce, i.e. the output depends on the sequence of the target nodes.

- Mixed content text node content is not supported/mapped.
- The sequence of child nodes is dependent on the target schema file.



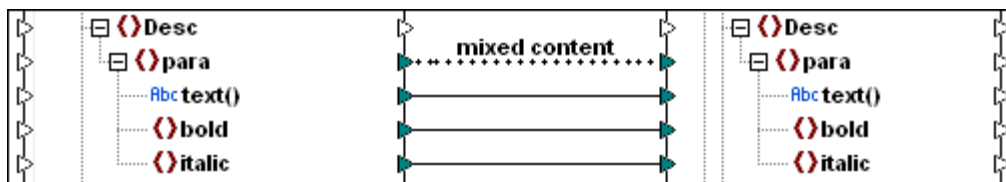
Standard mappings are shown with a solid line.



### 6.1.2 Source-driven / mixed content mapping

Source-driven (Mixed Content) mapping enables you to automatically map text and child nodes in the same sequence that they appear in the XML **source** file.

- Mixed content text node content is supported/mapped.
- The sequence of child nodes is dependent on the source XML instance file.



Mixed content mappings are shown with a dotted line.

Source-driven / mixed content mapping can, of course, also be applied to XML schema **complexType** items if you wish. Child nodes will then be mapped according to their sequence in the XML source file.

Source-driven / mixed content mapping supports:

Mappings from

- As **source** components:
  - XML schema complexTypes (including mixed content, i.e. mixed=true)
- As **target** components:
  - XML schema complexTypes (including mixed content), Note: CDATA sections are treated as text.

#### Mapping mixed content

The files used in the following example (**Tut-OrgChart.mfd**) are available in the [...MapForceExamples\Tutorial\](#) folder.

#### Source XML instance

A portion of the **Tut-OrgChart.XML** file used in this section is shown below. Our area of concern is the mixed content element "para", along with it's child nodes "bold" and "italic".

Please note that the para element also contains a Processing Instruction (sort alpha-ascending) as well as Comment text (Company details...) which can also be mapped.

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with XMLSpy v2005 sp2 U (http://www.altova.com) by Mr. Nobody (Altova GmbH) -->
<OrgChart xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="Tut-OrgChart.xsd">
  <CompanyLogo href="nanonull.gif"/>
  <Name>Organization Chart</Name>
  <Office>
    <Name>Nanonull, Inc.</Name>
    <Desc>
      <para>The company was established in<b>Vereno</b>in 1995. Nanonull
develops nanoelectronic technologies for<i>multi-core processors.</i>February 1999
saw the unveiling of the first prototype <b>Nano-grid.</b>The company hopes to expand
its operations <i>offshore</i>to drive down operational costs.
      <?sort alpha-ascending?>
      <!--Company details: location and general company information.-->
    </para>
    <para>White papers and further information will be made available in the near future.
  </Desc>

```

Please note the **sequence** of the text and bold/italic nodes of Nanonull., Inc in the XML instance file, they are:

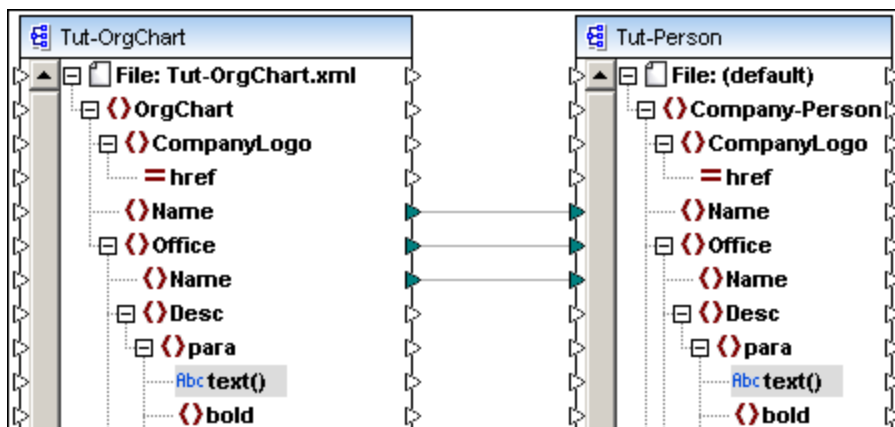
```

<para> The company...
  <b>Vereno</b>in 1995 ...
  <i>multi-core...</i>February 1999
  <b>Nano-grid.</b>The company ...
  <i>offshore...</i>to drive...
</para>

```

### Initial mapping

The initial state of the mapping when you open Tut-Orgchart.mfd is shown below.



### Output of above mapping

The result of the initial mapping is shown below: Organization Chart as well as the individual office names have been output.

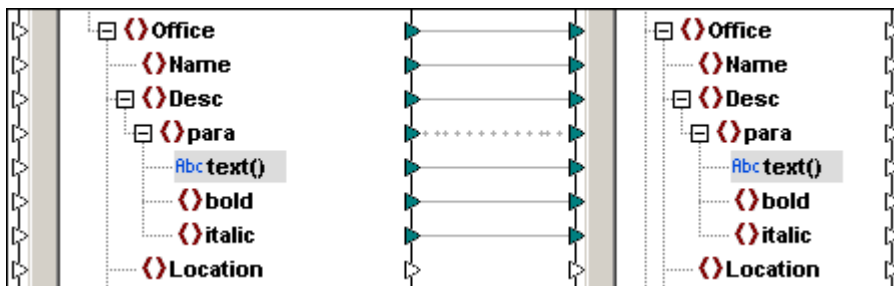
```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <Company-Person xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNames
3  <Name>Organization Chart</Name>
4  <Office>
5  <Name>Nanonull, Inc.</Name>
6  </Office>
7  <Office>
8  <Name>Nanonull Europe, AG</Name>
9  </Office>
10 </Company-Person>
11

```

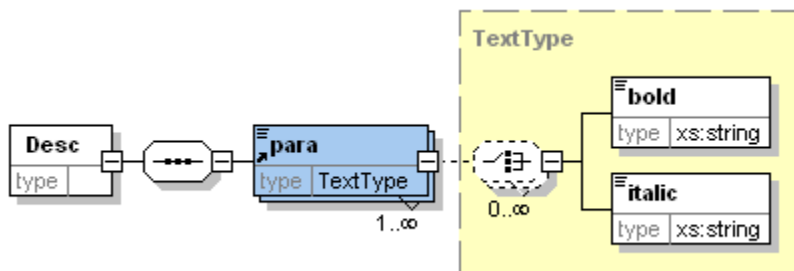
### Mapping the para element

The image below shows an example of mixed content mapping. The para element is of mixed content, and the connector is shown as a **dotted** line to highlight this. The **text()** node contains the textual data and needs to be mapped for the text to appear in the target component.



Right clicking a connector and selecting Properties, allows you to annotate, or label the connector. Please see section ["Connection"](#) in the Reference section for more information.

The image below shows the content model of the Description element (Desc) of the **Tut-OrgChart.xsd** schema file. This definition is identical in both the source and target schemas used in this example.



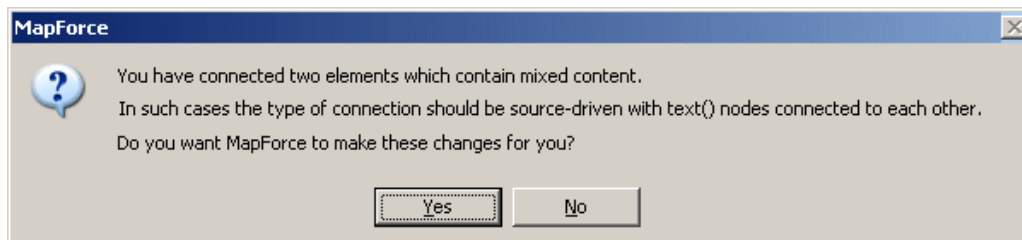
Note the following properties of the **para** element in the Content model:

- **para** is a complexType with mixed="true", of type "TextType"
- **bold** and **italic** elements are both of type "xs:string", they have not been defined as recursive in this example, i.e. neither **bold**, nor **italic** are of type "TextType"
- **bold** and **italic** elements can appear any number of times in any sequence within **para**
- any number of text nodes can appear within the **para** element, interspersed by any number of **bold** and **italic** elements.

### To create mixed content connections between items:

1. Select the menu option **Connection | Auto Connect Matching Children** to activate this option, if it is not currently activated.
2. Connect the **para** item in the source schema, with the **para** item in the target schema.

A message appears, asking if you would like MapForce to define the connectors as source driven.



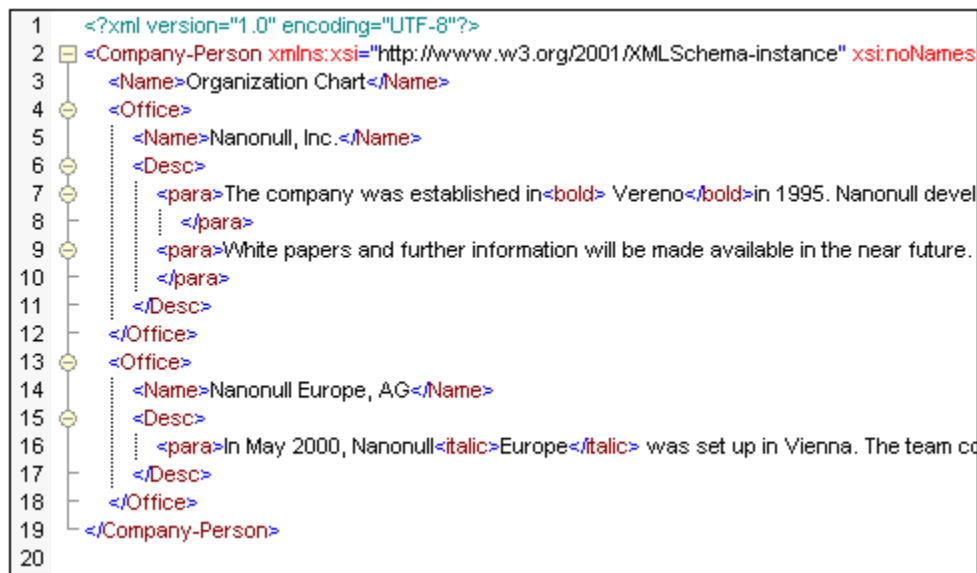
3. Click Yes to create a mixed content connection.


Please note:

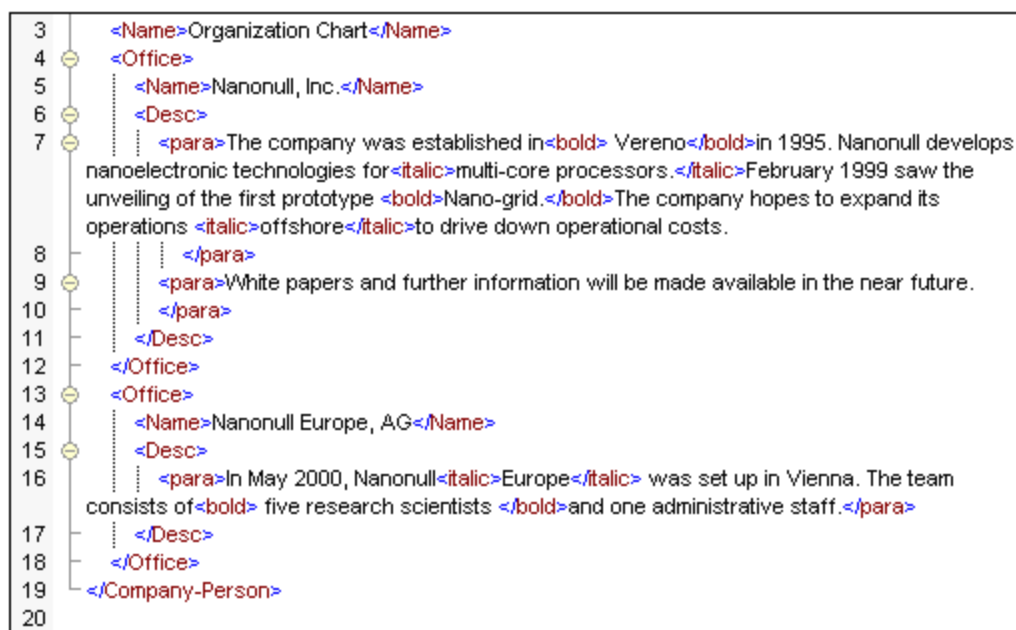
Para is of mixed content, and makes the message appear at this point. The mixed-content message also appears if you only map the para items directly, without having the autoconnect option activated.

All child items of para have been connected. The connector joining the para items is displayed as a dotted line, to show that it is of type mixed content.

4. Click the Output tab to see the result of the mapping.



5. Click the word **Wrap** icon  in the Output tab icon bar, to view the complete text in the Output window.

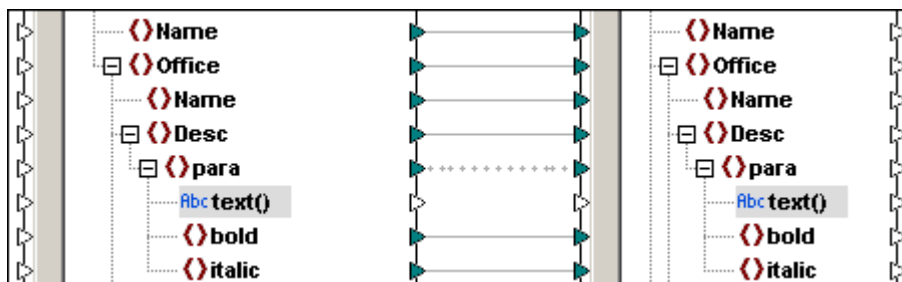


The mixed content text of each office description has been mapped correctly; the text, as well as the bold and italic tag content, have been mapped as they appear in the XML **source** file.

- Switch back to the Mapping view.

#### To remove text nodes from mixed content items:

- Click the **text()** node connector and press Del. to delete it.



- Click the Output tab to see the result of the mapping.



Result:

- all **text** nodes of the para element have been removed.
- mapped bold and italic text content remain
- the bold and italic item **sequence** still follows that of the source XML file!

### Mixed content example

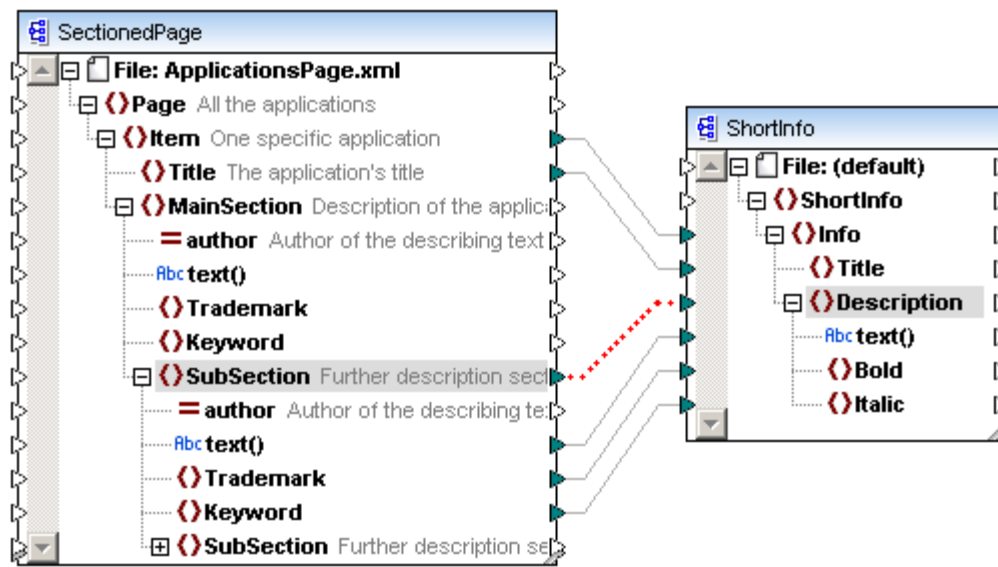
The following example is available as "**ShortApplicationInfo.mfd**" in the [...MapForceExamples](#) folder.

A snippet of the XML source file for this example is shown below.

```
<Page xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="SectionedPage.xsd">
  <Item>
    <Title>XMLSpy</Title>
    <MainSection author="altova">
      Altova <Trademark>XMLSpy</Trademark>
      <SubSection>Altova <Trademark>XMLSpy</Trademark> 2005 Enter
is the industry standard <Keyword>XML</Keyword> development environment
editing, debugging and transforming all <Keyword>XML</Keyword> technolo
automatically generating runtime code in multiple programming languages
    </MainSection>
  </Item>
```

The mapping is shown below. Please note that:

- The "SubSection" item connector is of mixed content, and is mapped to the Description item in the target XML/schema.
- The text() nodes are mapped to each other
- Trademark text is mapped to the Bold item in the target
- Keyword text is mapped to the Italic item in the target



### Mapping result

The mixed content text of each description has been mapped correctly; the text, as well as the bold and italic tag content, have been mapped as they appear in the XML source file.

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <ShortInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="
  C:/PROGRAM~1/Altova/MapForce2005/MapForceExamples/ShortInfo.xsd">
3   <Info>
4     <Title>XMLSpy</Title>
5     <Description>Altova <Bold>XMLSpy</Bold> 2005 Enterprise Edition is the industry standard
    <Italic>XML</Italic> development environment for modeling, editing, debugging and transforming
    all <Italic>XML</Italic> technologies, then automatically generating runtime code in multiple
    programming languages.</Description>
6   </Info>

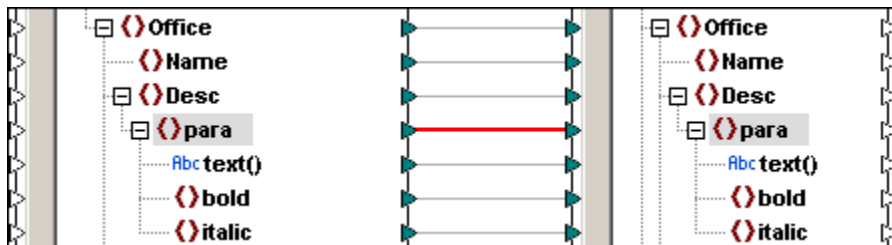
```

### Using standard mapping on mixed content items

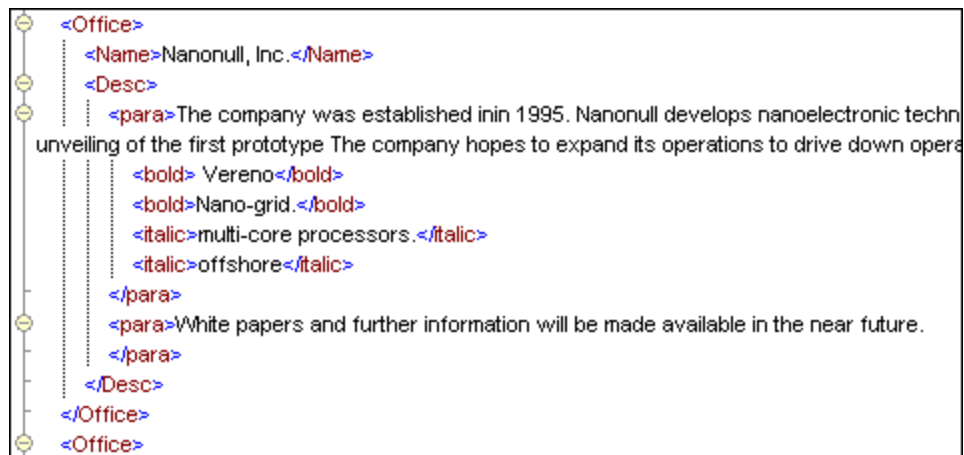
This section describes the results when defining **standard** mappings (or using standard connectors) on **mixed content** nodes. The files used in the following example ( **Tut-OrgChart.mfd** ) are available in the [.../MapForceExamples/Tutorial/](#) folder.

#### To create standard connections between mixed content items:

1. Create a connector between the two **para** items.  
A message appears, asking if you would like MapForce to define the connectors as source driven.
2. Click No to create a standard mapping.



3. Click the Output tab to see the result of the mapping.



### Result

Mapping mixed content items using standard mapping produces the following result:

- Text() **content** is supported/mapped.
- The start/end tags of the child nodes, bold and italic, are removed from the text node.
- The child nodes appear after the mixed content node text.
- The **sequence** of child nodes depends on the sequence in the **target** XML/schema file.

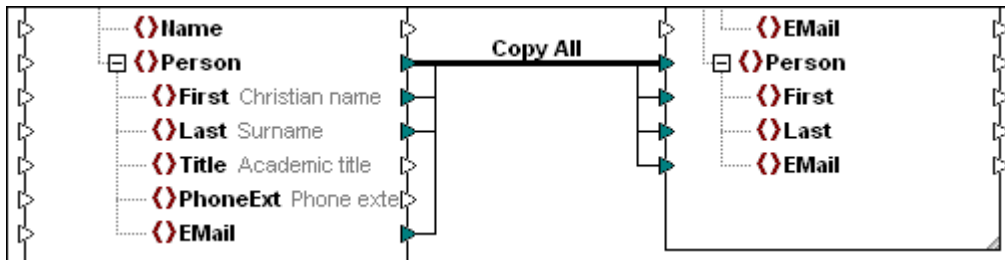
That is:

For each **para** element, map the text() node, then **all bold** items, finally **all italic** items. This results in the child item sequence shown above: bold, bold - italic, italic. The content of each item is mapped if a connector exists.

### 6.1.3 Copy-all connections

This type of connection allows you to simplify your workspace and automatically connect **all** identical items in source and target components, meaning that, depending on the source and target **type**, all source child items are **copied** to the target component, if either the source and target **types** are **identical**, or if the target type is xs:anyType.

If the source and target **types** are **not identical**, and if the target type is not xs:anyType, the source data is transferred/mapped to the respective target items of the same name and the same hierarchy level. If the names of the target items differ, then the mapping to the target item is not created.



Connectors of type Copy All are shown with a single bold line that connects the various identical items of source and target components.

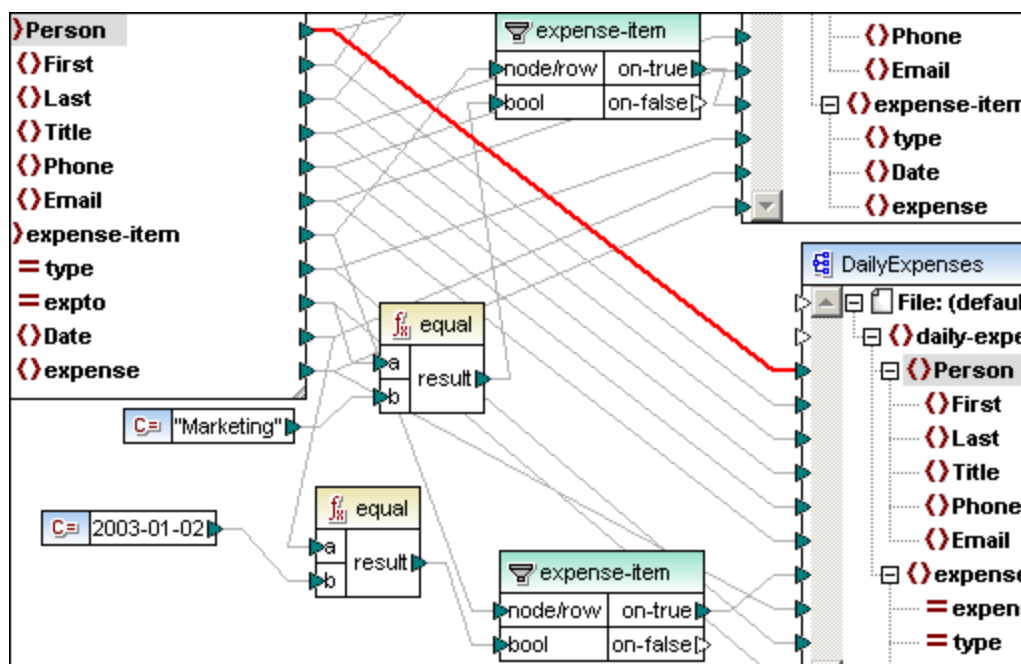
Note that only the names of the child items, but not their individual types, are compared/matched.

Currently Copy-all connections are supported (i) between XML schema complex types, and (ii) between complex components (XML schema) and [complex user-defined functions/components](#) containing the same corresponding complex parameters.

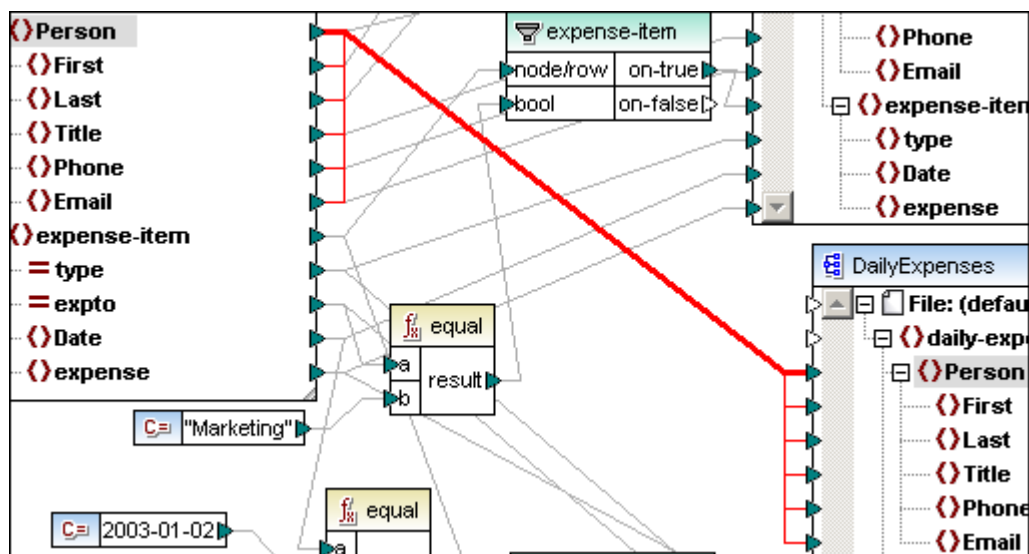
The example below shows these connectors using the **MarketingAndDailyExpenses.mfd** file in the [...MapForceExamples](#) folder.

#### To define a Copy-all connection:

1. Right-click an existing connector, e.g. the Person connector, and select "Copy-all" from the context menu.  
A prompt appears reminding you that all connections to the target child items will be replaced by the copy-all connection.



2. Click OK to create Copy-all connectors.



All connectors to the target component, and all source and target items with identical names are created.

Please note:

- When the existing target connections are deleted, connectors from other source components, or other functions are also deleted.
- This type of connection cannot be created between an item and the root element of a schema component.
- Individual connectors cannot be deleted, or reconnected from the Copy-all group, once you have used this method.

#### To resolve/delete copy-all connectors:

1. Connect any item to a child item of the copy-all connection at the target component.

You are notified that only one connector can exist at the target item. Click Replace to replace the connector.

- Click the **Resolve copy-all connection** button in the next message box that opens. The copy-all connection is replaced by individual connectors to the target component.

### Copy-all connections and user-defined functions

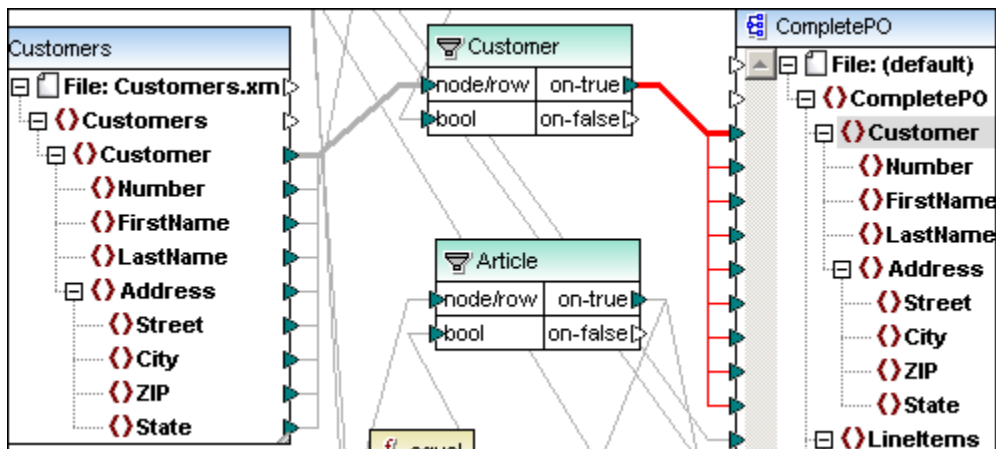
When creating Copy-all connections between a schema and a user-defined function parameter, the two components must be based on the same schema! It is not necessary that they both have the same root elements however. Please see ["Complex output components - defining"](#) for an example.

### Copy-all connections and filters

Copy-all connections can also be created through filter components if the source component:

- consists of structured data, meaning a schema component,
- receives data through a complex output parameter of a user-defined function, or Web service,
- receives data through another filter component.

Only the filtered data is passed on to the target component.

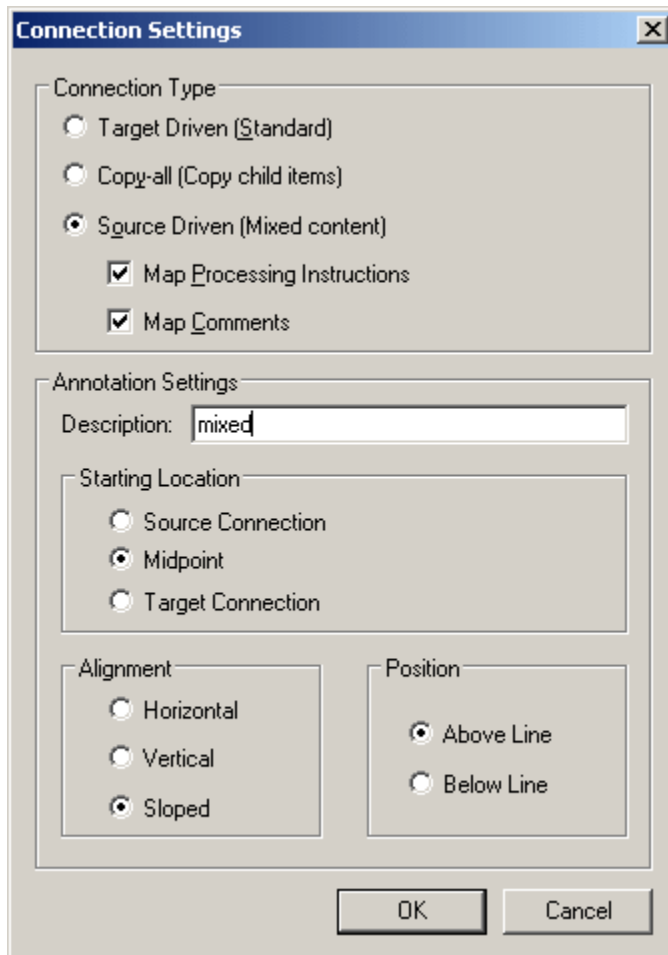


### To define a copy-all connection through a filter component:

- Create a connector from the **on-true/on-false** item to the target item, e.g. Customer.
- Right click the connector and select "Copy-all (Copy child items)" from the context menu. The copy-all connector between items of the same name are created.

## 6.2 Connection settings

Right-clicking a connector and selecting **Properties** from the context menu, or double-clicking a connector, opens the Connection Settings dialog box in which you can define the specific (mixed content) settings of the current connector. Note that unavailable options are greyed out.

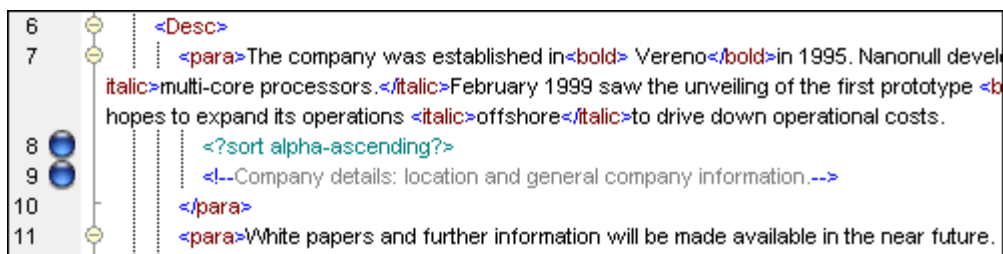


### Connection type

For items of **complexType**, you can choose one of the following connection types for mapping (please note that these settings also apply to **complexType** items which do not have any text nodes!):

- **Target Driven (Standard)**: Changes the connector type to Standard mapping, please see [Target-driven / Standard mapping](#) for more information.
- **Copy-all (Copy child items)**: Changes the connector type to Copy-all and automatically connects all identical items in the source and target components. Please see [Copy-all connections](#) for more information.
- **Source Driven (mixed content)**: Changes the connector type to source driven / mixed content, and enables the selection of additional elements to be mapped. The additional elements have to be **child items** of the mapped item in the XML source file, to be able to be mapped.

Activating the **Map Processing Instructions** and/or **Map Comments** check boxes enables you to include those data in the output file.




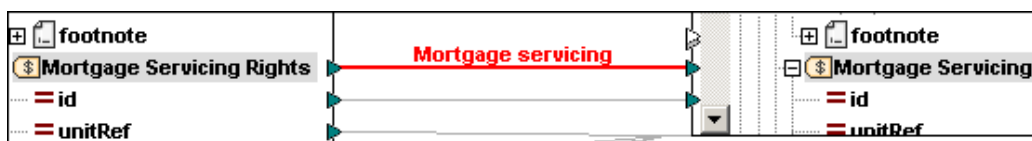
Please note: CDATA sections are treated as text.


### Annotation Settings

Individual connectors can be labeled allowing you to comment your mapping in great detail. When you enter a character in the Description field, the Starting Location, Alignment, and Position group boxes are activated and can be edited. This option is available for **all connection types**.

#### To add an annotation to a connector:

1. Enter the name of the currently selected connector in the **Description** field. This enables all the options in the Annotation Settings group.
2. Use the remaining groups to define the **starting location**, **alignment** and **position** of the label.
3. Activate the **Show annotations**  icon in the View Options toolbar to see the annotation text.



**Note:** If the **Show annotations** icon is inactive, you can still see the annotation text if you place the mouse cursor over the connector. The annotation text will appear in a popup if the **Show tips**  icon is active in the View Options toolbar.

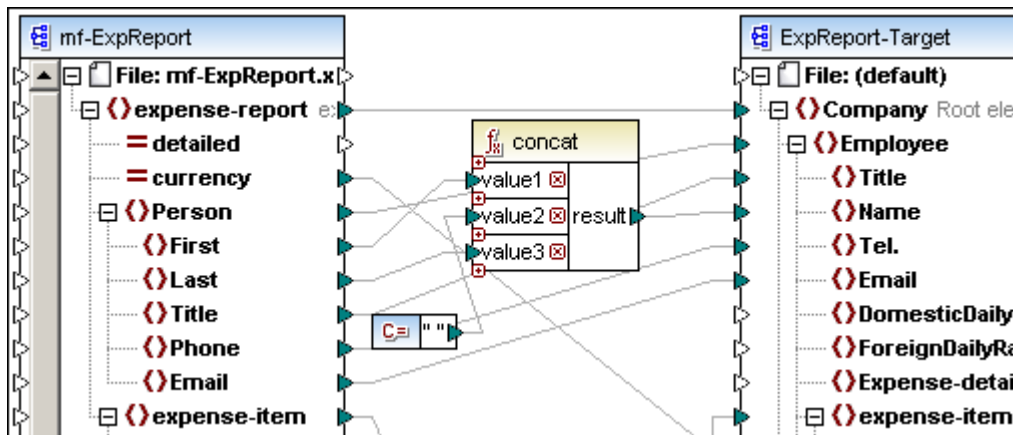
## 6.3 Moving connectors

### Moving connectors and the effect on child connectors

When moving a parent connector to a different parent connector item, MapForce automatically matches identical child connections under the new location of the connector. This is not the same as the auto-connect child option, as it uses different rules to achieve this.

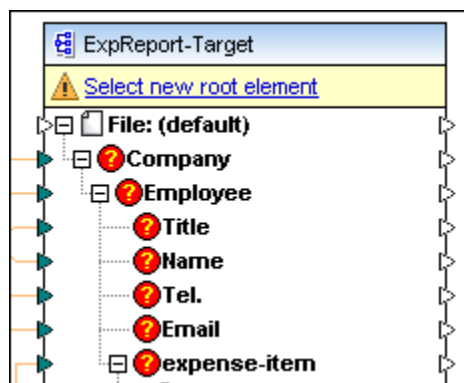
A common use of this feature is if you have an existing mapping and then change the root element of the target schema. This would normally force you to remap all descending connectors manually.

This example uses the **Tut-ExpReport.mfd** file available in the ...MapForceExamples\Tutorial folder.

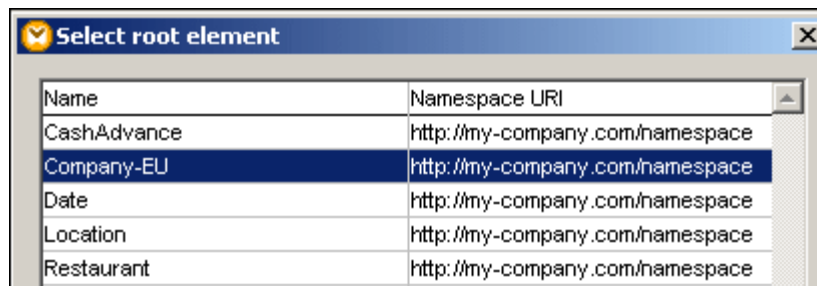


If the Company root element of the target schema, is changed to Company-EU then a "Changed files" prompt appears in MapForce.

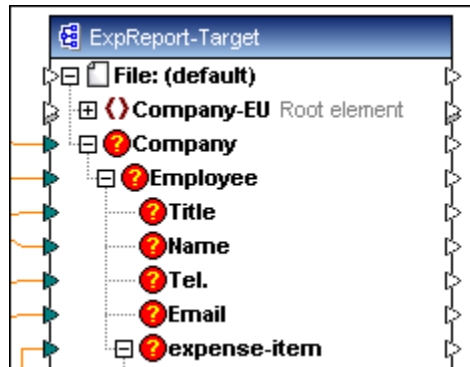
1. Click the **Reload** button to reload the updated Schema.  
You are now presented with multiple missing nodes as the root element has changed.



2. Click on the "Select new root element" link at the top of the component.

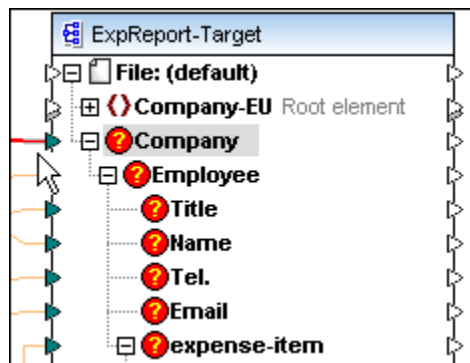


3. Select the updated root element, Company-EU and click OK to confirm.

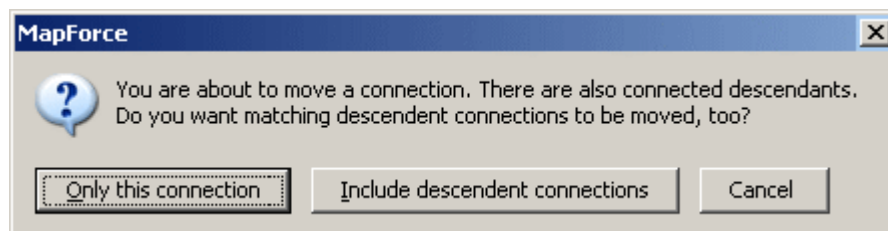


The Company-EU root element is now visible at the top of the component.

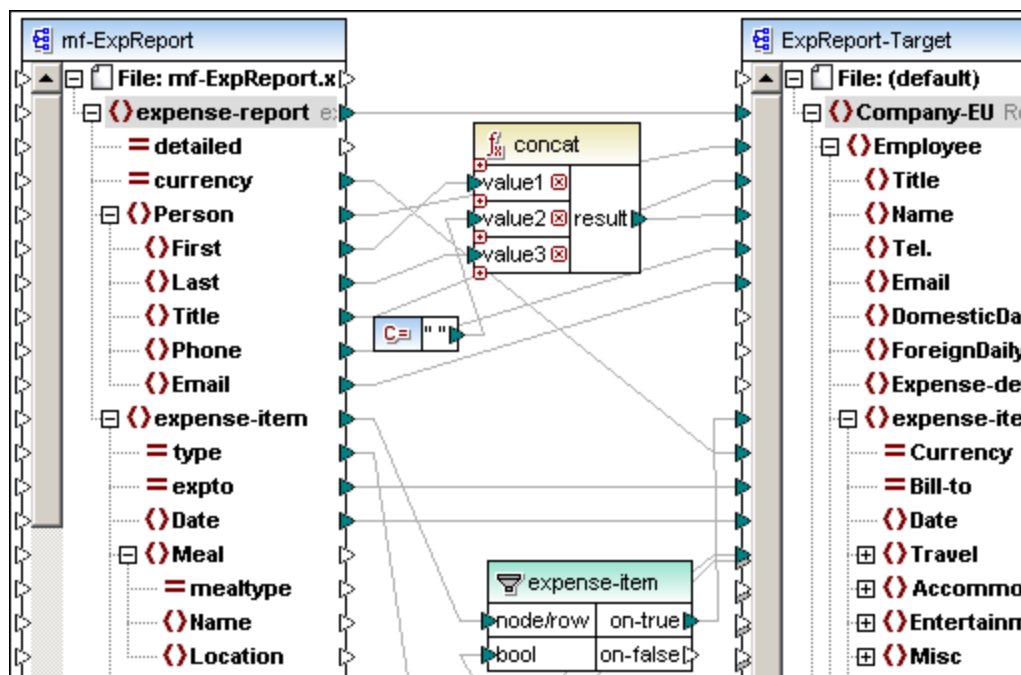
4. Click the connector on the Company item and use drag-and-drop to drop it on the new Company-EU root element.



A prompt appears asking which connectors you want to move.



5. Click the "Include descendent connections" button if you want to map the child connectors.  
The "missing" item nodes have been removed and all connectors have been mapped to the correct child items under the new root element.



Please note:

If the item/node you are mapping **to** has the same name (as the source node) but is in a different namespace, then the prompt will contain an additional button "Include descendants and map namespace".

Clicking this button moves the child connectors of the same namespace as the source parent node, to the same child nodes under the different namespace node. I.e. If the parent nodes only differ in their namespace, then the child nodes may only differ in the same way, if they are to be mapped automatically.

You can also change the root element by right clicking the component header and selecting "Change Root Element" from the context menu.

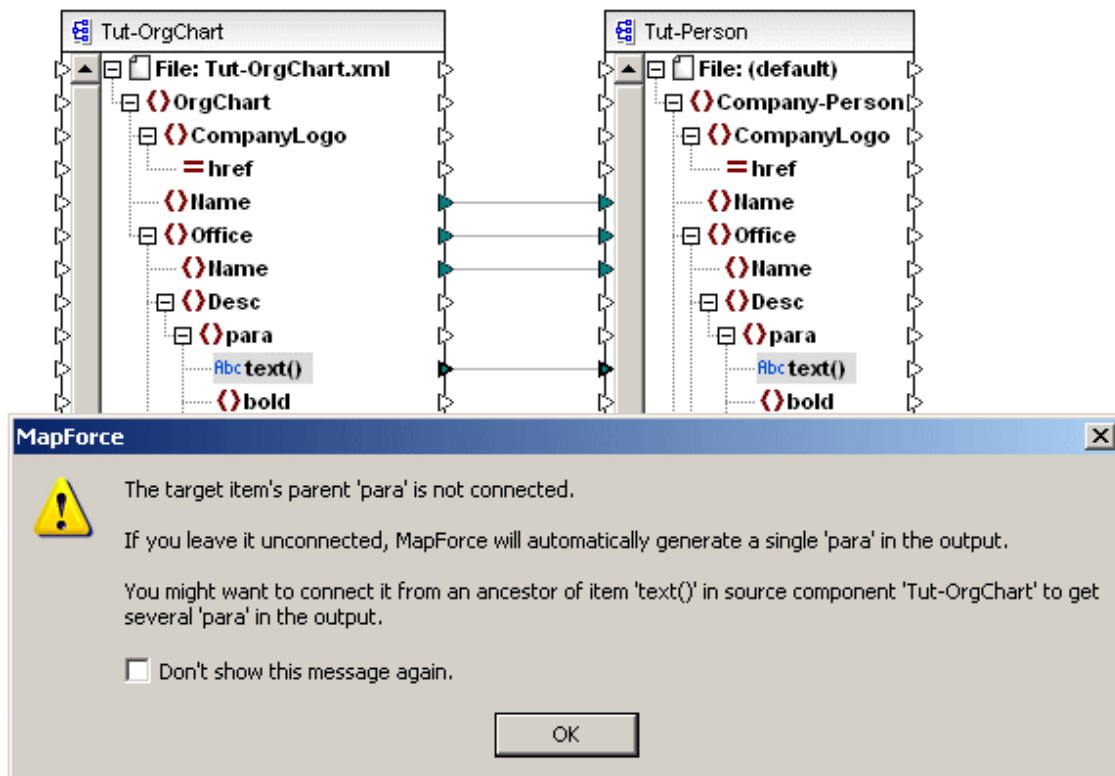
## 6.4 Connections and mapping results

When you are creating connections between source and target items manually, MapForce automatically analyzes the possible mapping outcomes. If you are mapping two child items, a prompt can appear suggesting that you also connect the parent of the source item with the parent in the target item.

This avoids having only a single child item appear in the Output window when you preview the mapping. This will generally be the case if the source node supplies a sequence instead of a single value.

The Tut-OrgChart.mfd mapping shown below is available in the ...MapForceExamples\Tutorial folder.

When connecting the source text() item to the target text() item, a message box appears, stating that the parent item "para" is not connected and will only be generated once in the output. To generate multiple para items in the target, connect the source and target "para" items to each other.

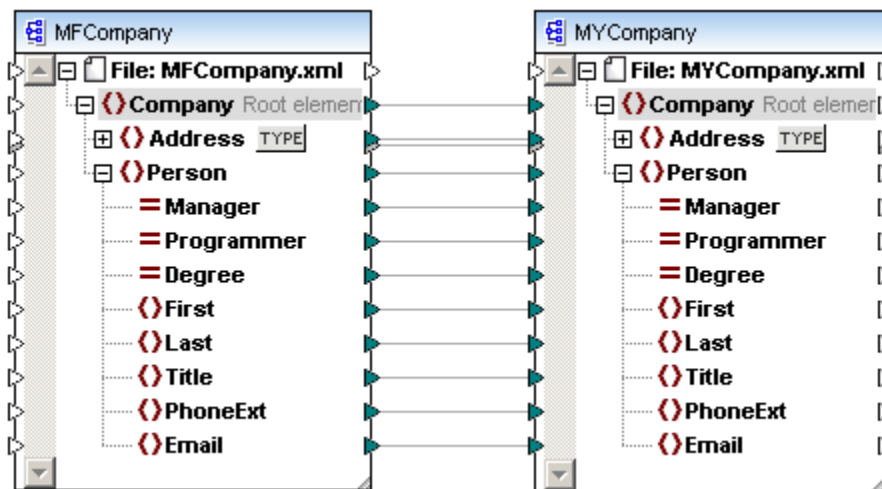


## 6.5 Missing items

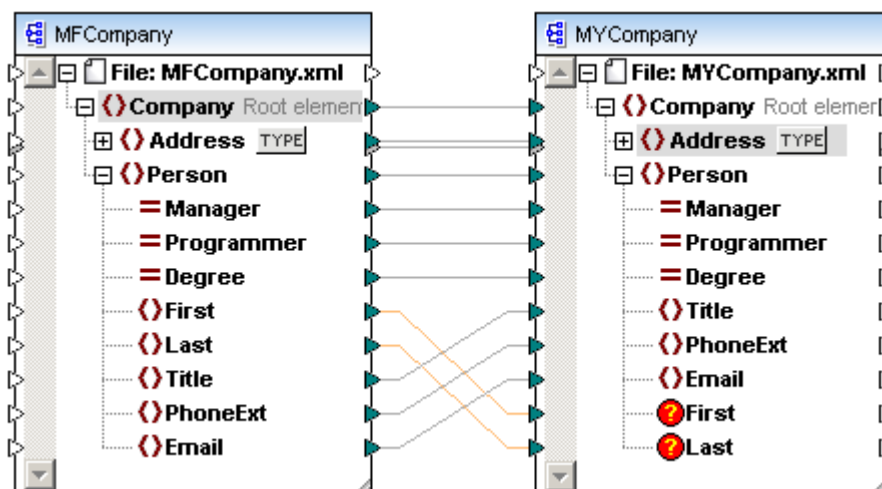
Over time, it is likely that the structure of one of the components in a mapping may change e.g. elements or attributes are added/deleted to an XML schema. MapForce uses placeholder items to retain all the connectors, and any relevant connection data between components, when items have been deleted.

Example:

Using the **MFCompany.xsd** schema file as an example. The schema is renamed to **MyCompany.xsd** and a connector is created between the **Company** item in both schemas. This creates connectors for all child items between the components, if the Autoconnect Matching Children is active.



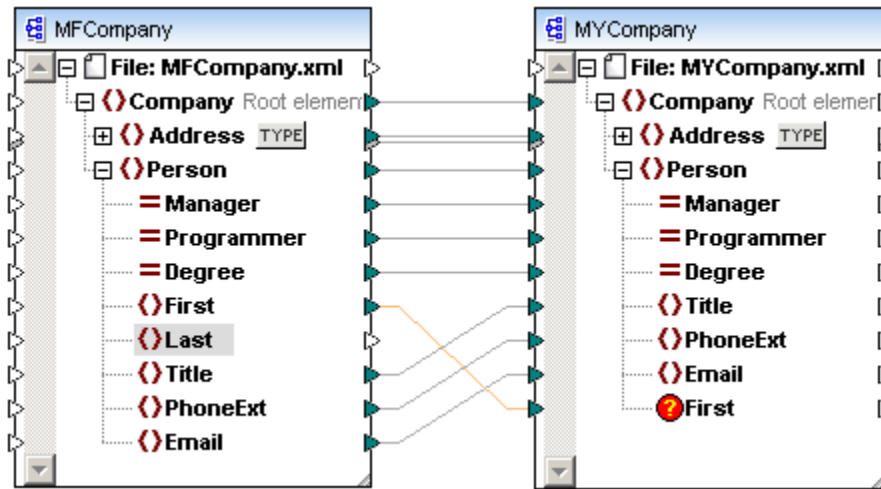
While editing **MyCompany.xsd**, in XMLSpy, the **First** and **Last** items in the schema are deleted. Returning to MapForce opens a Changed Files notification dialog box, prompting you to reload the schema. Clicking **Reload** updates the components in MapForce.



The deleted **items** and their **connectors** are now marked in the **MyCompany** component. You could now reconnect the connectors to other items if necessary, or delete the connectors.

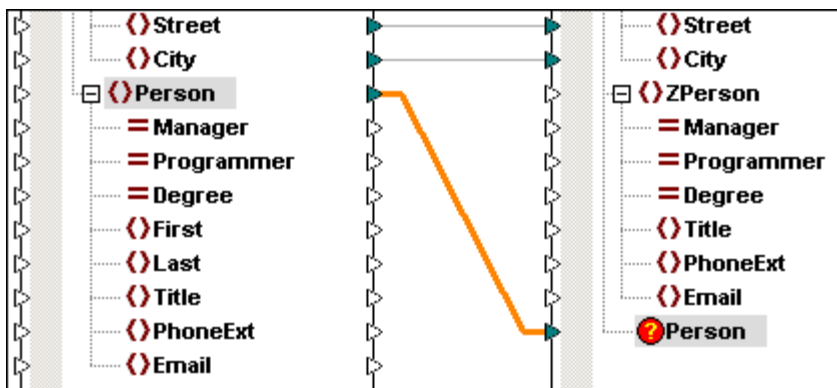
Note that you can still preview the mapping (or generate code), but warnings will appear in the Messages window if you do so at this point. All connections to, and from, missing items are ignored during preview or code-generation.

Clicking one of the highlighted connectors and deleting it, removes the "missing" item from the component, e.g. Last, in MyCompany.



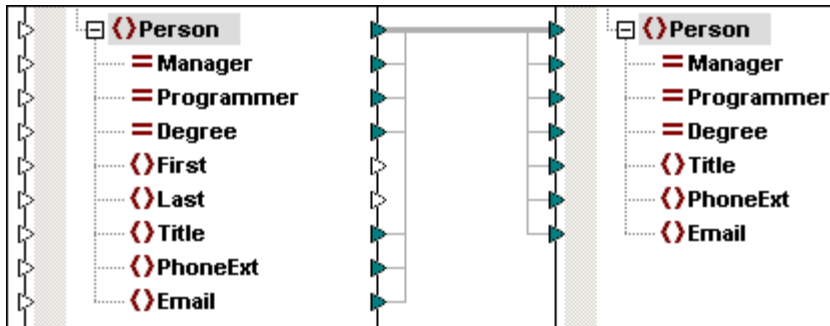
### Renamed items

If a parent item is renamed e.g. Person to ZPerson, then the original parent item connector is retained and the child items and their connectors are deleted.



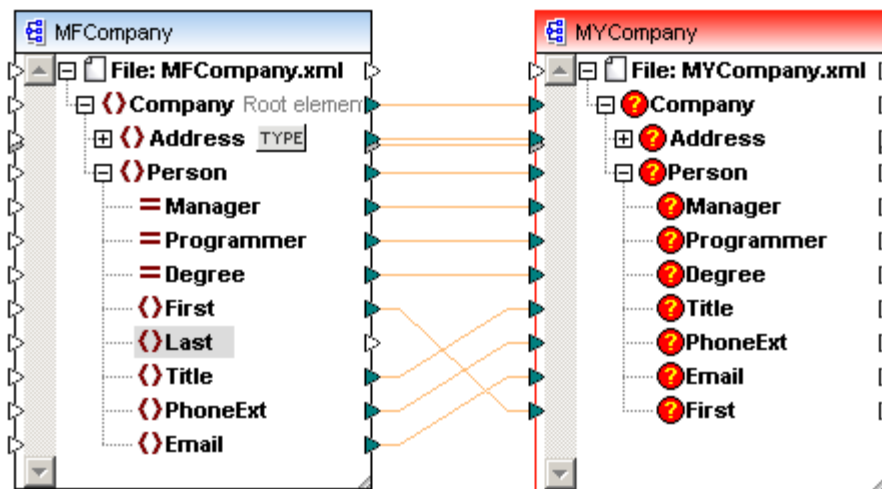
### "Copy all" connectors and missing items

Copy all connections are treated in the same way as normal connections, with the only difference being that the connectors to the missing child items are not retained or displayed.



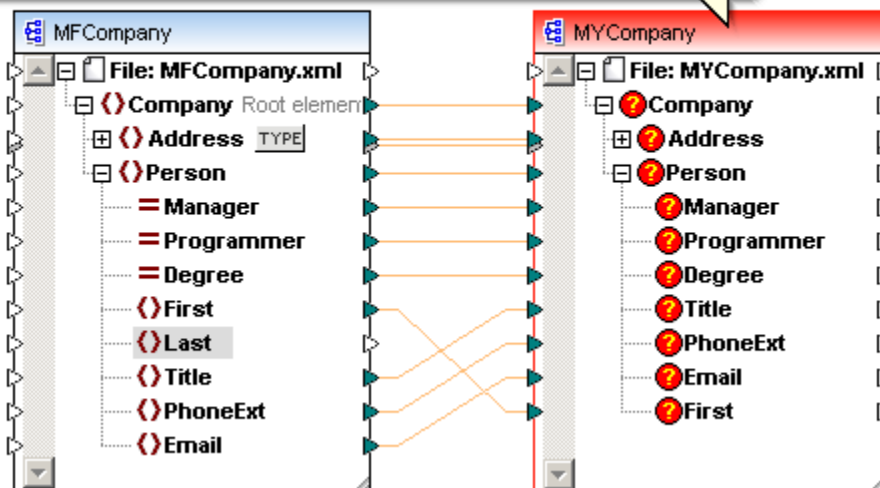
### Renamed or deleted component sources

If the **data source** of a component i.e. schema has been renamed or deleted, then all items it contained are highlighted. The red frame around the component denotes that there is no valid connection to a schema and prevents preview and code generation.



Placing the mouse cursor over the highlighted component, opens a popup containing pertinent information.

This component does not have any valid structure information.  
Local file 'C:\2010\MapForceExamples\Tutorial\MYCompany.xsd' was not found.



Double-clicking the title bar of the highlighted component opens the Component Settings dialog box. Clicking the **Browse** button in the **Schema file** group allows you to select a different, or backed-up version of the schema. Please see "[Component](#)" in the Reference section for more information.

**Component Settings**

Schema file:

Input XML File:

Output XML File:

Prefix for target namespace:

☒ Add schema/DTD reference (leave field empty to use absolute file path of schema):

☒ Cast values to target types (disable to preserve formatting of numeric or date values at risk of writing invalid output)

☒ Pretty print output

☒ Create digital signature (Built-in execution only)

In case of failed creation: ☐ Stop processing ☒ Continue without signature

Encoding:

Encoding name:

Byte order:  ☐ Include byte order mark

StyleVision Power Stylesheet file:

☒ Enable input processing optimizations based on min/maxOccurs

☒ Save all file paths relative to MFD file

All valid/correct connections will be retained if you select a schema of the same structure.

## 6.6 Chained mappings / pass-through components

MapForce supports mappings that consist of multiple components in a mapping chain. Chained mappings are mappings where at least one component acts as both a source and a target. Such a component creates output which is later used as input for a following mapping step in the chain. Such a component is called an "intermediate" component.

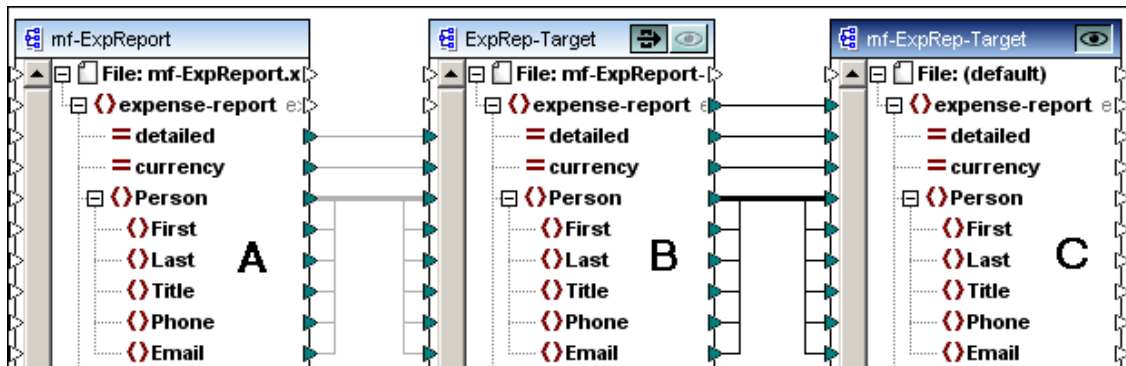
Chained mappings introduce a feature called "pass-through", which allows you to create intermediate file outputs of "intermediate" components for preview, command line execution and in code generation. "Pass-through" is a preview capability allowing you to view the various stages of a chained mapping in the Output window. The Built-in execution engine is used to preview the mappings and uses temp files to generate the results.

If the mapping is executed from the command line, or generated code, then regardless of the entries in the Input/Output XML File fields of the "intermediate" component, the full mapping chain is executed, and the output of a previous step of a mapping chain is forwarded as input to the following mapping step.

Note:

Only "intermediate" components which are file based, i.e. XML, CSV, TXT file, etc., provide the feature "pass-through". Database components can be intermediate but the pass-through button is not shown. The intermediate component is always regenerated from scratch when previewing or generating code. This would not be feasible with a database as it would have to be deleted prior to each regeneration.

The screenshot below, for example, shows three components A, B, and C, where C is the target component. Component B (ExpRep-Target) is the "intermediate" component, as it has both input and output connections.



Note that when executing a chained mapping using the command line, or executing the generated code, the mapping executes all steps in the correct order and generates the necessary output files.




### Preview button

Component B, as well as C, both have preview buttons. This allows you to preview the intermediate mapping result of B, as well as the final result of the chained mapping of component C in the Built-in execution engine. Click the preview button of the respective component, then click Output to see the mapping result.


"Intermediate" components with the pass-through button active, cannot be previewed since the preview button is automatically disabled. To see the output of such a component, click the "pass-through" button, to deactivate it, then click the preview button of the intermediate component.

**Pass-through button**

The intermediate component B, has an extra button in the component title bar called "pass-through".

If the pass-through button is **active**  MapForce maps all data into the preview window in one go; from component A to component B, then on to component C. Two result files will be created:

- the result of mapping component A to intermediate component B
- the result of the mapping from the intermediate component B, to target component C.

If the pass-through button is **inactive**  MapForce will execute only parts of the full mapping chain. It depends on which Preview buttons are active on the components B or C, as to which data is generated:

- if the Preview button of component B is active then the result of mapping component A to component B is generated. The mapping chain actually stops at component B. Component C is not involved in the preview at all.
- if the Preview button of component C is active, then the result of mapping intermediate component B to the component C is generated. When pass-through is inactive, automatic chaining has been interrupted for component B. Only the right part of the mapping chain is executed. Component A is not used.

Note, if the mapping is executed from the command line, or generated code, then regardless of the settings of the pass-through button of component B, as well as the currently selected preview component, the output of all components is generated.

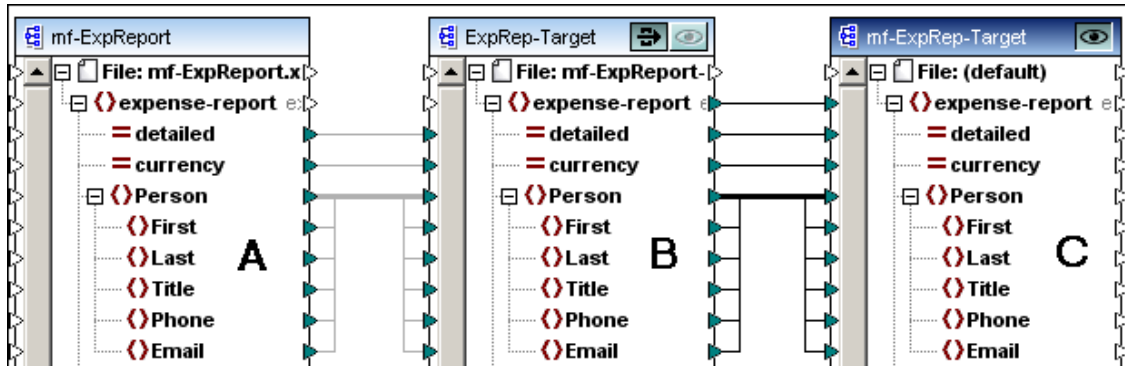
In our sample two result files will be generated! This is the case because MapForce automatically analyzes the dependency of all components and generates all outputs of intermediate and final target components in the correct order.

Since the "pass-through" setting is currently inactive, it is vital that the intermediate component B has identical file names in the "Input XML file" and "Output XML file" fields.

Please see the following sections for more on this example, and how the source data is transferred differently when the pass-through button is [active](#) or [inactive](#). Please see [Chained mapping example](#) for a more plausible example.

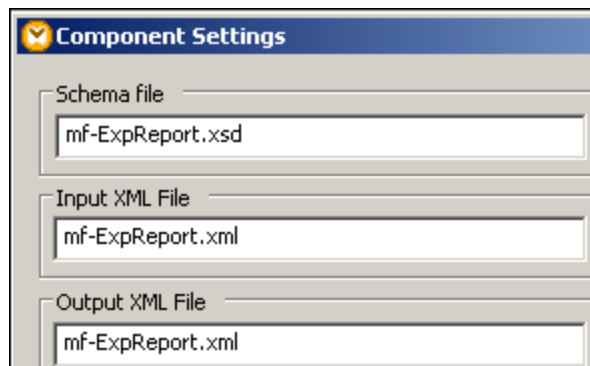
### 6.6.1 Chained mappings - Pass-through active

The files used in the following example (**Tut-ExpReport-chain.mfd**) are available in the [...MapForceExamples\Tutorial\](#) folder.



The Tut-ExpReport-chain.mfd example (*screenshot above*) is set up as follows:

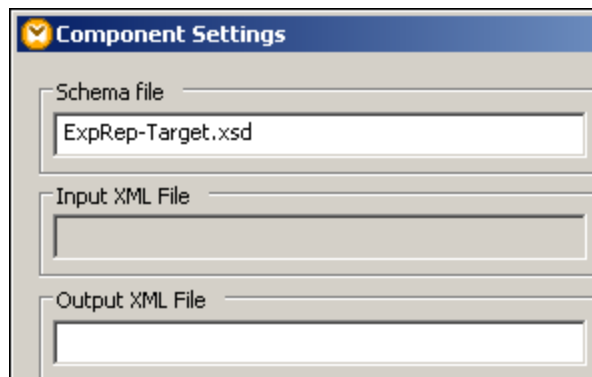
- **Component A** supplies all the mapping data, using a sample XML file. The XML file (mf-ExpReport.xml) appears in the *Input XML File* field of the **Component Settings** dialog box. The Output XML File, of the same name, is automatically inserted when you define an Input XML file.



- Intermediate **component B** "pass-through" active:  
When pass-through is active, the *Input XML File* field of the intermediate component, is automatically deactivated. A file name need not exist for the mapping to execute, as intermediate data is stored in temp files.

If no Output XML File is defined, a default file name will be automatically used. If an Output XML File entry exists, then it is used for the file name of the intermediate output file.

Note that it is also possible for intermediate components to have dynamic file names i. e. connectors to the "File:" item of a component (or even file name wildcards). Please see [Dynamic input/output files per component](#).



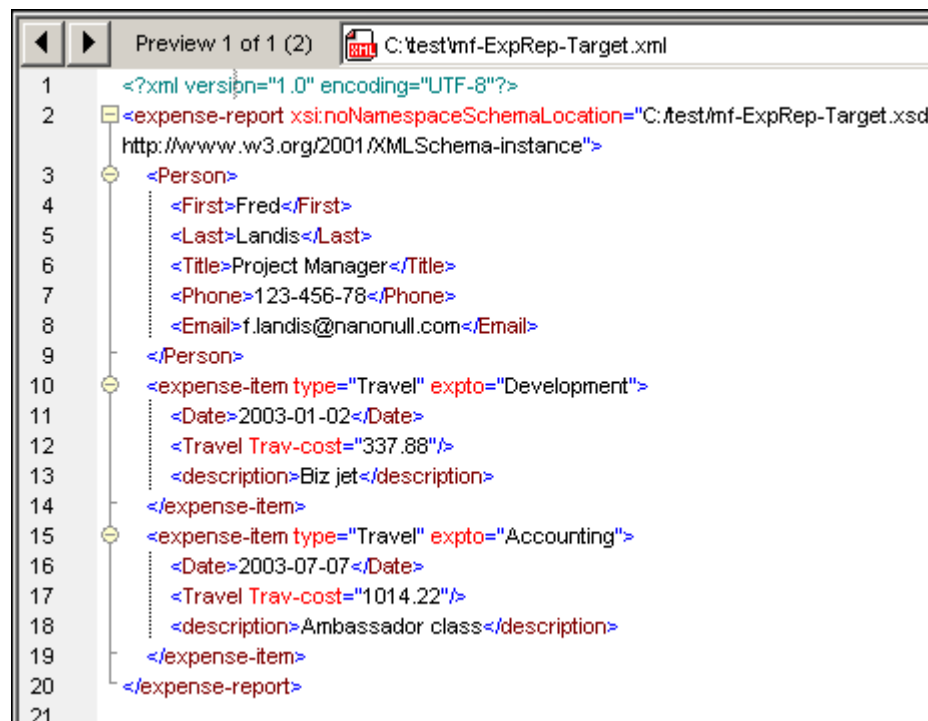
The 'Component Settings' dialog box has a title bar with a yellow icon and the text 'Component Settings'. It contains three sections, each with a label and a text input field: 'Schema file' with 'ExpRep-Target.xsd', 'Input XML File' (empty), and 'Output XML File' (empty).

- Final **component C** does **not** have an Output XML File assigned to it. The preview button of component C is active.

Click the Output button to preview the results in the Built-in execution engine.

Preview 1:

The final result of the mapping from component A via intermediate component B, to target component C. These are the Travel expenses below 1500.



The 'Preview 1 of 1 (2)' window shows the XML output. The title bar indicates the file path 'C:\test\mf-ExpRep-Target.xml'. The XML content is as follows:

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <expense-report xsi:noNamespaceSchemaLocation="C:\test\mf-ExpRep-Target.xsd"
   http://www.w3.org/2001/XMLSchema-instance">
3    <Person>
4      <First>Fred</First>
5      <Last>Landis</Last>
6      <Title>Project Manager</Title>
7      <Phone>123-456-78</Phone>
8      <Email>f.landis@nanonull.com</Email>
9    </Person>
10   <expense-item type="Travel" expto="Development">
11     <Date>2003-01-02</Date>
12     <Travel Trav-cost="337.88"/>
13     <description>Biz jet</description>
14   </expense-item>
15   <expense-item type="Travel" expto="Accounting">
16     <Date>2003-07-07</Date>
17     <Travel Trav-cost="1014.22"/>
18     <description>Ambassador class</description>
19   </expense-item>
20 </expense-report>
21

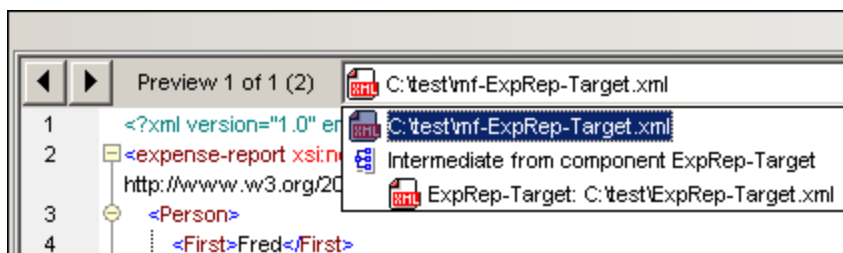
```

Preview 2:

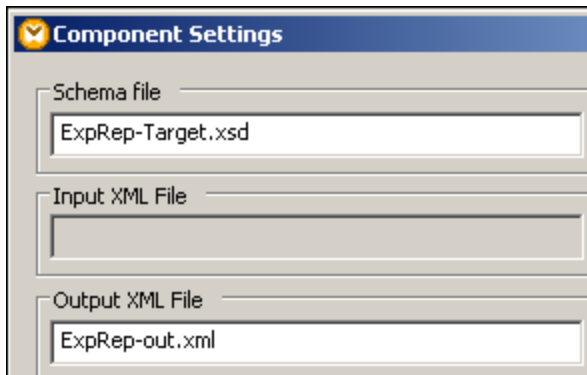
The result of the mapping from component A to the intermediate component B, i.e. all Travel expense items. ExpRep-Target.xml is a default file name which is automatically generated because a file name was not entered in the Output XML file field.

**Please note:**

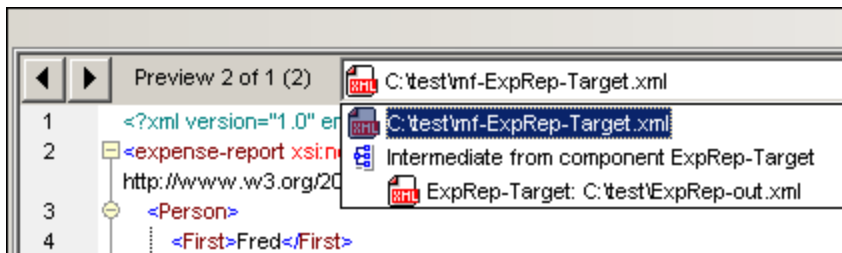
Each mapping result is displayed in its own Preview window. Click the scroll button(s) to see the next/previous result.



Clicking the File name combo box displays the result file(s) in a hierarchy. The final target result is shown at the top, with the intermediate result file(s) shown below. Click a file name to select it, or use the keyboard keys to navigate through the file list and press Enter.



Setting an Output XML File in the intermediate component B, e.g. to "ExpRep-out.xml", causes the intermediate data of component B to be saved in a file of that name, e.g. ExpRep-out.xml.




When "pass-through" is active, files created by an intermediate component are **automatically** saved as a temp files and used for further processing of that components output.

The setting "Write directly to final output file" (Tools | Options | General) determines whether the intermediate files are saved as temporary files or as physical files. For intermediate components a default file name is used to save the intermediate result, unless a dynamic file name is supplied/mapped.

The Preview XX of 1 means the number of final targets from the selected target component, one in this case. The Preview ... (2) refers to the total number of results including all intermediate components.

### Displaying the result with StyleVision

If an SPS file has been assigned to a target component, then clicking the HTML, RTF tab, will show the resulting data in the respective StyleVision tab in MapForce.



---

## Personal Expense Report

Currency:

☒ Dollars
 ☐ Euros
 ☐ Yen

Currency \$

☒ Detailed report

**Employee Information**

First Name

Last Name

Title

E-Mail

Phone

**Expense List**

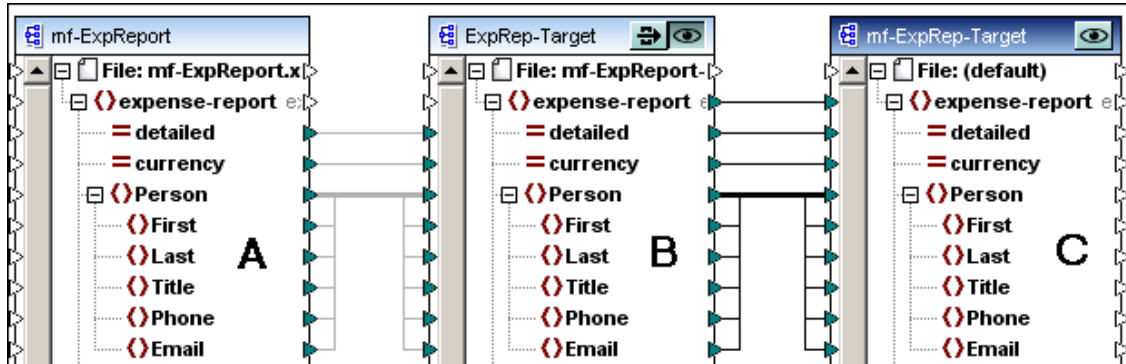
Type	Expense To	Date (yyyy-mm-dd)	Expenses \$		Description
<input type="text" value="Travel"/>	<input type="text" value="Development"/>	2003-01-02	<div style="border: 1px solid #ccc; padding: 2px;">Travel</div> <div style="border: 1px solid #ccc; padding: 2px;">337.88</div>	<div style="border: 1px solid #ccc; padding: 2px;">Lodging</div> <div style="border: 1px solid #ccc; padding: 2px;"></div>	Biz jet
<input type="text" value="Travel"/>	<input type="text" value="Accounting"/>	2003-07-07	<div style="border: 1px solid #ccc; padding: 2px;">Travel</div> <div style="border: 1px solid #ccc; padding: 2px;">1014.22</div>	<div style="border: 1px solid #ccc; padding: 2px;">Lodging</div> <div style="border: 1px solid #ccc; padding: 2px;"></div>	Ambassador class

Mapping
Database Query
Output
 HTML
 RTF

Note that only outputs of final target components of a mapping chain are shown in the StyleVision tab in MapForce. StyleVision outputs of intermediate components can not be shown.

### 6.6.2 Chained mappings - Pass-through inactive

The Tut-ExpReport-chain.mfd example works differently if the pass-through button is **inactive** on component B.



The automatic transfer of data from component A via component B and further to component C, has been interrupted by disabling the pass-through button. The Preview buttons of components B and C determine which part of the mapping chain is generated.

MapForce generates the output for the component where the Preview button is active.

- If the Preview button of component **B** is active, then the result of mapping component A to component B is generated. Component C is ignored.

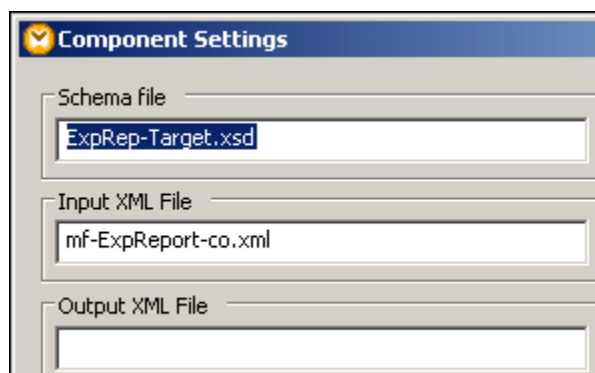
Clicking the Output button previews the results in the Built-in execution engine.

Preview:

The result of the mapping from component A to the intermediate component B, i.e. all Travel expense items.



- If the Preview button of component **C** is active, MapForce maps the data from the intermediate component B to component C. Component A is ignored. Component B has an Input XML File, mf-ExpReport-co.xml, assigned to it, see [Saving an intermediate mapping result](#) in the text below.



MapForce opens the intermediate file and maps its data to component C. If the input file of component B exists, this mapping will produce output. This file entry must exist here for the mapping to execute. MapForce displays an error message if the input file is

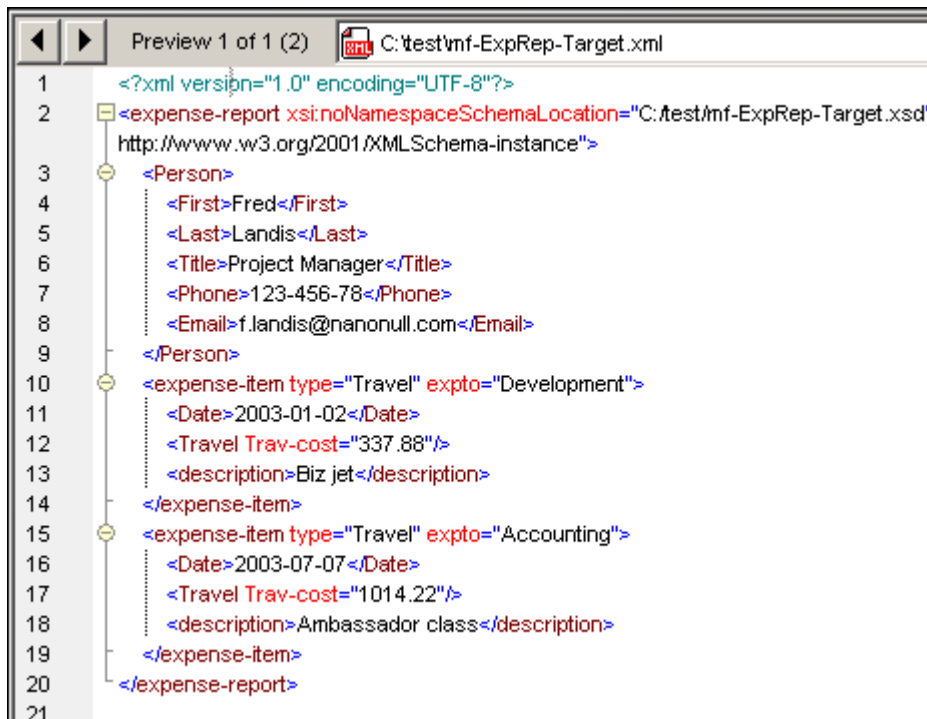
missing.

When "pass-through" is inactive, the *Input XML File* field of the intermediate component is enabled, as shown above.

Note the difference to the case where component B had the "pass-through" button active, in that case the Input XML file field is automatically disabled.

Preview:

The result of the mapping from intermediate component B to the target component C, i.e. Travel expenses below 1500.



Note:

If this mapping is executed from the command line, or generated code, then regardless of the state of the pass-through button in component B and the selected preview component, MapForce attempts to generate the output of component B and component C. The setting of the preview button has no effect.

Since the Input XML file entry is different from the Output XML file entry (which is empty) the mapping chain is broken and the output for component C cannot be generated. Both the Input XML File field and Output XML File field have to be identical for code generation to succeed.

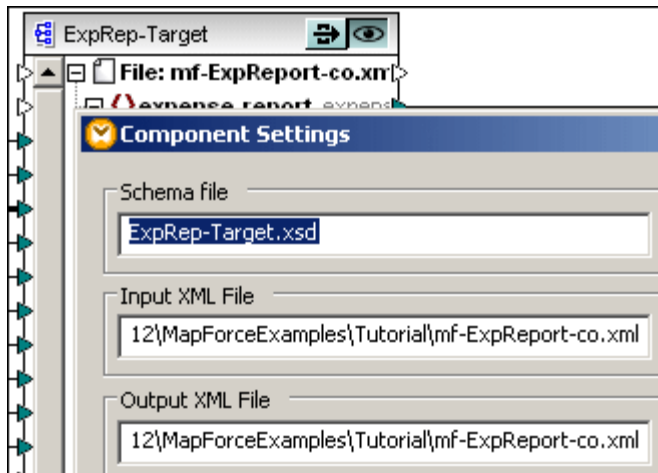
### **Saving the intermediate mapping result**

To make the input file of the intermediate component accessible, when "pass-through" is inactive, the result of the mapping of component A to B must be saved. This file name is then placed in the *Input XML File* of component B. Only then can data be displayed in the final component C.

#### **To save the mapping result of component B to a file:**

1. Click the Preview button of component B to make it active, then click the Output button.

2. Click the **Save generated output**  button in the Output Preview tool bar and give the XML file a name, e.g. mf-ExpReport-co.xml.
3. Double click the header of component B to open the **Component Settings** dialog box, and copy the file name into the *Input XML File* field and click **OK**.



**Please note:** Both the Input and Output file names **must** be identical (and present) for **code generation** and execution from the command line to occur.

#### Displaying the result with StyleVision

If an SPS file has been assigned to a target component, then clicking the HTML, RTF tab, will show the resulting data in the respective StyleVision tab in MapForce.



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## Personal Expense Report

Currency: ☒ Dollars ☐ Euros ☐ Yen

Currency \$

☒ Detailed report

---

Employee Information

Fred

Landis

Project Manager

First Name

Last Name

Title

f.landis@nanonull.com

123-456-78

E-Mail

Phone

---

Expense List

Type	Expense To	Date (yyyy-mm-dd)	Expenses \$		Description
Travel	Development	2003-01-02	Travel 337.88	Lodging	Biz jet
Travel	Accounting	2003-07-07	Travel 1014.22	Lodging	Ambassador class

Mapping Database Query Output  HTML  RTF

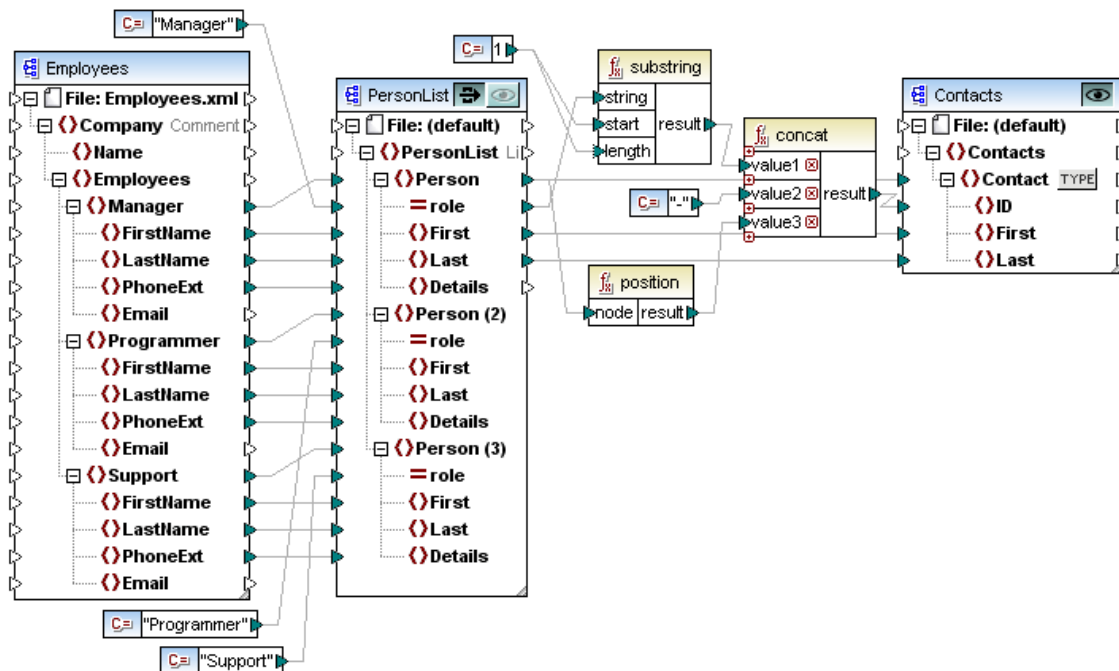
### 6.6.3 Chained mapping example

The example shown below is available as **ChainedPersonList.mfd** in the ... \MapForceExamples folder.

#### Aim:

To create two sets of employee documents, one for human resources and the other for bookkeeping.

- The document for the bookkeeping department assigns a unique ID to the employee.
- The document for the HR department has the person details, and additionally the telephone extension.



#### Components:

##### Employees:

The Employees.xml instance file contains four people with the roles in the sequence: manager, programmer and support.

PersonList: (output will be the HR document) - Intermediate component

- A **role** attribute is added to the person data, and the position hierarchy that exists in the Employees component is removed.
- The "pass-through" button is active.

Contacts: (output will be the bookkeeping document)

- An ID element is added to the Contact data to make sure that person data is unique.

#### How it works:

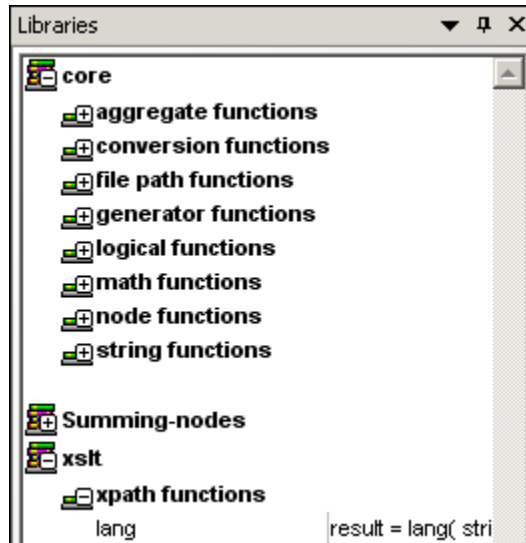
##### PersonList:

- The person element is **duplicated** twice to allow for the three types of roles that exist within the company.




## 6.7 Using Functions

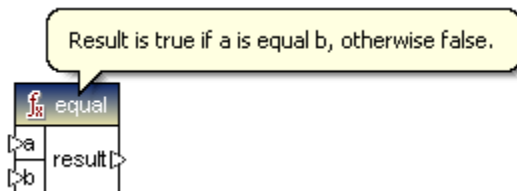
The functions available in the selected language (XSLT/XSLT2, BUILTIN ) are displayed in the Libraries window. The expand and contract icons show, or hide the functions of that library.



*XSLT selected*

### Function tooltips

Explanatory text (visible in the libraries pane) on individual functions can be toggled on/off by clicking the **Show tips**  icon in the tool bar. Placing the mouse pointer over a function header, displays the information on that function.



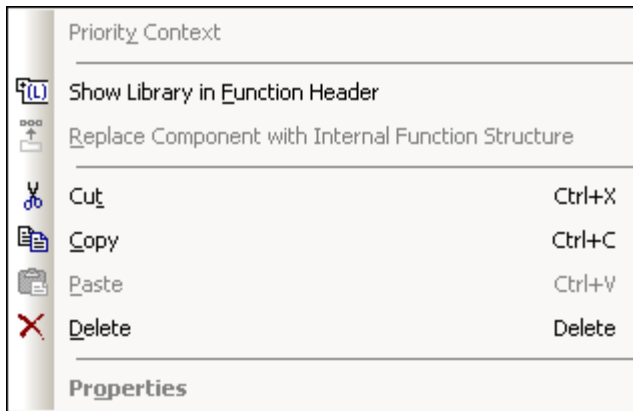
### To use a function in Mapping window:

1. Select the **programming language** you intend to generate code for, by clicking one of the output icons in the title bar.
2. Click the **function name** and drag it into the Mapping window.
3. Use drag and drop to connect the input and output parameters to the various icons.

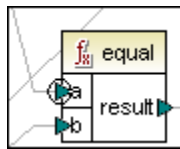
Note that placing the mouse pointer over the "result = xxx" expression in the library pane, displays a ToolTip describing the function in greater detail.

### Function context menu

Right clicking a function in the Mapping window, opens the context window.

**Priority Context**

When applying a function to different items in a schema, MapForce needs to know what the context node will be. All other items are then processed relative to this one. This is achieved by designating the item (or node) as the priority context. A circle appears around the icon so designated. Please see [Priority Context](#) in the Reference section, for an example.

**Show Library in Function Header**

Displays the library name in the function component.

**Replace Component with Internal Function Structure**

Replaces the user-defined component/function with its constituent parts, not available for functions.

**Cut/Copy/Paste/Delete**

The standard MS Windows Edit commands, allow you to cut, copy etc., any components or functions visible in the mapping window. All connectors will be retained except for those which would have to be replaced.

**Properties**

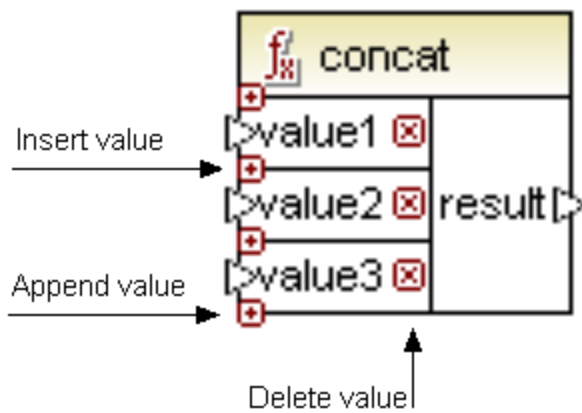
Not available for functions.

**Extendable functions**

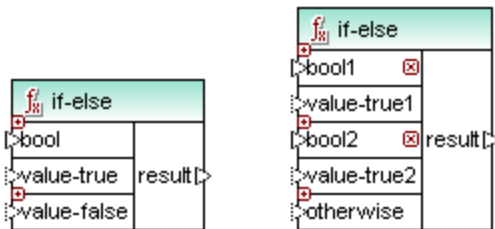
Several functions available in the function libraries are extendable: e.g. the concat, "logical-and", "logical-or", and IF-ELSE functions. The parameters of these types of function can be inserted/appendes and deleted at will.

Clicking the "plus" icon inserts or appends the same type of parameter, while clicking the check mark deletes the parameter.

Please note: "dropping" a connector on the "plus" symbol, automatically inserts/appends the parameter and connects it.




The IF test parameters, of the [IF-Else](#) function can be extended in the same way.



## 6.8 Previewing the transformation result

The Built-in execution engine allows you to immediately preview and save the result of a transformation, without having to go the path of generating program code, compiling it, and viewing the results.

This is achieved by simply clicking the **Output** button irrespective of the output language that you select. The Output pane also supports the **Find** command, enabling you to locate any XML data that you might need to find.

The **BUILTIN**  icon allows you to explicitly select the Built-in execution engine as the Output target. Having clicked the BUILTIN icon and clicked the Output button, all the standard options of the Output window are available, i.e. **Validate Output File**, **Save Output File...**, **Save All Output Files...**, etc.

MapForce can also be started from the [command line](#) and produce a result using the /BUILTIN parameter, without having to generate any intermediate code.

### Streaming

The Built-in execution engine is the only target that supports XML, CSV, and FLF **streaming**. What this means is that the **output** files can be of an unlimited size. If the output file is very large, a **Load more...** button appears at the bottom of the Output pane. Clicking the button, appends a large chunk to the currently visible data. The **Pretty-print** button becomes active when the complete file has been loaded into the output pane.

### Digital Signatures:

MapForce supports creating XML digital signatures for XML and XBRL output files. Digital signatures can only be generated when the output target is BUILTIN. A signature is created for the generated result file, when the output button is pressed, and the result file is saved. Please see: Digital signatures for more information.

### Previewing the transformation output

In the **Output** menu, or by selecting one of the icons in the Language Selection toolbar ( *screenshot below*), you can define which language MapForce should use to transform the data of the input file.



The following options are available:

- XSLT
- XSLT2

XSLT code can be previewed in the XSLT/XSLT2 tab, and is generated and saved using the **File | Generate code in | XSLT 1.0** or **XSLT 2.0** menu option, respectively. .

### Previewing the program code

Before generating program code it is a good idea to preview the result of the XSLT using the Built-in execution engine.

#### To preview an XSLT result:

Having opened the \*.mfd file in MapForce:

1. Do one of the following:
  - Click the **XSLT** button to preview the generated XSLT 1.0 code.
  - Click the **XSLT2** button to preview the generated XSLT 2.0 code.

2. Click the **Output** button to preview the result of the mapping

### Generating XSLT code

XSLT 1.0 and XSLT 2.0 program code generated by MapForce can be executed using Altova's XML engine which is included in the AltovaXML package, or opened directly in XMLSpy and executed using the menu option **XSL/XQuery | XSL Transformation**.

### To download the AltovaXML package:

1. Point your Browser to [http://www.altova.com/download\\_components.html](http://www.altova.com/download_components.html).
2. Click the "Learn more and download AltovaXML" link.
3. Select the AltovaXML edition you need and install it.

### To generate XSLT code:

1. Select the menu option **File | Generate code in | XSLT 1.0 (or XSLT 2.0)**.
2. Browse for the folder where you want to save the XSLT file.  
A message appears when the generation was successful.
3. Navigate to the previously defined folder, where you will find the generated XSLT file.

**Please note:** Activating the Byte Order Mark check box in the Component Settings dialog box, does not have any effect when outputting XSLT 1.0/2.0 as these languages do not support BOMs (Byte Order Marks).

### Transforming the XML source file using the generated XSLT

When you generate XSLT code, a batch file named DoTransform.bat, which uses AltovaXML to transform the XML file, is also generated and saved to the folder you have specified for the XSLT file.

### To transform the XML file using the generated XSLT:

1. Download and install the free AltovaXML engine from the [AltovaXML download page](#).  
AltovaXML is installed to C:\Program Files\Altova\AltovaXML2012\ by default.
2. Start the **DoTransform.bat** batch file located in the previously designated output folder.  
This generates the output XML file in the current folder.

**Note:** You might need to add the AltovaXML installation location to the path variable of the Environment Variables.

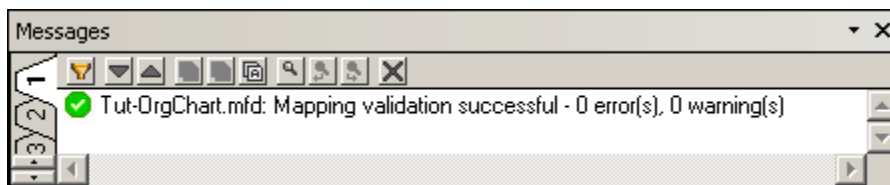
## 6.9 Validating mappings and mapping output

It is not mandatory for functions or components to be mapped. The Mapping tab is a work area where you can place any available components. XSLT 1.0, XSLT 2 is only generated for those components for which valid connections exist.

**Free standing** components do not generate any type of error or warning message.

**Partially connected** components can generate two types of warning:

- If a function component **input icon** is unconnected, an error message is generated and the transformation is halted.
- If the function **output icon** is unconnected, then a warning is generated and the transformation process continues. The offending component and its data are ignored, and are not mapped to the target document.




You can use multiple message tabs if your project contains many separate mapping files. Click one of the numbered tabs in the Messages window, and click the preview tab for a different mapping in your project. The validation message now appears in the tab that you selected. The original message in tab 1, is retained however.

Use the different icons of the Messages tab to:

- Filter the message types, errors or warnings
- Scroll through the entries
- Copy message text to the clipboard
- Find a specific string in a message
- Clear the message window.





### To validate a mapping:

- Click the **Validate Mapping**  icon in the application toolbar, or select the menu item **File | Validate Mapping**.  
A validation message appears in the Messages window.

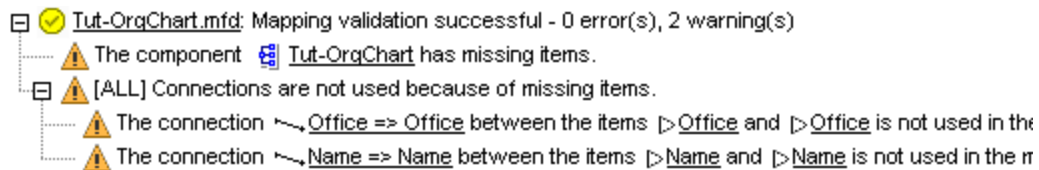
### Validation messages

Validation messages are displayed in the Messages window and indicate whether or not the validation was successful. In addition, error messages, warnings, and information on the mapping is displayed. Two types of validation messages can appear:

- Validation successful - 0 error(s), n warning(s)

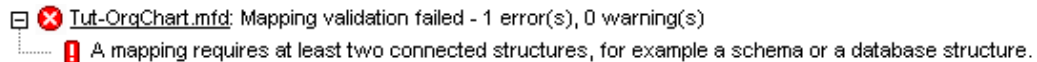
  Tut-OrgChart.mfd: Mapping validation successful - 0 error(s), 0 warning(s)  
 Information: The output component  Tut-Person has no output file name set. A default file name

**Warnings** alert you to something, while still enabling the mapping process and preview of the transformation result to continue. It is therefore possible for a mapping to have 0 errors and n warnings.



- Validation failed - x error(s), y warning(s)

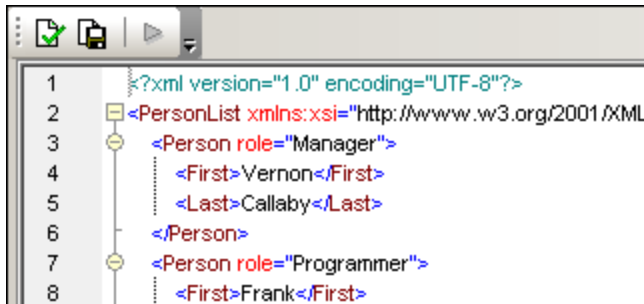
**Errors**, halt the transformation process and deliver an error message. An XSLT, XQuery, or Output preview is not possible when an error of this type exists. Clicking a validation message in the Messages window, highlights the offending component icon in the Mapping window.



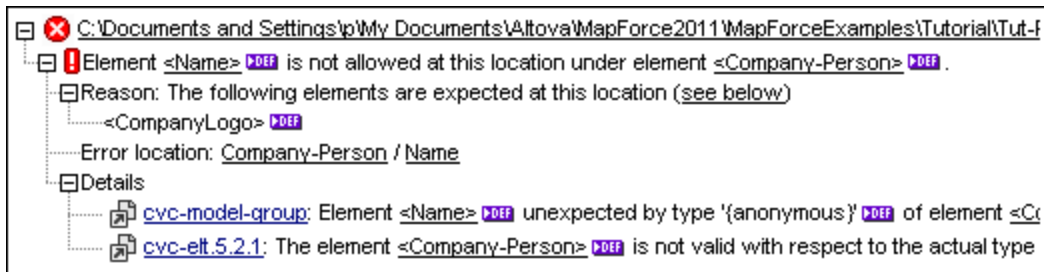
### Validating the mapping output

Clicking the Output tab uses the MapForce, XSLT 1.0/2.0 or XQuery engine, to transform the data and produce a result in a Text view.

If the data is mapped to an XML Schema, then the resulting XML document can be validated against the underlying schema.




The result of the validation is displayed in the Messages window. If the validation was not successful, the message contains detailed information on the errors that occurred (see screenshot below).




The validation message contains a number of hyperlinks you can click for more detailed information:

- Clicking the file path opens the output of the transformation in the Output tab of MapForce.
- Clicking <ElementName> link highlights the element in the Output tab.
- Clicking the icon opens the definition of the element in [XMLSpy](#) (if installed).
- Clicking the hyperlinks in the Details subsection (e.g., cvc-model-group) opens a description of the corresponding validation rule on the <http://www.w3.org/> website.

**To validate the mapping OUTPUT:**

- Click the **Validate**  button to validate the document against the schema. An "Output file validation successful. 0 error(s), 0 warning(s)" message, or a message detailing any errors appears.

 ...\\Tutorial\\ExpReport-Target.xml: Output file validation successful. - 0 error(s), 0 warning(s)

Please note:

The entry in the **Add Schema/DTD reference** field of the component settings dialog box allows you to add the path of the referenced XML Schema file to the root element of the XML output.

The path allows you to define where the schema file, referenced by the XML instance file, is to be located. This ensures that the output instance can be validated at the mapping destination when the mapping is executed. You can enter an http:// address as well as an absolute, or relative path in this field.

## 6.10 Loops, groups and hierarchies

There are several ways of looping through source and target hierarchies which allow you to define how you want to loop, or group, sets of data.

The following links show you how this can be achieved. Please note that these examples are not sequential, they appear in various locations within the documentation.

[Value-Map - lookup table](#)

[Priority Context](#)

## 6.11 Mapping rules and strategies

MapForce generally maps data in an intuitive way, but there are some scenarios where the resulting output seems to have too many, or too few items. This is what this section will cover.

### General rule:

Generally, every connection between a source and target item means: for each source item, create one target item.

If the source node contains simple content (e.g. string, integer etc.) and the target node accepts simple content, then the content is copied, and the data type is converted if necessary.

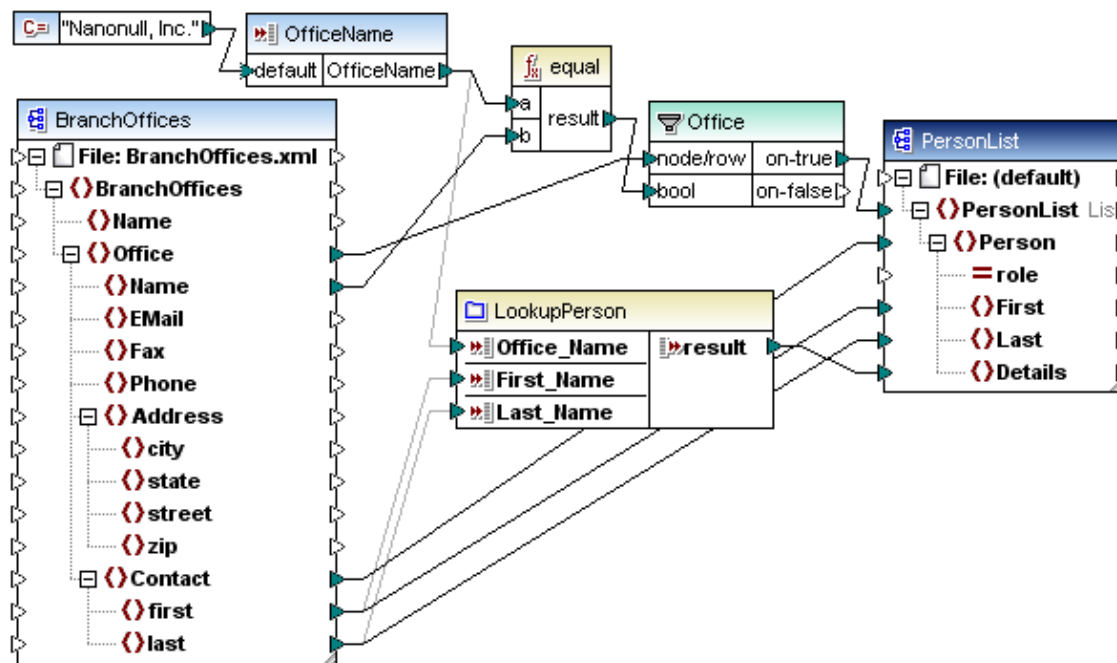
There are some exceptions to this rule, but it generally holds for all connections.

### The "context" and "current" items

MapForce displays the structure of a schema file as a hierarchy of mappable items in the component. Each of these nodes may have many instances (or none) in the instance file or database.

Example: If you look at the source component in `PersonListByBranchOffice.mfd`, there is only a single node **first** (under **Contact**). In the **BranchOffices.xml** instance file, there are multiple **first** nodes and **Contact** nodes having different content, under different **Office** parent nodes.

It depends on the current **context** (of the **target** node) which source nodes are actually selected and have their data copied, via the connector, to the target component/item.



This context is defined by the **current target node** and the connections to its ancestors:

- Initially the context contains only the source components, but no specific nodes. When evaluating the mapping, MapForce processes the **target root** node first (PersonList), then works down the hierarchy.
- The connector to the **target** node is traced back to all source items directly or indirectly connected to it, even via functions that might exist between the two components. The

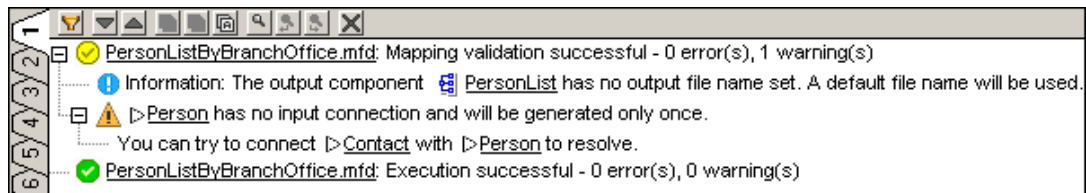
source items and functions results are added to the context for this node.

- For each new target node a new context is established, that initially contains all items of the parent node's context. Target sibling nodes are thus independent of each other, but have access to all source data of their parent nodes.

Applied to the example mapping above (**PersonListByBranchOffice.mfd**):

- The connection from **Office** through the filter (Office) to **PersonList** defines a **single** office as the context for the whole target document (because PersonList is the root element of the target component). The office name is supplied by the input component, which has a default containing "Nanonull, Inc."
- All connections/data to the **descendants** of the root element PersonList, are automatically affected by the filter condition, because the selected single office is in the context.
- The connection from **Contact** to **Person** creates one target Person **per** Contact item of the source XML (general rule). For each Person one specific Contact is added to the context, from which the children of Person will be created.
- The connector from **first** to **First** selects the first name of the current Contact and writes it to the target item First.

Leaving out the connector from **Contact** to **Person** would create only **one** Person with multiple First, Last, and Detail nodes, which is not what we want here. In such situations, MapForce issues a warning and a suggestion to fix the problem: "You can try to connect Contact with Person to resolve":



## Sequences

MapForce displays the structure of a schema file as a hierarchy of mappable items in the component.

Depending on the (target) context, each **mappable item** of a **source** component can represent:

- a **single instance** node of the assigned input file
- a **sequence** of 0 to **multiple instance** nodes of the input file

If a sequence is connected to a **target** node, a loop is created to create as many target nodes as there are source nodes.

If a **filter** is placed between the sequence and target node, the bool condition is checked for each input node i.e. each item in the sequence. More exactly, a check is made to see if there is at least one bool in each sequence that evaluates to true. The priority context setting can influence the order of evaluation, see below.

As noted above, filter conditions automatically apply to all descendant nodes.

Note: If the source schema specifies that a specific node occurs exactly once, MapForce may remove the loop and take the first item only, which it knows must exist. This optimization can be disabled in the source Component Settings dialog box (check box "Enable input processing optimizations based on min/maxOccurs").

**Function inputs** (of normal, non-sequence functions) work similar to target nodes: If a sequence is connected to such an input, a loop is created around the function call, so it will produce as **many results** as there are items in the sequence.

If a sequence is connected to **more than one** such function input, MapForce creates nested loops which will process the **Cartesian product** of all inputs. Usually this is not desired, so only one single sequence with multiple items should be connected to a function (and all other parameters bound to singular current items from parents or other components).

Note: If an empty sequence is connected to such a function (e.g. concat), you will get an **empty sequence** as result, which will produce no output nodes at all. If there is no result in your target output because there is no input data, you can use the "substitute-missing" function to insert a substitute value.

Functions with **sequence inputs** are the only functions that can produce a result if the input sequence is **empty**:

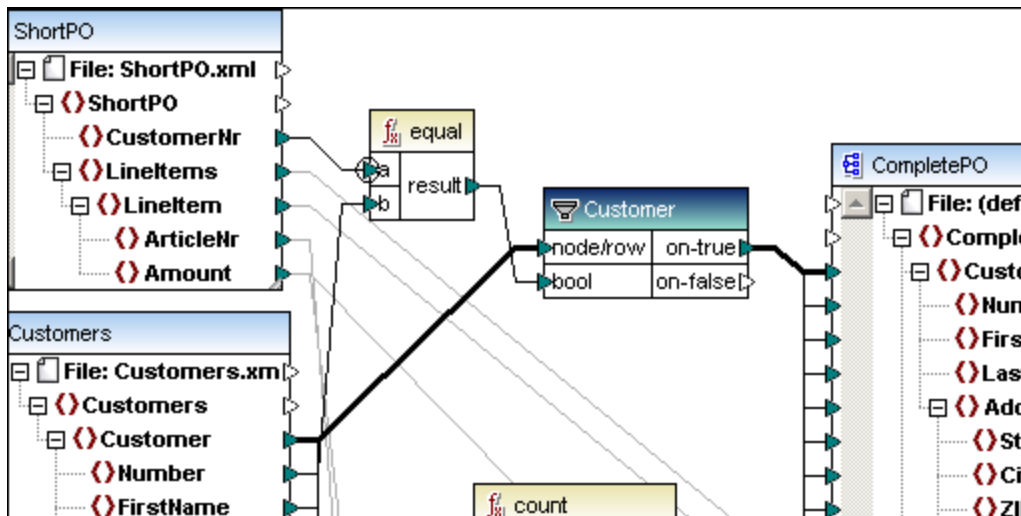
- **"exists"**, "not-exists" and "substitute-missing" (also "is-not-null", "is-null" and "substitute-null", which are aliases for the first three)
- **aggregate** functions ("sum", "count" etc.)
- **regular** user-defined functions that accept sequences (i.e. non-inlined functions)

The sequence input to such functions is always evaluated independently of the current target node in the context of its ancestors. This also means that any filter components connected to such functions, do not affect any other connections.

## Priority context

Usually, function parameters are evaluated from top to bottom, but it is possible to define one parameter to be evaluated before all others, using the **priority context** setting.

In functions connected to the bool input of **filter** conditions, the priority context affects not only the comparison function itself but also the evaluation of the filter, so it is possible to join together two source sequences (see CompletePO.mfd, CustomerNo and Number).

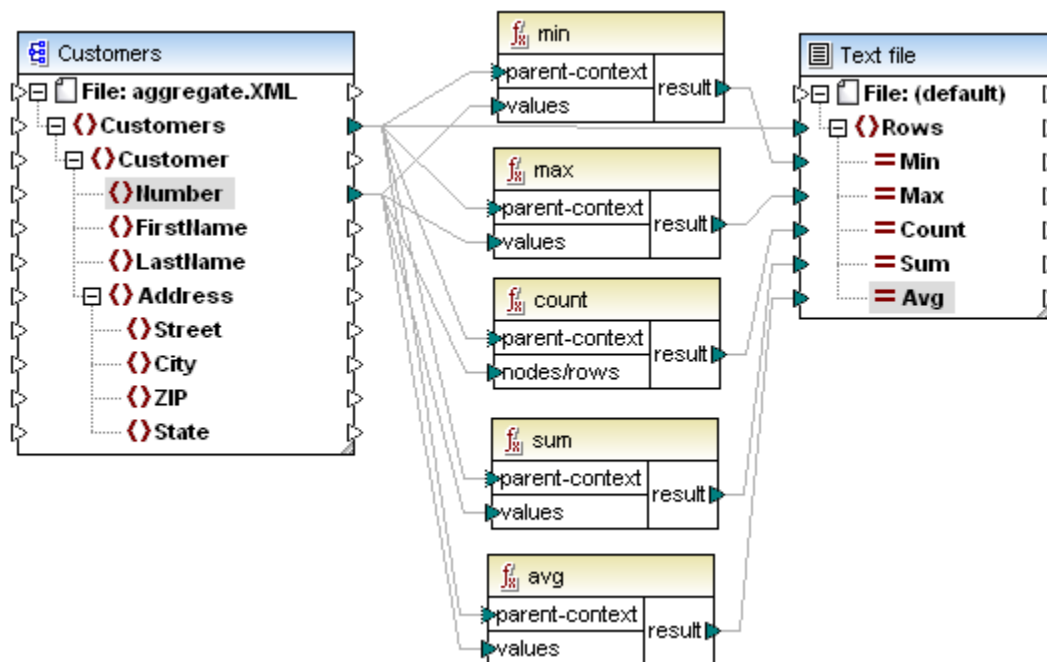


In this example, the priority context forces ShortPO/CustomerNr to be evaluated before iterating and filtering the Customer nodes from the Customers component. See example Priority Context node/item.

### Overriding the context

Some [aggregate functions](#) have an optional “parent-context” input.

If this input is not connected, it has no effect and the function is evaluated in the normal context for sequence inputs (that is, in the context of the target node's parent).



If the parent-context input is connected to a source node, the function is evaluated **for each** “parent-context” node and will produce a separate result for each occurrence.

**Exceptions to the general rule** (for each source item, create one target item)

- A [target XML root element](#) is always created once and only once. If a sequence is connected to it, only the contents of the element will be repeated, but not the root element itself. The result may, however, not be schema-valid. If attributes of the root element are also connected, the XML serialization will fail at runtime, so you should avoid connecting a sequence the root element. To create multiple output files, connect the sequence to the "File" node instead, via some function that generates file names.
- Some other nodes, like XML attributes, or the output component inside a user-defined function, accept only a single value.

**Bringing multiple nodes of the same source component into the context:**

This is required in some special cases and can be done with [Intermediate variables](#).

# Chapter 7

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Sequence of processing mapping components

## 7 Sequence of processing mapping components

MapForce supports mappings that have several target components. Each of the target components has a preview button allowing you to preview the mapping result for that specific component.

If the mapping is executed from the command line, or from generated code, then regardless of the currently active preview, the full mapping is executed and the output for each target component is generated.

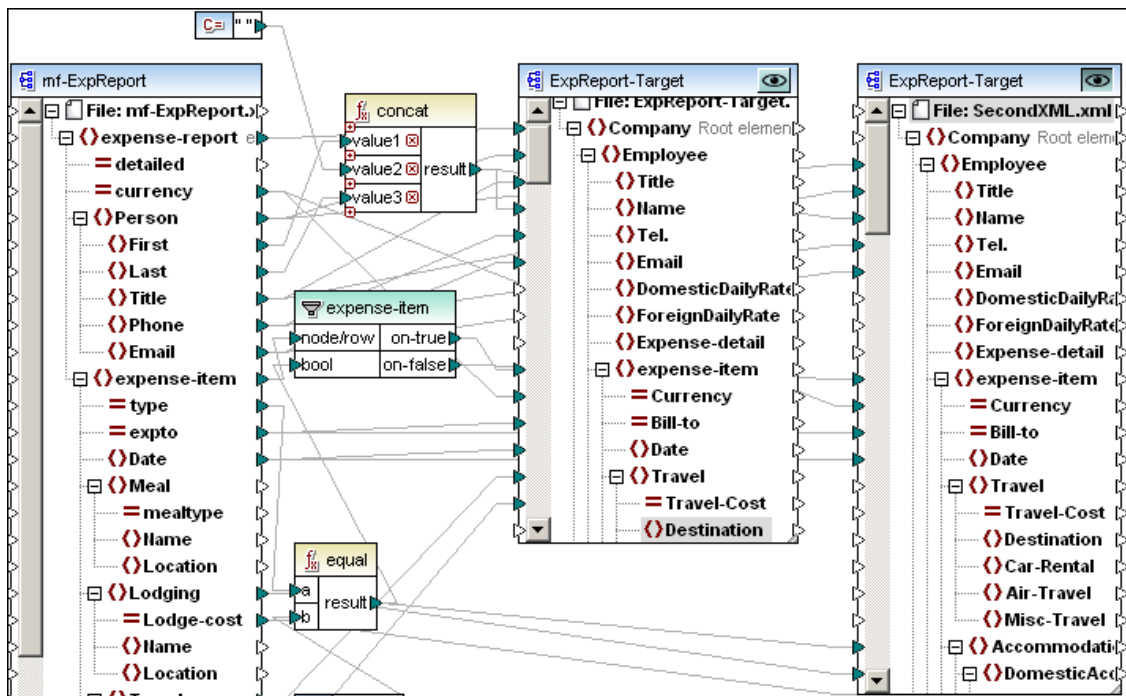
The order in which the target components are processed can be directly influenced by changing the position of target components in the mapping window. The **position** of a component is defined as its top left corner.

Target components are processed according to their Y-X position on screen, from top to bottom and left to right.

- If two components have the same vertical position, then the leftmost takes precedence.
- If two component have the same horizontal position, then the highest takes precedence.
- In the unlikely event that components have the exact same position, then an unique internal component ID is automatically used, which guarantees a well-defined order but which cannot be changed.

The screenshot below shows the tutorial sample Tut-ExpReport-multi.mfd available in the ... \MapForceExamples\Tutorial folder.

Both target components (ExpReport-Target) have the same **vertical** position, and the preview button is active on the right hand target component.



Having selected XSLT2 and generated the code:

- The leftmost target component is processed first and generates the ExpReport.xml file.
- The component to the right of it is processed next and generates the SecondXML.xml file.

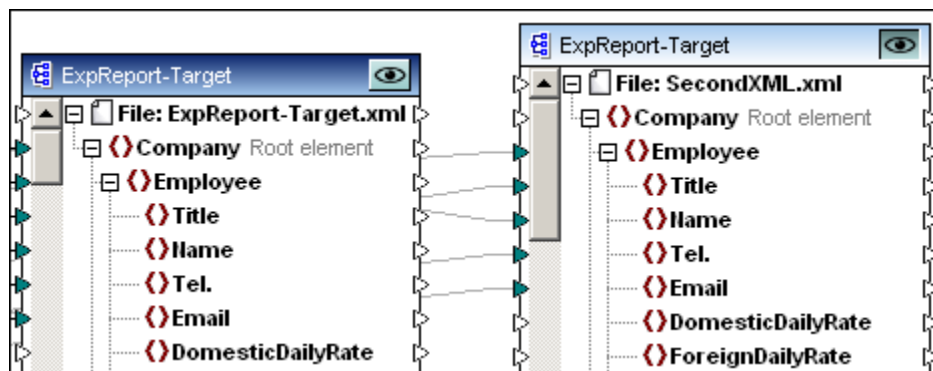
You can check that this is the case by opening the **DoTransform.bat** file (in the output folder you specified) and see the sequence the output files are generated. ExpReport-Target.xml is the first output to be generated by the batch file, and SecondXML.xml the second.

```
@echo off

AltovaXML /xslt2 "MappingMapToExpReport-Target.xslt" /in "C:/Documents and Se
Documents/Altova/MapForce2012/MapForceExamples/Tutorial/ExpReport-Target.xml"
IF ERRORLEVEL 1 EXIT/B %ERRORLEVEL%
AltovaXML /xslt2 "MappingMapToExpReport-Target2.xslt" /in "C:/Documents and S
Documents/Altova/MapForce2012/MapForceExamples/Tutorial/SecondXML.xml" %*
IF ERRORLEVEL 1 EXIT/B %ERRORLEVEL%
```

### Changing the mapping processing sequence:

1. Click the left target component and move it below the one at right.



2. Regenerate your code and take a look at the DoTransform.bat file.

```
Listner - [c:\temp2\DoTransform.bat]
File Edit Options Help
@echo off

AltovaXML /xslt2 "MappingMapToExpReport-Target.xslt" /in "C:/Documents and Se
Documents/Altova/MapForce2012/MapForceExamples/Tutorial/SecondXML.xml" %*
IF ERRORLEVEL 1 EXIT/B %ERRORLEVEL%
AltovaXML /xslt2 "MappingMapToExpReport-Target2.xslt" /in "C:/Documents and S
Documents/Altova/MapForce2012/MapForceExamples/Tutorial/ExpReport-Target.xml"
IF ERRORLEVEL 1 EXIT/B %ERRORLEVEL%
```

SecondXML.xml is now the first output to be generated by the batchfile, and ExpReport-Target.xml the second.

### Chained mappings

The same processing sequence as described above, is followed for [chained mappings](#). The chained mapping group is taken as one unit however. Repositioning the intermediate, or final, target component of a single chained mapping has no effect on the processing sequence.

Only if multiple "chains", or multiple target components, exist in a mapping, does the position of the **final** target components of each group determine which is processed first.

- If two final target components have the same vertical position, then the leftmost takes precedence.
- If two final target component have the same horizontal position, then the highest takes precedence.
- In the unlikely event that components have the exact same position, then an unique internal component ID is automatically used, which guarantees a well-defined order but which cannot be changed

# Chapter 8

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## Global Resources

## 8 Global Resources

Global resources are a major enhancement in the interoperability between products of the Altova product line, and are currently available in the following Altova products: XMLSpy, MapForce, StyleVision and DatabaseSpy. Users of the Altova MissionKits have access to the same functionality in the respective products.

General uses:

- Workflows can be defined that use various Altova applications to process data.
- An application can invoke a target application, initiate data processing there, and route the data back to the originating application.
- Defining input and output data, file locations , as global resources.
- Switching between global resources during runtime to switch between development or deployment resources.
- What-if scenarios for QA purposes.

The default location of the global resource definitions file, **GlobalResources.xml**, is c:\Documents and Settings\UserName\My Documents\Altova\.. This is the default location for all Altova applications that can use global resources. Changes made to global resources are thus automatically available in all applications. The file name and location can be changed. Please see [Global Resources - Properties](#) for more information.

General mechanism:

- Global resources are [defined](#) in an application and automatically saved.
- Global resources are [assigned](#) to components whose data you intend to be variable.
- The global resource is invoked / [activated](#) in an application, allowing you to switch resources at runtime.


This section will describe how to define and use, global resources using existing mappings available in the [...\MapForceExamples\Tutorial\](#) folder.

### To activate the Global Resources toolbar:

Select the menu option **Tools | Customize** | click the **Toolbar tab** and activate the Global Resources check box. This displays the global resources tool bar.



The combo box allows you to switch between the various resources, a "Default" entry is always available.

Clicking the Global Resources icon  opens the Global Resources dialog box (alternatively Tools | Global Resources).

## 8.1 Global Resources - Files

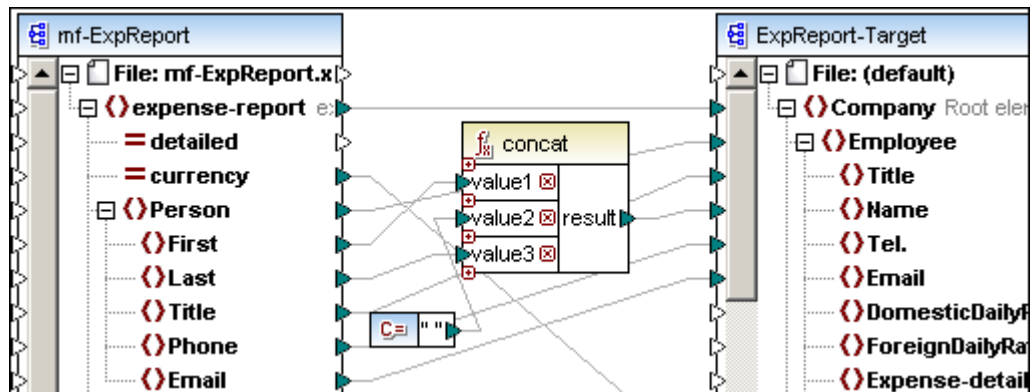
Global Resources in MapForce:

- Any input/output components **files** can be defined as global resources, e.g. XML, XML Schema, files.

Aim of this section:


- To make the source component input file, **mf-ExpReport**, a global resource.
- To **switch** between the two XML files that supply its **input data** at runtime, and check the resulting XML output in the Output preview tab.

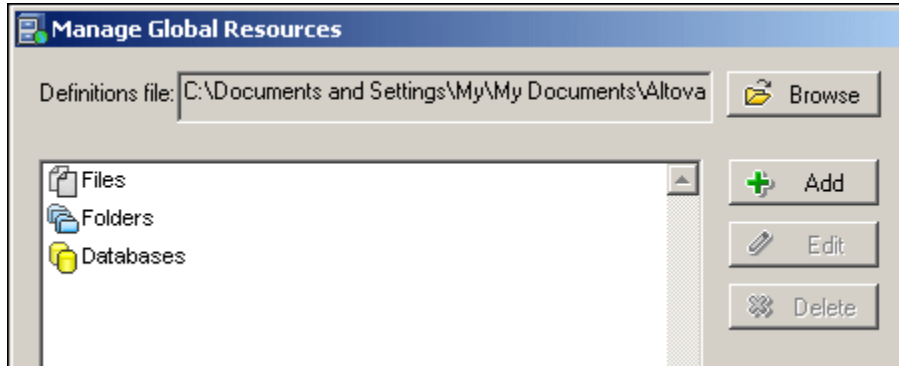
This section uses the **Tut-ExpReport.mfd** file available in the [...\MapForceExamples\Tutorial\](#) folder.



### 8.1.1 Defining / Adding global resources

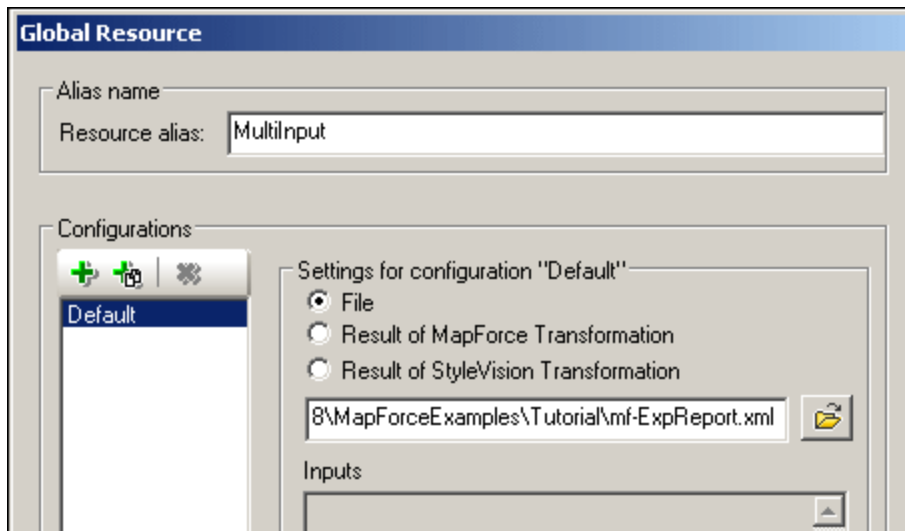
#### Defining / Adding a global resource file



1. Click the Global Resource icon  to open the dialog box.

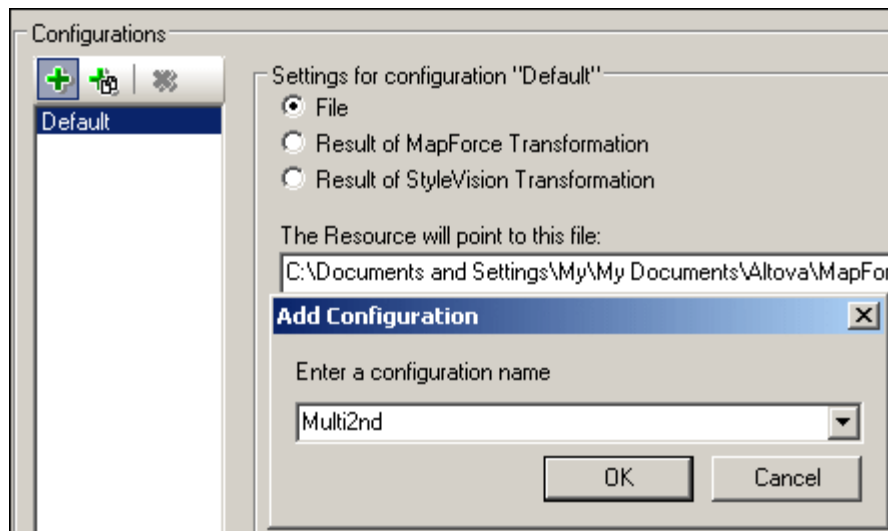


This is the state of an empty global resources file.

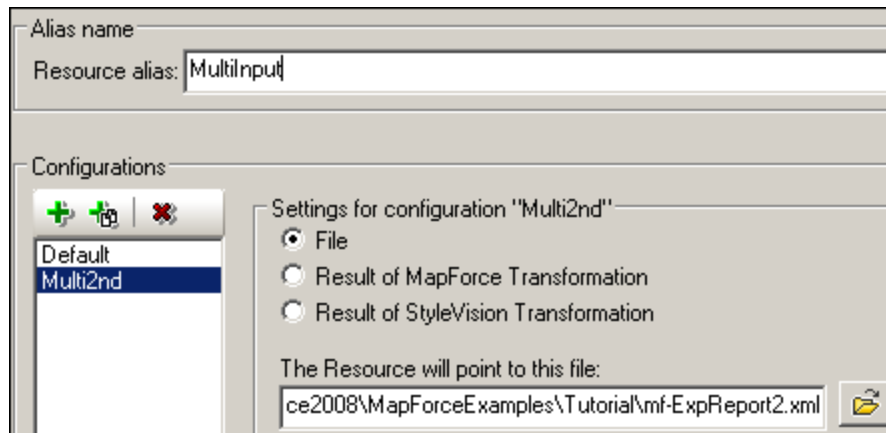
2. Click the **Add** button and select **File** from the popup.
3. Enter the name of the Resource alias e.g. **Multilinput**.
4. Click the Open folder icon and select the XML file that is to act as the "Default" input file e.g. **mf-ExpReport.xml**.



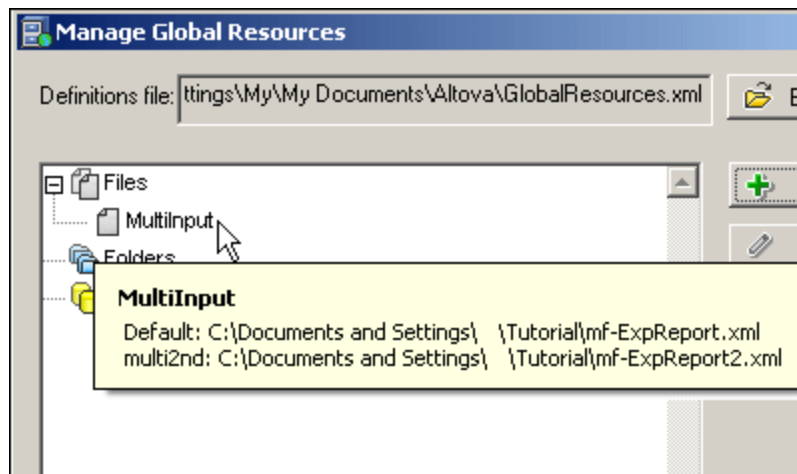
5. Click the Add button  of the **Configurations** group, to add a new configuration to the current Alias. Note that the Copy configuration icon , allows you to copy a selected configuration and save it under a new name.



6. Enter a name for the configuration, **Multi2nd**, and click OK to confirm. Multi2nd has now been added to the Configurations list.
7. Click the Open folder icon again and select the XML file that is to act as the input file for the multi2nd configuration e.g. **mf-ExpReport2.xml**.



8. Click OK to complete the definition of the resource. The **MultiInput** alias has now been added to the Files section of the global resources. Placing the mouse cursor over an alias entry, opens a tooltip showing its definition.



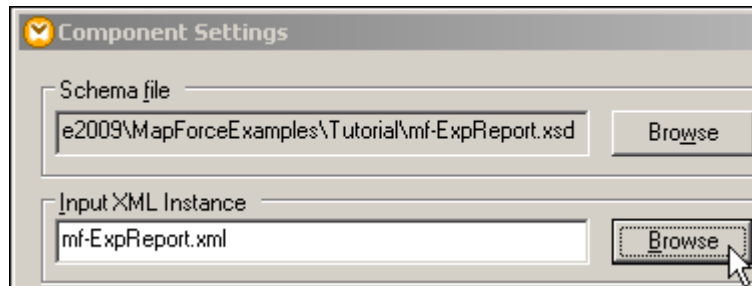
9. Click OK to confirm.  
This concludes the definition part of defining global resources. The next step is [Assigning a global resource](#) to a component.

## 8.1.2 Assigning a global resource

### Assigning global resources to a component

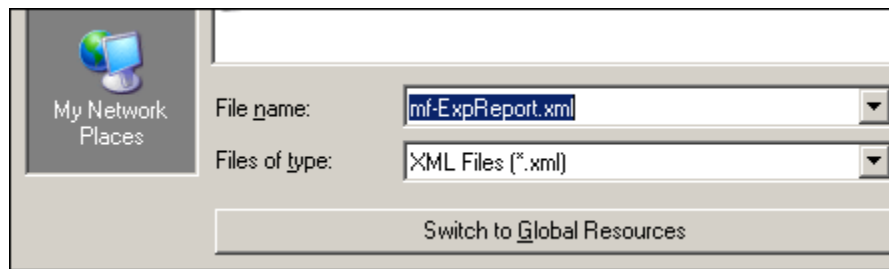
We now have to assign the global resource to the component that is to make use of it.

1. Double click the **mf-ExpReport** component and click the Browse button next to the Input XML-Instance field.

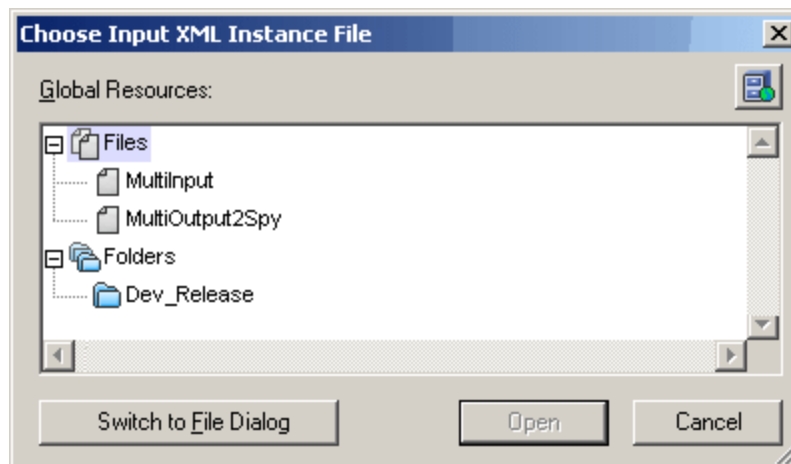


This opens the "Choose XML Instance file" dialog box.

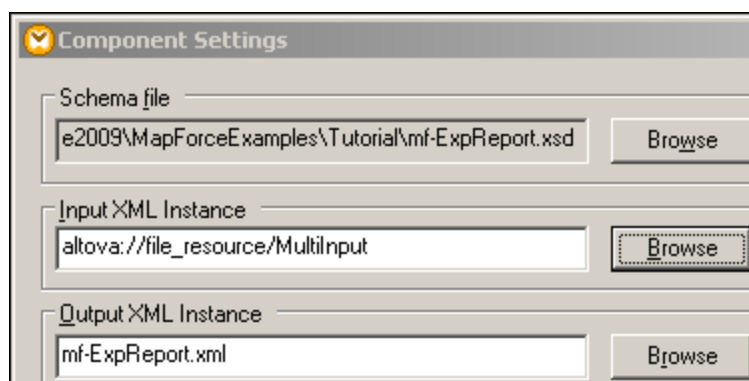
2. Click the **Switch to Global Resources** button at the base of the dialog box.



3. Click the resource you want to assign, **MultilInput** in this case, and click OK.



The **Input XML-Instance File** now contains a reference to a resource i.e. **altova://file\_resource/MultilInput**.



4. Click OK to complete the assignment of a resource to a component. The next step is [Using / activating a global resource](#).

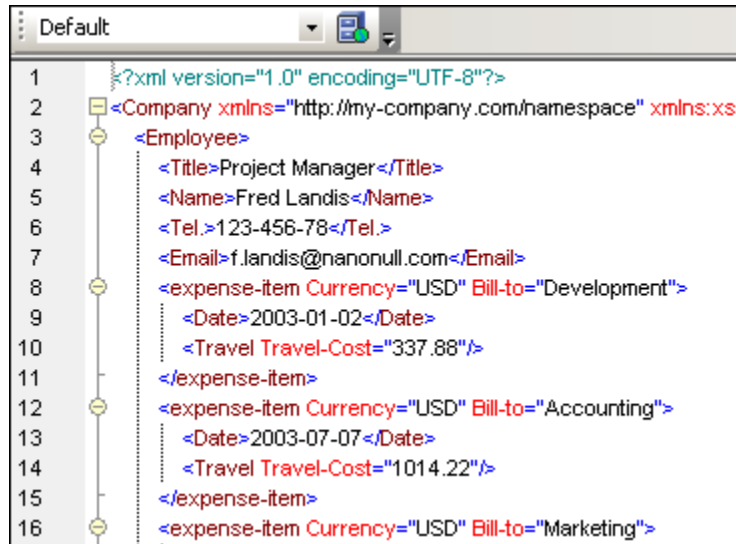
### 8.1.3 Using / activating a global resource

#### Using / activating a global resource

At this point the previously defined **Default** configuration for the **Multilinput** Alias is active. You can check this by noting that the entry in the Global Resources icon bar is "Default".



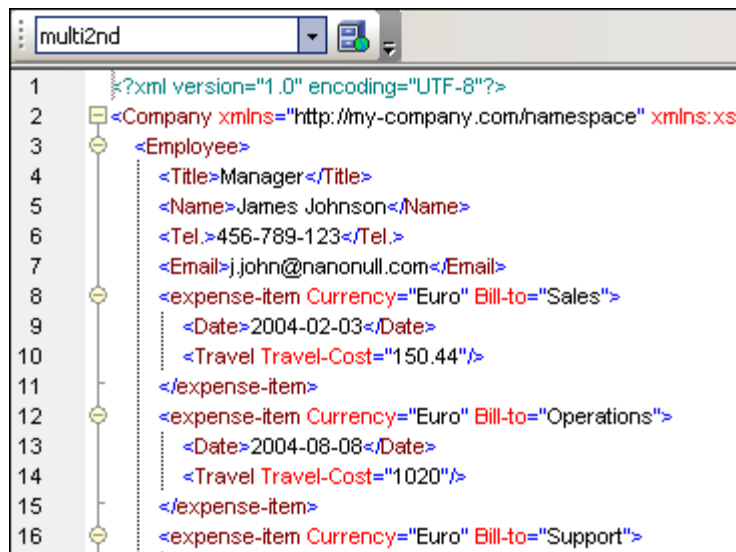
1. Click the Output tab to see the result of the mapping.



2. Click the **Mapping** tab to return to the mapping view.
3. Click the global resources combo box select **multi2nd** from the combo box.



4. Click the Output tab to see the new result.  
The mf-ExpReport2.xml file is now used as the source component for the mapping, and produces different output.

**Note:**

The **currently active** global resource (**multi2nd** in the global resources toolbar) determines the result of the mapping. This is also the case when you generate code.


## 8.2 Global Resources - Folders

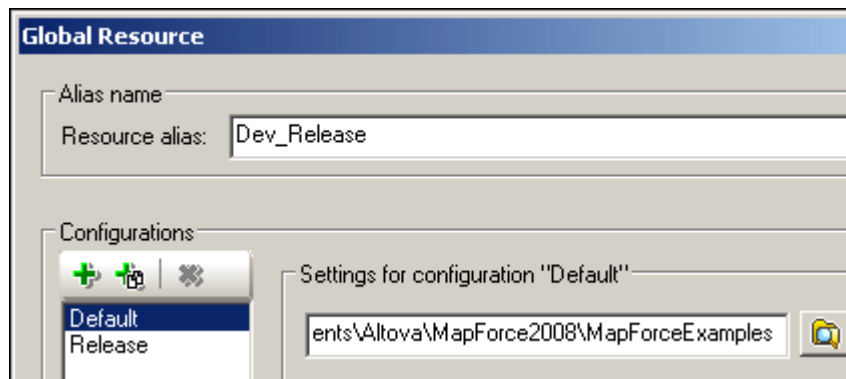
Folders can also be defined as a global resource, which means that input components can contain files that refer to different folders, for development and release cycles for example.



Defining folders for output components is not really useful in MapForce, as you are always prompted for the target folders when generating XSLT or code for other programming languages.

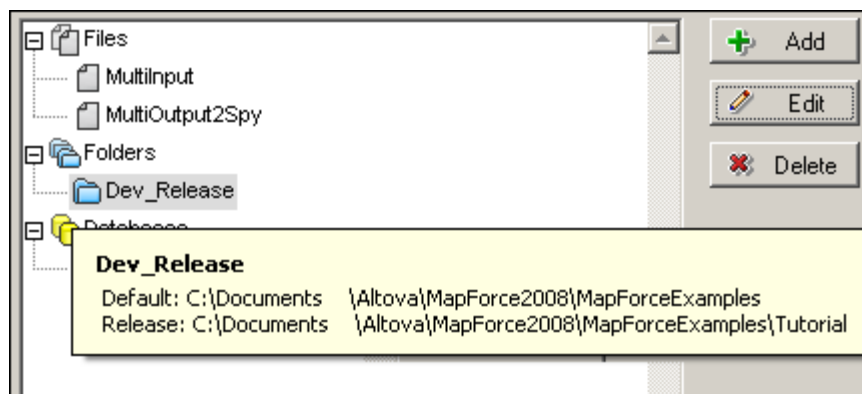
The mapping file used in this section is available as "**global-folder.mfd**" in the [... \MapForceExamples\Tutorial](#) folder.

### Defining / Adding global resource folders

1. Click the Global Resource icon  to open the dialog box.
2. Click the **Add** button and select **Folder** from the popup.
3. Enter the name of the Resource alias e.g. **Dev\_Release**.
4. Click the Open folder icon and select the "Default" input folder, ... \MapForceExamples.



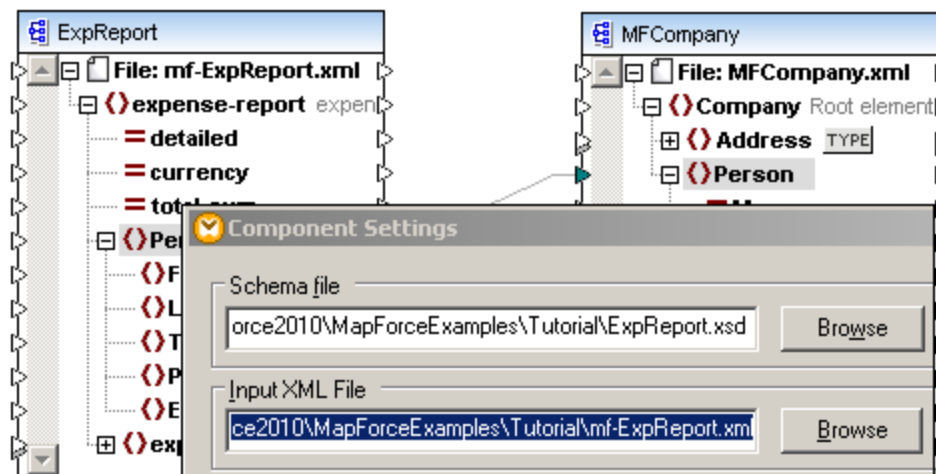
5. Click the Add button  of the **Configurations** group, to add a new configuration to the current Alias, and enter a name for it e.g. Release. Note that the Copy configuration icon , allows you to copy a selected configuration and save it under a new name.
6. Click the Open folder icon and select the Release input folder, ... \MapForceExamples \Tutorial.



7. Click OK to finish the global folder definition.

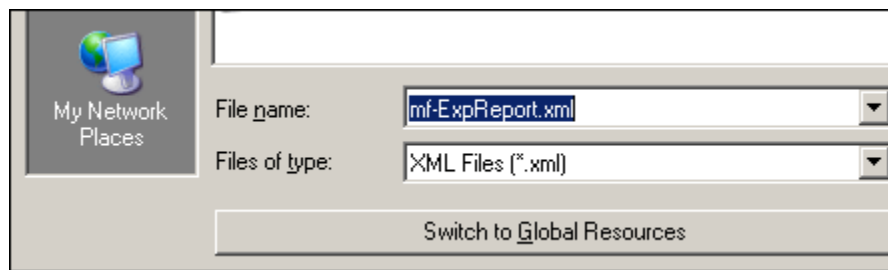
### Assigning the global resource folders:

1. Double click the **ExpReport** component and click the **Browse** button next to the **Input XML File** field.

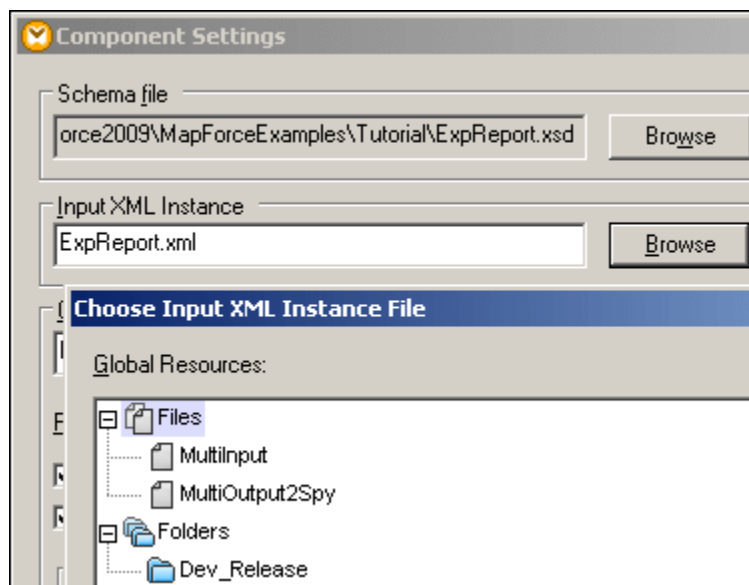


This opens the "Choose XML Instance file" dialog box.

2. Click the **Switch to Global Resources** button at the base of the dialog box.

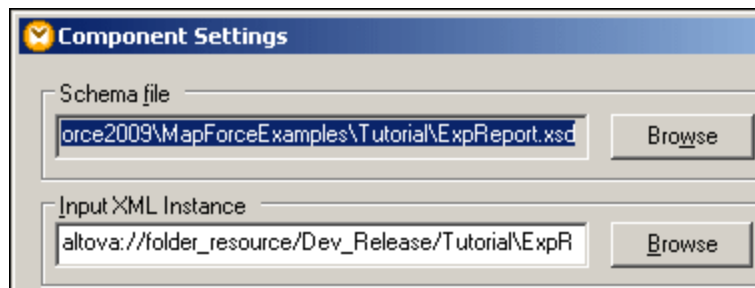


3. Click the resource you want to assign, **Dev\_Release** in this case, and click OK.



The "Open..." dialog appears.

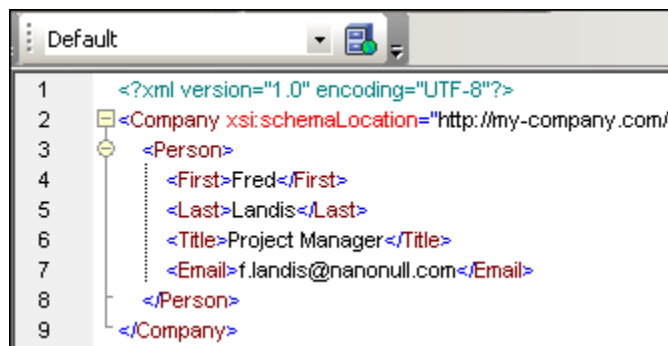
4. Select the **file** name that is to act as both the Development and Release **resource** file in each of the folders, e.g. **ExpReport.xml** and click OK to finish assigning the resource folder.



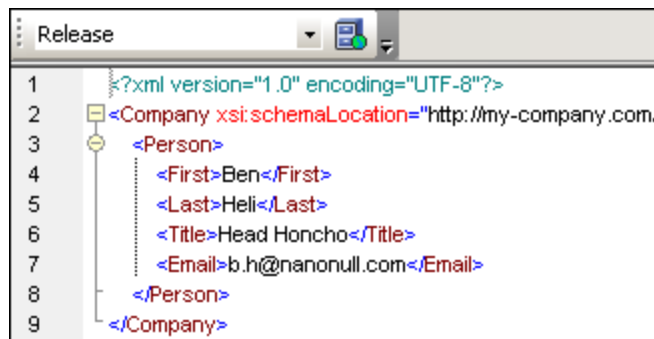
Note that this file is available in both folders but has different content.

#### Changing the resource folder at runtime:

1. Click the Output tab to see the result of the transformation.  
Note that this is the **Default** configuration/folder .../MapforceExamples.



2. Click the Mapping tab to return to the mapping window.
3. Click the Global Resource combo box and select the "**Release**" entry.
3. Click the Output button to see the result using the Release global resource.

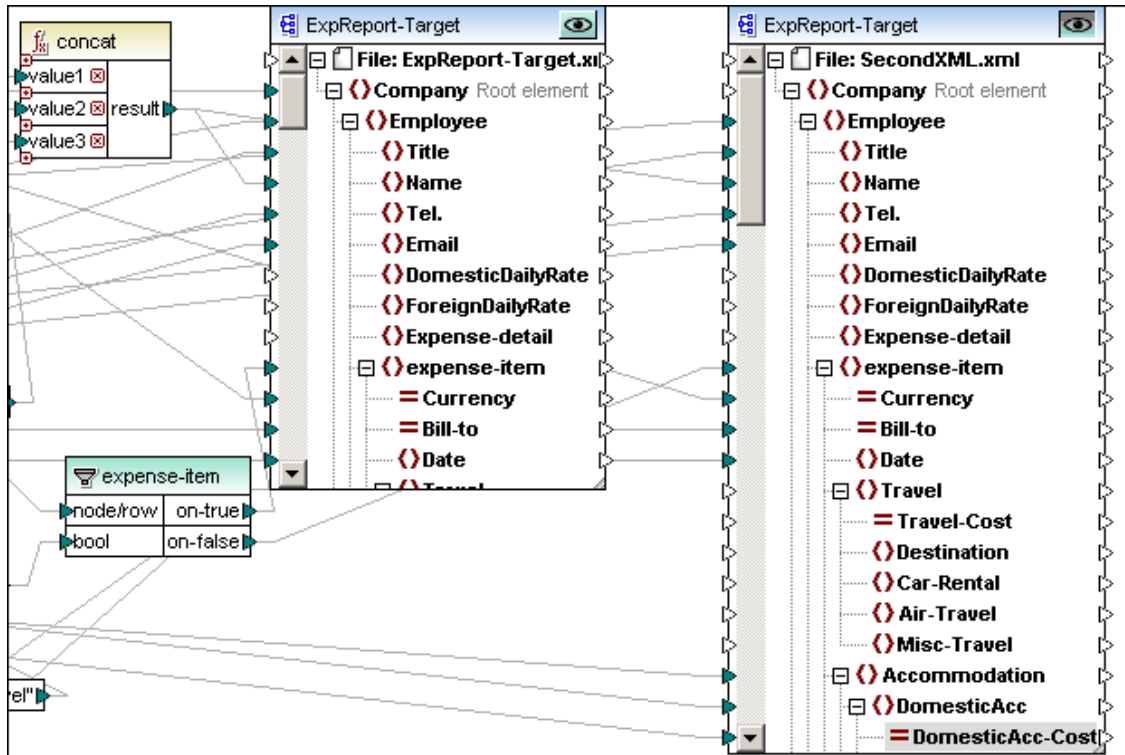


The output from the "Release" folder .../MapforceExamples/Tutorial is now displayed.

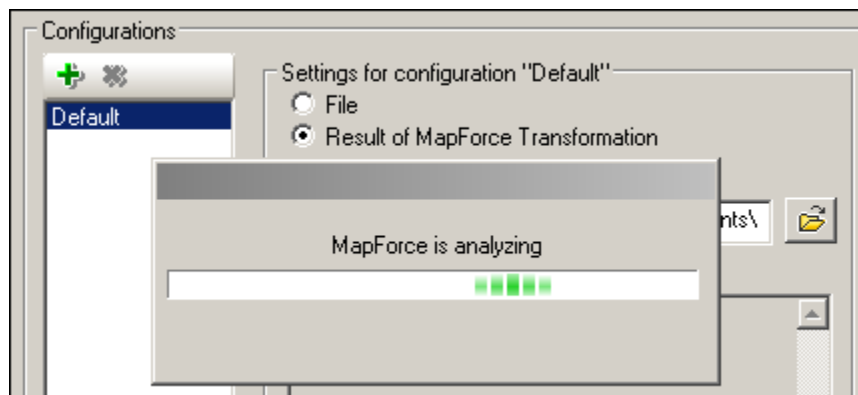
### 8.3 Global Resources - Application workflow

The aim of this section is to create a workflow situation between two Altova applications. Workflow is initiated in XMLSpy which starts MapForce and passes the generated XML file output back to XMLSpy for further processing.

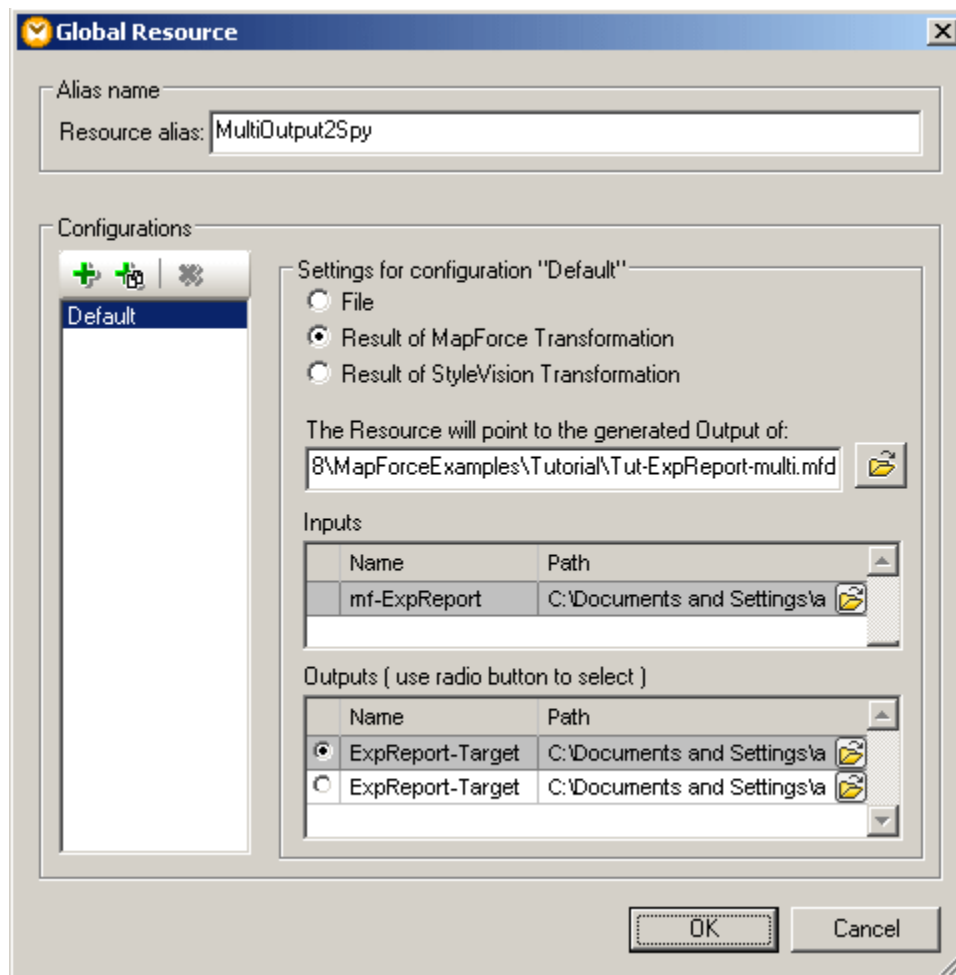
This mapping uses two output components to produce two types of filtered output; Travel and Non-travel expenses of the expense report input file. This section uses the **Tut-ExpReport-multi.mfd** mapping file available in the [...MapForceExamples\Tutorial](#) folder.




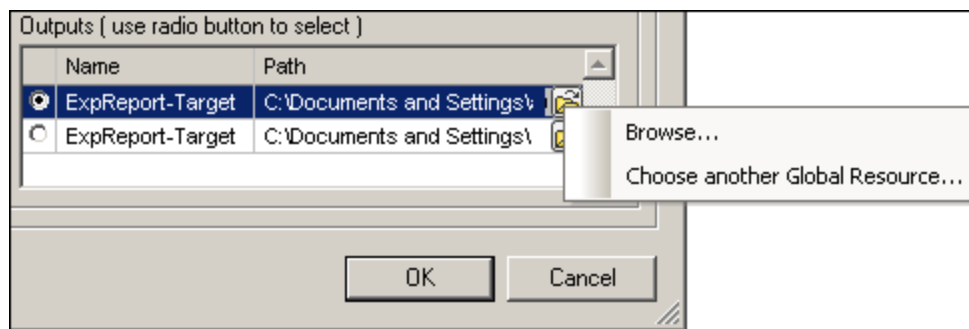
1. Click the Global Resource icon  to open the dialog box.
2. Click the **Add** button and select **File** from the popup.
3. Enter the name of the Resource alias e.g. **MultiOutput2Spy**
4. Click the **"Result of MapForce Transformation"** radio button, then click the Open file icon.
5. Select the **Tut-ExpReport-multi.mfd** mapping.




MapForce analyzes the mapping and displays the input and output files in separate list boxes.



6. Click the top radio button entry in the **Outputs** section, if not already selected. Note that the output file name is **ExpReport-Target.xml** and that we are currently defining the **Default** configuration.
7. Click the  icon to define the **new** location of the output file, and select **Browse...** from the popup menu.




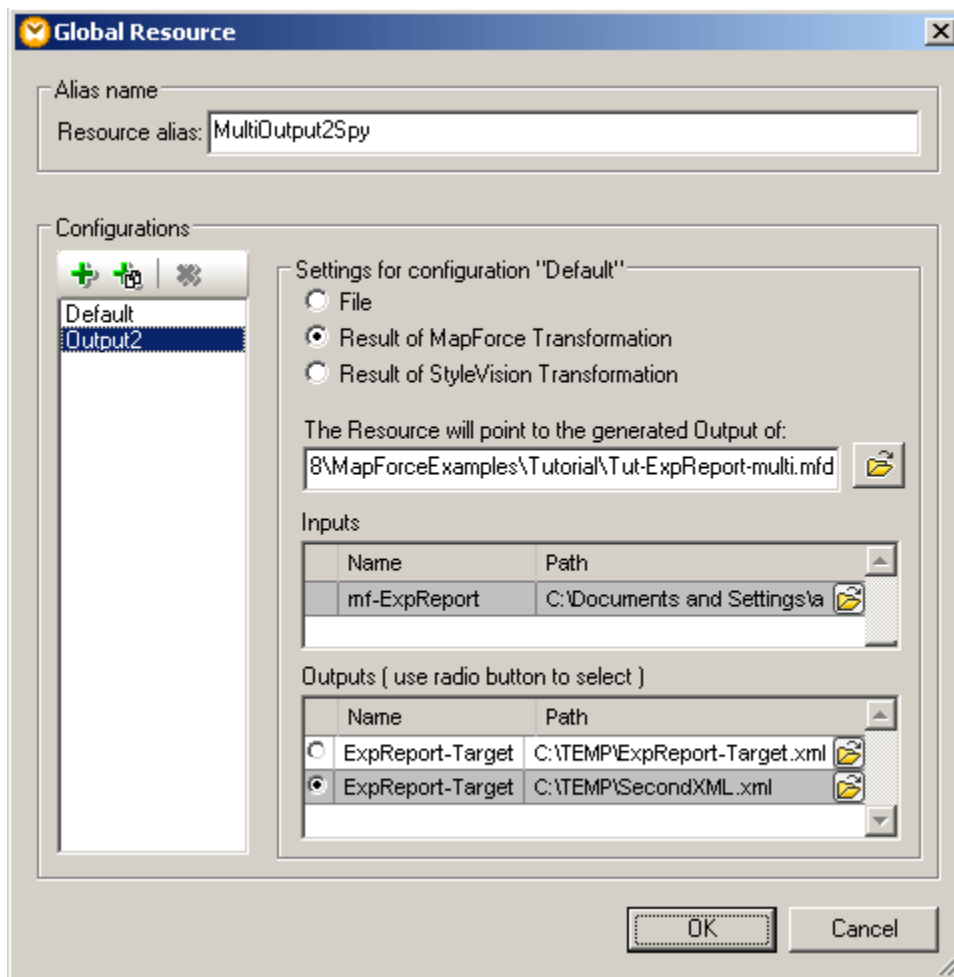
8. Enter the new output location e.g. C:\Temp and click the Save button. This location can differ from the location defined in the component settings.
9. Click the Add button  of the Configurations group (of this dialog box), to add a new

configuration to the resource alias.

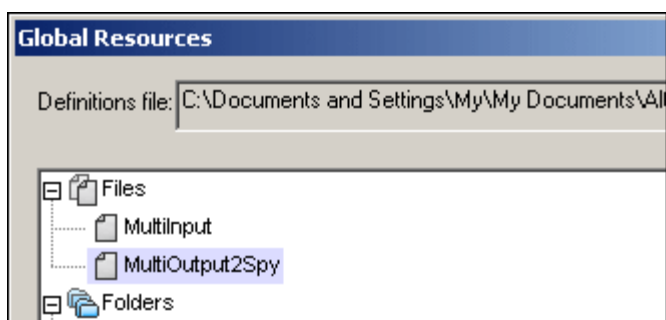
10. Enter the name of the configuration, e.g. **Output2**, click the Open file icon, then click the lower radio button of the Outputs listbox. Note that the output file name is **SecondXML.xml**.



11. Click the "Save as" icon  to define the new location of the output file e.g. C:\Temp.  
Note: clicking the "**Choose another Global Resource...**" in the popup, allows you to save the MapForce output as a global resource. I.e. the output is stored to a file that the global resource physically points to/references.



12. Click OK to save the new global resources.  
The new resource alias **MultiOutput2Spy** has been added to the Global Resources definition file.

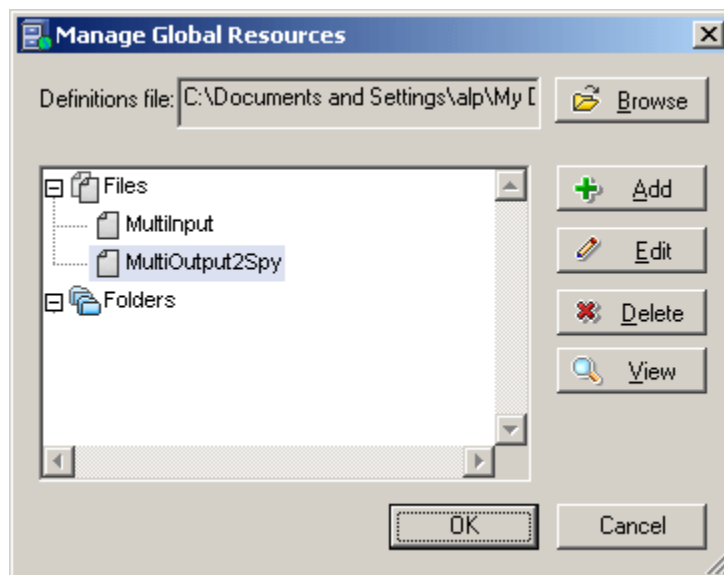


13. Click OK to complete the definition phase.

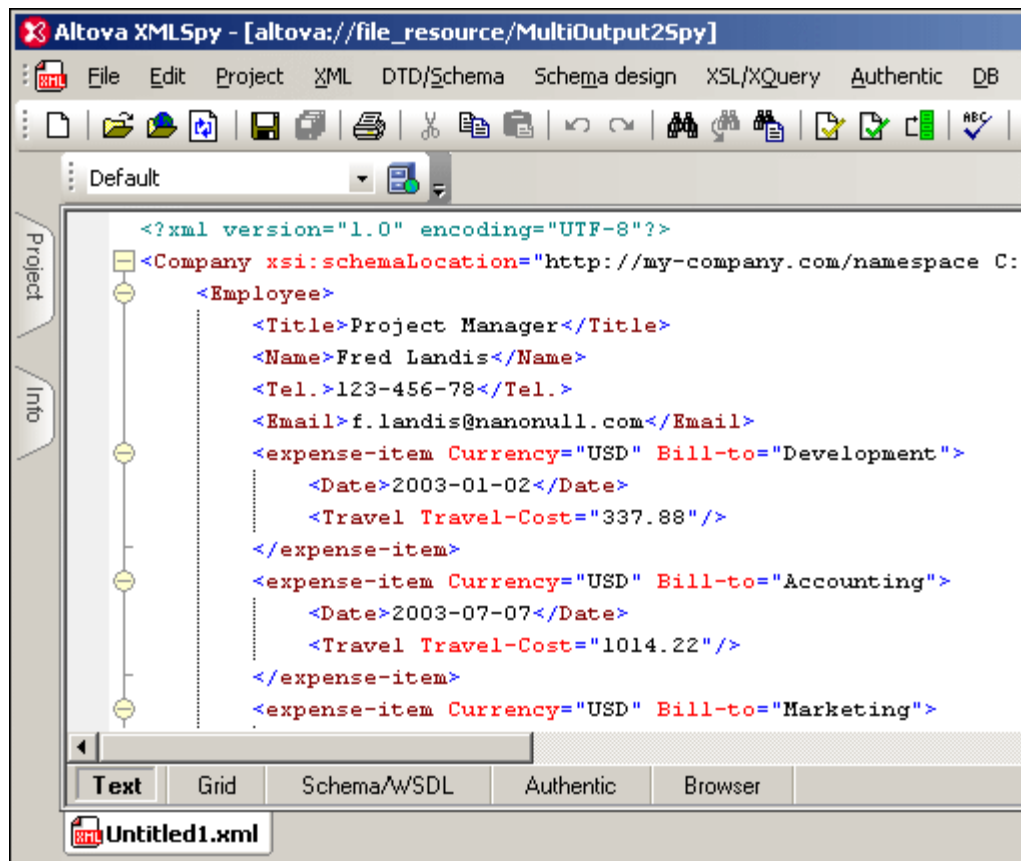
### 8.3.1 Start application workflow

This section shows how the Global Resource is activated in XMLSpy and how the resulting MapForce transformation is routed back to it.

1. Start XMLSpy and shut down MapForce, if open, to get a better view of how the two applications interact.
2. Select the menu option **Tools | Global Resources** in XMLSpy.
3. Select the **MultiOutput2Spy** entry, and click the **View** button.



A message box stating that MapForce is transforming appears, with the result of the transformation appearing in the Text view window.

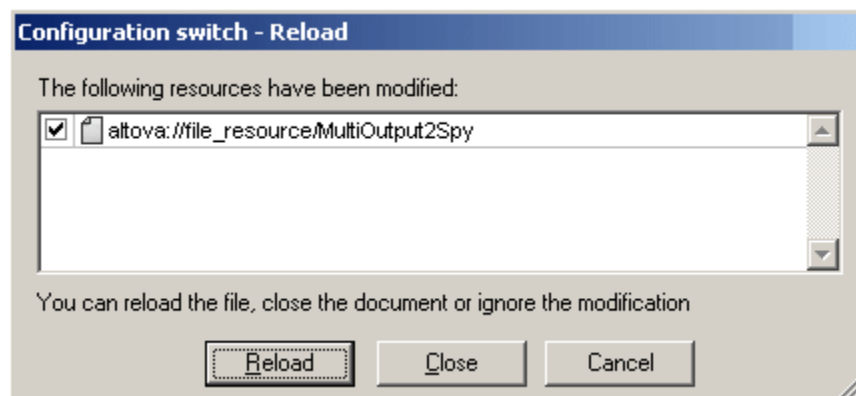


Note:

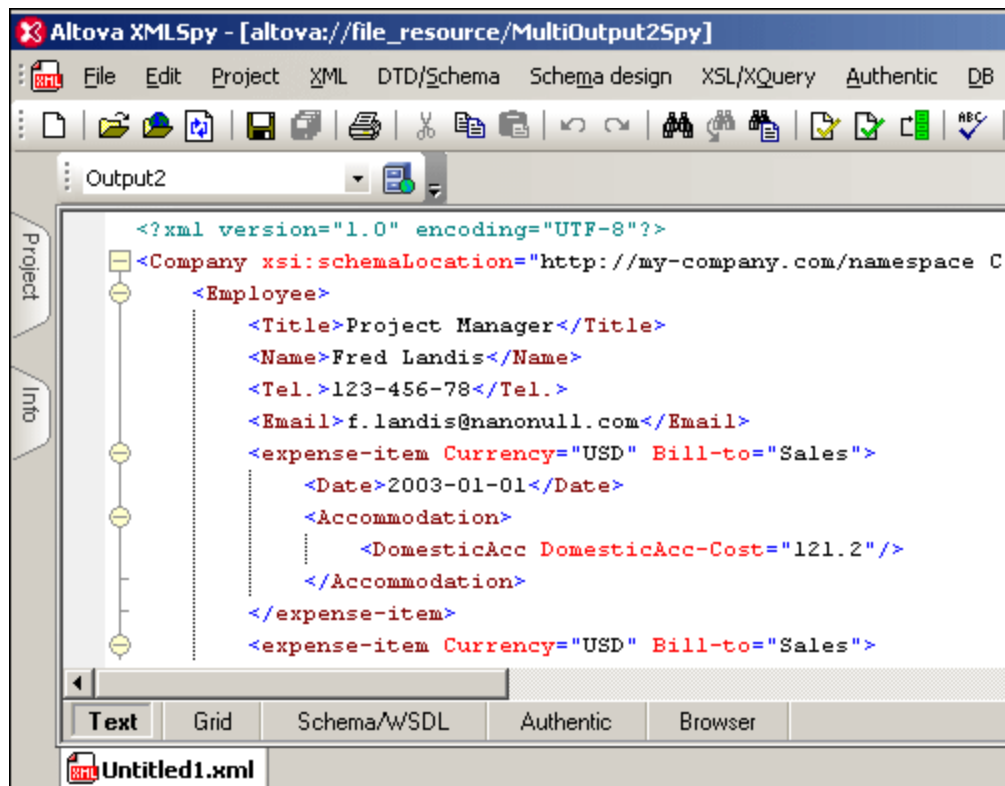
- The currently selected configuration is "Default".
- The name of the resource alias is in the application title bar **altova://file\_resource/MultiOutput2Spy**.
- The output file has been opened as "Untitled1.xml" for further processing.
- The **ExpReport-Target.xml** file has been copied to the C:\Temp folder.

#### To retrieve the non-travel expenses output:

1. Click the Global Resources combo box and select "Output2".  
A notification message box opens.



2. Click **Reload** to retrieve the second output file defined by the resource.



The result of the transformation appears in the Text view window and overwrites the previous MultiOutput2Spy.xml file.

Note:

- The currently selected configuration is "**Output2**".
- The output file has been opened as "Untitled1.xml" for further processing.
- The **SecondXML.xml** file has been copied to the C:\Temp folder.

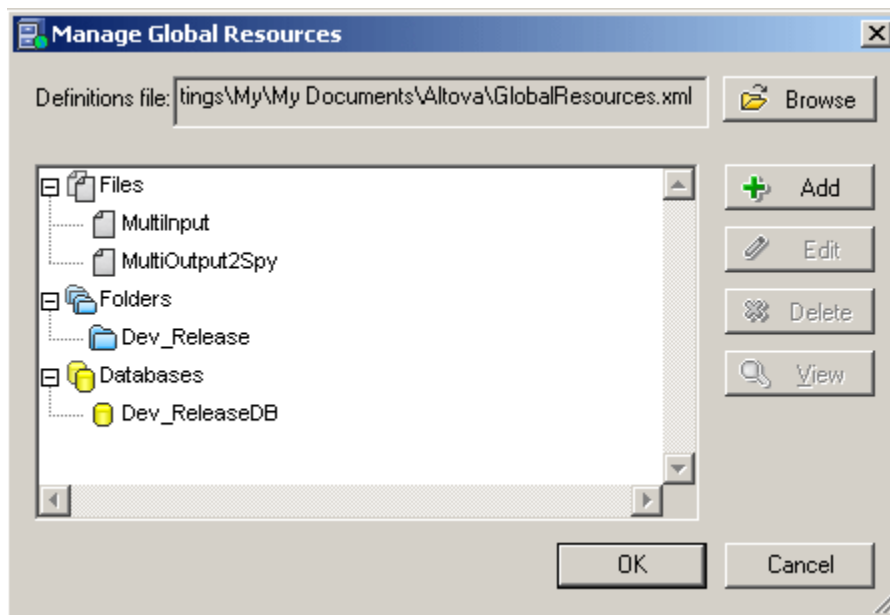
## 8.4 Global Resources - Properties

### The Global Resources XML File

Global resources definitions are stored in an XML file. By default, this XML file is called `GlobalResources.xml`, and it is stored in the folder `C:\Documents and Settings\<username>\My Documents\Altova\`. This file is set as the default Global Resources XML File for all Altova applications. As a result, a global resource defined in any application will be available to all Altova applications—assuming that all applications use this file.

You can also re-name the file and save it to any location. You can therefore have multiple Global Resources XML files. However, only one of these Global Resources XML File can be active, per application, at one time, and only the definitions contained in this file will be available to the application.

To make the Global Resources XML file active, click the **Browse** button of the "Definitions file" field and select the one you want to use from the "Open..." dialog box.



### Managing global resources: adding, editing, deleting

In the Global Resources dialog, you can add a global resource to the selected Global Resources XML File, or edit or delete a selected global resource. The Global Resources XML File organizes the aliases you add into the following sections: files, folders.

#### To add a global resource:

Click the **Add** button and define the global resource in the Global Resource dialog that pops up. After you define a global resource and save it, the global resource (or alias) is added to the list of global definitions in the selected Global Resources XML File.

#### To edit a global resource:

Select it and click **Edit**. This pops up the Global Resource dialog, in which you can make the necessary changes.

#### To delete a global resource:

Select it and click **Delete**.

#### To view the result of an application workflow:

If the calling application e.g. XMLSpy, calls another application e.g. MapForce, then a View

button is available in the Manage Global Resources dialog box.

Clicking the View button shows the affect of the currently selected global resource in the calling application. Please see [Global Resources - Application workflow](#) for an example.

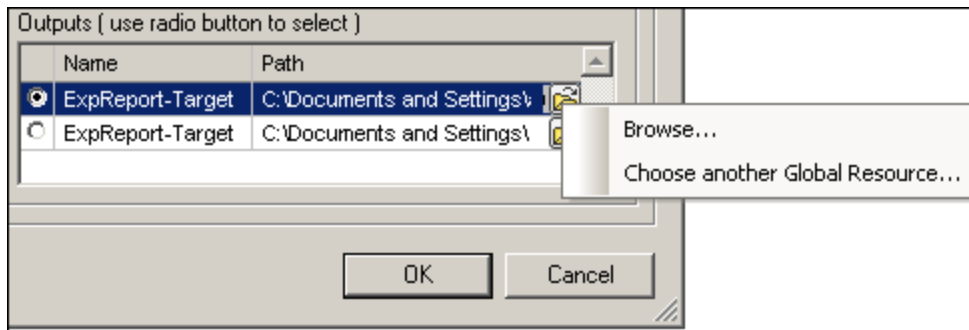
#### To save modifications made in the Managing Global Resources dialog box:

Having finished adding, editing, or deleting, make sure to click **OK** in the Global Resources dialog to save your modifications to the Global Resources XML File.

Note: Alias resource names must be unique **within** each of the Files, Folders. You can however define an identical alias name in two different sections, e.g. a multiInput alias can exist in the Files section as well as in the Folders section.

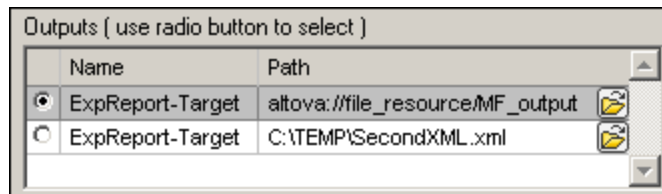
#### Selecting Results of MapForce transformations as a global resource

In a MapForce transformation that has multiple outputs, you can select which one of the output files should be used for the global resource by clicking its radio button.



The **output** file that is generated by the mapping can be saved as:

- a global resource via the **Choose another Global Resource** entry in the popup, visible as **altova://file\_resource/MF\_output**. The output is stored to a file that the global resource physically points to/references.



- a file via the icon, shown as C:\TEMP\Second.xml.

If neither of these options is selected, a **temporary** XML file is created when the global resource is used.

#### Determining which resource is used at runtime

There are two application-wide selections that determine what global resources can be used and which global resources are actually used at any given time:

- The active Global Resources XML File* is selected in the Global Resource dialog. The active Global Resources XML File can be changed at any time, and the global-resource definitions in the new active file will immediately replace those of the previously active file.

The active Global Resources XML File therefore determines: (i) what global resources can be assigned, and (ii) what global resources are available for look-up (for example, if a global resource in one Global Resource XML File is assigned but there is no global

resource of that name in the currently active Global Resources XML File, then the assigned global resource (alias) cannot be looked up).

- The *active configuration* is selected via the menu item **Tools | Active Configuration** or via the Global Resources toolbar. Clicking this command (or dropdown list in the toolbar) pops up a list of configurations across all aliases.

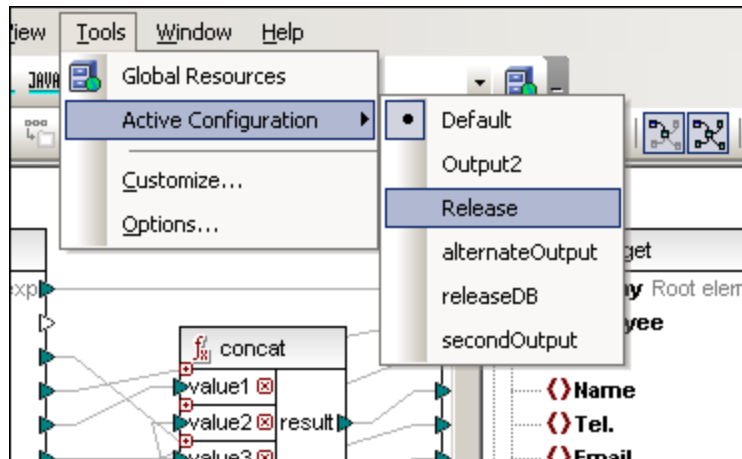
Selecting a configuration makes that configuration active application-wide. This means that wherever a global resource (or alias) is used, the resource corresponding to the active configuration of each used alias will be loaded.

The active configuration is applied to all used aliases. If an alias does not have a configuration with the name of the active configuration, then the **default configuration** of that alias will be used. The active configuration is not relevant when assigning resources; it is significant only when the resources are actually used.

### Changing resources / configurations

Resources can be switched by selecting a different configuration name. This can be done in two ways:

- When you hover over the menu command **Tools | Active Configuration**, a submenu with a list of all configurations in the Global Resources XML File appears. Select the required configuration from the submenu.



- In the combo box of the Global Resources toolbar, select the required configuration. The Global Resources toolbar can be toggled on and off with the menu command **Tools | Customize**, then click the **Toolbar tab** and enable/disable the Global resources check box.





## Chapter 9

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Dynamic input/output files per component

## 9 Dynamic input/output files per component

MapForce is able to process multiple input / output files per component, and can thus process all the files in a directory, or a subset of them, by using wildcard characters in the input component.

The example in the [tutorial](#) shows how a source component processes two XML input files, and how the target component outputs two XML documents.

Multiple input / output files can be defined for the following components:

- XML files

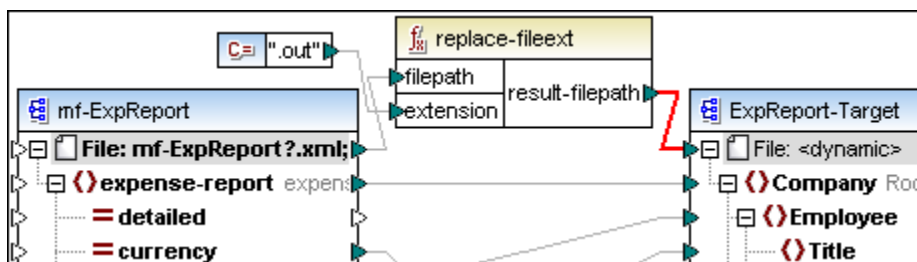
Please take note of the **File:** item at the top of the abovementioned components:



- The **File:mf-ExpReport.xml** item of mf-ExpReport, displays the Input XML file entry. This is automatically filled when you assign an XML instance file to an XML schema file. (If an output file has been defined then the output file name will also be displayed.)
- The **File: (default)** item of ExpReport-Target shows that an output instance file was not assigned to the XML schema component when it was inserted. I.e. the Output XML file field is empty. A default value will therefore be used when the mapping executes.

Dynamic file name support is activated by mapping a string containing a file name to the File item. If the component is used as an input component, the file name may contain wildcards. See also: [relative path handling](#).

- The **File: <dynamic>** item is shown when there is a connection to the File item, i.e. multiple files are now supported.
- The **replace-fileext** function converts the .xml extension to .out for the dynamic target files.



Dynamic/multi-file and wildcard support for MapForce supported languages:

Target language	Dynamic input file name	Wildcard support for input file name	Dynamic output file name
XSLT 1.0	*	not supported by XSLT 1.0	not supported by XSLT 1.0
XSLT 2.0	*	*(1)	*

\* supported

- (1) Uses the **fn:collection** function. The implementation in the **Altova** XSLT 2.0 and XQuery engines resolves wildcards. Other engines may behave differently.

Wildcards \* and ? are resolved when entered in the Component Settings dialog box and also when mapping a string to the File: name node.

To transform XSLT 1.0/2.0 and XQuery code using AltovaXML, please see [Generating XSLT 1.0 and 2.0 code](#)

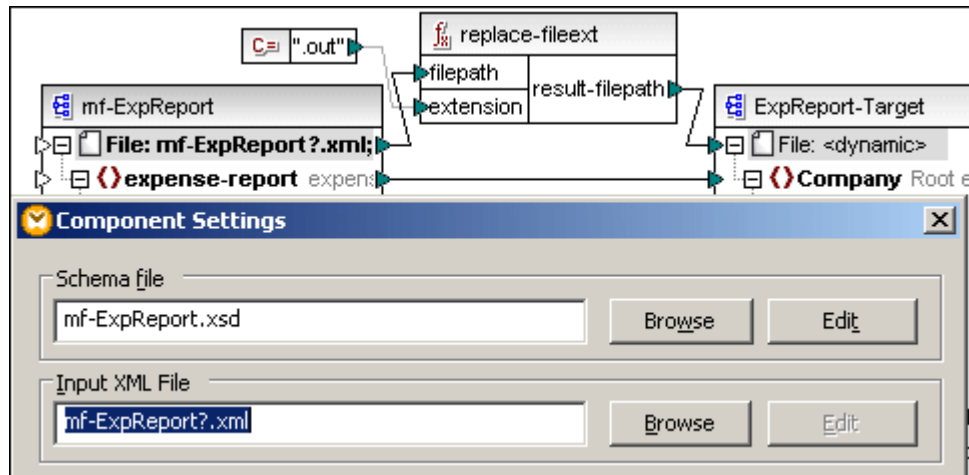
## 9.1 Dynamic file names - input / output

By mapping file names dynamically inside the mapping, you can:

- generate a mapping application where the input and output file names can be defined at runtime
- convert a set of files to another format (many-to-many)
- split a large file (or database) into smaller sections/parts
- merge multiple files into one large file (or load them into a database)

**To process multiple input files, you can do one of the following:**

- Enter a file path with wildcards (\* or ?) as **input file** in the **Component Settings** dialog box. All matching files will be processed. The example below uses the ? wildcard character in the Input XML file field to map all files starting with mf-ExpReport with one following character, of which there are two in the ...Tutorial folder.



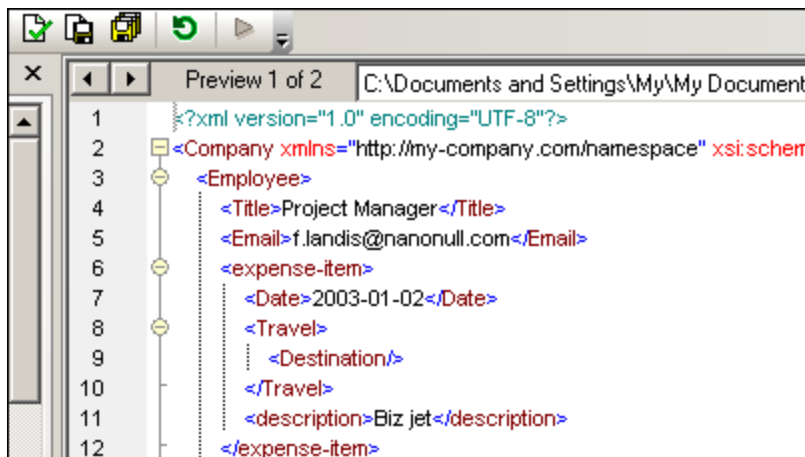
- Map a **sequence** of strings to the *File* node of the source component. Each string in the sequence represents one file name. The strings may also contain wildcards, which are automatically resolved.


A sequence of file names can be supplied by:

- An XML file

### Preview of dynamic input / output mappings

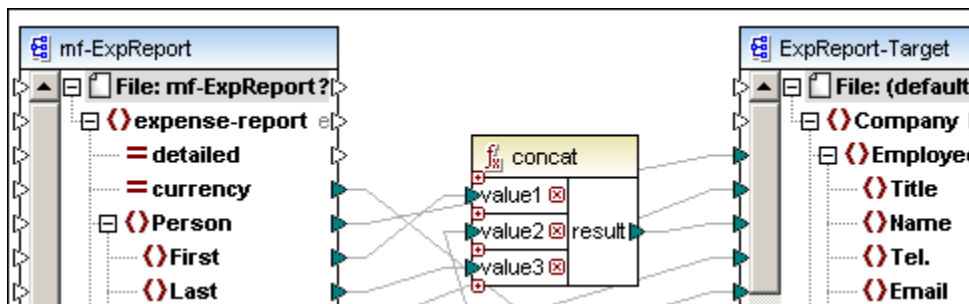
Clicking the Output tab displays the mapping result in a preview window. If the mapping produces multiple output files, as shown below, Preview 1 of 2, each file has its own numbered pane in the Output tab. Click the arrow buttons to see the individual output files.



Click the Save all generated outputs icon , to save the generated output files you see here.

### Multi input / single output - merging input files

Multiple input files can be merged into a **single** output file if the connector **between** the two **File:** items is removed, while the source component still accesses multiple files e.g. per wildcard "?". While the source component can take multiple files, the output component cannot. The multiple source files are thus appended in the target document.



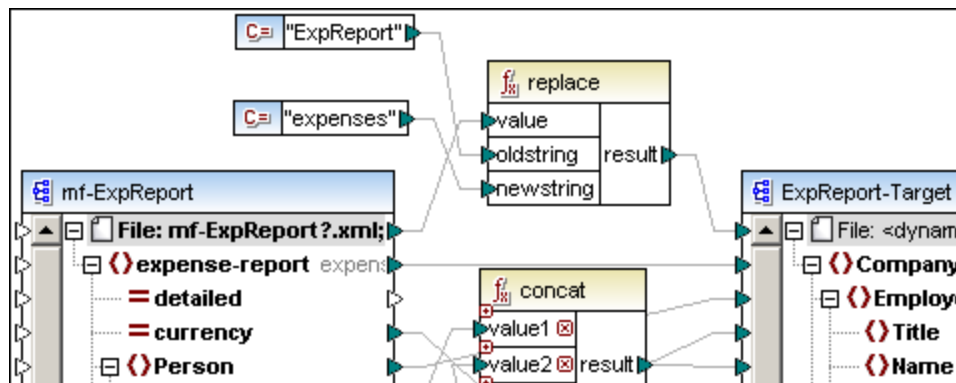
### Multi input / multi output

To map multiple files n:n to multiple target files, you need to generate unique output file names. In some cases, the output file names can be derived from strings in the input data, and in other cases it is useful to derive the output file name from the input file name, e.g. by changing the file extension.

The full path name of the currently processed file is available by connecting the output icon of the **File:** node, e.g. to concat for adding a new file extension.

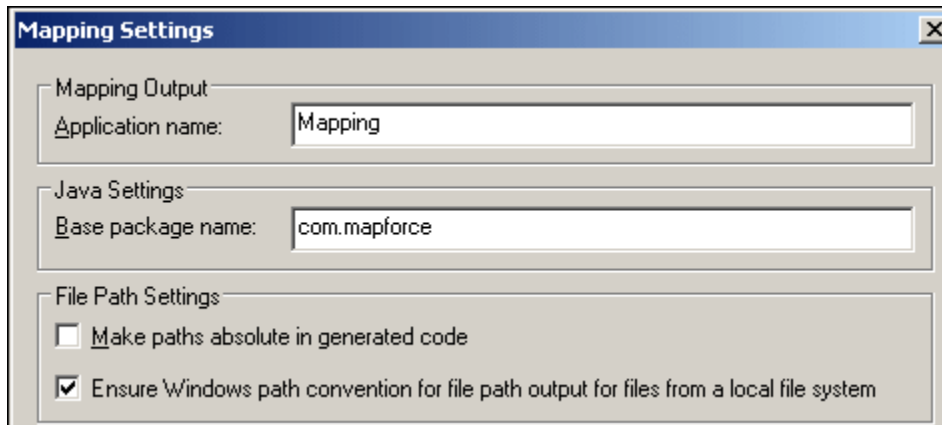
Please note:

Avoid simply connecting the **File:** nodes **directly** without using any processing functions, as this will overwrite your input files when you run the mapping. You can change the output file names using various functions e.g. the replace function as shown below.



The output file names in the above case will be **mf-expenses1.xml** and **mf-expenses2.xml**.

The menu option **File | Mapping Settings** allows you to globally define the file path settings used for the mapping project.



The "Ensure Windows path convention...." check box makes sure that Windows path conventions are followed. When outputting XSLT2 (and XQuery), the currently processed file name is internally retrieved using the **document-uri** function, which returns a path in the form **file:// URI** for local files.

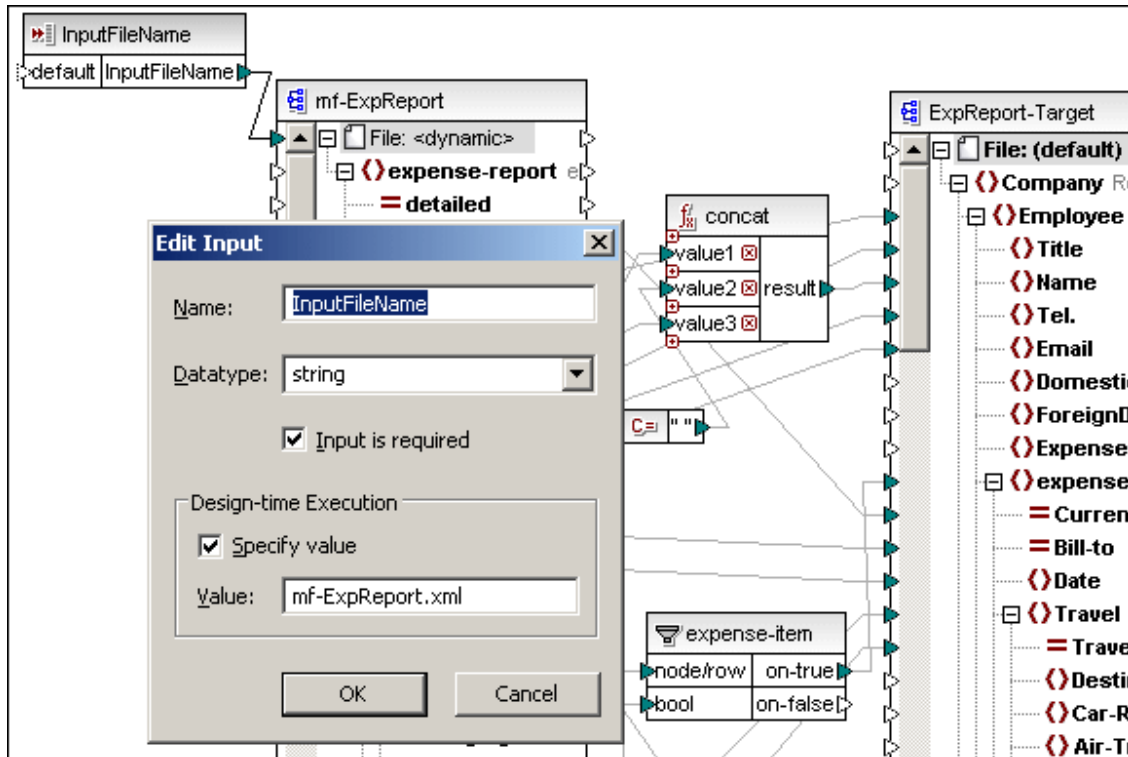
When this check box is active, a file:// URI path specification is automatically converted to a complete Windows file path (e.g. "C:\...") to simplify further processing.

## 9.2 Dynamic file names as Input parameters

MapForce allows you to create special input components that can act as a **parameter** in the command line execution of the compiled mapping. This specific type of input component cannot be used **inside** a user-defined function, it is only available in the main mapping window.

### To process a file using an Input parameter at runtime:

To define the path and file name at runtime, connect an [input parameter](#) component to the input icon of the *File* node in the source component. Depending on the connections to other items, this will define the input and/or the output file name.



The mf-ExpReport.xml entry in the Value field is only used for preview purposes in the Output window. It has no effect on the parameter values used when running the code from the command line. Please see [Input parameters, overrides and command line parameters](#) for more information.

When you have generated and compiled your code you can supply the file name for the mapping using the command line:

**mapping.exe /InputFileName Filename.xml.**

Where:

- **/InputFileName** is the name of the first parameter
- **Filename.xml** is the second parameter i.e. the dynamic file name you want to be used when running the application from the command line.

### 9.3 Multiple XML files from single XML source file

The content of the XML source file **mf-ExpReport.xml**, available in the ...\\MapForceTutorial folder, is shown below. It consists of the expense report for Fred Landis and contains five expense items of different types. This example is available as **Tut-ExpReport-dyn.mfd** in the ...\\Tutorial folder.

Aim:

To generate a separate XML file for each of the expense items listed below.

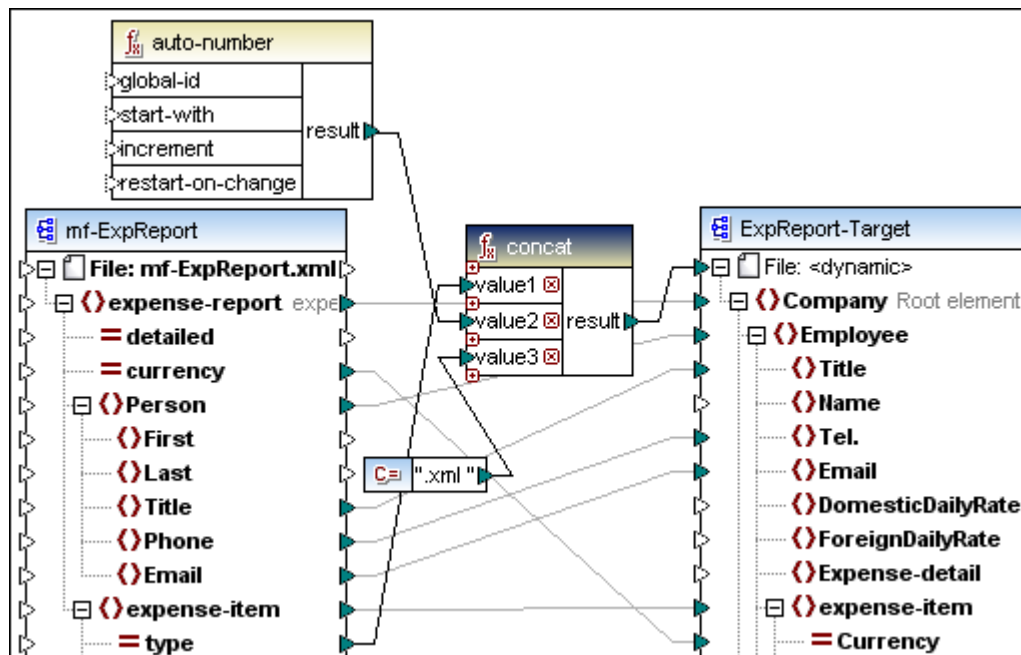
Person					
First	Fred				
Last	Landis				
Title	Project Manager				
Phone	123-456-78				
Email	f.landis@nanonull.com				

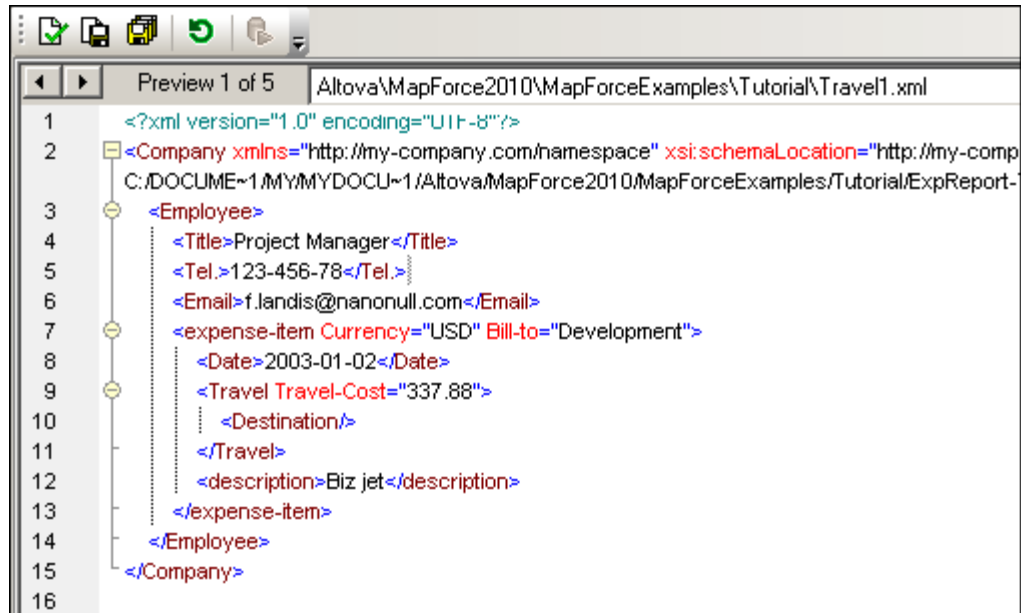
expense-item (5)					
#	type	expto	Date	Travel	Lodging
1	Travel	Development	2003-01-02	Travel Trav-cost=337.88	
2	Lodging	Sales	2003-01-01		Lodging
3	Travel	Accounting	2003-07-07	Travel Trav-cost=1014.22	
4	Travel	Marketing	2003-02-02	Travel Trav-cost=2000	
5	Meal	Sales	2003-03-03		

As the "type" attribute defines the specific expense item type, this is the item we will use to split up the source file.

1. Insert a concat function from the libraries pane and a constant component from the icon bar.
2. Enter \*.xml as the string value in the constant component when the dialog box opens.
3. Insert the auto-number function from the **core | generator functions** library of the libraries pane.

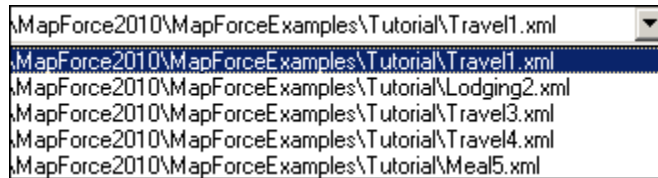



4. Create the connections as shown above: type to value1, auto-number to value2 and the constant to value3.
5. Connect the **result** parameter/output of the concat function to the **File:** item of the target component. Note that File: <dynamic> is now displayed.
6. Define the remaining connections as needed.
7. Click the Output tab to see the result of the mapping.




Each record is now visible in its own Preview tab, the first one is shown above.

8. Click the drop-down list arrow to see all the files that have been generated.



Clicking the Next/Previous  arrows allows you to see each of the files in the Output tab.

Note:

- The **type** attribute supplies the first part of the file name e.g. Travel.
- The **auto-number** function supplies the file number increments (default settings are start at=1 and increase=1) thus Travel1.
- The **constant** component supplies the file extension i.e. .xml, thus Travel1.xml is the file name of the first file.
- Clicking the Save All icon  allows you to save the individual files directly from the Output tab, without having to generate code.

## 9.4 Relative and absolute file paths

A relative path is a path that does not start with a drive letter, i.e. it can be a file name without path. The specific context in which the relative file name is used, defines the base path. The handling of relative file names has changed in MapForce version 2010 due to the support for mapping file names as data inside a mapping.

Previous versions of MapForce (prior to 2010) saved file paths relative to the \*.MFD file for files in the same, or a descendent folder, and changed them to absolute paths when they were opened/loaded.

Since MapForce 2010, all references to external files, such as schemas or XML instance files, are stored the way they are entered in the dialog box – in this way, relative paths can be used where required.

### **Save all paths relative to MFD file**

This new option, common to all component settings dialog boxes, saves all file paths (of the component) relative to the location of the current MFD file. This allows you to move a mapping together with all related files to a different location, while keeping all file references intact.

This means that:

- Absolute file paths will be changed to relative paths
- The parent directory "..\\" will be also be inserted/written
- Using Save as... will adjust the file paths (relative to the MFD file) to the new location you are saving the MFD file to

Please note:

Paths that reference a non-local drive, or use a URL, will not be made relative.

**Component Settings**

Schema file: ExpReport-Target.xsd [Browse] [Edit]

Input XML File: mf-ExpReport-combined.xml [Browse] [Edit]

Output XML File: ExpReport-out [Browse] [Edit]

Prefix for target namespace: [ ]

☒ Add schema/DTD reference (leave field empty to use absolute file path of schema):  
/MYDOCU~1/Altova/MapForce2010/MapForceExamples/Tutorial/mf-ExpReport.xsd

☒ Cast values to target types (disable to preserve formatting of numeric or date values at risk of writing invalid output)

☒ Pretty print output

☐ Create digital signature (Built-in execution only) [Signature Settings]

In case of failed creation: ☐ Stop processing ☒ Continue without signature

Encoding:  
Encoding name: Unicode UTF-8  
Byte order: Little Endian ☐ Include byte order mark

StyleVision Power Stylesheet file: [ ] [Browse] [Create...]

☒ Enable input processing optimizations based on min/maxOccurs

☒ Save all file paths relative to MFD file

[OK] [Cancel]

There are two separate types of files that are referenced from an MFD file:

- Schema-type files (XML Schemas, WSDL, FlexText configuration files, ...) entered in the **schema file** field.
- Instance files entered in the **Input xxx File**, or **Output xxx File** fields.

### Schema-type files

Schema-type files are used when designing a mapping. They define the **structure** of the mapped input and output instance files. This information is used to display the item trees/hierarchy in the various components. MapForce supports entering and storing a relative

path to schema-type files.

- Relative paths to **schema-type** files will be always resolved **relative to the MFD file**.
- Selecting a schema via the "Open" dialog, e.g. after inserting a new component, or clicking the "Browse" button in the Component Settings dialog box, always inserts the **absolute** path into the field.
- To set a relative path, which will also be stored in the MFD file, delete the path from the text box, or type a relative path or file name. This will happen automatically on saving the MFD file if the "Save all paths relative to MFD file" checkbox is activated. You may also use "..\\" to specify the parent folder of the MFD file.
- Saving a MFD file that references files from the same directory, then moving the complete directory to another location, **does not** update any **absolute** paths stored in the mfd file. Users who use source control systems and different working directories should therefore use relative paths, in this case.

### Instance files and the execution environment

The processing of instance files is done in the generated XSLT, XQuery or in the generated application, as well as MapForce preview.

In most cases it does not make sense to interpret relative paths to instance files as being relative to the MFD file, because that path may not exist at execution time - the generated code may be deployed to a different machine. **Relative** file names for instance files are therefore resolved relative to the **execution environment**:

Target language	Base path for relative instance file name
XSLT/XSLT2	Path of the XSLT file

A new check box that ensures compatibility of generated code with mapping files (\*.mfd) from versions prior to Version 2010, has been added in the **File | Mapping Settings** dialog box, i.e. "**Make paths absolute in generated code**".

The state of the check box is automatically set depending on what is opened, the check box is:

- **inactive** if a **new** mapping file, i.e. version 2010, is created or opened  
Relative paths for input and output instance files are written as is, into the generated code.  
  
This allows deployment of the generated code to a different directory or even machine. You must ensure that files addressed using relative paths are available in the runtime environment at the correct location.
- **active** if an older mapping file from version 2009, 2008 etc. is opened  
Relative paths for input and output instance files are made absolute (relative to the \*.MFD file) before generating code. This has the same effect as generating code with an older version of MapForce.

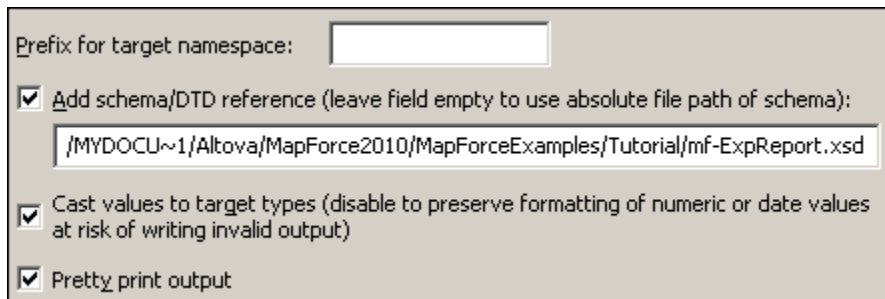
Note that the **source** instance file name is also used for the following purposes:

- Detection of the XML root element and the referenced schema
- Validation against the selected schema
- Reading Excel worksheet names and columns
- To read column names and preview contents of text files (CSV or FLF)

### New "schemaLocation" field for target XML files

Since schema references may be stored relative to the MFD file, and the **generated** XML file from a target component is often in a different directory, there is a way to enter a separate **schemaLocation** path for the target XML **instance**, so that the XML file can be validated there.

This is the field below the “Add schema/DTD reference” check box, of the Component Settings dialog box (Double click a component to open it). A similar field exists for the taxonomy reference in XBRL components.



Prefix for target namespace:

☒ Add schema/DTD reference (leave field empty to use absolute file path of schema):

☒ Cast values to target types (disable to preserve formatting of numeric or date values at risk of writing invalid output)

☒ Pretty print output

The path of the referenced/associated schema, entered in this field, is written into the generated **target instance** files in the **xsi:schemaLocation** attribute, or into the DOCTYPE declaration if a DTD is used.

Note: A URL e.g. <http://mylocation.com/mf-expreport.xsd> can also be entered here.



# Chapter 10

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## Intermediate variables

## 10 Intermediate variables

Intermediate variables are a special type of component used to solve various [advanced mapping problems](#). They store an intermediate mapping result for further processing.


- Variables work in all languages except XSLT1.0.
- Variable results are always sequences, i.e. a delimited list of values, and can also be used to create sequences.
- Variables are structural components, with a root node, and do not have instances (XML files etc.) associated to them.
- Variables make it possible to compare items of one sequence, to other items within the same sequence.
- Variables can be used to build intermediate sequences. Records can be filtered before passing them on to a target, or filtered after the variable by using the position function for example.

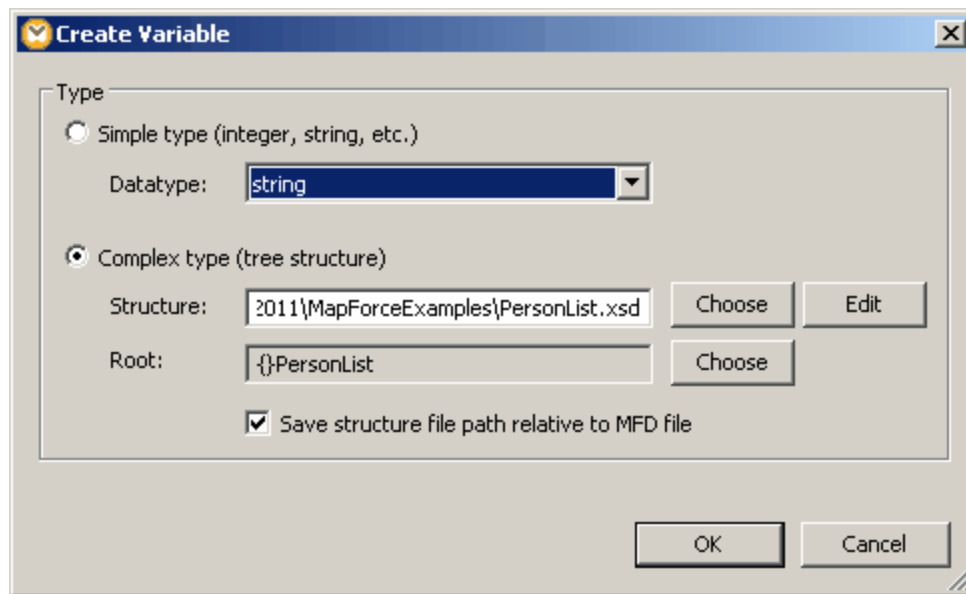
### Difference between variables and chained mappings

Chained mappings	Variables
Involve two totally independent steps.	Evaluated depending on context / scope. Controlled by "compute-when" connection
Intermediate results are stored externally in XML files when mapping is executed.	Intermediate results are stored internally, not in any physical files, when mapping is executed.
Intermediate result can be previewed using preview button.	Variable result cannot be previewed.

### To insert intermediate variables:

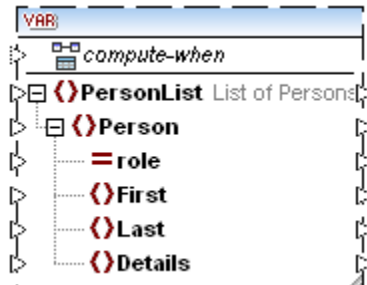
There are several ways of inserting intermediate variables: Using the menu option, by clicking the Var. icon, or by right clicking input/output icons and creating variables based on the input/output components.

1. Select **Insert | Variable** or click the Variable icon  in the icon bar. You can now select if you want to insert a simple or complex variable.



2. Click the radio button for the type of variable you want to insert, i.e. Simple type, or Complex type.  
If you clicked the "Complex type" radio button:
3. Click the "Choose" button to select XML Schema for example, and select the Root item from the next dialog box.
4. Click OK to insert the variable.

Complex variable:



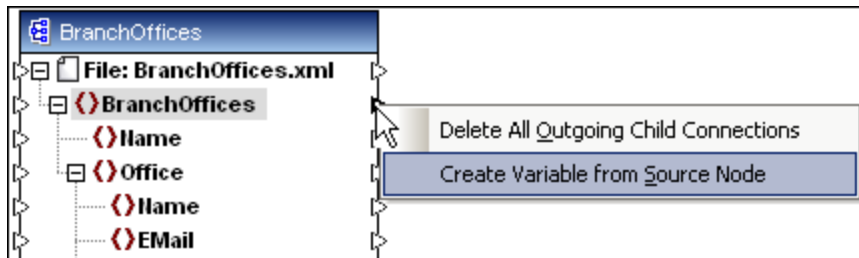
Simple variable:



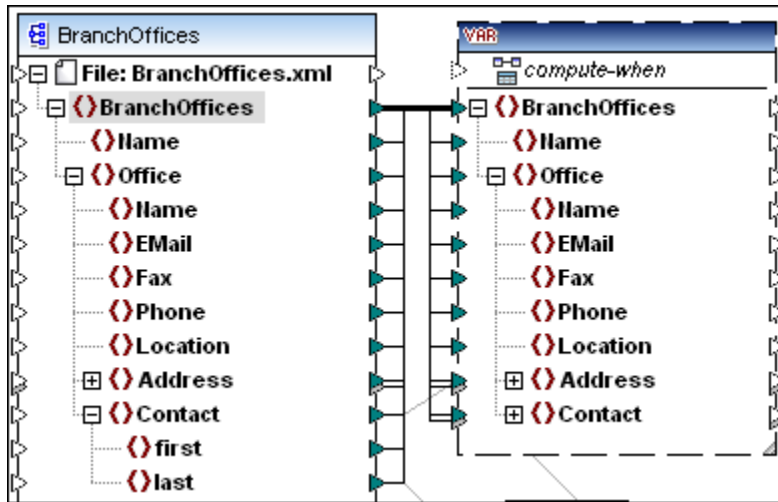
Have a single mappable item/value e.g. string, integer. Note that the "value" item can be [duplicated](#).

#### Alternate methods of inserting variables:

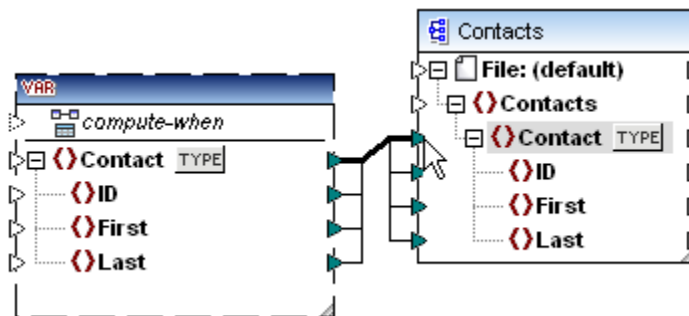
- Right click an **output** icon of a component (e.g. BranchOffices) and select "Create Variable from Source node".



This creates a complex variable using the same source schema and automatically connects all items with a copy-all connection.

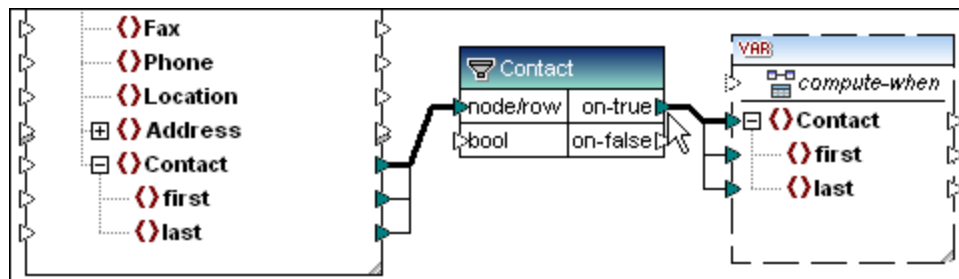


- Right click an **input** icon of a target component (e.g. Contact) and select "Create Variable for Target Node".



This creates a complex variable using the same schema as the target, with the Contact item as the root node, and automatically connects all items with a copy-all connection.

- Right click an **output** icon of a filter component (on-true/on-false) and select "Create Variable from Source node".



This creates a complex component using the source schema, and automatically uses the item linked to the filter input node/row, i.e. Contact, as the root element of the intermediate component.



### Compute-when

The compute-when input item allows you to control the **scope** of the variable; in other words when and how often the variable value is computed when the mapping is executed. You do not have to connect this input in many cases, but it can be essential to override the default context, or to optimize mapping performance.

A **subtree** in the following text means the set of an item/node in a target component and all of its descendants, e.g. a <Person> element with its <FirstName> and <LastName> child elements.

**Variable value** means the data that is available at the **output** side of the variable component.

- For simple variables, it is a sequence of atomic values that have the datatype specified in the component properties.
- For complex variables, it is a sequence of root nodes (of the type specified in the component properties), each one including all its descendant nodes.

The sequence of atomic values (or nodes) may of course also contain only one, or even zero elements. This depends on what is connected to the input side of the variable component, and to any parent items in the source and target components.

### Compute-when **not connected** (default)

If the compute-when input item is **not connected** (to an output node of a source component), the variable value is computed whenever it is **first** used in a **target** subtree (via a connector from the variable component directly to a node in the target component, or indirectly via functions). The same variable value is also used for all target child nodes inside the subtree.

The actual variable value depends on any connections between parent items of the source and target components (see "[Loops, groups and hierarchies - The context](#)").

This default behavior is the same as that of complex outputs of [regular user-defined functions](#) and Web service function calls.

If the variable output is connected to multiple **unrelated** target nodes, the variable value is computed separately for each of them. This can produce different results in each case, because different parent connections influence the context in which the variable's value is evaluated.

### Compute-when - **connected**

By connecting compute-when to an **output node** of a source component, the variable is

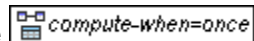
computed whenever that **source item** is **first** used in a target subtree.

The variable actually acts as if it were a child item of the item connected to compute-when.

This makes it possible to **bind** the variable to a specific source item, i.e. at runtime the variable is re-evaluated whenever a new item is read from the sequence in the source component.

This relates to the general rule governing connections in MapForce - "for each source item, create one target item". With compute-when, it means "for each source item, compute the variable value".

### Compute-once



Right clicking the "compute-when" icon and selecting "Compute Once" from the context menu, changes the icon to "compute-when=once" and also removes the input icon.

This setting causes the variable value to be computed once **before** any of the target components, making the variable essentially a global constant for the rest of the mapping.

In a user-defined function, the variable is evaluated each time the function is called, before the actual function result is evaluated.

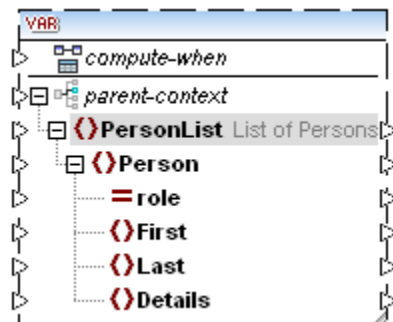
### Parent-context

The main use of adding a parent-context, is when using multiple filters and you need an additional parent node to iterate over.

#### To add a parent-context to a variable:

- Right click the root node, e.g. PersonList and select "Add Parent Context" from the context menu.

This adds a new node, "parent-context", to the existing hierarchy.

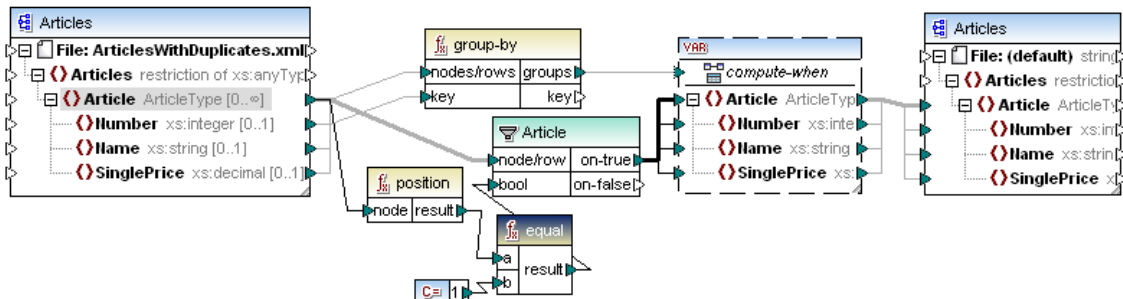


The parent context adds a virtual "parent" node to the hierarchy within the component. This allows you to iterate over an additional node in the same, or different source component.

## 10.1 Variables - use cases

### Filtering out multiple instances of the same record from a source instance

Source data can often contain multiple instances of the same record. In most cases you would only want one of these records to be mapped to the target component. The example below is available as **DistinctArticles.mfd** in the ...MapForceExamples folder.



The ArticlesWithDuplicates.xml file contains two articles both having the same article number (two with article no. 1 and two with article no 3).

Articles

= xmlns:xsi

http://www.w3.org/2001/XMLSchema-instance

= xsi:nillamespace...

Articles.xsd

Article (6)

	Number	Name	SinglePrice
1	1	T-Shirt	25
2	1	T-Shirt Duplicate	25
3	2	Socks	2.30
4	3	Pants	34
5	4	Jacket	57.50
6	3	Pants Duplicate	34

The article Number is used as the key in the [group-by function](#), so it creates one group per unique article number. Each group thus contains one article and all the unwanted duplicates of that article. The next step is to extract the first item of each group and discard the rest.

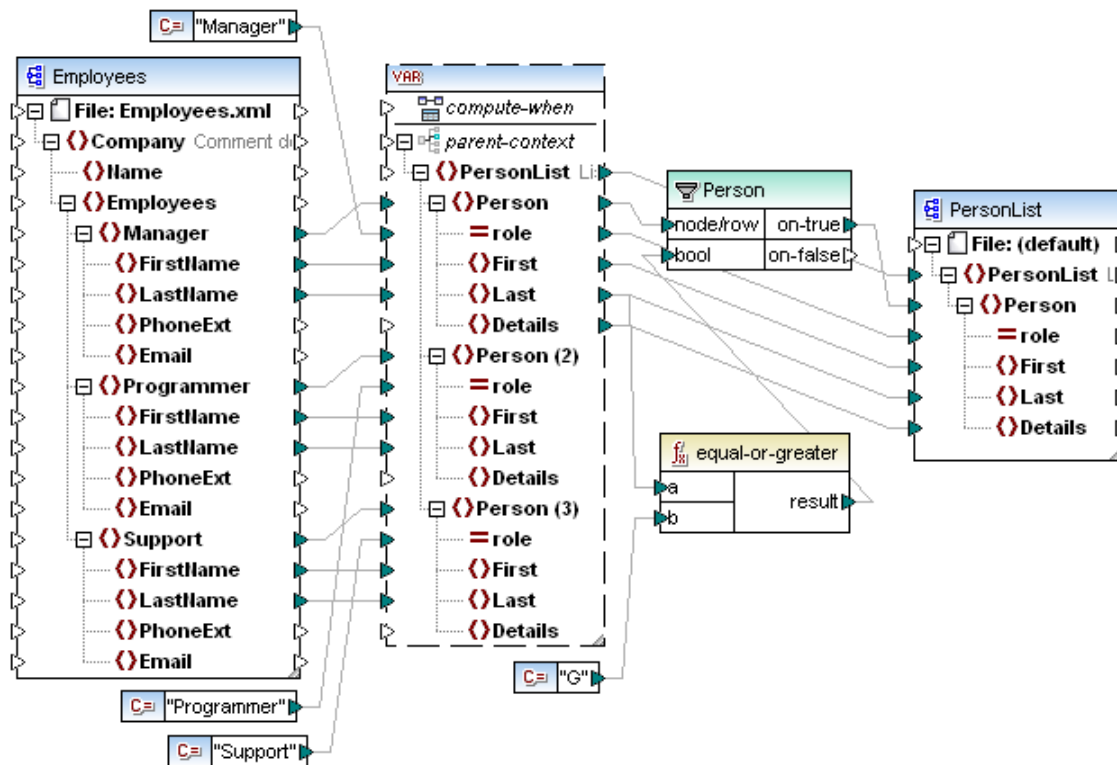
The connection of the group output to "compute-when" causes the variable to be evaluated once for each group, in the context of that group. This establishes an additional context level, as if we had connected a parent element of the target Article element.

To select the first article of each group, we use the position function and a filter component, which are connected to the variable input.

### Applying filters to intermediate sequences:

Nodes in variable components can be [duplicated](#) as in any other type of component. This allows you to build sequences from multiple different sources and then further process the sequence.

The screenshot below shows how PersonList.mfd could be modified using an intermediate variable, and how constant components can also act as source items.

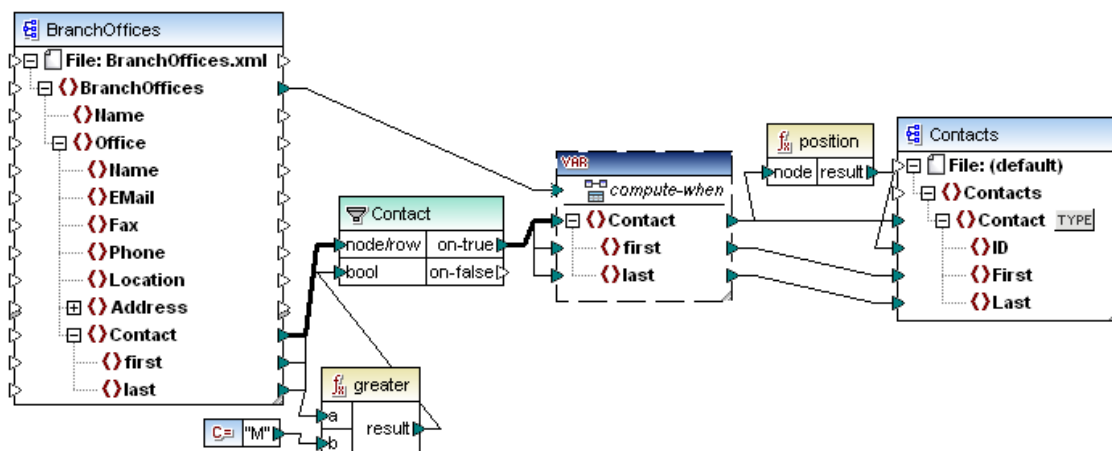


The **Person** node of the **variable** has been duplicated twice, and a filter has been added to filter those persons whose Last name starts with a letter higher than "G".

### Numbering nodes of a filtered sequence

This example is available as **PositionInFilteredSequence.mfd** in ...MapForceExamples folder and uses the variable to collect the filtered contacts where the last name starts with a letter higher than M.

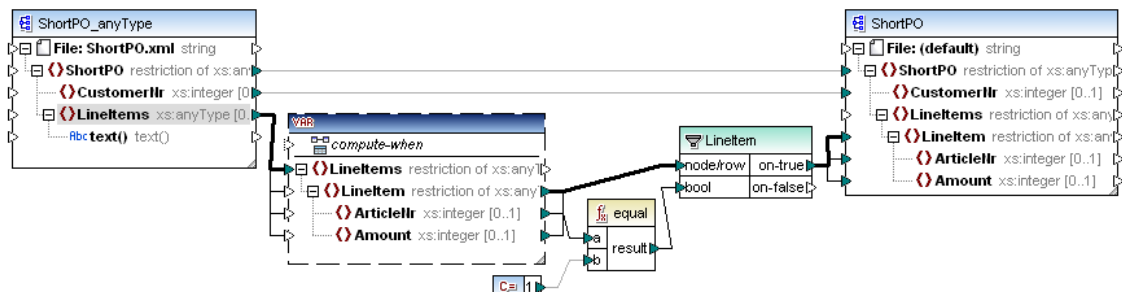
The contacts are then passed on (from the variable) to the target component, with the position function numbering these contacts sequentially.



The variable acts like another source component allowing the position function to process the filtered sequence.

### Extract specific data from a source components' anyType node

This example consists of a source component containing anyType elements from which we want to filter specific data.



The intermediate variable is based on a schema that has nodes of the specific type of data that we want to map, i.e. ArticleNr and Amount are both of type integer. That specific data is filtered by ArticleNr. and passed on to the target component.



# Chapter 11

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How To... Filter, Transform, Aggregate

## 11 How To... Filter, Transform, Aggregate

This section deals with common tasks that will be encountered when creating your own mappings.

### General:

#### I want to:

**Filter** data based on specific criteria

Use **dynamic/multiple input** and output files when mapping

Map/use a **derived complex type** (xsi:type)

Create a **recursive** user-defined mapping

Use min, max, sum, avg, and count aggregate functions

Use an **input component** as a **parameter** during command line execution

Specify an **alternative** value for an input component

Transform an input value to an output value using a **lookup table**

Run MapForce from the **command line**

Know about type conversion when mapping

Create my own **catalog** files

Merge multiple source files into a single target file

#### Read this section

[Filter - retrieving dynamic data](#)

[Dynamic and multiple input/output files per component](#)

[Derived XML Schema types - mapping to](#)

[Recursive user-defined mapping](#)

[Aggregate functions](#)

[Input values /overrides](#)

[Input values / overrides](#)

[Value-Map - Transforming input data](#)

[Command line parameters](#)

[Type conversion checking](#)

[Catalog files in MapForce](#)

[Merging multiple files into one target](#)

### Nodes

#### I want to:

**Test** nodes; existing / not existing nodes

**Group** nodes by their content

Map data based on the **position** of a node in a sequence

**Comment** a mapping / specific connectors or nodes

Define the node which is to act as the context node in a source file.

#### Read this section

[Node testing, exists / not exist](#)

[Grouping nodes / node content](#)

[Position of context items in a sequence](#)

[Annotations / Commenting](#)

[Priority context node/item](#)



## 11.1 Filter components - Tips

For information on filtering XML data, please see [Filtering data](#).

This section will deal with methods enabling you to optimize data access and generally speed up the mapping process.

In general, use as few filter components as possible, and:

1. Avoid concatenating filter-components
2. Connect the "on-true/on-false" parameters, to parent items if possible, instead of child items directly
3. Connect the "on-false" parameter to map the complement node set, delivered by the on-true parameter
4. Don't use filters to map to child data, if the parent item is mapped
5. Use the "Priority context" to prioritize execution of unrelated items

### Avoid concatenating filter components

Every filter-component leads to a loop through the source data, thus accessing the source **n** times. When you concatenate two filters, it loops **n\*n** times.

Solution:

Use "**logical-and**" components to combine the boolean expressions of two filter-components. The result is a single filter component looping only **n**-times.

### Connect the "on-true/on-false" parameter of the filter component, to target parent items

Filter components work best when they are connected to parent items containing child items, instead of individual items directly.

The filter **boolean** expression is therefore evaluated against the parent, **before** looping through the child elements. Using filters mapped from a database table will generate:

- "SELECT \* FROM table WHERE <expression>" if the **parent** item is mapped, or
- "SELECT \* FROM table", and then evaluate for each row, if child items are mapped

Please note:

when connecting a filter from a source parent item, it is also necessary to connect the on-true/on-false parameter to the parent target element. If this cannot be done, then do not apply this rule.

### Connect the "on-false" parameter to map the complement node set

Connecting this parameter allows you quick access to the complement node set defined by the current mapping. The same tips apply when using this parameter, connect to parent items etc.

### Don't use filters to map to child data, if the parent item is mapped

Using a filter to map data from a source parent to a target parent, automatically applies the **same filter** to **every child** item of the particular parent.

Filter components do not have to be used to supply filtered data to child items, if the parent item can be mapped! You can therefore map child data directly.

### Use priority-context to prioritize execution when mapping unrelated items

Mappings are always executed top-down; if you loop/search through two tables then each loop is processed consecutively. When mapping unrelated elements, without setting the priority context, MapForce does not know which loop needs to be executed first, it therefore automatically selects the first table, or data source.

**Solution:**

Decide which table, or source data is to be looped/searched first, and then set the priority context on the connector to that table. Please see [Priority Context node/item](#) for a more concrete example.

**To define a priority context:**

- Right click an input icon and select "Priority Context" from the pop-up menu. If the option is not available, mapping the remaining input icons of that component will make it accessible.

**Filters and source-driven / mixed content mapping**

Source-driven mappings only work with direct connections between source and target components. Connections that exist below a source-driven connection, are not taken as source-driven and the items will be handled in target component item/node order.

A single filter where both outputs are connected to same/separate targets, acts as if there were two separate filter components, one having a negated condition.

If an exception component is connected to one of the filter outputs, the exception condition is checked when the mappings to the the other filter output are executed.

## 11.2 Value-Map - transforming input data

The Value-Map component allows you to transform an input value to a different output value using a lookup table. This is useful for converting different enumeration types. The component only has one input and output item.

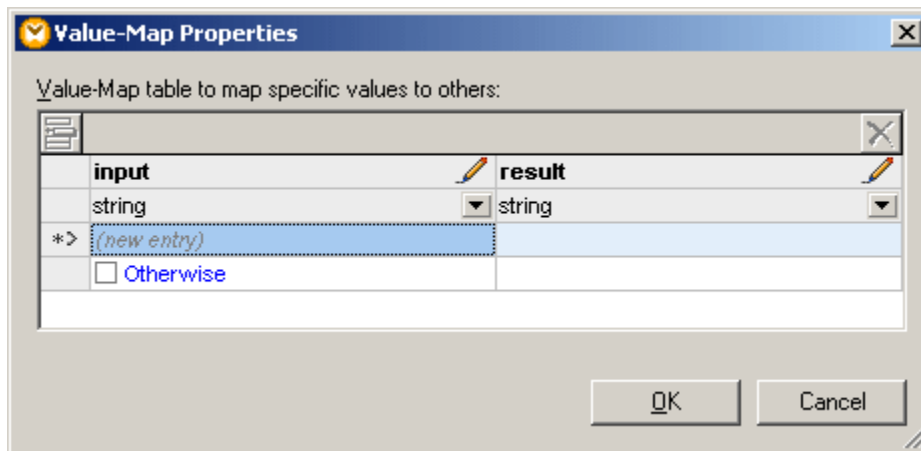
Note: if you want to retrieve/filter data based on specific criteria, please use the **Filter** component, see Filtering XML data: [Filtering data](#).

### To use a Value-Map component:

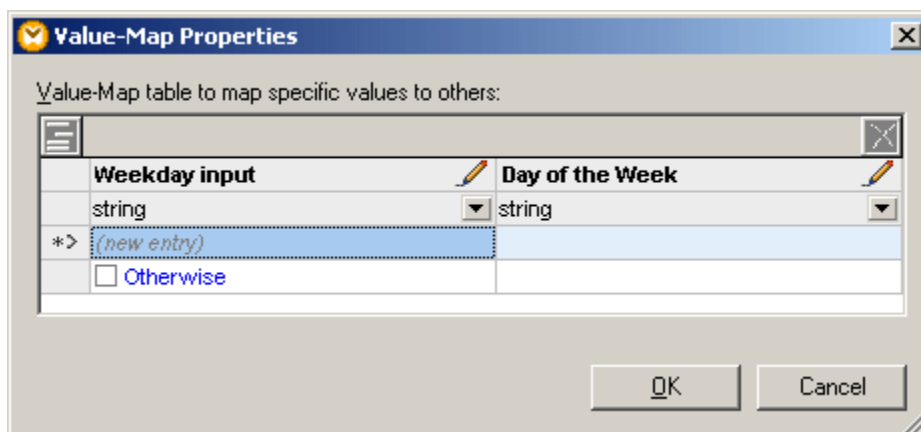
1. Select the menu option **Insert | Value-Map**, or click the Value-Map icon  in the icon bar.



2. Double click the Value-Map component to open the value map table.

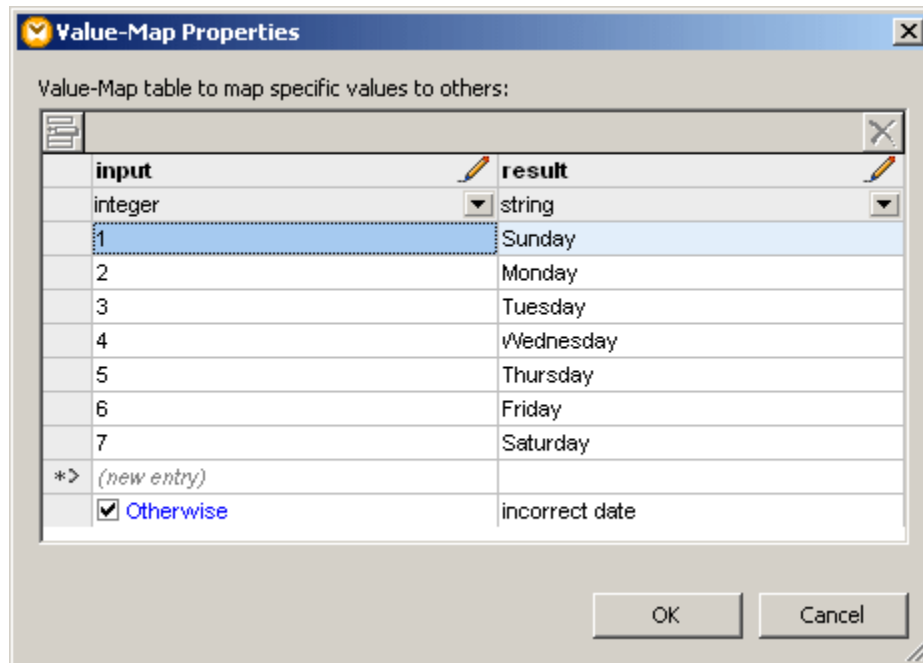


3. Click into the column headers and enter **Weekday input** in the first, and **Day of the Week** in the second.



4. Enter the input value that you want to transform, in the **Weekday input** column.
5. Enter the output value you want to transform that value to, in the **Day of the week** column.
6. Simply type in the **(new entry)** input field to enter a new value pair.
7. Click the **datatype** combo box, below the column header to select the input and output

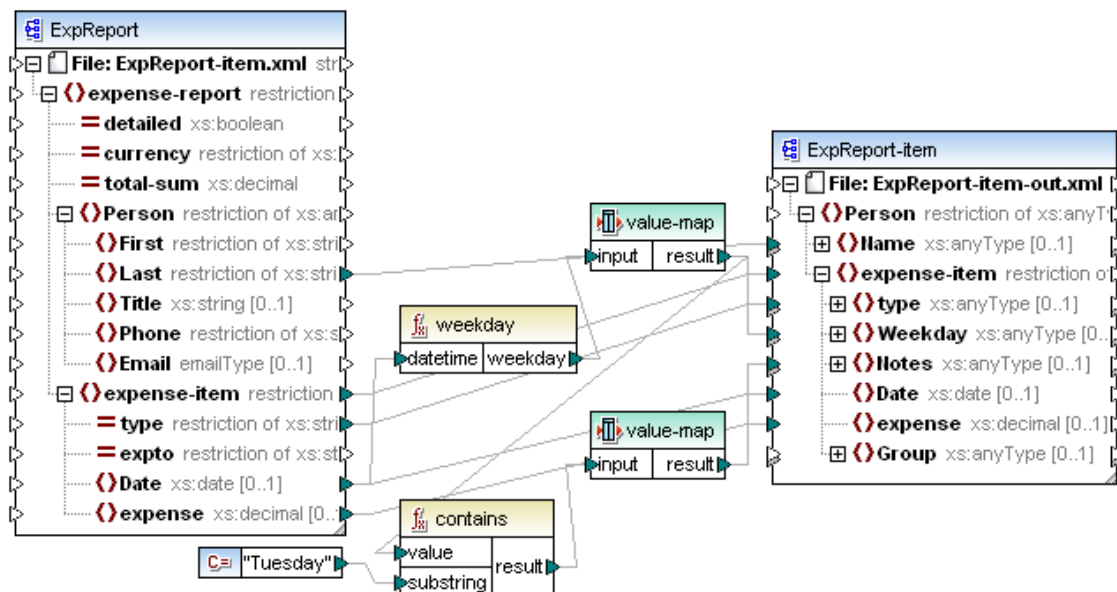
datatypes, e.g. integer and string.



Note: activate the **Otherwise** check box, and enter the value, to define an alternative output value if the supplied values are not available on input. To pass through source data without changing it please see [Passing data through a Value-Map unchanged](#).

- You can click the edit icons in the header rows to change the column names, which are also displayed in the mapping. This will make it easier to identify the purpose of the component in the mapping.

The **Expense-valmap.mfd** file in the [...MapForceExamples\Tutorial\](#) folder is a sample mapping that shows how the Value-Map can be used.



What this mapping does:

Extracts the day of the week from the Date item in the data source, converts the numerical value into text, and places it in the Weekday item of the target component i.e. Sunday, Monday etc.

- The **weekday** function extracts the weekday number from the **Date** item in the ExpReport source file. The result of this function are integers ranging from 1 to 7.
- The Value-Map component transforms the integers into weekdays, i.e. Sunday, Monday, etc. as shown in the graphic at the top of this section.
- If the output contains "Tuesday", then the corresponding output "Prepare Financial Reports" is mapped to the Notes item in the target component.
- Clicking the Output tab displays the target XML file with the transformed data.



```

3  <Name>Landis</Name>
4  <expense-item>
5    <type>Meal</type>
6    <Weekday>Tuesday</Weekday>
7    <Notes>-- Prepare financial reports --</Notes>
8    <Date>2003-01-01</Date>
9    <expense>122.11</expense>
10 </expense-item>
11 <expense-item>
12   <type>Lodging</type>
13   <Weekday>Monday</Weekday>
14   <Notes> --</Notes>
15   <Date>2003-01-14</Date>
16   <expense>122.12</expense>
17 </expense-item>

```

**Note:**

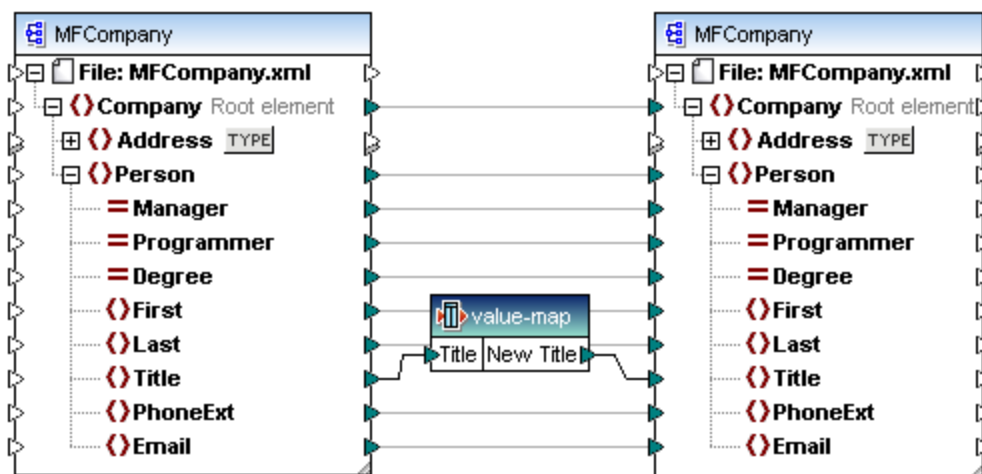
Placing the mouse cursor over the value map component opens a popup containing the currently defined values.

The output from various types of logical, or string functions, can only be a boolean "**true**" or "**false**" value. The value you want to test for, must thus be entered into the **input** field of the value map table e.g. "true".

### 11.2.1 Passing data through a Value-Map unchanged

This section describes a mapping situation where some specific node data have to be transformed, while the rest of the node data have to be passed on to the target node unchanged.

An example of this would be a company that changes some of the titles in a subsidiary. In this case it might change two title designations and want to keep the rest as they currently are.



The obvious mapping would be the one shown above, which uses the value-map component to transform the specific titles.

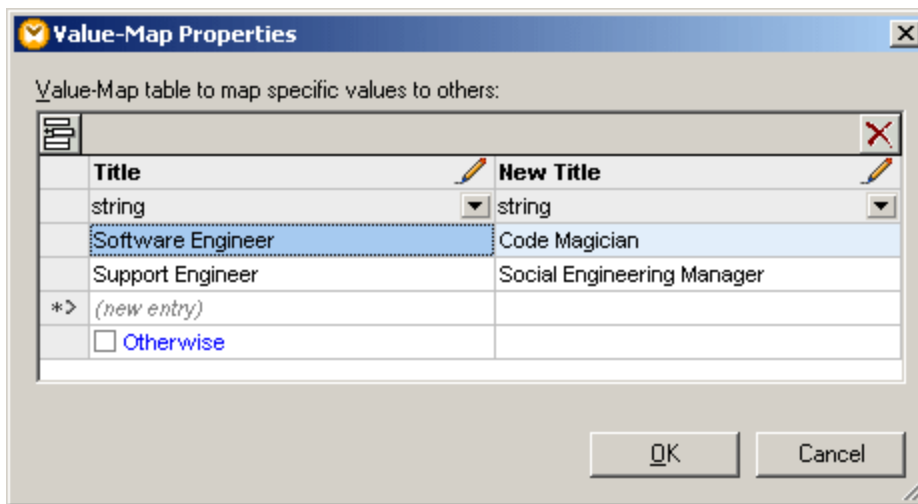
Clicking the Output tab shows us the result of the mapping:

```

33  <Person>
34    <First>Fred</First>
35    <Last>Landis</Last>
36    <PhoneExt>951</PhoneExt>
37    <Email>f.landis@nanonull.com</Email>
38  </Person>
39  <Person>
40    <First>Michelle</First>
41    <Last>Butler</Last>
42    <Title>Code Magician</Title>
43    <PhoneExt>654</PhoneExt>
44    <Email>m.landis@nanonull.com</Email>
45  </Person>

```

For those persons who are neither of the two types shown in the value-map component, the Title element is deleted in the output file.



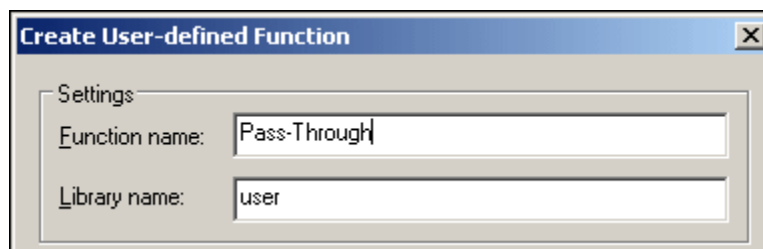
Possible alternative:

Clicking the **Otherwise** check box and entering a substitute term, does make the Title node reappear in the output file, but it now contains the same **New Title** for all other persons of the company.

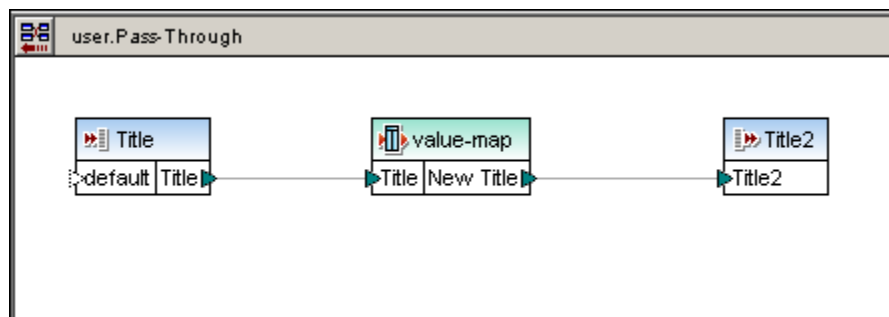
#### Solution:

Create a user-defined function containing the value-map component, and use the **substitute-missing** function to supply the original data for the empty nodes.

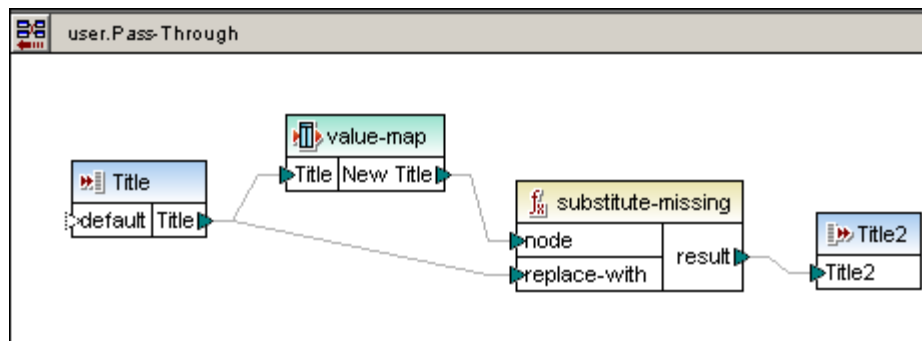
1. Click the value-map component and select **Function | Create user-defined function from Selection**.



2. Enter a name for the function e.g. Pass-Through and click OK.



3. Insert a **substitute-missing** function from the **core | node function** section of the Libraries pane, and create the connections as shown in the screen shot below.



4. Click the Output tab to see the result:

Result of the mapping:

- The two Title designations in the value-map component are transformed to New Title.
- All other Title nodes of the source file, retain their original Title data in the target file.

```

38  <Person>
39    <First>Fred</First>
40    <Last>Landis</Last>
41    <Title>Program Manager</Title>
42    <PhoneExt>951</PhoneExt>
43    <Email>f.landis@nanonull.com</Email>
44  </Person>
45  <Person>
46    <First>Michelle</First>
47    <Last>Butler</Last>
48    <Title>Code Magician</Title>
49    <PhoneExt>654</PhoneExt>
50    <Email>m.landis@nanonull.com</Email>
51  </Person>

```

Why is this happening:

The value-map component evaluates the input data.

- If the incoming data **matches one** of the entries in the first column, the data is transformed and passed on to the node parameter of substitute-missing, and then on to Title2.
- If the incoming data does not match **any entry** in the left column, then nothing is passed on from value-map to the node parameter i.e. this is an **empty node**.

When this occurs the substitute-missing function retrieves the original node and data from the Title node, and passes it on through the **replace-with** parameter, and then on to Title2.

### 11.2.2 Value-Map component properties

#### Actions:



Click the insert icon to **insert** a new row before the currently active one.



Click the delete icon to **delete** the currently active row.

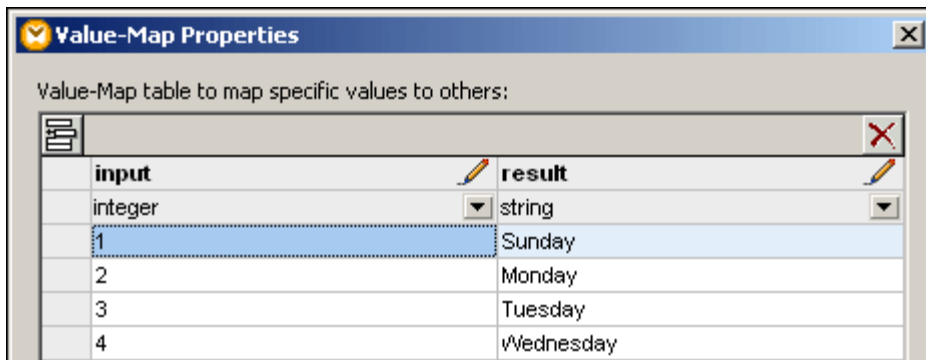


Click the edit icon to **edit** the column header.

You can also reorder lines by dragging them.

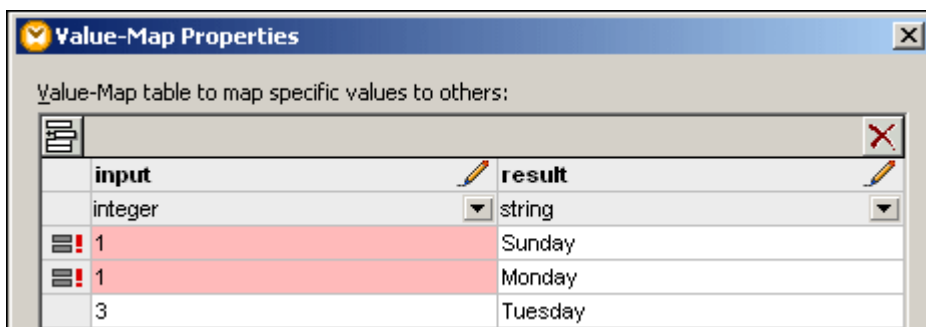
#### Changing the column header:

Double clicking the column header, or clicking the pencil icon, allows you to edit the column name and change it to something more meaningful. This will make it easier to identify the purpose of the component, as the column names are also displayed in the mapping.



#### Using unique Input values:

The values entered into the input column must be unique. If you enter two identical values, both are automatically highlighted for you to enable you to correct one of them.

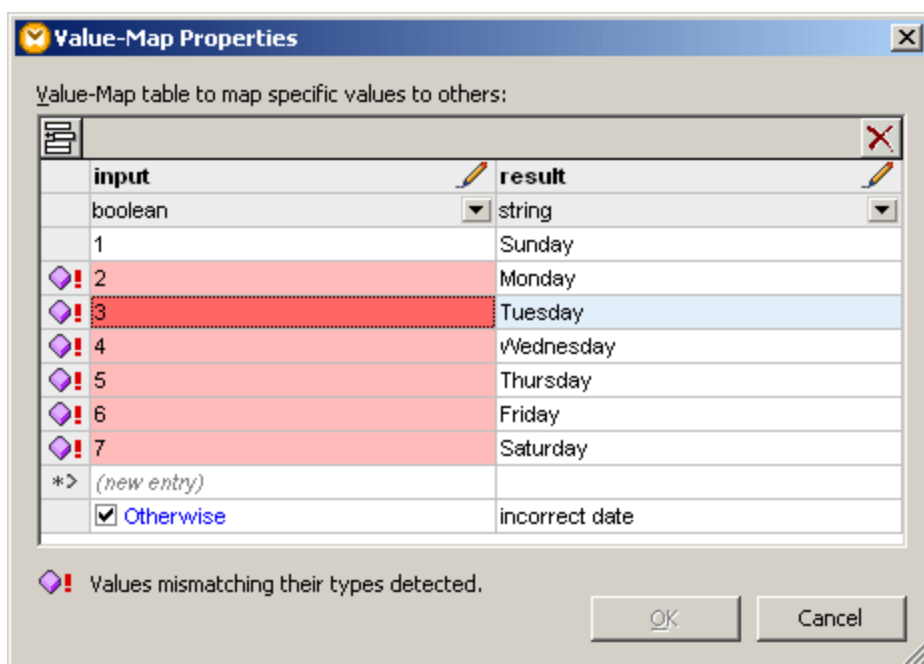


Having corrected one of the values, the OK button is again enabled.

#### Input and output datatypes

The input and result datatypes are automatically checked when a selection is made using the combo box. If a mismatch occurs, then the respective fields are highlighted and the OK button is disabled. Change the datatype to one that is supported.

In the screenshot below a boolean and string have been selected.



### 11.3 Aggregate functions: min, max, sum, count, avg

Aggregate functions perform operations on a set of input values (or a sequence of values) as opposed to a single value. The aggregate functions can all be found in the core library. The mapping shown below is available as **Aggregates.mfd** in the ...\\Tutorial folder.

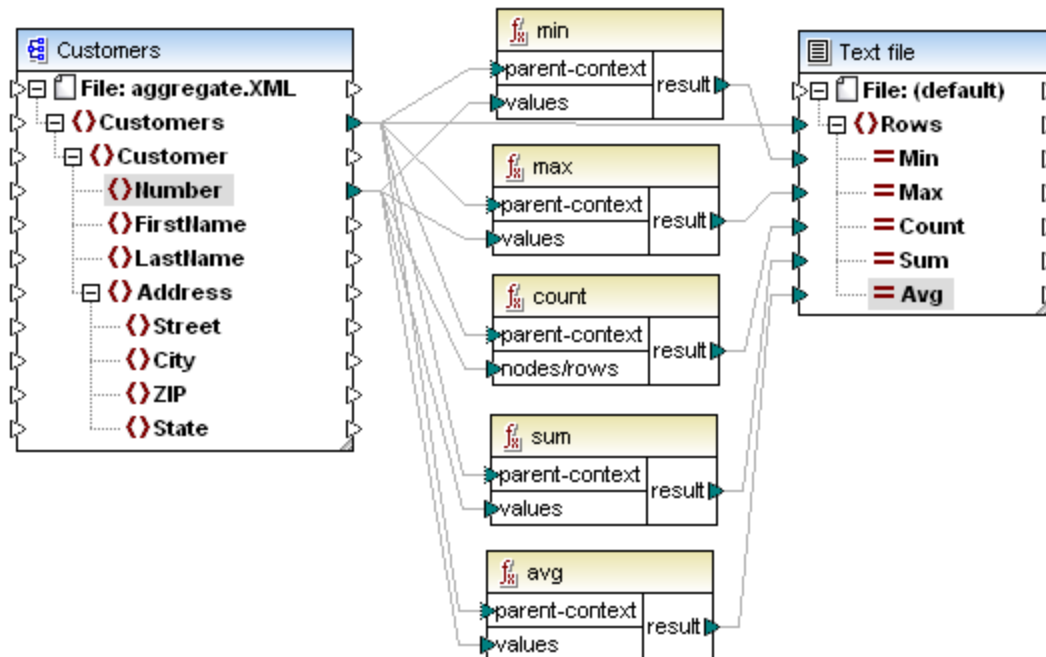
Please also see [Aggregate functions - summing nodes in XSLT1 and 2](#) on how to create aggregate functions using Named Templates.

Libraries	
core	
aggregate functions	
avg	result = avg( values )
count	result = count( nodes/rows )
max	result = max( values )
min	result = min( values )
string-join	result = string-join( strings [,delimiter]
sum	result = sum( values )

Java Selected

Aggregate functions have two input items.

- **values** (nodes/rows) is connected to the source item that provides the data, in this case Number.
- **parent-context** is connected to the item you want to iterate over, i.e. the context, in this case over all Customers. The parameter is, however, optional.



The input instance in this case is an XML file containing the following data:

Comment edited with XMLSPY v2004 U (<http://www.xmlspy.com>) by M

<b>Customers</b>		
<b>xmlns:xsi</b>	<a href="http://www.w3.org/2001/XMLSchema">http://www.w3.org/2001/XMLSchema</a>	
<b>xsi:noNamespace...</b>	Customers.xsd	
<b>Customer (4)</b>		
	<b>Number</b>	<b>FirstName</b>
1	2	FredJohn
2	4	MichelleAnn-marie
3	6	TedMac
4	8	AnnLong

- The source data supplied to the values item is the number sequence 2,4,6,8.
  - The output component in this case is a simple text file.
- Clicking the Output tab for the above mapping delivers the following result:

1	2,8,4,20,5
2	

min=2, max=8, count=4, sum=20 and avg=5.

## 11.4 Mappings and root element of target documents

### **Root element of target XML files**

When creating a mapping to the **root** element of the target Schema/XML file, please make sure that only one element is passed on to the target XML, as an XML document may only have one root element.

Use the filter component to limit the mapped data to a single element or record.

### **Root element not limited:**

If you do not limit the target schema root element, then all source elements/records are inserted between the first root element. This will still create well-formed, but not valid, XML files.

## 11.5 Boolean comparison of input nodes

### Data type handling in boolean functions (first introduced with MapForce 2006 SP2)

During the evaluation of the core functions, less-than, greater-than, equal, not-equal, less equal, and greater equal, the evaluation result of two input nodes depends on the input values as well as the data types used for the comparison.

Example:

The 'less than' comparison of the integer values 4 and 12, yields the boolean value "true", since 4 is less than 12. If the two input strings contain '4' and '12', the lexical analysis results in the output value false", since '4' is alphabetically greater than the first character '1' of the second operand (12).

If all "input" data types are of the same type, e.g. all input nodes are numerical types, or strings, then the comparison is done for the common type.

### Differing input node types

If the input nodes are of differing types, e.g. integer and string, or string and date, then the following rule is applied:

The data type used for the comparison **is always the most general, i. e. least restrictive, input data type** of the two input types.

Before comparing two values, all input values are converted to a common datatype. Using the previous example; the datatype "string" is less restrictive than "integer". Comparing integer value 4 with the string '12', converts integer value 4 to the string '4', which is then compared with the string '12'.

The type handling for comparing mixed types follows the XSLT2 guidelines and prevents any content-sensitive type conversion strategies. The advantage is that the logic is fixed by the mapping and does not change dynamically.

### Additional checks:

Version 2006SP2 additionally checks mappings for incompatible combinations and raises validation errors and warnings if necessary. Examples are the comparison of dates with booleans, or "datetimes" with numerical values.

In order to support explicit data type conversion, the following **type conversion** functions are available in the core library: "boolean", "number" and "string". In the previously mentioned context, these three functions are suitable to govern the interpretation of comparisons.

core	
<b>conversion functions</b>	
boolean	result = boolean ( arg )
number	result = number ( arg )
string	result = string ( arg )
<b>logical functions</b>	
equal	result = a equal b

### Java selected

Adding these conversion functions to input nodes of related functions might change the common data type and the result of the evaluation in the desired manner. E. g. if string nodes store only numeric values, a numerical comparison is achieved by adding the "number" conversion function (in the **conversion** section of the **core** library) to each input node.

## 11.6 Priority Context node/item

When applying a function to different items in a schema, MapForce needs to know what the context node will be. All other items are then processed relative to this one. This is achieved by designating the item (or node) as the priority context.

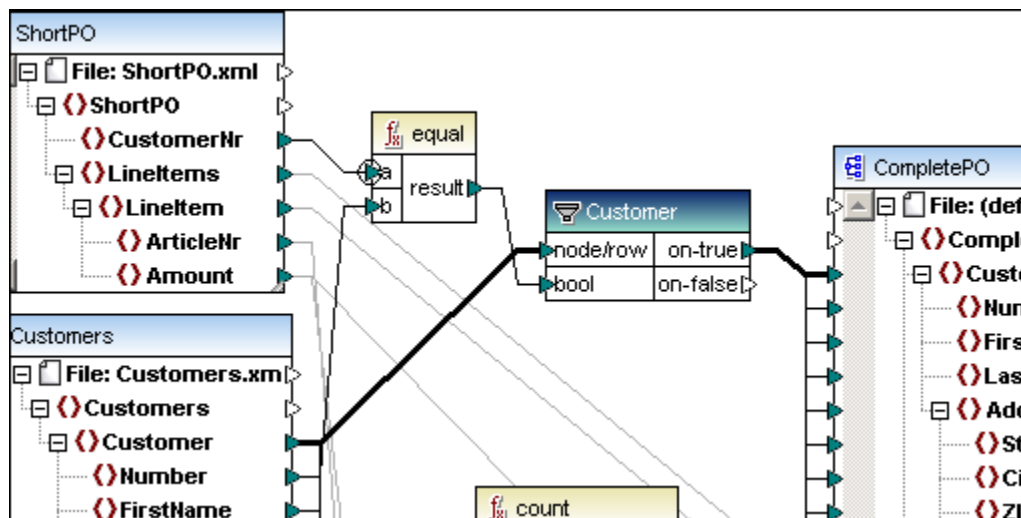
The **CompletePO.mfd** file available in the [...MapForceExamples](#) folder, is shown below.

Please note that there are multiple source components in this example. **ShortPO, Customers, and Articles** are all schemas with associated XML instance files. The data from each, are then mapped to the CompletePO schema / XML file. The priority context icon, is enclosed in a circle as a visual indication.

- The **CustomerNr** in ShortPO is compared with the item **Number** in the Customers file.
- **CustomerNr** has been designated as the **priority context**, and is placed in the **a** parameter of the equal function.
- The **Customers** file is then searched (**once**) for the **same** number. The **b** parameter contains the Number item from the Customers file.
- If the number is found, then the result is passed to the **bool** parameter of the **filter** function.
- The **node/row** parameter passes on the **Customers** data to "on-true" when the bool parameter is true, i.e. when the same number has been found.
- The rest of the customer data is then passed on as: Number, FirstName, LastName items, are all connected to the corresponding items in the target schema.

Designating the **b** parameter of the equal function (i.e. item Number), as the **priority context** would cause:

- MapForce to load the first Number into the **b** parameter
- Check against the **CustomerNr** in **a**, if not equal,
- Load the next Number into **b**, check against a, and
- Iterate through every Number in the file while trying to find that number in ShortPO.

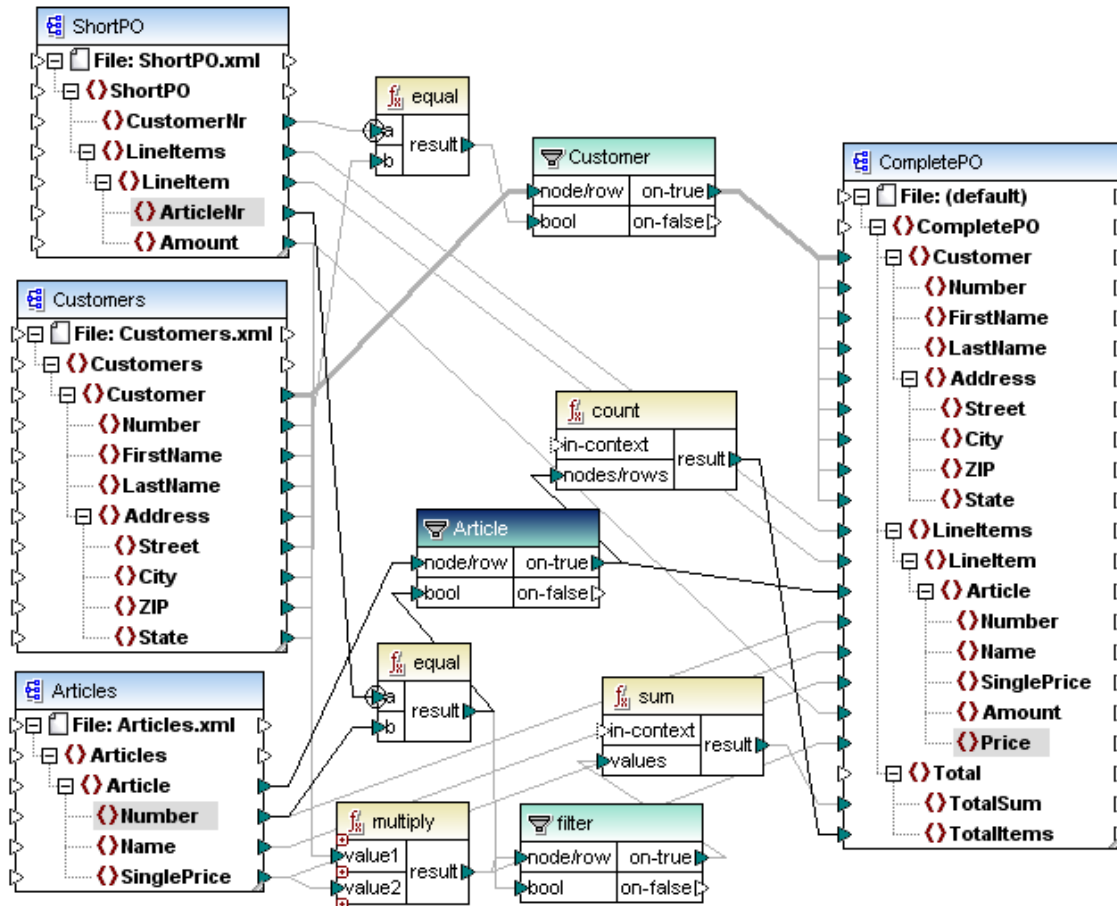


## 11.7 Merging multiple files into one target

MapForce allows you to merge multiple files into a single target file.

This example merges multiple source components, with different schemas to a target schema. To merge an arbitrary number of files using the same schema, see "[Dynamic file names - input / output](#)".

The **CompletePO.mfd** file available in the [...MapForceExamples](#) folder, shows how three XML files are merged into one purchasing order XML file.



Note that multiple source component data are combined into one target XML file - CompletePO

- **ShortPO** is a schema with an associated XML instance file and contains only customer number and article data, i.e. Line item, number and amount.
- **Customers** is a schema with an associated XML instance file and contains customer number and customer information details, i.e. Name and Address info. (There is only one customer in this file with the Customer number of 3)
- **Articles** is a schema with an associated XML instance and contains article data, i.e. article name number and price.
- **CompletePO** is a schema file without an instance file as all the data is supplied by the three XML instance files. The hierarchical structure of this file makes it possible to merge and output all XML data.

This schema file has to be created in an XML editor such as XMLSpy, it is not

generated by MapForce (although it would be possible to create if you had an CompletePO.xml instance file).

The structure of CompletePO is a combination of the source XML file structures.

The **filter** component (Customer) is used to find/filter the data where the customer numbers are identical in both the ShortPO and Customers XML files, and pass on the associated data to the target CompletePO component.

- The **CustomerNr** in ShortPO is compared with the **Number** in Customers using the "equal" function.
- As ShortPO only contains one customer (number 3), only customer and article data for customer number 3, can be passed on to the filter component.
- The **node/row** parameter, of the filter component, passes on the **Customer** data to "on-true" when the bool parameter is true, i.e. when the same number has been found, in this case customer number 3.
- The rest of the customer and article data are passed on to the target schema through the two other filter components.

## 11.8 Command line parameters

The command line parameter syntax for MapForce is shown below.

General syntax:

**MapForce.exe** *filename* [ */target outputdir* [ **/GLOBALRESOURCEFILE** *globalresourcefilename* ] [ **/GLOBALRESOURCECONFIG** *configurationname* ] [ **/LOG** *logfilename* ] ]

*target* { **XSLT** | **XSLT2** }

- The square brackets [...] denote optional parameters.
- The curly brackets {...} denote a parameter group containing several choices.
- The **pipe** symbol | denotes OR, e.g. **/XSLT** or **/XSLT2**

MapForce.exe returns an exit code of 0, if the command line execution was successful. Any other value indicates a failure. You can check for this code using the IF ERRORLEVEL command in batch files.

Description of general parameters:

<i>filename</i>	path of YourMAPFORCEfile.MFD <b>If the path, or file name contains a space, please use quotes around the path/file name i.e. "c:\Program Files\...\Filename"</b>
<i>outputdir</i>	For code generation, the directory the generated mapping code is to be placed in. <i>outputdir</i> is now optional if you use the <i>/target</i> parameter. If an output path is not supplied, the working/current directory will be used.
<i>/LOG logfilename</i>	Relative means only the file name is supplied, not a complete path starting with a drive letter. generates a log file called <i>logfilename</i> . <i>Logfilename</i> can be a full path name, i.e. directory and file name of the log file, but the directory must exist for the logfile to be generated if a full path is supplied.  If you only specify the file name, then the file will be placed in the <i>/outputdir</i> directory.

Description of target parameters:

<i>/XSLT</i>	generates XSLT1 code
<i>/XSLT2</i>	generates XSLT2 code

Description of global resource parameters:

<i>/GLOBALRESOURCEFILE globalresourcefilename</i>	uses the global resources defined in the specified global resource file
<i>/GLOBALRESOURCECONFIG configurationname</i>	uses the specified global resource configuration

Examples:

**MapForce.exe** *filename* starts MapForce and opens the file defined by *filename*.

l) generate all XSLT files and output a log file.

**MapForce.exe** *filename* **/XSLT** *outputdir* **/LOG** *logfilename*

II) generate all XSLT files and use all global resources of the global resource file for the specified configuration

**Mapforce.exe** *filename* **/XSLT** *outputdir* **/GLOBALRESOURCEFILE**  
*globalresourcefilename* **/GLOBALRESOURCECONFIG** *configurationname*

Having executed the command line, several files are produced:

- The generated XSLT file
- A batch file called **DoTransform.bat** which uses AltovaXML to transform the XML file.
- A log file, if one was specified in the command line.

**To transform the XML file using the generated XSLT:**

1. Download and install the free AltovaXML engine from the [AltovaXML download page](#). AltovaXML is installed to c:\Program Files\Altova\AltovaXML2012\ per default.
2. Start the **DoTransform.bat** batch file located in the previously designated output folder.  
This generates the output file in the current folder.

**Note:**

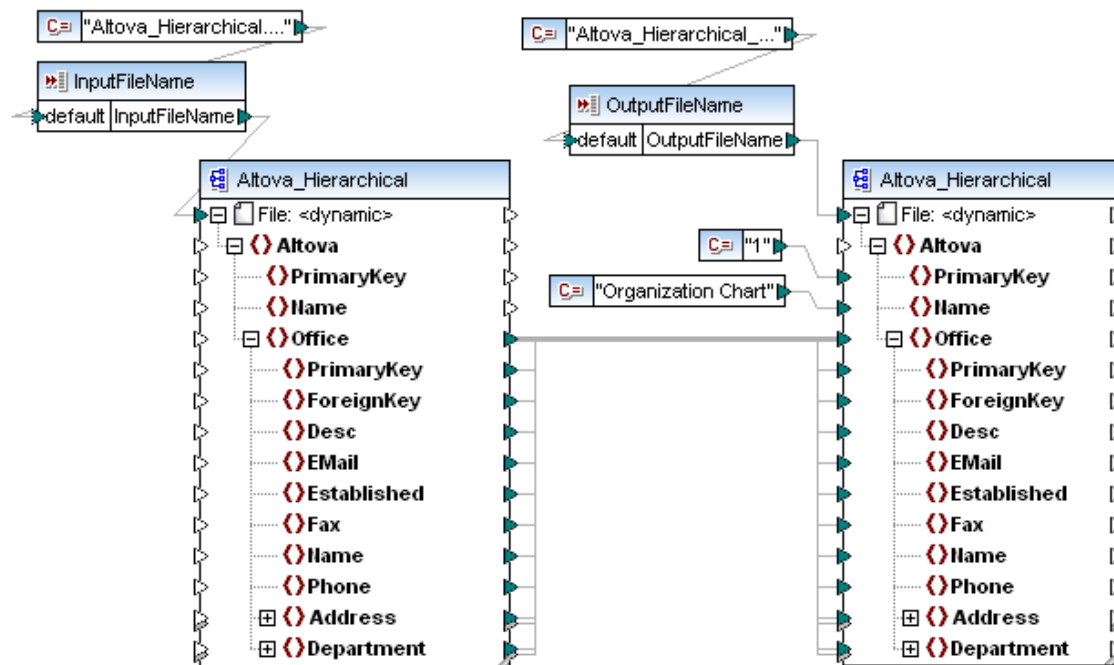
You might need to add the AltovaXML installation location to the path variable of the Environment Variables.

## 11.9 Command line - defining input/output files

MapForce allows you to create special "input" components that can act as **parameters** in the command line execution of a mapping. These input components allow you to define the content of the parameter when executing the command line, as well as the values when previewing the output in MapForce. The content of a parameter can be a file name, or a specific value.

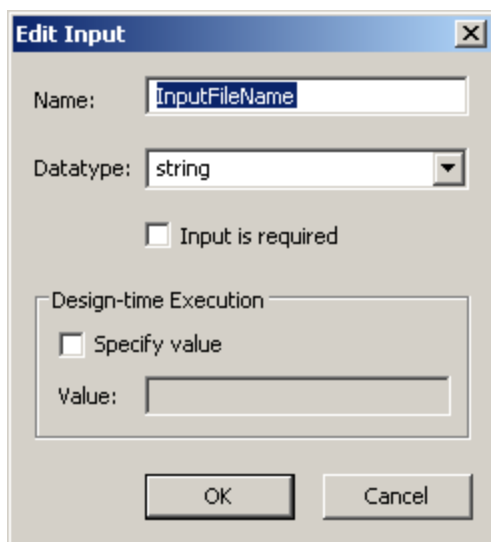
This specific type of "input" component cannot be used **inside** a user-defined function, it is only available in the main mapping window.

The mapping below (**FileNamesAsParameters.mfd** in ...MapForceExamples) uses two such components, one to supply the input file name and the other, the output file name, to the File: <dynamic> item of each component. See [Dynamic input/output files per component](#) for more information on dynamic file names.



### To define an input component / command line parameter:

1. Use the menu option **Function | Insert Input** to insert the component. This opens the Create Input dialog box.
2. Enter a name for the function e.g. **InputFileName** and select the datatype you want to use, e.g. string.



3. Click OK to complete the definition.
4. Use the same method to create the **OutputFileName** component/parameter.

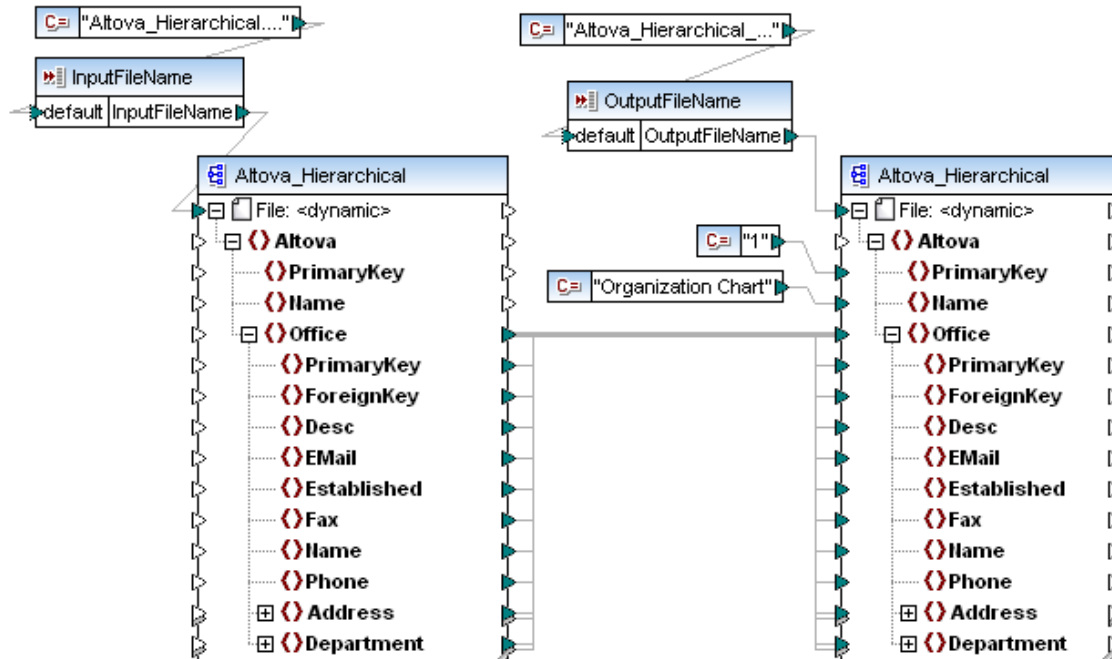
The **/InputFileName** and **/OutputFileName** components are the special input components in the mapping that allow you to use them as file name parameters in the command line execution.

The other fields in this dialog box are used to specify the preview output (or files) while running MapForce. They are not needed when executing from the command line. The two constant components (shown in the mapping above) supply default file names to the input components for the preview output. See [Input parameters - default and preview settings](#).

## 11.10 Input parameters - default and preview settings

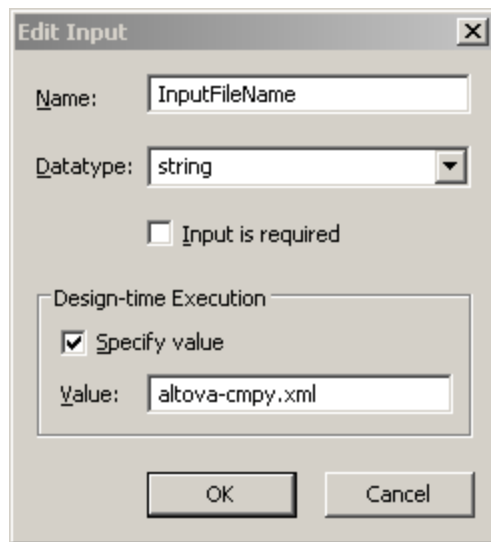
The mapping below (available as **FileNamesAsParameters.mfd** in ...MapForceExamples folder) uses two input components, one to supply the input file name and the other, the output file name, to the File: <dynamic> item of each component.

The **InputFileName** and **OutputFileName** components are the special input components in the mapping, that allow you to use them as file name parameters in the command line execution. If you want to define the input data from the command line, please see [Command line - defining input/output files](#).



### To define an input component:

1. Use the menu option **Function | Insert Input** to insert the component.  
This opens the Create Input dialog box.
2. Enter a name for the function e.g. **InputFileName** and select the datatype you want to use, e.g. string.



3. Click the "Specify value" check box, and enter a value/string in the textbox, that you want to use when previewing the output, e.g. altova-cmpy.xml.
4. Click the OK button then the Output button to see the result.  
The altova-cmpy.xml is used as the source file for the mapping and the mapped data appears in the output window.

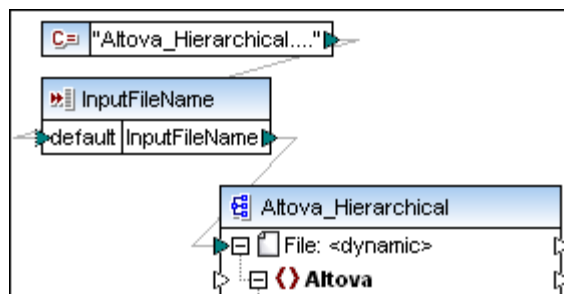
The value entered in the Design-time Execution **value** field is **only** applicable when **previewing** results in the **Output** tab. It is not used for code generation, or command line execution of mappings.

#### To define a default value for the output preview:

Having defined the input component and clicked the OK button, the component appears in the mapping area as shown below. Note that a default item appears on the left, while the component name is the name of the other mappable item.

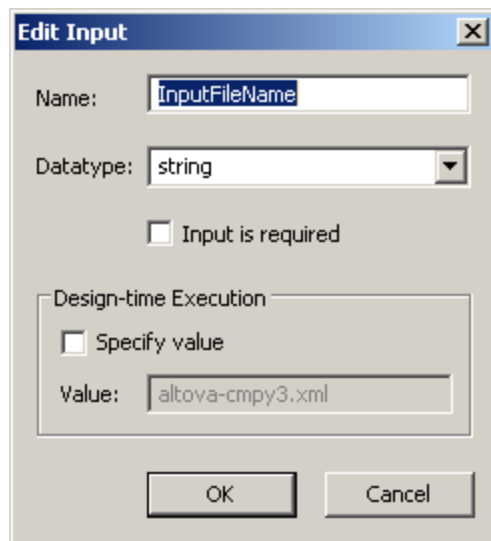


1. You can use a Constant component to supply the default value as shown in the example below, e.g. Altova\_Hierarchical.xml.
2. Create the constant component and connect it to the default item of the input component.



#### To use the default value of an Input component:

1. Double click the input component and **deselect** the "Input is required" and "Specify value" check boxes.



2. Click the Output tab to see the result of the mapping. The data from the Altova\_Hierarchical.xml file is now used for the preview.

**Generating XSLT 1.0 or XSLT 2.0 code:**

The value in the "Value" text box is written into the **DoTransform.bat** batch file. This batch file is automatically generated for execution in the AltovaXML engine. If you want to use a different input (or output) file you can change the name in the batch file.

If no value has been entered in the "Value" text box, then the default value, present in the generated XSLT code, will be used.

**Using default parameters/values in command line execution:**

The "Input is required" check box must be set to **inactive** (before generating the code) to use the default parameter from the command line. Enter **mapping.exe** to have the generated code use the default parameter from the command line.

## 11.11 Node testing, position and grouping

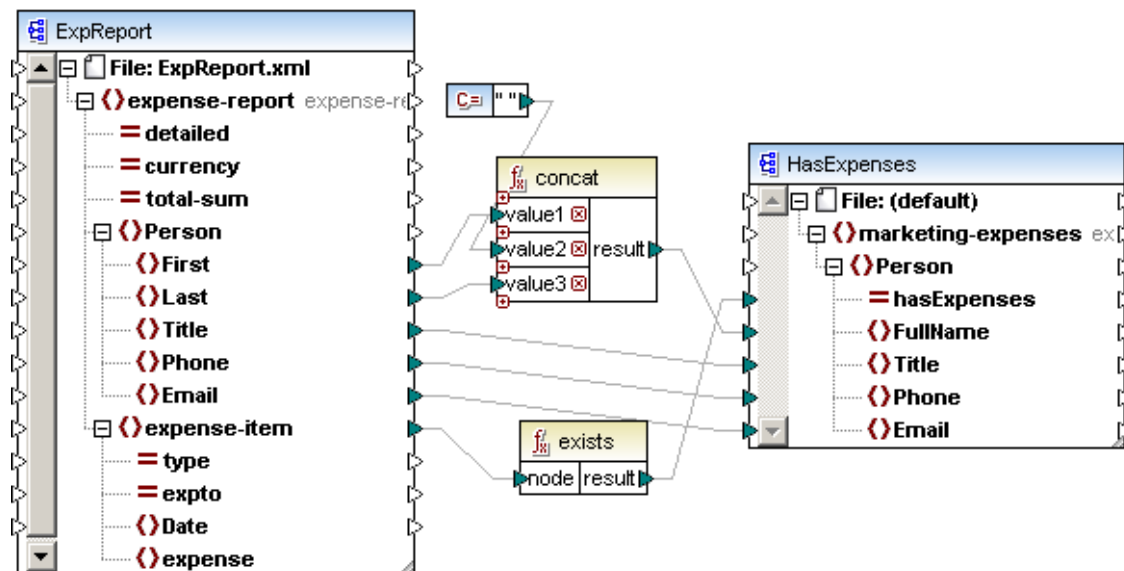
The node testing functions allow you to test for the existence of nodes in the **XML instance** files. Elements or attributes defined as optional in the XML Schema, may, or may not, appear in the XML instance file. Use these functions to perform the specific node test and base further processing on the result.

### Exists

Returns true if the node exists, else returns false.

The "**HasMarketingExpenses.mfd**" file in the [.../MapForceExamples](#) folder contains the small example shown below.

If an expense-item exists in the source XML, then the "hasExpenses" attribute is set to "true" in the target XML/Schema file.

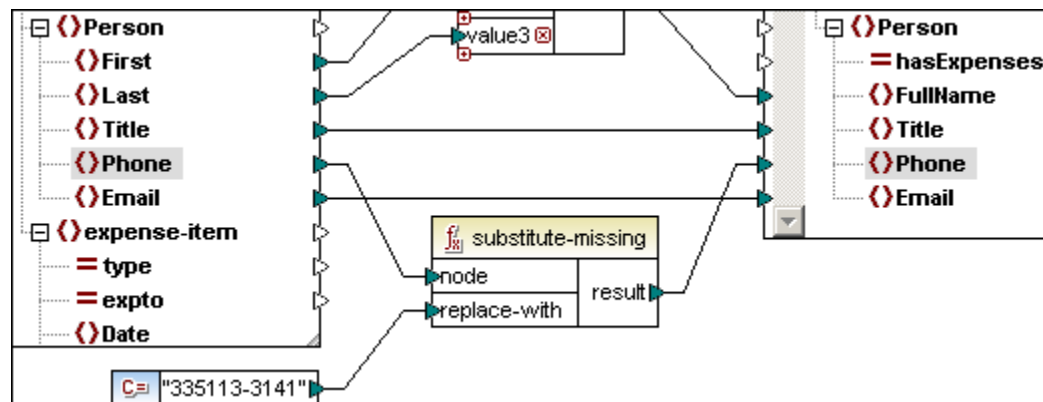


### Not-exists

Returns false if the node exists, else returns true. Please see [Mapping missing nodes - using Not-exists](#) for an example on how to map missing nodes.

### substitute-missing

This function is a convenient combination of **exists** and a suitable **if-else** condition. It is used to map the current field content if the node exists in the XML source file, otherwise use the item mapped to the "replace-with" parameter.



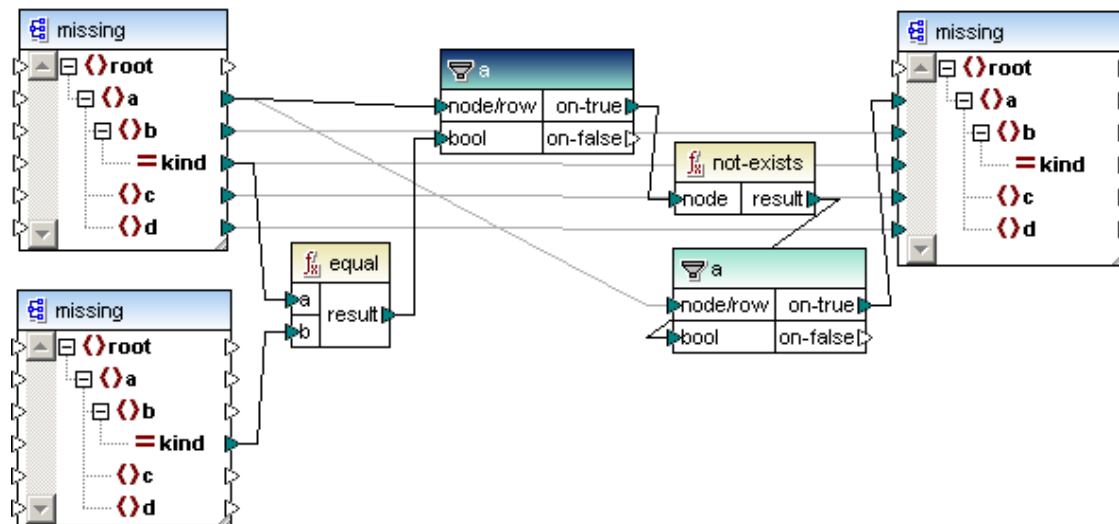
In the image above, the existence of the node "Phone" is checked in the XML instance file. If the node is not present, then the value supplied by the constant is mapped.

### 11.11.1 Mapping missing nodes - using Not-exists

The example below shows how you can use the not-exists function to map nodes that do not exist in one of a pair of source files.

What this mapping does is to:

- Compare the nodes of two source XML files
- Filter out the nodes of the first source XML file, that do not exist in the second source XML file
- Map only the missing nodes, and their content, to the target file.



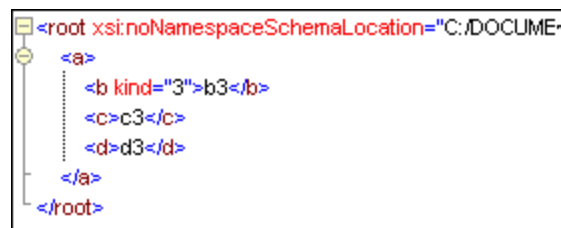
The two XML instance files are shown below, the differences between them are:

- **a.xml** at left, contains the node `<b kind="3">`, which is missing from **b.xml**.
- **b.xml** at right, contains the node `<b kind="4">` which is missing from **a.xml**.



- The **equal** function compares the **kind** attribute of both XML files and passes the result to the filter.
- A **not-exists** function is placed after the initial filter, to select the missing nodes of each of the source files.
- The second filter is used to pass on the missing node and other data **only** from the **a.xml** file to the target.

The mapping result is that the node missing from **b.xml**, `<b kind="3">`, is passed on to the target component.

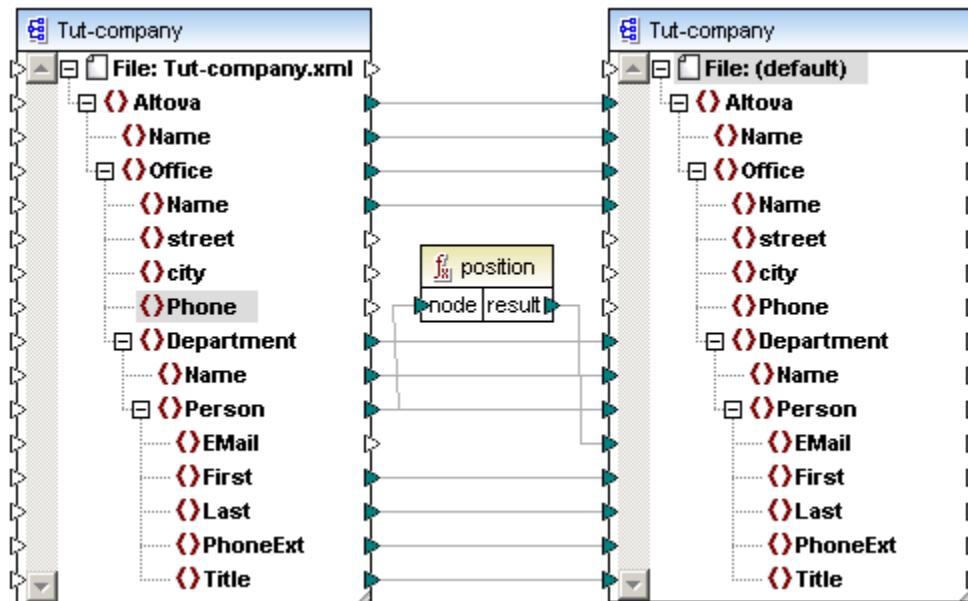


### 11.11.2 Position of context items in a sequence

The position function allows you to determine the position of a specific node in a sequence, or use a specific position to filter out items based on that position.

The context item is defined by the item connected to the "node" parameter of the position function, Person, in the example below.

The simple mapping below adds a position number to each Person of each Department.



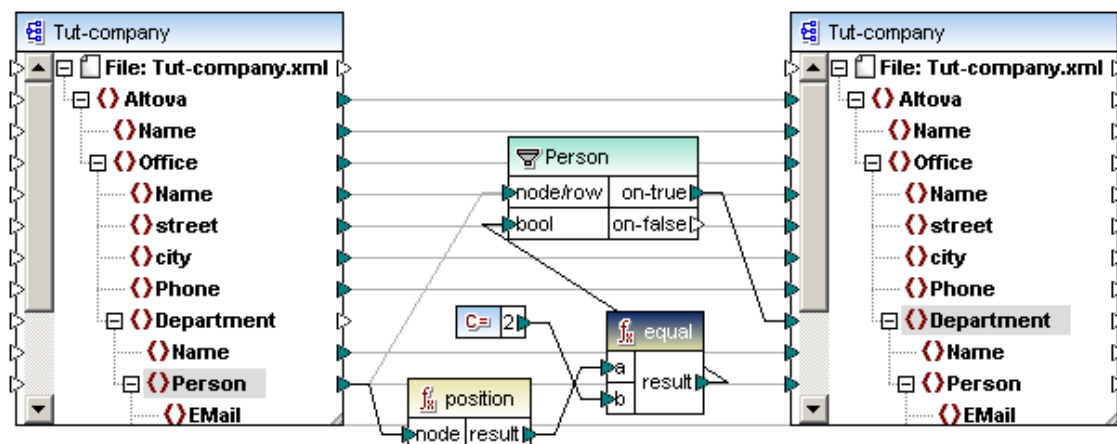
The position number is reset for each Department in the Office.

```
<Office>
  <Name>Microtech, Inc.</Name>
  <Department>
    <Name>Admin</Name>
    <Person>
      <EMail>1</EMail>
      <First>Albert</First>
      <Last>Aldrich</Last>
      <PhoneExt>582</PhoneExt>
      <Title>Manager</Title>
    </Person>
    <Person>
      <EMail>2</EMail>
      <First>Bert</First>
      <Last>Bander</Last>
      <PhoneExt>471</PhoneExt>
      <Title>Accounts Receivable</Title>
    </Person>
  </Department>
</Office>
```

#### Using the position function to filter out specific nodes

Using the position function in conjunction with a filter allows you to map only those specific nodes that have a certain position in the source component.

The filter "node/row" parameter and the position "node" must be connected to the same item of the source component, to filter out a specific position of that sequence.



What this mapping does is to output:

- The **second** Person in each Department
- of each Office in Altova.

```

<Office>
  <Name>Microtech, Inc.</Name>
  <Department>
    <Name>Admin</Name>
    <Person>
      <EMail>b.bander@microtech.com</EMail>
      <First>Bert</First>
      <Last>Bander</Last>
      <Title>Accounts Receivable</Title>
    </Person>
  </Department>
  <Department>
    <Name>Sales and Marketing</Name>
    <Person>
      <EMail>e.ellas@microtech.com</EMail>
      <First>Eve</First>
      <Last>Ellas</Last>
      <Title>Art Director</Title>
    </Person>
  </Department>
  <Department>
    <Name>Manufacturing</Name>
    <Person>
      <EMail>g.gundall@microtech.com</EMail>
    </Person>
  </Department>
</Office>

```

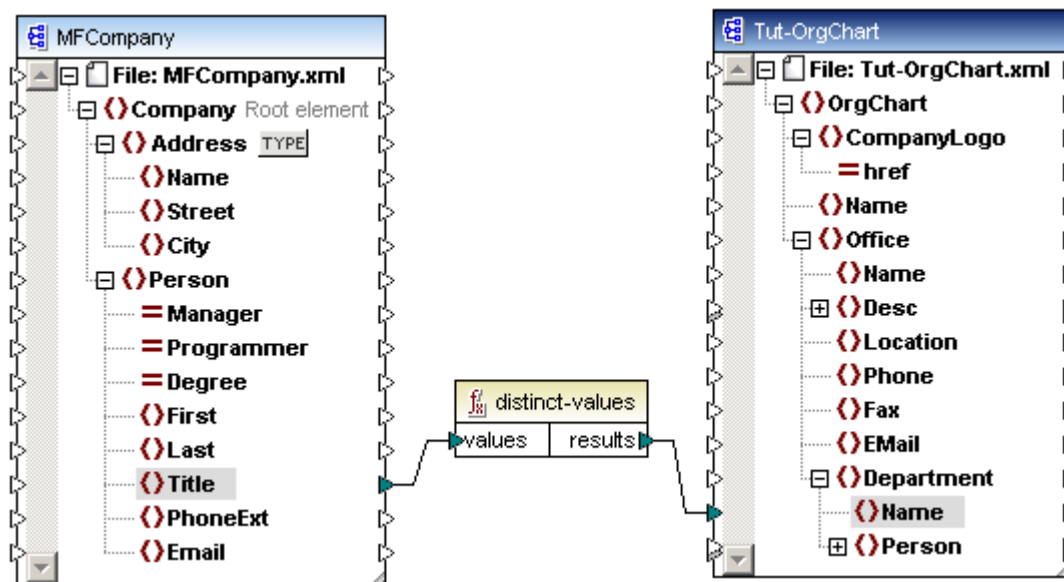
### 11.11.3 Grouping nodes / node content

MapForce now supports the grouping of nodes and their content. These functions can be found in the "Sequence functions" section in the Libraries window.

#### distinct-values

Allows you to remove duplicate values from a result set and map the unique items to the target component.

In the example below, the content of the source component "Title" items, are scanned and each unique title is mapped to the Department / Name item in the target component.



Note that the sequence of the individual Title items in the source component are retained when mapped to the target component.

```

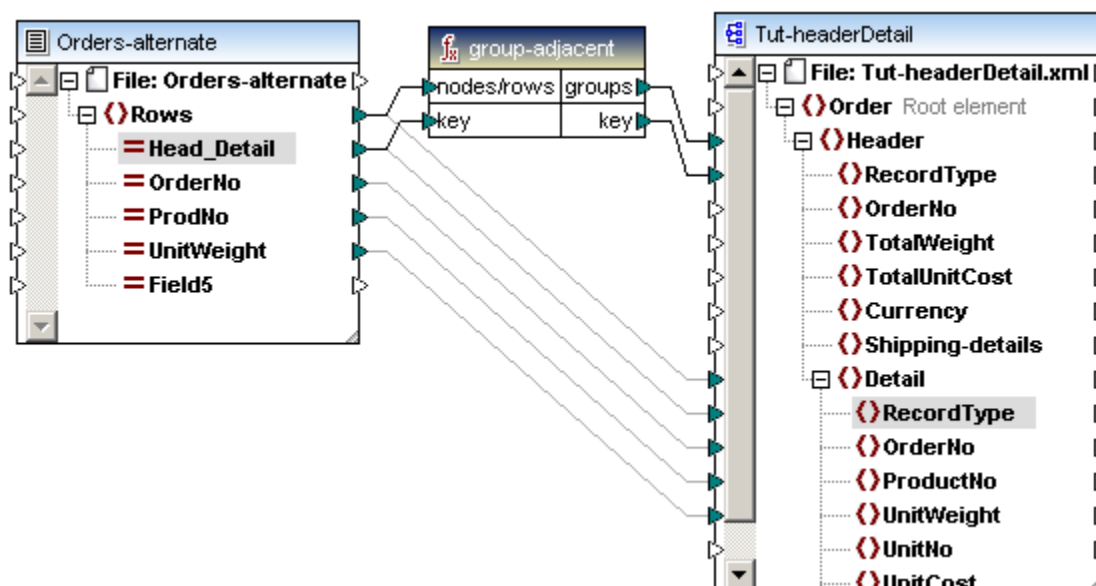
1  <?xml version="1.0" encoding="UTF-8"?>
2  <OrgChart xmlns:schemaLocation="http://www.xmlspy.com/schemas/orgchart C:/DOCU
3  <Office>
4  <Department>
5      <Name>Office Manager</Name>
6      <Name>Accounts Receivable</Name>
7      <Name>Accounting Manager</Name>
8      <Name>Marketing Manager Europe</Name>
9      <Name>Art Director</Name>
10     <Name>Program Manager</Name>
11     <Name>Software Engineer</Name>
12     <Name>Technical Writer</Name>
13     <Name>IT Manager</Name>
14     <Name>Web Developer</Name>
15     <Name>Support Engineer</Name>
16     <Name>PR & Marketing Manager US</Name>
17 </Department>
18 </Office>
19 </OrgChart>

```

#### group-adjacent

Groups the input sequence into a series of groups where each set of identically adjacent items/

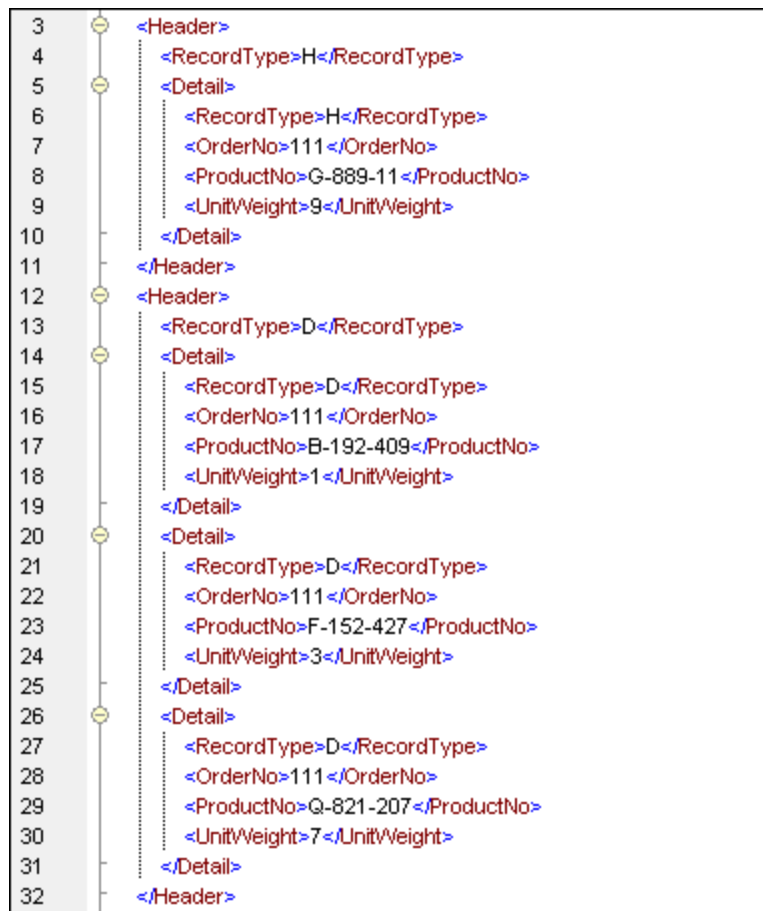
nodes are placed into a new separate group.



Given the CSV file shown below, what we want to happen is to have all the Header and Detail records in their own groups.

Head/Detail	OrderNo	ProdNo	Unitweight	Field5	Field6	Field7	Field8	Field9
string	string	string	string	string	string	string	string	string
H	111	G-889-11	9		Container ship			
D	111	B-192-409	1	2	232	Barley		
D	111	F-152-427	3	1	456	Corn		
D	111	Q-821-207	7	5	52	Coconut		
H	222	A-978-4	22		Air freight			
D	222	M-623-111	8	8	78	Oil		
D	222	L-524-201	2	3	669	Miscellaneous		

- A new group is started with the first element, in this case H.
- As the next element (or key) in the sequence is different, i.e. D, this starts a second group called D.
- The next two D elements are now added to the same group D, as they are of the same type.
- A new H group is started with a single H element.
- Followed by a new D group containing two D elements.

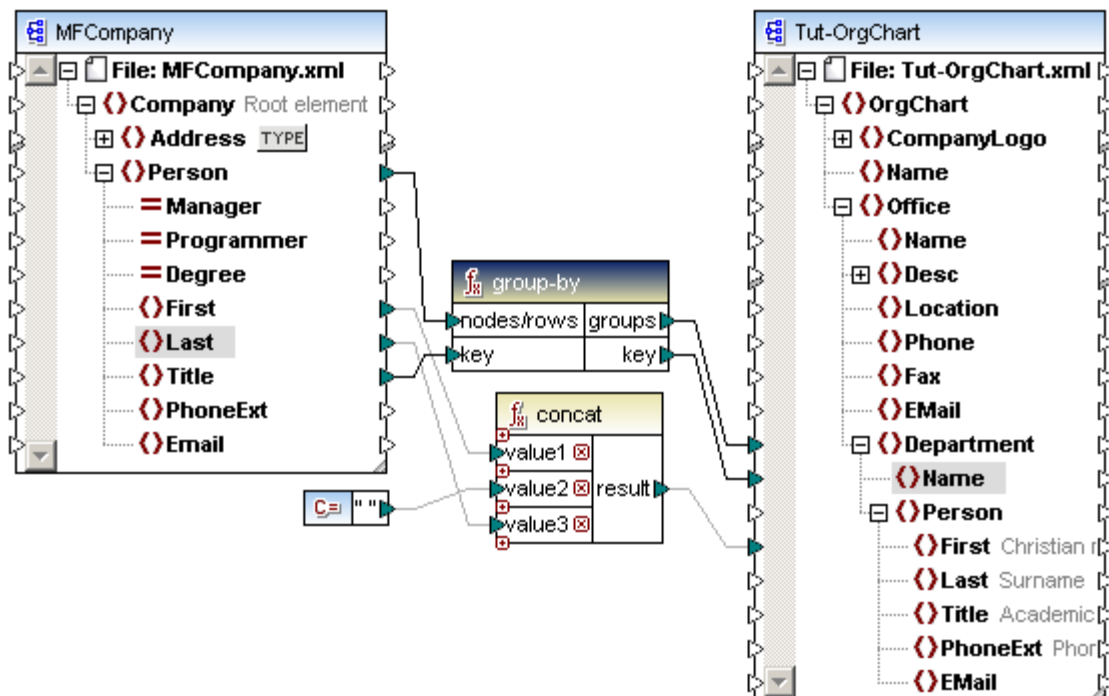


Note that group-adjacent uses the **content** of the node/item as the grouping key! The content of the Head\_Detail field is used to group the records by record type in the target.

### group-by

Groups the input sequence by distinct keys and outputs the series of groups along with their keys. The example below shows how this works:

- The key that defines the specific groups of the source component is the **Title** item. This is used to group the persons of the company.
- The group name is placed in the Department/Name item of the target component, while the concatenated person's first and last names are placed in the Person/First child item.



Note that group-by uses the **content** of the node/item as the grouping key! The content of the Title field is used to group the persons and is mapped to the Department/Name item in the target.

Note also: there is an **implied filter** of the rows from the source document to the target document, which can be seen in the included example. In the target document, each Department item only has those Person items that **match** the grouping **key**, as the group-by component creates the necessary hierarchy on the fly.

If you have a flat hierarchy (CSV, FLF, etc) with a dynamic output file name, built in part from the key value, the implied filter still exists. This means that you may not need to connect the 'groups' output to any item in the target component.

Clicking the Output button shows the result of the grouping process.

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <OrgChart xsi:schemaLocation="http://www.xmlspy.com/schemas/orgchart C:/DOCU
3  <Office>
4  <Department>
5  <Name>Office Manager</Name>
6  <Person>
7  <First>Vernon Callaby</First>
8  <First>Steve Meier</First>
9  </Person>
10 </Department>
11 <Department>
12 <Name>Accounts Receivable</Name>
13 <Person>
14 <First>Frank Further</First>
15 <First>Theo Bone</First>
16 </Person>
17 </Department>

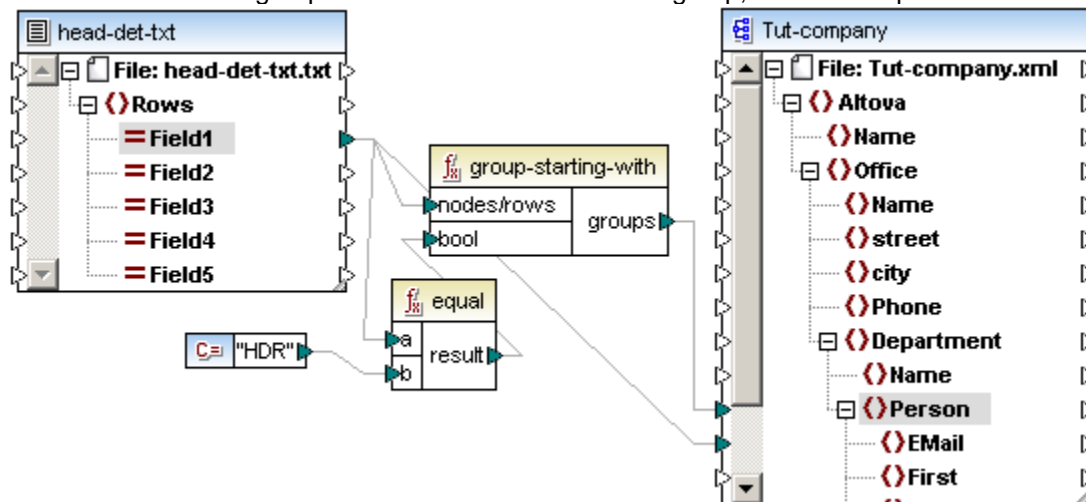
```

**group-starting-with**

This function groups the input sequence by the supplied item, if it exists in the source data. A boolean function is needed to test the input data.

Field1	Field2	Field3	Field4	Field5
string	string	string	string	string
HDR	custid0001	ordid	0001	EUR
DTL	itemABC	qty0100	price	0001.100
TXT	please	deliver	ASAP	
DTL	itemxx2	qty0001	price	0010.000
DTL	itemDDD	qty0010	price	0010.500
HDR	custid0002	ordid	0001	EUR
DTL	itemABC	qty0100	price0001.100	
HDR	custid0003	ordid	0002	USD
DTL	itemDEF	qty0003	price	200.000

The function creates groups based on the **first** item of a group, in this example HDR.



The **value** of the item/nodes do not need to be identical or even exist. The node **"pattern"** i.e. the node/item names need to be identical for the grouping to occur.

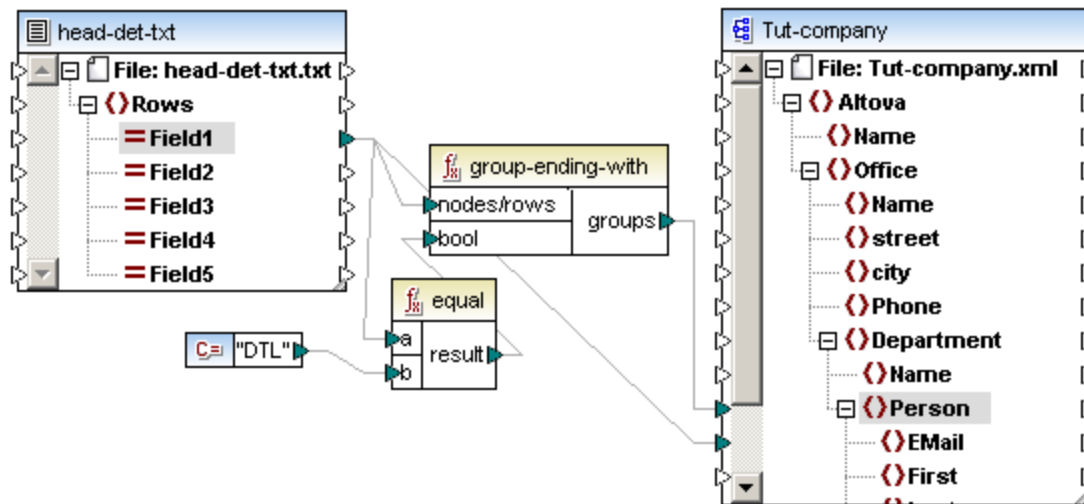
3	<Office>
4	<Department>
5	<Person>
6	<Email>HDR</Email>
7	<Email>DTL</Email>
8	<Email>TXT</Email>
9	<Email>DTL</Email>
10	<Email>DTL</Email>
11	</Person>
12	<Person>
13	<Email>HDR</Email>
14	<Email>DTL</Email>
15	</Person>
16	<Person>
17	<Email>HDR</Email>
18	<Email>DTL</Email>
19	</Person>

The result above shows that a new group was started for every HDR element.

**group-ending-with**

This complements the group-starting-with function, and ends each group of the input sequence by the supplied item, if it exists in the source data. A boolean function is needed to test the input data.

Using the same source component as the group-starting-with example above, this example shows the result when using DTL as the group-ending-with item.



In this case the **value** of the item/nodes do not need to be identical or even exist. The node "pattern" i.e. the node/item names need to be identical for the grouping to occur.



The result above shows that a new group was started wherever DTL can be the last element.

**set-empty**

Allows you to generate an empty sequence for a specific node. When connected to a parent node, then all child nodes are also set to empty. Actually removes the node from the target component.

## 11.12 Using DTDs as "schema" components

MapForce 2006 SP2 and above, support namespace-aware DTDs for source and target components. The namespace-URLs are extracted from the DTD "xmlns"-attribute declarations, to make mappings possible.

### Adding DTD namespace URIs

There are however some DTDs, e.g. DTDs used by StyleVision, which contain xmlns\*-attribute declarations, without namespace-URLs. These DTDs have to be extended to make them useable in MapForce.

- The DTD has to be altered by defining the xmlns-attribute with the namespace-URI as shown below:

```
<!ATTLIST fo:root
  xmlns:fo CDATA #FIXED 'http://www.w3.org/1999/XSL/Format'
  ...
>
```

## 11.13 Type conversion checking

From MapForce **2006 SP2** on, the generated applications and preview (with the Built-in execution engine) check for type-conversion errors in more detail, inline with XSLT2 and XQUERY.

Converting values from one type to another may now result in a runtime-error, where in prior versions of MapForce would have produced some type of result.

Example: conversion of a xs:string 'Hello', to xs:decimal

MapForce **2006** Versions up to, and including **SP1**:

XSLT:	'Hello' (or 'NaN' when passed to a function dealing with number)
XSLT2:	error: "invalid lexical value"
Xquery:	error: "invalid lexical value"
Preview with Built-in execution engine:	0
C++ app:	0
C# app:	error: "values not convertible"
Java app:	error: "values not convertible"

MapForce **2006 SP2**:

XSLT:	'Hello' (or 'NaN' when passed to a function dealing with number)
XSLT2:	error: "invalid lexical value"
Xquery:	error: "invalid lexical value"
Preview with Built-in execution engine:	<b>error: "string-value 'Hello' could not be converted to decimal"</b>
C++ app:	<b>error: "values not convertible"</b>
C# app:	error: "values not convertible"
Java app:	error: "values not convertible"

If type-conversion-errors occur, check that the types have been handled correctly. E.g. use the lang:numeric() function, to check if the source-value may be converted into a number, and then an if-else component to pass a different value in case it fails (e.g. a constant containing -1, on the value-false parameter).

## 11.14 Catalog files in MapForce

MapForce supports a subset of the OASIS XML catalogs mechanism. The catalog mechanism enables MapForce to retrieve commonly used schemas (as well as stylesheets and other files) from local user folders. This increases the overall processing speed, enables users to work offline (that is, not connected to a network), and improves the portability of documents (because URIs would then need to be changed only in the catalog files.)

The catalog mechanism in MapForce works as outlined below.

### RootCatalog.xml

When MapForce starts, it loads a file called `RootCatalog.xml` (*structure shown in listing below*), which contains a list of catalog files that will be looked up. You can modify this file and enter as many catalog files to look up as you like, each in a `nextCatalog` element. Each of these catalog files is looked up and the URIs in them are resolved according to the mappings specified in them.

```
<?xml version="1.0" encoding="UTF-8"?>
<catalog xmlns="urn:oasis:names:tc:entity:xmlns:xml:catalog"
          xmlns:spy="http://www.altova.com/catalog_ext"
          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
          xsi:schemaLocation="urn:oasis:names:tc:entity:xmlns:xml:catalog
Catalog.xsd">
  <nextCatalog catalog="%PersonalFolder%/Altova/%AppAndVersionName%/
CustomCatalog.xml"/>
  <nextCatalog catalog="CoreCatalog.xml"/>
  <!-- Include all catalogs under common schemas folder on the first directory
level -->
  <nextCatalog spy:recurseFrom="%AltovaCommonFolder%/Schemas" catalog="
catalog.xml" spy:depth="1"/>
  <!-- Include all catalogs under common XBRL folder on the first directory
level -->
  <nextCatalog spy:recurseFrom="%AltovaCommonFolder%/XBRL" catalog="
catalog.xml" spy:depth="1"/>
</catalog>
```

In the listing above, notice that in the `Schemas` and `XBRL` folders of the folder identified by the variable `%AltovaCommonFolder%` are catalog files named `catalog.xml`. (The value of the `%AltovaCommonFolder%` variable is given in the table below.)

The catalog files in the Altova Common Folder map the pre-defined public and system identifiers of commonly used schemas (such as SVG and WSDL) and XBRL taxonomies to URIs that point to locally saved copies of the respective schemas. These schemas are installed in the Altova Common Folder when MapForce is installed. You should take care not to duplicate mappings in these files, as this could lead to errors.

### CoreCatalog.xml, CustomCatalog.xml, and Catalog.xml

In the `RootCatalog.xml` listing above, notice that `CoreCatalog.xml` and `CustomCatalog.xml` are listed for lookup:

- `CoreCatalog.xml` contains certain Altova-specific mappings for locating schemas in the Altova Common Folder.
- `CustomCatalog.xml` is a skeleton file in which you can create your own mappings. You can add mappings to `CustomCatalog.xml` for any schema you require but that is not addressed by the catalog files in the Altova Common Folder. Do this using the supported elements of the OASIS catalog mechanism (*see below*).
- There are a number of `Catalog.xml` files in the Altova Common Folder. Each is inside the folder of a specific schema or XBRL taxonomy in the Altova Common Folder, and

each maps public and/or system identifiers to URIs that point to locally saved copies of the respective schemas.

### Location of catalog files and schemas

The files `RootCatalog.xml` and `CoreCatalog.xml` are installed in the MapForce application folder. The file `CustomCatalog.xml` is located in your `MyDocuments/Altova/MapForce` folder. The `catalog.xml` files are each in a specific schema folder, these schema folders being inside the folders: `%AltovaCommonFolder%\Schemas` and `%AltovaCommonFolder%\XBRL`.

### Shell environment variables and Altova variables

Shell environment variables can be used in the `nextCatalog` element to specify the path to various system locations (see *RootCatalog.xml* listing above). The following shell environment variables are supported:

<code>%AltovaCommonFolder%</code>	C:\Program Files\Altova\CommonMapForce
<code>%DesktopFolder%</code>	Full path to the Desktop folder for the current user.
<code>%ProgramMenuFolder%</code>	Full path to the Program Menu folder for the current user.
<code>%StartMenuFolder%</code>	Full path to Start Menu folder for the current user.
<code>%StartupFolder%</code>	Full path to Start Up folder for the current user.
<code>%TemplateFolder%</code>	Full path to the Template folder for the current user.
<code>%AdminToolsFolder%</code>	Full path to the file system directory that stores administrative tools for the current user.
<code>%AppDataFolder%</code>	Full path to the Application Data folder for the current user.
<code>%CommonAppDataFolder%</code>	Full path to the file directory containing application data for all users.
<code>%FavoritesFolder%</code>	Full path of the Favorites folder for the current user.
<code>%PersonalFolder%</code>	Full path to the Personal folder for the current user.
<code>%SendToFolder%</code>	Full path to the SendTo folder for the current user.
<code>%FontsFolder%</code>	Full path to the System Fonts folder.
<code>%ProgramFilesFolder%</code>	Full path to the Program Files folder for the current user.
<code>%CommonFilesFolder%</code>	Full path to the Common Files folder for the current user.
<code>%WindowsFolder%</code>	Full path to the Windows folder for the current user.
<code>%SystemFolder%</code>	Full path to the System folder for the current user.
<code>%CommonAppDataFolder%</code>	Full path to the file directory containing application data for all users.
<code>%LocalAppDataFolder%</code>	Full path to the file system directory that serves as the data repository for local (nonroaming) applications.

```
%MyPicturesFolder
%
```

Full path to the MyPictures folder.

### How catalogs work

Catalogs are commonly used to redirect a call to a DTD to a local URI. This is achieved by mapping, in the catalog file, public or system identifiers to the required local URI. So when the DOCTYPE declaration in an XML file is read, the public or system identifier locates the required local resource via the catalog file mapping.

For popular schemas, the PUBLIC identifier is usually pre-defined, thus requiring only that the URI in the catalog file point to the correct local copy. When the XML document is parsed, the PUBLIC identifier in it is read. If this identifier is found in a catalog file, the corresponding URL in the catalog file will be looked up and the schema will be read from this location. So, for example, if the following SVG file is opened in MapForce:

```
<?xml version="1.0" standalone="no"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"
"http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">

<svg width="20" height="20" xml:space="preserve">
  <g style="fill:red; stroke:#000000">
    <rect x="0" y="0" width="15" height="15"/>
    <rect x="5" y="5" width="15" height="15"/>
  </g>
</svg>
```

This document is read and the catalog is searched for the PUBLIC identifier. Let's say the catalog file contains the following entry:

```
<catalog>
...
  <public publicId="-//W3C//DTD SVG 1.1//EN" uri="schemas/svg/svg11.dtd"/>
...
</catalog>
```

In this case, there is a match for the PUBLIC identifier, so the lookup for the SVG DTD is redirected to the URI `schemas/svg/svg11.dtd` (this path is relative to the catalog file), and this local file will be used as the DTD. If there is no mapping for the Public ID in the catalog, then the URL in the XML document will be used (in the example above:

`http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd`).

### The catalog subset supported by MapForce

When creating entries in `CustomCatalog.xml` (or any other catalog file that is to be read by MapForce), use only the following elements of the OASIS catalog specification. Each of the elements below is listed with an explanation of their attribute values. For a more detailed explanation, see the [XML Catalogs specification](#). Note that each element can take the `xml:base` attribute, which is used to specify the base URI of that element.

- `<public publicId="PublicID of Resource" uri="URL of local file"/>`
- `<system systemId="SystemID of Resource" uri="URL of local file"/>`
- `<uri name="filename" uri="URL of file identified by filename"/>`
- `<rewriteURI uriStartString="StartString of URI to rewrite" rewritePrefix="String to replace StartString"/>`
- `<rewriteSystem systemIdStartString="StartString of SystemID" rewritePrefix="Replacement string to locate resource locally"/>`

In cases where there is no public identifier, as with most stylesheets, the system identifier can be directly mapped to a URL via the `system` element. Also, a URI can be mapped to another URI using the `uri` element. The `rewriteURI` and `rewritesSystem` elements enable the rewriting of the starting part of a URI or system identifier, respectively. This allows the start of a filepath to be replaced and consequently enables the targeting of another directory. For more information on these elements, see the [XML Catalogs specification](#).

### File extensions and intelligent editing according to a schema

Via catalog files you can also specify that documents with a particular file extension should have MapForce's intelligent editing features applied in conformance with the rules in a schema you specify. For example, if you create a custom file extension `.myhtml` for (HTML) files that are to be valid according to the HTML DTD, then you can enable intelligent editing for files with these extensions by adding the following element of text to `CustomCatalog.xml` as a child of the `<catalog>` element.

```
<spy:fileExtHelper ext="myhtml" uri="schemas/xhtml1/xhtml1-transitional.dtd"/>
```

This would enable intelligent editing (auto-completion, entry helpers, etc) of `.myhtml` files in MapForce according to the XHTML 1.0 Transitional DTD. Refer to the `catalog.xml` file in the `%AltovaCommonFolder%\Schemas\xhtml` folder, which contains similar entries.

### XML Schema and catalogs

XML Schema information is built into MapForce and the validity of XML Schema documents is checked against this internal information. In an XML Schema document, therefore, no references should be made to any schema for XML Schema.

The `catalog.xml` file in the `%AltovaCommonFolder%\Schemas\schema` folder contains references to DTDs that implement older XML Schema specifications. You should not validate your XML Schema documents against either of these schemas. The referenced files are included solely to provide MapForce with entry helper info for editing purposes should you wish to create documents according to these older recommendations.

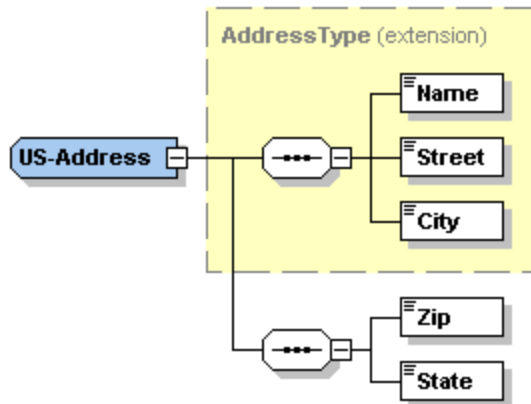
### More information

For more information on catalogs, see the [XML Catalogs specification](#).

## 11.15 Derived XML Schema types - mapping to

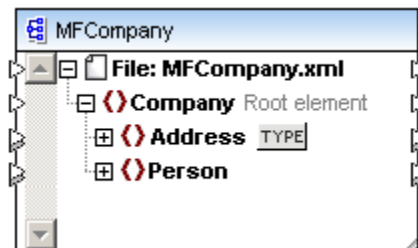
MapForce supports the mapping to/from derived types of a complex type. Derived types are complex types of an XML Schema that use the **xsi:type** attribute to identify the specific derived types.

The screenshot below shows the definition of the derived type "US-Address", in XMLSpy. The base type (or originating complex type) is, in this case, **AddressType**. Two extra elements were added to create the derived type US-Address.

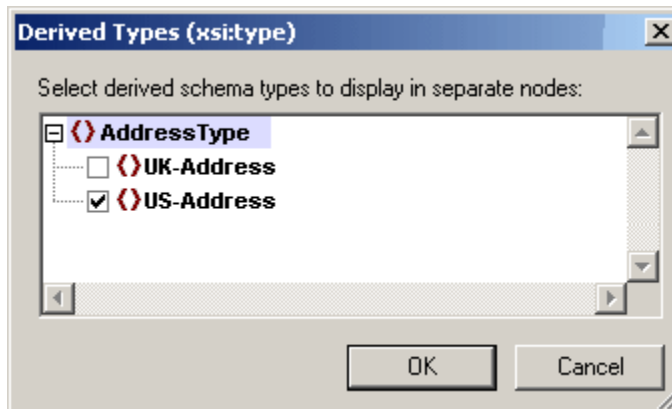


### Mapping to derived types in MapForce:

1. Insert the XML schema MFCompany.xsd that is available in the ...Tutorial folder, click Skip, then select Company as the root element.



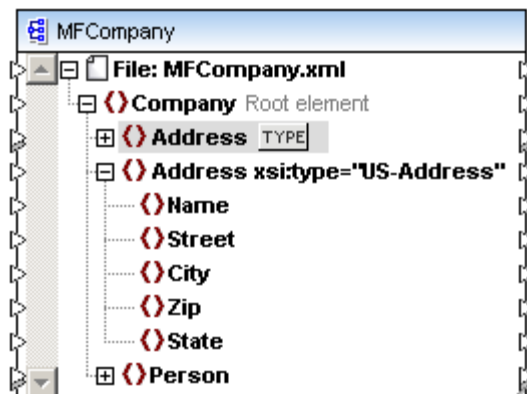
2. Click the TYPE button to the right of the Address element which shows that derived types exist in the Schema component.



3. Click the check box next to the derived type you want to use, e.g. US-Address, and confirm with OK.

A new element **Address xsi:type="US-Address"** has been added to the component.

4. Click the expand button to see the mappable items of the element.



5. You can now map directly to/from these items.

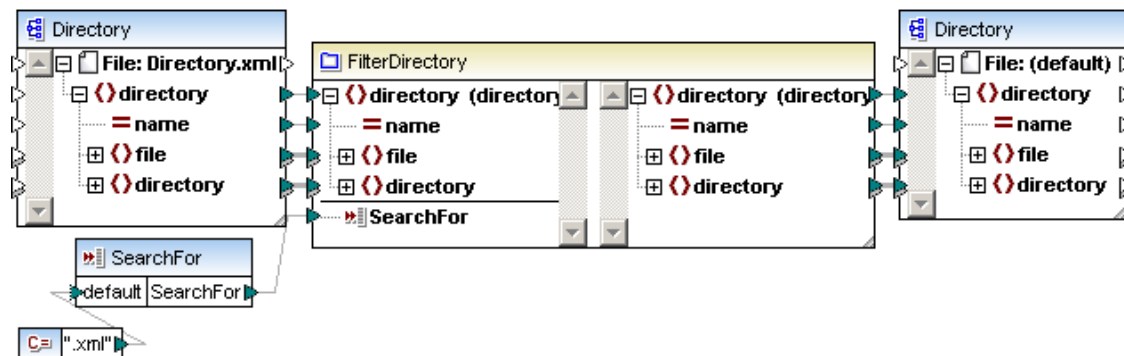
Please note:

You can include/insert multiple derived types by selecting them in the Derived Types dialog box, each will have its own xsi:type element in the component.

## 11.16 Recursive user-defined mapping

This section will describe how the mapping **RecursiveDirectoryFilter.mfd**, available in the ... **IMapForceExamples** folder, was created and how recursive mappings are designed. The MapForceExamples project folder contains further examples of recursive mappings.

The screenshot below shows the finished mapping containing the recursive user-defined function **FilterDirectory**, the aim being to filter a list of the .xml files in the source file.



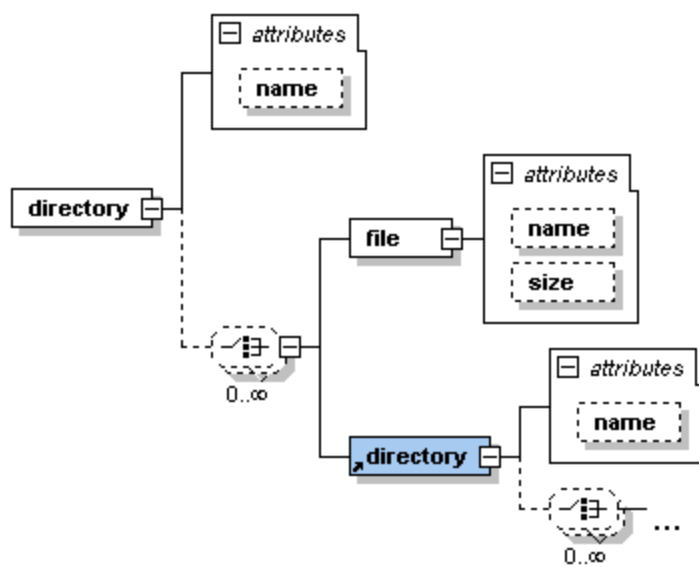
The **source file** that contains the file and directory data for this mapping is **Directory.xml**. This XML file supplies the directory and file data in the hierarchical form you see below.

```

24      <directory name="output">
25          <file name="examplesite1.css" size="3174"/>
26          <directory name="images">
27              <file name="blank.gif" size="88"/>
28              <file name="block_file.gif" size="13179"/>
29              <file name="block_schema.gif" size="9211"/>
30              <file name="nav_file.gif" size="60868"/>
31              <file name="nav_schema.gif" size="6002"/>
32          </directory>
33      </directory>
34  </directory>
35  <directory name="Import">
36      <file name="altova.mdb" size="266240"/>
37      <file name="Data_shape.mdb" size="225280"/>
38  </directory>
39  <directory name="IndustryStandards">
40      <directory name="News">
41          <file name="high-tide.jpg" size="10793"/>
42          <file name="Newsml-example.xml" size="5004"/>
43          <file name="nitf-example.xml" size="9327"/>
44      </directory>

```

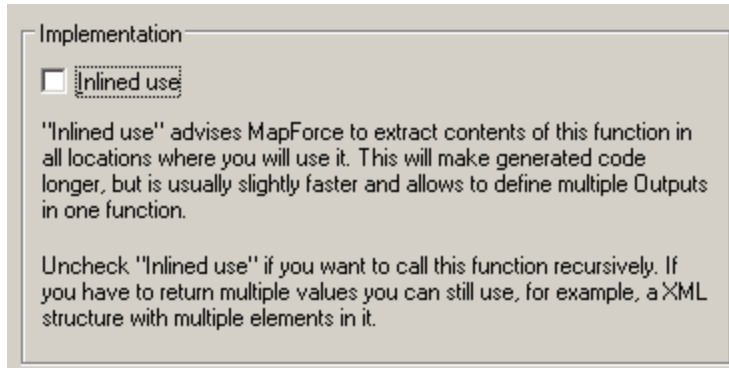
The XML schema file referenced by **Directory.xml** has a **recursive** element called "directory" which allows for any number of subdirectories and files below the directory element.



### 11.16.1 Defining a recursive user-defined function

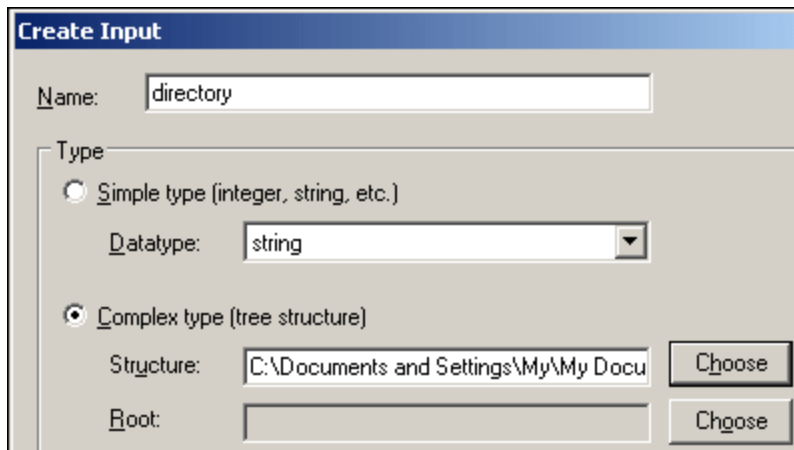
From the **main** mapping window:

1. Select **Function | Create User defined Function** to start designing the function and enter a name e.g. FilterDirectory.
2. Make sure that you **deselect** the **Inlined Use** check box in the Implementation group, to make the function recursive, then click OK.

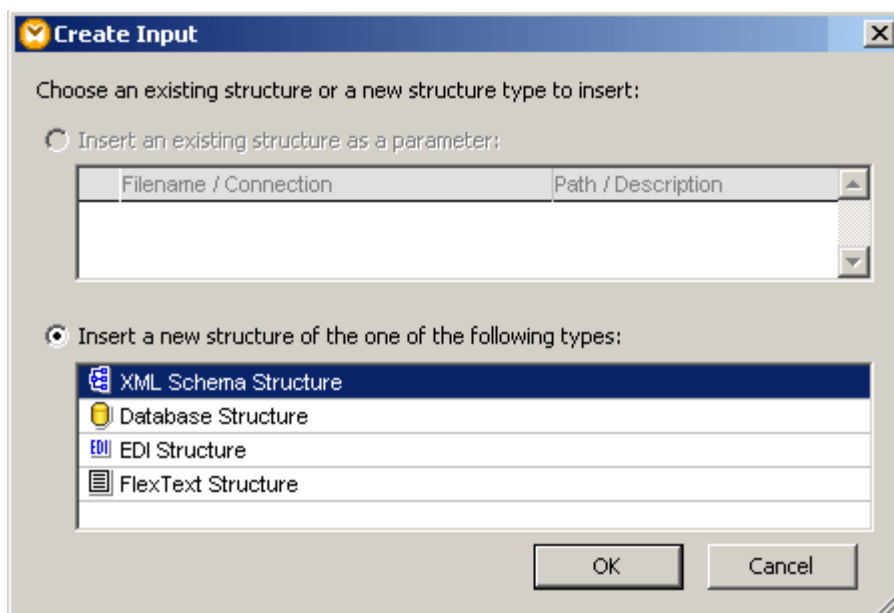


You are now in the **FilterDirectory** window where you create the user-defined function.

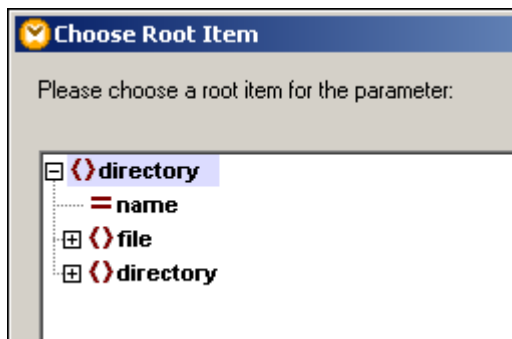
3. Select **Function | Insert Input** to insert an input component.
4. Give the component a name e.g. "directory" and click on the **Complex Type** (tree structure) radio button.



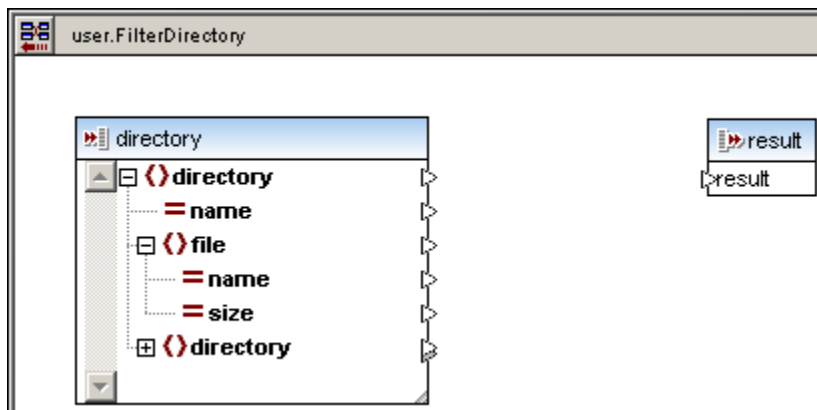
5. Click the **Choose** button, click the "XML Schema Structure" entry in the lower pane, then click OK.



6. Select the **Directory.xsd** file in the ...MapForceExamples folder and click the Open button.
8. Click OK again when asked to select the root item, which should be "directory" as shown below.

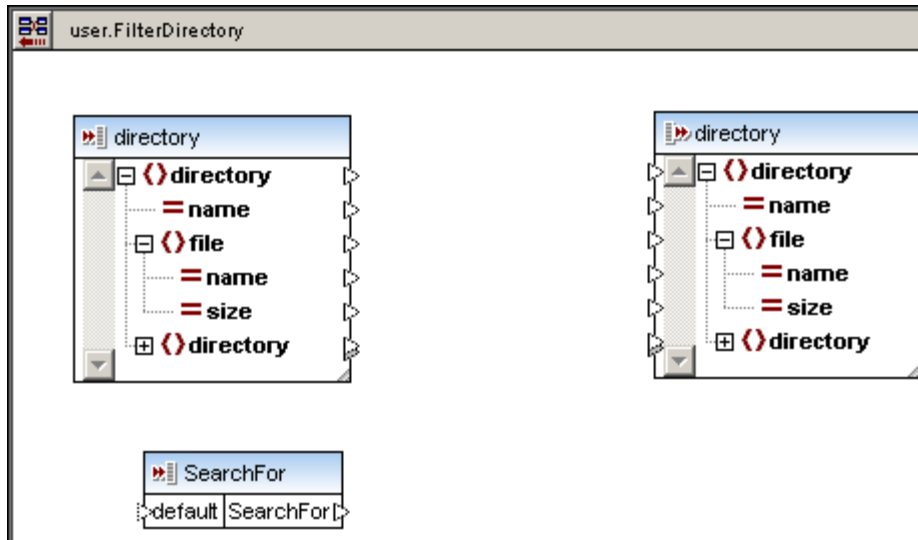


9. Click OK again to insert the complex input parameter. The user-defined function is shown below.



10. Delete the simple result output component, as we need to insert a complex output component here.

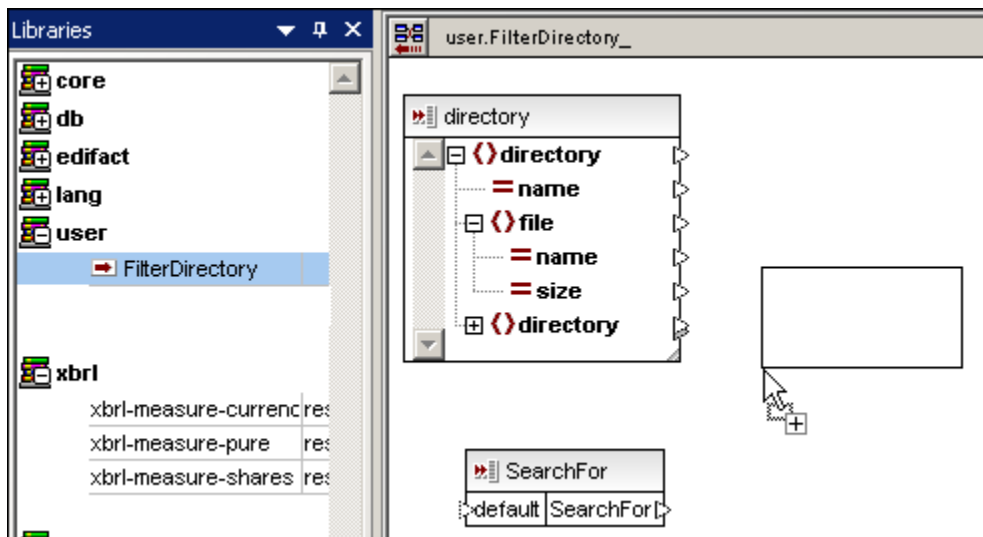
11. Select **Function | Insert Output...** to insert an **output** component and use the same method as outlined above, to make the output component, "directory", a complex type. You now have two complex components, one input and the other output.
12. Select **Function | Insert Input...** and insert a component of type Simple type, and enter a name e.g. **SearchFor**. Deselect the "Input is required" checkbox.



### Inserting the recursive user-defined function

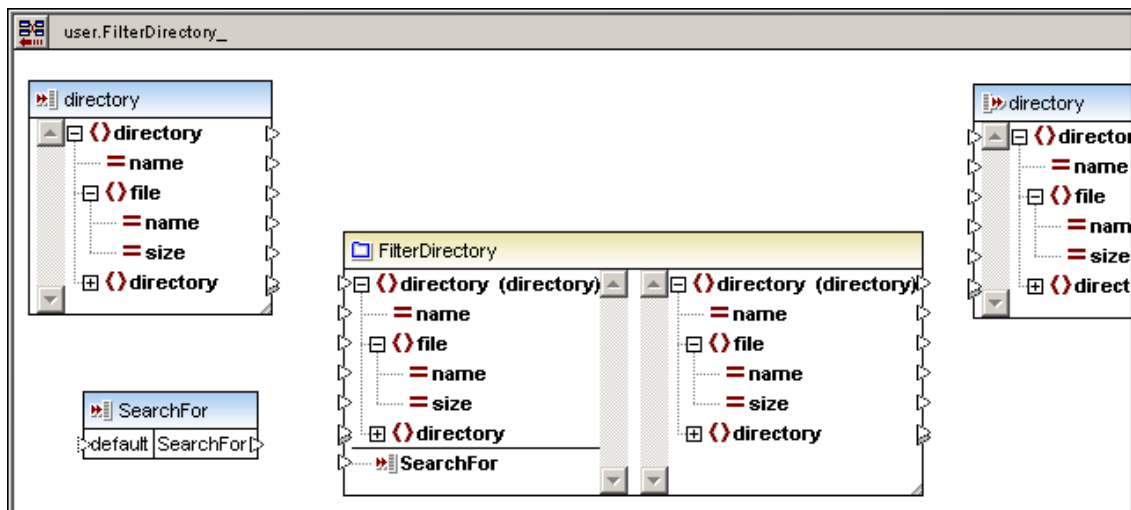
At this point, all the necessary input and output components have been defined for the user-defined function. What we need to do now is insert the "unfinished" function into the current user-defined function window. (You could do this at almost any point however.)

1. Find the FilterDirectory function in the **user** section of the **Libraries** window.
2. Click FilterDirectory then drag and drop it into the FilterDirectory window you have just been working in.

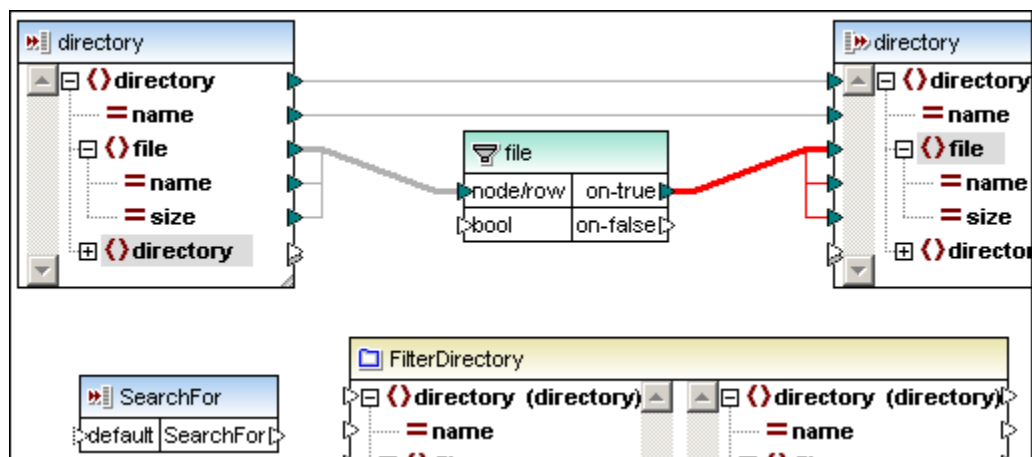


**Java Selected**

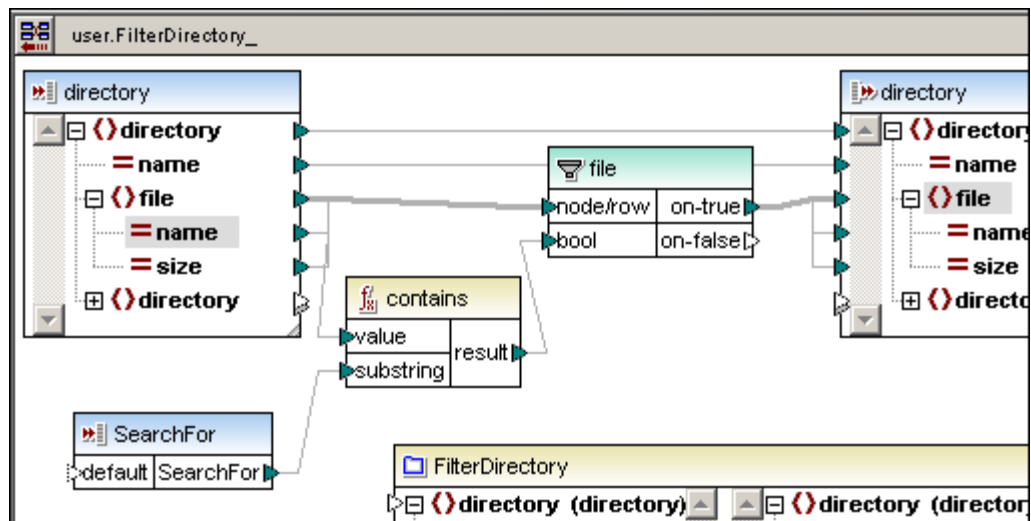
The user-defined function now appears in the user-defined function window as a recursive component.



3. Connect the **directory**, **name** and **file** items of the input component to the same items in the output component.
4. Right click the connector between the **file** items and select "Insert Filter" to insert a filter component.
5. Right click the on-true connector and select **Copy-All** from the context menu. The connectors change appearance to Copy-All connectors.




6. Insert a Contains function from the **Core | String functions** library.
7. Connect **name** to **value** and the **SearchFor** parameter to **substring**, then result to the bool item of the filter.



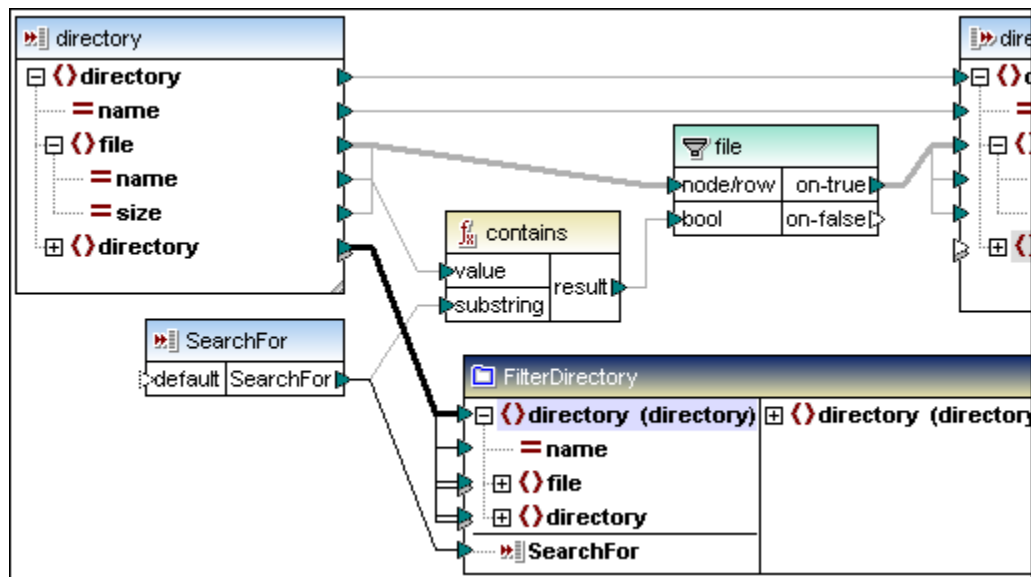
8. Connect the SearchFor item of the input component to the SearchFor item of the user-defined function.

### Defining the recursion

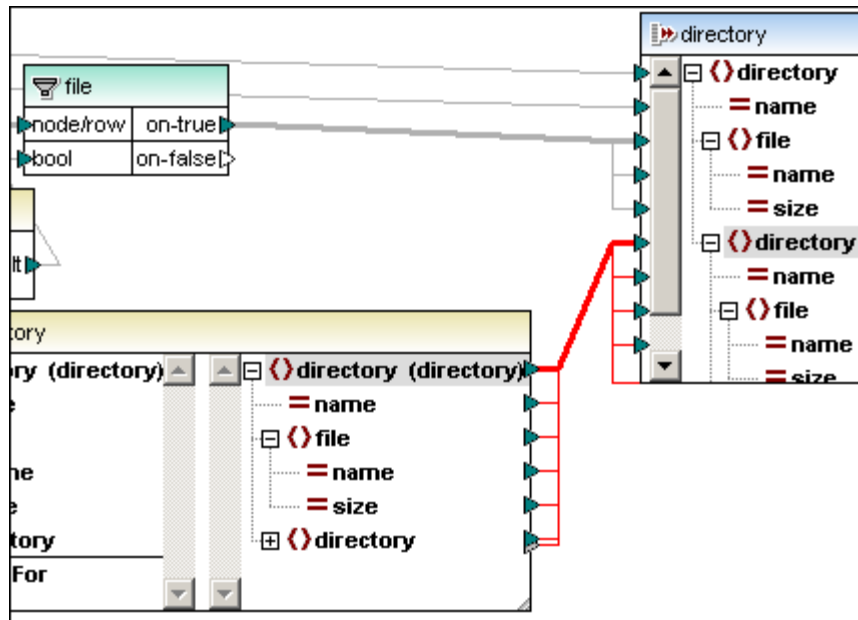
At this point, the mapping of a single directory recursion level is complete. Now we just need to define how to process a subdirectory.

Making sure that the Toggle Autoconnect icon  is active in the icon bar:


1. Connect the lower **directory** item of the input component to the top **directory** item of the recursive user-defined function.



2. Connect the top output directory item of the user-defined function to the lower directory item of the output component.
3. Right click the top connector, select Copy-All from the context menu and click OK when prompted if you want to create Copy-All connection.

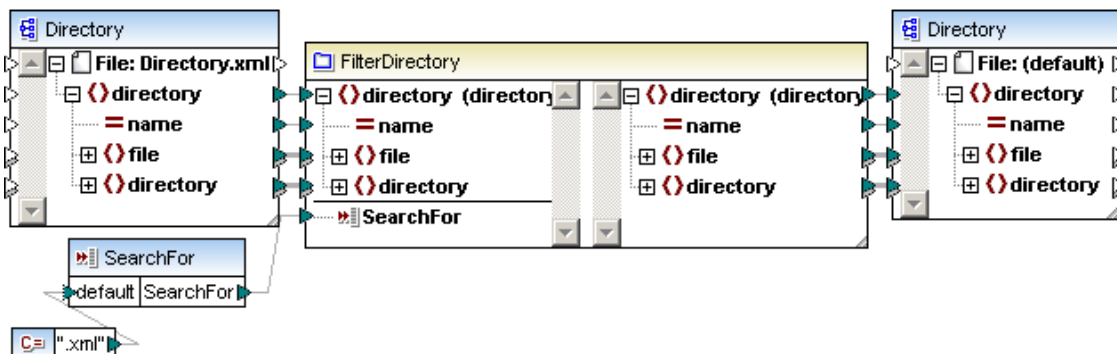


This completes the definition of the user-defined function in this window.

Click the Return to main mapping window icon,  to continue defining the mapping there.

### Main Mapping window

1. Drag the FilterDirectory function from the **user** section of the Libraries window, into the **main** mapping area.
2. Use **Insert | XML Schema file** to insert Directory.xsd and select Directory.xml as the instance file.
3. Use the same method to insert Directory.xsd and select Skip, to create the output component.
4. Insert a constant component, then a Input component e.g. SearchFor.
5. Create the connections as shown in the screenshot below.
6. When connecting the top-level connectors, directory to directory, on both sides of the user-defined component, right click the connector and select **Copy-All** from the context menu.



7. Click the Output tab to see the result of the mapping.

### Notes:

Double clicking the lowest "directory" item in the Directory component, opens a new level of recursion, i.e. you will see a new **directory | file | directory** sublevel. Using the Copy-all

connector automatically uses all existing levels of recursion in the XML instance, you do not need expand the recursion levels manually.

# Chapter 12

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## StyleVision Power Stylesheets in Preview

## 12 StyleVision Power Stylesheets in Preview

MapForce is now able to preview/render XML Schema components using an associated StyleVision Power Stylesheet (SPS). This means the target component data are previewed as HTML, RTF, PDF, or Word 2007+ documents. If you are using the Enterprise edition of StyleVision then charts will also be rendered in these previews.

To be able to preview components in this way, Altova StyleVision must be installed on your computer; either as a standalone installation, or as part of Altova MissionKit.

StyleVision Power Stylesheets are created in StyleVision and are assigned to a component in MapForce. You cannot edit or change the stylesheet in MapForce directly, but can open them via MapForce in StyleVision. In the 64-bit edition of MapForce the Word 2007+ and RTF previews are opened as a non-embedded application.


Additional tabs are added to the MapForce tab bar if StyleVision has been installed, and an SPS file has been assigned to the target component.


- HTML
- RTF - previews RTF
- PDF - requires FOP version 0.93 or 1.0
- Word 2007+ - previews MS Word documents from version 2007 and later

Please note:

The tabs available in MapForce depend on the installed version of StyleVision. All tabs mentioned above are available in the Enterprise editions. Whenever you see these extra tabs you know that an SPS file has been assigned to the component. The ... \MapForceExamples folder contains many examples where this is the case.

The Professional edition of StyleVision restricts the tabs to HTML and RTF in MapForce.

Note: if your mapping contains multiple linked components, i.e. a [chained mapping](#), the SPS preview will only be visible for those components containing an SPS entry, and where the Preview button  of the component has been set as active.



---

## Personal Expense Report

Currency: ☒ Dollars ☐ Euros ☐ Yen

Currency \$

☒ Detailed report

---

Employee Information

Fred

Landis

Project Manager

First Name

Last Name

Title

f.landis@nanonull.com

123-456-78

E-Mail

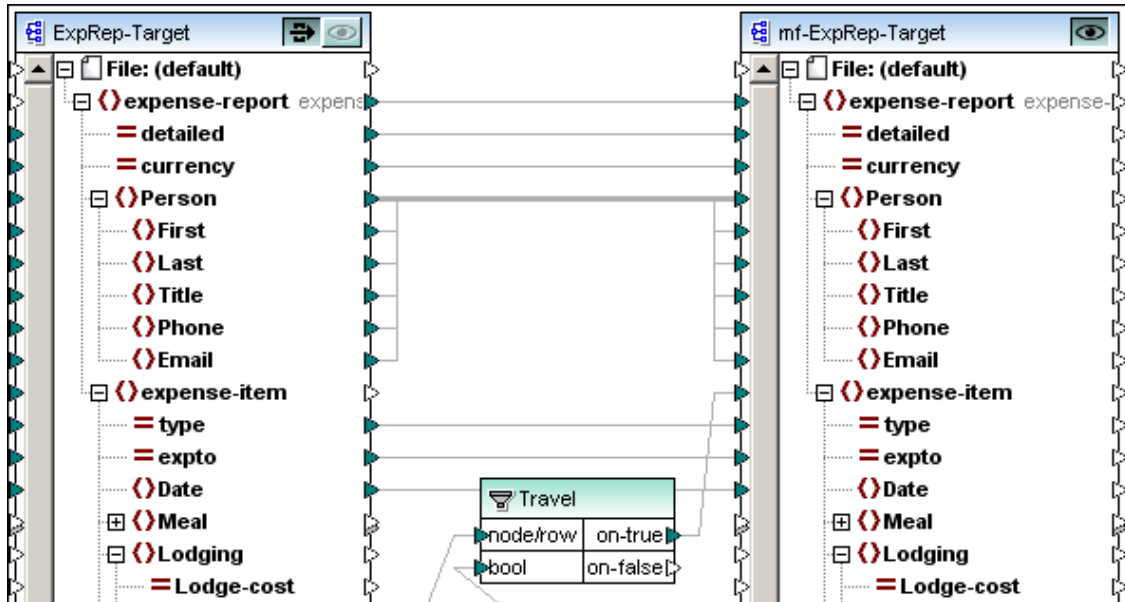
Phone

Expense List

Mapping
Database Query
Output
☒ HTML
☒ RTF

## 12.1 Assigning an SPS file to a component

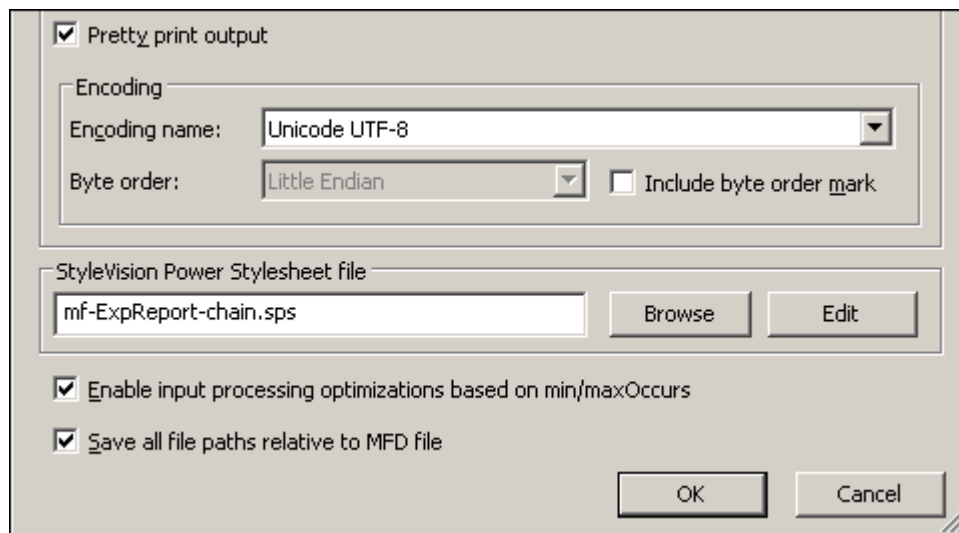
The **Tut-ExpReport-chain.mfd** example shown below, is available in the ...  
 \MapForceExamples\Tutorial folder. For more information on chained mapping, as shown in the example below, please see [Chained mappings - Pass-through components](#).



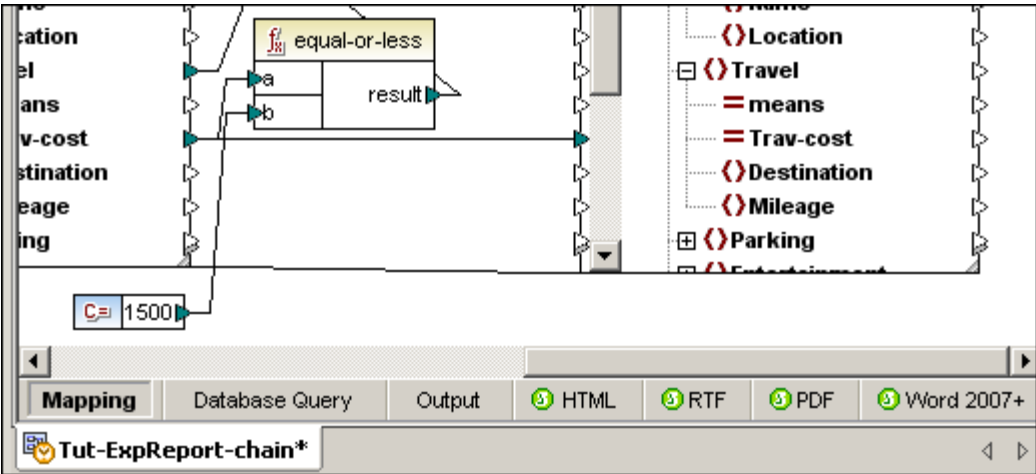
### To assign an SPS template to a MapForce component:

Having designed the SPS template in StyleVision, or obtained the template from a third party,

1. Double click the component title bar of the component you want to assign the SPS file to, e.g. mf-ExpRep-Target.



2. Click the Browse button to select the StyleVision SPS file, then click OK.



The HTML, RTF, PDF and Word 2007+ tabs appear to the right of the Output tab. Clicking a tab renders the component data in the specific format.

Nanonull

Personal Expense Report

Currency: ☒ Dollars ☐ Euros ☐ Yen 

Currency \$

☒ Detailed report

Employee Information

Fred

Landis

Project Manager

First Name

Last Name

Title

f.landis@nanonull.com

123-456-78

E-Mail

Phone

Expense List

Type	Expense To	Date (yyyy-mm-dd)	Expenses \$	Description
<div>Travel</div>	<div>Development</div>	2003-01-02	<div>Travel</div> <div>337.88</div> <div>Lodging</div>	Biz jet
<div>Travel</div>	<div>Accounting</div>	2003-07-07	<div>Travel</div> <div>1014.22</div> <div>Lodging</div>	Ambassador class

Mapping Database Query Output **HTML** RTF

Please note:  
Clicking the Create... button in the Component Settings dialog box, prompts for an SPS

file name and opens StyleVision allowing you to create a new SPS file. Double clicking the same component once an SPS file has been assigned, shows the Create button as Edit.

# Chapter 13

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## Documenting mapping projects

## 13 Documenting mapping projects

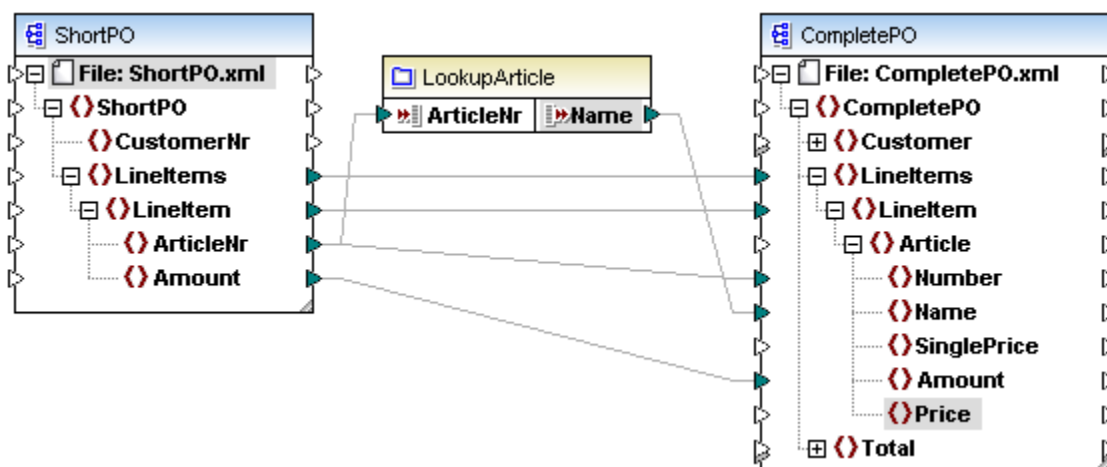
The **Generate Documentation** command generates detailed documentation about your mapping in HTML, MS Word, RTF or PDF. The documentation generated by this command can be freely altered and used; permission from Altova to do so is not required.

Documentation is generated for components you select in the Generate Documentation dialog box. You can either use the fixed design, or use a StyleVision SPS for the design. Using a StyleVision SPS enables you to customize the design of the generated documentation. How to do this is explained in the section, [User-Defined Design](#).

**Note:** To use an SPS to generate mapping documentation, you must have StyleVision installed on your machine. Related elements are typically hyperlinked in the onscreen output, enabling you to navigate from component to component.

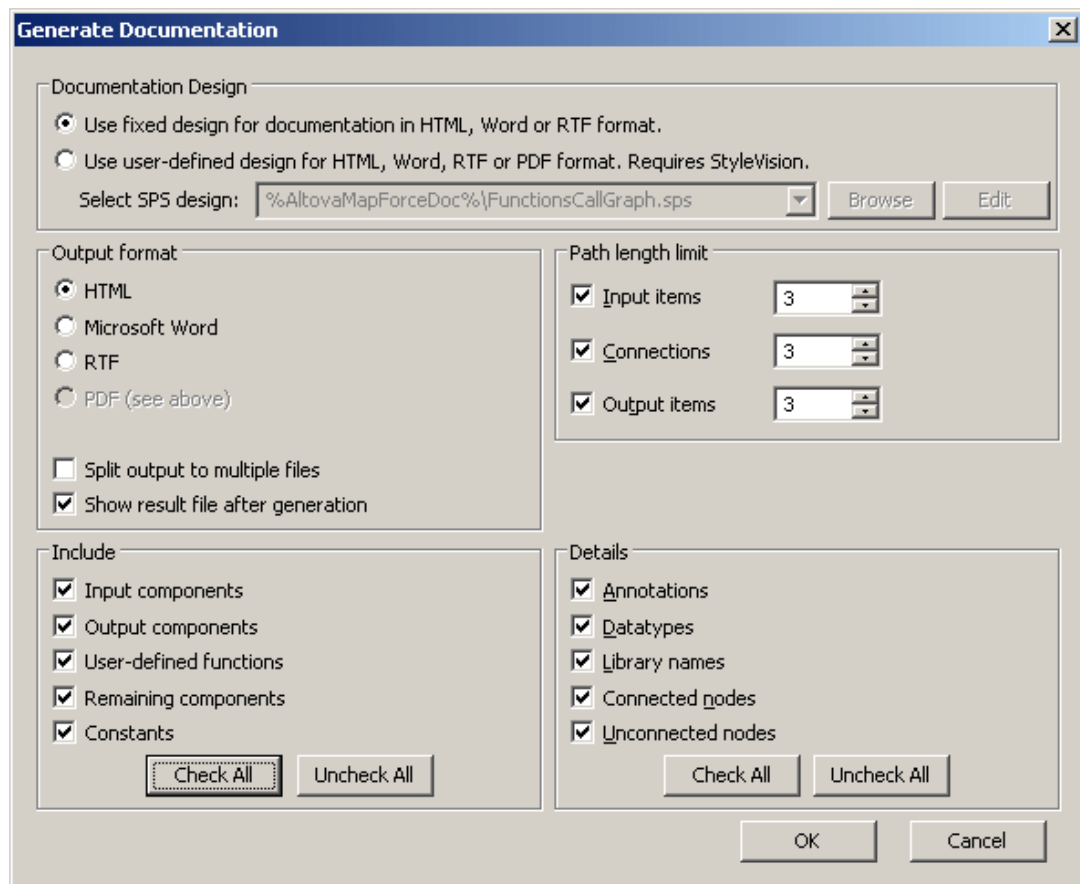
To generate documentation in MS Word format, you must have MS Word (version 2000 or later) installed.

The screenshot below shows a portion of the **Lookup-standard.mfd** file available in the ... **\MapForceExamples** folder.



Having opened a mapping file e.g. Lookup-standard.mfd:

- Select the menu option **File | Generate Documentation**. This opens the "Generate documentation" dialog box. The screenshot below shows the default dialog box settings.



### Documentation Design

- Select "Use fixed design..." to use the built-in documentation template.
- Select "Use user-defined..." to use a predefined StyleVision Power Stylesheet created in StyleVision. The SPS files are available in the **...My Documents\Altova MapForce2012\Documentation\MapForce\** folder.
- Click **Browse** to browse for a predefined SPS file.
- Click **Edit** to launch StyleVision and open the selected SPS in a StyleVision window.

The following predefined SPS stylesheets are available in the ...MapForce2012\Documentation\MapForce folder:

- [FunctionCallGraph.sps](#) - shows the call graph of the main mapping and any user-defined functions.
- [FunctionsUsedBy.sps](#) - shows which functions are used directly, or indirectly, in the mapping.
- [ImpactAnalysis.sps](#) - lists every source and target node, and the route taken via various functions, to the target node.
- [OverallDocumentation.sps](#) - shows all nodes, connections, functions, and target nodes. The output using this option outputs the maximum detail and is identical to the built-in "fixed design..." output.

**Output Format**

- The output format is specified here: either HTML, Microsoft Word, RTF, or PDF.  
Microsoft Word documents are created with the **.doc** file extension when generated using a fixed design, and with a **.docx** file extension when generated using a StyleVision SPS.  
The PDF output format is only available if you use a StyleVision SPS to generate the documentation.
- Select "**Split output to multiple files**" if you would like separate input, output, constant components, user-defined functions from the Library component documentation. In fixed designs, links between multiple documents are created automatically.
- The "**Show Result File...**" option is enabled for all output options. When checked, the result files are displayed in default browser (HTML output), MS Word (MS Word output), and the default application for .rtf files (RTF output).

**Path length limit**

Allows you to define the maximum "path" length to be shown for items.

- E.g. .../ShortPO/LinelItems/LinelItem, which would be the maximum length for the default setting 3.

**Include**

- Allows you to define the specific components to appear in the documentation.

**Details**

Allows you to set the specific details to appear in the documentation.

- selecting "Library Names" would insert the "core" prefix for functions.
- You can document both connected, as well as unconnected nodes.

Note:

The **Check/Uncheck All** buttons allow you to check/uncheck all check boxes of that group.

Having used the default settings shown above, clicking **OK**, prompts you for the name of the output file and the location to which it should be saved. A portion of the fixed design generated documentation is shown below. Note that this shows a single output file.

This table shows the connections **from** the source component to the target component(s).

Mapping **lookup-standard**

(C:\Documents and Settings\My\My Documents\Altova\MapForce2011\MapForceExamples\Lookup-standard.mfd)

Input **ShortPO** ([ShortPO.xsd](#))

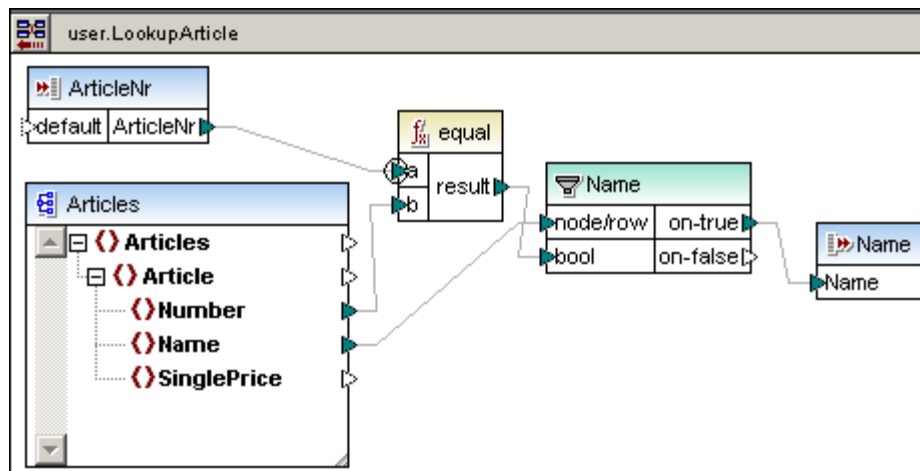
Nodes	Connections	
File: ShortPO.xml Type: string		
ShortPO Type: restriction of xs:anyType [0..1]		
ShortPO/CustomerNr Type: xs:integer		
ShortPO/LinItems Type: restriction of xs:anyType	direct	<a href="#">CompletePO/LinItems</a> Type: restriction of xs:anyType
ShortPO/LinItems/LinItem Type: restriction of xs:anyType [1..∞]	direct	<a href="#">CompletePO/LinItems/LinItem</a> Type: restriction of xs:anyType [1..∞]
.../LinItems/LinItem/ArticleNr Type: xs:integer	direct	<a href="#">.../LinItem/Article/Number</a> Type: xs:integer
	<a href="#">user.LookupArticle</a> => ArticleNr   Name =>	<a href="#">.../LinItem/Article/Name</a> Type: xs:string
.../LinItems/LinItem/Amount Type: xs:integer	direct	<a href="#">.../LinItem/Article/Amount</a> Type: xs:integer

The sequence in which the components are documented is: Input, Output, Constant, User-defined functions, then Library functions.

E.g. **Input component ShortPO**:

- The first two items ShortPO and ShortPO/CustomerNr are not connected to any item in the target, thus the Connections column is empty.
- **ShortPO/LinItems** is directly connected to **CompletePO/LinItems** in the target.
- /LinItems/LinItem/**ArticleNr** has two connectors:
  - directly to LinItem/Article/**Number** in the target
  - to the User-defined function **LookupArticle**, with ArticleNr as the input parameter, and Name as the output parameter of the user-defined function.

The contents of the user-defined function are shown below.



**Output component CompletePO:** This table shows the connections **to** the target component from the source component(s).

Output **CompletePO** ([CompletePO.xsd](#))

Connections		Nodes
		File: CompletePO.xml Type: string
		CompletePO Type: restriction of xs:anyType [0..1]
		CompletePO/Customer Type: restriction of xs:anyType
<a href="#">ShortPO/LinItems</a> Type: restriction of xs:anyType	direct	CompletePO/LinItems Type: restriction of xs:anyType
<a href="#">ShortPO/LinItems/LinItem</a> Type: restriction of xs:anyType [1..∞]	direct	CompletePO/LinItems/LinItem Type: restriction of xs:anyType [1..∞]
		.../LinItems/LinItem/Article Type: extension of ArticleType
<a href="#">.../LinItems/LinItem/ArticleNr</a> Type: xs:integer	direct	.../LinItem/Article/Number Type: xs:integer
<a href="#">.../LinItems/LinItem/ArticleNr</a> Type: xs:integer	<a href="#">user.LookupArticle</a> => ArticleNr   Name =>	.../LinItem/Article/Name Type: xs:string

- The first two items CompletePO and CompletePO/Customer are not connected to any item in the source component, thus the Connections column is empty.
- **CompletePO/LinItems** is directly connected to **ShortPO/LinItems** in the source component.
- LinItem/Article/Name is connected to the User-defined function **LookupArticle**, with LinItems/LinItem/ArticleNr as the source item.

**User-defined function defines****user.LookupArticle**Input **Articles** ([Articles.xsd](#))

Nodes	Connections	
File: Articles.xml Type: string		
Articles Type: restriction of xs:anyType [0..1]		
Articles/Article Type: ArticleType [1..∞]		
Articles/Article/Number Type: xs:integer	<a href="#">core.equal =&gt; b   result =&gt;</a> <a href="#">core.filter =&gt; bool   on-true =&gt;</a>	<a href="#">core.output =&gt; Name</a> Type: string
Articles/Article/Name Type: xs:string	<a href="#">core.filter =&gt; node/row   on-true =&gt;</a>	<a href="#">core.output =&gt; Name</a> Type: string
Articles/Article/SinglePrice Type: xs:decimal		

Input **(required) core.ArticleNr**

Nodes	Connections	
ArticleNr Type: string	<a href="#">core.equal =&gt; a   result =&gt;</a> <a href="#">core.filter =&gt; bool   on-true =&gt;</a>	<a href="#">core.output =&gt; Name</a> Type: string

## 13.1 Supplied SPS stylesheets

### Function Call Graphs - PersonListByBranchOffice.mfd

**This report shows call graphs of the main mapping and all user-defined functions.**

[Show all functions](#) [Collapse all functions](#)

#### Main mapping

```

|---core.equal
|---core.filter
|---user.LookupPerson
|   |---core.filter
|   |---user.EqualAnd
|   |   |---core.equal
|   |   |---core.logical-and
|   |---user.Person2Details
|   |---core.concat

```

#### [user.LookupPerson](#)

```

|---core.filter
|---user.EqualAnd
|   |---core.equal
|   |---core.logical-and
|---user.Person2Details
|   |---core.concat

```

#### [user.EqualAnd](#)

```

|---core.equal
|---core.logical-and

```

#### [user.Person2Details](#)

```

|---core.concat

```

### Functions Used By - PersonListByBranchOffice.mfd

Library **core**

Function	Directly used by	Indirectly used by
core.equal	Main mapping user.EqualAnd	user.LookupPerson
core.filter	Main mapping user.LookupPerson	
core.logical-and	user.EqualAnd	Main mapping user.LookupPerson
core.concat	user.Person2Details	Main mapping user.LookupPerson

Library **user**

Function	Directly used by	Indirectly used by
user.LookupPerson	Main mapping	
user.EqualAnd	user.LookupPerson	Main mapping
user.Person2Details	user.LookupPerson	Main mapping

## Impact Analysis - PersonListByBranchOffice.mfd

**This report lists every input and output node connection independently and is perfect for further impact analysis with modelling tools.**

Input Node	Functions	Output Node
OfficeName	core.equal, core.filter	PersonList
OfficeName	user.LookupPerson	PersonList/Person/Details
BranchOffices/Office	core.filter	PersonList
BranchOffices/Office/Name	core.equal, core.filter	PersonList
BranchOffices/Office/Contact		PersonList/Person
.../Office/Contact/first		PersonList/Person/First
.../Office/Contact/first	user.LookupPerson	PersonList/Person/Details
.../Office/Contact/last		PersonList/Person/Last
.../Office/Contact/last	user.LookupPerson	PersonList/Person/Details

## Overall Documentation - PersonListByBranchOffice.mfd

Mapping **PersonListByBranchOffice.mfd**Input **core.OfficeName**

Nodes	Connections	
OfficeName Type: string	<u>core.equal =&gt; a   result =&gt;</u> <u>core.filter =&gt; bool   on-true =&gt;</u>	PersonList Type: restriction of xs:anyType [0..1] Annotation: List of Persons
	<u>user.LookupPerson =&gt;</u> <u>Office Name   result =&gt;</u>	PersonList/Person/Details Type: xs:string [0..1]

Input **BranchOffices** (BranchOffices.xsd)

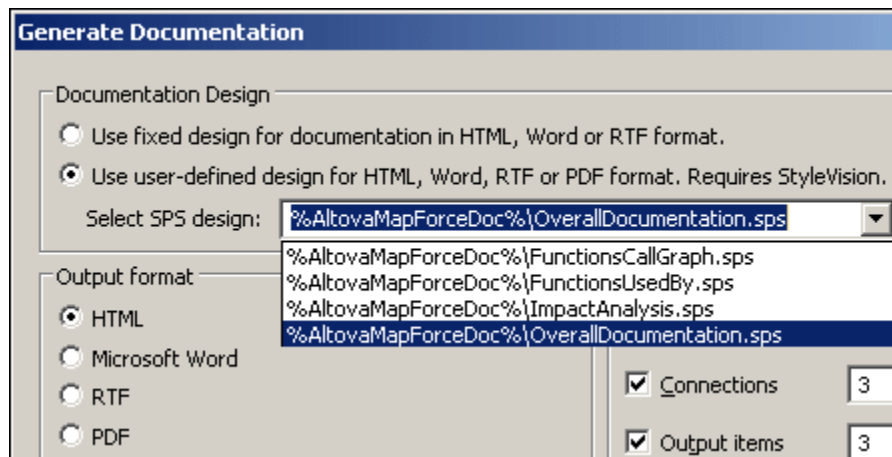
Nodes	Connections	
File: BranchOffices.xml Type: string		
BranchOffices Type: restriction of xs:anyType [0..1]		
BranchOffices/Name Type: restriction of xs:string		
BranchOffices/Office Type: restriction of xs:anyType [0..∞]	<u>core.filter =&gt; node/row   on-true =&gt;</u>	PersonList Type: restriction of xs:anyType [0..1] Annotation: List of Persons
BranchOffices/Office/Name Type: restriction of xs:string	<u>core.equal =&gt; b   result =&gt;</u> <u>core.filter =&gt; bool   on-true =&gt;</u>	PersonList Type: restriction of xs:anyType [0..1] Annotation: List of Persons

## 13.2 User-Defined Design

Instead of the fixed design, you can create a customized design for the MapForce documentation. The customized design is created in a StyleVision SPS. Note that there are 4 predefined SPS Stylesheets supplied with MapForce, please see [Documenting mapping projects](#).

### Specifying the SPS to use for MapForce documentation

The SPS you wish to use for generating the documentation is specified in the Generate Documentation dialog (accessed via **File | Generate Documentation**). Select the "Use User-Defined Design..." radio button then click the dropdown arrow of the combo box and select the file you want. The default selection is the **OverallDocumentation.sps** entry.



These predefined SPS files are located in the ...MapForce2012\Documentation\MapForce folder.

Please note:

To use an SPS to generate documentation, you must have StyleVision installed on your machine.

### Creating the SPS

A StyleVision Power Stylesheet (or SPS) is created using [Altova's StyleVision](#) product. An SPS for generating MapForce documentation must be based on the XML Schema that specifies the structure of the XML document that contains the MapForce documentation.

This schema is called **MapForceDocumentation.xsd** and is delivered with your MapForce installation package. It is stored in the ...My Documents\Altova\MapForce2012\Documentation folder.

When creating the SPS design in StyleVision, nodes from the MapForceDocumentation.xsd schema are placed in the design and assigned styles and properties. Note that the MapForceDocumentation.xsd **includes** the Documentation.xsd file located in the folder above it.

Additional components, such as links and images, can also be added to the SPS design. How to create an SPS design in StyleVision is described in detail in the StyleVision user manual.

The advantage of using an SPS for generating mapping documentation is that you have complete control over the design of the documentation. Note also that PDF output of the

documentation is available only if an SPS is used; PDF output is not available if the fixed design is used.

# Chapter 14

---

## Nil Values / Nillable

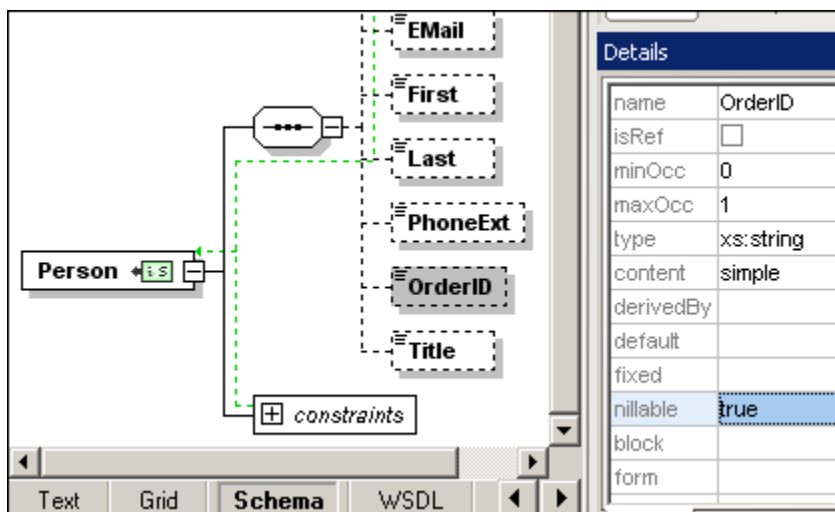
## 14 Nil Values / Nillable

The XML Schema specification allows for elements to be valid without content (despite a content type which does not allow empty content), if the `nillable="true"` attribute has been defined for the specific element in the schema.

An **attribute**, `xsi:nil="true"` in the XML **instance** document, is used to indicate that the element exists but that it has no content.

Note that this only applies to **element** values, and not attribute values. The element with `xsi:nil="true"` may not have element or textual content, but may still have other attributes.

The **nillable="true"** attribute is defined in the XML **Schema** and can be present in both the source and target components.



The **xsi:nil="true"** attribute is defined in the XML **Instance** file and is only present in the instance file.

```

14  <Person>
15    <PrimaryKey>2</PrimaryKey>
16    <ForeignKey>1</ForeignKey>
17    <EMail>biff@amail.com</EMail>
18    <First>biff</First>
19    <Last>bander</Last>
20    <PhoneExt>22</PhoneExt>
21    <OrderID xsi:nil="true"/>
22    <Title>IT services</Title>
23  </Person>

```

The `xsi:nil` attribute is not displayed explicitly in the MapForce graphical mapping, because it is handled automatically in most cases: A "nilled" node (that has the `xsi:nil="true"` attribute set) exists, but its content does not exist.

### Nillable elements as mapping source

Whenever a mapping is reading data **from** nilled XML element, the `xsi:nil` attribute is automatically checked. If the value of `xsi:nil` is true, the content will be treated as non-existent.

When creating a **Target-driven** mapping from a nillable source element to a nillable target element with simple content (a single value with optional attributes, but without child elements), where `xsi:nil` is set on a source element, the `xsi:nil` attribute is inserted into the target element e.g. `<OrderID xsi:nil="true"/>`.

When creating a **Copy-All** mapping from a nillable source element to a nillable target element, where `xsi:nil` is set on a source element, the `xsi:nil` attribute is inserted into the target element e.g. `<OrderID xsi:nil="true"/>`.

### Using functions

Connecting the "exists" function to a nilled source element will return "true" for all elements, due to the fact that the **element** node actually exists, even if it has no content.

To check explicitly whether a source element has the `xsi:nil` attribute set to true, use the **is-xsi-nil** function. It returns true for "nilled" elements and false for other nodes.

Using functions that expect simple values (e.g. multiply, concat) on elements where `xsi:nil` has been set, do not yield a result, as no element content is present and no value can be extracted. These functions behave as if the source node did not exist.

To substitute a "nilled" (non-existing) source element value with something specific, use the **substitute-missing** function.

## Nillable elements as mapping target

When creating a **Target-driven** mapping from a nillable source element to a nillable target element with **simple content** (a single value with optional additional attributes, but without child elements), where `xsi:nil` is set on a source element, the `xsi:nil` attribute is inserted into the target element e.g. `<OrderID xsi:nil="true"/>`.

If the `xsi:nil="true"` attribute has **not** been set in the XML **source** element, then the element content is mapped to the target element in the usual fashion.

When mapping to a nillable target element with **complex type** (with child elements), the `xsi:nil` attribute will **not** be written automatically, because MapForce cannot know at the time of writing the element's attributes if any child elements will follow. Define a **Copy-All connection** to copy the `xsi:nil` attribute from the source element.

When mapping an **empty sequence** to a target element, the element will not be created at all - independent of its nillable designation.

### Using functions

To force the creation of an empty target element with `xsi:nil` set to true, connect the **set-xsi-nil** function directly to the target element. This works for target elements with simple and complex types.

Use the **substitute-missing-with-xsi-nil** function to insert `xsi:nil` in the target if no value from your mapping source is available. This can happen if the source node does not exist at all, or if a calculation (e.g. multiply) involved a nilled source node and therefore yielded no result.

This function works only for nodes with simple content.

To create `xsi:nil` on an element of **complex type** depending on some condition, do the following:

1. Create the mapping as usual for the case where the target node contains content.
2. Insert a filter component into the connection to the target node, and define the condition when there is any content.
3. Use the "duplicate input" function to duplicate your target node.
4. Connect the set-xsi-nil function via another filter component, to the duplicated target node.
5. Insert a logical-not function to negate the condition, and connect it to the filter between set-xsi-nil and the duplicated target node.

# Chapter 15

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HL7 v3.x to/from XML schema mapping

## 15 HL7 v3.x to/from XML schema mapping

Support for HL7 version **3.x** is automatically included in MapForce 2012 as it is XML based.

A separate installer for the HL7 V2.2 - V2.5.1 XML Schemas and configuration files, is available on the [MapForce Libraries](#) page of the altova website. Select the Custom Setup in the installer, to only install the HL7 V3 components and XML Schemas.

Location of HL7 XML Schemas after installation:

Windows XP machine:	"C:\Program Files\Altova\Common2011\Schemas\hl7v3"
Windows Vista machine:	"C:\Program Files\Altova\Common2011\Schemas\hl7v3"
Windows7 machine:	"C:\Program Files\Altova\Common2011\Schemas\hl7v3"

If a 32-bit MapForce application is used on a 64-bit operating system, then the location is "C:\Program Files(x86)\Altova\Common2011\Schemas\hl7v3".

HL7 documents can be used as source and target components in MapForce. This data can also be mapped to any number of XML schema components.

# Chapter 16

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## Libraries and Functions

## 16 Libraries and Functions

The following sections describe how to define your own user-defined functions as well as libraries for the various programming languages.

[Defining User-defined functions](#)

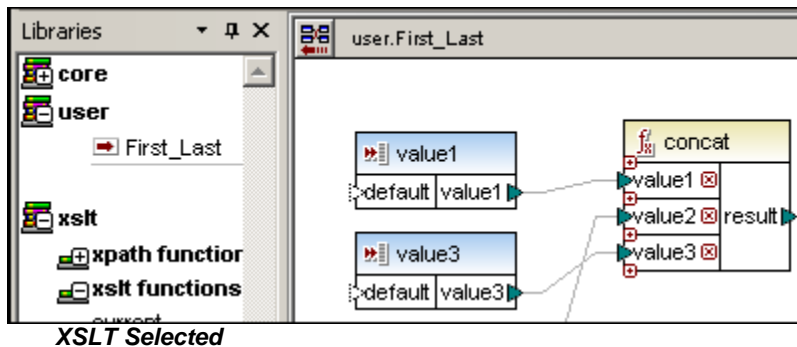
[Adding custom XSLT and XQuery functions](#)

[Library Functions Reference](#)

## 16.1 Defining User-defined functions

MapForce allows you to create user-defined functions visually, in the same way as in the main mapping window.

These functions are then available as function entries in the Libraries window (e.g. First\_Last), and are used in the same way as the currently existing functions. This allows you to organize your mapping into separate building blocks, and reuse them in the same, or different mappings.



User-defined functions are stored in the \*.mfd file, along with the main mapping.

A user-defined function uses **input** and **output components** to pass information from the main mapping (or another user-defined function) to the user-defined function and back.

User-defined functions can contain "local" source components (i.e. that are within the user-defined function itself) such as XML schemas, which are useful when implementing lookup functions.

User-defined functions can contain any number of input and outputs where any of these can be in the form of: simple values, or XML nodes.

User-defined functions are useful when:

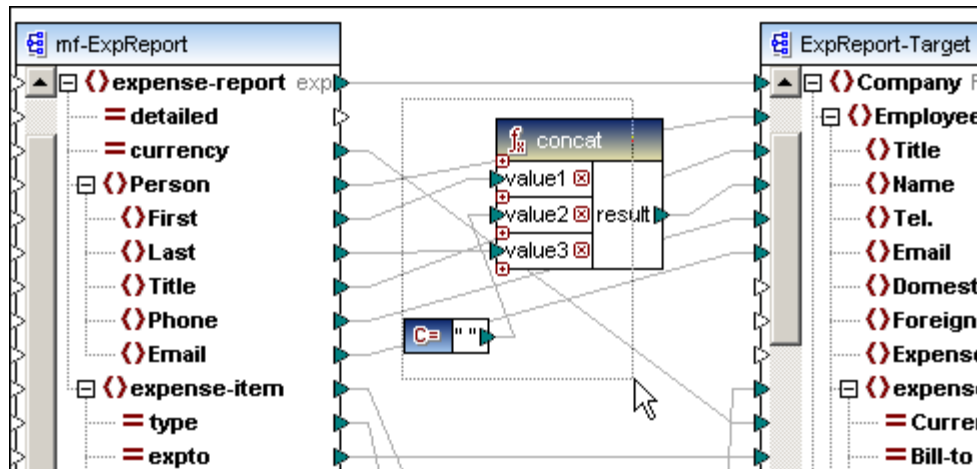
- combining multiple processing functions into a single component, e.g. for formatting a specific field or looking up a value
- reusing these components any number of times
- [importing](#) user-defined functions into other mappings (by loading the mapping file as a library)
- using [inline functions](#) to break down a complex mapping into smaller parts that can be edited individually
- mapping **recursive schemas** by creating [recursive user-defined functions](#)

User-defined functions can be either built from scratch, or from functions already available in the mapping tab.

This example uses the **Tut-ExpReport.mfd** file available in the [...\MapForceExamples\Tutorial\](#) folder.

**To create a user-defined function from existing components:**

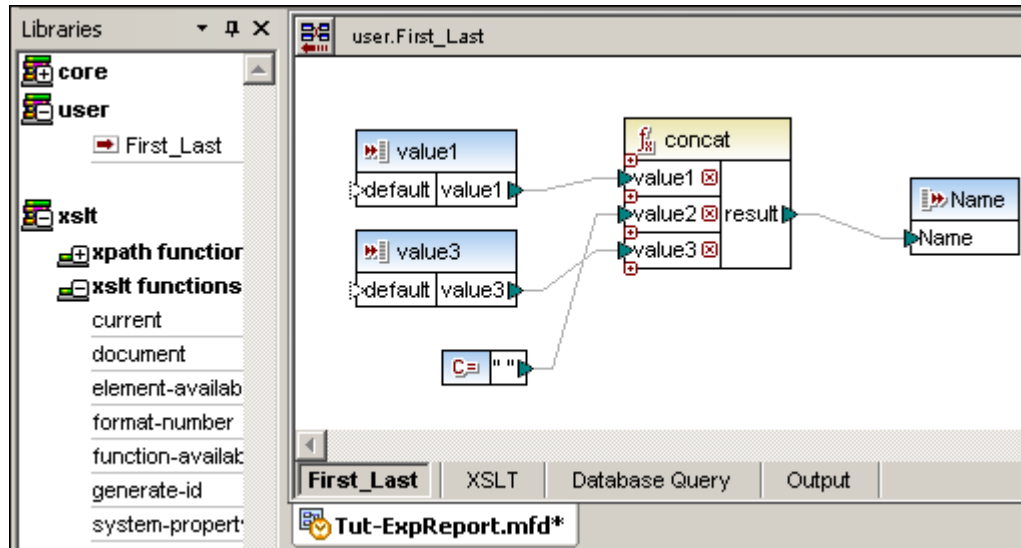
1. Drag to mark both the concat and the constant components (you can also hold down the CTRL key and click the functions individually).




2. Select the menu option **Function | Create User-Defined Function from Selection**.
3. Enter the name of the new user-defined function (First\_Last).  
Note: valid characters are: alphanumeric, a-z, A-Z, 0-9 as well as underscore "\_", hyphen/dash "-" and colon ":".
4. Use the Syntax and Detail fields to add extra information on the new function, and click OK to confirm. The text you enter will appear as a tooltip when the cursor is placed over the function.  
The library name "user" is supplied as a default, you can of course define your own library name in this field.

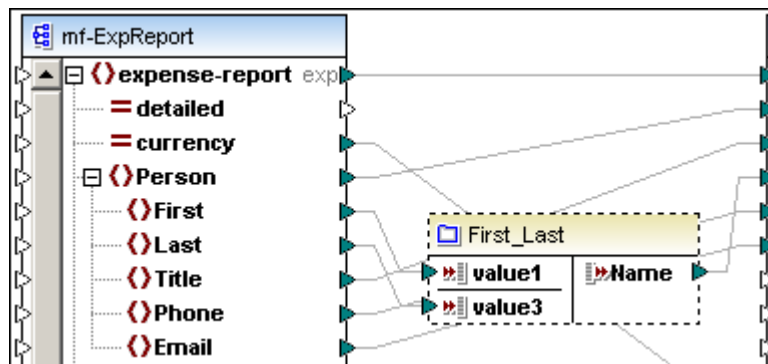
The individual elements that make up the function group appear in a tab with the

function name. The new library "user" appears in the Libraries pane with the function name "First\_Last" below it.



#### XSLT Selected

Click the Home button  to return to the main mapping window. The components have now been combined into a single function component called First\_Last. The input and output parameters have been automatically connected.




Note that inline user-defined functions are displayed with a dashed outline. See [Inline user-defined functions](#) for more information.

Dragging the function name from the Libraries pane and dropping it in the mapping window, allows you to use it anywhere in the current mapping. To use it in a different mapping, please see [Reusing user-defined functions](#)

#### To open a user-defined function:

Do one of the following:

- Double-click the title bar of a user-defined function component or
- Double-click the specific user-defined function in the Libraries window.

This displays the individual components inside the function in a tab of that name. Click the Home button  to return to the main mapping.

- Double clicking a user-defined function of a different \*.mfd file (in the main mapping window) opens that MFD file in a new tab.

### Navigating user-defined functions:

When navigating the various tabs (or user-defined function tabs) in MapForce, a history is automatically generated which allows you to travel forward or backward through the various tabs, by clicking the back/forward icons. The history is session-wide, allowing you to traverse multiple MFD files.



The Home button returns you to the main mapping tab from within the user-defined function.



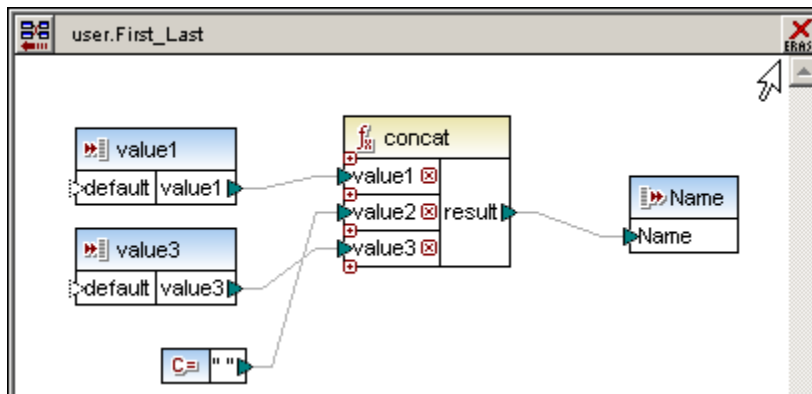
The Back button takes you back through your history



The Forward button moves you forward through your history

### To delete a user-defined function from a library:

1. Double click the specific user-defined function in the Libraries window. The user-defined function is visible in its tab.
2. Click the **Erase** button in the top right of the title bar to delete the function.



### Reusing - exporting and importing User-defined functions:

User-defined functions, defined in one mapping, can be imported into any other mapping:

1. Click the **Add/Remove Libraries** button, at the base of the Libraries pane, click the Add button and select a \*.mfd file that contains the user-defined function(s) you want to import.

The user-defined function now appear in the Libraries window (under "user" if that is the default library you selected). You can of course enter anything in the "Library name" field when defining the user-defined function.

2. Drag the imported function into the mapping to make use of it.

### Library Names

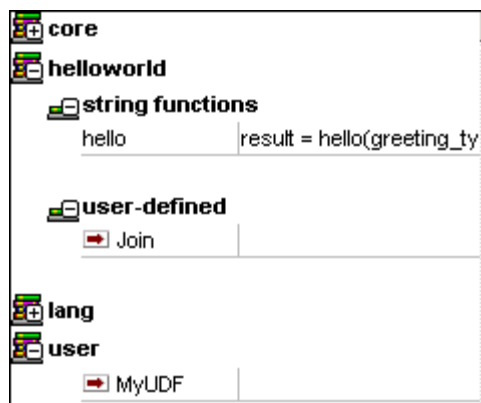
Note: It is possible to use the same library name for user-defined functions in multiple \*.mfd files and/or custom libraries .

Functions from all available sources will appear under the same library name/header in the Libraries pane. However, only the functions in the currently active document can be

**edited** by double-clicking.

In the following example:

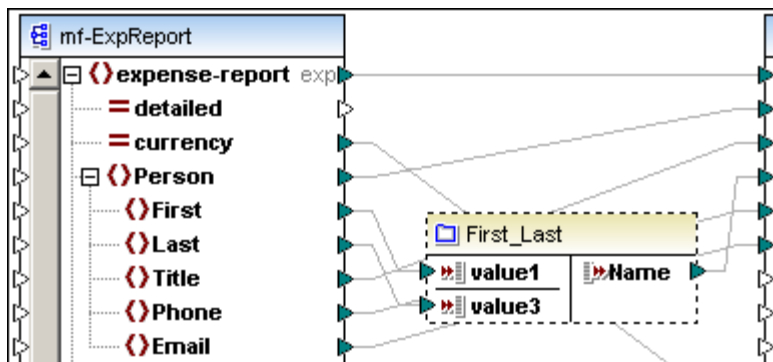
- the function "hello" in the "helloworld" library is imported from a custom,
- the function "Join" in the "helloworld" library is a user-defined function defined in the **current** \*.mfd file and
- the function "MyUDF" in the "user" library is also a user-defined function defined in the current \*.mfd file



**Java Selected**

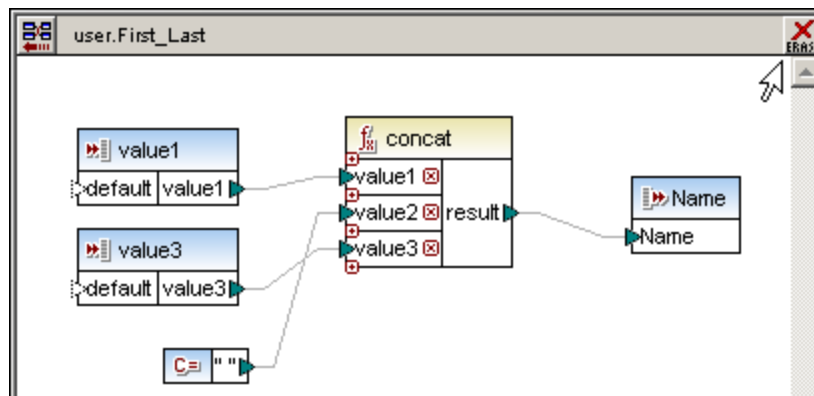
Note that possible changes in imported functions are applied to importing mappings when saving the library \*.mfd file.

### Parameter order in user-defined functions



The parameter order within user-defined functions can be directly influenced:

- Input and output parameters are sorted by their position from top to bottom (from the top left corner of the parameter component).
- If two parameters have the same vertical position, the leftmost takes precedence.
- In the unusual case that two parameters have exactly the same position, the internal component ID is automatically used.

**Notes:**

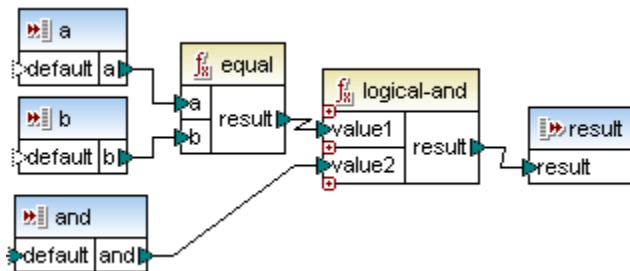
- Component positioning and resizing actions are "undoable".
- Newly added input or output components, are created below the last input or output component.
- Complex and simple parameters can be mixed. The parameter order is derived from the component positions.

### 16.1.1 Function parameters

Function **parameters** are represented inside a user-defined function by **input** and **output components**.

Input components/parameters: **a, b, and**

Output component/parameter: **result**

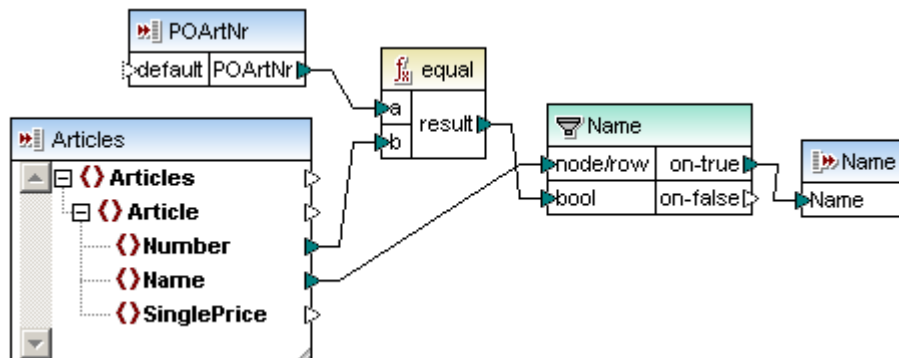


Input parameters are used to pass data from the main mapping into the user-defined function, while output parameters are used to return data back to the main mapping. Note that user-defined functions can also be called from other user-defined functions.

#### Simple and complex parameters

The input and output parameters of user-defined functions can be of various types:

- Simple values, e.g. string or integer
- Complex node trees, e.g. an XML element with attributes and child nodes



Input parameter **POArtNr** is a simple value of datatype "string"

Input parameter **Articles** is a **complex** XML document node tree

Output parameter **Name** is a simple value of type string

Note:

The user-defined functions shown above are all available in the **PersonListByBranchOffice.mfd** file available in the ...\\MapForceExamples folder.

#### Sequences

Sequences are data consisting of a range, or sequence, of values. Simple and complex user-defined **parameters** (input/output) can be defined as sequences in the component properties dialog box.

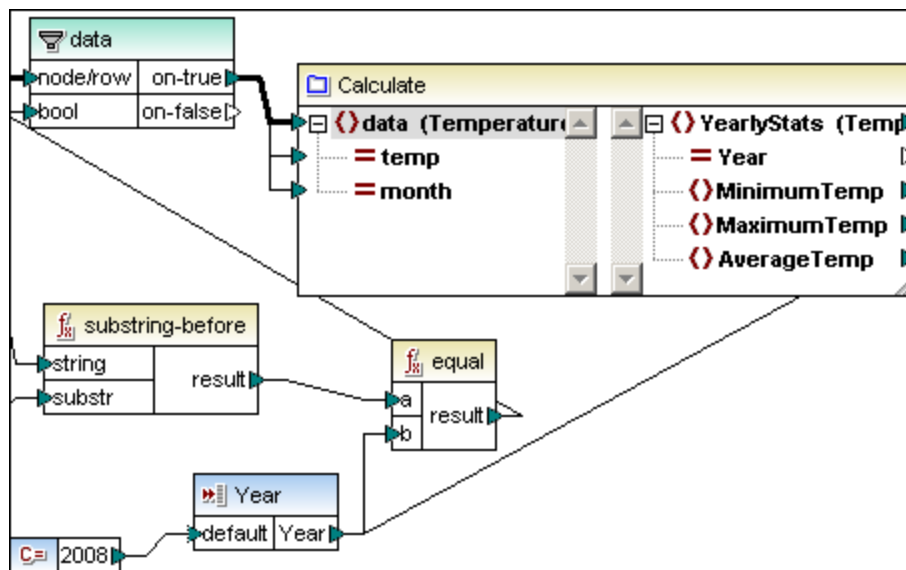
Aggregate functions, e.g. min, max, avg, etc., can use this type of input to supply a single

specific value from the input sequence. Please see [Aggregate functions](#) for more information.

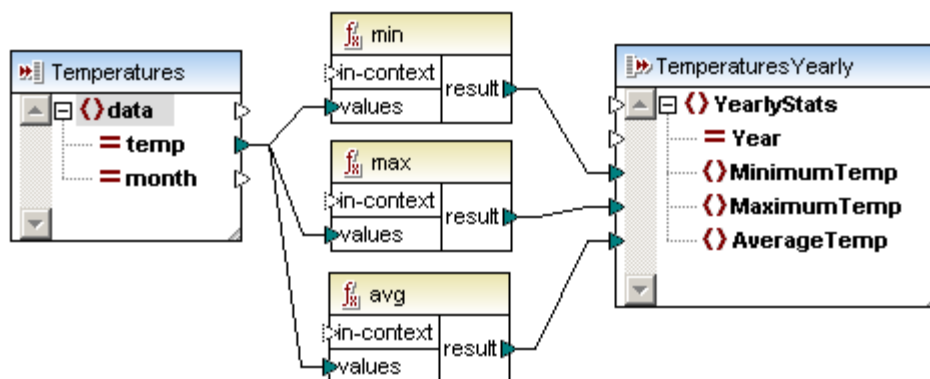
When the **"Input is a Sequence"** check box is active, the component handles the input as a sequence. When inactive, input is handled as a single value.

This type of input data, sequence or non-sequence, determines **how often** the function is called.

- When connected to a **sequence** parameter the user-defined function is called only **once** and the complete sequence is passed into the user-defined function.



The screenshot shows the user-defined function "Calculate" of the **"InputIsSequence.mfd"** mapping in the ...MapForceExamples folder. The **Temperatures** input component (shown below) is defined as a sequence.



- When connected to a **non-sequence** parameter, the user-defined function is called **once** for **each** single item in the sequence.

Please note:

The sequence setting of input/output parameters are ignored when the user-defined function is of type [inline](#).

Connecting an **empty sequence** to a **non-sequence parameter** has the result that the function **is not called at all!**

This can happen if the source structure has **optional** items, or when a filter condition returns no matching items. To avoid this, either use the [substitute-missing](#) function before the function input to ensure that the sequence is never empty, or set the parameter to sequence, and add handling for the empty sequence inside the function.

When a function passes a sequence of multiple values to its output component, and the output component is not set to sequence, only the first result is used when the function is called.

### 16.1.2 Inline and regular user-defined functions

Inline functions differ fundamentally from regular functions, in the way that they are implemented when code is generated.

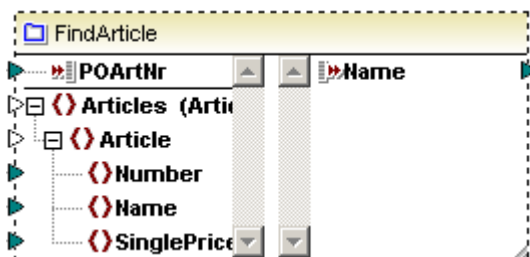
- The code for **inline** type functions is inserted at **all locations** where the user-defined functions are called/used
- The code of a **regular** function is implemented as a function call.

Inline functions thus behave as if they had been replaced by their implementation. That makes them ideal for breaking down a complex mapping into smaller encapsulated parts.

Please note:

using **inline** functions can significantly increase the amount of generated program code! The user-defined function code is actually inserted at all locations where the function is called/used, and thus increases the code size substantially - as opposed to using a regular function.

**INLINE** user-defined functions are shown with a **dashed** outline:



Inline user-defined functions **support**:

- **Multiple output components** within a function

**do not support**:

- The setting of a priority context on a parameter
- Recursive calls to an inline user-defined function

**REGULAR** user-defined functions i.e. non-inline functions are shown with a **solid** outline:



**Regular** (non-inline) user-defined functions **support**:

- Only a **single output component** within a function
- **Recursive** calls (where the exit condition must be supplied, e.g. use an If-Else condition where one branch, or value, exits the recursion)
- Setting a priority context on a parameter

Please note:

Although regular functions **do not** support multiple output components, they **can be created** in this type of function. However, an error message appears when you try to

generate code, or preview the result of the mapping.

If you are not using recursion in your function, you can change the type of the function to "inline".

**do not support:**

- Direct connection of filters to simple non-sequence **input** components
- Sequence or aggregate functions on simple input components (like exists, substitute-missing, sum, group-by, ...)

**Code generation**

The implementation of a regular user-defined function is generated only once as a callable XSLT template or function. Each user-defined function component generates code for a **function call**, where inputs are passed as parameters, and the output is the function (component) return value.

At runtime, all the input parameter values are evaluated first, then the function is called for each occurrence of the input data. See [Function parameters](#) for details about this process.

**To change the user-defined function "type":**

1. Double click the user-defined function to see its constituent components.
2. Select the menu option **Function | Function settings** and click the "Inlined use" checkbox.

**User-defined functions and Copy-all connections**

When creating Copy-all connections between a schema and a complex user-defined function parameter, the two components must be based on the same schema! It is not necessary that they both have the same root elements however. Please see "[Complex output components - defining](#)" for an example.

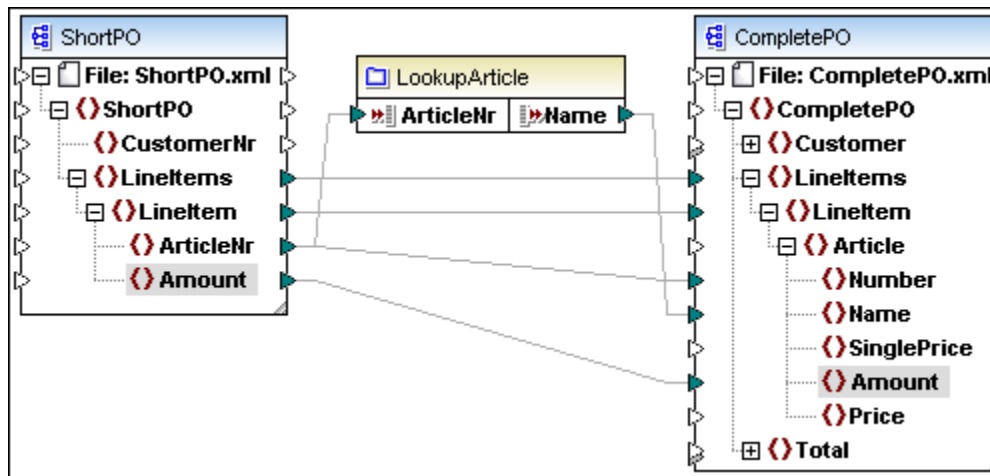
### 16.1.3 Creating a simple look-up function

This example is provided as the **lookup-standard.mfd** file available in the [...MapForceExamples](#) folder.

Aim:

To create a generic look-up function that:

- supplies Articles/Number data from the Articles XML file, to be compared to Article numbers of a different XML file, ShortPO in this case.



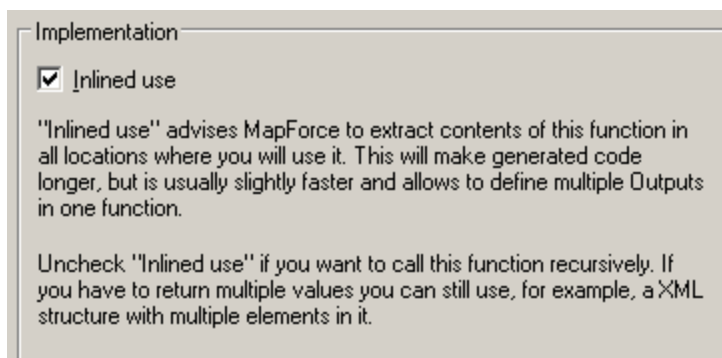
- Insert the ShortPO.xsd and assign ShortPO.xml as the source XML file.
- Insert the CompletePO.xsd schema file, and select CompletePO as the root element.
- Insert a new user-defined function using the method described below.

**To create a user-defined function from scratch:**

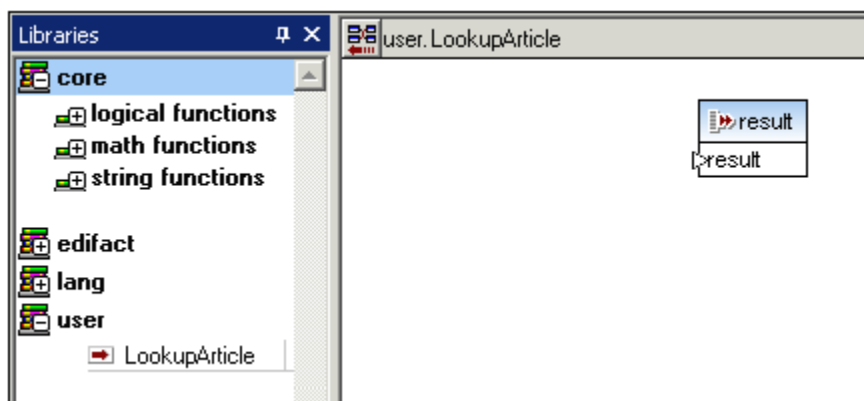
1. Select the menu option **Function | Create User-defined function**.
2. Enter the name of the function e.g. LookupArticle.

The screenshot shows a dialog box titled 'Create User-defined Function'. It has a 'Settings' section with two text input fields: 'Function name:' containing 'LookupArticle' and 'Library name:' containing 'user'. Below these is a 'Description' section with an empty text area. The dialog has a standard Windows-style title bar with a close button (X) in the top right corner.

3. Uncheck the "Inlined use" checkbox and click OK to confirm





A tab only containing only one item, an output function currently called "result", is displayed.

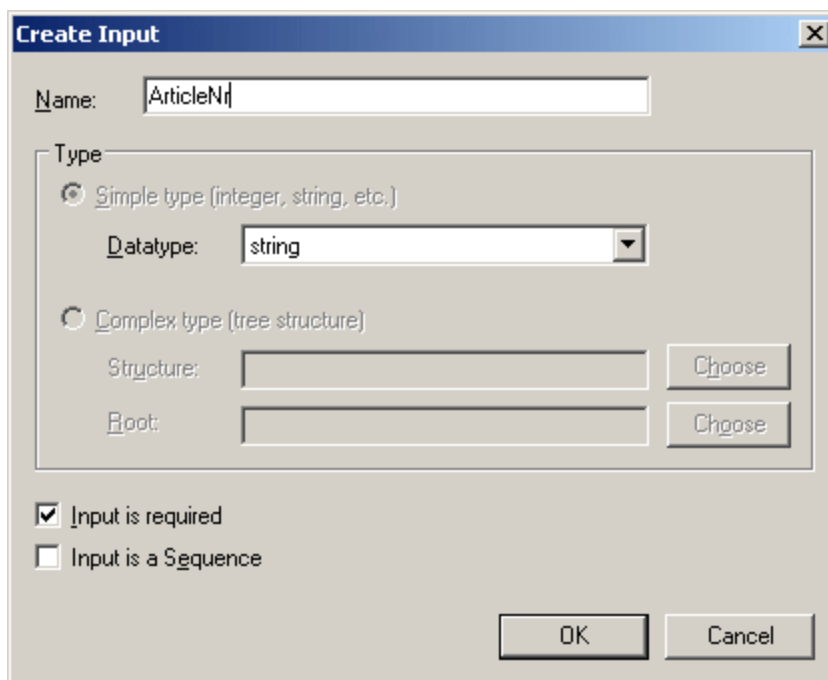


#### Java Selected

This is the working area used to define the user-defined function.

A new library has been created in the Libraries pane with the name "user" and the function name "LookupArticle".

3. Click the **Insert Schema/XML file** icon  to insert the **Articles** schema and select the XML file of the same name to act as the data source.
4. Click the **Insert input component** icon  to insert an input component.
5. Enter the name of the input parameter, ArticleNr in this case, and click OK.



**Create Input**

Name:

Type

☒ Simple type (integer, string, etc.)

Datatype:

☐ Complex type (tree structure)


Structure:

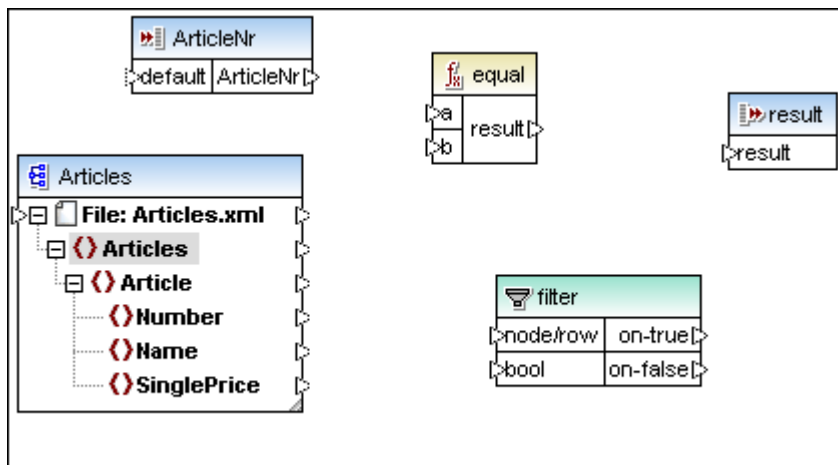
Root:

☒ Input is required

☐ Input is a Sequence

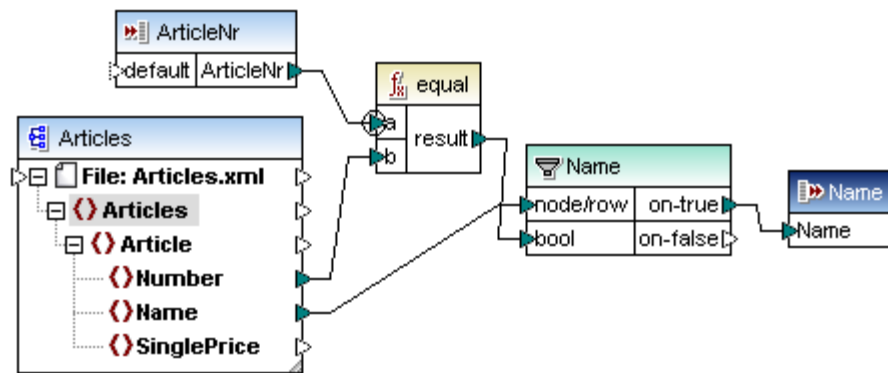
This component acts as a data input to the user-defined function and supplies the input icon of the user-defined function.

6. Insert an **"equal"** component by dragging it from the core library/logical functions group.
7. Insert a **filter** component by clicking the Insert Filter icon  in the toolbar.



Use the diagram below as an aid to creating the mappings in the user-defined function, please take note of the following:

8. Right click the **a** parameter and select **Priority context** from the pop up menu.
9. **Double click** the output function and enter the name of the output parameter, in this case **"Name"**.




This ends the definition of the user-defined function.

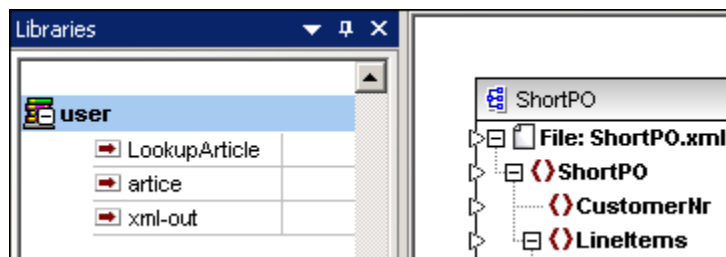
Please note:

Double clicking the **input** and **output** functions opens a dialog box in which you can change the name and datatype of the input parameter, as well as define if the function is to have an input icon (Input is required) and additionally if it should be defined as a sequence.

This user-defined function:

- has one **input** function, ArticleNr, which will receive data from the ShortPO XML file.
- **compares** the ShortPO ArticleNr, with the Article/Number from the **Articles** XML instance file, inserted into the user-defined function for this purpose.
- uses a **filter** component to forward the Article/Name records to the output component, if the comparison returns true.
- has one output function, Name, which will forward the Article Name records to the CompletePO XML file.

10. Click the Home icon  to return to the main mapping.  
The LookupArticle user-defined function, is now available under the **user** library.

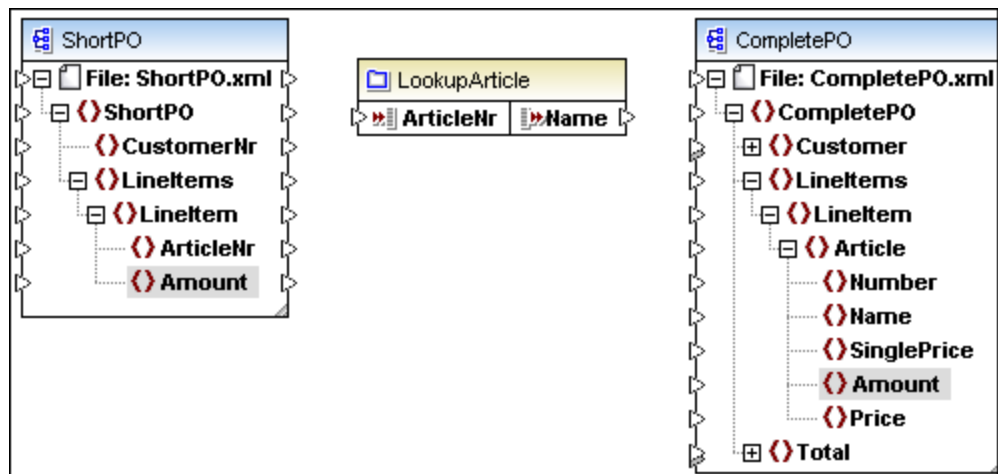


**Java Selected**

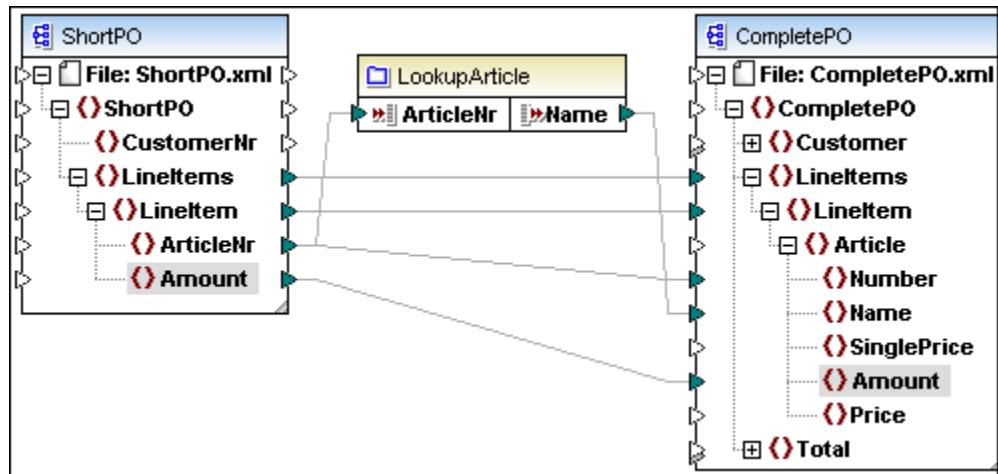
11. Drag the LookupArticle function into the Mapping window.

The user-defined function is displayed:

- with its name "LookupArticle" in the title/function bar,
- with named input and output icons.



10. Create the connections displayed in the graphic below and click the Output tab to see the result of the mapping.



### 16.1.4 Complex user-defined function - XML node as input

This example is provided as the **lookup-udf-in.mfd** file available in the [.../MapForceExamples](#) folder. What this section will show, is how to define an inline user-defined function that contains a complex input component.

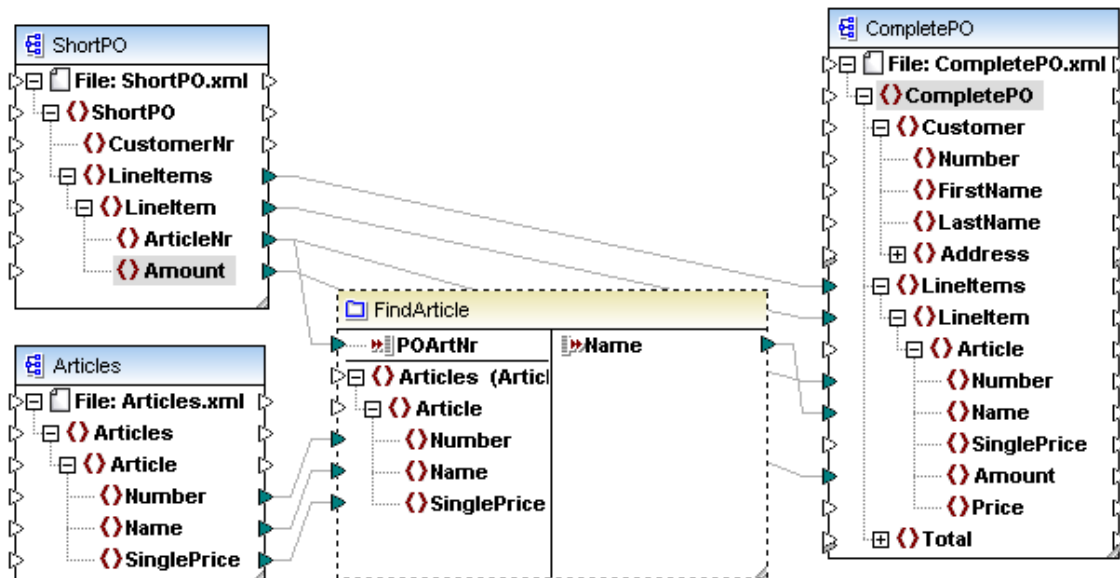
Note that the user-defined function "FindArticle" consists of two halves.

A left half which contains the input parameters:

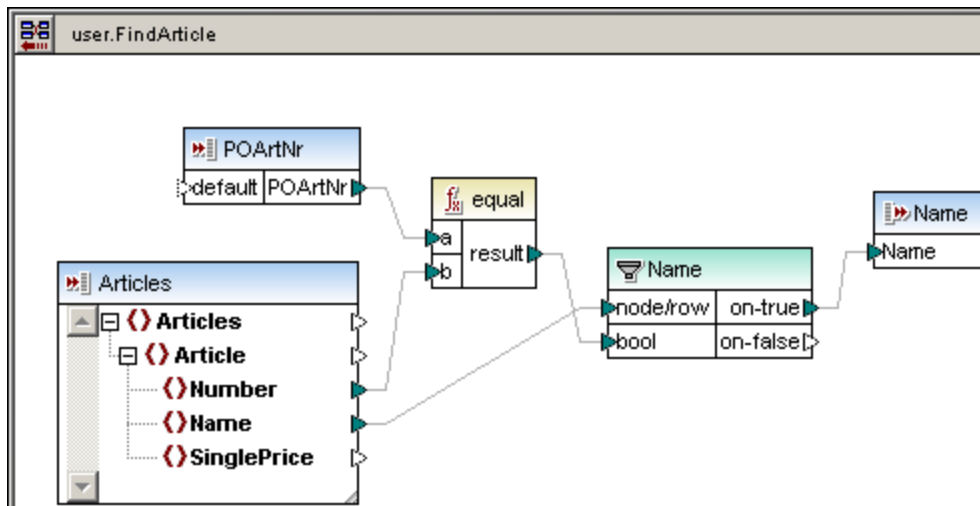
- a simple input parameter **POArtNr**
- a complex input component **Articles**, with mappings directly to its XML child nodes

A right half which contains:

- a simple output parameter called "Name".



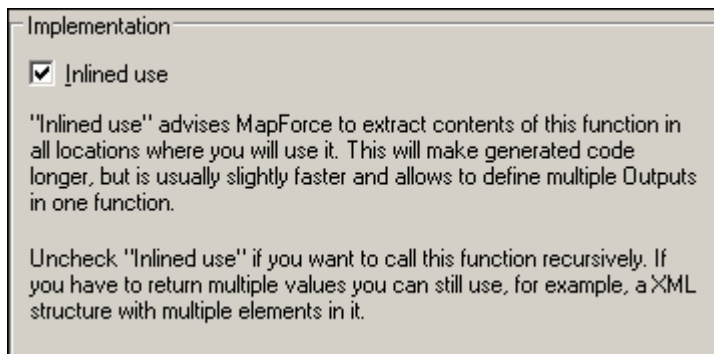
The screenshot below shows the constituent components of the user-defined function, the two input components at left and the output component at right.




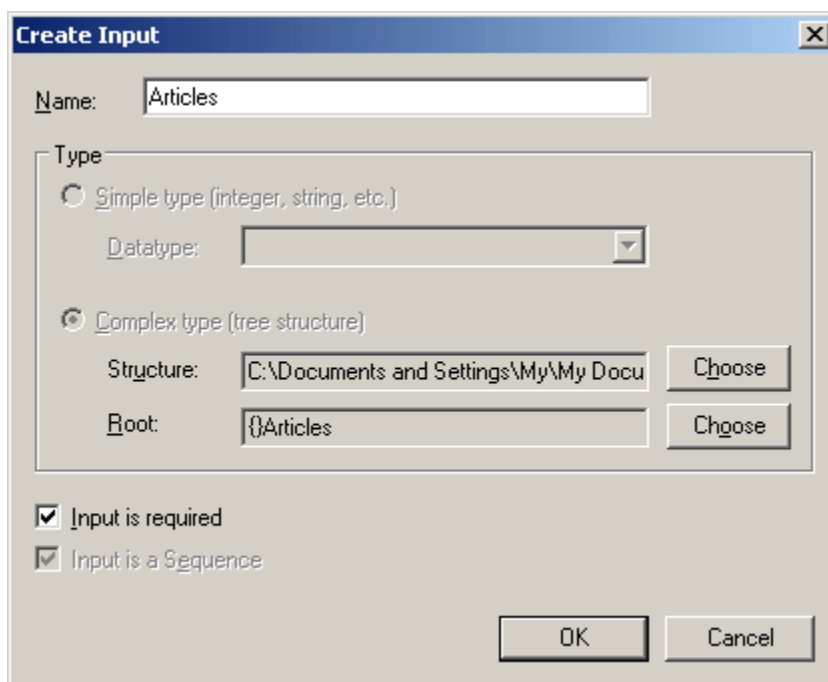
### Complex input components - defining

#### Defining complex input components:

1. Create a user-defined function in the usual manner, i.e. **Function | Create User-Defined function** and click OK to confirm. Note that the **Inlined use** check box is automatically selected.



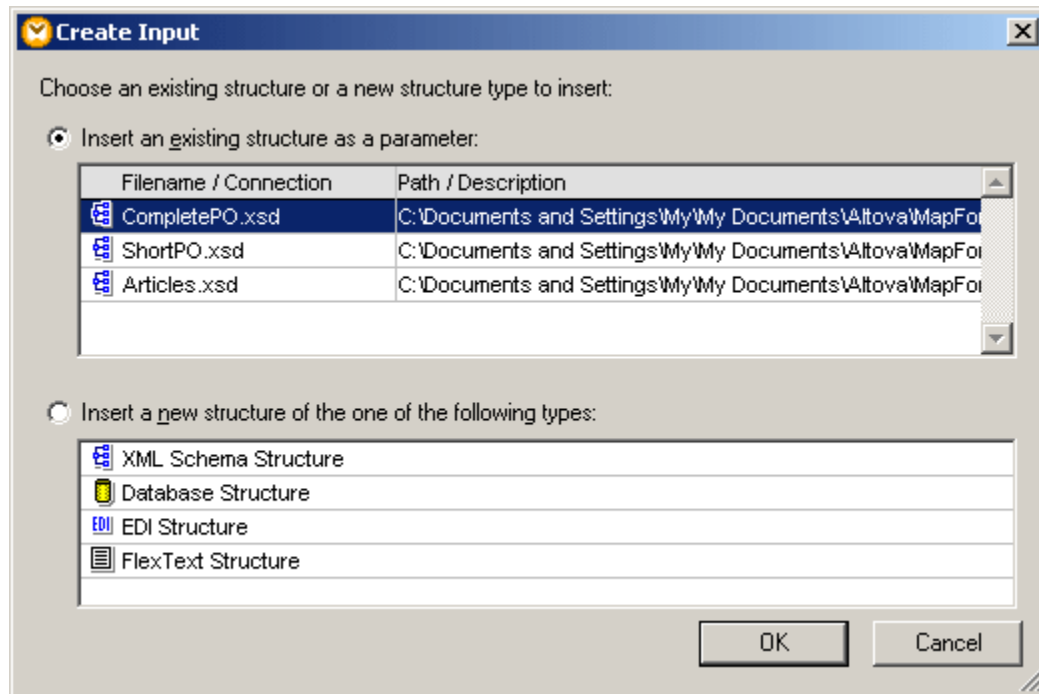
2. Click the **Insert input component** icon  in the icon bar.
3. Enter the name of the input component into the Name field.



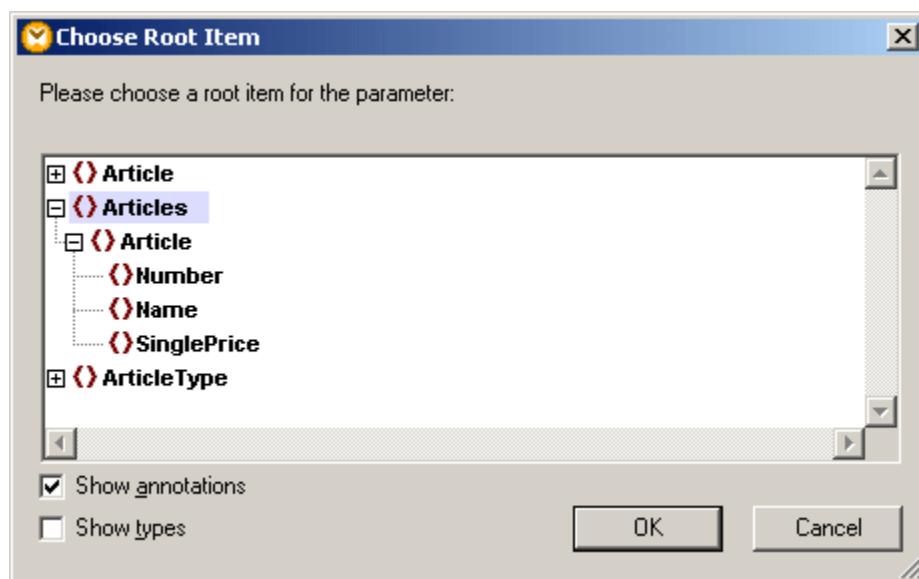
4. Click the **Complex type (tree structure)** radio button, then click the **"Choose"** button next to the Structure field. This opens another dialog box.

The top list box displays the **existing** components in the mapping (three schemas if you opened the example mapping). Note that this list contains all of the components that have been inserted into the active mapping: e.g. XML schema file.


The lower list box allows you to select a new complex data structure i.e. XML Schema file.

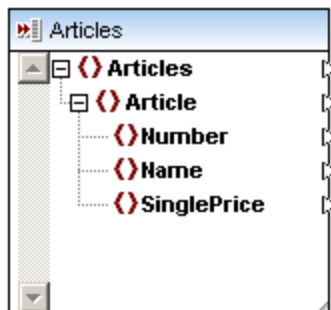


5. Click "Insert a new structure..." radio button, select the XML Schema Structure entry, and click OK to continue.
6. Select **Articles.xsd** from the "Open" dialog box.
7. Click the element that you would like to become the root element in the component, e.g. Articles, and click OK, then OK again to close both dialog boxes.

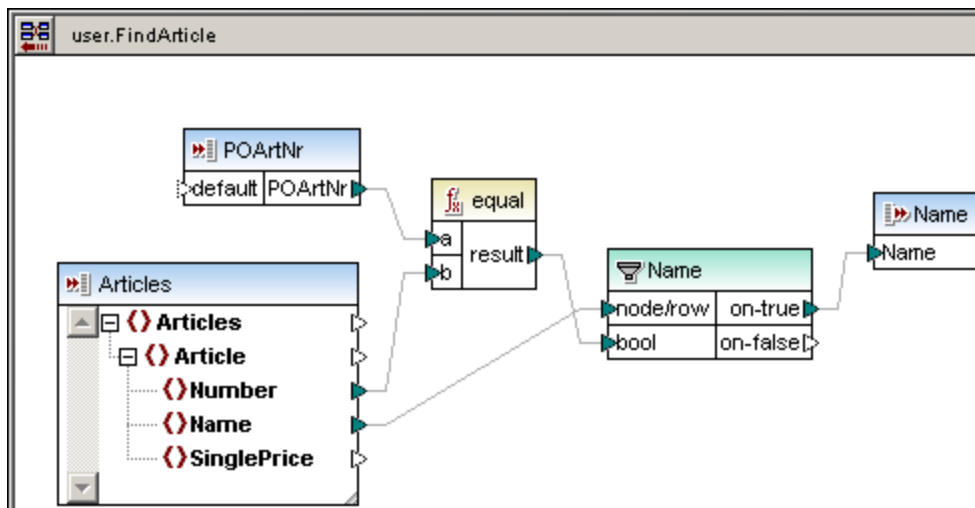


The Articles component is inserted into the user-defined function. Please note the input

icon  to the left of the component name. This shows that the component is used as a complex input component.



8. Insert the rest of the components as shown in the screenshot below, namely: a second "simple" input component (called POArtNr), filter, equal and output component (called Name), and connect them as shown.

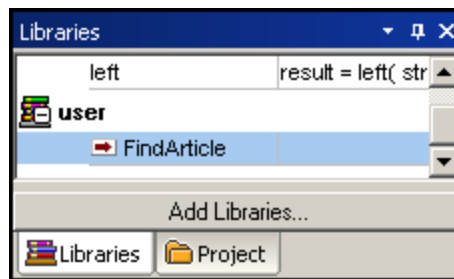


Please note:

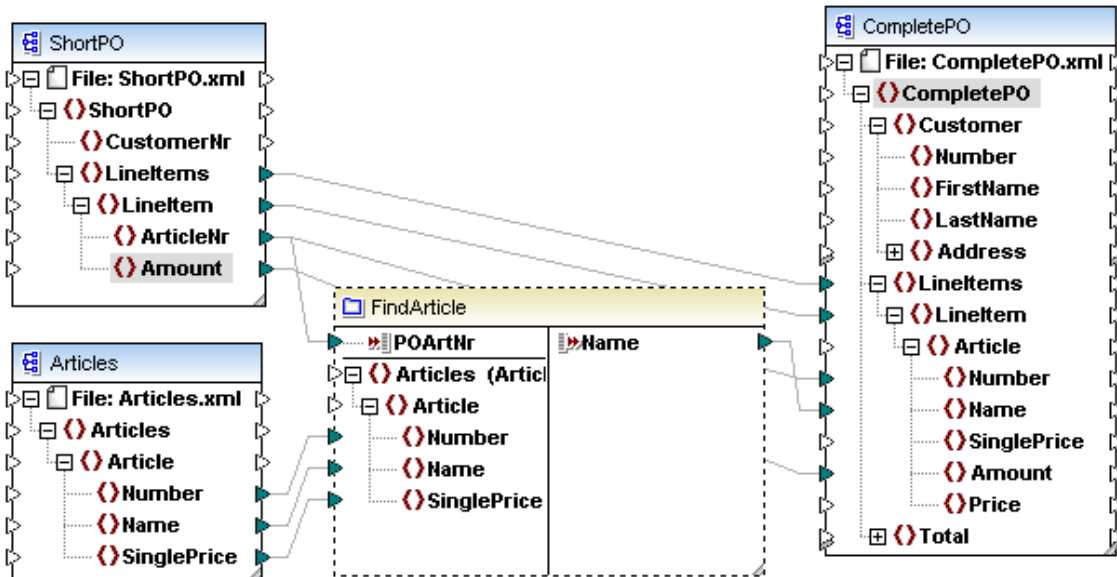
- The **Articles** input component receives its data from **outside** of the user-defined function. Input icons that allow mapping to this component, are available there.
- An XML **instance** file to provide data from within the user-defined function, cannot be assigned to a complex input component.
- The other input component POArtNr, supplies the ShortPO article number data to which the **Article | Number** is compared.
- The filter component filters the records where both numbers are identical, and passes them on to the output component.

10. Click the Home icon  to return to the mapping.

11. Drag the newly created user-defined component from the Libraries pane into the mapping.

**Java Selected**

12. Create the connections as shown in the screenshot below.



The left half contains the input parameters to which items from two schema/xml files are mapped:

- **ShortPO** supplies the data for the input component **POArtNr**.
- **Articles** supplies the data for the complex input component. The Articles.xml instance file was assigned to the Articles schema file when the component was inserted.
- The complex input component **Articles** with its XML child nodes, to which data has been mapped from the Articles component.

The right half contains:

- a simple output parameter called "**Name**", which passes on the filtered line items which have the same Article number, to the Name item of Complete PO.

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <CompletePO xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3  <LinItems>
4  <LinItem>
5  <Article>
6  <Number>3</Number>
7  <Name>Pants</Name>
8  <Amount>5</Amount>
9  </Article>
10 </LinItem>
11 <LinItem>
12 <Article>
13 <Number>1</Number>
14 <Name>T-Shirt</Name>
15 <Amount>17</Amount>
16 </Article>
17 </LinItem>
18 </LinItems>
19 </CompletePO>
```

Please note:

When creating **Copy-all** connections between a schema and a user-defined function parameter, the two components must be based on the same schema! It is not necessary that they both have the same root elements however.

### 16.1.5 Complex user-defined function - XML node as output

This example is provided as the **lookup-udf-out.mfd** file available in the [...MapForceExamples](#) folder. What this section will show is how to define an inline user-defined function that allows a complex output component.

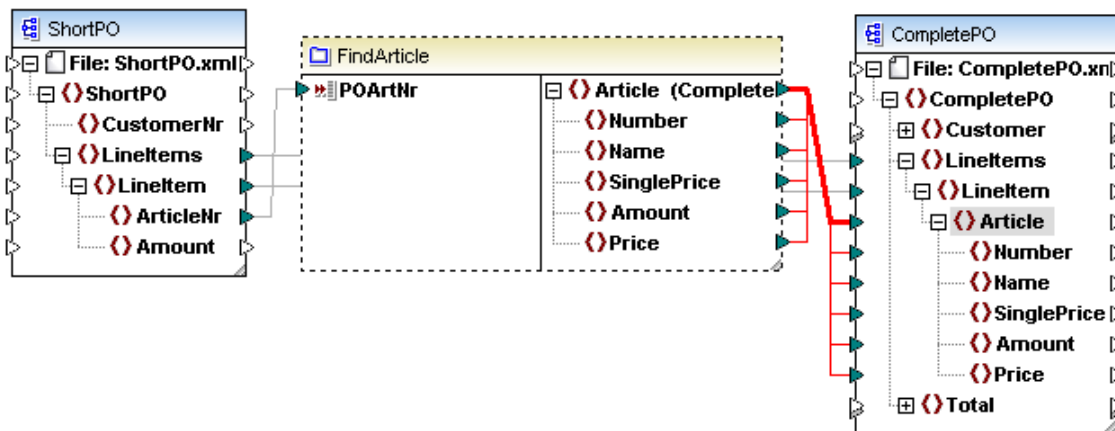
Note that the user-defined function FindArticle consists of two halves.

A left half which contains the input parameter:

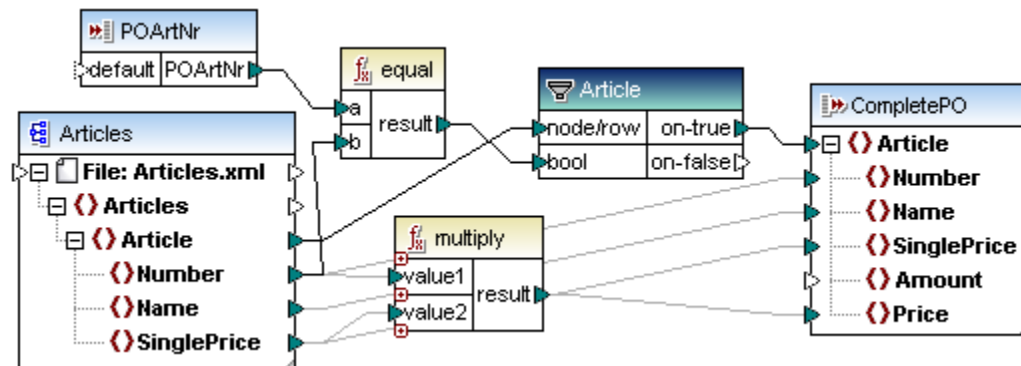
- a simple input parameter **POArtNr**

A right half which contains:

- a complex output component **Article (CompletePO)** with its XML child nodes mapped to CompletePO.



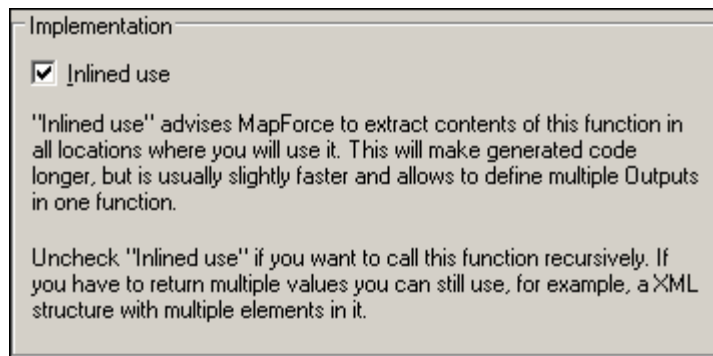
The screenshot below shows the constituent components of the user-defined function, the input components at left and the complex output component at right.




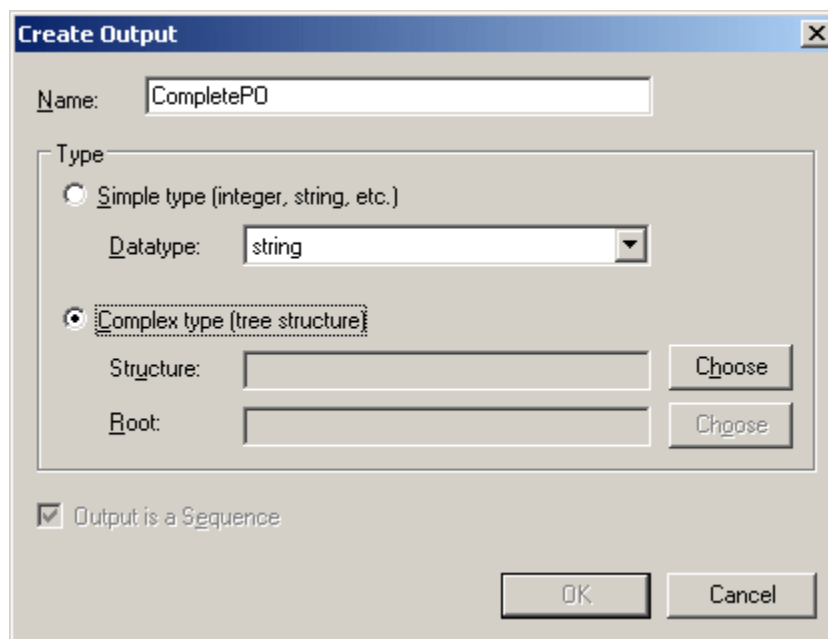
#### Complex output components - defining

##### Defining complex output components:

1. Create a user-defined function in the usual manner, i.e. **Function | Create User-Defined function** name it **FindArticle**, and click OK to confirm. Note that the **Inline...** option is automatically selected.



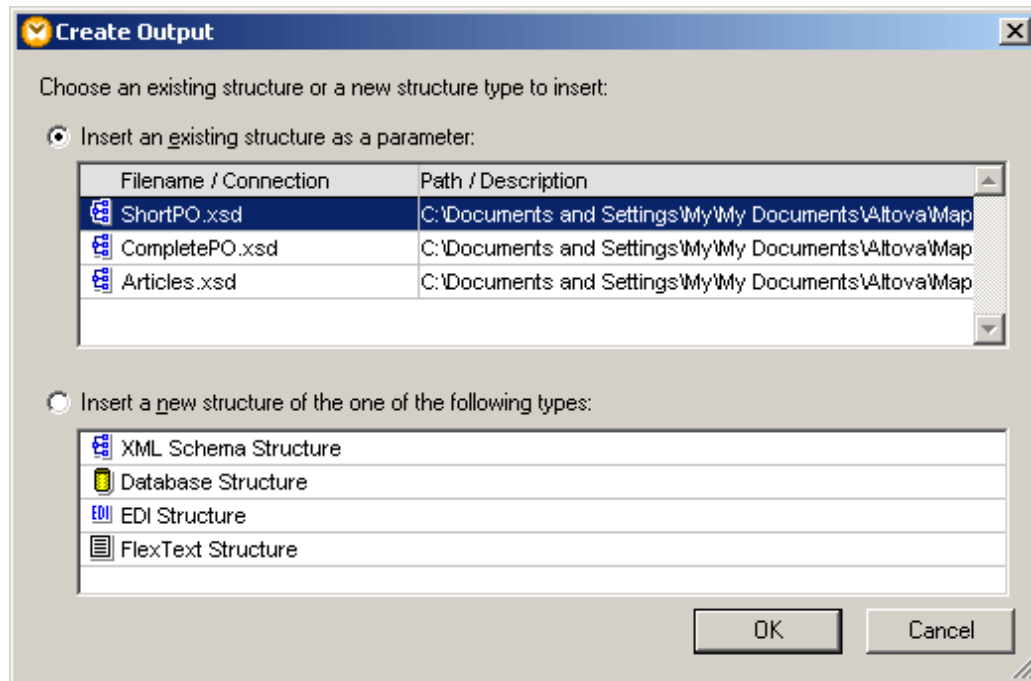
2. Click the Insert **Output** icon  in the icon bar, and enter a name e.g. CompletePO.



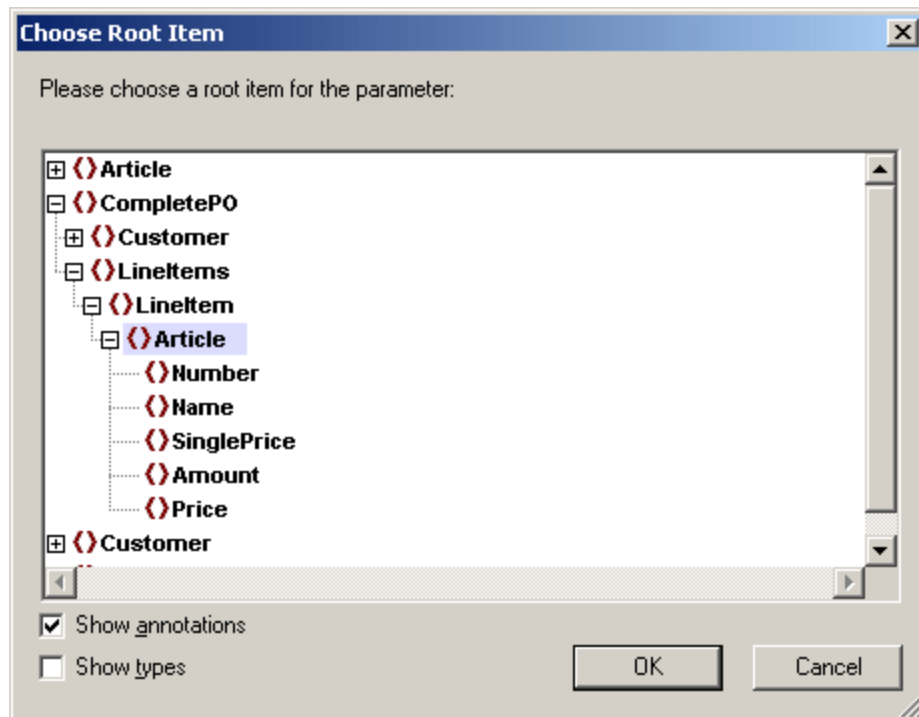
3. Click the **Complex type...** radio button, then click the "**Choose**" button. This opens another dialog box.


The top list box displays the **existing** components in the mapping, (three schemas if you opened the example file). Note that this list contains all of the components that have been inserted into the active mapping: e.g. XML Schema file.

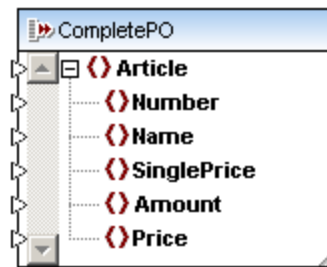
The lower list box allows you to select a new complex data structure i.e. XML Schema file.



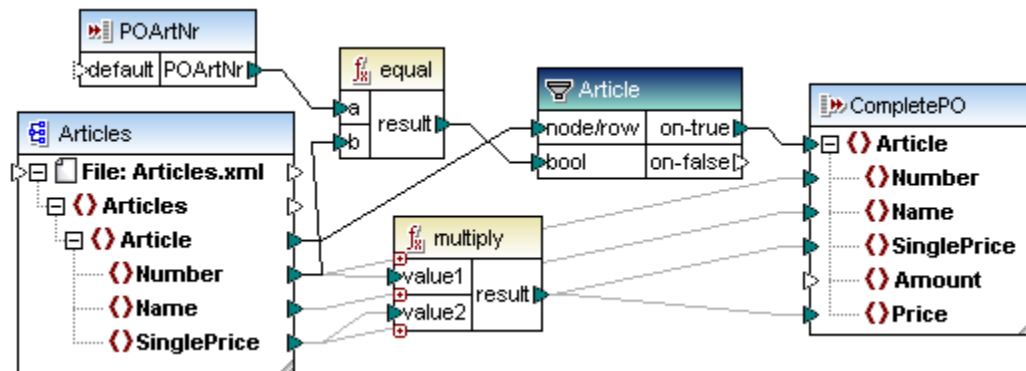
4. Click "Insert new structure..." radio button, select the XML Schema Structure entry, and click OK to continue.
5. Select the **CompletePO.xsd** from the "Open" dialog box.
6. Click the element that you would like to become the root element in the component, e.g. **Article**, and click OK, then OK again to close the dialog boxes.



The CompletePO component is inserted into the user-defined function. Please note the output icon  to the left of the component name. This shows that the component is used as a complex output component.




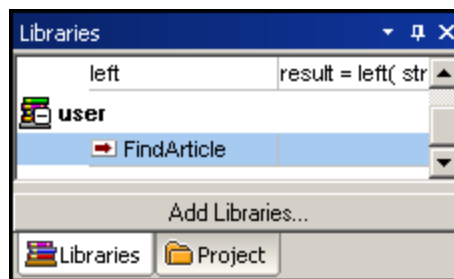
7. Insert the Articles schema/XML file into the user-defined function and assign the **Articles.xml** as the XML instance.
8. Insert the rest of the components as shown in the screenshot below, namely: the "simple" input components (POArtNr), filter, equal and multiply components, and connect them as shown.



Please note:

- The **Articles** component receives its data from the Articles.xml instance file, within the user-defined function.
- The input components supply the POArtNr (article number) and Amount data to which the Articles | Number & Price are compared.
- The filter component filters the records where both numbers are identical, and passes them on to the CompletePO output component.

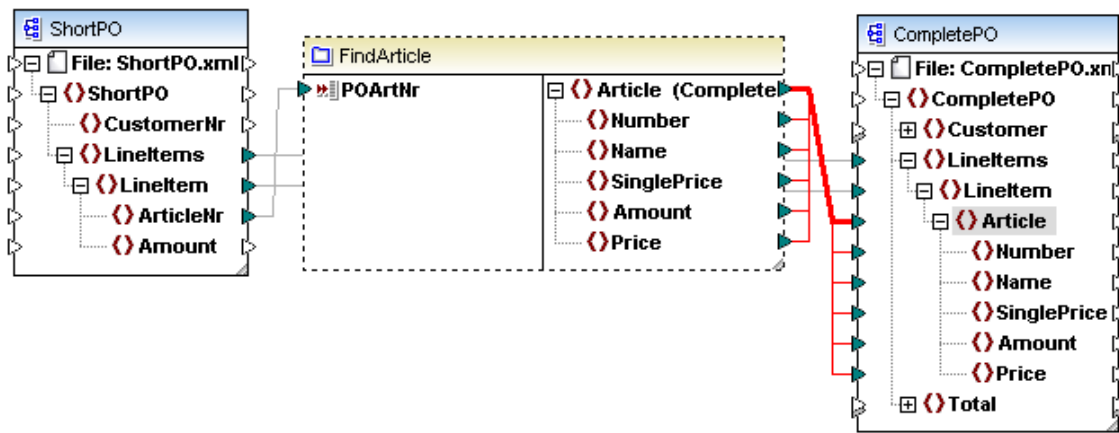
9. Click the Home icon  to return to the mapping.
10. Drag the newly created user-defined component from the Libraries pane into the mapping.



**Java Selected**

11. Create the connections as shown in the screenshot below. Having created the Article (CompletePO) connector to the target, right click it and

select "Copy-all" from the context menu. The rest of the connectors are automatically generated, and are highlighted in the screenshot below.



Please note:

When creating **Copy-all** connections between a schema and a user-defined function of type "Inline", the two components must be based on the same schema! It is not necessary that they both have the same root elements however.

The left half contains the input parameter to which a single item is mapped:

- ShortPO supplies the article number to the **POArtNr** input component.

The right half contains:

- a complex output component called "**Article (CompletePO)**" with its XML child nodes, which maps the filtered items, of the same Article number, to CompletePO.

```

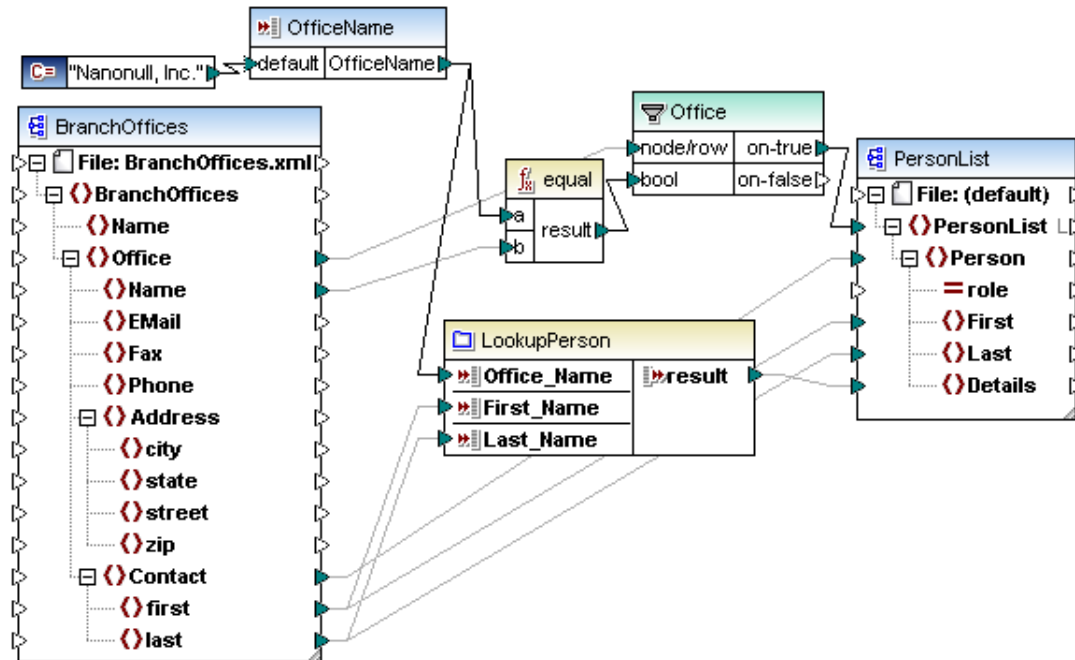
1  <?xml version="1.0" encoding="UTF-8"?>
2  <CompletePO xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespace
3  <LineItems>
4  <LineItem>
5  <Article>
6  <Number>3</Number>
7  <Name>Pants</Name>
8  <SinglePrice>34</SinglePrice>
9  <Price>102</Price>
10 </Article>
11 </LineItem>
12 <LineItem>
13 <Article>
14 <Number>1</Number>
15 <Name>T-Shirt</Name>
16 <SinglePrice>25</SinglePrice>
17 <Price>25</Price>
18 </Article>

```

### 16.1.6 User-defined function - example

The **PersonListByBranchOffice.mfd** file available in the [...MapForceExamples](#) folder, describes the following features in greater detail:

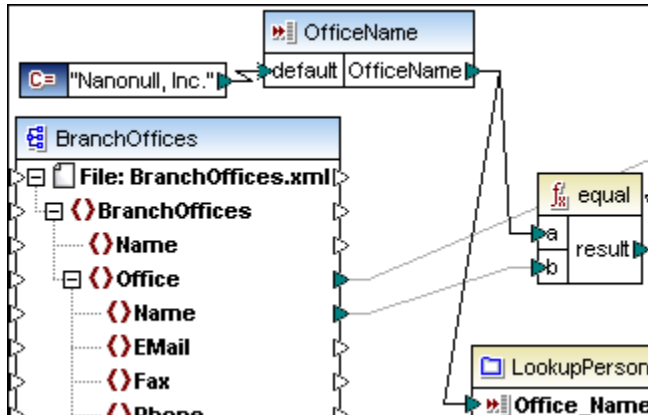
- Nested User-defined functions e.g. **LookupPerson**
- Look-up functions that generate a string output e.g. **LookupPerson**
- **Optional** input-parameters which can also supply a **default** value e.g. the **EqualAnd** component (contained in the LookupPerson component)
- **Configurable** input parameters, which can also double as a command line parameter(s) when executing the generated mapping code!



### Configurable input parameters

The input component (OfficeName) receives data supplied when a mapping is executed. This is possible in two ways:

- as a **command line** parameter when executing the generated code, e.g. Mapping.exe /OfficeName "Nanonull Partners, Inc."
- as a **preview** value when using the Built-in execution engine to preview the data in the Output window.



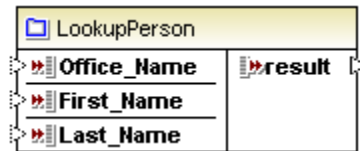
#### To define the Input value:

1. Double click the input component and enter a different value in the "Value" text box of the Preview Mode group e.g. "Nanonull Partners, Inc.", and click OK to confirm.
2. Click the Output tab to see the effect.  
A different set of persons are now displayed.

Please note that the data entered in this dialog box is only used in "**preview**" mode i.e. when clicking the Output tab. If a value is not entered, or the check box is deactivated, then the data mapped to the input icon "default" is used.

Please see [Input values, overrides and command line parameters](#) for more information.

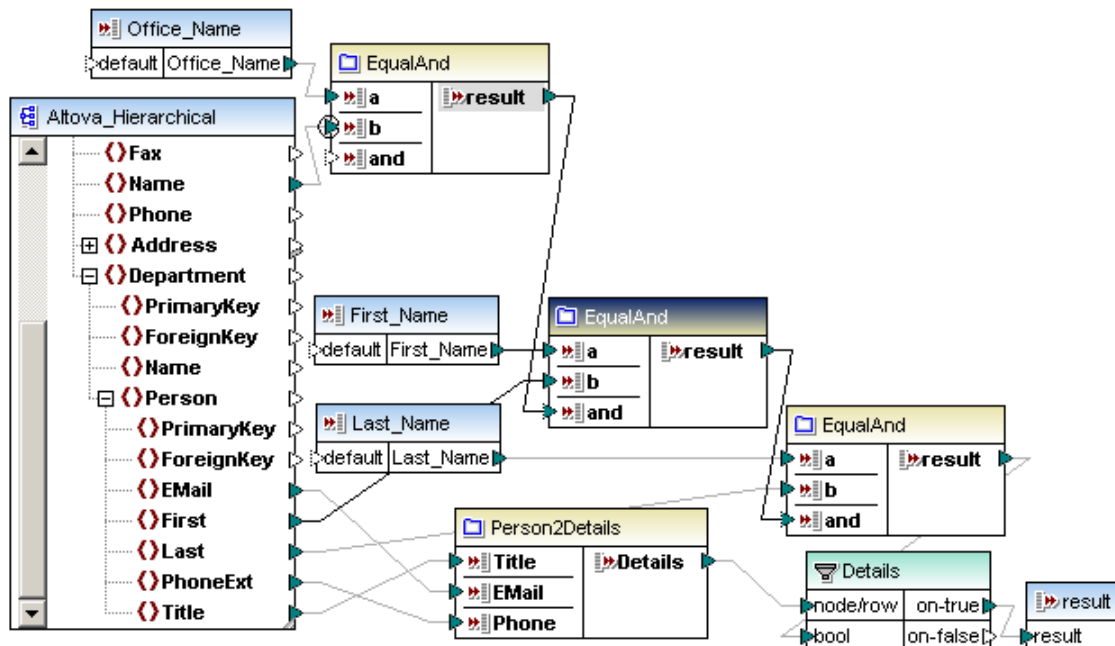
### LookupPerson component



Double clicking this user-defined component displays its constituent components shown below. What this component does is:

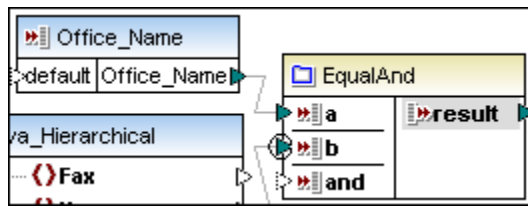
- **Compares** the Office, First, and Last names of BranchOffices.xml, with the same fields of the Altova\_Hierarchical.xml file, using the **input** components and the **EqualAnd** user-defined components.
- **Combines** the Email, PhoneExt and Title items using the **Person2Details** user-defined function
- **Passes on** the combined person data to the **output** component if the previous EqualAnd comparisons are all true (i.e. supplied "true" to the filter component).

A user-defined function always outputs a value, which may even be an empty string! This would be the case if the filter component bool value is false. Only an empty string would be output instead of data supplied by the Person2Details component.



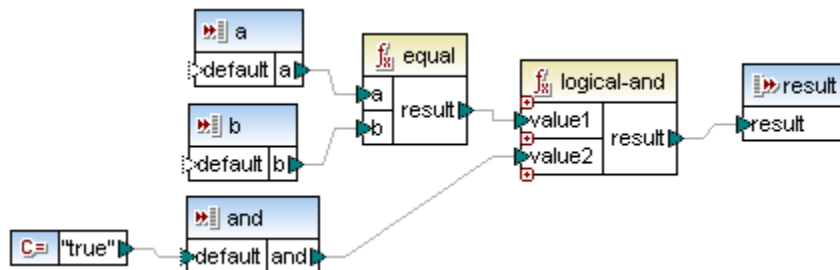
- The three **input** components, Office\_Name, First\_Name, Last\_Name, receive their data from the BranchOffices.xml file.
- The **EqualAnd** component compares two values and provides an **optional** comparison value, as well as a default value.
- Person2Details combines three person fields and passes on the result to the filter component.

### EqualAnd component



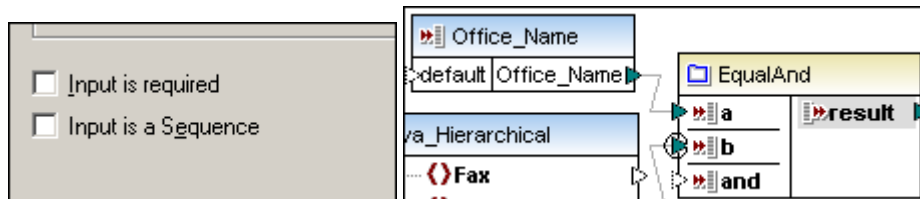
Double clicking this user-defined component displays its constituent components shown below. What this component does is:

- Compare two input parameters **a** and **b**, and pass the result on to the logical-and component. Note that the **b** parameter has been defined as the **priority context** (right click the icon to do so). This ensures that the person data of the specific office, supplied by the input parameter **a**, is processed first.
- **Logical-and** the result of the first comparison, with an **optional** input parameter, "and".
- Pass on the boolean value of this comparison to the output parameter.



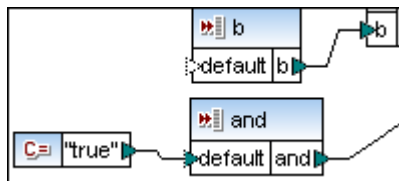
### Optional parameters

Double clicking the "and" parameter, of the EqualAnd user-defined function shown above, allows you to make parameters optional, by unchecking the "Input is required" check box.



If "Input is required" is **unchecked**, then:

- A mapping connector is not required for the input icon of this user-defined function, e.g. the **and** parameter of the first EqualAnd function, does not have an input connector. The input icon has a dashed outline to show this visually.
- A **default** value can be supplied by connecting a component, within the user-defined function e.g. using a constant component containing the value "true".

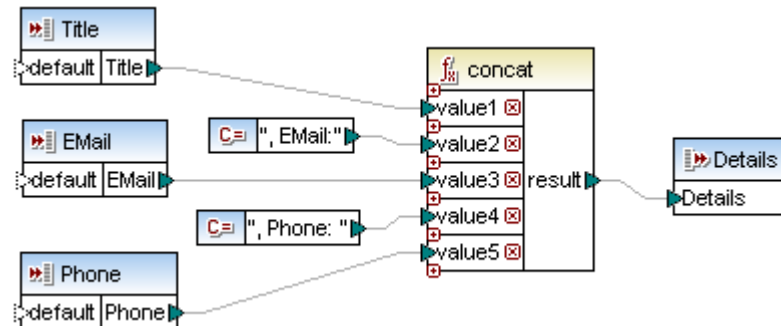


- A mapping from another item, mapped to the optional Input, takes precedence over the default value. E.g. the "and" parameter of second EqualAnd function, receives input data from the "result" parameter of the first EqualAnd user-defined function.

**Person2Details** component

Double clicking this user-defined component displays its constituent components shown below. What this component does is:

- Concatenate three inputs and pass on the result string to the output parameter.
- Double clicking an output parameter allows you to change the parameter name (Details), and select the datatype (String).



## 16.2 Adding custom XSLT and XQuery functions

MapForce allows you to extend the installed XSLT function libraries with your own custom functions. This option is made available when you select XSLT as the output, by clicking the XSLT icon, or selecting **Output | XSLT 1.0**.

XSLT files appear as libraries, and display all **named templates** as functions below the library name.

- Functions must be declared as Named Templates conforming to the XSLT 1.0 specification in the XSLT file.
- If the imported XSLT file imports or includes other XSLT files, then these XSLT files and functions will be imported as well.
- Each named template appears as a function below each library name.
- The amount of mappable input icons depends on the number of parameters used in the template call; optional parameters are also supported.
- Updates to imported XSLT files occur at program start or whenever the files change.
- Namespaces are supported

Please note:

When writing named templates please make sure that the XPath statements used in the template are bound to the correct namespace(s). The namespace bindings of the mapping can be viewed by clicking the XSLT tab. Please see: the [XSLT 1.0](#) implementation specific document for more information.

### 16.2.1 Adding custom XSLT 1.0 functions

The files needed for the simple example shown below, are available in the [...MapForceExamples](#) directory.

- Name-splitter.xslt
- Name-splitter.xml (the XML instance file for Customers.xsd)
- Customers.xsd
- CompletePO.xsd

Please see: [Aggregate functions](#) for an additional example of using named templates to sum nodes.

#### To add a custom XSLT function:

1. Create an XSLT file that achieves the transformation/result you want.  
The example below, **Name-splitter.xslt**, shows a named template called **"tokenize"** with a single parameter "string". What the template does, is work through an input string and separate capitalized characters with a space for each occurrence.

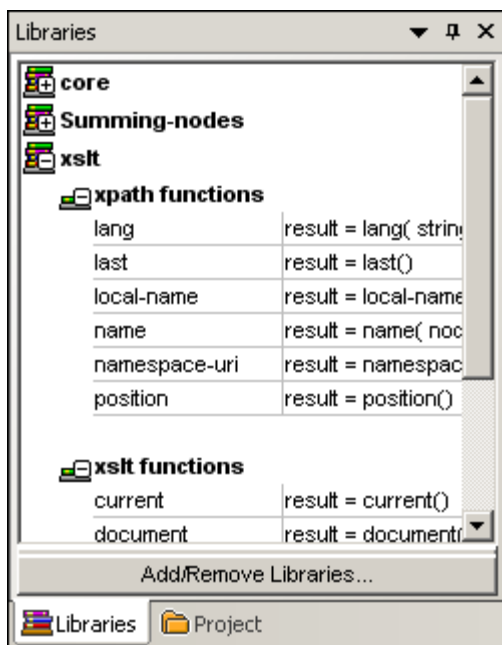


```

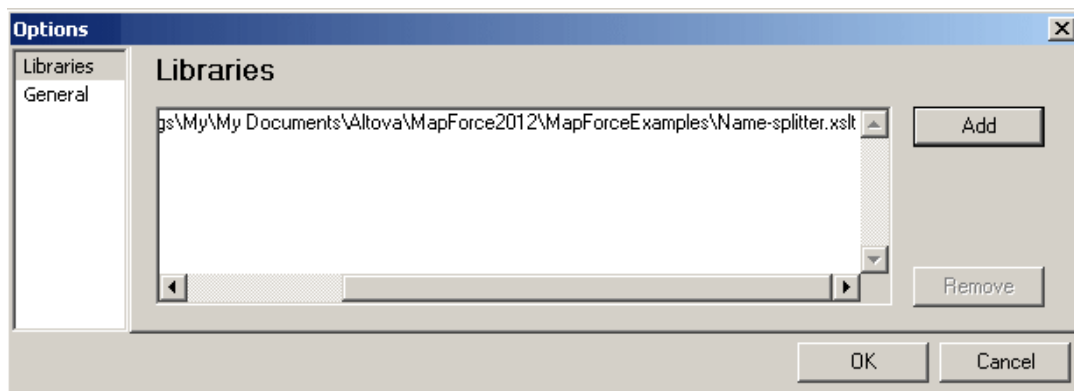
2  <xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
3  <xsl:output method="xml" version="1.0" encoding="UTF-8" indent="yes"/>
4
5  <xsl:template match="*"
6  <xsl:for-each select="."
7  <xsl:call-template name="tokenize"
8  <xsl:with-param name="string" select="."
9  </xsl:call-template>
10 </xsl:for-each>
11 </xsl:template>
12
13 <xsl:template name="tokenize"
14 <xsl:param name="string" select="."
15 <xsl:variable name="caps" select="translate($string, '-abcdefghijklmnopqrstuvwxyz'
16 <xsl:variable name="capscount" select="string-length($caps)"
17 <xsl:variable name="token">

```

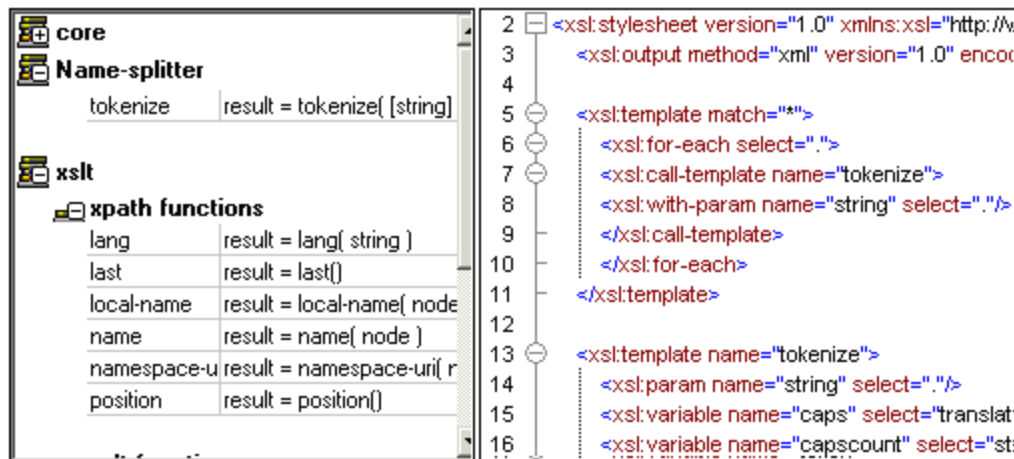
2. Click the **Add/Remove Libraries** button, and then click the Add button in the following dialog box.

**XSLT Selected**

3. Select the XSL, or XSLT file, that contains the named template you want to act as a function, in this case **Name-splitter.xslt**. The XSLT file appears in the Libraries tab.

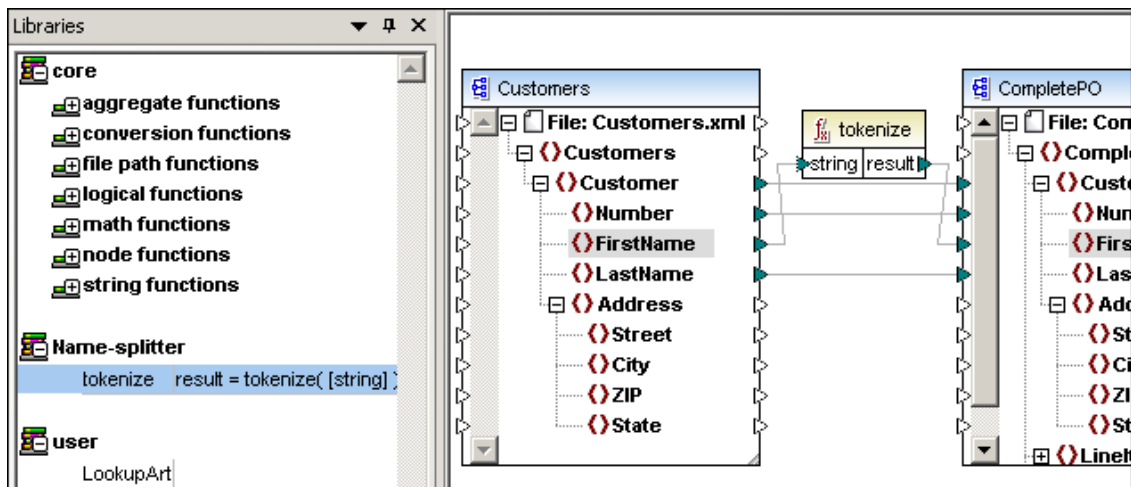


4. Click **OK** to insert the new function.

**XSLT Selected**

The XSLT file name appears in the library window, along with the function(s) defined as named templates, below it. In this example **Name-splitter** with the **tokenize** function.

5. Drag the function into the Mapping window, to use it in your current mapping, and map the necessary items, as shown in the screenshot below.

**XSLT Selected**

6. Click the XSLT tab to see the generated XSLT code.



```

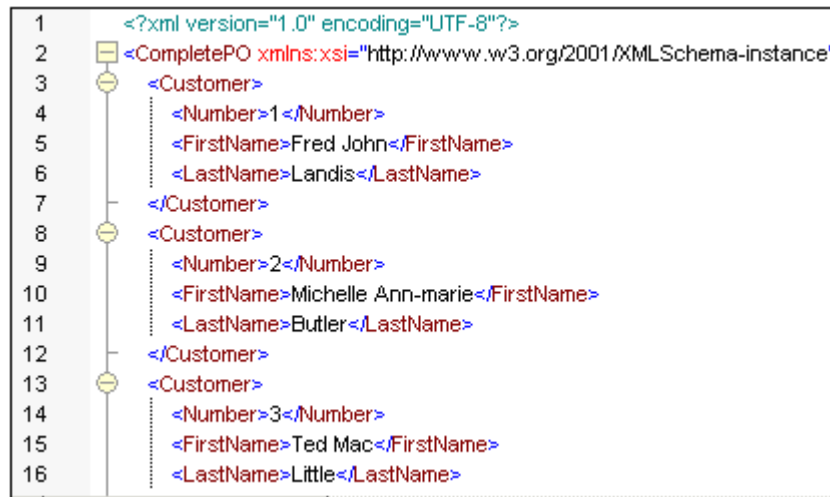
<!-->
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <xsl:output method="xml" encoding="UTF-8"/>
  <xsl:include href="C:\Program Files\Altova\MAPFORCE2004\MapForceExamples\Name-splitter.xslt"/>
  <xsl:template match="/Customers">
    <CompletePO>
      <xsl:attribute name="xsi:noNamespaceSchemaLocation" value="C:/PROGRA~1/Altova/MAPFORCE2004/MapForceExamples/Name-splitter.xslt"/>
      <xsl:for-each select="Customer">
        <Customer>
          <xsl:for-each select="Number">
            <Number>
              <xsl:value-of select="."/>
            </Number>
          </xsl:for-each>
          <xsl:for-each select="FirstName">
            <xsl:variable name="V47993824_47988944" select="."/>
            <xsl:variable name="V47993824_47939520">
              <xsl:call-template name="tokenize">
                <xsl:with-param name="string" select="$V47993824_47988944"/>
              </xsl:call-template>
            </xsl:variable>
          </xsl:for-each>
        </Customer>
      </xsl:for-each>
    </CompletePO>
  </xsl:template>
</xsl:stylesheet>

```

Please note:

As soon as a named template is used in a mapping, the XSLT file containing the named template is **included** in the generated XSLT code (**xsl:include href=...**), and is **called** using the command **xsl:call-template**.

7. Click the Output tab to see the result of the mapping.



```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <CompletePO xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
3    <Customer>
4      <Number>1</Number>
5      <FirstName>Fred John</FirstName>
6      <LastName>Landis</LastName>
7    </Customer>
8    <Customer>
9      <Number>2</Number>
10     <FirstName>Michelle Ann-marie</FirstName>
11     <LastName>Butler</LastName>
12   </Customer>
13   <Customer>
14     <Number>3</Number>
15     <FirstName>Ted Mac</FirstName>
16     <LastName>Little</LastName>

```

#### To delete custom XSLT functions:

1. Click the **Add/Remove Libraries** button.
2. Click to the specific XSLT **library name** in the Libraries tab
3. Click the Delete button, then click OK to confirm.

### 16.2.2 Adding custom XSLT 2.0 functions

MapForce also allows you to import XSLT 2.0 functions that occur in an XSLT 2.0 document in the form:

```
<xsl:function name="MyFunction">
```

Please see: the [XSLT 2.0](#) implementation specific document for more information, as well as [Aggregate functions](#) for an additional example of using named templates to sum nodes.

#### Datatypes in XPath 2.0

If your XML document references an XML Schema and is valid according to it, you must explicitly construct or cast datatypes that are not implicitly converted to the required datatype by an operation.

In the XPath 2.0 Data Model used by the Altova XSLT 2.0 Engine, all **atomized** node values from the XML document are assigned the `xs:untypedAtomic` datatype. The `xs:untypedAtomic` type works well with implicit type conversions.

For example,

- the expression `xs:untypedAtomic("1") + 1` results in a value of 2 because the `xdt:untypedAtomic` value is **implicitly** promoted to `xs:double` by the addition operator.
- Arithmetic operators implicitly promote operands to `xs:double`.
- Value comparison operators promote operands to `xs:string` before comparing.

### 16.2.3 Aggregate functions - summing nodes in XSLT1 and 2

This section describes the method you can use to process multiple nodes of an XML instance document and have the result mapped as a single value to a target item. The files used in this example are available in the [...MapForceExamples\Tutorial\](#) folder and consists of:

Summing-nodes.mfd	mapping file
input.xml	input XML file
input.xsd and output.xsd	source and target schema files
Summing-nodes.xslt	xslt file containing a named template to sum the individual nodes

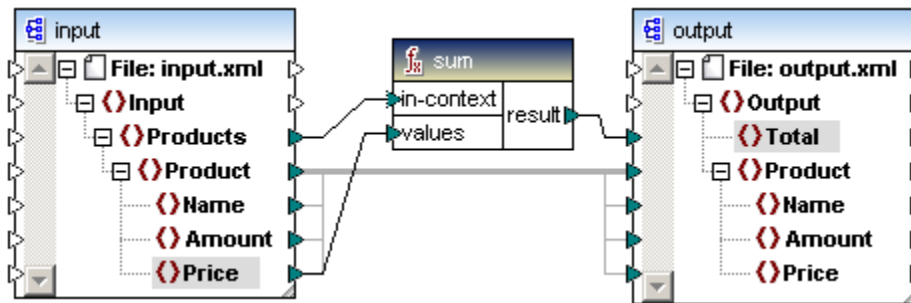
There are two separate methods of creating and using aggregate functions:

- Using the aggregate functions available in the **core library** of the Library pane
- Using a **Named Template**.

#### Aggregate functions - library

Depending on the XSLT library you select, XSLT 1 or XSLT 2, different aggregate functions are available in the core library. XSLT 1 supports count and sum, while XSLT 2 supports avg, count, max, min, string-join and sum.

Drag the aggregate function that you use from the library into the mapping area and connect the source and target components as shown in the screenshot below.



For more information on this type of aggregate function, please also see [Aggregate functions](#).

#### Aggregate function - Named template

The screenshot below shows the **XML input** file. The aim of the example is to sum the Price fields of any number of products, in this case products A and B.

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <Input xmlns:xsi="http://www.w3.org/2001/XMLSchema
3  <Products>
4  <Product>
5  <Name>ProductA</Name>
6  <Amount>10</Amount>
7  <Price>5</Price>
8  </Product>
9  <Product>
10 <Name>ProductB</Name>
11 <Amount>5</Amount>
12 <Price>20</Price>
13 </Product>
14 </Products>
15 </Input>

```

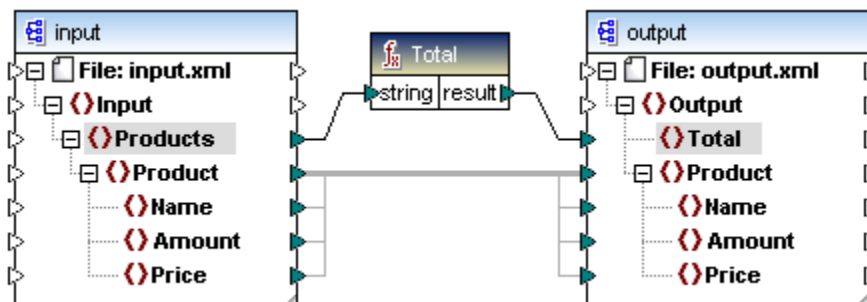
The screenshot below shows the XSLT stylesheet which uses the named template "Total" and a single parameter "string". What the template does, is work through the XML input file and sum all the values obtained by the XPath expression `/Product/Price`, in the document.

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/19
  <xsl:output method="xml" version="1.0" encoding="UTF-8" i

  <xsl:template match="*">
    <xsl:for-each select=".">
      <xsl:call-template name="Total">
        <xsl:with-param name="string" select="."/>
      </xsl:call-template>
    </xsl:for-each>
  </xsl:template>

  <xsl:template name="Total">
    <xsl:param name="string"/>
    <xsl:value-of select="sum($string/Product/Price)"/>
  </xsl:template>
</xsl:stylesheet>
```

1. Click the **Add/Remove Libraries** button, and select the Libraries tab of the Options dialog box.
2. Click the Add button and select the **Summing-nodes.xslt** file from the [...MapForceExamples\Tutorial\](#) folder.
3. Drag in the Total function from the newly created Summing-nodes library and create the mappings as shown below.



4. Click the Output tab to preview the mapping result.

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <Output xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNa
3   <Total>25</Total>
4   <Product>
5     <Name>ProductA</Name>
6     <Amount>10</Amount>
7     <Price>5</Price>
8   </Product>
9   <Product>
10    <Name>ProductB</Name>
11    <Amount>5</Amount>
12    <Price>20</Price>
13  </Product>
14 </Output>
15
```

The two Price fields of both products have been added and placed into the Total field.

**To sum the nodes in XSLT 2.0:**

- Change the stylesheet declaration in the template to ... version="2.0".

```
1      <?xml version="1.0" encoding="UTF-8"?>
2      <xsl:stylesheet version="2.0" xmlns:xs
3      <xsl:output method="xml" version="
```

## 16.3 Functions Reference

This reference section describes all the functions that are available in the Libraries pane for each of the supported languages: XSLT1, XSLT2.

The following libraries are currently available:

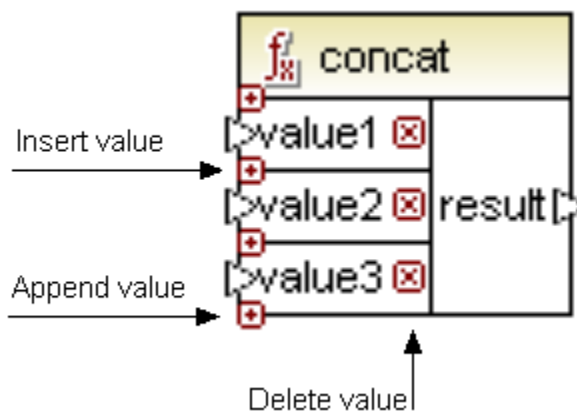
[core](#)  
[xpath2](#)  
[xslt](#)

### Extendable functions

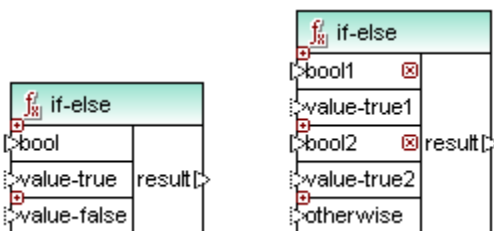
Several functions available in the function libraries are extendable: e.g. the concat, "logical-and", "logical-or", and IF-ELSE functions. The parameters of these types of function can be inserted/appended and deleted at will.

Clicking the "plus" icon inserts or appends the same type of parameter, while clicking the check mark deletes the parameter.

Please note: "dropping" a connector on the "plus" symbol, automatically inserts/appends the parameter and connects it.



The IF test parameters, of the [IF-Else](#) function can be extended in the same way.



Placing the mouse cursor over the function title bar, pops up a tooltip describing the function.

Placing it over a parameter (any input or result parameter) displays the datatype of the argument in a tooltip.

### 16.3.1 core

The core library supplies the most useful functions for all languages. The sequence functions are not available if XSLT (XSLT 1.0) has been selected.

#### Core library

- [aggregates](#)
- [conversion functions](#)
- [file path functions](#)
- [generator functions](#)
- [logical functions](#)
- [math functions](#)
- [node functions](#)
- [sequence functions](#)
- [string functions](#)

#### aggregates

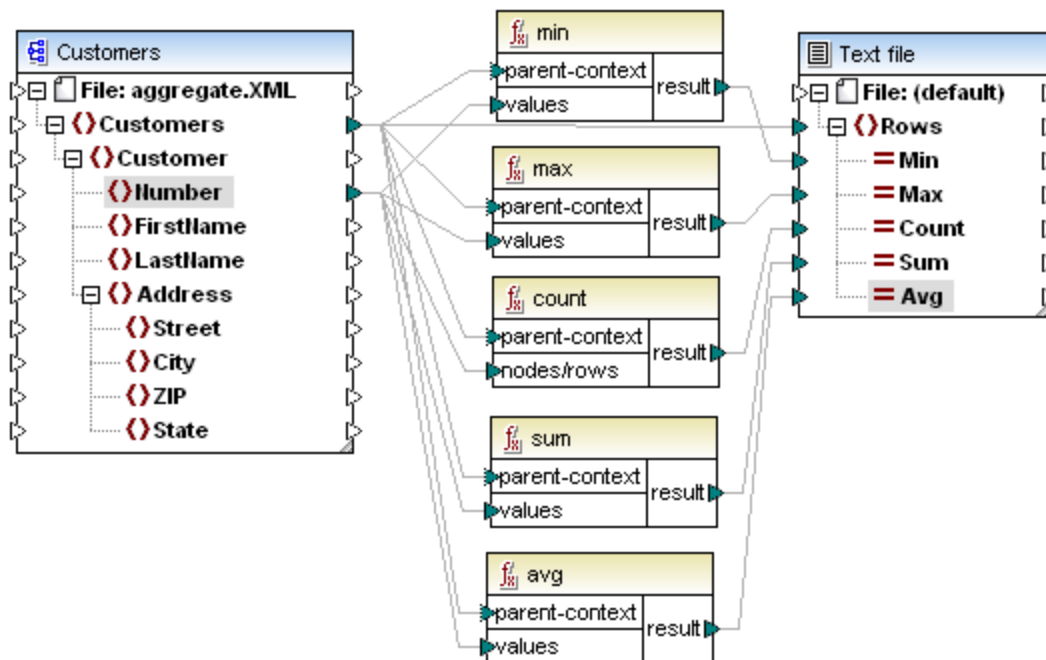
Aggregate functions perform operations on a set, or sequence, of input values. The input data for min, max, sum and avg is converted to the **decimal** datatype for processing.

- The input values must be connected to the **values** parameter of the function.
- A context node (item) can be connected to the **parent-context** parameter to override the default context from which the input sequence is taken. This also means that the parent-context parameter is optional!
- The **result** of the function is connected to the specific target item.

The mapping shown below is available as **Aggregates.mfd** in the ...\\Tutorial folder and shows how these functions are used.

Aggregate functions have two input items.

- **values** (nodes/rows) is connected to the source item that provides the data, in this case Number.
- **parent-context** is connected to the item you want to iterate over, i.e. the context, in this case over all Customers. The parameter is, however, optional.



The input instance in this case is an XML file containing the following data:

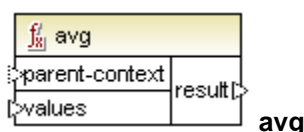
Comment edited with XMLSPY v2004 U (<http://www.xmlspy.com>) by M

Customers		
<div>xmlns:xsi</div> <div>http://www.w3.org/2001/XMLSchema</div>		
<div>xsi:noNamespace...</div> <div>Customers.xsd</div>		
Customer (4)		
	Number	Firstname
1	2	FredJohn
2	4	MichelleAnn-marie
3	6	TedMac
4	8	AnnLong

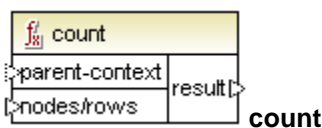
- The source data supplied to the values item is the number sequence 2,4,6,8.
  - The output component in this case is a simple text file.
- Clicking the Output tab for the above mapping delivers the following result:

1	2,8,4,20,5
2	

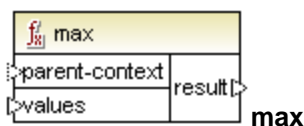
min=2, max=8, count=4, sum=20 and avg=5.



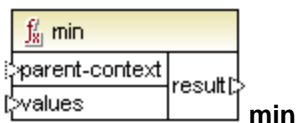
Returns the average value of all values within the input sequence. The average of an empty set is an empty set. Not available in XSLT1.



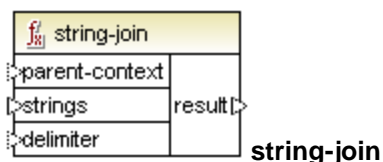
Returns the number of individual items making up the input sequence. The count of an empty set is zero. Limited functionality in XSLT1.



Returns the maximum value of all values in the input sequence. The maximum of an empty set is an empty set. Not available in XSLT1.



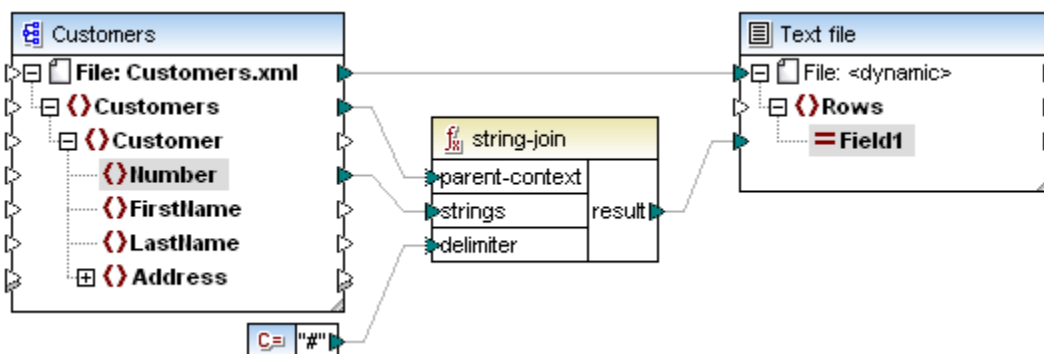
Returns the minimum value of all values in the input sequence. The minimum of an empty set is an empty set. Not available in XSLT1.



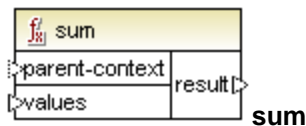
Concatenates all the values of the input sequence into one string delimited by whatever string you choose to use as the delimiter. The string-join of an empty set is the empty string. Not available in XSLT1.

The example below contains four separate customer numbers 2 4 6 and 8. The constant character supplies a hash character "#" as the delimiter.

Result = 2#4#6#8



If you do not supply a delimiter, then the default is an empty string, i.e. no delimiter of any sort. Result = 2468.

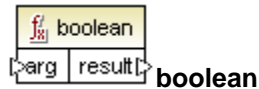


Returns the arithmetic sum of all values in the input sequence. The sum of an empty set is zero. Not available in XSLT1.

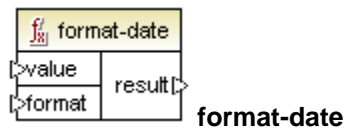
### conversion functions

To support explicit data type conversion, the type conversion functions "boolean", "number" and "string" are available in the conversion function library. Note that in most cases, MapForce creates necessary conversions automatically and these functions need to be used only in special cases.

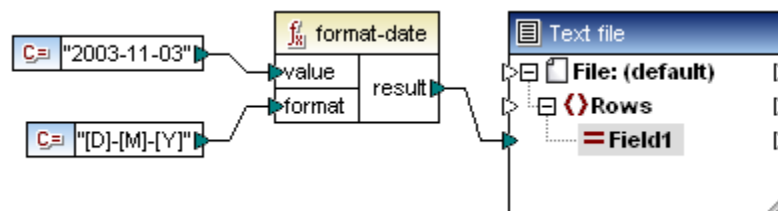
input parameters = **arg/value**  
output parameter = **result**



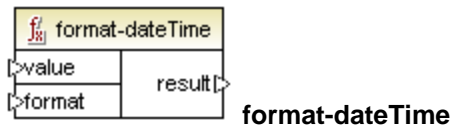
Converts an input numeric value into a boolean (as well as a string to numeric - true to 1). E.g. 0 to "false", or 1 to "true", for further use with logical functions (equal, greater etc.) filters, or if-else functions.



Converts an xs:date input value into a string.



Result: is 3-11-2003



Converts a dateTime into a string.

Argument	Description
value	The dateTime to be formatted
format	A format string identifying the way in which the dateTime is to be formatted

**Note:**

If the function's output (i.e. result) is connected to a node of type other than string, the formatting may be lost as the value is cast to the target type. This automatic cast can be disabled by unchecking the "[Cast target values to target types](#)" check box in the component settings of the target component.

**Format String**

The format argument consists of a string containing so-called variable markers enclosed in square brackets. Characters outside the square brackets are literal characters to be copied into the result. If square brackets are needed as literal characters in the result, then they should be doubled.

Each variable marker consists of a component specifier identifying which component of the date or time is to be displayed, an optional formatting modifier, another optional presentation modifier and an optional width modifier, preceded by a comma if it is present.

```
format := (literal | argument)*
argument := [component(format)?(presentation)?(width)?]
width := , min-width ("-" max-width)?
```

The components are:

Specifier	Description	Default Presentation
Y	year (absolute value)	four digits (2010)
M	month of the year	1-12
D	day of month	1-31
d	day of year	1-366
F	day of week	name of the day (language dependent)
W	week of the year	1-53
w	week of month	1-5
H	hour (24 hours)	0-23
h	hour (12 hour)	1-12
P	A.M. or P.M.	alphabetic (language dependent)
m	minutes in hour	00-59
s	seconds in minute	00-59
f	fractional seconds	numeric, one decimal place
Z	timezone as a time offset from UTC	+08:00 or PST with alphabetic modifier
z	timezone as a time offset using GMT	GMT+n

The presentation modifier:

Specifier	Description	Example
o	Indicates ordinal numbering	[1o] gives 1st, 2nd, 3rd, 4th,...

The formatting modifier:

Character	Description	Example
1	decimal numeric format with no leading zeros: 1, 2, 3, ...	1, 2, 3
01	decimal format, two digits: 01, 02, 03, ...	01, 02, 03
i	roman numerals	i, ii, iii, iv
I	roman numerals, upper case	I, II, III, IV
N	name of component, upper case	MONDAY, TUESDAY
n	name of component, lower case	monday, tuesday
Nn	name of component, title case	Monday, Tuesday
W	number expressed, upper case (not for parsing)	ONE, TWO, THREE
w	number expressed, lower case (not for parsing)	one, two, three
Ww	number expressed, title case (not for parsing)	One, Two, Three

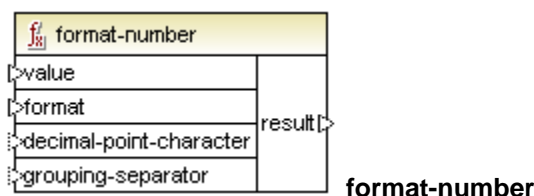
1) N, n, and Nn modifiers only support the following components: M, d, D.

The width modifier, if present, is introduced by a comma. It takes the form:

, min-width ("-" max-width)?

#### Supported examples

DateTime	format String	Result
2003-11-03T00:00:00	[D]/[M]/[Y]	3/11/2003
2003-11-03T00:00:00	[Y]-[M,2]-[D,2]	2003-11-03
2003-11-03T00:00:00	[Y]-[M,2]-[D,2]	2003-11-03
2003-11-03T00:00:00	[Y]-[M,2]-[D,2] [H,2]:[m]:[s]	2003-11-03 00:00:00
2010-06-02T08:02	[Y] [MNn] [D01] [F,3-3] [d] [H]:[m]:[s].[f]	2010 June 02 Wed 153 8:02:12.054
2010-06-02T08:02	[Y] [MNn] [D01] [F,3-3] [d] [H]:[m]:[s].[f] [z]	2010 June 02 Wed 153 8:02:12.054 GMT+02:00
2010-06-02T08:02	[Y] [MNn] [D1] [F] [H]:[m]:[s].[f] [Z]	2010 June 2 Wednesday 8:02:12.054 +02:00
2010-06-02T08:02	[Y] [MNn] [D] [F,3-3] [H01]:[m]:[s]	2010 June 2 Wed 08:02:12



Available for XSLT 1.0, XSLT 2.0, Java, C#, C++ and Built-in execution engine.

Argument	Description
value	The number to be formatted
format	A format string that identifies the way in which the number is to be formatted
decimal-point-format	The character to be used as the decimal point character. Default is the '.' character (optional)
grouping-separator	The separator/delimiter used to separate groups of numbers. Default is the ',' character (optional)

**Note:**

If the function's output (i.e. result) is connected to a node of type other than string, the formatting may be lost as the value is cast to the target type. This automatic cast can be disabled by unchecking the "[Cast target values to target types](#)" check box in the component settings of the target component.

**format**

A format string identifies the way in which the number is to be formatted.

Format:

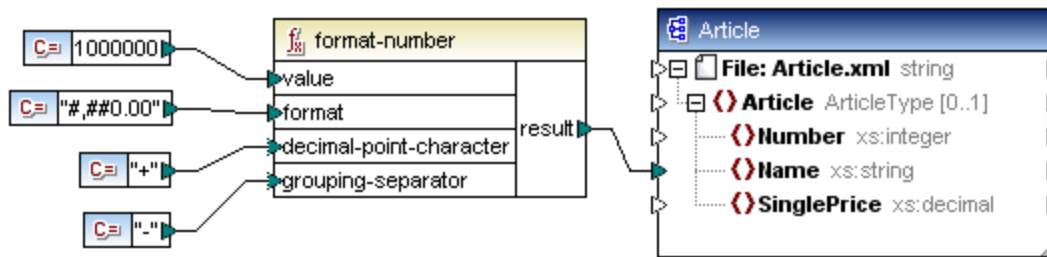
```
format := subformat (;subformat)?
subformat := (prefix)? integer (.fraction)? (suffix)?
prefix := any characters except special characters
suffix := any characters except special characters
integer := (#)* (0)* (allowing ',' to appear)
fraction := (0)* (#)* (allowing ',' to appear)
```

The first *subformat* is used for formatting positive numbers, and the second subformat for negative numbers. If only one *subformat* is specified, then the same subformat will be used for negative numbers, but with a minus sign added before the *prefix*.

Special Character	default	Description
zero-digit	0	A digit will always appear at this point in the result
digit	#	A digit will appear at this point in the result string unless it is a redundant leading or trailing zero
decimal-point	.	Separates the integer and the fraction part of the number.

grouping-seperator	,	Seperates groups of digits.
percent-sign	%	Multiplies the number by 100 and shows it as a percentage
per-mille	‰	Multiplies the number by 1000 and shows it as per-mille

The characters used for decimal-point-character and grouping-separator are always "." and ",", respectively. They can however, be changed in the formatted output, by mapping constants to these nodes.



The result of the format number function shown above.

- The decimal-point character was changed to a "+".
- The grouping separator was changed to a "-".

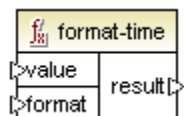
```
<Article xsi:noNamespaceSchemaLocation='
  <Name>1-000-000+00</Name>
</Article>
```

### Rounding

The rounding method used for this function is half up, e.g. rounds up if the fraction is > or equal to 0.5. Rounds down if fraction is <0.5.

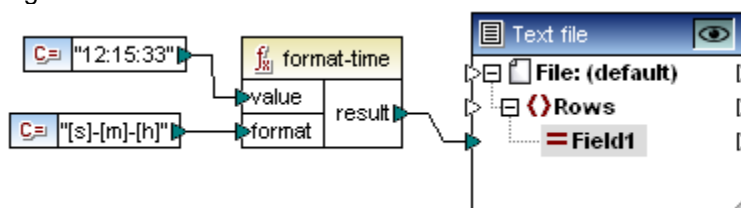
Number	format String	Result
1234.5	#,##0.00	1,234.50
123.456	#,##0.00	123.46
1000000	#,##0.00	1,000,000.00
-59	#,##0.00	-59.00
1234	###0.0###	1234.0
1234.5	###0.0###	1234.5
.00025	###0.0###	0.0003
.00035	###0.0###	0.0004
0.25	#00%	25%
0.736	#00%	74%
1	#00%	100%
-42	#00%	-4200%

-3.12	#.00;(#.00)	(3.12)
-3.12	#.00;#.00CR	3.12CR

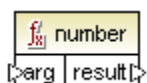
**format-time**

Converts an xs:time input value into a string.

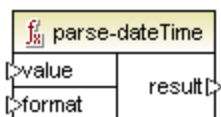
E.g



Result: 33-15-12

**number**

Converts an input string into a number. Also converts a boolean input to a number.

**parse-dateTime**

Available for Java, C#, C++, and the Built-in execution engine.

Converts a string into an dateTime.

Argument	Description
value	The string containing the date/time
format	The picture string which defines how value is currently formatted

The components are:

Specifier	Description	Default Presentation
Y	year (absolute value)	four digits (2010)
M	month of the year	1-12
D	day of month	1-31
d	day of year	1-366
H	hour (24 hours)	0-23

h	hour (12 hour)	1-12
P	A.M. or P.M.	alphabetic (language dependent)
m	minutes in hour	00-59
s	seconds in minute	00-59
f	fractional seconds	numeric, one decimal place
Z	timezone as a time offset from UTC	+08:00 or PST with alphabetic modifier
z	timezone as a time offset using GMT	GMT+n

The formatting modifier:

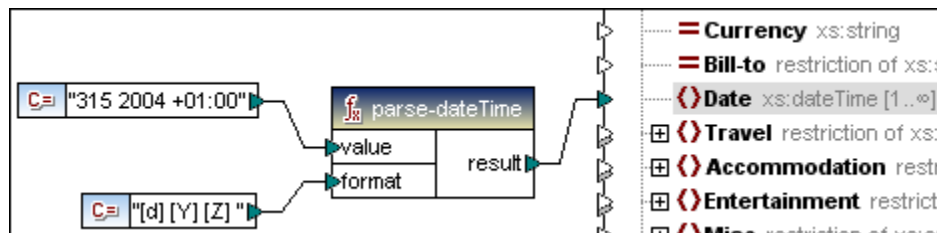
Character	Description	Example
1	decimal numeric format with no leading zeros: 1, 2, 3, ...	1, 2, 3
01	decimal format, two digits: 01, 02, 03, ...	01, 02, 03
N	name of component, upper case	MONDAY, TUESDAY
n	name of component, lower case	monday, tuesday
Nn	name of component, title case	Monday, Tuesday

1) **N, n, and Nn modifiers** only support the component M (month).

**Examples:**

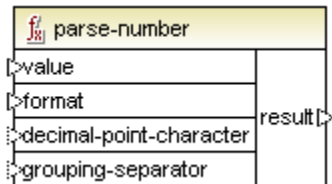
Date String	Picture String	Result
21-03-2002 16:21:12.492 GMT+02:00	[D]-[M]-[Y] [H]:[m]:[s].[f] [z]	2002-03-21T16:21:12.492+02:00
315 2004 +01:00	[d] [Y] [Z]	2004-11-10T00:00:00+01:00
1.December.10 03:2:39 p.m. +01:00	[D].[MNn].[Y,2-2] [h]:[m]:[s] [P] [Z]	2010-12-01T15:02:39+01:00
20110620	[Y,4-4][M,2-2][D,2-2]	2011-06-20T00:00:00

Example in MapForce:



Result:

```
<expense-item xmlns="http://my-company.com/ham
C:/DOCUME~1/MYDOCU~1/Altova/MapForce2020
  <Date>2004-11-10T00:00:00+01:00</Date>
</expense-item>
```



**parse-number**

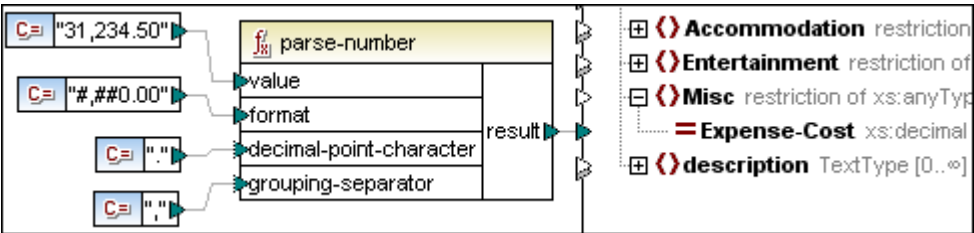
Available for Java, C#, C++, and the Built-in execution engine.

Converts an input string into a decimal number.

Argument	Description
value	The string to be parsed/converted to a number
format	A format string that identifies the way in which the number is currently formatted (optional). Default is "#,##0.#"
decimal-point-character	The character to be used as the decimal point character. Default is the '.' character (optional)
grouping-separator	The separator/delimiter used to separate groups of numbers. Default is the ',' character (optional)

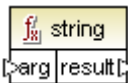
The **format** string used in parse-number is the same as that used in [format-number](#).

Example in MapForce:



Result:

```
<expense-item xmlns="http://my-company.com/ham
C:/DOCUME~1/MYDOCU~1/Altova/MapForce2011
  <Misc MiscExpense-Cost="31234.5"/>
</expense-item>
```



**string**

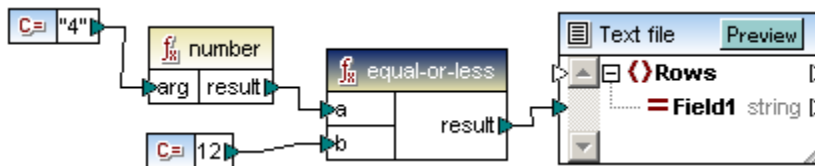
Converts an input value into a string. The function can also be used to retrieve the text content

of a node.

If the input node is a XML complex type, then all descendents are also output as a single string.

### Comparing differing input node types

If the input nodes are of differing types, e. g. integer and string, you can use the conversion functions to force a string or numeric comparison.



In the example above the first constant is of type string and contains the string "4".

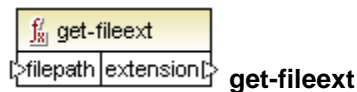
The second constant contains the numeric constant 12. To be able to compare the two values explicitly the types must agree.

Adding a **number** function to the first constant converts the string constant to the numeric value of 4. The result of the comparisons is then "true".

Note that if the number function were not be used, i.e 4 would be connected directly to the **a** parameter, a string compare would occur, with the result being false.

### file path functions

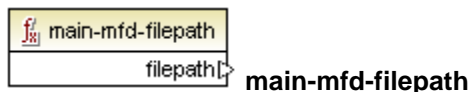
The file path functions allow you to directly access and manipulate file path data, i.e. folders, file names, and extensions for further processing in your mappings. They can be used in all languages supported by MapForce.



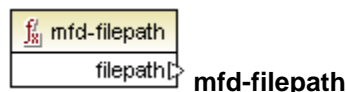
Returns the extension of the file path including the dot "." character.  
E.g. 'c:\data\Sample.mfd' returns '.mfd'



Returns the folder name of the file path including the trailing slash, or backslash character.  
E.g. 'c:/data/Sample.mfd' returns 'c:/data/'



Returns the full path of the mfd file containing the main mapping. An empty string is returned if the mfd is currently unsaved.



If the function is called in the main mapping, it returns the same as main-mfd-filepath function, i. e. the full path of the mfd file containing the main mapping. An empty string is returned if the

mfd is currently unsaved.

If called within an **user-defined function** which is **imported** by a mfd-file, it returns the full path of the imported mfd file which contains the **definition** of the user-defined function.



Removes the extension of the file path including the dot-character.

E.g. 'c:/data/Sample.mfd' returns 'c:/data/Sample'.



Removes the directory of the file path including the trailing slash, or backslash character.

E.g. 'c:/data/Sample.mfd' returns 'Sample.mfd'.



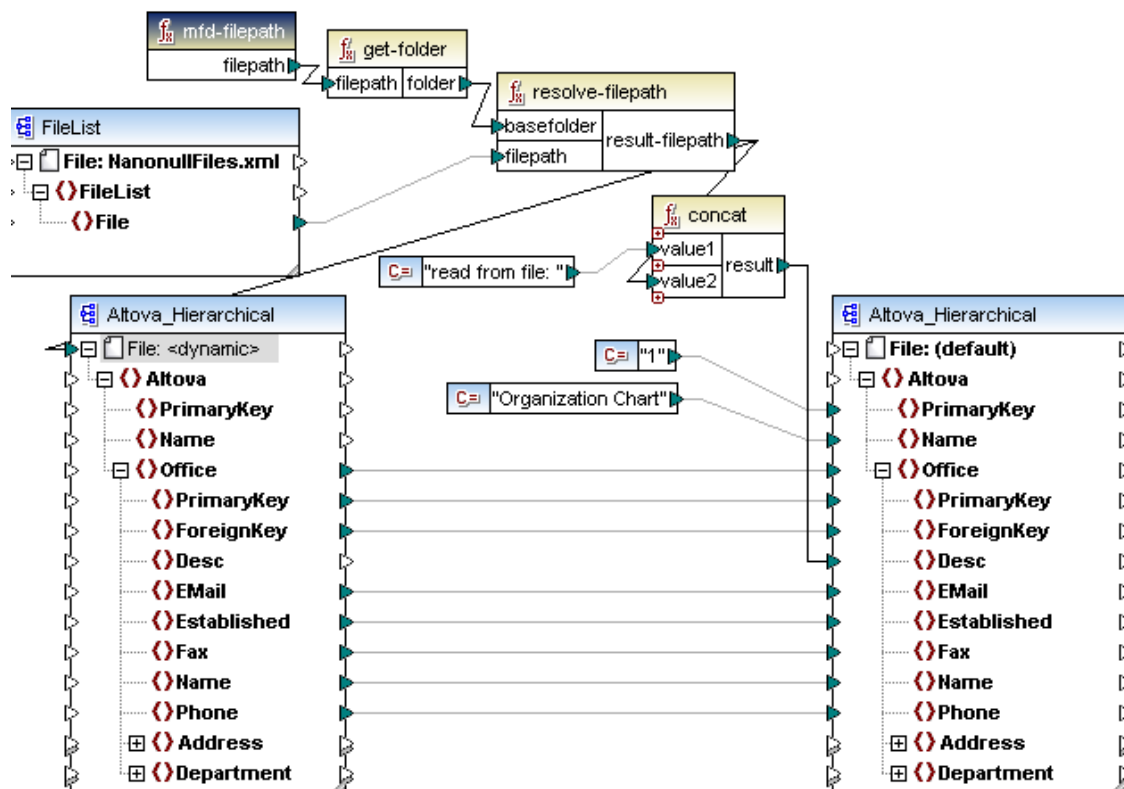
Replaces the extension of the file path supplied by the filepath parameter, with the one supplied by the connection to the extension parameter.

E.g. c:/data/Sample.mfd' as the input filepath, and '.mfp' as the extension, returns 'c:/data/Sample.mfp'



Resolves a relative file path to a relative, or absolute, base folder. The function supports '.' (current directory) and '..' (parent directory).

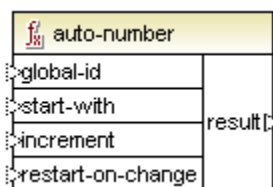
Please see the mapping **MergeMultipleFiles\_List.mfd** available in the ...\\MapForceExamples folder, for an example.



### generator functions

The **auto-number** function generates integers in target nodes of a component, depending on the various parameters you define.

Make sure that the result connector (of the auto-number function) is **directly** connected to a target node. The exact order in which functions are called by the generated mapping code is undefined. MapForce may choose to cache calculated results for reuse, or evaluate expressions in any order. It is therefore strongly recommended to take care when using the auto-number function.



#### auto-number

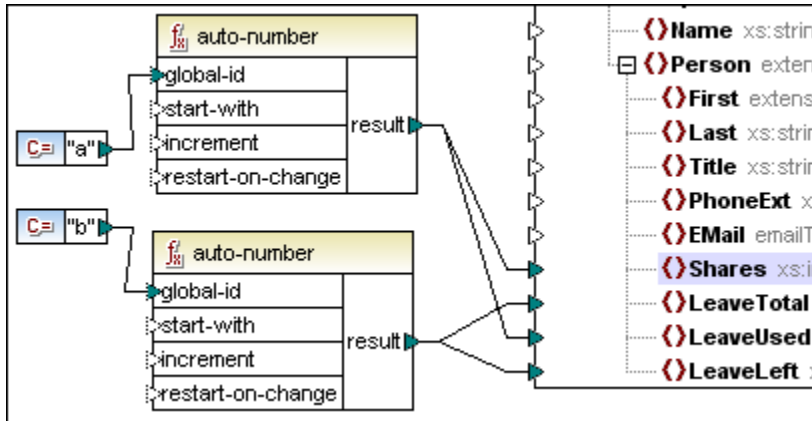
Result is a value starting at **start\_with** and increased by **increment**. Default values are: start-with=1 and increase=1. Both parameters can be negative.

#### global-id

This parameter allows you to synchronize the number sequence output of two separate auto-number functions connected to a single target component.

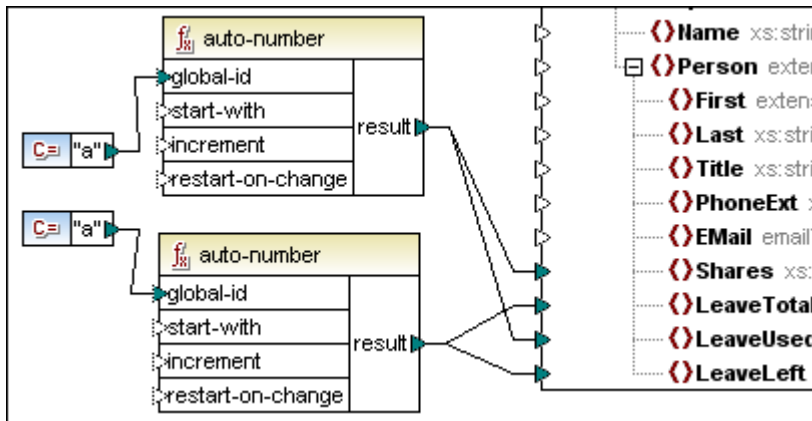
If the two auto-number functions do **not** have the same global-id, then each increments the target items separately. In the example below, each function has a different global-id i.e. a and b.

The output of the mapping is 1,1,2,2. The top function supplies the first 1 and the lower one the second 1.



If both functions have **identical** global-ids, **a** in this case, then each function "knows" about the current auto-number state (or actual value) of the other, and both numbers are then synchronised/in sequence.

The output of the mapping is therefore 1, 2, 3, 4. The top function supplies the first 1 and the lower one now supplies a 2.



#### start-with

The initial value used to start the auto numbering sequence. Default is 1.

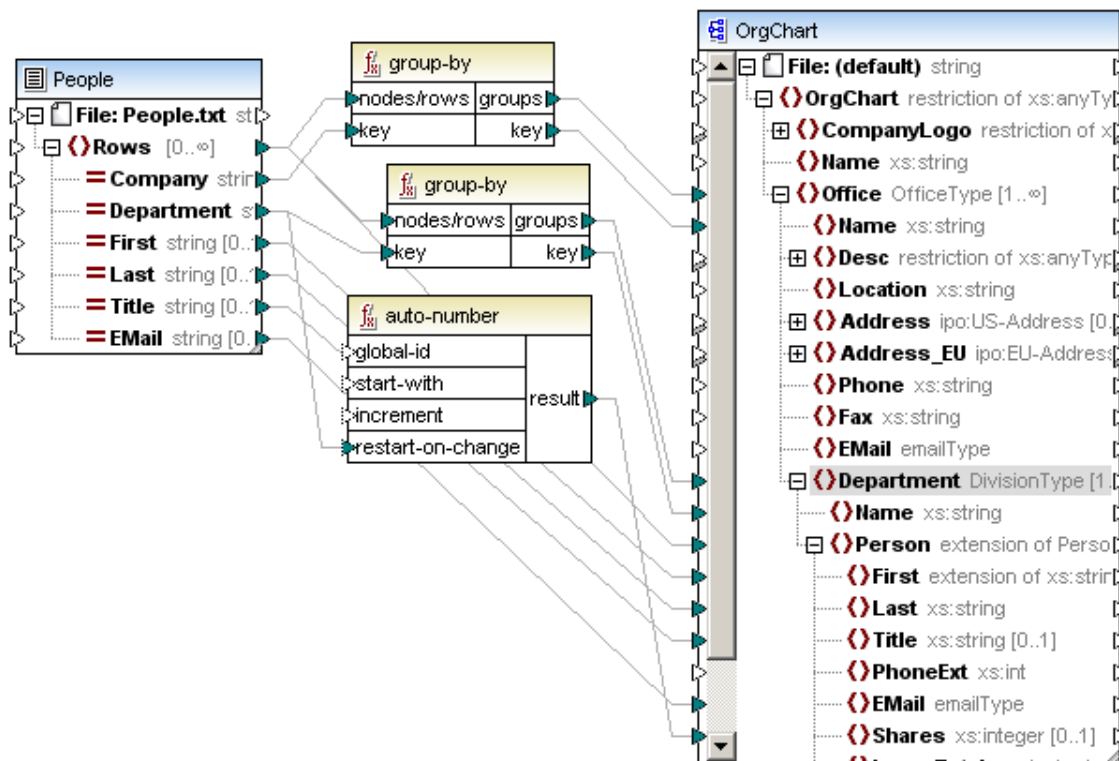
#### increment

The increment you want auto-number sequence to increase by. Default is 1.

#### restart on change

Resets the auto-number counter to "start-with", when the **content** of the connected item changes.

In the example below, start-with and increment are both using the default 1. As soon as the **content** of Department changes, i.e. the department name changes, the counter is reset and starts at 1 for each new department.

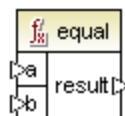


### logical functions

Logical functions are (generally) used to compare input data with the result being a boolean "true" or "false". They are generally used to test data before passing on a subset to the target component using a filter.

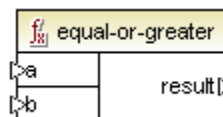
When comparing input parameters, MapForce selects the most specific common type for each parameter and then compares them. If the common type is anySimpleType, then both input parameters are compared as strings.

input parameters = **a | b**, or **value1 | value2**  
 output parameter = **result**



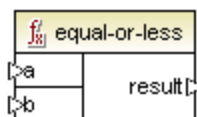
**equal**

Result is true if a=b, else false.

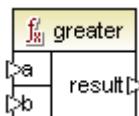


**equal-or-greater**

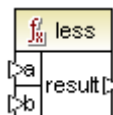
Result is true if a is equal/greater than b, else false.

**equal-or-less**

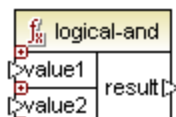
Result is true if a is equal/less than b, else false.

**greater**

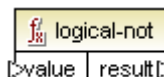
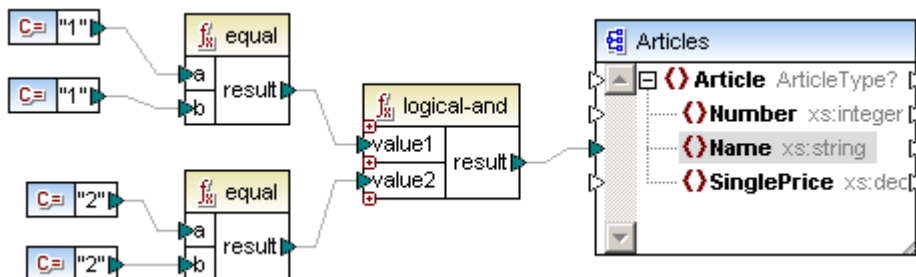
Result is true if a is greater than b, else false.

**less**

Result is true if a is less than b, else false.

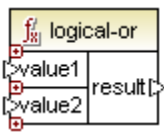
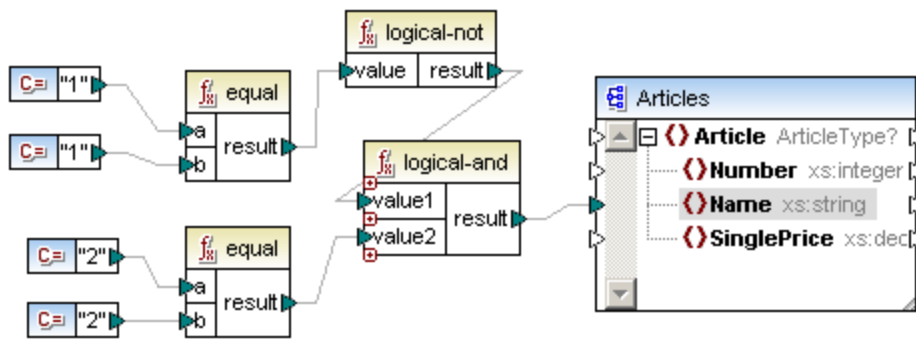
**logical-and**

If **both** value1 and value2 of the logical-and function are **true**, then result is true; if different then false.

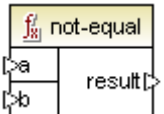
**logical-not**

Inverts or flips the logical state/result; if input is true, result of logical-not function is false. If input is false then result is true.

The logical-not function shown below, inverts the result of the equal function. The logical-and function now only returns true if boolean values of value1 and value2 are different, i.e. true-false, or false-true.

**logical-or**

Requires both input values to be boolean. If **either** value1 or value2 of the logical-or function are **true**, then the result is true. If both values are false, then result is false.

**not equal**

Result is true if a is not equal to b.

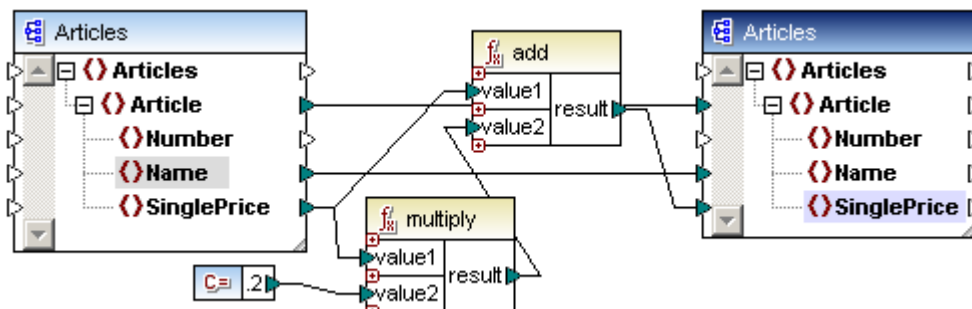
**math functions**

Math functions are used to perform basic mathematical functions on data. Note that they cannot be used to perform computations on durations, or datetimes.

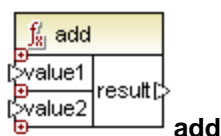
input parameters = **value1** | **value2**

output parameter = **result**

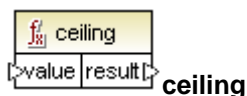
input values are automatically converted to decimal for further processing.



The example shown above, adds 20% sales tax to each of the articles mapped to the target component.

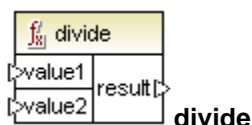


Result is the decimal value of adding **value1** to **value2**.

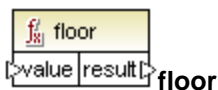


Result is the smallest integer that is greater than or equal to **value**, i.e. the next highest integer value of the decimal input **value**.

E.g. if the result of a division function is 11.2, then applying the ceiling function to it makes the result 12, i.e. the next highest whole number.



Result is the decimal value of dividing **value1** by **value2**. The result precision depends on the target language. Use the [round-precision](#) function to define the precision of result.



Result is the largest integer that is less than or equal to **value**, i.e. the next lowest integer value of the decimal input **value**.

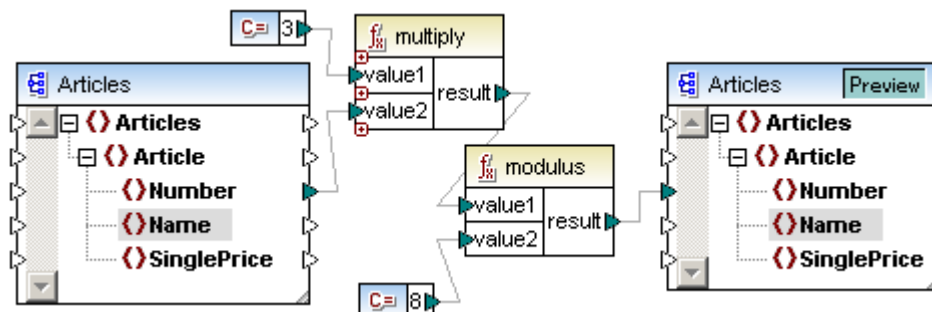
E.g. if the result of a division function is 11.2, then applying the floor function to it makes the result 11, i.e. the next lowest whole number.

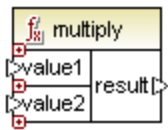


Result is the remainder of dividing **value1** by **value2**.

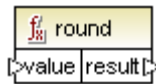
In the mapping below, the numbers have been multiplied by 3 and passed on to value1 of the modulus function. Input values are now 3, 6, 9, and 12.

When applying/using modulus 8 as value2, the remainders are 3, 6, 1, and 4.

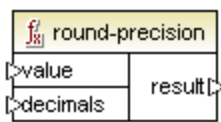


**multiply**

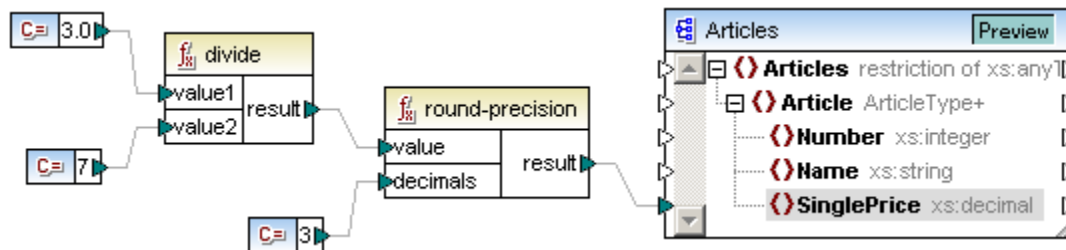
Result is the decimal value of multiplying **value1** by **value2**.

**round**

Result is the rounding by half, of **value** to the nearest integer.

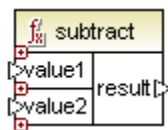
**round-precision**

Result is the decimal value of the number rounded to the decimal places defined by "decimals".



In the mapping above the result = 0.429.

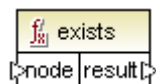
If you want this result to appear correctly in an XML file, make sure to map to an element of xs: decimal type.

**subtract**

Result is the decimal value of subtracting **value2** from **value1**.

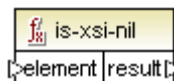
**node functions**

The node testing functions allow you to test for the existence/non-existence of nodes in many types of input files, XML schema, text, database, EDI and even function results. Exists actually checks for a non-empty sequence i.e. if any node exists.

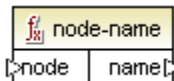
**exists**

Returns true if the node exists, else returns false.

Please see [exists](#) for an example.

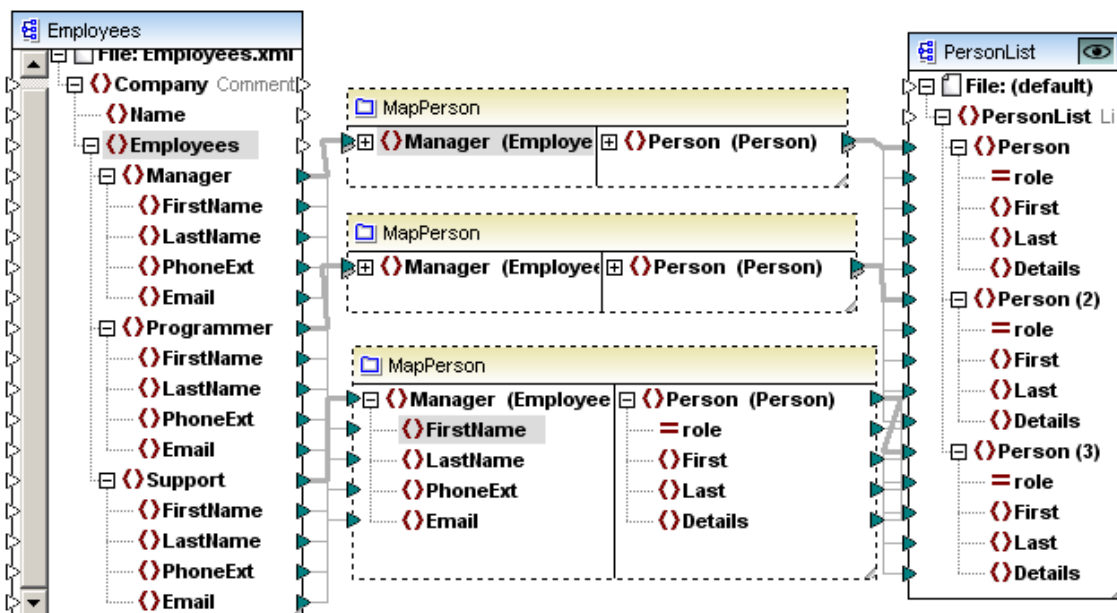
**is-xsi-nil**

Returns true (`<OrderID>true</OrderID>`) if the element node, of the source component, has the xsi:nil attribute set to "true".

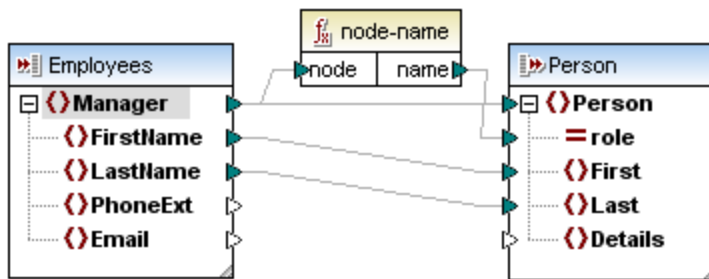
**node-name**

Returns the QName of the connected node unless it is an XML text() node; if this is the case, an empty QName is returned. This function only works on those nodes that have a name. If XSLT is the target language (which calls fn:node-name), it returns an empty sequence for nodes which have no names.

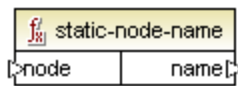
- Getting a name from database tables/fields is not supported.
- XBRL and Excel are not supported.
- Getting a name of File input node is not supported.
- WebService nodes behave like XML nodes except that:
  - node name from "part" is not supported.
  - node-name from root node ("Output" or "Input") is not supported.



The MapPerson user-defined function uses **node-name** to return the name of the input **node**, and place it in the role attribute. The root node of the Employees.xsd, in the user-defined function, has been defined as "Manager".



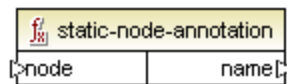
Manager gets its data from **outside** the user-defined function, where it can be either: Manager, Programmer, or Support. This is the data that is then passed on to the role attribute in PersonList.



#### **static-node-name**

Returns the string with the name of the connected node. The input must be: (i) a [source component](#) node, or (ii) an [inline function](#) that is directly connected to a [parameter](#), which in turn is directly connected to a node in the calling mapping.

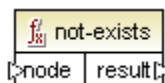
The connection must be direct. It cannot pass through a filter or a non-inlined user-defined function. This is a pseudo-function, which is replaced at generation time with the text acquired from the connected node, and is therefore available for all languages.



#### **static-node-annotation**

Returns the string with annotation of the connected node. The input must be: (i) a [source component](#) node, or (ii) an [inline function](#) that is directly connected to a [parameter](#), which in turn is directly connected to a node in the calling mapping.

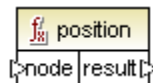
The connection must be direct. It cannot pass through a filter or a non-inlined user-defined function. This is a pseudo-function, which is replaced at generation time with the text acquired from the connected node, and is therefore available for all languages.



#### **not-exists**

Returns false if the node exists, else returns true.

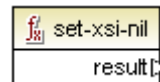
Please see [not-exists](#) for an example.



#### **position**

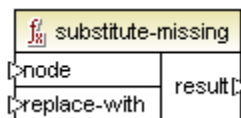
Returns the position of a node inside its containing sequence.

Please see [position](#) for an example.



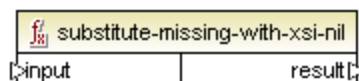
#### **set-xsi-nil**

Sets the target node to xsi:nil.

**substitute-missing**

This function is a convenient combination of exists and a suitable if-else condition. Used to map the current field content if the node exists in the XML source file, otherwise use the item mapped to the "replace-with" parameter.

Please see [substitute-missing](#) for an example.

**substitute-missing-with-xsi-nil**

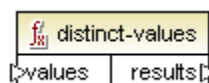
Substitutes any missing (or null values) of the source component, with the xsi:nil attribute in the target node.

**sequence functions**

Sequence functions are not available if XSLT (XSLT 1.0) has been selected.

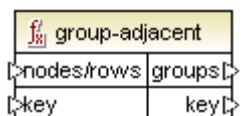
MapForce supports sequence functions which allow the processing of input sequences and the grouping of their content. The value/content of the **key** input parameter, mapped to nodes/rows, is used to group the sequence.

- Input parameter **key** is of an arbitrary data type that can be converted to string for **group-adjacent** and **group-by**
- Input parameter **bool** is of type Boolean for **group-starting-with** and **group-ending-with**
- The output **key** is the key of the current group.

**distinct-values**

Allows you to remove duplicate values from a sequence and map the unique items to the target component.

Please see [distinct-values](#) for an example.

**group-adjacent**

Groups the input sequence **nodes/rows** into groups of adjacent items sharing the same **key**.

Note that group-adjacent uses the **content** of the node/item as the grouping key!

Please see [group-adjacent](#) for an example.

f <sub>81</sub> group-by	
↳nodes/rows	groups↳
↳key	key↳

**group-by**

Groups the input sequence **nodes/rows** into groups of not necessarily adjacent items sharing the same **key**. Groups are output in the order the key occurs in the input sequence.

Please see [group-by](#) for an example.

f <sub>81</sub> group-ending-with	
↳nodes/rows	groups↳
↳bool	

**group-ending-with**

This function groups the input sequence **nodes/rows** into groups, ending a new group whenever **bool** is true.

Please see [group-ending-with](#) for an example.

f <sub>81</sub> group-starting-with	
↳nodes/rows	groups↳
↳bool	

**group-starting-with**

This function groups the input sequence **nodes/rows** into groups, starting a new group whenever **bool** is true.

Please see [group-starting-with](#) for an example.

f <sub>81</sub> set-empty
empty↳

**set-empty**

Allows you to cancel of an XBRL document that were defined higher up the XBRL component/taxonomy.

**string functions**

The string functions allow you to use the most common string functions to manipulate many types of source data to: extract portions, test for substrings, or retrieve information on strings.

f <sub>81</sub> char-from-code	
↳value	result↳

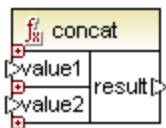
**char-from-code**

Result is the character representation of the decimal Unicode value of **value**.

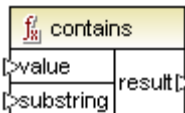
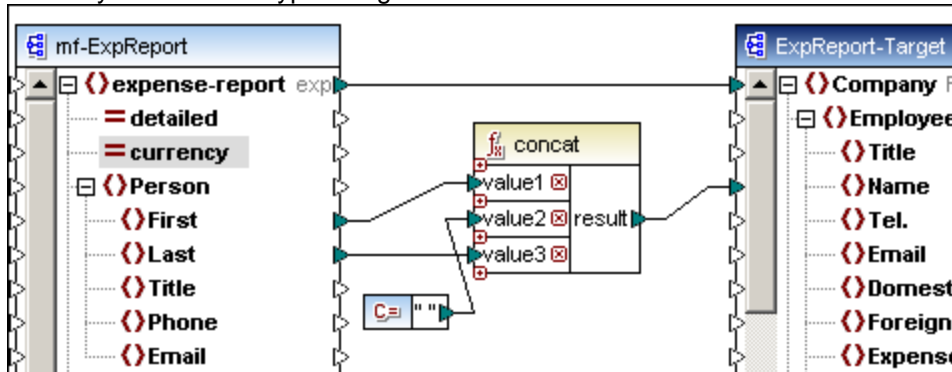
f <sub>81</sub> code-from-char	
↳value	result↳

**code-from-char**

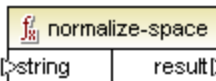
Result is the decimal Unicode value of the first character of **value**.

**concat**

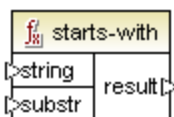
Concatenates (appends) two or more values into a single result string. All input values are automatically converted to type string.

**contains**

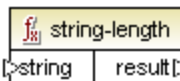
Result is true if data supplied to the value parameter contains the string supplied by the substring parameter.

**normalize-space**

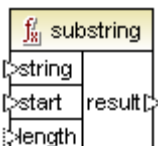
Result is the normalized input string, i.e. leading and trailing spaces are stripped out, and multiple consecutive whitespace characters are condensed into a single whitespace character.

**starts-with**

Result is true if the input string "string" starts with **substr**, else false.

**string-length**

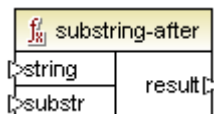
Result is the number of characters supplied by the **string** parameter.

**substring**

Result is the substring (string fragment) of the "string" parameter where "start" defines the position of the start character, and "length" the length of the substring.

If the length parameter is not specified, the result is a fragment starting at the start position and ending at the end position of the string. Indices start counting at 1.

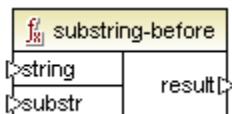
E.g. `substring("56789",2,3)` results in 678.



#### substring-after

Result is the remainder of the "**string**" parameter, where the first occurrence of the **substr** parameter defines the start characters; the remainder of the string is the result of the function. An empty string is the result, if **substr** does not occur in **string**.

E.g. `substring-after("2009/01/04","/")` results in the substring 01/04. **substr** in this case is the first "/" character.



#### substring-before

Result is the string fragment of the "**string**" parameter, up to the first occurrence of the **substr** characters. An empty string is the result, if **substr** does not occur in **string**.

E.g. `substring-before("2009/01/04","/")` results in the substring 2009. **substr** in this case is the first "/" character.

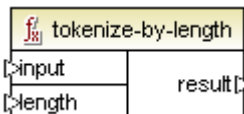


#### tokenize

Result is the input string split into a sequence of chunks/sections defined by the delimiter parameter. The result can then be passed on for further processing.

E.g. Input string is A,B,C and delimiter is "," - then result is A B C.

Please see [Tokenize examples](#) for a specific example supplied with MapForce.



#### tokenize-by-length

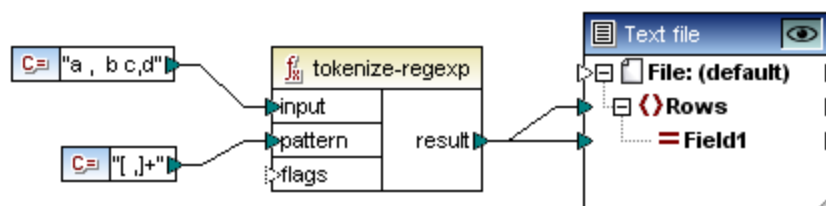
Result is the input string split into a sequence of chunks/sections defined by the length parameter. The result can then be passed on for further processing.

E.g. Input string is ABCDEF and length is "2" - then result is AB CD EF.

Please see [Tokenize examples](#) for a specific example supplied with MapForce.



Result is the input string split into a sequence of strings, where the supplied regular expression **pattern** match defines the separator. The separator strings are not output by the result parameter. Optional flags may also be used.



In the example shown above:

**input** string is a succession of characters separated by spaces and/or commas, i.e. a , b c,d

The regex **pattern** defines a character class ["space""comma"] - of which one and only one character will be matched in a character class, i.e. either space or comma.

The **+** quantifier specifies "one or more" occurrences of the character class/string.

result string is:

1	a
2	b
3	c
4	d
5	

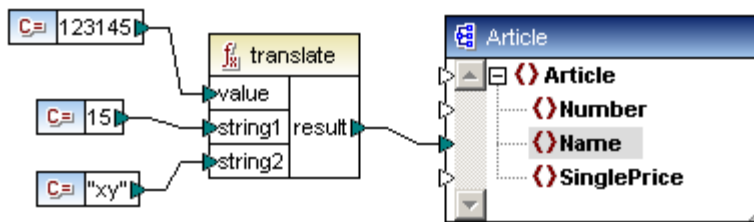
Please note that there are slight differences in regular expression syntax between the various languages. Tokenize-regex in C++ is only available in Visual Studio 2008 SP1 and later.

For more information on regular expressions please see: [Regular expressions](#).



The characters of **string1** (search string) are replaced by the characters at the same position in **string2 (replace string)**, in the input string "**value**".

When there are no corresponding characters in string2, the character is removed.



E.g.  
 input string is 123145  
     (search) string1 is 15  
     (replace) string2 is xy

So:  
 each 1 is replaced by **x** in the input string value  
 each 5 is replaced by **y** in the input string value

Result string is **x23x4y**

If string2 is empty (fewer characters than string1) then the character is removed.

E.g.2  
 input string aabaacbc  
     string1 is "a"  
     string2 is "" (empty string)

result string is "bcbc"

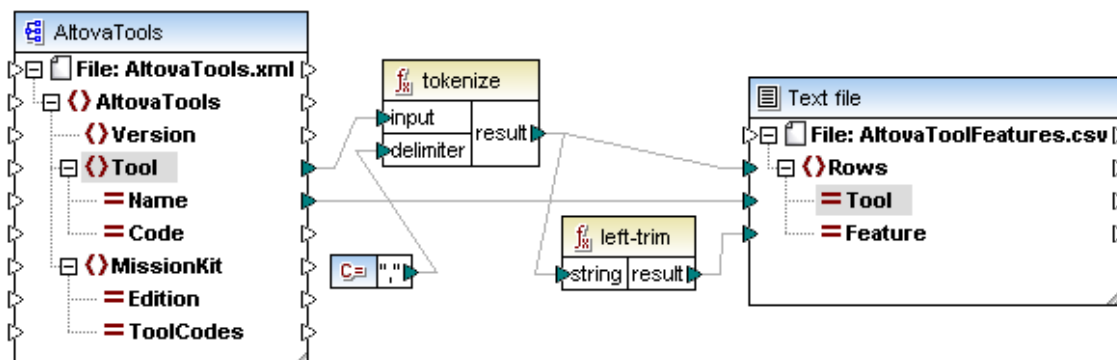
E.g.3  
 input string aabaacbc  
     string1 is "ac"  
     string2 is "ca"

result string is "cbccabac"

Tokenize examples

Example **tokenize**

The **tokenizeString1.mfd** file available in the ...MapForceExamples folder shows how the tokenize function is used.



The XML source file is shown below. The **Tool** element has two attributes: Name and Code, with the Tool element data consisting of comma delimited text.

AltovaTools

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#### What the mapping does:

- The tokenize function receives data from the **Tool** element/item and uses the comma "," delimiter to split that data into separate chunks. I.e. the first chunk "XML editor".
- As the result parameter is mapped to the **Rows** item in the target component, one **row** is generated for each chunk.
- The result parameter is also mapped to the **left-trim** function which removes the leading white space of each chunk.
- The result of the left-trim parameter (each chunk) is mapped to the **Feature** item of the target component.
- The target component output file has been defined as a CSV file (AltovaToolFeatures.csv) with the field delimiter being a semicolon (double click component to see settings).

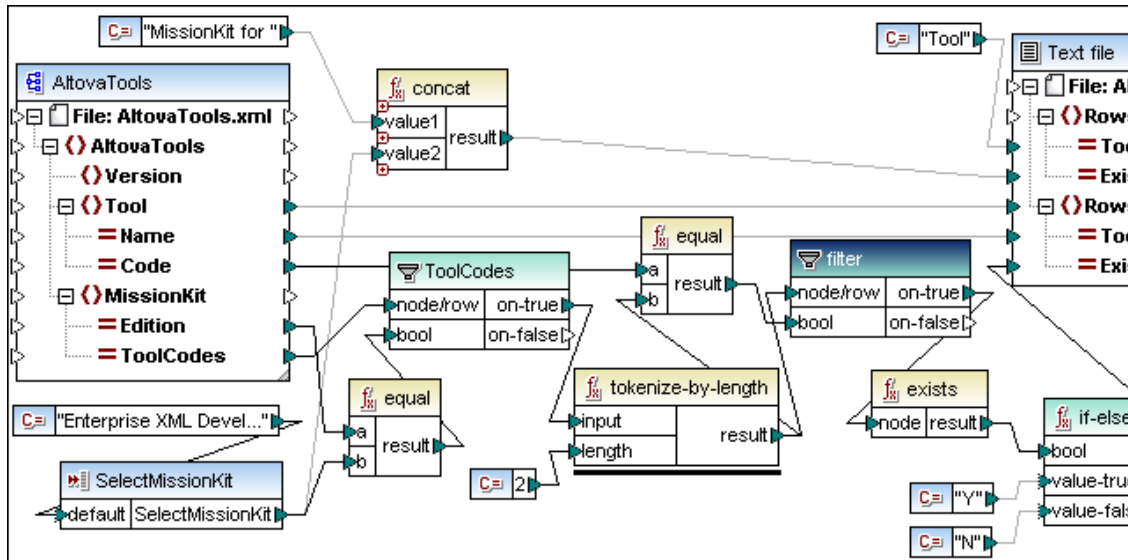
#### Result of the mapping:

- For each Tool element of the source file
- The (Tool) Name is mapped to the Tool item in the target component
- Each chunk of the tokenized Tool content is appended to the (Tool Name) Feature item
- E.g. The first tool, XMLSpy, gets the first Feature chunk "XML editor"
- This is repeated for all chunks of the current Tool and then for all Tools.
- Clicking the Output tab delivers the result shown below.

1	Tool;Feature
2	XMLSpy;XML editor
3	XMLSpy;XSLT editor
4	XMLSpy;XSLT debugger
5	XMLSpy;XQuery editor
6	XMLSpy;XQuery debugger
7	XMLSpy;XML Schema / DTD editor
8	XMLSpy;WSDL editor
9	XMLSpy;SOAP debugger
10	MapForce;Data integration
11	MapForce;XML mapping
12	MapForce;database mapping

### Example `tokenize-by-length`

The `tokenizeString2.mfd` file available in the `...MapForceExamples` folder shows how the `tokenize-by-length` function is used.



The XML source file is shown below, and is the same as the one used in the previous example. The **MissionKit** element also has two attributes: **Edition** and **ToolCodes**, but no MissionKit element content.

Tool (9)			
	Name	Code	Text
1	XMLSpy	XS	XML editor, XSLT editor, XSLT debugger, XQuery editor, XQuery debugger, XML S
2	MapForce	MF	Data integration, XML mapping, database mapping, text conversion, EDI translator,
3	StyleVision	SV	Stylesheet designer, electronic forms, XSLT design, XSL:FO design, database rep
4	UModel	UM	UML modeling tool, code generation, reverse engineering, UML, BPMN, SysML, pro
5	DatabaseSpy	DS	Multi-database tool, SQL auto-completion, graphical database design, table brows
6	DiffDog	DD	Diff / merge tool, compare files, sync directories, compare XML, compare OOXML,
7	SchemaAgent	SA	XML Schema management tool, IIR management, XSLT management, WSDL manag
8	SemanticWorks	SW	Semantic Web tool, RDF editor, OWL editor, RDF/XML and N-Triples generation and
9	Authentic	AU	XML authoring tool, database editor, XML publishing tool, e-Forms editor

MissionKit (4)	
Edition	ToolCodes
1 Enterprise Software Architects	XSMFSVUMSDSDSASW
2 Professional Software Architects	XSMFSVUMDS
3 Enterprise XML Developers	XSMFSVDDSDASW
4 Professional XML Developers	XSMFSV

#### Aim of the mapping:

To generate a list showing which Altova tools are part of the respective MissionKit editions.

#### How the mapping works:

- The **SelectMissionKit** **Input** component receives its default input from a constant component, in this case "Enterprise XML Developers".
- The **equal** function compares the input value with the "Edition" value and passes on the result to the **bool** parameter of the **ToolCodes** filter.

- The **node/row** input of the ToolCodes filter is supplied by the **ToolCodes** item of the source file. The value for the Enterprise XML Developers edition is: XSMFSVDDDSASW.
- The XSMFSVDDDSASW value is passed to the **on-true** parameter, and further to the **input** parameter of the **tokenize-by-length** function.

#### What the **tokenize-by-length** function does:

- The ToolCodes **input** value XSMFSVDDDSASW, is split into multiple chunks of two characters each, defined by **length** parameter, which is 2, thus giving 6 chunks.
- Each chunk (placed in the **b** parameter) of the **equal** function, is compared to the 2 character **Code** value of the source file (of which there are 9 entries/items in total).
- The result of the comparison (true/false) is passed on to the **bool** parameter of the filter.
- Note that **all** chunks, of the **tokenize-by-length** function, are passed on to the **node/row** parameter of the filter.

- The **exists** functions now checks for existing/non-existing nodes passed on to it by the **on-true** parameter of the filter component.

Existing nodes are those where there **is** a match between the **ToolCodes** chunk and the Code value.

Non-existing nodes are where there was **no ToolCodes** chunk to match a Code value.

- The **bool** results of the **exists** function are passed on to the **if-else** function which passes on a Y to the target if the node exists, or a N, if the node does not exist.

Result of the mapping:

1	Tool;MissionKit for Enterprise XML Developers
2	XMLSpy;Y
3	MapForce;Y
4	StyleVision;Y
5	UModel;N
6	DatabaseSpy;N
7	DiffDog;Y
8	SchemaAgent;Y
9	SemanticWorks;Y
10	Authentic;N
11	

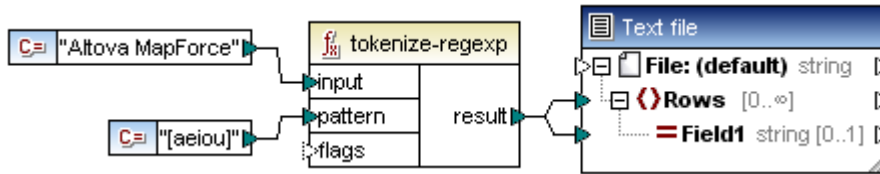
#### Regular expressions

MapForce can use regular expressions in the **pattern** parameter of the the **match-pattern** and **tokenize-regex** functions, to find specific strings of the input parameter.

The regular expression syntax and semantics for XSLT and XQuery are identical to those defined in <http://www.w3.org/TR/xmlschema-2/>. Please note that there are slight differences in regular expression syntax between the various programming languages.

#### Terminology:

input	the string that the regex works on
pattern	the regular expression
flags	optional parameter to define how the regular expression is to be interpreted
result	the result of the function



Tokenize-regex returns a sequence of strings. The connection to the Rows item creates one row per item in the sequence.

### regex syntax

**Literals** e.g. a single character:

e.g. The letter "a" is the most basic regex. It matches the first occurrence of the character "a" in the string.

### Character classes []

This is a set of characters enclosed in square brackets.

**One**, and only one, of the characters in the square brackets are matched.

pattern **[aeiou]**

Matches a lowercase vowel.

pattern **[mj]ust**

Matches must or just

Please note that "pattern" is case sensitive, a lower case **a** does not match the uppercase **A**.

### Character ranges [a-z]

Creates a range between the two characters. Only one of the characters will be matched at one time.

pattern **[a-z]**

Matches any lowercase characters between a and z.

### negated classes [^]

using the caret as the first character after the opening bracket, negates the character class.

pattern **[^a-z]**

Matches any character not in the character class, including newlines.

### Meta characters "."

Dot meta character

matches **any single** character (except for newline)

pattern **.**

Matches any single character.

### Quantifiers ? + \* {}

Quantifiers define how often a regex component must repeat within the input string, for a match to occur.

<b>?</b>	zero or one	preceding string/chunk is optional
<b>+</b>	one or more	preceding string/chunks may match one or more times
<b>*</b>	zero or more	preceding string/chunks may match zero or more times
<b>{ }</b>	min / max repetitions	no. of repetitions a string/chunks has to match e.g. mo{1,3} matches mo, moo, mooo.

**()**  
subpatterns  
parentheses are used to group parts of a regex together.

**|**  
Alternation/or allows the testing of subexpressions from left to right.  
**(horse|make) sense** - will match "horse sense" or "make sense"

### flags

These are optional parameters that define how the regular expression is to be interpreted. Individual letters are used to set the options, i.e. the character is present. Letters may be in any order and can be repeated.

#### **s**

If present, the matching process will operate in the "dot-all" mode.

The meta character "." matches any character whatsoever. If the input string contains "hello" and "world" on two *different* lines, the regular expression "hello\*world" will only match if the **s** flag/character is set.

#### **m**

If present, the matching process operates in multi-line mode.

In multi-line mode the caret ^ matches the start of **any** line, i.e. the start of the entire string **and** the first character after a newline character.

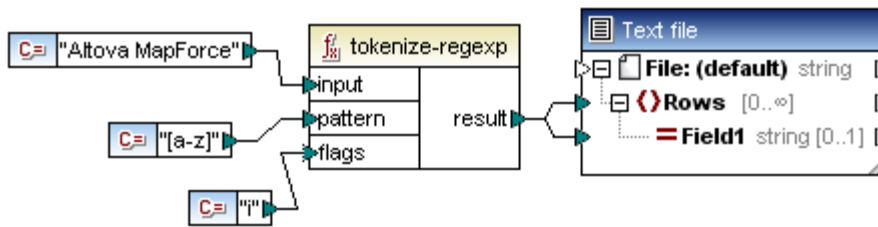
The dollar character \$ matches the end of **any** line, i.e. the end of the entire string and the character immediately before a newline character.

Newline is the character #x0A.

#### **i**

If present, the matching process operates in case-insensitive mode.

The regular expression [a-z] plus the **i** flag would then match all letters a-z and A-Z.



**x**

If present, whitespace characters are removed from the input string prior to the matching process. Whitespace chars. are #x09, #x0A, #x0D and #x20.

*Exception:*

Whitespace characters within character class expressions are not removed e.g. [#x20].

Please note:

When generating code, the advanced features of the regex syntax might differ slightly between the various languages, please see the specific regex documentation for your language.

### 16.3.2 xpath2

XPath2 functions are available when either XSLT2 or XQuery languages are selected.

- [accessor functions](#)
- [anyURI functions](#)
- [boolean functions](#)
- [constructors](#)
- [context functions](#)
- [durations, date and time functions](#)
- [node functions](#)
- [numeric functions](#)
- [QName functions](#)
- [string functions](#)

#### accessors

The following accessor functions are available:

##### base-uri

The `base-uri` function takes a node argument as input, and returns the URI of the XML resource containing the node. The output is of type `xs:string`. MapForce returns an error if no input node is supplied.

##### document-uri

Not implemented.

##### node-name

The `node-name` function takes a node as its input argument and returns its QName. When the QName is represented as a string, it takes the form of `prefix:localname` if the node has a prefix, or `localname` if the node has no prefix. To obtain the namespace URI of a node, use the `namespace-URI-from-QName` function (in the library of QName-related functions).

##### string

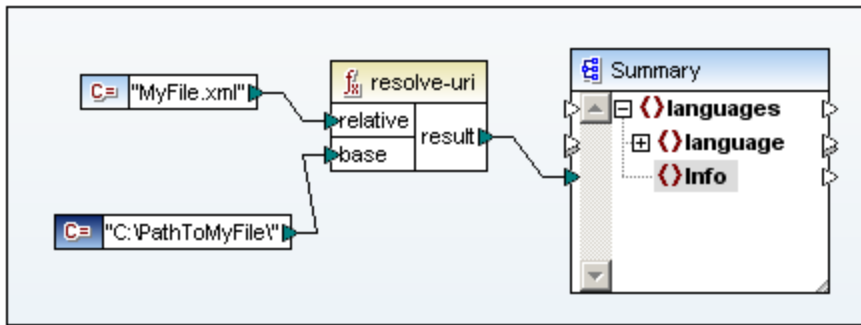
The `string` function works like the `xs:string` constructor: it converts its argument to `xs:string`.

When the input argument is a value of an atomic type (for example `xs:decimal`), this atomic value is converted to a value of `xs:string` type. If the input argument is a node, the string value of the node is extracted. (The string value of a node is a concatenation of the values of the node's descendant nodes.)

#### anyURI functions

The `resolve-uri` function takes a URI as its first argument (datatype `xs:string`) and resolves it against the URI in the second argument (datatype `xs:string`).

The result (datatype `xs:string`) is a combined URI. In this way a relative URI (the first argument) can be converted to an absolute URI by resolving it against a base URI.



In the screenshot above, the first argument provides the relative URI, the second argument the base URI. The resolved URI will be a concatenation of base URI and relative URI, so `C:\PathToMyFile\MyFile.xml`.

**Note:** Both arguments are of datatype `xs:string` and the process of combining is done by treating both inputs as strings. So there is no way of checking whether the resources identified by these URIs actually exist. MapForce returns an error if the second argument is not supplied.

### boolean functions

The Boolean functions `true` and `false` take no argument and return the boolean constant values, `true` and `false`, respectively. They can be used where a constant boolean value is required.

#### true

Inserts the boolean value "true".

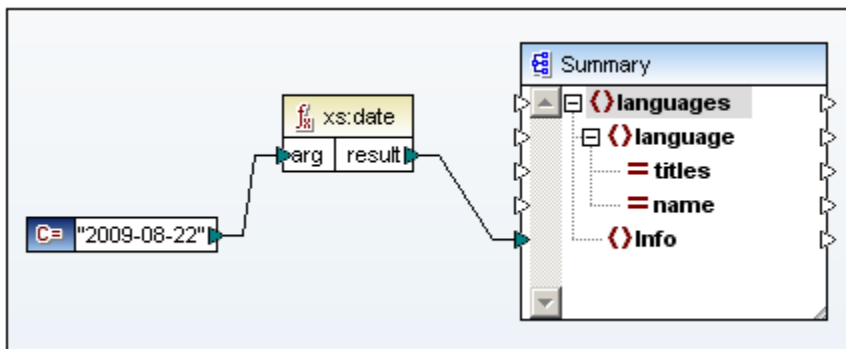
#### false

Inserts the boolean value "false".

### constructors

The functions in the Constructors part of the XPath 2.0 functions library construct specific datatypes from the input text. Typically, the lexical format of the input text must be that expected of the datatype to be constructed. Otherwise, the transformation will not be successful.

For example, if you wish to construct an `xs:date` datatype, use the `xs:date` constructor function. The input text must have the lexical format of the `xs:date` datatype, which is: `YYYY-MM-DD` (screenshot below).



In the screenshot above, a string constant (2009-08-22) has been used to provide the input

argument of the function. The input could also have been obtained from a node in the source document.

The `xs:date` function returns the input text (2009-08-22), which is of `xs:string` datatype (specified in the *Constant* component), as output of `xs:date` datatype.

When you mouseover the input argument in a function box, the expected datatype of the argument is displayed in a popup.

### context functions

The Context functions library contains functions that provide the current date and time, the default collation used by the processor, and the size of the current sequence and the position of the current node.

#### Date-time functions

The `current-date`, `current-time`, and `current-dateTime` functions take no argument and return the current date and/or time from the system clock.

The datatype of the result depends on the particular function: `current-date` returns `xs:date`, `current-time` returns `xs:time`, and `current-dateTime` returns `xs:dateTime`.

#### default-collation

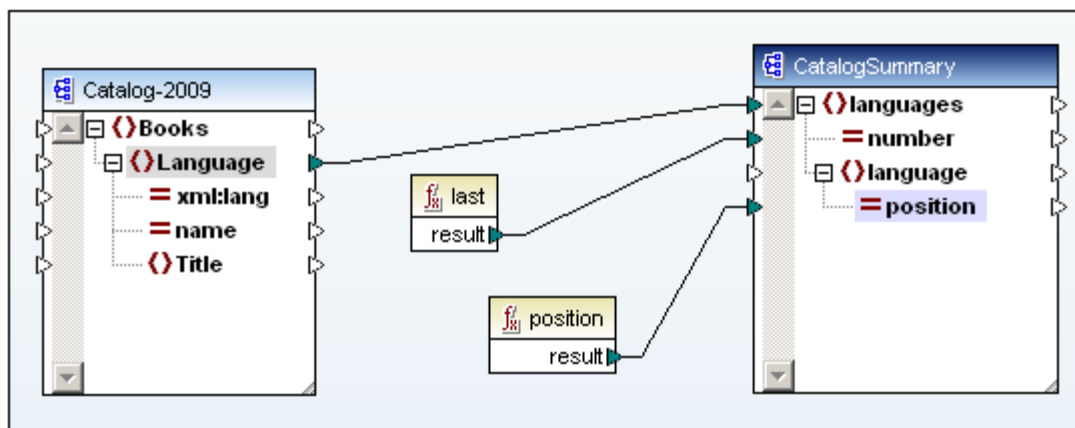
The `default-collation` function takes no argument and returns the default collation, that is, the collation that is used when no collation is specified for a function where one can be specified.

The Altova XSLT 2.0 Engine supports the Unicode codepoint collation only. Comparisons, including for the `fn:max` and `fn:min` functions, are based on this collation.

#### last, position

The `last` and `position` functions take no argument. The `last` function returns the position of the last node in the context nodeset. The `position` function returns the position of the current node in the nodeset being processed.

The context nodeset at the nodes where the functions are directed, is the nodeset to which the functions will apply. In the screenshot below, the nodeset of `Language` elements is the context nodeset for the `last` and `position` functions.



In the example above, the `last` function returns the position of the last node of the context nodeset (the nodeset of `Language` elements) as the value of the `number` attribute. This value is

also the size of the nodeset since it indicates the number of nodes in the nodeset.

The `position` function returns the position of the `Language` node being currently processed. For each `Language` element node, its position within the nodeset of `Language` elements is output to the `language/@position` attribute node.

We would advise you to use the **position** and **count** functions from the **core** library.

### **durations, date and time functions**

The duration and date and time functions enable you to adjust dates and times for the timezone, extract particular components from date-time data, and subtract one date-time unit from another.

#### **The 'Adjust-to-Timezone' functions**

Each of these related functions takes a date, time, or `dateTime` as the first argument and adjusts the input by adding, removing, or modifying the timezone component depending on the value of the second argument.

The following situations are possible when the first argument contains no timezone (for example, the date `2009-01` or the time `14:00:00`).

- Timezone argument (the second argument of the function) is present: The result will contain the timezone specified in the second argument. The timezone in the second argument is added.
- Timezone argument (the second argument of the function) is absent: The result will contain the implicit timezone, which is the system's timezone. The system's timezone is added.
- Timezone argument (the second argument of the function) is empty: The result will contain no timezone.

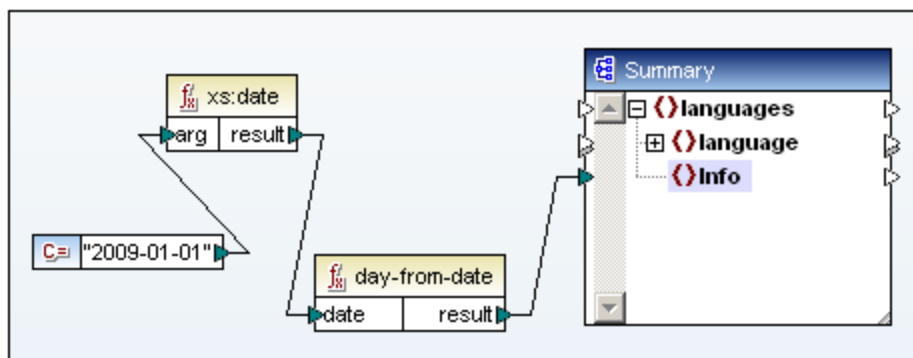
The following situations are possible when the first argument contains a timezone (for example, the date `2009-01-01+01:00` or the time `14:00:00+01:00`).

- Timezone argument (the second argument of the function) is present: The result will contain the timezone specified in the second argument. The original timezone is replaced by the timezone in the second argument.
- Timezone argument (the second argument of the function) is absent: The result will contain the implicit timezone, which is the system's timezone. The original timezone is replaced by the system's timezone.
- Timezone argument (the second argument of the function) is empty: The result will contain no timezone.

#### **The 'From' functions**

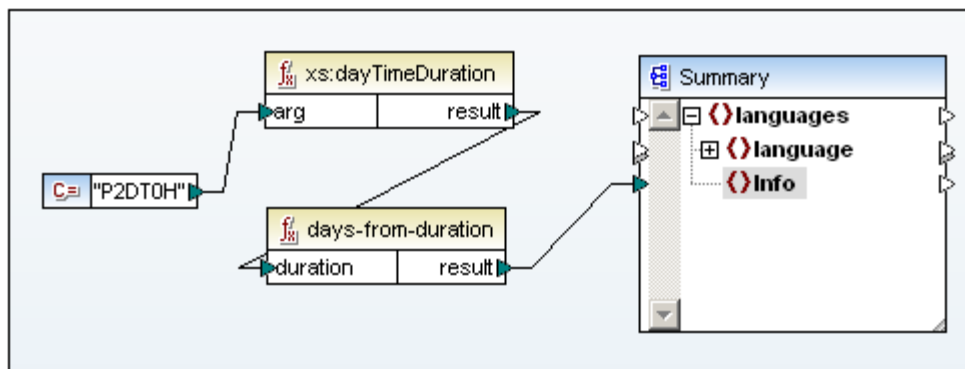
Each of the 'From' functions extracts a particular component from: (i) date or time data, and (ii) duration data. The results are of the `xs:decimal` datatype.

As an example of extracting a component from date or time data, consider the `day-from-date` function (*screenshot below*).



The input argument is a date (2009-01-01) of type `xs:date`. The `day-from-date` function extracts the day component of the date (1) as an `xs:decimal` datatype.

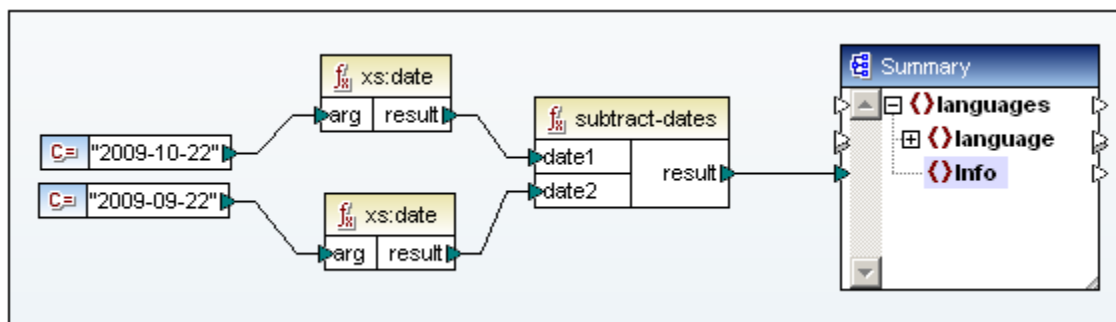
Extraction of time components from durations requires that the duration be specified either as `xs:yearMonthDuration` (for extracting years and months) or `xs:dayTimeDuration` (for extracting days, hours, minutes, and seconds). The result will be of type `xs:decimal`. The screenshot below shows a `dayTimeDuration` of `P2DT0H` being input to the `days-from-duration` function. The result is the `xs:decimal` 2.



### The 'Subtract' functions

Each of the three subtraction functions enables you to subtract one time value from another and return a duration value. The three subtraction functions are: `subtract-dates`, `subtract-times`, `subtract-dateTimes`.

The screenshot below shows how the `subtract-dates` function is used to subtract two dates (2009-10-22 minus 2009-09-22). The result is the `dayTimeDuration` `P30D`.



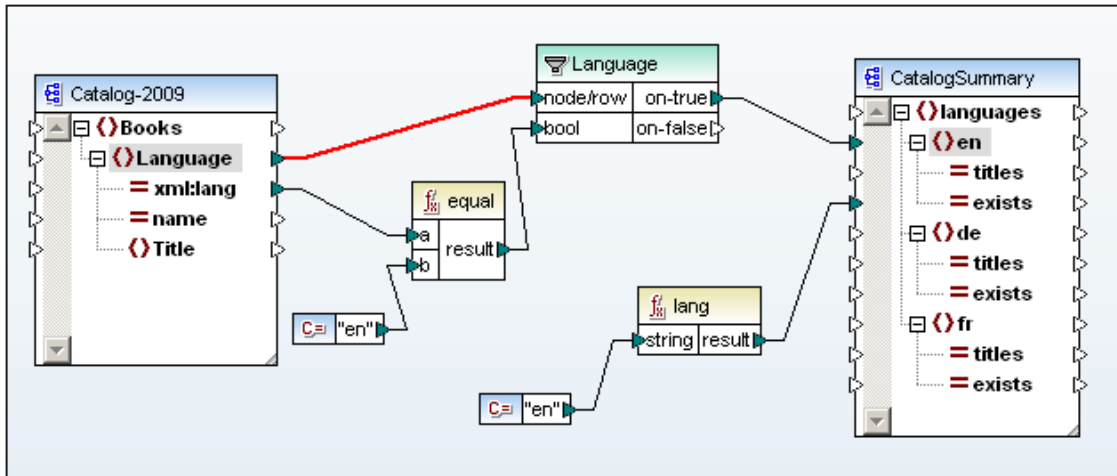
**Note:** When you mouseover the input argument in a function box, the expected datatype of the argument is displayed in a popup.

### node functions

The following Node functions are available:

#### lang

The `lang` function takes a string argument that identifies a language code (such as `en`). The function returns `true` or `false` depending on whether the context node has an `xml:lang` attribute with a value that matches the argument of the function.



In the screenshot above notice the following:

1. In the source schema, the `Language` element has an `xml:lang` attribute.
2. `Language` nodes are filtered so that only those `Language` nodes having an `xml:lang` value of `en` are processed (the filter test is specified in the `equal` function).
3. The `Language` node is the context node at the point where the `en` element is created in the output document.
4. The output of the `lang` function (`true` or `false`) is sent to the `en/@exists` attribute node of the output. The argument of the function is provided by the string constant `en`. The `lang` function then checks whether the context node at this point (the `Language` element) has an `xml:lang` attribute with a value of `en` (the argument of the function). If yes, then `true` is returned, otherwise `false`.

#### local-name, name, namespace-uri

The `local-name`, `name`, and `namespace-uri` functions, return, respectively, the local-name, name, and namespace URI of the input node. For example, for the node `altova:Products`, the local-name is `Products`, the name is `altova:Products`, and the namespace URI is the URI of the namespace to which the `altova:` prefix is bound (say, `http://www.altova.com/examples`).

Each of these three functions has two variants:

- With no argument: the function is then applied to the context node (for an example of a context node, see the example given for the `lang` function above).
- An argument that must be a node: the function is applied to the submitted node.

The output of each of these six variants is a string.

**number**

Converts an input string into a number. Also converts a boolean input to a number.

The `number` function takes a node as input, atomizes the node (that is, extracts its contents), and converts the value to a decimal and returns the converted value. The only types that can be converted to numbers are booleans, strings, and other numeric types. Non-numeric input values (such as a non-numeric string) result in `NaN` (Not a Number).

There are two variants of the `number` function:

- With no argument: the function is then applied to the context node (for an example of a context node, see the example given for the `lang` function above).
- An argument that must be a node: the function is applied to the submitted node.

**numeric functions**

The following numeric functions are available:

**abs**

The `abs` function takes a numeric value as input and returns its absolute value as a decimal. For example, if the input argument is `-2` or `+2`, the function returns `2`.

**round-half-to-even**

The `round-half-to-even` function rounds the supplied number (first argument) to the degree of precision (number of decimal places) supplied in the optional second argument. For example, if the first argument is `2.141567` and the second argument is `3`, then the first argument (the number) is rounded to three decimal places, so the result will be `2.141`. If no precision (second argument) is supplied, the number is rounded to zero decimal places, that is, to an integer.

The 'even' in the name of the function refers to the rounding to an even number when a digit in the supplied number is midway between two values. For example, `round-half-to-even (3.475, 2)` would return `3.48`.

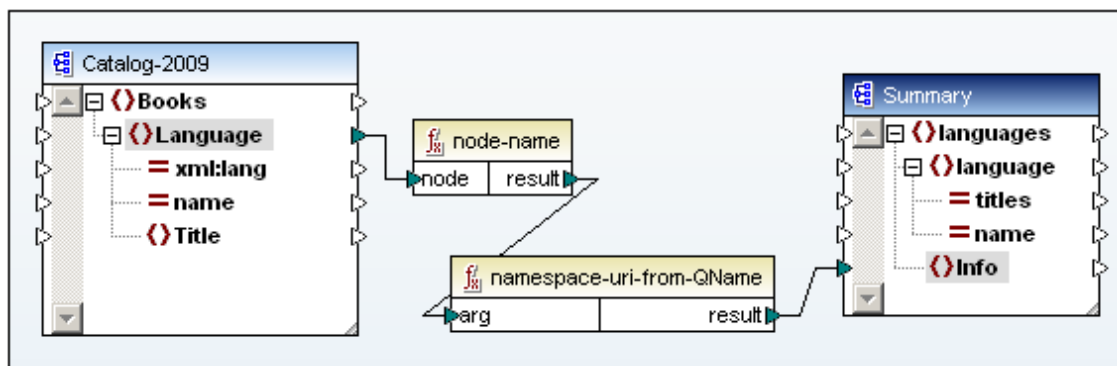
**qname-related functions**

There are two QName-related functions that work similarly: `local-name-from-QName` and `namespace-uri-from-QName`.

Both functions take an expanded QName (in the form of a string) as their input arguments and output, respectively, the local-name and namespace-uri part of the expanded QName.

The important point to note is that since the input of both functions are strings, a node cannot be connected directly to the input argument boxes of these functions.

The node should first be supplied to the `node-name` function, which outputs the expanded QName. This expanded QName can then be provided as the input to the two functions (see *screenshot below*).



The output of both functions is a string.

### string functions

The following string functions are available:

#### compare

The `compare` function takes two strings as arguments and compares them for equality and alphabetically. If *String-1* is alphabetically less than *String-2* (for example the two string are: A and B), then the function returns -1. If the two strings are equal (for example, A and A), the function returns 0. If *String-1* is greater than *String-2* (for example, B and A), then the function returns +1.

A variant of this function allows you to choose what collation is to be used to compare the strings. When no collation is used, the default collation, which is the Unicode codepoint collation, is used. The Altova Engines support the Unicode codepoint collation only.

#### ends-with

The `ends-with` function tests whether *String-1* ends with *String-2*. If yes, the function returns `true`, otherwise `false`.

A variant of this function allows you to choose what collation is to be used to compare the strings. When no collation is used, the default collation, which is the Unicode codepoint collation, is used. The Altova Engines support the Unicode codepoint collation only.

#### escape-uri

The `escape-uri` function takes a URI as input for the first string argument and applies the URI escaping conventions of RFC 2396 to the string. The second boolean argument (`escape-reserved`) should be set to `true()` if characters with a reserved meaning in URIs are to be escaped (for example "+" or "/").

For example:

```
escape-uri("My A+B.doc", true()) would give My%20A%2B.doc
escape-uri("My A+B.doc", false()) would give My%20A+B.doc
```

#### lower-case

The `lower-case` function takes a string as its argument and converts every upper-case character in the string to its corresponding lower-case character.

**matches**

The `matches` function tests whether a supplied string (the first argument) matches a regular expression (the second argument). The syntax of regular expressions must be that defined for the `pattern` facet of XML Schema. The function returns `true` if the string matches the regular expression, `false` otherwise.

The function takes an optional `flags` argument. Four flags are defined (`i`, `m`, `s`, `x`). Multiple flags can be used: for example, `imx`. If no flag is used, the default values of all four flags are used.

The meaning of the four flags are as follows:

- `i`    Use case-insensitive mode. The default is case-sensitive.
- `m`    Use multiline mode, in which the input string is considered to have multiple lines, each separated by a newline character (`\n`). The meta characters `^` and `$` indicate the beginning and end of each line. The default is string mode, in which the string starts and ends with the meta characters `^` and `$`.
- `s`    Use dot-all mode. The default is not-dot-all mode, in which the meta character `.` matches all characters except the newline character (`\n`). In dot-all mode, the dot also matches the newline character.
- `x`    Ignore whitespace. By default whitespace characters are not ignored.

**normalize-unicode**

The `normalize-unicode` function normalizes the input string (the first argument) according to the rules of the normalization form specified (the second argument). The normalization forms NFC, NFD, NFKC, and NFKD are supported.

**replace**

The `replace` function takes the string supplied in the first argument as input, looks for matches as specified in a regular expression (the second argument), and replaces the matches with the string in the third argument.

The rules for matching are as specified for the `matches` attribute above. The function also takes an optional `flags` argument. The flags are as described in the `matches` function above.

**starts-with**

The `starts-with` function tests whether *String-1* starts with *String-2*. If yes, the function returns `true`, otherwise `false`.

A variant of this function allows you to choose what collation is to be used to compare the strings. When no collation is used, the default collation, which is the Unicode codepoint collation, is used. The Altova Engines support the Unicode codepoint collation only.

**substring-after**

The `substring-after` function returns that part of *String-1* (the first argument) that occurs after the test string, *String-2* (the second argument). An optional third argument specifies the collation to use for the string comparison. When no collation is used, the default collation, which is the Unicode codepoint collation, is used. The Altova Engines support the Unicode codepoint collation only.

**substring-before**

The substring-before function returns that part of *String-1* (the first argument) that occurs before the test string, *String-2* (the second argument). An optional third argument specifies the collation to use for the string comparison. When no collation is used, the default collation, which is the Unicode codepoint collation, is used. The Altova Engines support the Unicode codepoint collation only.

**upper-case**

The `upper-case` function takes a string as its argument and converts every lower-case character in the string to its corresponding upper-case character.

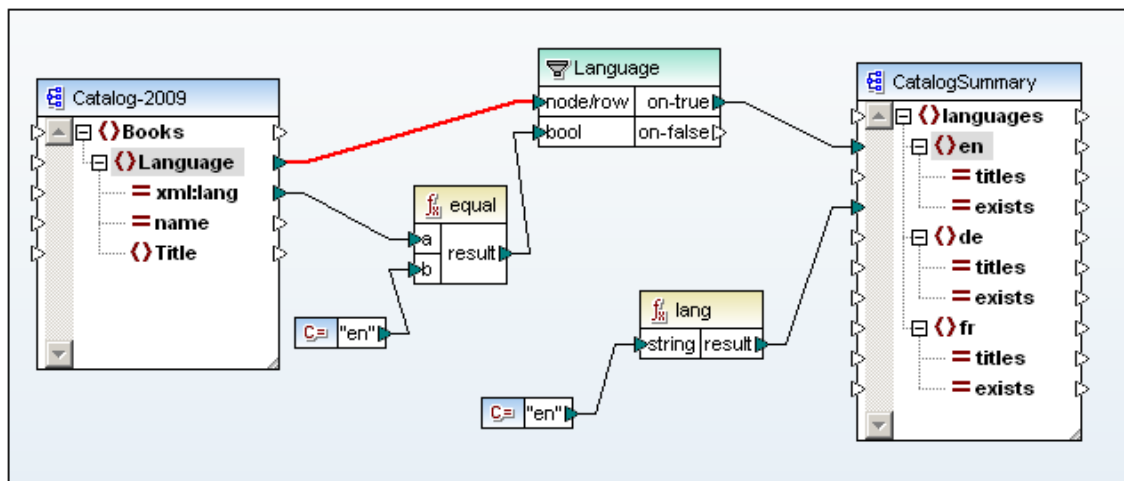
### 16.3.3 xslt

- [xpath functions](#)  
The functions in the XPath Functions library are XPath 1.0 nodeset functions.
- [xslt functions](#)  
The functions in the XSLT Functions library are XSLT 1.0 functions.

#### xpath functions

The functions in the XPath Functions library are XPath 1.0 nodeset functions. Each of these functions takes a node or nodeset as its context and returns information about that node or nodeset. These function typically have:

- a context node (in the screenshot below, the context node for the `lang` function is the `Language` element of the source schema).
- an input argument (in the screenshot below, the input argument for the `lang` function is the string constant `en`). The `last` and `position` functions take no argument.



#### lang

The `lang` function takes a string argument that identifies a language code (such as `en`). The function returns `true` or `false` depending on whether the context node has an `xml:lang` attribute with a value that matches the argument of the function. In the screenshot above notice the following:

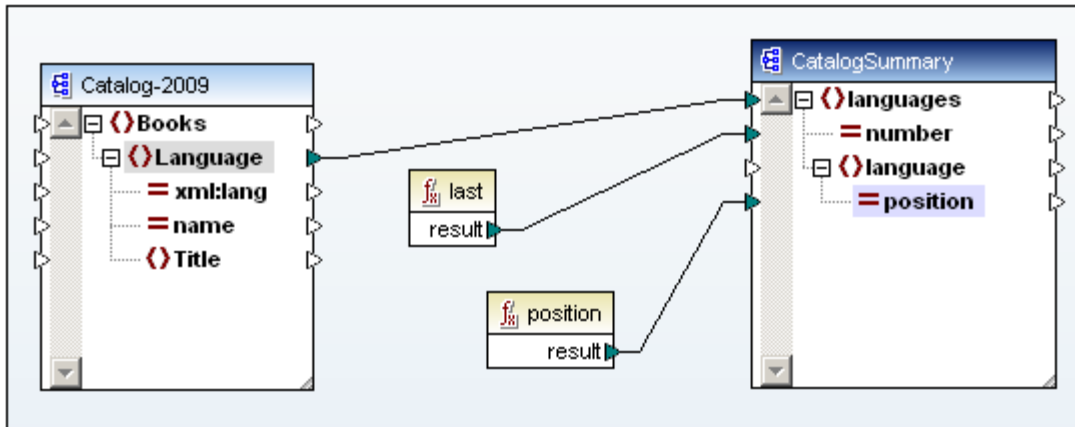
1. In the source schema, the `Language` element has an `xml:lang` attribute.
2. `Language` nodes are filtered so that only those `Language` nodes having an `xml:lang` value of `en` are processed (the filter test is specified in the `equal` function).
3. The `Language` node is the context node at the point where the `en` element is created in the output document.
4. The output of the `lang` function (`true` or `false`) is sent to the `en/@exists` attribute node of the output. The argument of the function is provided by the string constant `en`. The `lang` function then checks whether the context node at this point (the `Language` element) has an `xml:lang` attribute with a value of `en` (the argument of the function). If yes, then `true` is returned, otherwise `false`.

#### last, position

The `last` and `position` functions take no argument. The `last` function returns the position of the last node in the context nodeset. The `position` function returns the position of the current

node in the nodeset being processed.

The context nodeset at the nodes where the functions are directed is the nodeset to which the functions will apply. In the screenshot below, the nodeset of `Language` elements is the context nodeset for the `last` and `position` functions.



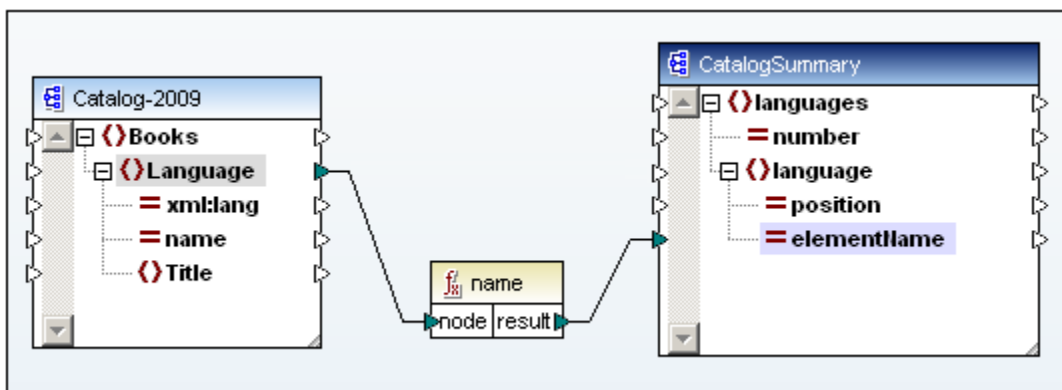
In the example above, the `last` function returns the position of the last node of the context nodeset (the nodeset of `Language` elements) as the value of the `number` attribute. This value is also the size of the nodeset since it indicates the number of nodes in the nodeset.

The `position` function returns the position of the `Language` node being currently processed. For each `Language` element node, its position within the nodeset of `Language` elements is output to the `language/@position` attribute node.

### name, local-name, namespace-uri

These functions are all used the same way and return, respectively, the name, local-name, and namespace URI of the input node. The screenshot below shows how these functions are used. Notice that no context node is specified.

The `name` function returns the name of the `Language` node and outputs it to the `language/@elementname` attribute. If the argument of any of these functions is a nodeset instead of a single node, the name (or local-name or namespace URI) of the first node in the nodeset is returned.



The `name` function returns the QName of the node; the `local-name` function returns the local-name part of the node's QName. For example, if a node's QName is `altova:MyNode`, then `MyNode` is the local name.

The namespace URI is the URI of the namespace to which the node belongs. For example, the `altova:` prefix can be declared to map to a namespace URI in this way: `xmlns:altova="http://www.altova.com/namespaces"`.

**Note:** Additional XPath 1.0 functions can be found in the Core function library.

### xslt functions

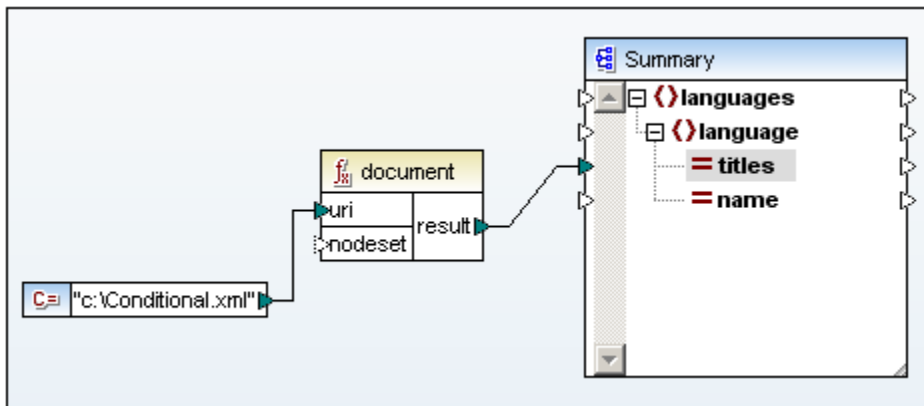
The functions in the XSLT Functions library are XSLT 1.0 functions, and are described below. Drag a function into the mapping to use it. When you mouseover the input argument part of a function box, the expected datatype of the argument is displayed in a popup.

#### current

The `current` function takes no argument and returns the current node.

#### document

The `document` function addresses an external XML document (with the `uri` argument; see *screenshot below*). The optional `nodeset` argument specifies a node, the base URI of which is used to resolve the URI supplied as the first argument if this URI is relative. The result is output to a node in the output document.

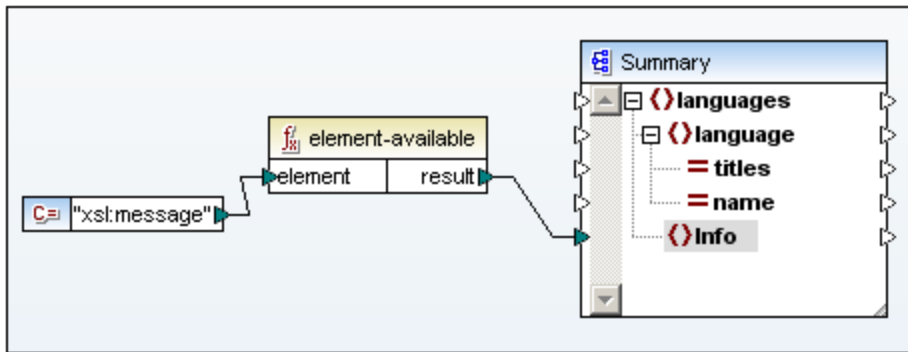


Note that the `uri` argument is a string that must be an absolute file path.

#### element-available

The `element-available` function tests whether an element, entered as the only string argument of the function, is supported by the XSLT processor.

The argument string is evaluated as a QName. Therefore, XSLT elements must have an `xsl:` prefix and XML Schema elements must have an `xs:` prefix—since these are the prefixes declared for these namespaces in the underlying XSLT that will be generated for the mapping.



The function returns a boolean.

### function-available

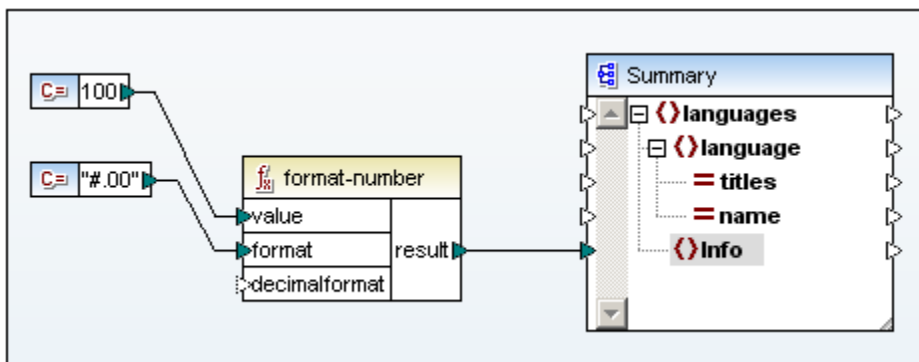
The `function-available` function is similar to the `element-available` function and tests whether the function name supplied as the function's argument is supported by the XSLT processor.

The input string is evaluated as a QName. The function returns a boolean.

### format-number

The `format-number` takes an integer as its first argument (*value*) and a format string as its second argument (*format*). The third optional argument is a string that names the decimal format to use. If this argument is not used, then the default decimal format is used.

Decimal formats are defined by the XSLT 1.0 `decimal-format` element: each decimal format so defined can be named and the name can be used as the third argument of the `format-number` function. If a decimal format is defined without a name, it is the default decimal format for the transformation.



The function returns the number formatted as a string.

### generate-id

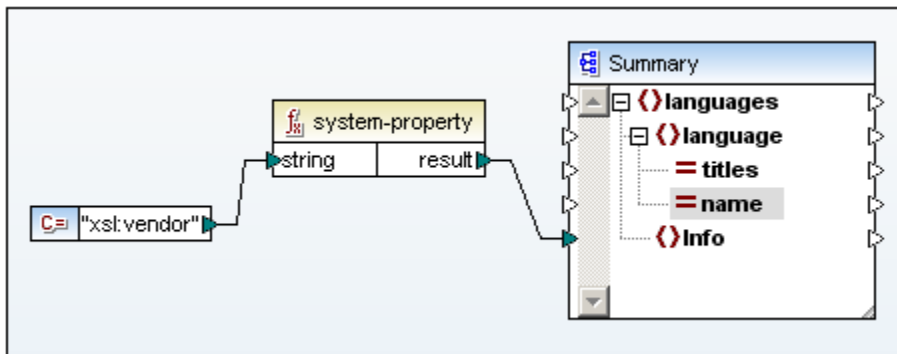
The `generate-id` function generates a unique string that identifies the first node in the nodeset identified by the optional input argument.

If no argument is supplied, the ID is generated on the context node. The result can be directed to any node in the output document.

**system-property**

The `system-property` function returns properties of the XSLT processor (the system). Three system properties, all in the XSLT namespace, are mandatory for XSLT processors. These are `xsl:version`, `xsl:vendor`, and `xsl:vendor-url`.

The input string is evaluated as a QName and so must have the `xsl:prefix`, since this is the prefix associated with the XSLT namespace in the underlying XSLT stylesheet.

**unparsed-entity-uri**

If you are using a DTD, you can declare an unparsed entity in it. This unparsed entity (for example an image) will have a URI that locates the unparsed entity.

The input string of the function must match the name of the unparsed entity that has been declared in the DTD. The function then returns the URI of the unparsed entity, which can then be directed to a node in the output document, for example, to an `href` node.



# Chapter 17

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## QName support

## 17 QName support

QNames (Qualified Names) allow you reference and abbreviate namespace URIs used in XML and XBRL instance documents. There are two types of QNames; Prefixed or Unprefixed QNames.

PrefixedName    Prefix ':' LocalPart

UnPrefixedName    LocalPart

where LocalPart is an Element or Attribute name.

```
<Doc xmlns:x="http://myCompany.com">
  <x:part>
</Doc>
```

x is the namespace reference to "**http://myCompany.com**" and <x:part> is therefore a valid QName, as:

**x** is the namespace prefix  
**part** is the LocalPart, i.e. the element name.

When mapping from source to target components QName prefixes will be resolved.

MapForce supports the following QName functions in the **Lang** section of the Libraries pane:

### QName

Constructs a QName from a namespace URI and a local part. Use this function to create a QName in a target component. The uri and localname parameters can be supplied by a constant function.

f(x,y) QName	
uri	result
localname	

### QName-as-string

Converts a QName to a string in the form {**http://myCompany.com**}local.

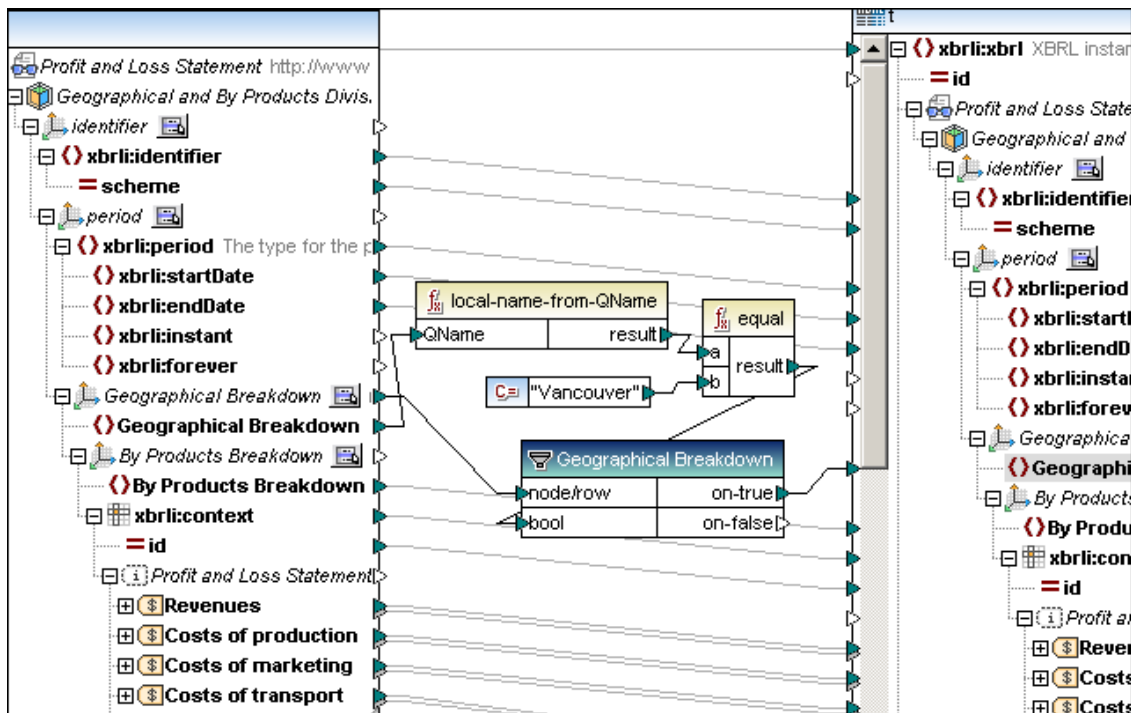
f(x,y) QName-as-string	
QName	result

### local-name-from-QName

Extracts the local name from a QName.

f(x,y) local-name-from-QName	
QName	result

This function is extremely useful when mapping XBRL instance documents containing hypercubes.



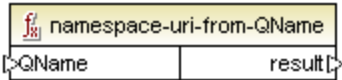
What the mapping does is filter those facts where the **local name** of the **content** of the explicit member (d-g:Vancouver) is equal to "Vancouver". Note that the content of the member is itself a QName.

```
<xbrli:context id="Year2007_Vancouver_BeveragesTotal">
  <xbrli:entity>
    <xbrli:identifier scheme="http://www.stockexchange/ticker">ACME</xbrli:identifier>
    <xbrli:segment>
      <xbrldi:explicitMember dimension="d-g:GeographicalBreakdown">d-g:Vancouver</xbrldi:explicitMember>
      <xbrldi:explicitMember dimension="d-b:ByProductsBreakdown">d-b:BeveragesTotal</xbrldi:explicitMember>
    </xbrli:segment>
  </xbrli:entity>
</xbrli:context>
```

All the facts that belong to the dimension GeographicalBreakdown are filtered and passed to the target component.

```
<context id="Year2007_Vancouver_BeveragesTotal">
  <entity>
    <identifier scheme="http://www.stockexchange/ticker">ACME</identifier>
    <segment>
      <explicitMember dimension="d-b:ByProductsBreakdown" xmlns="http://xbrl.org/2006/xbrldi">d-b:BeveragesTotal</explicitMember>
      <explicitMember dimension="d-g:GeographicalBreakdown" xmlns="http://xbrl.org/2006/xbrldi">d-g:Vancouver</explicitMember>
    </segment>
  </entity>
  <period>
    <startDate>2007-01-01</startDate>
    <endDate>2007-12-31</endDate>
  </period>
</context>
<p:Revenues contextRef="Year2007_Vancouver_BeveragesTotal" unitRef="USD" decimals="0">4</p:Revenues>
<p:CostsOfProduction contextRef="Year2007_Vancouver_BeveragesTotal" unitRef="USD" decimals="0">1</p:CostsOfProduction>
<p:CostsOfMarketing contextRef="Year2007_Vancouver_BeveragesTotal" unitRef="USD" decimals="0">1</p:CostsOfMarketing>
<p:ProfitLoss contextRef="Year2007_Vancouver_BeveragesTotal" unitRef="USD" decimals="0">2</p:ProfitLoss>
```

**namespace-uri-from-QName**  
Extracts the namespace URI from a QName.



# Chapter 18

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## User Reference

## 18 User Reference

The following section lists all the menus and menu options in MapForce, and supplies a short description of each.

## 18.1 File

### New

Creates a new mapping document

### Open

Opens previously saved mapping (\*.mfd) files.

Please note:

Opening a mapping that contains features available in a higher-level MapForce edition is not possible.

E.g. A mapping containing Web service features in the Professional version, or database mappings the Basic editions is not possible.

### Save

Saves the currently active mapping using the currently active file name.

### Save As

Saves the currently active mapping with a different name, or allows you to supply a new name if this is the first time you save it.

### Save All

Saves all currently open mapping files.

### Reload

Reloads the currently active mapping file. You are asked if you want to lose your last changes.

### Close

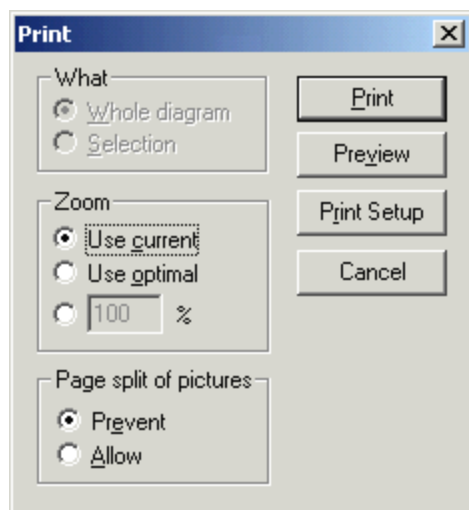
Closes the currently active mapping file. You are asked if you want to save the file before it closes.

### Close All

Closes all currently open mapping files. You are asked if you want to save any of the unsaved mapping files.

### Print

Opens the Print dialog box, from where you can printout your mapping as hardcopy.



"Use current", retains the currently defined zoom factor of the mapping. "Use optimal" scales the mapping to fit the page size. You can also specify the zoom factor numerically. Component scrollbars are not printed. You can also specify if you want to allow the graphics to be split over several pages or not.

### Print Preview

Opens the same Print dialog box with the same settings as described above.

### Print Setup

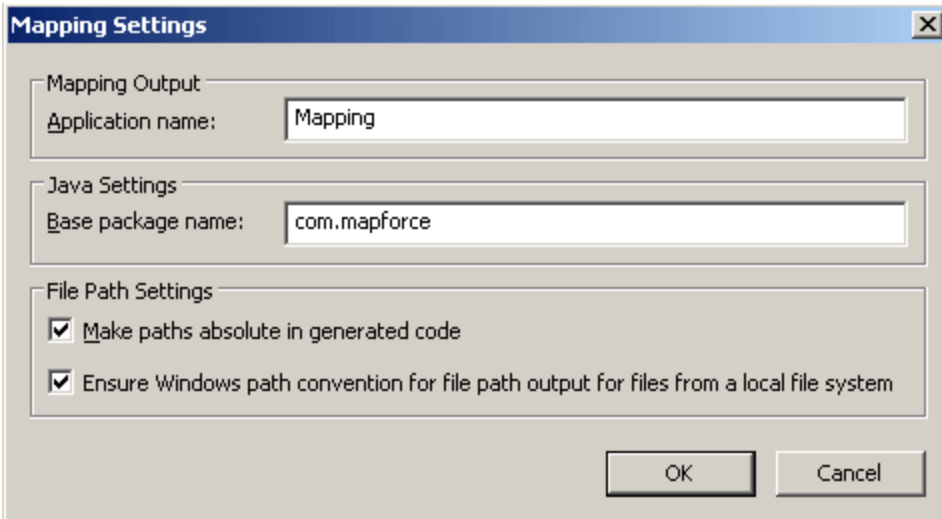
Open the Print Setup dialog box in which you can define the printer you want to use and the paper settings.

### Validate Mapping

Validating a Mapping validates that all mappings (connectors) are valid and displays any warnings or errors.

Please see "[Validating mappings](#)" for more information.

### Mapping settings

The image shows a 'Mapping Settings' dialog box with a title bar and a close button. It contains three sections: 'Mapping Output' with an 'Application name' text box containing 'Mapping'; 'Java Settings' with a 'Base package name' text box containing 'com.mapforce'; and 'File Path Settings' with two checked checkboxes: 'Make paths absolute in generated code' and 'Ensure Windows path convention for file path output for files from a local file system'. At the bottom right are 'OK' and 'Cancel' buttons.

The document-specific settings are defined here. They are stored in the \*.mfd file.

#### *Mapping Output*

Application Name: defines the XSLT1.0/2.0 file name prefix for the generated transformation files.

#### *File Path Settings*

##### **Make paths absolute in generated code**

Ensures compatibility of generated code with mapping files (\*.mfd) from versions prior to Version 2010, please see [Relative and absolute file paths](#) for more information.

##### **Ensure Windows path convention for file path...**

The "Ensure Windows path convention...." check box makes sure that Windows path conventions are followed. When outputting XSLT2 (and XQuery), the currently processed file name is internally retrieved using the document-uri function, which returns a path in the form file:// URI for local files.

When this check box is active, a file:// URI path specification is automatically converted to a

complete Windows file path (e.g. "C:\...") to simplify further processing.

**Generate code in selected language**

Generates code in the currently selected language of your mapping. The currently selected language is visible as a highlighted programming language icon in the toolbar: XSLT, XSLT 2.

**Generate code in | XSLT (XSLT2)**

This command generates the XSLT file(s) needed for the transformation from the source file(s). Selecting this option opens the Browse for Folder dialog box where you select the location of the XSLT file.

Note: the name of the generated XSLT file(s) is defined in the **Application Name** field of the Mapping Output dialog box. This dialog is opened by selecting **File | Mapping Settings** menu option.

**Generate documentation**

Generates documentation of your mapping projects in great detail in various output formats. Please see [Documenting mapping projects](#) for more information.

**Recent files**

Displays a list of the most recently opened files.

**Recent projects**

Displays a list of the most recently opened projects.

**Exit**

Exits the application. You are asked if you want to save any unsaved files.

## 18.2 Edit

Most of the commands in this menu, become active when you view the result of a mapping in the **Output** tab, or preview XSLT code in the XSLT tab.

### Undo

MapForce has an unlimited number of "Undo" steps that you can use to retrace you mapping steps.

### Redo

The redo command allows you to redo previously undone commands. You can step backward and forward through the undo history using both these commands.

### Find

Allows you to search for specific text in either the XSLT, XSLT2 or Output tab.

### Find Next F3

Searches for the next occurrence of the same search string.

### Find Previous Shift F3

Serches for the previous occurrence of the same search string.

### Cut/Copy/Paste/Delete

The standard windows Edit commands, allow you to cut, copy etc., any components or functions visible in the mapping window.

### Select all

Selects all components in the Mapping tab, or the text/code in the XSLT, XSLT2, or Output tab.

## 18.3 Insert

### XML Schema / File

Inserts an XML schema file into the mapping tab as data source or target component. You can select XML files with a schema reference, in this case the referenced schema is automatically inserted. If you select an XML schema file, you are prompted if you want to include an XML instance file which supplies the data for the XSLT, XSLT2, , and Output previews. If you select an XML file without a schema reference, you are prompted if you want to generate a matching XML schema automatically.

### Constant

Inserts a constant which is a function component that supplies fixed data to an input icon. The data is entered into a dialog box when creating the component. There is only one output icon on a constant function. You can select the following types of data: String, Number and All other.

### Variable

Inserts an Intermediate Variable which is equivalent to a regular (non-inline) user-defined function. Variables are structural components, without instance files, and are used to simplify the mapping process. Please see [Intermediate variables](#) for more information.

### Filter: Nodes/Rows

Inserts a component that uses two input and output parameters: **node/row** and **bool**, and **on-true**, **on-false**. If the Boolean is true, then the value of the node/row parameter is forwarded to the on-true parameter. If the Boolean is false, then the complement value is passed on to the on-false parameter. Please see the [tutorial example](#) on how to use a filter.

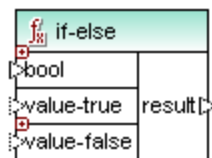
### Value-Map

Inserts a component that transforms an input value to an output value using a lookup table. The component only has one input and output item. Please see [Value-Map - transforming input data](#) for more information.



### IF-Else Condition

A condition is a component which allows you to pass on different sets of data depending on the outcome of a preset condition. The component header displays the text **if-else**.

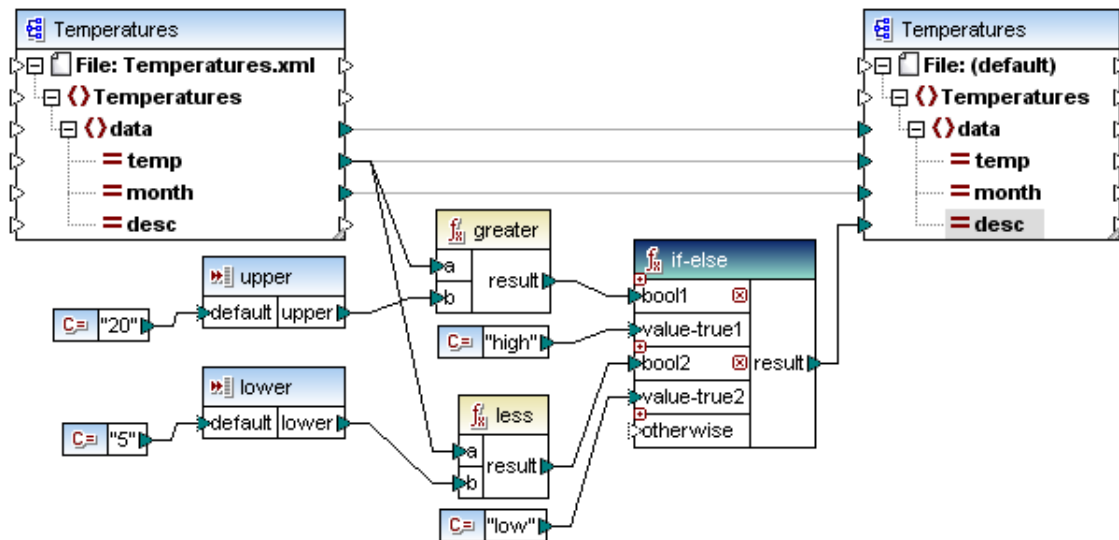


- The first input parameter is a **bool**, which contains the data you are checking against.
- The **value-true** input parameter supplies the data to be passed on, as a result, if the condition is true.
- The **value-false** supplies the data to be passed on if the condition is false.
- The **result** parameter outputs the data supplied by the value-true/false input parameters.

The IF-Else function is **extendable**. This means that you can check for multiple conditions and

use the **otherwise** parameter to output the Else condition/value.

Clicking the "plus" icon inserts or appends a new if-else **pair**, i.e. boolX and value-trueX, while clicking the "x" deletes the parameter pair.



In the example above, the temperature data is analyzed:

- If temp is **greater** than 20, then true is passed on to **bool1** and the result is "**high**" from **value-true1**.
- Else, If temp is **less** than 5, then true is passed on to **bool2** and the result is "**low**" from **value-true2**.
- Otherwise, nothing (an empty sequence) is the result of the component, since there is no connection to the "otherwise" input.

Result of the mapping:

```
<?xml version="1.0" encoding="UTF-8"?>
<Temperatures xsi:noNamespaceSchemaLocation="c:/DOCUME~1/
http://www.w3.org/2001/XMLSchema-instance">
  <data temp="-3.6" month="2006-01" desc="low"/>
  <data temp="-0.7" month="2006-02" desc="low"/>
  <data temp="7.5" month="2006-03"/>
  <data temp="12.4" month="2006-04"/>
</Temperatures>
```

## 18.4 Component

### Change Root Element

Allows you to change the root element of the XML instance document.

### Edit Schema Definition in XMLSpy

Selecting this option, having previously clicked an XML-Schema/document, opens the XML Schema file in the Schema view of XMLSpy where you can edit it.

### Add Duplicate Input Before

Inserts a copy/clone of the selected item before the currently selected item. Duplicate items do not have output icons, you cannot use them as data sources. Please see the [Duplicating input items](#) section in the tutorial for an example of this.

Right clicking a duplicate item also allows you to reposition it using the menu items Move Up/Move Down, depending on where the item is.

### Add Duplicate Input After

Inserts a copy/clone of the selected item after the currently selected item. Duplicate items do not have output icons, you cannot use them as data sources. Please see the [Duplicating input items](#) section in the tutorial for an example of this.

Right clicking a duplicate item also allows you to reposition it using the menu items Move Up/Move Down, depending on where the item is.

### Remove Duplicate

Removes a previously defined duplicate item. Please see the [Duplicating input items](#) section in the tutorial for more information.

### Align Tree Left

Aligns all the items along the left hand window border.

### Align Tree Right

Aligns all the items along the right hand window border. This display is useful when creating mappings to the target schema.

### Properties

Opens a dialog box which displays the currently selected component settings. If the component is an XML-Schema file then the Component Settings dialog box is opened. If the component is a Text file, then the "Text import / export" dialog box is opened.

**Schema file:** Shows the file name and path of the target schema.

**Input XML-File:** Allows you to select, or change the XML-Instance for the currently selected schema component. This field is filled when you first insert the schema component and assign an XML-instance file.

**Output XML-File:** This is file name and path where the XML target instance is placed, when generating and executing program code. The file name is also visible as the first item in the component.

The entry from the Input XML-Instance field, is automatically copied to this field when you assign the XML-instance file. If you do not assign an XML-Instance file to the component, then this field contains the entry **schemafilenameandpath.xml**.

**Prefix for target namespace:** Allows you to enter a prefix for the Target Namespace if this is a schema / XML document. A Target namespace has to be defined in the target schema, for the prefix to be assigned here.

**Add Schema/DTD reference:** Adds the path of the referenced XML Schema file to the root element of the XML output.

Entering a path in this field allows you to define where the schema file, referenced by the XML instance file, is to be located. This ensures that the output instance can be validated at the mapping destination when the mapping is executed. You can enter an http:// address as well as an absolute or relative path in this field.

Deactivating this option allows you to decouple the XML instance from the referenced XML Schema or DTD. E.g. if you want to send the resulting XML output to someone who does not have access to the underlying XML Schema.

**Cast target values to target types:** Allows you to define if the target XML schema types should be used when mapping (default - active), or if all data mapped to the target component should be treated as **string** values.

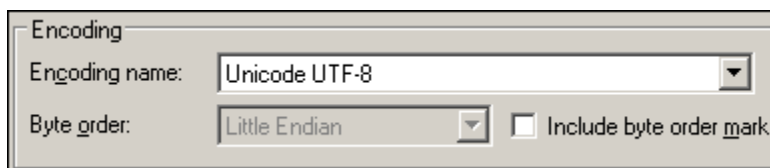
Deactivating this option allows you to retain the precise formatting of values. E.g., this is useful to "satisfy" a pattern facet in a schema, that requires a specific number of decimal digits in a numeric value.

You can use mapping functions to format the number as a string in the required format, and then map this string to the target.

Note that disabling this option will also disable the detection of invalid values, e.g. writing letters into numeric fields.

**Pretty-print output:** Reformats your XML document in the Output pane to give a structured display of the document. (Each child node is offset from its parent by a single tab character.)

### Encoding settings



The screenshot shows a dialog box titled "Encoding". It contains two dropdown menus: "Encoding name:" with "Unicode UTF-8" selected, and "Byte order:" with "Little Endian" selected. To the right of the "Byte order:" dropdown is a checkbox labeled "Include byte order mark", which is currently unchecked.

From MapForce version 2008 each component, source, as well as target, has its own encoding settings. This means that the \*.mfd mapping files do not have a default encoding, each component that makes up the mapping file has its own. Components in this general sense are all XML, and Text components.

There is however a default encoding setting defined in the **Tools | Options** General tab, called "Default encoding for new components" which is applied whenever new components are created/inserted. When mappings from previous versions are opened, the default encoding setting will be used.

The encoding control group consists of 3 controls:

- Encoding name selection combobox.
- Byte order selection combobox (little endian, big endian).
- Include Byte Order Mark checkbox.

Default settings are:

- UTF-8
- little endian (disabled for UTF-8)
- no Byte Order Mark.

Please note:

Activating the Byte Order Mark check box in the Component Settings dialog box, does not have any effect when outputting **XSLT 1.0/2.0**, as these languages do not support BOMs (Byte Order Marks).

#### **Enable input processing optimizations based on min/maxOccurs**

MapForce version 2009 introduces special handling for sequences that are known to contain exactly one item, e.g. required attributes, or child elements with minOccurs and maxOccurs = 1. In this case the first item of the sequence is extracted, then the item is directly processed as an atomic value (and not as a sequence).

If the input data is **not valid** against the schema, an empty sequence might be encountered in a mapping, which stops the mapping with an error message. To allow the processing of such **invalid input**, this optimization can be disabled in the component settings of XML and EDI components.

## 18.5 Connection


### Auto Connect Matching Children

Activates or de-activates the "Auto connect child items" function, as well as the icon in the icon bar.

### Settings for Connect Matching Children

Opens the Connect Matching Children dialog box in which you define the connection settings.

### Connect Matching Children

This command allows you to create multiple connectors for items of the **same name**, in both the source and target schemas. The settings you define in this dialog box are retained, and are applied when connecting two items, if the "**Auto connect child items**" icon  in the title bar is active. Clicking the icon, switches between an active and inactive state. Please see the section on [Connector properties](#) for further information.

### Target Driven (Standard)

Changes the connector type to Standard mapping, please see: "[Source-driven / mixed content vs. standard mapping](#)" for more information.

### Copy-all (Copy Child Items)

Creates connectors for all matching child items, where each of the child connectors are displayed as a subtree of the parent connector, please see "[Copy-all connections](#)" for more information.

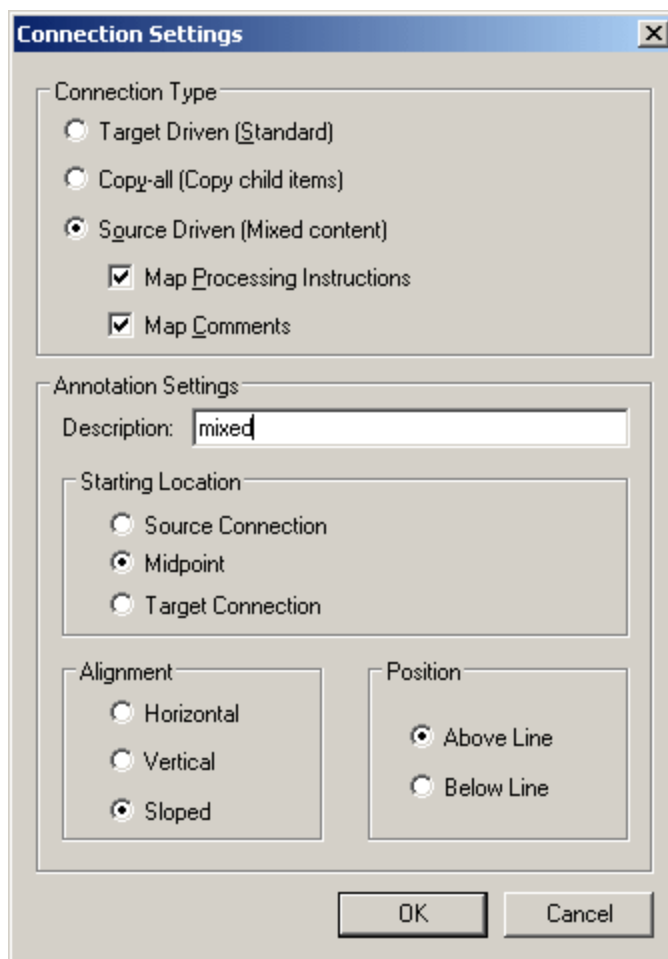
### Source Driven (Mixed Content)

Changes the connector type to source driven / mixed content, and enables the selection of additional elements to be mapped. The additional elements have to be **child items** of the mapped item in the XML source file, to be able to be mapped. Please see [Default settings: mapping mixed content](#) for more information.

### Properties:

Opens a dialog box in which you can define the specific (mixed content) settings of the current connector. Note that unavailable options are greyed out.

Please note that these settings also apply to **complexType** items which do not have any text nodes!

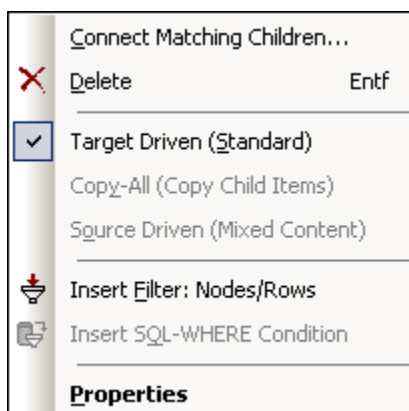


### Annotation settings:

Individual connectors can be **labeled** for clarity.

1. Double click a connector and enter the name of the connector in the Description field.  
This enables all the options in the Annotation Settings group.
2. Use the remaining groups to define the position and alignment of the label.

### Connector context menu:



### Connect matching children

Opens the "Connect Matching Children" dialog box, allowing you to change the connection settings and connect the items when confirming with OK.

**Delete**

Deletes the selected connector.

**Target Driven (Standard)**

Changes the connector type to Standard mapping, please see: "[Source-driven / mixed content vs. standard mapping](#)" for more information.

**Copy-all (Copy Child Items)**

Changes the connector type to "Copy-all" and connects all child items of the same name in a graphically optimized fashion, please see "[Copy-all connections](#)" for more information.

**Source Driven (Mixed Content)**

Changes the connector type to source-driven / mixed content, please see: "[Source driven and mixed content mapping](#)" for more information.

**Insert Filter: Nodes/Rows**

Inserts a Filter component into the connector. The source connector is connected to the nodes/row parameter, and the target connector is connected to the on-true parameter. Please see Filter - retrieving dynamic data, lookup table for more information.

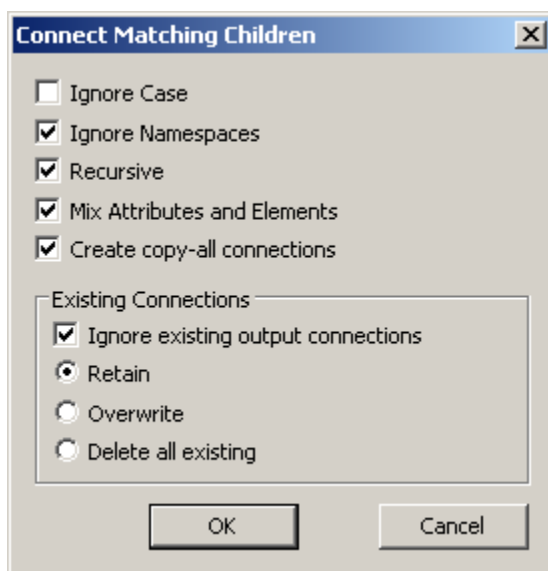
**Properties:**

Opens the Connections Settings dialog, in which you can define the specific mixed content settings as well as the connector annotation settings, please see the [Connection](#) section in the Reference section.

**Connect Matching Children dialog box**

This command allows you to create multiple connectors between items of the **same name** in both the source and target components. Note that a copy-all connection is created by default.

1. Connect two (parent) items that share identically named **child items** in both components.
2. Right click the connector and select the **Connect matching child elements** option.




3. Select the required options discussed in the text below, and click OK to create the

connectors.

Connectors are created for all the child items that have identical names and adhere to the settings defined in the dialog box.

Please note:

The settings you define here are retained, and are applied when connecting two items,

if the "**Auto connect child items**" icon  in the title bar is active. Clicking the icon switches between an active and inactive state.

**Ignore Case:**

Ignores the case of the child item names.

**Ignore Namespaces:**

Ignores the namespaces of the child items.

**Recursive:**

Having created the first set of connectors, the grandchild items are then checked for identical names. If some exist, then connectors are also created for them. The child elements of these items are now checked, and so on.

**Mix Attributes and Elements:**

Allows the creation of connectors between items of the same name, even if they are of different types e.g. two "Name" items exist, but one is an element, the other an attribute. If set active, a connector is created between these items.

**Create copy-all connections:**

Default setting is active. Creates copy-all connection between source and target items if possible.

*Existing connections:*

**Ignore existing output connections:**

Creates **additional** connectors to other components, even if the currently existing output icons already have connectors.

**Retain**

Retains existing connectors.

**Overwrite:**

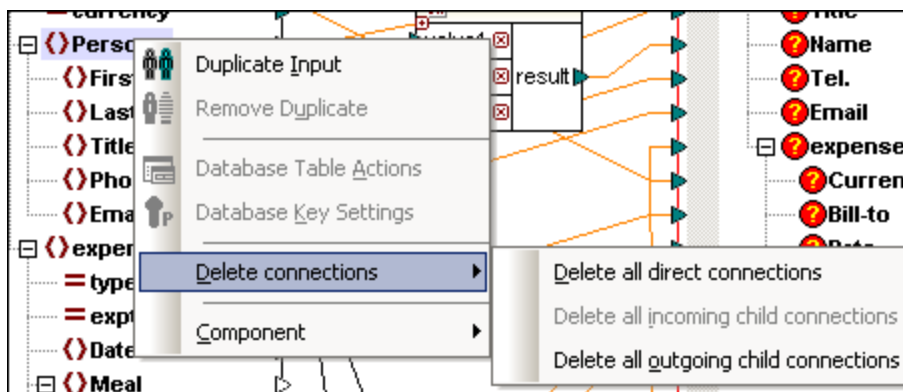
Recreates connectors, according to the settings defined. Existing connectors are scrapped.

**Delete all existing:**

Deletes all existing connectors, before creating new ones.

**Deleting connections**

Connectors that have been created using the Connect Matching Children dialog, or during the mapping process can be removed as a group.



Right click the item name in the component, not the connector itself, Person in this example. Select **Delete Connections | Delete all ... connections**.

**Delete all direct connections:**

Deletes all connectors directly mapped to, or from, the current component to any other source or target components.

**Delete all incoming child connections:**

Only active if you have right clicked an item in a target component. Deletes all incoming child connectors.

**Delete all outgoing child connections:**

Only active if you have right clicked an item in a source component. Deletes all outgoing child connectors.

## 18.6 Function

### Create User-Defined Function...:

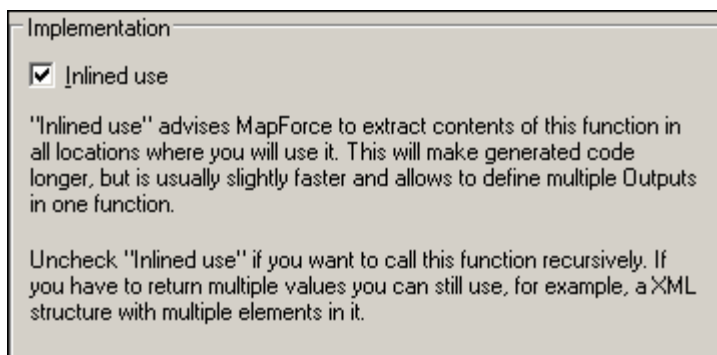
Creates a new user-defined function. Selecting this option creates an empty user-defined function, into which you insert the components you need. A single output component is automatically inserted when you define such a function, and only one output component can be present in a user-defined function unless it is defined as inlined. Please see "[Creating a user-defined function from scratch](#)" for more information.

### Create User-Defined Function from Selection:

Creates a new user-defined function based on the currently selected elements in the mapping window. Please see "[Adding user-defined functions](#)" for more information.

### Function Settings:

Opens the settings dialog box of the currently active user-defined function allowing you to change the current settings. Use this method to change the user-defined function type, i.e. double click the title bar of a user-defined function to see its contents, then select this menu option to change its type.



### Remove Function

Deletes the currently active user-defined function while working on an existing user-defined function, in the tab of that name. I.e. this only works on existing user-defined functions while viewing their contents.

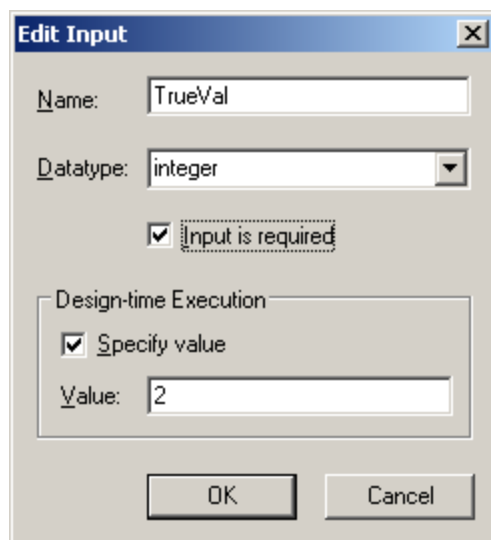
A prompt appears reminding you that instances may become invalid and in what libraries the user-defined function exists.

### Insert Input:

Inserts an "input" component into the mapping, or into a user-defined function.

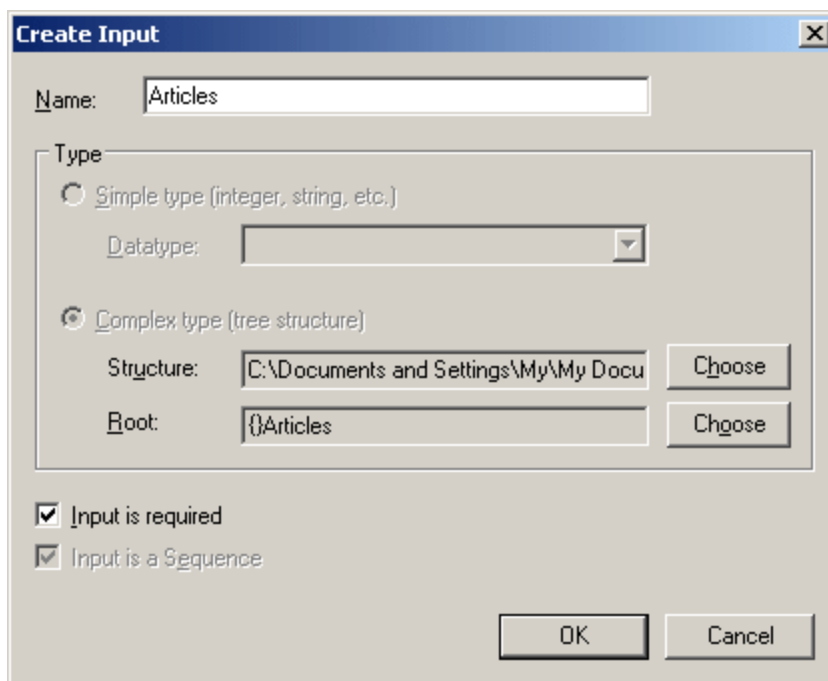
If you are working in the **main** Mapping tab, the dialog box shown below is displayed. This type of input component allows you to define a **parameter** in the command line execution of the compiled mapping.

Please see "[Input values, overrides and command line parameters](#)" for more information.



If you are working in a user-defined function tab, the dialog box shown below is displayed. This type of input component allows you to define:

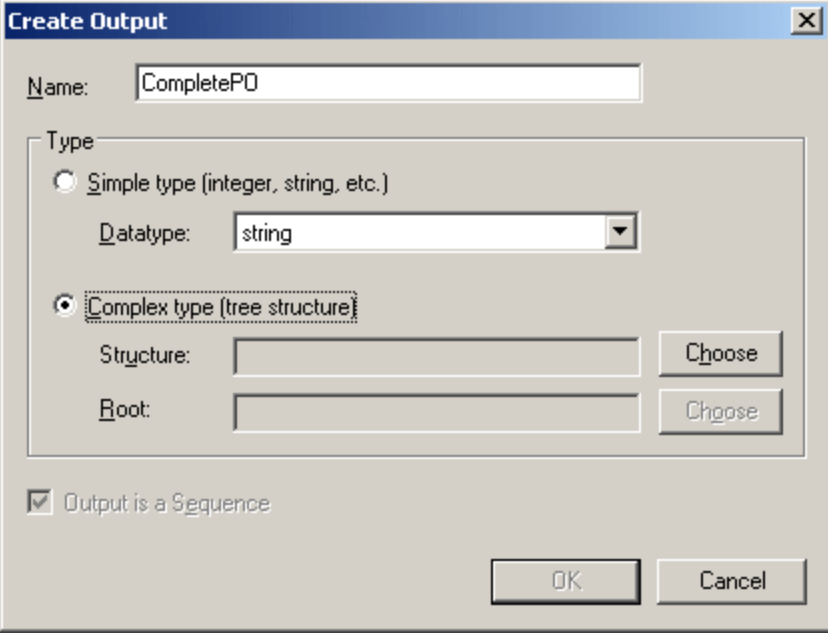
- simple inputs
- complex inputs, e.g. schema structures



### Insert Output

Inserts an "Output" component into a user-defined function. In a user-defined function tab, the dialog box shown below is displayed. This type of input component allows you to define:

- simple outputs
- complex outputs, e.g. schema structures



The "Create Output" dialog box is used to define the output of a function. It features a title bar with a close button (X). The "Name" field is set to "CompletePO". Under the "Type" section, the "Simple type (integer, string, etc.)" option is unselected, while the "Complex type (tree structure)" option is selected. The "Datatype" dropdown menu is set to "string". The "Structure" and "Root" fields are empty, each with a "Choose" button next to it. The "Output is a Sequence" checkbox is checked. At the bottom, there are "OK" and "Cancel" buttons.

**Create Output**

Name: CompletePO

Type

☐ Simple type (integer, string, etc.)

Datatype: string

☒ Complex type (tree structure)

Structure: Choose

Root: Choose

☒ Output is a Sequence

OK Cancel

## 18.7 Output

The first group of options (**XSLT 1.0, XSLT 2.0, etc.**) allow you to define the target language you want your code to be in.

Note that the Built-in execution engine presents a preview of the mapping result, when you click the Output tab and cannot be used to generate program code. .

### **Validate Output**

Validates the output XML file against the referenced schema.

### **Save generated Output**

Saves the currently visible data in the Output tab.

### **Save all generated outputs**

Saves all the generated output files of dynamic mappings. Please see: [Dynamic Input/Output file name](#) for more information.

### **Regenerate output**

Regenerates the current mapping from the Output window.

### **Insert/Remove Bookmark**

Inserts a bookmark at the cursor position in the Output window.

### **Next Bookmark**

Navigates to the next bookmark in the Output window.

### **Previous Bookmark**

Navigates to the previous bookmark in the Output window.

### **Remove All Bookmarks**

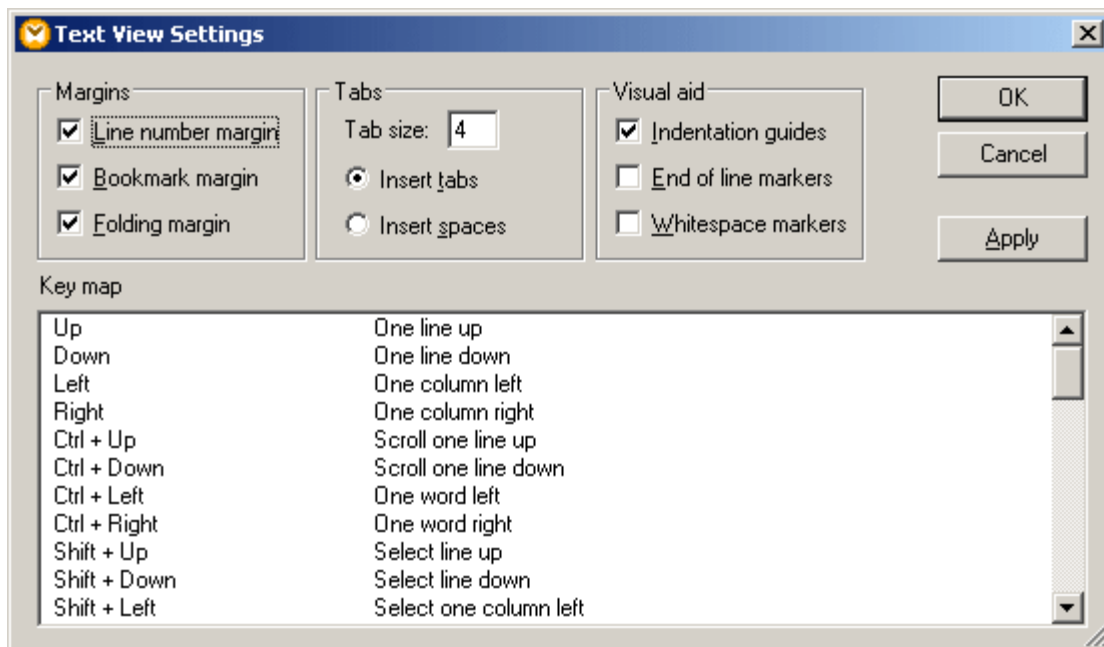
Removes all currently defined bookmarks in the Output window.

### **Pretty-Print XML Text**

Reformats your XML document in the Output pane to give a structured display of the document. Each child node is offset from its parent by a single tab character.

### **Text View Settings**

Allows you to customize the text settings in the Output window and also shows the currently defined hotkeys that apply in the window.



## 18.8 View

### Show Annotations

Displays XML schema annotations in the component window.  
If the Show Types icon is also active, then both sets of info are show in grid form.

= F1060	
type	string
ann.	Revision identifier

### Show Types

Displays the schema datatypes for each element or attribute.  
If the Show Annotations icon is also active, then both sets of info are show in grid form.

### Show library in Function Header

Displays the library name in parenthesis in the function title.

### Show Tips

Displays a tooltip containing explanatory text when the mouse pointer is placed over a function.

### Show Selected Component Connectors

Switches between showing:

- all mapping connectors, or
- those connectors relating to the currently selected components.

### Show Connectors from Source to Target

Switches between showing:

- connectors that are **directly** connected to the currently selected component, or
- connectors linked to the currently selected component, originating from source and terminating at the target components.

### Zoom

Opens the Zoom dialog box. You can enter the zoom factor numerically, or drag the slider to change the zoom factor interactively.

### Back

Steps back through the currently open mappings of the mapping tab.

### Forward

Steps forward through the currently open mappings of the mapping tab.

### Status Bar

Switches the Status Bar, visible below the Messages window, on or off.

### Library Window

Switches the Library window, containing all library functions, on or off.

### Messages

Switches the Validation output window on, or off. When generating code the Messages output window is automatically activated to show the validation result.

**Overview**

Switches the Overview window on, or off. Drag the rectangle to navigate your Mapping view.

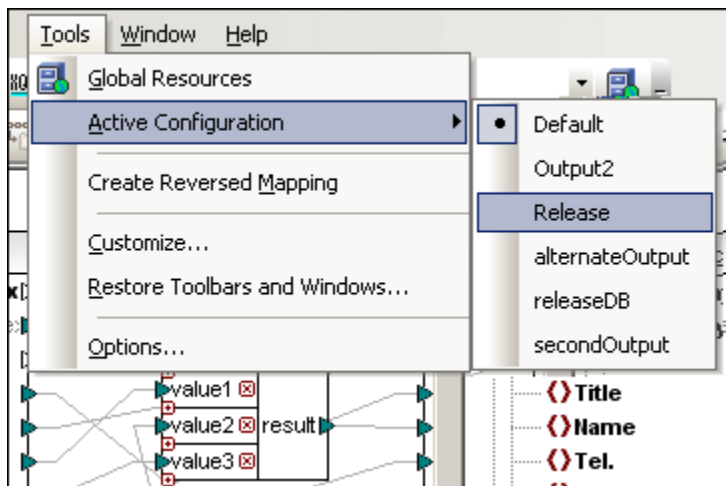
## 18.9 Tools

### Global Resources

Opens the Manage Global Resources dialog box allowing you to Add, Edit and Delete global resources to the Global Resources XML file, please see [Global Resources - Properties](#) for more information.

### Active Configuration

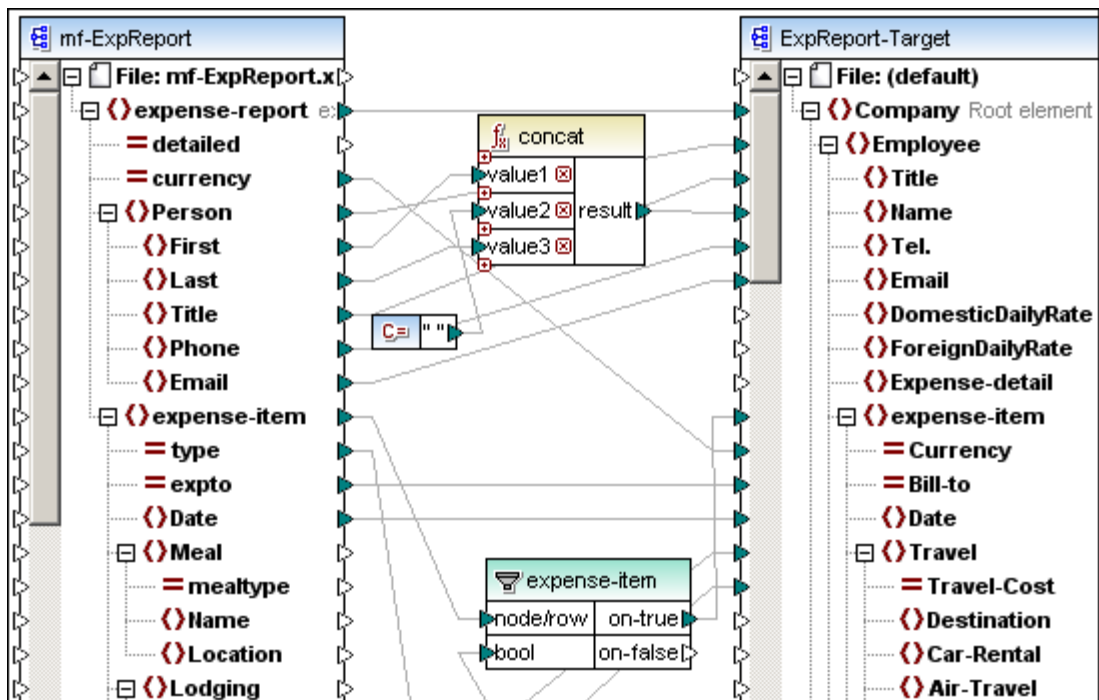
Allows you to select/change the currently active global resource from a list of all resources/configurations in the Global Resources. Select the required configuration from the submenu.



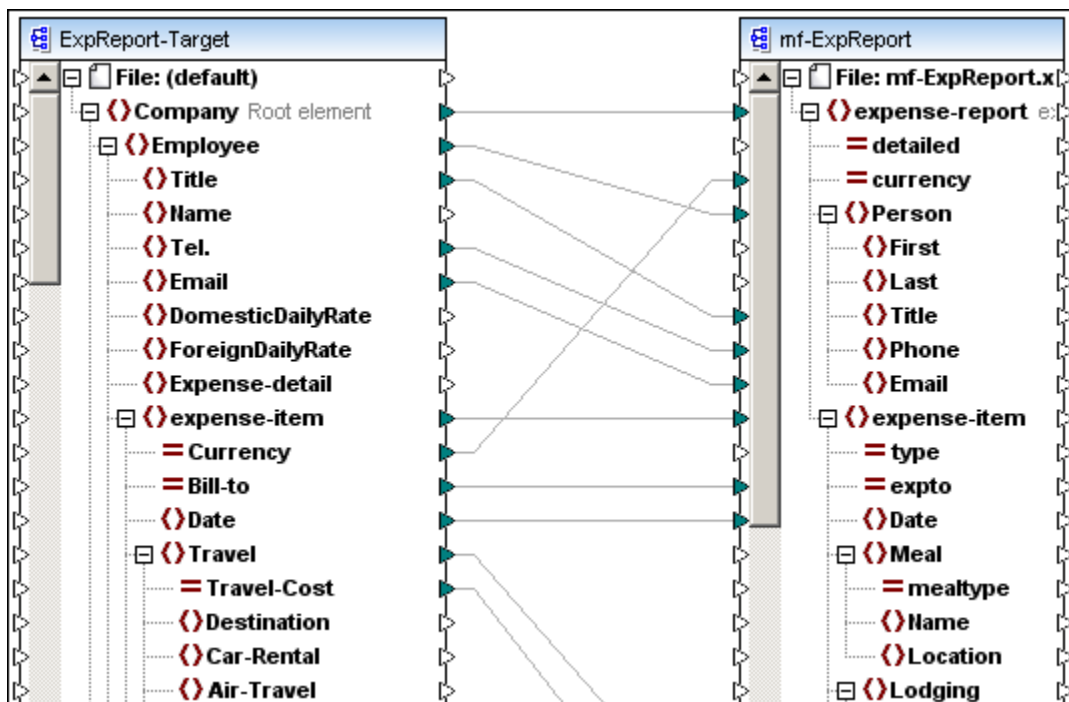
### Create Reversed Mapping

Creates a "reversed" mapping from the currently active mapping in MapForce, which is to be the basis of a new mapping. Note that the result is not intended to be a complete mapping, only the direct connections between components are retained in the reversed mapping. It is very likely that the resulting mapping will not be valid, or be able to be executed when clicking the Output tab, without manual editing.

E.g. **Tut-ExpReport.mfd** in the ...\\MapForceExamples\\Tutorial folder:



Result of a reversed mapping:



General:

- The source component becomes the target component, and target component becomes the source.
- If an Input, and Output XML, instance file have been assigned to a component, then they will both be swapped.

**Retained connections**

- Direct connections between components
- Direct connections between components in a chained mapping
- The type of connection: Standard, Mixed content, Copy-All
- Pass-through component settings
- Database components are unchanged.

**Deleted connections**

- Connections via functions, filters etc. are deleted, along with the functions etc.
- User-defined functions
- Webservice components

**Restore Toolbars and Windows**

Resets the toolbars, entry helper windows, docked windows etc. to their defaults. MapForce needs to be restarted for the changes to take effect.

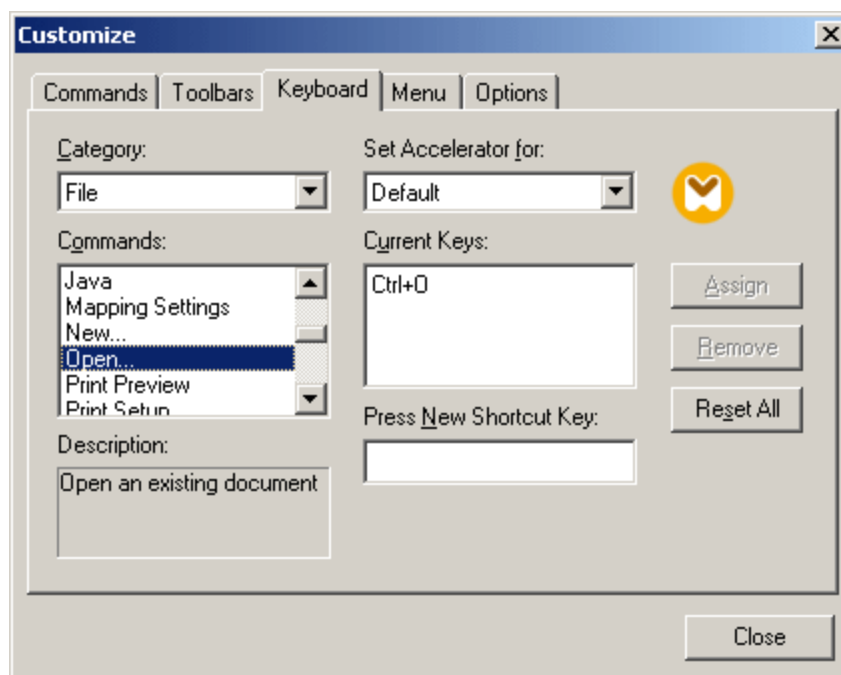
**Customize...**

The customize command lets you customize MapForce to suit your personal needs.

The **Keyboard** tab allows you to define (or change) keyboard shortcuts for any MapForce command.

**To assign a new Shortcut to a command:**

1. Select the **Tools | Customize** command and click the Keyboard tab.
2. Click the **Category** combo box to select the menu name.
3. Select the **command** you want to assign a new shortcut to, in the Commands list box
4. Click in the **Press New Shortcut Key:** text box, and press the shortcut keys that are to activate the command.



The shortcuts appear immediately in the text box. If the shortcut was assigned previously, then that function is displayed below the text box.

- Click the **Assign** button to assign the shortcut.  
The shortcut now appears in the Current Keys list box.  
(To **clear** the entry in the Press New Shrotcut Key text box, press any of the control keys, **CTRL**, **ALT** or **SHIFT**).

#### To de-assign or delete a shortcut:

- Click the shortcut you want to delete in the Current Keys list box.
- Click the **Remove** button.
- Click the **Close** button to confirm.

#### Set accelerator for:

Currently no function.

#### Currently assigned keyboard shortcuts:

##### Hotkeys by key

F1	Help Menu
F2	Next bookmark (in output window)
F3	Find Next
F10	Activate menu bar
Num +	Expand current item node
Num -	Collapse item node
Num *	Expand all from current item node
CTRL + TAB	Switches between open mappings
CTRL + F6	Cycle through open windows
CTRL + F4	Closes the active mapping document
Alt + F4	Closes MapForce
Alt + F, F, 1	Opens the last file
Alt + F, T, 1	Opens the last project
CTRL + N	File New
CTRL + O	File Open
CTRL + S	File Save
CTRL + P	File Print
CTRL + A	Select All
CTRL + X	Cut
CTRL + C	Copy
CTRL + V	Paste
CTRL + Z	Undo
CTRL + Y	Redo
Del	Delete component (with prompt)
Shift + Del	Delete component (no prompt)
CTRL + F	Find
F3	Find Next
Shift + F3	Find Previous
<b>Arrow keys</b> (up / down)	Select next item of component
Esc	Abandon edits/close dialog box
Return	Confirms a selection

**Output window hotkeys**

CTRL + F2	Insert Remove/Bookmark
F2	Next Bookmark
SHIFT + F2	Previous Bookmark
CTRL + SHIFT + F2	Remove All Bookmarks

**Zooming hotkeys**

CTRL + mouse wheel forward	Zoom In
CTRL + mouse wheel back	Zoom Out
CTRL + 0 (Zero)	Reset Zoom

**Options**

Opens the Options dialog box through which you can:

- Add or delete user defined [XSLT functions](#).
- Define **general** settings, such as the default character encoding for new components, in the General tab.
- Define which message notifications you want to re-enable

**Libraries tab:**

- Add or delete user-defined XSLT, or programming language Libraries/functions to MapForce.

**General tab:**

- Specify if you want to show the logo, copyright etc., on start and/or when printing.
- Align components or functions with other components, while dragging them with the mouse.
- Enable/disable the MapForce gradient background.
- Limit the annotation text in components to X lines. Also applies to SELECT statements visible in a component.
- Define the default character encoding for new components.
- Define an execution timeout for the Output tab when previewing the mapping result.
- Specify if you want to output to **temporary** files (default), or write output files **directly** to disk when clicking the Output button/tab.

**Warning:** Enabling "Write directly to final output files" will overwrite output files without requesting further confirmation.

- Limit the output to X million characters, when outputting to the built-in execution engine. The Built-in execution engine is the only target that supports XML, CSV, and FLF streaming

**Messages tab:**

Allows you to re-enable message boxes that you previously disabled using the "Don't ask me again" check box.



## 18.10 Window

### Cascade

This command rearranges all open document windows so that they are all cascaded (i.e. staggered) on top of each other.

### Tile Horizontal

This command rearranges all open document windows as **horizontal tiles**, making them all visible at the same time.

### Tile Vertical

This command rearranges all open document windows as **vertical tiles**, making them all visible at the same time.

### 1 2

This list shows all currently open windows, and lets you quickly switch between them. You can also use the Ctrl-TAB or CTRL F6 keyboard shortcuts to cycle through the open windows.

## 18.11 Help Menu

The **Help** menu contains commands to access the onscreen help manual for MapForce, commands to provide information about MapForce, and links to support pages on the Altova web site. The Help menu also contains the [Registration dialog](#), which lets you enter your license key-code once you have purchased the product.

The description of the Help menu commands is organized into the following sub-sections:

- [Table of Contents, Index, Search](#)
- [Registration, Order Form](#)
- [Other Commands](#)

### 18.11.1 Table of Contents, Index, Search

The **Table of Contents** command opens the onscreen help manual for MapForce with the Table of Contents displayed in the left-hand-side pane of the Help window. The Table of Contents provides a good overview of the entire Help document. Clicking an entry in the Table of Contents takes you to that topic.

The **Index** command opens the onscreen help manual for MapForce with the Keyword Index displayed in the left-hand-side pane of the Help window. The index lists keywords and lets you navigate to a topic by double-clicking the keyword. If a keyword is linked to more than one topic, you are presented with a list of the topics to choose from.

The **Search** command opens the onscreen help manual for MapForce with the Search dialog displayed in the left-hand-side pane of the Help window. To search for a term, enter the term in the input field, and press Return. The Help system performs a full-text search on the entire Help documentation and returns a list of hits. Double-click any item to display that item.

## 18.11.2 Activation, Order Form, Registration, Updates

### Software Activation

After you download your Altova product software, you can activate it using either a free evaluation key or a purchased permanent license key.

- **Free evaluation key.** When you first start the software after downloading and installing it, the Software Activation dialog will pop up. In it is a button to request a free evaluation key-code. Enter your name, company, and e-mail address in the dialog that appears, and click Request Now! The evaluation key is sent to the e-mail address you entered and should reach you in a few minutes. Now enter the key in the key-code field of the Software Activation dialog box and click **OK** to start working with your Altova product. The software will be unlocked for a period of 30 days.
- **Permanent license key.** The Software Activation dialog contains a button to purchase a permanent license key. Clicking this button takes you to Altova's online shop, where you can purchase a permanent license key for your product. There are two types of permanent license: single-user and multi-user. Both will be sent to you by e-mail. A *single-user license* contains your license-data and includes your name, company, e-mail, and key-code. A *multi-user license* contains your license-data and includes your company name and key-code. Note that your license agreement does not allow you to install more than the licensed number of copies of your Altova software on the computers in your organization (per-seat license). Please make sure that you enter the data required in the registration dialog exactly as given in your license e-mail.

**Note:** When you enter your license information in the Software Activation dialog, ensure that you enter the data exactly as given in your license e-mail. For multi-user licenses, each user should enter his or her own name in the Name field.

The Software Activation dialog can be accessed at any time by clicking the **Help | Software Activation** command.

### Order Form

When you are ready to order a licensed version of MapForce, you can use either the **Order license key** button in the Software Activation dialog (see *previous section*) or the **Help | Order Form** command to proceed to the secure Altova Online Shop.

### Registration

The first time you start your Altova software after having activated it, a dialog appears asking whether you would like to register your product. There are three buttons in this dialog:

- **OK:** Takes you to the Registration Form
- **Remind Me Later:** Pops up a dialog in which you can select when you wish to be next reminded.
- **Cancel:** Closes the dialog and suppresses it in future. If you wish to register at a later time, you can use the **Help | Registration** command.

### Check for Updates

Checks with the Altova server whether a newer version than yours is currently available and displays a message accordingly

### 18.11.3 Other Commands

The **Support Center** command is a link to the Altova Support Center on the Internet. The Support Center provides FAQs, discussion forums where problems are discussed, and access to Altova's technical support staff.

The **FAQ on the Web** command is a link to Altova's FAQ database on the Internet. The FAQ database is constantly updated as Altova support staff encounter new issues raised by customers.

The **Components Download** command is a link to Altova's Component Download Center on the Internet. From here you will be able to download a variety of companion software to use with Altova products. Such software ranges from XSLT and XSL-FO processors to Application Server Platforms. The software available at the Component Download Center is typically free of charge.

The **MapForce on the Internet** command is a link to the [Altova website](#) on the Internet. You can learn more about MapForce and related technologies and products at the [Altova website](#).

The **MapForce Training** command is a link to the Online Training page at the [Altova website](#). Here you can select from online courses conducted by Altova's expert trainers.

The **About MapForce** command displays the splash window and version number of your product.



# Chapter 19

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## Appendices

## 19 Appendices

These appendices contain technical information about MapForce and important licensing information. Each appendix contains sub-sections as given below:

### Technical Data

- OS and memory requirements
- Altova XML Parser
- Altova XSLT and XQuery Engines
- Unicode support
- Internet usage
- License metering

### License Information

- Electronic software distribution
- Copyrights
- End User License Agreement

## 19.1 Engine information

This section contains information about implementation-specific features of the Altova XML Validator, Altova XSLT 1.0 Engine, Altova XSLT 2.0 Engine, and Altova XQuery Engine.

### 19.1.1 XSLT 1.0 Engine: Implementation Information

The Altova XSLT 1.0 Engine is built into Altova's XMLSpy, StyleVision, Authentic, and MapForce XML products. It is also available in the free AltovaXML package. The Altova XSLT 1.0 Engine implements and conforms to the World Wide Web Consortium's [XSLT 1.0 Recommendation of 16 November 1999](#) and [XPath 1.0 Recommendation of 16 November 1999](#). Limitations and implementation-specific behavior are listed below.

#### Limitations

- The `xsl:preserve-space` and `xsl:strip-space` elements are not supported.
- When the `method` attribute of `xsl:output` is set to HTML, or if HTML output is selected by default, then special characters in the XML or XSLT file are inserted in the HTML document directly as special characters; they are not inserted as HTML character references in the output. For instance, the character `&#160;` (the decimal character reference for a non-breaking space) is not inserted as `&nbsp;` in the HTML code, but directly as a non-breaking space.

#### Implementation's handling of whitespace-only nodes in source XML document

The XML data (and, consequently, the XML Infoset) that is passed to the Altova XSLT 1.0 Engine is stripped of boundary-whitespace-only text nodes. (A boundary-whitespace-only text node is a whitespace-only text node that occurs between two elements within an element of mixed content.) This stripping may have an effect on the value returned by the `fn:position()`, `fn:last()`, and `fn:count()` functions.

For any node selection that selects text nodes also, boundary-whitespace-only text nodes would typically also be included in the selection. However, since the XML Infoset used by the Altova engines has boundary-whitespace-only text nodes stripped from it, these nodes are not present in the XML Infoset. As a result, the size of the selection and the numbering of nodes in the selection will be different than that for a selection which included these text nodes. The `fn:position()`, `fn:last()`, and `fn:count()` functions, therefore, could produce results that are different from those produced by some other processors.

A situation in which boundary-whitespace-only text nodes are evaluated as siblings of other elements arises most commonly when `xsl:apply-templates` is used to apply templates. When the `fn:position()`, `fn:last()`, and `fn:count()` functions are used in patterns with a name test (for example, `para[3]`, which is short for `para[position()=3]`), boundary-whitespace-only nodes are irrelevant since only the named elements (`para` in the above example) are selected. (Note, however, that boundary-whitespace-only nodes **are** relevant in patterns that use the wildcard, for example, `*[10]`.)

**Note:** If a boundary-whitespace-only text node is required in the output, then insert the required whitespace within one of the two adjoining child elements. For example, the XML fragment:

```
<para>This is <b>bold</b> <i>italic</i>.</para>
```

when processed with the XSLT template

```
<xsl:template match="para">
  <xsl:apply-templates/>
</xsl:template>
```

will produce:

```
This is bolditalic.
```

To get a space between `bold` and `italic` in the output, insert a space character within either

the `<b>` or `<i>` elements in the XML source. For example:

```
<para>This is <b>bold</b> <i> italic</i>.</para> or  
<para>This is <b>bold</b>&#x20;</b> <i>italic</i>.</para> or  
<para>This is <b>bold</b><i>&#x20;italic</i>.</para>
```

When any of the `para` elements above is processed with the same XSLT template given above, it will produce:

This is bold italic.

### 19.1.2 XSLT 2.0 Engine: Implementation Information

The Altova XSLT 2.0 Engine is built into Altova's XMLSpy, StyleVision, Authentic, and MapForce XML products. It is also available in the free AltovaXML package. This section describes the engine's implementation-specific aspects of behavior. It starts with a section giving general information about the engine, and then goes on to list the implementation-specific behavior of XSLT 2.0 functions.

For information about implementation-specific behavior of XPath 2.0 functions, see the section, XPath 2.0 and XQuery 1.0 Functions.

#### General Information

The Altova XSLT 2.0 Engine conforms to the World Wide Web Consortium's (W3C's) [XSLT 2.0 Recommendation](#) of 23 January 2007. Note the following general information about the engine.

#### Backwards Compatibility

The Altova XSLT 2.0 Engine is backwards compatible. The only time the backwards compatibility of the XSLT 2.0 Engine comes into play is when using the XSLT 2.0 Engine of Altova XML to process an XSLT 1.0 stylesheet. Note that there could be differences in the outputs produced by the XSLT 1.0 Engine and the backwards-compatible XSLT 2.0 Engine.

In all other Altova products, the backwards-compatibility issue never arises. This is because these products automatically select the appropriate engine for the transformation. For example, consider that in XMLSpy you specify that a certain XML document be processed with an XSLT 1.0 stylesheet. When the transformation command is invoked, XMLSpy automatically selects the XSLT 1.0 Engine of XMLSpy to carry out the transformation.

**Note:** The stylesheet version is specified in the `version` attribute of the `stylesheet` or `transform` element of the stylesheet.

#### Namespaces

Your XSLT 2.0 stylesheet should declare the following namespaces in order for you to be able to use the type constructors and functions available in XSLT 2.0. The prefixes given below are conventionally used; you could use alternative prefixes if you wish.

Namespace Name	Prefix	Namespace URI
XML Schema types	<code>xs:</code>	<code>http://www.w3.org/2001/XMLSchema</code>
XPath 2.0 functions	<code>fn:</code>	<code>http://www.w3.org/2005/xpath-functions</code>

Typically, these namespaces will be declared on the `xsl:stylesheet` or `xsl:transform` element, as shown in the following listing:

```
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:fn="http://www.w3.org/2005/xpath-functions"
  ...
>
```

The following points should be noted:

- The Altova XSLT 2.0 Engine uses the XPath 2.0 and XQuery 1.0 Functions namespace

(listed in the table above) as its **default functions namespace**. So you can use XPath 2.0 and XSLT 2.0 functions in your stylesheet without any prefix. If you declare the XPath 2.0 Functions namespace in your stylesheet with a prefix, then you can additionally use the prefix assigned in the declaration.

- When using type constructors and types from the XML Schema namespace, the prefix used in the namespace declaration must be used when calling the type constructor (for example, `xs:date`).
- With the CRs of 23 January 2007, the `untypedAtomic` and duration datatypes (`dayTimeDuration` and `yearMonthDuration`), which were formerly in the XPath Datatypes namespace (typically prefixed `xdt:`) have been moved to the XML Schema namespace.
- Some XPath 2.0 functions have the same name as XML Schema datatypes. For example, for the XPath functions `fn:string` and `fn:boolean` there exist XML Schema datatypes with the same local names: `xs:string` and `xs:boolean`. So if you were to use the XPath expression `string('Hello')`, the expression evaluates as `fn:string('Hello')`—not as `xs:string('Hello')`.

### Schema-awareness

The Altova XSLT 2.0 Engine is schema-aware.

### Whitespace in XML document

By default, the Altova XSLT 2.0 Engine strips all boundary whitespace from boundary-whitespace-only nodes in the source XML document. The removal of this whitespace affects the values that the `fn:position()`, `fn:last()`, `fn:count()`, and `fn:deep-equal()` functions return. For more details, see *Whitespace-only Nodes in XML Document* in the XPath 2.0 and XQuery 1.0 Functions section.

**Note:** If a boundary-whitespace-only text node is required in the output, then insert the required whitespace within one of the two adjoining child elements. For example, the XML fragment:

```
<para>This is <b>bold</b> <i>italic</i>.</para>
```

when processed with the XSLT template

```
<xsl:template match="para">
  <xsl:apply-templates/>
</xsl:template>
```

will produce:

```
This is bolditalic.
```

To get a space between `bold` and `italic` in the output, insert a space character within either the `<b>` or `<i>` elements in the XML source. For example:

```
<para>This is <b>bold</b> <i> italic</i>.</para> or
<para>This is <b>bold<#x20;</b> <i>italic</i>.</para> or
<para>This is <b>bold</b><i><#x20;italic</i>.</para>
```

When such an XML fragment is processed with the same XSLT template given above, it will produce:

```
This is bold italic.
```

### XSLT 2.0 elements and functions

Limitations and implementation-specific behavior of XSLT 2.0 elements and functions are listed

in the section [XSLT 2.0 Elements and Functions](#).

### **XPath 2.0 functions**

Implementation-specific behavior of XPath 2.0 functions is listed in the section XPath 2.0 and XQuery 1.0 Functions.

### **XSLT 2.0 Elements and Functions**

#### **Limitations**

The `xsl:preserve-space` and `xsl:strip-space` elements are not supported.

#### **Implementation-specific behavior**

Given below is a description of how the Altova XSLT 2.0 Engine handles implementation-specific aspects of the behavior of certain XSLT 2.0 functions.

##### **`xsl:result-document`**

Additionally supported encodings are: `x-base16tobinary` and `x-base64tobinary`.

##### **`function-available`**

The function tests for the availability of in-scope functions (XSLT 2.0, XPath 2.0, and extension functions).

##### **`unparsed-text`**

The `href` attribute accepts (i) relative paths for files in the base-uri folder, and (ii) absolute paths with or without the `file://` protocol. Additionally supported encodings are:

`x-binarytobase16` and `x-binarytobase64`.

##### **`unparsed-text-available`**

The `href` attribute accepts (i) relative paths for files in the base-uri folder, and (ii) absolute paths with or without the `file://` protocol. Additionally supported encodings are:

`x-binarytobase16` and `x-binarytobase64`.

**Note:** The following encoding values, which were implemented in earlier versions of AltovaXML are now deprecated: `base16tobinary`, `base64tobinary`, `binarytobase16` and `binarytobase64`.

### 19.1.3 Extensions

Altova Engines (XSLT 1.0, XSLT 2.0, and XQuery 1.0), which are used in a number of Altova products, support the use of a set of AltovaXML-specific custom extension functions.

#### Java Extension Functions

A Java extension function can be used within an XPath or XQuery expression to invoke a Java constructor or call a Java method (static or instance).

A field in a Java class is considered to be a method without any argument. A field can be static or instance. How to access fields is described in the respective sub-sections, static and instance.

This section is organized into the following sub-sections:

- [Java: Constructors](#)
- [Java: Static Methods and Static Fields](#)
- [Java: Instance Methods and Instance Fields](#)
- [Datatypes: XSLT/XQuery to Java](#)
- [Datatypes: Java to XSLT/XQuery](#)

#### Form of the extension function

The extension function in the XPath/XQuery expression must have the form `prefix:fname()`.

- The `prefix:` part identifies the extension function as a Java function. It does so by associating the extension function with an in-scope namespace declaration, the URI of which must begin with `java:` (see *below for examples*). The namespace declaration should identify a Java class, for example: `xmlns:myns="java:java.lang.Math"`. However, it could also simply be: `xmlns:myns="java"` (without a colon), with the identification of the Java class being left to the `fname()` part of the extension function.
- The `fname()` part identifies the Java method being called, and supplies the arguments for the method (see *below for examples*). However, if the namespace URI identified by the `prefix:` part does not identify a Java class (see *preceding point*), then the Java class should be identified in the `fname()` part, before the class and separated from the class by a period (see *the second XSLT example below*).

**Note:** The class being called must be on the classpath of the machine.

#### XSLT example

Here are two examples of how a static method can be called. In the first example, the class name (`java.lang.Math`) is included in the namespace URI and, therefore, must not be in the `fname()` part. In the second example, the `prefix:` part supplies the prefix `java:` while the `fname()` part identifies the class as well as the method.

```
<xsl:value-of xmlns:jMath="java:java.lang.Math"
  select="jMath:cos(3.14)" />

<xsl:value-of xmlns:jmath="java"
  select="jmath:java.lang.Math.cos(3.14)" />
```

The method named in the extension function (`cos()` in the example above) must match the name of a public static method in the named Java class (`java.lang.Math` in the example above).

**XQuery example**

Here is an XQuery example similar to the XSLT example above:

```
<cosine xmlns:jMath="java:java.lang.Math">
  {jMath:cos(3.14)}
</cosine>
```

**User-defined Java classes**

If you have created your own Java classes, methods in these classes are called differently according to: (i) whether the classes are accessed via a JAR file or a class file, and (ii) whether these files (JAR or class) are located in the current directory (the same directory as the XSLT or XQuery document) or not. How to locate these files is described in the sections [User-Defined Class Files](#) and [User-Defined Jar Files](#). Note that paths to class files not in the current directory and to all JAR files must be specified.

**User-Defined Class Files**

If access is via a class file, then there are two possibilities:

- The class file is in a package. The XSLT or XQuery file is in the same folder as the Java package.
- The class file is not packaged. The XSLT or XQuery file is in the same folder as the class file.
- The class file is in a package. The XSLT or XQuery file is at some random location.
- The class file is not packaged. The XSLT or XQuery file is at some random location.

Consider the case where the class file is not packaged and is in the same folder as the XSLT or XQuery document. In this case, since all classes in the folder are found, the file location does not need to be specified. The syntax to identify a class is:

```
java:classname
```

*where*

java: indicates that a user-defined Java function is being called; (Java classes in the current directory will be loaded by default)

classname is the name of the required method's class

The class is identified in a namespace URI, and the namespace is used to prefix a method call.

**Class file packaged, XSLT/XQuery file in same folder as Java package**

The example below calls the `getVehicleType()` method of the `Car` class of the `com.altova.extfunc` package. The `com.altova.extfunc` package is in the folder `JavaProject`. The XSLT file is also in the folder `JavaProject`.

```
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:fn="http://www.w3.org/2005/xpath-functions"
  xmlns:car="java:com.altova.extfunc.Car" >
  <xsl:output exclude-result-prefixes="fn car xsl fo xs"/>

  <xsl:template match="/">
    <a>
      <xsl:value-of select="car:getVehicleType()"/>
    </a>
```

```
</xsl:template>

</xsl:stylesheet>
```

### Class file not packaged, XSLT/XQuery file in same folder as class file

The example below calls the `getVehicleType()` method of the `Car` class of the `com.altova.extfunc` package. The `Car` class file is in the following folder location: `JavaProject/com/altova/extfunc`. The XSLT file is also in the folder `JavaProject/com/altova/extfunc`.

```
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:fn="http://www.w3.org/2005/xpath-functions"
  xmlns:car="java:Car" >
  <xsl:output exclude-result-prefixes="fn car xsl fo xs"/>

  <xsl:template match="/">
    <a>
      <xsl:value-of select="car:getVehicleType()" />
    </a>
  </xsl:template>

</xsl:stylesheet>
```

### Class file packaged, XSLT/XQuery file at any location

The example below calls the `getCarColor()` method of the `Car` class of the `com.altova.extfunc` package. The `com.altova.extfunc` package is in the folder `JavaProject`. The XSLT file is at any location. In this case, the location of the package must be specified within the URI as a query string. The syntax is:

```
java:classname[?path=uri-of-package]
```

where

`java:` indicates that a user-defined Java function is being called  
`uri-of-package` is the URI of the Java package  
`classname` is the name of the required method's class

The class is identified in a namespace URI, and the namespace is used to prefix a method call. The example below shows how to access a class file that is located in another directory than the current directory.

```
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:fn="http://www.w3.org/2005/xpath-functions"
  xmlns:car="
java:com.altova.extfunc.Car?path=file:///C:/JavaProject/" >

  <xsl:output exclude-result-prefixes="fn car xsl xs"/>

  <xsl:template match="/">
    <xsl:variable name="myCar" select="car:new('red') " />
    <a><xsl:value-of select="car:getCarColor($myCar)" /></a>
  </xsl:template>
```

```
</xsl:stylesheet>
```

### Class file not packaged, XSLT/XQuery file at any location

The example below calls the `getCarColor()` method of the `Car` class of the `com.altova.extfunc` package. The `com.altova.extfunc` package is in the folder `JavaProject`. The XSLT file is at any location. The location of the class file is specified within the namespace URI as a query string. The syntax is:

```
java:classname[?path=uri-of-classfile]
```

where

`java:` indicates that a user-defined Java function is being called  
`uri-of-classfile` is the URI of the folder containing the class file  
`classname` is the name of the required method's class

The class is identified in a namespace URI, and the namespace is used to prefix a method call. The example below shows how to access a class file that is located in another directory than the current directory.

```
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:fn="http://www.w3.org/2005/xpath-functions"
  xmlns:car="
java:Car?path=file:///C:/JavaProject/com/altova/extfunc/" >

  <xsl:output exclude-result-prefixes="fn car xsl xs"/>

  <xsl:template match="/">
    <xsl:variable name="myCar" select="car:new('red')"/>
    <a><xsl:value-of select="car:getCarColor($myCar)"/></a>
  </xsl:template>

</xsl:stylesheet>
```

**Note:** When a path is supplied via the extension function, the path is added to the `ClassLoader`.

### User-Defined Jar Files

If access is via a JAR file, the URI of the JAR file must be specified using the following syntax:

```
xmlns:classNS="java:classname?path=jar:uri-of-jarfile!/"
```

The method is then called by using the prefix of the namespace URI that identifies the class: `classNS:method()`

*In the above:*

`java:` indicates that a Java function is being called  
`classname` is the name of the user-defined class  
`?` is the separator between the classname and the path  
`path=jar:` indicates that a path to a JAR file is being given  
`uri-of-jarfile` is the URI of the jar file  
`! /` is the end delimiter of the path  
`classNS:method()` is the call to the method

Alternatively, the classname can be given with the method call. Here are two examples of the syntax:

```
xmlns:ns1="java:docx.layout.pages?path=jar:file:///c:/projects/docs/docx.jar!/
"
    ns1:main()

xmlns:ns2="java?path=jar:file:///c:/projects/docs/docx.jar!/"
ns2:docx.layout.pages.main()
```

Here is a complete XSLT example that uses a JAR file to call a Java extension function:

```
<xsl:stylesheet version="2.0"
    xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:fn="http://www.w3.org/2005/xpath-functions"
    xmlns:car="java?path=jar:file:///C:/test/Carl.jar!/" >
<xsl:output exclude-result-prefixes="fn car xsl xs"/>

<xsl:template match="/">
    <xsl:variable name="myCar" select="car:Carl.new('red')"/>
    <a><xsl:value-of select="car:Carl.getCarColor($myCar)"/></a>
</xsl:template>

<xsl:template match="car"/>

</xsl:stylesheet>
```

**Note:** When a path is supplied via the extension function, the path is added to the ClassLoader.

### Java: Constructors

An extension function can be used to call a Java constructor. All constructors are called with the pseudo-function `new()`.

If the result of a Java constructor call can be [implicitly converted to XPath/XQuery datatypes](#), then the Java extension function will return a sequence that is an XPath/XQuery datatype. If the result of a Java constructor call cannot be converted to a suitable XPath/XQuery datatype, then the constructor creates a wrapped Java object with a type that is the name of the class returning that Java object. For example, if a constructor for the class `java.util.Date` is called (`java.util.Date.new()`), then an object having a type `java.util.Date` is returned. The lexical format of the returned object may not match the lexical format of an XPath datatype and the value would therefore need to be converted to the lexical format of the required XPath datatype and then to the required XPath datatype.

There are two things that can be done with a Java object created by a constructor:

- It can be assigned to a variable:  

```
<xsl:variable name="currentdate" select="date:new()" xmlns:date="
java:java.util.Date" />
```
- It can be passed to an extension function (see [Instance Method and Instance Fields](#)):  

```
<xsl:value-of select="date:toString(date:new())" xmlns:date="
java:java.util.Date" />
```

### Java: Static Methods and Static Fields

A static method is called directly by its Java name and by supplying the arguments for the method. Static fields (methods that take no arguments), such as the constant-value fields `E` and `PI`, are accessed without specifying any argument.

#### XSLT examples

Here are some examples of how static methods and fields can be called:

```
<xsl:value-of xmlns:jMath="java:java.lang.Math"
  select="jMath:cos(3.14)" />

<xsl:value-of xmlns:jMath="java:java.lang.Math"
  select="jMath:cos( jMath:PI() )" />

<xsl:value-of xmlns:jMath="java:java.lang.Math"
  select="jMath:E() * jMath:cos(3.14)" />
```

Notice that the extension functions above have the form `prefix:fname()`. The prefix in all three cases is `jMath:`, which is associated with the namespace URI `java:java.lang.Math`. (The namespace URI must begin with `java:`. In the examples above it is extended to contain the class name (`java.lang.Math`).) The `fname()` part of the extension functions must match the name of a public class (e.g. `java.lang.Math`) followed by the name of a public static method with its argument/s (such as `cos(3.14)`) or a public static field (such as `PI()`).

In the examples above, the class name has been included in the namespace URI. If it were not contained in the namespace URI, then it would have to be included in the `fname()` part of the extension function. For example:

```
<xsl:value-of xmlns:java="java:"
  select="java:java.lang.Math.cos(3.14)" />
```

#### XQuery example

A similar example in XQuery would be:

```
<cosine xmlns:jMath="java:java.lang.Math">
  {jMath:cos(3.14)}
</cosine>
```

### Java: Instance Methods and Instance Fields

An instance method has a Java object passed to it as the first argument of the method call. Such a Java object typically would be created by using an extension function (for example a constructor call) or a stylesheet parameter/variable. An XSLT example of this kind would be:

```
<xsl:stylesheet version="1.0" exclude-result-prefixes="date"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:date="java:java.util.Date"
  xmlns:jlang="java:java.lang">
  <xsl:param name="CurrentDate" select="date:new()" />
  <xsl:template match="/">
    <enrollment institution-id="Altova School"
      date="{date:toString($CurrentDate)}"
      type="{jlang:Object.toString(jlang:Object.getClass( date:new()
        )))}">
    </enrollment>
  </xsl:template>
</xsl:stylesheet>
```

In the example above, the value of the node `enrollment/@type` is created as follows:

1. An object is created with a constructor for the class `java.util.Date` (with the `date:new()` constructor).
2. This Java object is passed as the argument of the `java.lang.Object.getClass` method.
3. The object obtained by the `getClass` method is passed as the argument to the `java.lang.Object.toString` method.

The result (the value of `@type`) will be a string having the value: `java.util.Date`.

An instance field is theoretically different from an instance method in that it is not a Java object per se that is passed as an argument to the instance field. Instead, a parameter or variable is passed as the argument. However, the parameter/variable may itself contain the value returned by a Java object. For example, the parameter `currentTime` takes the value returned by a constructor for the class `java.util.Date`. This value is then passed as an argument to the instance method `date.toString` in order to supply the value of `/enrollment/@date`.

#### Datatypes: XPath/XQuery to Java

When a Java function is called from within an XPath/XQuery expression, the datatype of the function's arguments is important in determining which of multiple Java classes having the same name is called.

In Java, the following rules are followed:

- If there is more than one Java method with the same name, but each has a different number of arguments than the other/s, then the Java method that best matches the number of arguments in the function call is selected.
- The XPath/XQuery string, number, and boolean datatypes (see *list below*) are implicitly converted to a corresponding Java datatype. If the supplied XPath/XQuery type can be converted to more than one Java type (for example, `xs:integer`), then that Java type is selected which is declared for the selected method. For example, if the Java method being called is `fx(decimal)` and the supplied XPath/XQuery datatype is `xs:integer`, then `xs:integer` will be converted to Java's `decimal` datatype.

The table below lists the implicit conversions of XPath/XQuery string, number, and boolean types to Java datatypes.

<code>xs:string</code>	<code>java.lang.String</code>
<code>xs:boolean</code>	<code>boolean</code> (primitive), <code>java.lang.Boolean</code>
<code>xs:integer</code>	<code>int</code> , <code>long</code> , <code>short</code> , <code>byte</code> , <code>float</code> , <code>double</code> , and the wrapper classes of these, such as <code>java.lang.Integer</code>
<code>xs:float</code>	<code>float</code> (primitive), <code>java.lang.Float</code> , <code>double</code> (primitive)
<code>xs:double</code>	<code>double</code> (primitive), <code>java.lang.Double</code>
<code>xs:decimal</code>	<code>float</code> (primitive), <code>java.lang.Float</code> , <code>double</code> (primitive), <code>java.lang.Double</code>

Subtypes of the XML Schema datatypes listed above (and which are used in XPath and XQuery) will also be converted to the Java type/s corresponding to that subtype's ancestor type.

In some cases, it might not be possible to select the correct Java method based on the supplied information. For example, consider the following case.

- The supplied argument is an `xs:untypedAtomic` value of 10 and it is intended for the method `mymethod(float)`.
- However, there is another method in the class which takes an argument of another datatype: `mymethod(double)`.
- Since the method names are the same and the supplied type (`xs:untypedAtomic`) could be converted correctly to either `float` or `double`, it is possible that `xs:untypedAtomic` is converted to `double` instead of `float`.
- Consequently the method selected will not be the required method and might not produce the expected result. To work around this, you can create a user-defined method with a different name and use this method.

Types that are not covered in the list above (for example `xs:date`) will not be converted and will generate an error. However, note that in some cases, it might be possible to create the required Java type by using a Java constructor.

#### Datatypes: Java to XPath/XQuery

When a Java method returns a value, the datatype of the value is a string, numeric or boolean type, then it is converted to the corresponding XPath/XQuery type. For example, Java's `java.lang.Boolean` and `boolean` datatypes are converted to `xsd:boolean`.

One-dimensional arrays returned by functions are expanded to a sequence. Multi-dimensional arrays will not be converted, and should therefore be wrapped.

When a wrapped Java object or a datatype other than string, numeric or boolean is returned, you can ensure conversion to the required XPath/XQuery type by first using a Java method (e.g. `toString`) to convert the Java object to a string. In XPath/XQuery, the string can be modified to fit the lexical representation of the required type and then converted to the required type (for example, by using the `cast as` expression).

#### .NET Extension Functions

If you are working on the .NET platform, you can use extension functions written in any of the .NET languages (for example, C#). A .NET extension function can be used within an XPath or XQuery expression to invoke a constructor, property, or method (static or instance) within a .NET class.

A property of a .NET class is called using the syntax `get_PropertyName()`.

This section is organized into the following sub-sections:

- [.NET: Constructors](#)
- [.NET: Static Methods and Static Fields](#)
- [.NET: Instance Methods and Instance Fields](#)
- [Datatypes: XSLT/XQuery to .NET](#)
- [Datatypes: .NET to XSLT/XQuery](#)

#### Form of the extension function

The extension function in the XPath/XQuery expression must have the form `prefix:fname()`.

- The `prefix:` part is associated with a URI that identifies the .NET class being addressed.
- The `fname()` part identifies the constructor, property, or method (static or instance) within the .NET class, and supplies any argument/s, if required.
- The URI must begin with `clitype:` (which identifies the function as being a .NET

- extension function).
- The `prefix:fname()` form of the extension function can be used with system classes and with classes in a loaded assembly. However, if a class needs to be loaded, additional parameters containing the required information will have to be supplied.

### Parameters

To load an assembly, the following parameters are used:

<code>asm</code>	The name of the assembly to be loaded.
<code>ver</code>	The version number (maximum of four integers separated by periods).
<code>sn</code>	The key token of the assembly's strong name (16 hex digits).
<code>from</code>	A URI that gives the location of the assembly (DLL) to be loaded. If the URI is relative, it is relative to the XSLT or XQuery document. If this parameter is present, any other parameter is ignored.
<code>partialname</code>	The partial name of the assembly. It is supplied to <code>Assembly.LoadWith.PartialName()</code> , which will attempt to load the assembly. If <code>partialname</code> is present, any other parameter is ignored.
<code>loc</code>	The locale, for example, <code>en-US</code> . The default is <code>neutral</code> .

If the assembly is to be loaded from a DLL, use the `from` parameter and omit the `sn` parameter. If the assembly is to be loaded from the Global Assembly Cache (GAC), use the `sn` parameter and omit the `from` parameter.

A question mark must be inserted before the first parameter, and parameters must be separated by a semi-colon. The parameter name gives its value with an equals sign (see *example below*).

### Examples of namespace declarations

An example of a namespace declaration in XSLT that identifies the system class

`System.Environment`:

```
xmlns:myns="clitype:System.Environment"
```

An example of a namespace declaration in XSLT that identifies the class to be loaded as

`Trade.Forward.Scrip`:

```
xmlns:myns="clitype:Trade.Forward.Scrip?asm=forward;version=10.6.2.1"
```

An example of a namespace declaration in XQuery that identifies the system class

`MyManagedDLL.testClass`:. Two cases are distinguished:

1. When the assembly is loaded from the GAC:

```
declare namespace cs="clitype:MyManagedDLL.testClass?asm=MyManagedDLL;
ver=1.2.3.4;loc=neutral;sn=b9f091b72dccfba8";
```

2. When the assembly is loaded from the DLL (complete and partial references below):

```
declare namespace
cs="clitype:MyManagedDLL.testClass?from=file:///C:/Altova
Projects/extFunctions/MyManagedDLL.dll;

declare namespace
cs="clitype:MyManagedDLL.testClass?from=MyManagedDLL.dll;
```

### XSLT example

Here is a complete XSLT example that calls functions in system class `System.Math`:

```
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:fn="http://www.w3.org/2005/xpath-functions">
  <xsl:output method="xml" omit-xml-declaration="yes" />
  <xsl:template match="/">
    <math xmlns:math="clitype:System.Math">
      <sqrt><xsl:value-of select="math:Sqrt(9)" /></sqrt>
      <pi><xsl:value-of select="math:PI()" /></pi>
      <e><xsl:value-of select="math:E()" /></e>
      <pow><xsl:value-of select="math:Pow(math:PI(), math:E())" /></pow>
    </math>
  </xsl:template>
</xsl:stylesheet>
```

The namespace declaration on the element `math` associates the prefix `math:` with the URI `clitype:System.Math`. The `clitype:` beginning of the URI indicates that what follows identifies either a system class or a loaded class. The `math:` prefix in the XPath expressions associates the extension functions with the URI (and, by extension, the class) `System.Math`. The extension functions identify methods in the class `System.Math` and supply arguments where required.

### XQuery example

Here is an XQuery example fragment similar to the XSLT example above:

```
<math xmlns:math="clitype:System.Math">
  {math:Sqrt(9)}
</math>
```

As with the XSLT example above, the namespace declaration identifies the .NET class, in this case a system class. The XQuery expression identifies the method to be called and supplies the argument.

#### .NET: Constructors

An extension function can be used to call a .NET constructor. All constructors are called with the pseudo-function `new()`. If there is more than one constructor for a class, then the constructor that most closely matches the number of arguments supplied is selected. If no constructor is deemed to match the supplied argument/s, then a 'No constructor found' error is returned.

#### Constructors that return XPath/XQuery datatypes

If the result of a .NET constructor call can be [implicitly converted to XPath/XQuery datatypes](#), then the .NET extension function will return a sequence that is an XPath/XQuery datatype.

#### Constructors that return .NET objects

If the result of a .NET constructor call cannot be converted to a suitable XPath/XQuery datatype, then the constructor creates a wrapped .NET object with a type that is the name of the class returning that object. For example, if a constructor for the class `System.DateTime` is called (with `System.DateTime.new()`), then an object having a type `System.DateTime` is returned.

The lexical format of the returned object may not match the lexical format of a required XPath datatype. In such cases, the returned value would need to be: (i) converted to the lexical format

of the required XPath datatype; and (ii) cast to the required XPath datatype.

There are three things that can be done with a .NET object created by a constructor:

- It can be used within a variable:  
`<xsl:variable name="currentdate" select="date:new(2008, 4, 29)"  
 xmlns:date="clitype:System.DateTime" />`
- It can be passed to an extension function (see [Instance Method and Instance Fields](#)):  
`<xsl:value-of select="date:ToString(date:new(2008, 4, 29))" xmlns:date  
 ="clitype:System.DateTime" />`
- It can be converted to a string, number, or boolean:
- `<xsl:value-of select="xs:integer(data:get_Month(date:new(2008, 4, 29)))  
 " xmlns:date="clitype:System.DateTime" />`

### .NET: Static Methods and Static Fields

A static method is called directly by its name and by supplying the arguments for the method. The name used in the call must exactly match a public static method in the class specified. If the method name and the number of arguments that were given in the function call matches more than one method in a class, then the types of the supplied arguments are evaluated for the best match. If a match cannot be found unambiguously, an error is reported.

**Note:** A field in a .NET class is considered to be a method without any argument. A property is called using the syntax `get_PropertyName()`.

### Examples

An XSLT example showing a call to a method with one argument (`System.Math.Sin(arg)`):

```
<xsl:value-of select="math:Sin(30)" xmlns:math="clitype:System.Math" />
```

An XSLT example showing a call to a field (considered a method with no argument) (`System.Double.MaxValue()`):

```
<xsl:value-of select="double:MaxValue()" xmlns:double="clitype:System.Double" />
```

An XSLT example showing a call to a property (syntax is `get_PropertyName()`) (`System.String()`):

```
<xsl:value-of select="string:get_Length('my string')" xmlns:string="clitype:System.String" />
```

An XQuery example showing a call to a method with one argument (`System.Math.Sin(arg)`):

```
<sin xmlns:math="clitype:System.Math">
  { math:Sin(30) }
</sin>
```

### .NET: Instance Methods and Instance Fields

An instance method has a .NET object passed to it as the first argument of the method call. This .NET object typically would be created by using an extension function (for example a constructor call) or a stylesheet parameter/variable. An XSLT example of this kind would be:

```
<xsl:stylesheet version="2.0"
```

```

xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fn="http://www.w3.org/2005/xpath-functions">
<xsl:output method="xml" omit-xml-declaration="yes"/>
<xsl:template match="/">
  <xsl:variable name="releasedate"
    select="date:new(2008, 4, 29)"
    xmlns:date="clitype:System.DateTime"/>
  <doc>
    <date>
      <xsl:value-of select="date:ToString(date:new(2008, 4, 29))"
        xmlns:date="clitype:System.DateTime"/>
    </date>
    <date>
      <xsl:value-of select="date:ToString($releasedate)"
        xmlns:date="clitype:System.DateTime"/>
    </date>
  </doc>
</xsl:template>
</xsl:stylesheet>

```

In the example above, a `System.DateTime` constructor (`new(2008, 4, 29)`) is used to create a .NET object of type `System.DateTime`. This object is created twice, once as the value of the variable `releasedate`, a second time as the first and only argument of the `System.DateTime.ToString()` method. The instance method `System.DateTime.ToString()` is called twice, both times with the `System.DateTime` constructor (`new(2008, 4, 29)`) as its first and only argument. In one of these instances, the variable `releasedate` is used to get the .NET object.

### Instance methods and instance fields

The difference between an instance method and an instance field is theoretical. In an instance method, a .NET object is directly passed as an argument; in an instance field, a parameter or variable is passed instead—though the parameter or variable may itself contain a .NET object. For example, in the example above, the variable `releasedate` contains a .NET object, and it is this variable that is passed as the argument of `ToString()` in the second `date` element constructor. Therefore, the `ToString()` instance in the first `date` element is an instance method while the second is considered to be an instance field. The result produced in both instances, however, is the same.

Datatypes: XPath/XQuery to .NET

When a .NET extension function is used within an XPath/XQuery expression, the datatypes of the function's arguments are important for determining which one of multiple .NET methods having the same name is called.

In .NET, the following rules are followed:

- If there is more than one method with the same name in a class, then the methods available for selection are reduced to those that have the same number of arguments as the function call.
- The XPath/XQuery string, number, and boolean datatypes (see *list below*) are implicitly converted to a corresponding .NET datatype. If the supplied XPath/XQuery type can be converted to more than one .NET type (for example, `xs:integer`), then that .NET type is selected which is declared for the selected method. For example, if the .NET method being called is `fx(double)` and the supplied XPath/XQuery datatype is `xs:integer`, then `xs:integer` will be converted to .NET's `double` datatype.

The table below lists the implicit conversions of XPath/XQuery string, number, and boolean

types to .NET datatypes.

<code>xs:string</code>	<code>StringValue</code> , <code>string</code>
<code>xs:boolean</code>	<code>BooleanValue</code> , <code>bool</code>
<code>xs:integer</code>	<code>IntegerValue</code> , <code>decimal</code> , <code>long</code> , <code>integer</code> , <code>short</code> , <code>byte</code> , <code>double</code> , <code>float</code>
<code>xs:float</code>	<code>FloatValue</code> , <code>float</code> , <code>double</code>
<code>xs:double</code>	<code>DoubleValue</code> , <code>double</code>
<code>xs:decimal</code>	<code>DecimalValue</code> , <code>decimal</code> , <code>double</code> , <code>float</code>

Subtypes of the XML Schema datatypes listed above (and which are used in XPath and XQuery) will also be converted to the .NET type/s corresponding to that subtype's ancestor type.

In some cases, it might not be possible to select the correct .NET method based on the supplied information. For example, consider the following case.

- The supplied argument is an `xs:untypedAtomic` value of 10 and it is intended for the method `mymethod(float)`.
- However, there is another method in the class which takes an argument of another datatype: `mymethod(double)`.
- Since the method names are the same and the supplied type (`xs:untypedAtomic`) could be converted correctly to either `float` or `double`, it is possible that `xs:untypedAtomic` is converted to `double` instead of `float`.
- Consequently the method selected will not be the required method and might not produce the expected result. To work around this, you can create a user-defined method with a different name and use this method.

Types that are not covered in the list above (for example `xs:date`) will not be converted and will generate an error.

#### Datatypes: .NET to XPath/XQuery

When a .NET method returns a value and the datatype of the value is a string, numeric or boolean type, then it is converted to the corresponding XPath/XQuery type. For example, .NET's `decimal` datatype is converted to `xsd:decimal`.

When a .NET object or a datatype other than string, numeric or boolean is returned, you can ensure conversion to the required XPath/XQuery type by first using a .NET method (for example `System.DateTime.ToString()`) to convert the .NET object to a string. In XPath/XQuery, the string can be modified to fit the lexical representation of the required type and then converted to the required type (for example, by using the `cast as` expression).

#### MSXSL Scripts for XSLT

The `<msxsl:script>` element contains user-defined functions and variables that can be called from within XPath expressions in the XSLT stylesheet. The `<msxsl:script>` is a top-level element, that is, it must be a child element of `<xsl:stylesheet>` or `<xsl:transform>`.

The `<msxsl:script>` element must be in the namespace `urn:schemas-microsoft-com:xslt` (see example below).

#### Scripting language and namespace

The scripting language used within the block is specified in the `<msxsl:script>` element's `language` attribute and the namespace to be used for function calls from XPath expressions is identified with the `implements-prefix` attribute (*see below*).

```
<msxsl:script language="scripting-language" implements-prefix="user-namespace-
prefix">

    function-1 or variable-1
    ...
    function-n or variable-n

</msxsl:script>
```

The `<msxsl:script>` element interacts with the Windows Scripting Runtime, so only languages that are installed on your machine may be used within the `<msxsl:script>` element. **The .NET Framework 2.0 platform or higher must be installed for MSXSL scripts to be used.** Consequently, the .NET scripting languages can be used within the `<msxsl:script>` element.

The `language` attribute accepts the same values as the `language` attribute on the HTML `<script>` element. If the `language` attribute is not specified, then Microsoft JScript is assumed as the default.

The `implements-prefix` attribute takes a value that is a prefix of a declared in-scope namespace. This namespace typically will be a user namespace that has been reserved for a function library. All functions and variables defined within the `<msxsl:script>` element will be in the namespace identified by the prefix specified in the `implements-prefix` attribute. When a function is called from within an XPath expression, the fully qualified function name must be in the same namespace as the function definition.

### Example

Here is an example of a complete XSLT stylesheet that uses a function defined within a `<msxsl:script>` element.

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="2.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:fn="http://www.w3.org/2005/xpath-functions"
    xmlns:msxsl="urn:schemas-microsoft-com:xslt"
    xmlns:user="http://mycompany.com/mynamespace">

    <msxsl:script language="VBScript" implements-prefix="user">
        <![CDATA[
            ' Input: A currency value: the wholesale price
            ' Returns: The retail price: the input value plus 20% margin,
            ' rounded to the nearest cent
            dim a as integer = 13
            Function AddMargin(WholesalePrice) as integer
                AddMargin = WholesalePrice * 1.2 + a
            End Function
        ]]>
    </msxsl:script>

    <xsl:template match="/">
        <html>
            <body>
                <p>
                    <b>Total Retail Price =
                    $<xsl:value-of select="user:AddMargin(50)" />
                    </b>
                </p>
            </body>
        </html>
    </template>
```

```

        <br/>
        <b>Total Wholesale Price =
          $<xsl:value-of select="50" />
        </b>
      </p>
    </body>
  </html>
</xsl:template>
</xsl:stylesheet>

```

### Datatypes

The values of parameters passed into and out of the script block are limited to XPath datatypes. This restriction does not apply to data passed among functions and variables within the script block.

### Assemblies

An assembly can be imported into the script by using the `msxsl:assembly` element. The assembly is identified via a name or a URI. The assembly is imported when the stylesheet is compiled. Here is a simple representation of how the `msxsl:assembly` element is to be used.

```

<msxsl:script>
  <msxsl:assembly name="myAssembly.assemblyName" />
  <msxsl:assembly href="pathToAssembly" />

  ...

</msxsl:script>

```

The assembly name can be a full name, such as:

```
"system.Math, Version=3.1.4500.1 Culture=neutral
PublicKeyToken=a46b3f648229c514"
```

or a short name, such as "myAssembly.Draw".

### Namespaces

Namespaces can be declared with the `msxsl:using` element. This enables assembly classes to be written in the script without their namespaces, thus saving you some tedious typing. Here is how the `msxsl:using` element is used so as to declare namespaces.

```

<msxsl:script>
  <msxsl:using namespace="myAssemblyNS.NamespaceName" />

  ...

</msxsl:script>

```

The value of the `namespace` attribute is the name of the namespace.

### Altova Extension Functions

Altova extension functions are in the namespace `http://www.altova.com/xslt-extensions` and are indicated in this section with the prefix `altova:`, which is assumed to be bound to the namespace given above.

The following extension functions are supported in the current version of your Altova product in the manner described below. However, note that in future versions of your product, support for one or more of these functions might be discontinued or the behavior of individual functions

might change. Consult the documentation of future releases for information about support for Altova extension functions in that release.

### General functions

- [altova:evaluate\(\)](#)
- [altova:distinct-nodes\(\)](#)
- [altova:encode-for-rtf\(\)](#)
- [altova:xbrl-labels\(\)](#)
- [altova:xbrl-footnotes\(\)](#)
- [altova:generate-auto-number\(\)](#)
- [altova:reset-auto-number\(\)](#)
- [altova:get-temp-folder\(\)](#)

### General Functions

The following extension functions are supported in the current version of your Altova product in the manner described below. However, note that in future versions of your product, support for one or more of these functions might be discontinued or the behavior of individual functions might change. Consult the documentation of future releases for information about support for Altova extension functions in that release.

- [altova:evaluate\(\)](#)
- [altova:distinct-nodes\(\)](#)
- [altova:encode-for-rtf\(\)](#)
- [altova:xbrl-labels\(\)](#)
- [altova:xbrl-footnotes\(\)](#)
- [altova:generate-auto-number\(\)](#)
- [altova:reset-auto-number\(\)](#)
- [altova:get-temp-folder\(\)](#)

#### **altova:evaluate()**

The `altova:evaluate()` function takes an XPath expression, passed as a string, as its mandatory argument. It returns the output of the evaluated expression.

```
altova:evaluate(XPathExp as xs:string)
```

For example:

```
altova:evaluate('//Name[1]')
```

In the example above, note that the expression `//Name[1]` is passed as a string by enclosing it in single quotes. The `altova:evaluate` function returns the contents of the first `Name` element in the document.

The `altova:evaluate` function can take additional (optional) arguments. These arguments are, respectively, the values of variables with the names `p1`, `p2`, `p3`... `pN` that can be used in the XPath expression.

```
altova:evaluate(XPathExp as xs:string [, p1value ... pNvalue])
```

where

- the variable names must be of the form `pX`, `X` being an integer
- the sequence of the function's arguments, from the second argument onwards corresponds to the sequence of variables named `p1` to `pN`. So the second argument will be the value of the variable `p1`, the third argument that of the variable `p2`, and so on.
- The variable values must be of type `item*`

For example:

```
<xsl:variable name="xpath" select="'$p3, $p2, $p1'" />
<xsl:value-of select="altova:evaluate( $xpath, 10, 20, 'hi' )" />
Outputs "hi 20 10"
```

In the above listing, notice the following:

- The second argument of the `altova:evaluate` expression is the value assigned to the variable `$p1`, the third argument that assigned to the variable `$p2`, and so on.
- Notice that the fourth argument of the function is a string value, indicated by its being enclosed in quotes.
- The `select` attribute of the `xs:variable` element supplies the XPath expression. Since this expression must be of type `xs:string`, it is enclosed in single quotes.

The following examples further illustrate usage:

```
<xsl:variable name="xpath" select="'$p1'" />
<xsl:value-of select="altova:evaluate( $xpath, //Name[1] )" />
Outputs value of the first Name element.

<xsl:variable name="xpath" select="'$p1'" />
<xsl:value-of select="altova:evaluate( $xpath, '//*[@Name[1]]' )" />
Outputs "//*[@Name[1]]"
```

The `altova:evaluate()` extension function is useful in situations where an XPath expression in the XSLT stylesheet contains one or more parts that must be evaluated dynamically. For example, consider a situation in which a user enters his request for the sorting criterion and this criterion is stored in the attribute `UserReq/@sortkey`. In the stylesheet, you could then have the expression :

```
<xsl:sort select="altova:evaluate(../UserReq/@sortkey)" order="ascending"/>
```

The `altova:evaluate()` function reads the `sortkey` attribute of the `UserReq` child element of the parent of the context node. Say the value of the `sortkey` attribute is `Price`, then `Price` is returned by the `altova:evaluate()` function and becomes the value of the `select` attribute:

```
<xsl:sort select="Price" order="ascending"/>
```

If this `sort` instruction occurs within the context of an element called `Order`, then the `Order` elements will be sorted according to the values of their `Price` children. Alternatively, if the value of `@sortkey` were, say, `Date`, then the `Order` elements would be sorted according to the values of their `Date` children. So the sort criterion for `Order` is selected from the `sortkey` attribute at runtime. This could not have been achieved with an expression like:

```
<xsl:sort select="../UserReq/@sortkey" order="ascending"/>
```

In the case shown above, the sort criterion would be the `sortkey` attribute itself, not `Price` or `Date` (or any other current content of `sortkey`).

Variables can be used in the `altova:evaluate()` extension function as shown in the examples below:

- Static variables: `<xsl:value-of select="$i3, $i2, $i1" />`  
*Outputs the values of three variables.*
- Dynamic XPath expression with dynamic variables:  
`<xsl:variable name="xpath" select="'$p3, $p2, $p1'" />`  
`<xsl:value-of select="altova:evaluate( $xpath, 10, 20, 30 )" />`  
*Outputs "30 20 10"*
- Dynamic XPath expression with no dynamic variable:  
`<xsl:variable name="xpath" select="'$p3, $p2, $p1'" />`  
`<xsl:value-of select="altova:evaluate( $xpath )" />`  
*Outputs error: No variable defined for \$p3.*

**Note:** The static context includes namespaces, types, and functions—but not variables—from the calling environment. The base URI and default namespace are inherited.

#### **altova:distinct-nodes()**

The `altova:distinct-nodes()` function takes a set of one or more nodes as its input and returns the same set minus nodes with duplicate values. The comparison is done using the XPath/XQuery function `fn:deep-equal`.

```
altova:distinct-nodes( $arg as node()* ) as node()*
```

#### **altova:encode-for-rtf()**

The `altova:encode-for-rtf()` function converts the input string into code for RTF.

```
altova:encode-for-rtf( $inputstr as xs:string?,  
  $preserveallwhitespace as xs:boolean,  
  $preservenewlines as xs:boolean ) as xs:string
```

Whitespace and new lines will be preserved according to the boolean value specified for their respective parameters.

#### **altova:xbrl-labels()**

The `altova:xbrl-labels()` function takes two input arguments: a node name and the taxonomy file location containing the node. The function returns the XBRL labels associated with the input node.

```
altova:xbrl-labels( $name as xs:QName, $file as xs:string ) as node()*
```

#### **altova:xbrl-footnotes()**

The `altova:footnotes()` function takes a node as its input argument and returns the set of XBRL footnote nodes referenced by the input node.

```
altova:footnotes( $arg as node() ) as node()*
```

```
altova:generate-auto-number(id as xs:string, start-with as xs:integer,  
  increment as xs:integer, reset-on-change as xs:string)
```

Generates a series of numbers having the specified ID. The start integer and the increment is specified.

**altova:reset-auto-number(id as xs:string)**

This function resets the auto-numbering of the auto-numbering series specified with the ID argument. The series is reset to the start integer of the series (see `altova:generate-auto-number` above).

**altova:get-temp-folder as xs:string**

Gets the temporary folder.

## 19.2 Technical Data

This section contains useful background information on the technical aspects of your software. It is organized into the following sections:

- [OS and Memory Requirements](#)
- [Altova XML Parser](#)
- [Altova XSLT and XQuery Engines](#)
- [Unicode Support](#)
- [Internet Usage](#)

### 19.2.1 OS and Memory Requirements

#### **Operating System**

Altova software applications are:

- 32-bit Windows applications for Windows XP, Windows Server 2003 and 2008, Windows Vista, and Windows 7, or
- 64-bit Windows applications for Windows Vista and Windows 7

#### **Memory**

Since the software is written in C++ it does not require the overhead of a Java Runtime Environment and typically requires less memory than comparable Java-based applications. However, each document is loaded fully into memory so as to parse it completely and to improve viewing and editing speed. The memory requirement increases with the size of the document.

Memory requirements are also influenced by the unlimited Undo history. When repeatedly cutting and pasting large selections in large documents, available memory can rapidly be depleted.

### 19.2.2 Altova XML Parser

When opening any XML document, the application uses its built-in validating parser (the Altova XML Parser) to check for well-formedness, validate the document against a schema (if specified), and build trees and Infosets. The Altova XML Parser is also used to provide intelligent editing help while you edit documents and to dynamically display any validation error that may occur.

The built-in Altova XML Parser implements the Final Recommendation of the W3C's XML Schema specification. New developments recommended by the W3C's XML Schema Working Group are continuously being incorporated in the Altova Parser, so that Altova products give you a state-of-the-art development environment.

### 19.2.3 Altova XSLT and XQuery Engines

Altova products use the Altova XSLT 1.0 Engine, Altova XSLT 2.0 Engine, and Altova XQuery 1.0 Engines. Documentation about implementation-specific behavior for each engine is in the section Engine Information, in Appendix 1 of the product documentation, should that engine be used in the product.

These three engines are also available in the AltovaXML package, which can be downloaded from the [Altova website](#) free of charge. Documentation for using the engines is available with the AltovaXML package.

### 19.2.4 Unicode Support

Unicode is the 16-bit character-set (extendable to 32-bit) defined by the [Unicode Consortium](#). It provides a unique number for every character,

- no matter what the platform,
- no matter what the program,
- no matter what the language.

Fundamentally, computers just deal with numbers. They store letters and other characters by assigning a number for each one. Before Unicode was invented, there were hundreds of different encoding systems for assigning these numbers. No single encoding could contain enough characters: for example, the European Union alone requires several different encodings to cover all its languages. Even for a single language like English, no single encoding was adequate for all the letters, punctuation, and technical symbols in common use.

These encoding systems used to conflict with one another. That is, two encodings used the same number for two different characters, or different numbers for the same character. Any given computer (especially servers) needs to support many different encodings; yet whenever data is passed between different encodings or platforms, that data always runs the risk of corruption.

#### **Unicode is changing all that!**

Unicode provides a unique number for every character, no matter what the platform, no matter what the program, and no matter what the language. The Unicode Standard has been adopted by such industry leaders as Apple, HP, IBM, JustSystems, Microsoft, Oracle, SAP, Sun, Base and many others.

Unicode is required by modern standards such as XML, Java, ECMAScript (JavaScript), LDAP, CORBA 3.0, WML, etc., and is the official way to implement ISO/IEC 10646. It is supported in many operating systems, all modern browsers, and many other products. The emergence of the Unicode Standard, and the availability of tools supporting it, are among the most significant recent global software technology trends.

Incorporating Unicode into client-server or multi-tiered applications and web sites offers significant cost savings over the use of legacy character sets. Unicode enables a single software product or a single web site to be targeted across multiple platforms, languages and countries without re-engineering. It allows data to be transported through many different systems without corruption.

#### **Windows XP**

Altova's XML products provide full Unicode support. To edit an XML document, you will also need a font that supports the Unicode characters being used by that document.

Please note that most fonts only contain a very specific subset of the entire Unicode range and are therefore typically targeted at the corresponding writing system. Consequently you may encounter XML documents that contain "unprintable" characters, because the font you have selected does not contain the required glyphs. Therefore it can sometimes be very useful to have a font that covers the entire Unicode range - especially when editing XML documents from all over the world.

The most universal font we have encountered is a typeface called Arial Unicode MS that has been created by Agfa Monotype for Microsoft. This font contains over 50,000 glyphs and covers the entire set of characters specified by the Unicode 2.1 standard. It needs 23MB and is included with Microsoft Office 2000.

We highly recommend that you install this font on your system and use it with the application if you are often editing documents in different writing systems. This font is not installed with the "Typical" setting of the Microsoft Office setup program, but you can choose the Custom Setup option to install this font.

In the /Examples folder in your application folder you will also find a new XHTML file called `Unicode-UTF8.html` that contains the sentence "When the world wants to talk, it speaks Unicode" in many different languages ("Wenn die Welt miteinander spricht, spricht sie Unicode") and writing-systems (世界的に話すなら、Unicode です) - this line has been adopted from the 10th Unicode conference in 1997 and is a beautiful illustration of the importance of Unicode for the XML standard. Opening this file will give you a quick impression on what is possible with Unicode and what writing systems are supported by the fonts available on your PC installation.

### Right-to-Left Writing Systems

Please note that even under Windows NT 4.0 any text from a right-to-left writing-system (such as Hebrew or Arabic) is not rendered correctly except in those countries that actually use right-to-left writing-systems. This is due to the fact that only the Hebrew and Arabic versions of Windows NT contains support for rendering and editing right-to-left text on the operating system layer.

### 19.2.5 Internet Usage

Altova applications will initiate Internet connections on your behalf in the following situations:

- If you click the "Request evaluation key-code" in the Registration dialog (**Help | Software Activation**), the three fields in the registration dialog box are transferred to our web server by means of a regular http (port 80) connection and the free evaluation key-code is sent back to the customer via regular SMTP e-mail.
- If you use the URL mode of the Open dialog box to open a document directly from a URL (**File | Open | Switch to URL**), that document is retrieved through a http (port 80) connection. (*This functionality is available in XMLSpy and Authentic Desktop.*)
- If you open an XML document that refers to an XML Schema or DTD and the document is specified through a URL, it is also retrieved through a http (port 80) connection once you validate the XML document. This may also happen automatically upon opening a document if you have instructed the application to automatically validate files upon opening in the File tab of the Options dialog (**Tools | Options**). (*This functionality is available in XMLSpy and Authentic Desktop.*)
- If you are using the Send by Mail... command (**File | Send by Mail**) in XMLSpy, the current selection or file is sent by means of any MAPI-compliant mail program installed on the user's PC.
- As part of Software Activation and LiveUpdate as further described in this manual and the Altova Software License Agreement.

## 19.3 License Information

This section contains:

- Information about the [distribution of this software product](#)
- Information about the [intellectual property rights](#) related to this software product
- The [End User License Agreement](#) governing the use of this software product

Please read this information carefully. It is binding upon you since you agreed to these terms when you installed this software product.

### 19.3.1 Electronic Software Distribution

This product is available through electronic software distribution, a distribution method that provides the following unique benefits:

- You can evaluate the software free-of-charge before making a purchasing decision.
- Once you decide to buy the software, you can place your order online at the [Altova website](#) and immediately get a fully licensed product within minutes.
- When you place an online order, you always get the latest version of our software.
- The product package includes a comprehensive integrated onscreen help system. The latest version of the user manual is available at [www.altova.com](http://www.altova.com) (i) in HTML format for online browsing, and (ii) in PDF format for download (and to print if you prefer to have the documentation on paper).

#### 30-day evaluation period

After downloading this product, you can evaluate it for a period of up to 30 days free of charge. About 20 days into this evaluation period, the software will start to remind you that it has not yet been licensed. The reminder message will be displayed once each time you start the application. If you would like to continue using the program after the 30-day evaluation period, you have to purchase an [Altova Software License Agreement](#), which is delivered in the form of a key-code that you enter into the Software Activation dialog to unlock the product. You can purchase your license at the online shop at the [Altova website](#).

#### Helping Others within Your Organization to Evaluate the Software

If you wish to distribute the evaluation version within your company network, or if you plan to use it on a PC that is not connected to the Internet, you may only distribute the Setup programs, provided that they are not modified in any way. Any person that accesses the software installer that you have provided, must request their own 30-day evaluation license key code and after expiration of their evaluation period, must also purchase a license in order to be able to continue using the product.

For further details, please refer to the [Altova Software License Agreement](#) at the end of this section.

### 19.3.2 Software Activation and License Metering

As part of Altova's Software Activation, the software may use your internal network and Internet connection for the purpose of transmitting license-related data at the time of installation, registration, use, or update to an Altova-operated license server and validating the authenticity of the license-related data in order to protect Altova against unlicensed or illegal use of the software and to improve customer service. Activation is based on the exchange of license related data such as operating system, IP address, date/time, software version, and computer name, along with other information between your computer and an Altova license server.

Your Altova product has a built-in license metering module that further helps you avoid any unintentional violation of the End User License Agreement. Your product is licensed either as a single-user or multi-user installation, and the license-metering module makes sure that no more than the licensed number of users use the application concurrently.

This license-metering technology uses your local area network (LAN) to communicate between instances of the application running on different computers.

#### Single license

When the application starts up, as part of the license metering process, the software sends a short broadcast datagram to find any other instance of the product running on another computer in the same network segment. If it doesn't get any response, it will open a port for listening to other instances of the application.

#### Multi license

If more than one instance of the application is used within the same LAN, these instances will briefly communicate with each other on startup. These instances exchange key-codes in order to help you to better determine that the number of concurrent licenses purchased is not accidentally violated. This is the same kind of license metering technology that is common in the Unix world and with a number of database development tools. It allows Altova customers to purchase reasonably-priced concurrent-use multi-user licenses.

We have also designed the applications so that they send few and small network packets so as to not put a burden on your network. The TCP/IP ports (2799) used by your Altova product are officially registered with the IANA (see <http://www.isi.edu/in-notes/iana/assignments/port-numbers> for details) and our license-metering module is tested and proven technology.

If you are using a firewall, you may notice communications on port 2799 between the computers that are running Altova products. You are, of course, free to block such traffic between different groups in your organization, as long as you can ensure by other means, that your license agreement is not violated.

You will also notice that, if you are online, your Altova product contains many useful functions; these are unrelated to the license-metering technology.

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# Index

(

**(default),**

multi input / output components, 51

■

**.NET extension functions,**

constructors, 406  
datatype conversions, .NET to XPath/XQuery, 409  
datatype conversions, XPath/XQuery to .NET, 408  
for XSLT and XQuery, 404  
instance methods, instance fields, 407  
overview, 404  
static methods, static fields, 407

<

**<dynamic>,**

file input / output, 51

## A

**About MapForce, 387**

**abs, 339**

**Absolute,**

paths - advantages / disadvantages, 160

**Accelerator,**

shortcut keys, 377

**Activating the software, 386**

**Add, 316**

duplicate before / after, 361  
global resource file, 130  
schema location, 361  
user-def. functions, 257

**Adjust-to-Timezone, 336**

**Aggregate,**

function - using named templates, 295

functions, 188

**Align,**

components in mapping window, 19

**Altova Engines,**

in Altova products, 419

**Altova extension functions,**

chart functions (see chart functions), 412  
general functions, 412

**Altova extensions,**

chart functions (see chart functions), 411

**Altova website, 387**

**Altova XML,**

DoTransform.bat, 34

**Altova XML Parser,**

about, 418

**Altova XSLT 1.0 Engine,**

limitations and implementation-specific behavior, 392

**Altova XSLT 2.0 Engine,**

general information about, 394  
information about, 394

**Annotation,**

connector, 365

**anyURI,**

functions, 333

**Application workflow,**

using global resources, 140

**Assign,**

global resource to component, 133  
Stylevision Power Stylesheet to component, 234

**ATTLIST,**

DTD namespace URIs, 214

**Autoalign,**

components in mapping, 60

**Autoalignment,**

guide lines, 19

**Autoconnect,**

child items, 70, 87

**Auto-mapping,**

child elements, 87

**auto-number, 312**

**avg, 299**

## B

**Background Information, 416**

**backwards compatibility,**  
of XSLT 2.0 Engine, 394

**Base,**  
type - derived types, 220

**base-uri, 333**

**Best fit,**  
double click resize icon, 18

**BOM,**  
Byte Order Mark, 361

**Bool,**  
output if false, 284

**boolean, 302**  
comparing input nodes, 191

**Builder,**  
user-defined function, 257

**Built-in,**  
execution engine - icon, 112

**Byte Order Mark,**  
in component settings, 361

## C

**Call,**  
template, 290

**Call graphs,**  
SPS stylesheet, 244

**Casting,**  
to target schema, 361

**Catalog,**  
file, 216

**ceiling, 316**

**Chained,**  
mapping - code generation, 102

**Chained mapping,**  
display final component using Stylevision, 97, 102

**Change,**  
configuration - global resource, 135

**character entities,**  
in HTML output of XSLT transformation, 392

**char-from-code, 322**

**Check,**  
type checking, 215

**Child items,**  
autoconnect, 70, 87  
Deleting, 87

**Children,**

standard with children, 80

**Code,**  
exit code - command line, 195  
inline functions & code size, 266  
strip schema names from, 361

**Code generation,**  
and absolute path, 35  
and input parameters, 197  
default file output name, 34  
input parameters, 197  
make paths absolute, 160  
of chained mappings, 102  
wrapper class version, 377

**code-from-char, 322**

**Command line,**  
default and preview settings, 199  
dynamic input file names, 154  
exit code, 195  
input parameter, 197  
Input parameters, 157  
parameters, 195  
parameters and input values, 197

**Command line parameters,**  
wildcards in quotes, 197

**Companion software,**  
for download, 387

**compare, 340**

**compl.,**  
complement node set, 30

**Complex,**  
function - inline, 266  
User-defined complex input, 274  
User-defined complex output, 279  
User-defined function, 273, 279

**Component,**  
assign global resource, 133  
assign SPS to, 234  
change database, 361  
changing settings, 361  
deleted items, 91  
enable input processing, 361  
encoding settings, 361  
input - default value, 199  
multi input / Output, 152  
multi-file input / output, 50  
mutli input / Output, 154  
pretty pring in output, 361  
resize to best fit, 18

**Component download center,**

at Altova web site, 387

**Components,**

multi file input/output, 51

processing sequence, 124

**Compute once,**

variable, 171

**Compute when,**

variable, 171

**concat, 322****Concatenate,**

filters - don't, 178

**Condition,**

extendable IF-Else, 359

**Configuration,**

add to global resource, 130

copy existing, 130

switch - global resource, 135

**Connection,**

Deleting, 87

move parent/child connectors, 87

properties, 87

settings, 365

**Connections,**

type driven, 82

**Connector,**

copying using CTRL, 70

mapping with, 70

naming, 365

popup, 70

properties, 87

**Connector icon,**

popup, 70

**Connectors,**

copy-all, 82

**Consolidating data,**

merging XML files, 193

**Constant,**

as default value, 199

**Constructor,**

XSLT2, 294

**constructors,**

xs:ENTITY, 334

**contains, 322****Context,**

override, 206

priority, 109

priority context, 192

**Conversion,**

functions - boolean, 191

type checking, 215

**Copy,**

existing connector elsewhere - CTRL, 70

**Copy all,**

mapping method, 72

**Copy-all,**

and filters, 82

connectors, 82

resolve / delete connectors, 82

**Copyright information, 423****Core,**

library functions, 299

**count, 299****count() function,**

in XPath 1.0, 392

**count, sum, avg,**

aggregate function, 188

**Create,**

function, 26

user-defined function, 257

**CSV,**

streaming, 112

**current, 345****current-date, 335****current-dateTime, 335****current-time, 335****Custom,**

function, 109

library, 109

XSLT 2.0 functions, 294

XSLT functions, 290

**Cut,**

move parent/child connectors, 87

## D

**Data,**

filtering, 30

**Database,**

and multiple sources, 361

change DB, 361

strip schema names from code, 361

**Datatype,**

explicit - implicit, 294

**Date,**

XSLT 2.0 constructor, 294

**Default,**

configuration - global resource, 130

input value, 284

parameter - input component, 199

**default functions namespace,**

in XSLT 2.0 stylesheets, 394

**default-collation, 335****Definition file,**

globalresource.xml, 128

**Delete,**

connections, 87

copy-all connections, 82

deletions - missing items, 91

user-defined function, 257

**Derived,**

types - using / mapping to, 220

**distinct-values, 321****Distribution,**

of Altova's software products, 423, 424, 426

**divide, 316****document, 345****Documentation,**

defining SPS stylesheets, 247

**Documenting,**

mappings, 238

**document-uri, 333****DoTransform,**

AltovaXML batch file, 34

**DoTransform bat,**

transforming XML, 39

**Driver,**

JDBC, 361

**DTD,**

source and target, 214

**Duplicate,**

add before/after, 361

connector - use CTRL, 70

input item, 45

**Dynamic,**

and multifile support, 152

file names as Input parameters, 157

input files at runtime, 154

## E

**EDI,**

validating, 114

**Edit, 358****Element,**

cast to target, 361

recursive element in XML Schema, 222

**element-available, 345****Enable input processing,**

optimization, 361

**Encoding,**

Byte Order Mark, 361

component settings, 361

**End User License Agreement, 423, 427****ends-with, 340****Engine,**

Mapforce, 112

**equal, 314****equal-or-greater, 314****equal-or-less, 314****Erase,**

delete user-defined func., 257

**Error,**

validation, 114

**Errorlevel,**

command line execution, 195

**escape-uri, 340****Evaluation key,**

for your Altova software, 386

**Evaluation period,**

of Altova's software products, 423, 424, 426

**Example,**

recursive user-defined mapping, 222

**Examples,**

tutorial folder, 16

**Exist,**

use not-exist to map missing nodes, 204

**exists, 318**

node test, 202

**Exit code, 195****Explicit,**

datatype, 294

**Export,**

user-defined function, 257

**Expression,**

regular, 329

**Extending,**

function parameters, 109

**Extension functions for XSLT and XQuery, 397****Extension Functions in .NET for XSLT and XQuery,**

see under .NET extension functions, 404

**Extension Functions in Java for XSLT and XQuery,**

see under Java extension functions, 397

**Extension Functions in MSXSL scripts, 409**

## F

**false, 334****FAQs on MapForce, 387****File, 355**

add resource configuration, 130  
catalog, 216  
define global resource, 130  
multi file input / output, 51

**File:,**

(default), 51  
item in component, 51

**Files,**

dynamic file names as Input, 157  
multiple from database, 158

**Filter,**

complement, 30  
component - tips, 178  
concatenate - don't, 178  
copy-all connector, 82  
data, 30  
map parent items, 178  
merging XML files, 193  
priority context, 178

**Find,**

function in library, 109  
XSLT - Output tab, 358

**FLF,**

streaming, 112

**floor, 316****Folders,**

as a global resource, 137

**format-dateTime, 302****format-number, 302, 345****From, 336****Function, 312, 370**

adding, 109  
adding custom XSLT, 290  
adding custom XSLT 2.0, 294  
aggregate, 188  
Changing type of user-defined, 257  
complex - inline, 266  
conversion - boolean, 191  
core library, 299  
custom, 109  
defining, 256  
exporting user-defined, 257  
extendable, 109  
extendable IF-Else, 359  
find in library, 109  
inline, 266  
input as parameter, 197  
library, 109  
nested user-defined, 284  
Query, 109  
restrictions in user-defined, 257  
standard user-defined function, 268  
sum, 295  
user-defined, 257  
user-defined - changing type, 257  
user-defined function, 224  
user-defined look-up function, 268  
visual builder, 257  
xpath2 library, 333  
xslt library, 343

**function-available, 345****functions,**

importing user-defined, 257  
mapping to, 26  
reference section, 298  
see under XSLT 2.0 functions, 396

**Functions used by, 244**

## G

**Generate,**

code & inline functions, 266  
multiple target Java, 39  
multiple target XSLT, 39  
XML Schema automatically, 18

**Generated,**

**Generated,**

file output name, 34

**generate-id, 345****get-fileext, 310****get-folder, 310****Global resource,**

activate, 135  
assign to component, 133  
copy configuration, 130  
default configuration, 130  
folders as, 137  
properties, 147  
start workflow, 144  
workflow, 140

**Global resources,**

define resource file, 130  
definition file, 128  
toolbar, 129

**Globalresource.xml,**

resource definition, 128

**greater, 314****Grid,**

snap line alignment, 60

**group-adjacent, 321****group-by, 321****group-ending-with, 321****Groups,**

loops and hierarchies, 117

**group-starting-with, 321**

## H

**Health Level 7,**

example, 254

**Help,**

see Onscreen Help, 385

**Help menu, 384****Hierarchies,**

loops and groups, 117

**HL7 2.6 to 3.x,**

example, 254

**Hotkeys,**

Output window zoom factor, 112  
shortcuts, 377

**How to..., 176****HTML,**

mapping documentation, 238

Stylevision Power Stylesheets, 232

tab, in mapping window, 56

**IF-Else,**

extendable, 359

**Impact analysis,**

SPS stylesheet, 244

**implementation-specific behavior,**

of XSLT 2.0 functions, 396

**Implicit,**

datatype, 294

**Import,**

user-def. functions, 257

**Include,**

XSLT, 290

XSLT 2.0, 294

**in-context,**

parameter, 299

**Inline, 257**

functions and code size, 266

**Inline / Standard,**

user-defined functions, 266

**Input,**

as command line param, 197  
command line parameter, 199  
comparing boolean nodes, 191  
default value, 284  
multi file, 154  
optional parameters, 284  
XML instance, 361

**Input component,**

default value, 199

**Input icon,**

mapping, 70

**Input parameter,**

and code generation, 197  
and dynamic file names, 157  
command line, 197  
dynamic, 154

**Insert, 359****Installation,**

examples folder, 16

**Instance,**

**Instance,**

- input XML instance, 361
- output XML instance, 361

**Intermediate variables, 166****Internet usage,**

- in Altova products, 422

**Introduction to MapForce, 3****is-xsi-nil, 318****Item,**

- duplicating, 45
- missing, 91
- schema - mapping, 23

**Iteration,**

- priority context, 192

## J

**Java,**

- generate multiple target, 39
- multiple targets, 35

**Java extension functions,**

- constructors, 401
- datatype conversions, Java to Xpath/XQuery, 404
- datatype conversions, Xpath/XQuery to Java, 403
- for XSLT and XQuery, 397
- instance methods, instance fields, 402
- overview, 397
- static methods, static fields, 402
- user-defined class files, 398
- user-defined JAR files, 400

## K

**Keeping data,**

- when using value-map, 183

**Keeping data unchanged,**

- passing through a value-map, 183

**Keyboard,**

- shortcuts, 377

**Key-codes,**

- for your Altova software, 386

## L

**lang, 338, 343****Languages,**

- and dynamic/multi file support, 152

**last, 335, 343****last() function,**

- in XPath 1.0, 392

**Legal information, 423****less, 314****Libraries,**

- and user-defined functions, 257

**Library,**

- adding XSLT 2.0 functions, 294
- adding XSLT functions, 290
- custom, 109
- defining, 256
- find function in, 109
- function, 109
- function reference, 298
- import user-def. functions, 257
- XPath2, 109

**License, 427**

- information about, 423

**License metering,**

- in Altova products, 425

**Licenses,**

- for your Altova software, 386

**Local,**

- schemas - catalog files, 216

**local-name, 338, 343****logical-and, 314****logical-not, 314****logical-or, 314****Lookup table,**

- mapping missing nodes, 204
- properties, 186
- value map table, 180

**Loops,**

- groups and hierarchies, 117

**lower-case, 340**

# M

**main-mfd-filepath, 310**

**Make paths,**

absolute in generated code, 160

**manespace-uri, 338**

**Mapforce,**

engine, 112

introduction, 3

Overview, 10

terminology, 12

**MapForce engine,**

Built-in execution engine, 112

**Mapping,**

child elements, 87

connector, 70

Documenting, 238

no. of connections, 70

predefined SPS stylesheets for documentation, 244

processing sequence, 124

properties, 87

schema items, 23

source driven - mixed content, 74

standard mapping, 80

target driven, 80

target schema name, 34

tutorial, 16

type driven, 82

validate structure, 114

validation, 114

window - autoalignment, 19

**Mapping methods,**

standard, 73

standard / mixed / copy all, 72

target-driven, 73

**Mapping window,**

autoalignment, 60

Stylevision tabs, 56

**MappingMap,**

toTargetSchemaName, 34

**Marked items,**

missing items, 91

**matches, 340**

**max, 299**

**Memory requirements, 417**

**Menu,**

connection, 365

edit, 358

file, 355

function, 370

insert, 359

output, 373

tools, 377

view, 375

**Merge,**

multiple input files, 154

**Merging,**

XML files, 193

**mfd-filepath, 310**

**MFF,**

and user-defined functions, 257

**min, 299**

**min, max,**

aggregate function, 188

**minOccurs/maxOccurs,**

input processing optimization, 361

**Missing items, 91**

**Missing nodes,**

mapping missing nodes, 204

**Mixed,**

content mapping, 74

content mapping example, 79

content mapping method, 72

source-driven mapping, 74

standard mapping, 80

**modulus, 316**

**Move,**

parent/child connectors, 87

**Move down,**

item in component, 361

**Move up,**

item in component, 361

**MSXML 6.0,**

library, 377

**msxsl:script, 409**

**Multi,**

file support - languages, 152

input / output, 152

**Multi file,**

input / output, 154

processing (tutorial), 51

**Multi-file,**

input / output, 50

**Multiple,**

- source schemas, 361
- target schemas, 35
- targets and Java, 35
- viewing multiple target schemas, 39

**multiple input,**

- items, 45

**Multiple source,**

- to single target, 193
- to single target item, 41

**Multiple XML files,**

- from single XML source, 158

**multiply, 316****MyDocuments,**

- example files, 16

# N

**Name, 338, 343**

- connector, 365

**Named,**

- template - namespaces, 290

**Named template,**

- summing nodes, 295

**Namespace,**

- named template, 290

**Namespace URI,**

- DTD, 214

**namespaces,**

- in XSLT 2.0 stylesheet, 394

**namespace-uri, 343****Nested,**

- user-defined functions, 284

**nil,**

- xsi:nil, 250

**node, 338**

- comparing boolean, 191
- mapping missing nodes, 204
- position, 206
- summing multiple, 295
- testing, 202

**Node set,**

- complement, 30

**node-name, 333****normalize-space, 322****normalize-unicode, 340****Not exist,**

- mapping missing nodes, 204

**not-equal, 314****not-exists, 318****Null,**

- nullable, 250

**number, 302, 338**

# O

**Onscreen help,**

- index of, 385
- searching, 385
- table of contents, 385

**Optimization,**

- enable input processing, 361

**Optional,**

- input parameters, 284

**Order,**

- components are processed, 124

**Ordering Altova software, 386****OS,**

- for Altova products, 417

**Ouput,**

- save data from, 39

**Output, 373**

- add schema location to output, 361
- Built-in execution engine, 112
- multi file, 154
- parameter, 284
- user-defined if bool = false, 284
- validate, 114
- validate XML, 112
- validating, 114
- window, 112
- window - zoom factor, 112
- XML instance, 361

**Output icon,**

- mapping, 70

**Overall documentation,**

- SPS stylesheet, 244

**Override,**

- context, 206

**Overview of MapForce, 10**

# P

**Parameter,**

- and code generation, 197
- command line, 195, 197
- default value, 199
- extending in functions, 109
- in-context, 299
- input - dynamic, 154
- Input function as a, 197, 199
- optional, 284
- output, 284
- using wildcards, 197

**Parent,**

- mapping and filters, 178

**Parent context,**

- variable, 171

**parse-dateTime, 302****parse-number, 302****Parser,**

- built into Altova products, 418

**Passing through data,**

- unchanged through value-map, 183

**Path,**

- absolute when generating code, 35

**PDF,**

- mapping documentation, 238
- Stylevision Power Stylesheets, 232

**Platforms,**

- for Altova products, 417

**position, 318, 335, 343**

- node / context, 206

**position() function,**

- in XPath 1.0, 392

**Pretty print,**

- in output component, 361

**Preview,**

- input component value, 199
- Mapforce engine, 112
- Stylevision Power Stylesheets, 232

**Priority,**

- and filters, 178
- function, 109

**Priority context,**

- defining, 192

**Processing sequence,**

- of components in a mapping, 124

**Processors,**

- for download, 387

**Properties,**

- value map table, 186

# Q

**qname-related,**

- functions, 339

**Question mark,**

- missing items, 91

**Quotes,**

- and command line params, 197

# R

**Recursive,**

- calls in functions, 266
- user-defined function, 224
- user-defined mapping, 222

**Reference, 354**

- functions in MapForce, 298

**Regex, 329****Registering your Altova software, 386****Regular expressions, 329****Relative,**

- paths - advantages, 160

**Remove,**

- Connection, 87
- copy-all connections, 82

**remove-fileext, 310****remove-folder, 310****replace, 340****replace-fileext, 310****Resize,**

- component "best fit", 18

**resolve-filepath, 310****resolve-uri, 333****Resource,**

- folder, 137
- global resource properties, 147

**Result of Transformation,**

**Result of Transformation,**

global resources, 140

**Retaining data,**

passing through vlaue-map, 183

**Right-to-left writing systems, 421****Root,**

element of target, 190

**Root element,**

create new, 87

**round, 316****round-half-to-even, 339****round-precision, 316****RTF,**

mapping documentation, 238

Stylevision Power Stylesheets, 232

tab, in mapping window, 56

## S

**Save,**

data in Output window, 39

XML output, 112

**Schema,**

add location to output, 361

auto-generate from XML file, 18

catalog file, 216

multiple source, 361

multiple target, 35

name, strip from generated code, 361

recursive elements, 222

viewing multiple targets, 39

**Schema names,**

strip from table names, 361

**Scripts in XSLT/XQuery,**

see under Extension functions, 397

**Search,**

XSLT - Output tab, 358

**Sequence,**

of processing components, 124

postition, 206

**set-empty, 321****Setting,**

connector, 365

**Settings,**

changing component, 361

**set-xsi-nil, 318****Shortcut,**

keyboard, 377

**Single target,**

multiple sources, 193

**Snap,**

lines - auto-align components, 60

**Software product license, 427****Source file,**

split into multiple target files, 158

**Source-driven,**

- mixed content mapping, 74

vs. standard mapping, 80

**Specify value,**

input component - preview, 199

**SPS,**

predefined stylesheets for documenting mappings, 244

Stylevision Power Stylesheet, 232

user-defined stylesheets, 247

**Standard,**

mapping method, 72, 73

mapping with children, 80

mixed content mapping, 80

user-defined function, 268

vs source-driven mapping, 80

XSLT library, 109

**starts-with, 322, 340****Streaming,**

XML, CSV and FLF, 112

**string, 302, 333****string-join, 299****string-length, 322****Strip,**

schema names, 361

**Stylesheet,**

Stylevision Power Stylesheet tabs, 65

**Stylesheets,**

defining for documentation, 247

**Stylevision,**

assigning SPS to component, 234

chained mapping - final component, 97, 102

defining SPS stylesheets for mappings, 247

HTML, PDF, RTF, Word2007+, 232

mapping output tabs, 65

Stylesheets in preview, 232

tabs, in mapping window, 56

**Substitute,**

missing node, 202

**substitute-missing, 318**

- substitute-missing-with-xsi-nil, 318**
- substring, 322**
- substring-after, 322, 340**
- substring-before, 322, 340**
- Subtract, 316, 336**
- sum, 299**
  - nodes in XSLT 1.0, 295
- Support for MapForce, 387**
- Switch,**
  - configuration - global resource, 135
- system-property, 345**

## T

- Table,**
  - lookup - value map, 180
  - strip schema names, 361
  - strip schema names from, 361
- Tabs,**
  - Stylevision output tabs, 65
- Target,**
  - multiple schemas, 35
  - root element, 190
  - viewing multiple schemas, 39
- Target file,**
  - multiple from single source file, 158
- Target item,**
  - mapping multi-source, 41
- Target-driven,**
  - mapping, 80
- Target-driven mapping, 73**
- Technical Information, 416**
- Technical support for MapForce, 387**
- Terminology, 12**
- Template,**
  - calling, 290
  - named - summing, 295
- Test,**
  - node testing, 202
- Tokenize, 322, 326**
- Tokenize-by-length, 322, 326**
- tokenize-regexp, 322**
- Toolbar,**
  - global resource, 129
- Tools, 377**
- Transform,**

- DoTransform.bat, 39
  - input data - value map, 180
- translate, 322**
- true, 334**
- Tutorial, 16**
  - examples folder, 16
- Type,**
  - cast to target type, 361
- Type conversion,**
  - checking, 215
- Type driven,**
  - connections, 82
- Types,**
  - derived types - xsi:type, 220

## U

- Unicode,**
  - support in Altova products, 420
- Unicode support,**
  - in Altova products, 420, 421
- unparsed-entity-uri, 345**
- upper-case, 340**
- URI,**
  - in DTDs, 214
- User defined,**
  - changing function type, 257
  - complex input, 274
  - complex output, 279
  - deleting, 257
  - function - inline / standard, 266
  - function - standard, 268
  - functions, 257
  - functions - complex, 273, 279
  - functions - restrictions, 257
  - functions changing type of, 257
  - importing/exporting, 257
  - look-up functions, 268
  - nested functions, 284
  - output if bool = false, 284
- User manual,**
  - see also Onscreen Help, 385
- User-defined,**
  - functions, 257
  - functions & mffs, 257
- user-defined function,**

**user-defined function,**

recursive, 224

**Using,**

global resources, 135

## V

**Validate,**

data in output window, 39

mapping project, 114

output data, 114

XML, 112

**Validator,**

in Altova products, 418

**Value,**

default, 284

input component - preview, 199

**Value-Map,**

lookup table, 180

lookup table - properties, 186

passing data unchanged, 183

**Variable,**

inserting, 166

intermediate variable, 166

use cases, 166

**Version,**

wrapper class compatibility, 377

**View, 375****Visual function builder, 257****Visual Studio,**

versions supported - code generation, 377

## W

**Warning,**

validation, 114

**whitespace in XML document,**

handling by Altova XSLT 2.0 Engine, 394

**whitespace nodes in XML document,**

and handling by XSLT 1.0 Engine, 392

**Wildcards,**

use of quotes in command line, 197

**Windows,**

support for Altova products, 417

**Word,**

mapping documentation, 238

**Word2007+,**

Stylevision Power Stylesheets, 232

tab, in mapping window, 56

**Workflow,**

start - global resource, 144

using global resource, 140

**Wrapper,**

classes, 377

**Wrapper classes,**

version compatibility, 377

## X

**Xerces,**

libraries, 377

**XML,**

generate XML Schema from, 18

save output, 112

streaming, 112

validate output, 112

**XML files,**

from single XML source, 158

**XML instance,**

absolute path, 35

input, 361

output, 361

**XML Parser,**

about, 418

**XML schema,**

automatically generate, 18

**xpath, 343**

summing multiple nodes, 295

**xpath2,**

library, 109

library functions, 333

**XQuery,**

Extension functions, 397

functions, 109

**XQuery processor,**

in Altova products, 419

**xs:,**

constructors, 334

**xs:date, 335****xs:time, 335**

- Xsi:nil,**
  - nillable, 250
- xsi:type,**
  - mapping to derived types, 220
- xsl:preserve-space, 392**
- xsl:strip-space, 392**
- XSLT,**
  - adding custom functions, 290
  - Extension functions, 397
  - generate multiple target, 39
  - library functions, 343
  - standard library, 109
  - tab, in mapping window, 56
  - template namespace, 290
- XSLT 1.0 Engine,**
  - limitations and implementation-specific behavior, 392
- XSLT 1.0/2.0,**
  - DoTransfrom batch file, 34
  - generate (tutorial), 34
- XSLT 2.0,**
  - adding custom functions, 294
- XSLT 2.0 Engine,**
  - general information about, 394
  - information about, 394
- XSLT 2.0 functions,**
  - implementation-specific behavior of, 396
  - see under fn: for specific functions, 396
- XSLT 2.0 stylesheet,**
  - namespace declarations in, 394
- XSLT processors,**
  - in Altova products, 419
- XSLT2.0,**
  - date constructor, 294

## Z

- Zoom,**
  - factor in Output window, 112