IBM InfoSphere DataStage
Version 11 Release 3

XML Pack Guide

SC19-4290-00

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IBM

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Note

Before using this information and the product that it supports, read the information in "Notices and trademarks" on page 75.

Contents

Chapter 1. Introduction

The XML Pack contains several components.

Extensible Markup Language (XML) is a major standard for representing structured data that flows between database systems and between business partners.

About XML Pack

Using the intuitive interfaces of XML Pack, you can quickly define conversion paths between XML documents and flat relational tables. Your XML sources and targets for data and transformation stylesheets include independent files, URLs, and table columns.

Components

XML Pack consists of active IBM® InfoSphere® DataStage® and QualityStage Designer stages and the standalone XML Meta Data Importer. The stages include:

- XML Input
- XML Output
- XML Transformer

There are two major steps in using XML Input and XML Output.

Step 1: Create mappings between XML and relational data

About this task

You create mappings only for XML Input and XML Output using the XML Meta Data Importer. The output is a table definition that contains a set of XML XPath expressions. For the XML Input stage, these XPath expressions specify how to extract information from the XML document to a relational database format.

For the XML Output stage, XPath expressions specify how to build the XML document from the relational data.

You can also manually create XPath expressions through the XML Input and XML Output stages.

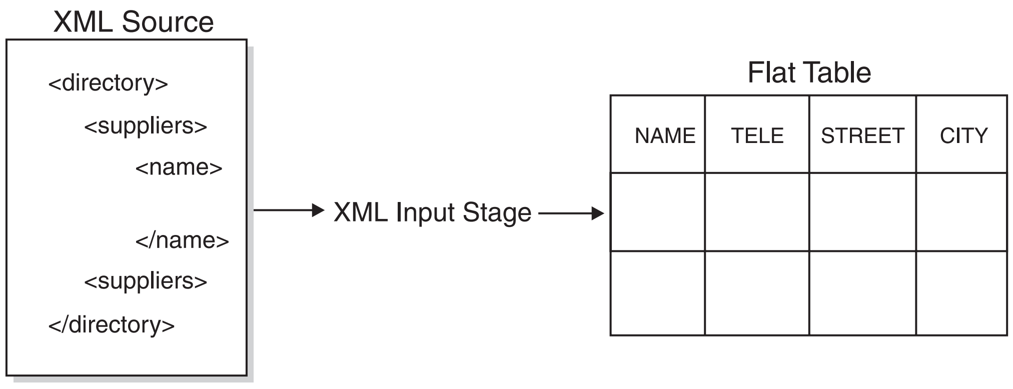
Step 2: Add XML Pack stages to a server job

About this task

Drag-and-drop one or more XML Pack stages to a server diagram, and set up properties within each stage.

About XML Input

Within a server job, use XML Input to convert XML data to flat relational tables.

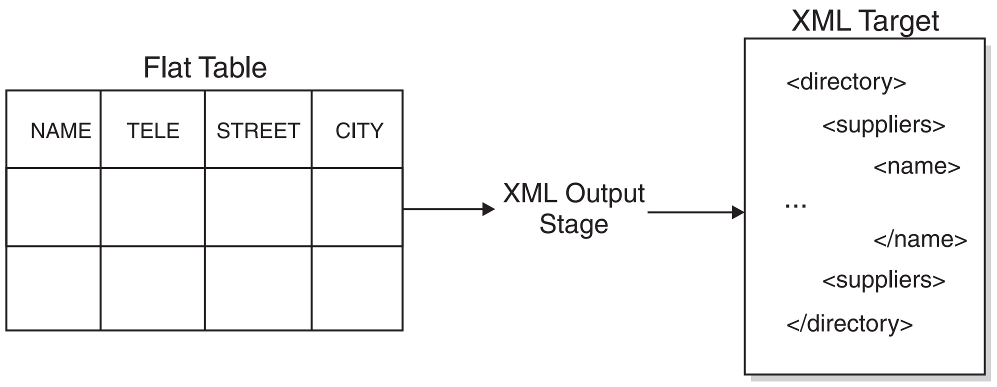


The major features of XML Input include:

- Data extraction through standard XPath expressions.
- XML schema support.
- Support for complex transformations using custom stylesheets.
- Support for multiple output links using different data sets.
- Robust error handling.
- Optional XML validation.

About XML Output

Use XML Output to convert tabular data, such as relational tables and sequential files, to XML hierarchical structures.

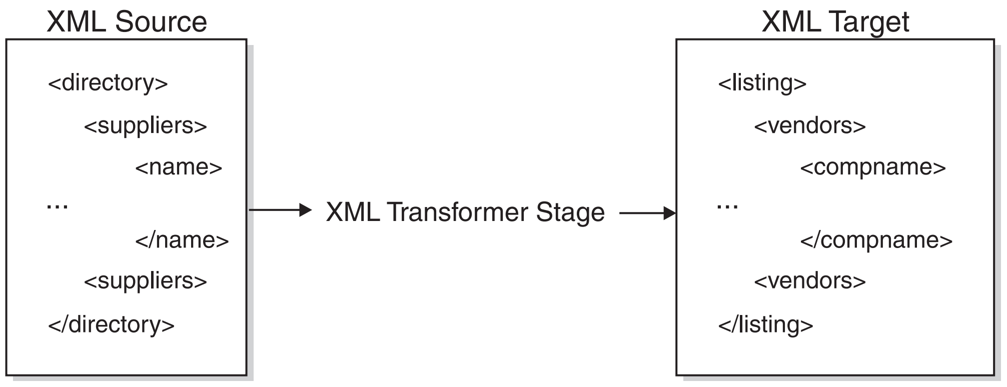


The major features of XML Output include:

- Generating XML output using a subset of XPath expressions.
- Generating multiple documents from the same input.
- XML namespace support.
- Configuring XML document generation, such as one document per input row.
- Generating output documents on disk or through an output link.
- Robust error handling.
- Optional XML validation.

About XML Transformer

Use XML Transformer to convert XML documents to another XML hierarchical format.



The major features of XML Transformer include:
- Generating multiple documents from the same input.
- XML schema validation.
- Robust error handling.
- Support for writing to disk or to an output link.
- Validation of XML input.
- Adherence to XSLT standard stylesheets.

Deriving and parsing XML hierarchies

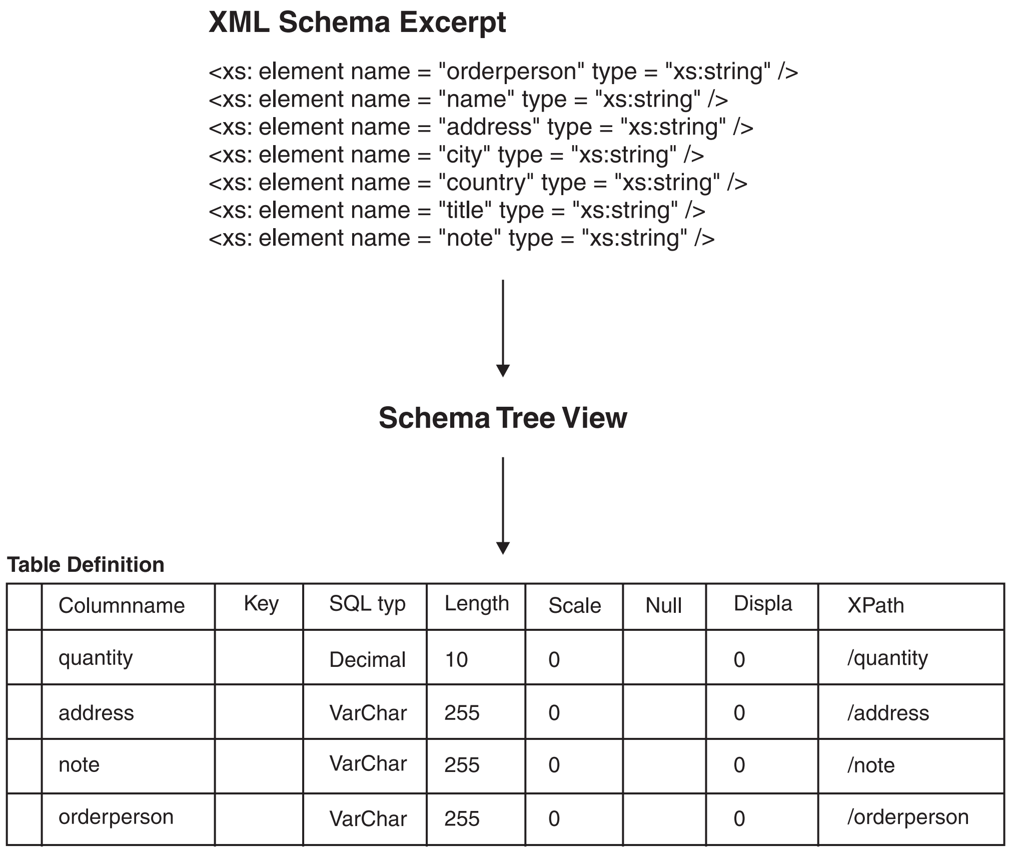
The following stages use XPath expressions:
- XML Input
- XML Output

The following stages use the Apache Xalan XSLT processor to transform XML documents:
- XML Input
- XML Transformer

About the XML Meta Data Importer

Use the XML Meta Data Importer to create table definitions for XML Input and XML Output. Using the tree view, you quickly point-and-click the elements and attributes that you want derived as XPath expressions. You can process both XML documents and schemas.

The following diagram provides an overview of major features in the XML Meta Data Importer.



XML Schema Excerpt

```
<xs: element name = "orderperson" type = "xs:string" />
<xs: element name = "name" type = "xs:string" />
<xs: element name = "address" type = "xs:string" />
<xs: element name = "city" type = "xs:string" />
<xs: element name = "country" type = "xs:string" />
<xs: element name = "title" type = "xs:string" />
<xs: element name = "note" type = "xs:string" />
```

Table Definition

	Columnname	Key	SQL typ	Length	Scale	Null	Displa	XPath
	quantity		Decimal	10	0		0	/quantity
	address		VarChar	255	0		0	/address
	note		VarChar	255	0		0	/note
	orderperson		VarChar	255	0		0	/orderperson

Chapter 2. Using the XML Meta Data Importer

Use the XML Meta Data Importer to create table definitions from XML sources. You can process both XML schemas and XML documents. Also, you can modify all XPath expressions that are created during an automated mapping from an XML source to a table definition.

For information about the effect of XPaths in the XML Pack, see Using XML input and Using XML output.

Converting XML data types

In creating table definitions, XML Meta Data Importer converts XML data to the equivalent SQL data type.

- For XML schemas, the explicit XML data types are converted to the closest SQL data types.
- For XML documents, in parsing the original string values, heuristics are used to find equivalent SQL data types. Current locale settings are used in evaluating date formats.

For a list of conversions from XML schema to SQL data types, see Advanced transformations.

Exploring the XML Meta Data Importer window

The XML Meta Data Importer window has the following panes:

- Tree View depicts the hierarchical structure in the XML source. This pane is the main view. It is always present and cannot be hidden or docked.
- Source contains the original XML schema or XML document, in read-only mode. To compare the tree view with the XML source, you can dock this pane next to the tree view.
- Node Properties describes XML and XPath information of the selected element.
- Table Definition maps elements that you select in the **Tree View**.
- Parser Output presents XML syntax and semantic errors.

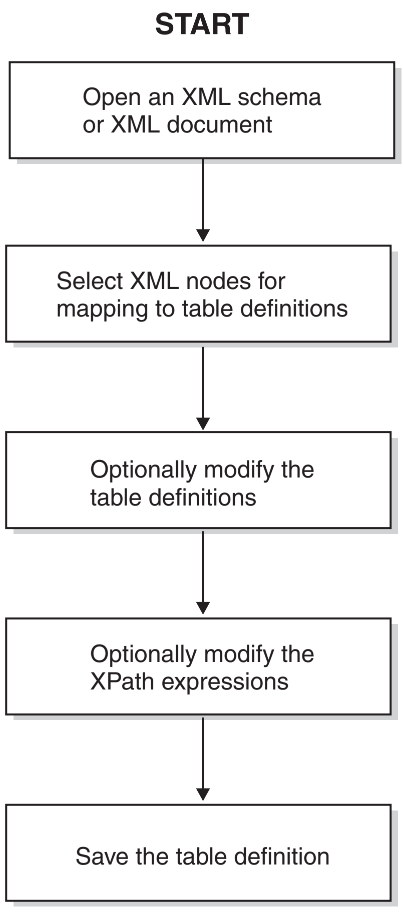
Examining parser output

XML Meta Data Importer reports any syntax and semantic errors in the Parser Output pane when you open a source file. To find the error in the Source pane, double-click the error in the Parser Output pane.

After correcting the error outside of the XML Meta Data Importer, you can load the revised source file. To reload the file, select **File** > **Refresh**.

Getting started with XML Meta Data Importer

The following diagram outlines the steps in deriving table definitions from XML sources using the XML Meta Data Importer.


START
Open an XML schema or XML document
Select XML nodes for mapping to table definitions
Optionally modify the table definitions
Optionally modify the XPath expressions
Save the table definition

Starting the XML Meta Data Importer

About this task

To start the XML Meta Data Importer:

Procedure

1. Start the IBM InfoSphere DataStage and QualityStage Designer.
2. Select **Import** > **Table Definitions** > **XML Table Definitions**.

Opening an XML source

About this task

You can process an XML schema file (.xsd) or an XML document (.xml). The file can be located on your file system or accessed with a URL.

About namespaces

This section describes how the XML Meta Data Importer handles namespaces and namespace prefixes in XML documents and XML schemas.

Processing XML documents

The XML Meta Data Importer retains namespaces and considers every node in an XML hierarchy to be fully qualified with a namespace prefix. The form is: Prefix:`node-name`. This approach applies to documents in which the prefixes are included or unspecified.

When prefixes are unspecified, XML Meta Data Importer generates prefixes using the pattern `ns#`, where `#` is a sequence number.

Example

The following input does not include a namespace prefix.

```
<Person xmlns="mynamespace">
   <firstName>John</firstName>
</Person>
```

The following code shows output data.

```
<ns1:Person xmlns:ns1="mynamespace">
   <ns1:firstName>John</firstName>
</Person>
```

Processing XML schemas

The XML Meta Data Importer processes namespaces in XML schemas according to three rules:

- General
- Import By Reference
- Target Namespace Unspecified

General rule

In general, the XML Meta Data Importer assigns the prefix `defns` to the target namespace. For example:

```
<xsd:schema targetNamespace="mynamespace" xmlns:xsd="http://www.w3.org/2001/XMLSchema">
   <xsd:element name="Person">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="firstName" type="xsd:string" minOccurs="1" maxOccurs="1"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
</xsd:schema>
```

The `firstName` node generates the following XPath expression:

```
/defns:Person/defns:firstName
```

where `defns=mynamespace`

Import by reference rule

If the schema imports by reference other schemas with different target namespaces, the XML Meta Data assigns a prefix in the form `ns#` to each of them.

To enable this processing, the dependent schema must specify `elementFormDefault="qualified"`. If this is omitted, the elements are considered as belonging to the caller's target namespace.

Example

The following example imports by reference the schema `mysecondschema.`

```
<xsd:schema targetNamespace "demonamespace"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:other="othernamespace">
```

```
   <xsd:import namespace="othernamespace"
    schemaLocation="mysecondschema.xsd"/>
   <xsd:element name="Person">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="address" type="other:Address" minOccurs="1"
            maxOccurs="1" />
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
</xsd:schema>
```

The schema `mysecondschema` contains the following statements:

```
<xsd:schema targetNamespace="othernamespace"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="unqualified">
   <xsd:complexType name="Address">
      <xsd:sequence>
         <xsd:element name="street" minOccurs="1" maxOccurs="1" />
         <xsd:element name="city" minOccurs="1" maxOccurs="1" />
         <xsd:element name="state" minOccurs="1" maxOccurs="1" />
         <xsd:element name="zip" minOccurs="1" maxOccurs="1" />
      </xsd:sequence>
   </xsd:complexType>
</xsd:schema>
```

The `street` node generates the following XPath expression:

```
/defns:Person/defns:address/ns2:street
```

where

```
defns=demonamespace
ns2=othernamespace
```

The target namespace unspecified rule

When the target namespace is unspecified, XML Meta Data Importer omits the prefix `defns` from XPath expressions.

Example

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
   <xsd:element name="Person">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="firstName" type="xsd:string" minOccurs="1"
             maxOccurs="1"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
</xsd:schema>
```

The `firstName` tree node generates the following XPath expression:

```
/Person/firstName
```

Mapping nodes from an XML schema

You can individually select elements and attributes, or select all leaf nodes except empty ones in one step.

Choosing individual items

Select the box that is next to the element or `TEXT` node that you want to map. If you select an element, you get all the sub-nodes and the actual content of the element.

Your selection is reflected in the Table Definition pane. An asterisk appears after the title Table Definition when you modify the table definition. It disappears when you save the information.

Selecting all nodes

You can simplify selecting all leaf nodes by using the `Auto-check` command. This command checks leaf nodes.

XML Meta Data Importer ignores leaf nodes in the following circumstances:

- Nodes are empty.
- In a branch in which a node represents a reference to an element or a type defined elsewhere, such as an included schema. To avoid recursive looping, which may be deep in the subschema, the node is not expanded.

  You may manually expand the reference branch down to a specific level, and run the **`Auto-check`** command on the top branch node. This action selects all nodes in the branch.
- Node represents a detected recursion. This happens with a schema that has the following form:

  ```
  parent = person >children>child = person
  ```

  You may manually expand the recursive branch and run the **`Auto-check`** command to select all nodes in the branch.

To run Auto-check:

Select **File** > **Edit** > **Auto-check**. The nodes appear in the Table Definition pane.

Modifying table definitions

About this task

You can modify each field for a mapped XML node. To make a change, type changes in the field. To commit the change for later saving, move the cursor into a different field or pane.

When you modify an XPath expression in the table definition, XML Meta Data Importer updates the property grid. The opposite action also holds true.

Modifying XPath expressions

About this task

You can modify XPath expressions manually or by using processing instructions.

Accessing the Edit XPath Expression dialog box

About this task

To access the Edit XPath Expression dialog box:

Procedure

1. Click inside the XPath field.
2. Click the ellipses next to the XPath expression.

Saving the table definition

About this task

To save a table definition:

Procedure

1. Select **File** > **Save**.

   Table definitions are associated with an InfoSphere DataStage project. XML Meta Data Importer prompts you, if needed, to connect to a project.

   The Save Table Definition dialog box opens.

2. Optionally, change the name of the table definition.

   InfoSphere DataStage requires that you follow this pattern: `source\dsn\table_name`

   For example: `XML\Importer\order`

   The default table definition name depends on the XML source name:

Source file	**Default**
UNC-name	Original file name without extension
URL	The value New
XML document	Original XML document filename
XML schema	Original XML schema filename

3. Optionally, supply short and long descriptions.
4. Optionally, change the current project.

   Your change affects only operations in the current XML Meta Data Importer session, not in future sessions or in the InfoSphere DataStage Designer.

5. Click **OK**.

Chapter 3. Using XML Input

You can transform hierarchical XML data to flat relational tables using the XML Input stage.

You can extract XML data from a variety of repositories, from documents that you edit with a text editor to a single column in a multi-column table.

XML Input supports a single input link and one or more output links.

About transforming XML documents

XML Input requires XPath expressions on output links to identify data in an XML document for extracting to output rows. XPath expressions are used to transform the input XML document into columns and rows. A table definition stores the XPath expressions for each XML document to be parsed.

Use the Description property on the Columns page to record or maintain the XPath expressions.

You have the following options for creating XPath expressions and table definitions:
- Use the XML Meta Data Importer, a visual tool for mapping XML elements and attributes. Start with this tool because it automatically generates the XPath expressions.
- Modify the generated XPath expressions to handle specific operating scenarios.
- Hand-code XPath expressions. This option is suited for advanced users.

Important: In order to process the document, the XML Input stage requires free memory space equivalent of five to seven times the size of the document. There is no direct connection between the memory and the size of the document. However, the memory requirement varies depending on the actual structure of the document, data within the document, and on the XPATH defined in the job. You must ensure that the size of the XML document is 100 MB or less in order to have a stable and serviceable set of jobs. Large files increase the risk of random job failures even when the memory usage is optimally configured.

For more information about using the XML Meta Data Importer, see Using the XML Meta Data Importer.

Identifying XML sources

An input column can contain an XML document, a URL, or a file path.

For more information about identifying the XML source, see Input link properties.

For information about the effect of engine tier host scodepages on accessing a file through a file path, see Local codepages on engine tier host.

About National Language Support (NLS)

This section applies only to running the InfoSphere DataStage Designer in NLS mode.

Preserving the encoding of input documents

An integral part of any XML document is its encoding. If you apply an InfoSphere DataStage map to the document, the document may become corrupted.

To prevent corrupting an XML document, perform one of the following steps:
- Set the stage map to `NONE` in each upstream stage.

- Set the map for the column that contains the XML input to `NONE` in each upstream stage.
- Set the SQL type for the column that contains the XML input to `VarBinary` in each upstream stage and on the input link of the XML Input stage.

Input link

The input link supports XML documents that are encoded using any Internet Assigned Numbers Authority (IANA) character sets. For a complete list of character sets, visit the following IANA web page:

`http://www.iana.org/assignments/character-sets`

Output link

When the InfoSphere DataStage Designer client runs in NLS mode, output columns are encoded in UTF-8.

When the InfoSphere DataStage Designer client runs in non-NLS mode, output columns are encoded using the local codepage of the system running the engine.

For information about the effect of the engine tier host codepages on accessing a file through a file path, see Local codepages on engine tier hosts.

Validating documents and schemas

XML Input performs two XML validations when the server job runs:

- Checks for well-formed XML.
- Optionally checks that elements and attributes conform to any XML schema that is referenced in the document. You control this option.

Validation against an XML schema is required when you want default values for elements and attributes that are specified in the schema written to an output row. To refer to a schema in your XML document, use the `schemaLocation` attribute within the root element tag.

For information about activating validation against a schema, see Stage properties.

Schema scan and schema validation

Schema scan and schema validation are performed during the XML Parsing process. The schema defined in the *schemaLocation* attribute of the XML is used for performing schema scan and validation.

The difference between schema scan and schema validation is:

Schema scan
: Reads the default values for elements, attributes, and other objects that are specified in the XML schema and writes them to the output row. Schema scan is performed even if validation is disabled. Schema scan reads the default values from the schema that is referenced in the *schemaLocation* attribute of the XML document.

Schema validation
: Validates the XML document against the XML schema, which is specified in the `.xsd` file. Schema validation ensures that the XML content conforms to the XML schema that is referenced in the *schemaLocation* attribute of the XML document.

Setting XML schema options

The XML parser compiles the validating schema to create a schema grammar. While validating the grammar, the parser can apply extra steps called full schema constraint checking, which may increase processing time and be memory-intensive. To enable this checking, use the Strict option. To disable this type of validation, use the Default option.

If your job processes two or more XML documents that use the same schema, you can avoid recompiling the schema by caching the grammar.

For information about activating schema validation, see Stage properties.

Mapping transformation errors to InfoSphere DataStage errors

The XML parser reports three types of conditions: fatal, error, and warning.

- Fatal errors are thrown when the XML is not well-formed.
- Non-fatal errors are thrown when the XML violates a validity constraint. For example, the root element in the document is not found in the validating XML schema.
- Warnings may be thrown when the schema has duplicate definitions.

For more information about these conditions, consult the XML and XML Schema specifications on the Worldwide Web Consortium web site (`http://www.w3c.org`).

By mapping parsing messages to InfoSphere DataStage error levels, you decide how parsing messages and faulty XML documents are processed.

The following table describes how each InfoSphere DataStage error level is processed.

InfoSphere DataStage error level	Result
Reject	Faulty document rows and messages can be written to a Reject link, if one exists. You can also send the messages to the job log.For more information about processing messages and documents, see Using reject links.
Fatal	The server job terminates, and the messages are written to the job log.
Warning	A warning message is written to the job log.
Info	An information message is written to the job log.
Trace	If the job runs with tracing set on, debug and monitoring information is written to the job log.

For more information about mapping errors and logging them, see Stage properties.

Using Reject links

XML Input supports one Reject link, which can store rejection messages and rejected rows.

Writing rejection messages to the link

About this task

To write rejection messages to a Reject link:

Procedure

1. Add a column on the Reject link.
2. Using the General page of the Output Link properties, identify the column as the target for rejection messages.

Writing rejected rows to the link
About this task

To write rejected rows to a Reject link:

Add a column on the Reject link that has the same name as the column on the input link that contains or references the XML document.

This is a passthrough operation. Column names for this operation are case-sensitive. Passthrough is available for any input column.

For information about setting up a Reject link, see Output link properties.

Writing rejection messages to the job log
About this task

To write rejection messages to the job log:

On the General page of the **Stage** properties, select the **Log Reject errors** box.

For more information about the General page, see Stage properties.

Passing data from input to output links

Each output link supports a passthrough mechanism by which data is copied without modification from the input link to the output link. This mechanism works with output columns for which XPath expressions are not supplied.

Passthrough requires an exact match between column names specified in both the output link and the input link. Also, column names are case-sensitive.

Note: When using passthrough in a parallel job, the output link column must be a string if the corresponding input link column is a string. Passthrough from a string type to a Unicode string type is not supported.

Controlling output rows

To populate the columns of an output row, XML Input uses XPath expressions that are specified on the output link. XPath expressions locate elements, attributes, and text nodes.

Controlling the number of output rows

You must designate one column on the output link as the repetition element. A repetition element consists of an XPath expression. For each occurrence of the repetition element, XML Input always generates a row. By varying the repetition element and using a related option, you can control the number of output rows.

Sample XML document

Consider the following XML document, which has three address blocks. The final address block does not have a `<city>` element.

```
<?xml version="1.0"?>
<customers>
   <customer id="55000">
      <name>Charter Group</name>
      <address>
         <street>100 Main</street>
         <city>Framingham</city>
```

```
            <state>MA</state>
            <zip>01701</zip>
         </address>
         <address>
            <street>720 Prospect</street>
            <city>Framingham</city>
            <state>MA</state>
            <zip>01701</zip>
         </address>
         <address>
            <street>120 Ridge</street>
            <state>MA</state>
            <zip>01760</zip>
         </address>
   </customer>
</customers>
```

Sample XPath expressions

Consider the following output columns and their XPath expressions. You can generate these XPath expressions using the XML Meta Data Importer.

Column name property	XPath expression
id	/customers/customer/@id
name	/customers/customer/name/text()
street	/customers/customer/address/street/text()
city	/customers/customer/address/city/text()
state	/customers/customer/address/state/text()
zip	/customers/customer/address/zip/text()

If you designate the XPath expression /customers/customer/name/text() as the repetition element, XML Input generates only one output row:

```
55000,"Charter Group","100 Main","Framingham","MA","01701"
```

This happens because the <name> element that the XPath expression selects occurs only one time in the XML document.

If you designate /customers/customer/address/city/text() as the repetition element, XML Input potentially generates three rows. Although there are only two occurrences of the city element found along the path that includes the ancestor elements /customers/customer/address, you can force a third row.

To force an output row when the final element in the XPath expression is not present, disable the option Repetition element required. The missing element is coded as NULL.

Here are three output rows generated from the sample XML document. The city column in the third row is coded as NULL.

```
55000,"Charter Group","100 Main","Framingham","MA","01701"
55000,"Charter Group","720 Prospect","Framingham","MA","01701"
55000,"Charter Group","120 Ridge",NULL,"MA","01760"
```

If the option Repetition element required is activated for this example, two rows are generated.

```
55000,"Charter Group","100 Main","Framingham","MA","01701"
55000,"Charter Group","720 Prospect","Framingham","MA","01701"
```

Identifying the repetition element

About this task

To identify the repetition element, set the **Key** property to Yes on the output link.

For more information about activating the option Repetition Element Required, see Transformation settings.

Processing NULLs and empty values

XML Input can replace NULLs with empty values, and replace empty values with NULLs. The target columns must use one of the string or binary SQL types.

In an input document, NULLs are missing elements or attributes that are referenced by XPath expressions. Empty values include empty elements (`<a></a>`) and empty attributes (`att=""`).

For examples using these replacements, see Null and empty value processing.

For information about specifying replacements, see Transformation settings.

Processing namespaces

XML Input requires namespace declarations when namespace prefixes are included in XPath expressions. If the input document uses namespaces, the XPath expression must be qualified. That is, a node the belongs to a namespace must have a prefix even if the namespace of the target node is the default namespace.

If you used the XML Meta Data Importer to create table definitions, you can extract namespace declarations from the generated table definition.

If you did not use the XML Meta Data Importer, you must:

- Write XPath expressions with namespace prefixes in the Description property of the Columns page of the Output Link Properties page.
- List the namespace declarations using the text box in the Transformation Settings page.

For more information about specifying namespace information, see Transformation settings.

Performing advanced transformations

To transform the XML document to columns and rows, XML Input uses an XSLT stylesheet that it generates from the XPath expressions that are specified on the output link.

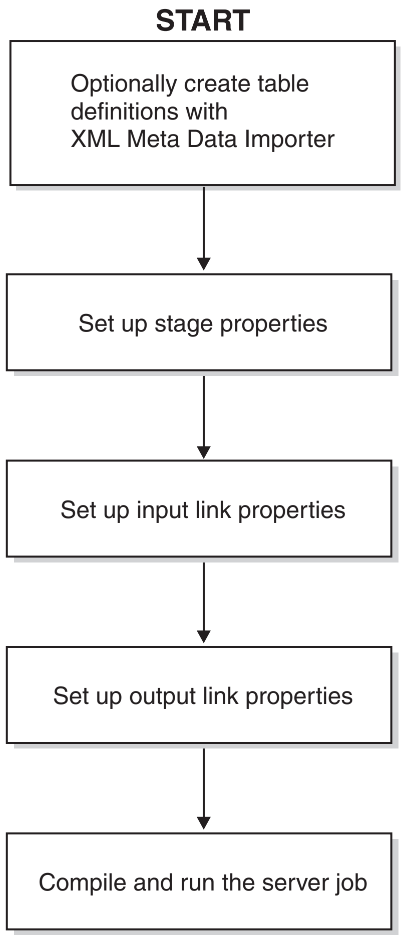
If the XML document contains nodes whose relationships are not explicit, XML Input may not be able to automatically perform the transformation. As an alternative to the generated XSLT stylesheet, you can substitute your own stylesheet.

For more information about using a custom XSLT stylesheet, see Advanced transformations.

For information about specifying a custom stylesheet in the XML Input stage, see Advanced.

Getting started with XML Input

The following diagram outlines setting up an XML Input stage within a server job.


START
Optionally create table definitions with XML Meta Data Importer
Set up stage properties
Set up input link properties
Set up output link properties
Compile and run the server job

Creating table definitions with XML Meta Data Importer

For information about creating table definitions using XML Meta Data Importer, see Using the XML Meta Data Importer.

Adding an XML Input stage to your server job

About this task

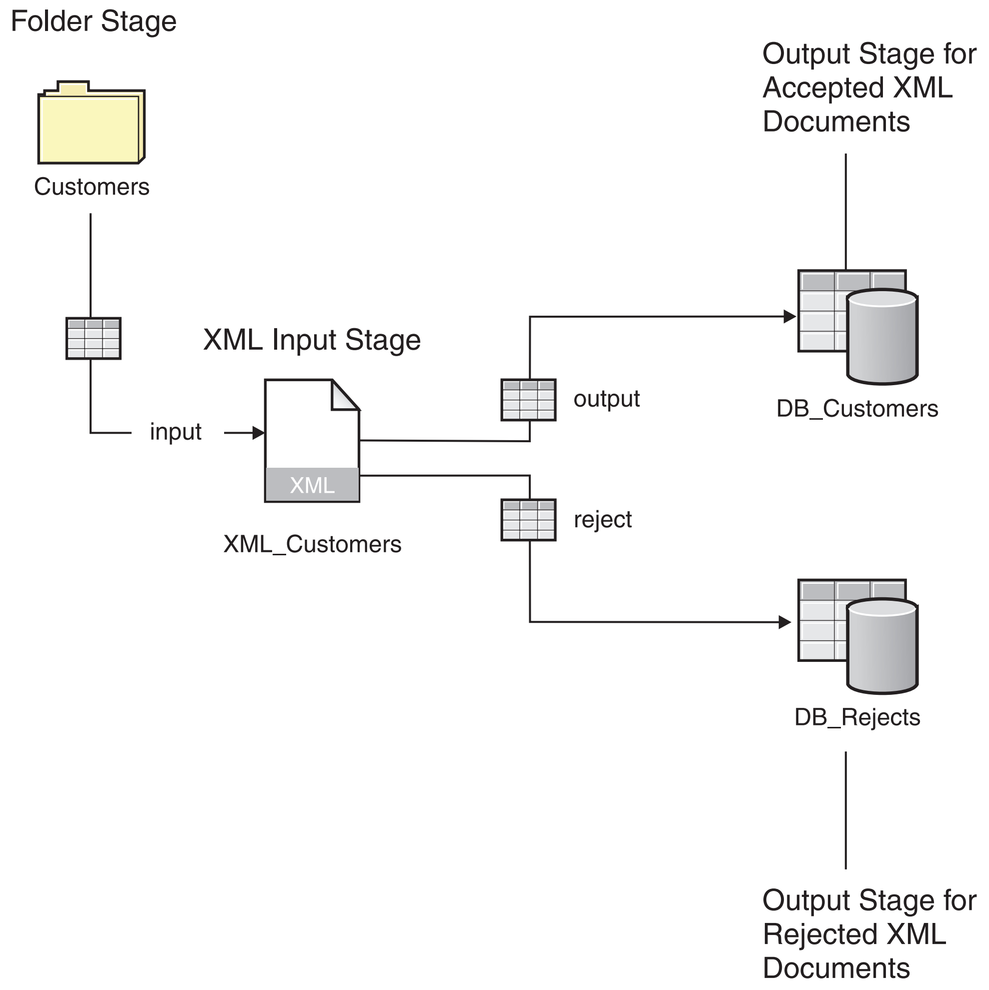
Using the InfoSphere DataStage Designer Client, add an XML Input stage to a server job diagram.

Procedure

1. Select the Real Time category in the Palette pane.
2. From the Palette pane, drag the XML Input icon onto the canvas.
3. Click the Link icon, and connect two stages in your diagram.
4. Repeat Step 2 as needed.

Results

The following diagram shows a sample server job diagram, with renamed stage labels.



Setting up properties for the XML Input stage

About this task

To set up properties, double-click the XML Input icon on your server job diagram.

Stage properties

The Stage properties are defined on two pages:

- General
- Transformation Settings

General

These properties control:

- Validating the input XML against the XML schema referenced in the XML document.
- Setting the schema validation level.
- Caching a schema grammar for another XML document that uses the same schema.
- Logging rejection errors for an input row into the job log.

- Mapping transformation error messages to InfoSphere DataStage error levels. These include fatal, error (non-fatal), and warning messages.

Transformation settings

These properties control the values that can be shared by multiple output links of the XML Input stage.

They fall into these categories:
- Requiring the repetition element
- Processing NULLs and empty values
- Processing namespaces
- Formatting extracted XML fragments

To use these values with a specific output link, select the **Inherit Stage Properties** box on the Transformation Settings tab of the output link.

For information about using repetition elements, see Controlling output rows.

For information about NULLs and empty values, see Processing NULLs and empty values".

Processing namespaces

If you used the XML Meta Data Importer to create table definitions, select the **Include namespace declaration** box and click the **Load** button to extract namespace declarations from a specific table definition.

If you did not use the XML Meta Data Importer, you must:
- Write XPath expressions with namespace prefixes in the Description property of the Columns page of the Output Link Properties page.
- Specify the namespace declarations in a space-delimited list using the text box.

  The syntax is: `xmlns:`<prefix>="<namespace_url>"

  Note: When you load a table definition from the Columns page, XML Input does not load namespace declarations.

Formatting extracted XML fragments

When an XPath expression ends with an element node, XML Input extracts and writes an XML fragment. You may want to generate XML fragments to:
- Preserve sections of the input on an output link.
- Split input that has multiple branches with implicit relationships into separate documents for subsequent processing. For an example that illustrates this relationship, see Sample input XML document.

Writing XML

XML Input can write the fragment on the output link as an unformatted or formatted block.

The following XPath ends with an element node:

```
/customers/customer/address
```

Unformatted output is the default for writing fragments. For example:

```
<address><street>1 Main</street><city>Fram</city><state>MA</state>
<zip>01701</zip></address>
```

Here is the same output, written as a formatted block:

```
<address>
   <street>1 Main</street>
   <city>Fram</city>
   <state>MA</state>
   <zip>01701</zip>
</address>
```

To generate a formatted fragment, select the **Format extracted XML fragments** box.

Note: To write tabular data, end XPath expressions with text or attribute nodes.

Input Link properties

The Input Link properties are defined on two pages:

- XML Source
- Columns

XML source

About this task

Use this page to specify the input column that contains the XML document, its URL, or file path.

For information about the effect of engine tier host codepages on accessing a file through a file path, see Local codepages on engine tier hosts.

Columns

About this task

Use this standard InfoSphere DataStage grid to describe the input columns.

Output Link properties

The Output Link properties are defined on four pages:

- General
- Transformation Settings
- Advanced
- Columns

General

Use this page to set the following properties:

- Define an output link as a Reject link.
- Specify, for Reject links, the column that will contain rejection errors.

Transformation settings

About this task

This page controls transformation options for the output link.

To indicate that the output link inherits properties from the Stage page, select the **Input Stage properties**box.

Note: The Inherit Stage properties box is not available when the output link is a Reject link.

For information about:

- Repetition elements, see Controlling output rows.

- NULLs and empty values, see Processing NULLs and empty values.
- Namespaces, see Processing Namespaces.

Advanced

About this task

Use this page to specify a custom XSLT stylesheet to transform an XML document.

You can specify a stylesheet in these ways:

- Identify an input column that contains the stylesheet, or its URL or file path.
- Type the stylesheet in the Stylesheet box.
- Type the URL or file path of the stylesheet in the Stylesheet box.
- Load the content or path of a stylesheet that is stored on the engine tier host.

For information about the effect of engine tier host codepages on accessing a file through a file path, see Local codepages on engine tier hosts.

To identify an input column as the source:
Procedure

1. Click the **Use custom stylesheet** box.
2. Click the **Get stylesheet from input column** box.
3. In the list box, select the input column.
4. Using the Source content buttons, identify the column contents. Valid choices are text (the stylesheet itself) and URL/File path.

To type a stylesheet:
Procedure

1. Click the **Use custom stylesheet** box.
2. Click the **Text** button.
3. In the Stylesheet box, type the stylesheet.

   Regarding the XML declaration:

To type a URL or file path:
Procedure

1. Click the **Use custom stylesheet** box.
2. Click the **URL/File path** button.
3. In the Stylesheet box, type the URL or file path.

Results

For information about the effect of engine tier host codepages on accessing a file through a file path, see Local codepages on engine tier host.

To specify a stylesheet on the engine tier host:
Procedure

1. Click the **URL/File path** button.
2. Click the **Load (Server)** button.

   The Browse File dialog box opens.
3. Locate the file and click **OK**.

   The file path appears in the Stylesheet box.

To specify a stylesheet on the InfoSphere DataStage client workstation:
Procedure

1. Click the **Text** button.
2. Click the **Load (Client)** button.

   The Open dialog box opens.
3. Locate the file and click **OK**.

   The stylesheet appears in the Stylesheet box.

To paste a stylesheet:
Procedure

1. Make sure that the encoding for the stylesheet matches the InfoSphere DataStage Designer client map.
2. Click the **Text** button.
3. Paste a copied stylesheet in the Stylesheet box.
4. Remove the XML declaration from the stylesheet header.

Columns

About this task

Use this standard InfoSphere DataStage grid to describe the output columns. Use the Description property to supply XPath expressions.

If a column name exactly matches an input column name and the output column's Description property is empty, the output column is a passthrough column. XML Input copies the contents from the input column to the passthrough column.

To load XPath expressions from the table definition that the XML Meta Data Importer generates:

Procedure

1. Click the **Load** button.

   The Table Definitions dialog box opens.
2. Double-click the generated table definition.

   The Select Columns dialog box opens.
3. Click **OK** to select all the columns.

Chapter 4. Using XML Output

You can convert tabular data, such as relational tables and sequential files, to XML hierarchical structures, using the XML Output stage.

XML Output supports a single input link and zero or one output link.

About transforming tabular data

XML Output requires XPath expressions to transform tabular data to XML. A table definition stores the XPath expressions. Using the Description property on the Columns pages within the stage, you record or maintain the XPath expressions.

About National Language Support (NLS)

XML Output supports different character encodings for output documents, depending on the NLS mode.

InfoSphere DataStage in NLS mode

When InfoSphere DataStage runs in NLS mode, all Internet Assigned Numbers Authority (IANA) character sets are supported. For a complete list of character sets, visit the following IANA web page:
`http://www.iana.org/assignments/character-sets`

For information about selecting the output encoding, see Options page.

Preserving the encoding of output documents

An integral part of any XML document is its encoding. If you apply an InfoSphere DataStage map to the document, the document may become corrupted.

To prevent corrupting an XML document, perform one of the following steps:
- Set the stage map to `NONE` in each downstream stage.
- Set the map for the column that contains the XML input to `NONE` in each downstream stage.
- Set the SQL type for the column that contains the XML input to `VarBinary` in each downstream stage and on the output link of the XML Input stage.

InfoSphere DataStage in non-NLS mode

When InfoSphere DataStage runs in non-NLS mode, note the following information:
- The document is written in UTF-8.
- Input columns are encoded using the local codepage of the machine hosting the engine tier. Therefore, assume that input data to the XML Output stage has been encoded with this codepage. For information about the local codepage, see Local codepages on engine tier hosts.

Supported XPath expressions

The following Backus Naur Form (BNF) diagram describes the subset of XPath expressions that you can use in XML Output.

```
path             ::= ['/'] (element_spec '/')* end_segment
end_segment      ::= element_spec['/text()'] | '@' attribute
element_spec     ::= element '[ 'attr_value ( 'and' attr_value )*' ]'
attr_value       ::= '@' attribute '=' '"'value'"'
```

You have the following options for creating XPath expressions and table definitions:

- Using the XML Meta Data Importer, generate the XPath expressions from an XML schema that you want the XML output to comply with.
- Modify the generated XPath expressions to handle specific operating scenarios.
- Hand-code XPath expressions. This option is suited for advanced users.

For more information about using the XML Meta Data Importer, see Using the XML meta data importer.

Equivalent XPath expressions

For an XML Output operation, two types of XPath expressions are equivalent. Both expressions result in the text node being included:

- An expression that ends with an element name: `/a/b`
- An expression that ends with a text node: `/a/b/text()`

Using XPath expressions

If a stage has both an input and an output link, XPath expressions are required on both links.

XPaths on input link

On the input link, the XPath expressions drive the generation of XML. Each XPath expression maps the values of an input column to a node in an XML hierarchy.

The following example illustrates a possible mapping of values in the Customer column.

XPaths on output link

Each output column that has an XPath expression is a candidate for receiving XML. The source of the XML for an output column are those input columns whose XPath expressions start with and contain the same nodes.

To make the entire XML available to an output column, use one forward slash as the XPath expression. The forward slash identifies the root node.

The following table demonstrates the relationship between XPath expressions on the input and output links. Two output columns use XPath expressions that form the first part of one of more XPath expressions used by input columns. For example, the output column that uses the XPath expression `/orders` receives XML generated using the XPath expressions `/orders/cust` and `/orders/items`. The column that uses the forward slash receives all the XML.

Table 1. Relationship between XPath expressions on the input and output links.

Input column XPaths	**Output column XPaths**		
	`/orders`	`/orders/items`	`/`
`/orders/cust`	Yes	No	Yes
`/addresses`	No	No	Yes
`/addresses/orders`	No	No	Yes
`/orders/items`	Yes	Yes	Yes

Mapping related data to different root elements

You can easily segregate related data in the XML by varying the root element. This feature is available when your XML Output stage has both input and output links. In a stage with only an input link, all XPath expressions must specify the same root element.

Example of XPath expressions

The input consists of addresses and orders for customers. The address data is grouped using the root element `/addresses`. The order data is grouped using the root element `/orders`.

Input Column XPaths	Output Column XPaths		
	/orders	/orders/items	/
/orders/cust	Yes	No	Yes
/addresses	No	No	Yes
/addresses/orders	No	No	Yes
/orders/items	Yes	Yes	Yes

The `ADDRESSES` column receives the following XML structures:

```
<addresses>
   <address street=" " city=" ">
   ...
</addresses>
```

The `ORDERS` column receives the following XML structures:

```
<orders>
   <order id=" ">
      <order item=" ">
      ...
</orders>
```

Parsing XML reserved and special characters

You can avoid parsing reserved and special XML characters that are already represented by entity references (&entity;) by setting the Data element property on the input link to `XML`.

If you use a different data element value or omit it, XML Output parses the input to make it XML-safe.

For example, the value `&lt;` replaces the less-than symbol (<).

Validating documents and schemas

XML Output provides an option to run two XML validation checks at run time:

- Checks for well-formed XML.
- Checks that elements and attributes conform to any XML schema that is referenced in the document.

If you decide to use the option, both validations are performed. Otherwise, no validation occurs.

To refer to a schema in your XML document, use the attribute `schemaLocation` within the root element tag.

For information about activating validation against a schema, see Stage properties.

Setting XML schema options

To enable validation, use the `Strict` option. To disable validation, use the `Default` option.

The XML parser compiles the validating schema to create a schema grammar. While validating the grammar, the parser can apply extra steps called full schema constraint checking, which may increase processing time and be memory-intensive.

If your job produces two or more XML documents that use the same schema, you can avoid recompiling the schema by caching the grammar.

For information about activating schema validation, see Stage properties.

Mapping validation errors to InfoSphere DataStage errors

The XML parser reports three types of conditions: fatal, error, and warning.

- Fatal errors are thrown when the XML is not well-formed.
- Non-fatal errors are thrown when the XML violates a validity constraint. For example, the root element in the document is not found in the validating XML schema.
- Warnings may be thrown when the schema has duplicate definitions.

For more information about these conditions, consult the XML and XML Schema specifications on the Worldwide Web Consortium web site.

By mapping parsing messages to InfoSphere DataStage error levels, you decide how parsing messages and faulty XML documents are processed.

The following table describes how each InfoSphere DataStage error level is processed.

InfoSphere DataStage error level	Result
Reject	Faulty document rows and messages can be written to a Reject link, if one exists. You can also send the messages to the job log. For more information about processing messages and documents, see Using Reject links.
Fatal	The server job terminates, and the messages are written to the job log.
Warning	A warning message is written to the job log.
Info	An information message is written to the job log.
Trace	If the job runs with tracing set on, debug and monitoring information is written to the job log.

For more information about mapping errors and logging them, see Stage properties.

Using Reject links

XML Output supports one Reject link, which can store rejection messages and rejected rows.

Writing rejection messages to the link

About this task

To write rejection messages to a Reject link:

Procedure

1. Add a column on the Reject link.
2. Using the General page of the Output Link properties, identify the column as the target for rejection messages.

Writing rejected rows to the link

About this task

To write rejected rows to a Reject link:

Add a column on the Reject link that has the same name as the column on the target column on the output link.

Column names for this operation are case-sensitive.

For information about setting up a Reject link, see Output link properties.

Writing rejection messages to the job log

About this task

To write rejection messages to the job log:

On the Validation Settings page of the Stage properties, select the Log Reject Errors box.

For more information about the General page, see Stage properties.

Aggregating input rows on output

You have several options for aggregating input rows on output.

- Aggregate all rows in a single output row. This is the default option.
- Generate one output row per input row. This is the `Single row` option.
- Trigger a new output row when the value of an input column changes.
- Trigger a new output row when the value of a passthrough column changes.

  A passthrough column is an output column that has no XPath expression in the Description property and whose name exactly matches the name of an input column.

Example

Four columns are involved in the transformation. `ZONE` values also pass through to an output column called `ZONE`.

CUSTOMER	DIVISION	CITY	ZONE
`Acme`	`Toys`	`Boston`	`East`
`Acme`	`Toys`	`New York`	`East`
`Acme`	`Chemical`	`Raleigh`	`East`
`Acme`	`Chemical`	`St. Louis`	`Midwest`

XPath expressions

On the input link, the following XPath expressions are used. The CITY column has the repetition path.

Input column	XPath expression
CUSTOMER	/directory/customer/@name
DIVISION	/directory/customer/division/text()
CITY	/directory/customer/city/text()
ZONE	/directory/customer/@zone

Each example in Generating output uses the output column CUSTOMERS. The CUSTOMERS column uses a forward slash (/) as the XPath expression, which makes the entire XML available to it.

The passthrough example (see Modes: Using passthrough and aggregate all rows) adds the ZONE column, which omits an XPath expression. This makes the column available as a passthrough target.

Generating output

The section demonstrates the use of various output modes. For more information about setting the output mode, see Transformation settings page.

Mode: Aggregate all rows

If you aggregate all input rows, XML Output creates one output row, which contains a single XML document.

```
<directory>
   <customer name="Acme" zone="East">
      <division>Toys</division>
      <city>Boston</city>
      <city>New York</city>
   </customer>
   <customer name="Acme" zone="East">
      <division>Chemical</division>
      <city>Raleigh</city>
   </customer>
   <customer name="Acme" zone="Midwest">
      <division>Chemical</division>
      <city>St. Louis</city>
   </customer>
</directory>
```

Mode: Single row

If you request one output row per input row, XML Output generates four output rows. Each output row contains the XML chunk generated from a different input row.

Row One

```
<directory>
   <customer name="Acme" zone="East">
      <division>Toys</division>
      <city>Boston</city>
   </customer>
</directory>
```

Row Two

```
<directory>
   <customer name="Acme" zone="East">
      <division>Toys</division>
      <city>New York</city>
   </customer>
</directory>
```

Row Three

```
<directory>
   <customer name="Acme" zone="East">
      <division>Chemical</division>
      <city>Raleigh</city>
   </customer>
</directory>
```

Row Four

```
<directory>
   <customer name="Acme" zone="East">
      <division>Chemical</division>
      <city>St. Louis</city>
   </customer>
</directory>
```

Mode: Use trigger column

If you trigger a new output row based on a change in values in the `DIVISION` column, there will be two rows with different XML chunks: one for the Toys division and one for the Chemical division.

Row One

```
<directory>
   <customer name="Acme" zone="East">
      <division>Toys</division>
      <city>Boston</city>
      <city>New York </city>
   </customer>
</directory>
```

Row Two

```
<directory>
   <customer name="Acme" zone="East">
      <division>Chemical</division>
      <city>Raleigh</city>
   </customer>
   <customer name="Acme" zone="Midwest">
      <division>Chemical</division>
      <city>St. Louis</city>
   </customer>
</directory>
```

Modes: Passthrough and Aggregate all rows

The passthrough mechanism works in conjunction with other options. For example, if you use the Aggregate All Rows option, the column `ZONE` forces two output rows: one for the XML chunks generated from the first three input rows and one for the last input row.

The XML output is written to the `CUSTOMERS` column. The passthrough data is written to the `ZONE` column.

	CUSTOMERS	ZONE
row 1	`<directory> <customer name="Acme" zone="East"> <division>Toys</division> <city>Boston </city> <city>New York</city> </customer> <customer name="Acme" zone="East"> <division>Chemical</division> <city>Raleigh</city> </customer> </directory>`	`East`
row 2	`<directory> <customer name="Acme" zone="Midwest"> <division>Chemical</division> <city>St. Louis</city> </customer> </directory>`	`Midwest`

Note: When using passthrough in a parallel job, the output link column must be a string if the corresponding input link column is a string. Passthrough from a string type to a Unicode string type is not supported.

Writing output to your file system

You can direct the XML output to files on your file system. With this option, file paths are written to the output link. The number of files depends partly on the number of output columns that contain XPath expressions and the number of input rows.

You select the root name of the output file, such as `acme.xml`. When there is a single output column that has an XPath expression, and you choose the Aggregate All Rows option, XML Output generates a single file, using the root name.

For information about the local codepage on the engine tier host when accessing a file through a file path, see Local codepages on engine tier host.

Generating output files for multiple columns

When two or more output columns have XPath expressions, XML Output generates a file for each column. You must add a column index flag to the root filename to prevent overwriting. This creates a naming pattern.

Valid flags include:

%%	**Column position, starting with zero (0)**
%@	Column names

You can add these flags before, within, or after the root filename.

Examples

The first output column is `CUSTOMERS`. The second output column is `DIVISIONS`.

1. The naming pattern is `acme%%.xml`. XML Output generates two files, called `acme0.xml` and `acme1.xml`.
2. The naming pattern is `acme%@.xml`. XML Output generates two files, called `acmeCUSTOMERS.xml` and `acmeDIVISIONS.xml`.

Generating output files for rows

When there are two or more output rows, XML Output appends a row index to the generated filenames. The first index number, zero (0), is omitted from the file for the first row. The second index number, one (1), is appended as _1.

Use a column index flag when there is more than one output column with an XPath expression and you expect multiple output rows.

For information about setting the output filename, see Options page.

Examples using Single row mode

The output mode is Single row, which generates one output row per input row. The first output column is CUSTOMERS. The second output column is DIVISIONS. Both output columns use XPath expressions.

There are three input rows.

In row 1, the naming pattern is acme%%.xml. XML Output generates six files:

- acme0.xml
- acme0_1.xml
- acme0_2.xml
- acme1_xml
- acme1_1.xml
- acme1_2.xml

In row 2, the naming pattern is acme%@.xml. XML Output generates six files:

- acmeCUSTOMERS.xml
- acmeCUSTOMERS_1.xml
- acmeCUSTOMERS_2.xml
- acmeDIVISIONS.xml
- acmeDIVISIONS_1.xml
- acmeDIVISIONS_2.xml

In row 3, the root filename acme.xml is used. Because a column index flag is omitted, XML Output generates and overwrites three files. The final files contain XML chunks for the second column (DIVISIONS).

- acme.xml
- acme_1.xml
- acme_2.xml

To avoid this result, use column index flags when there are multiple columns and rows.

Example using passthrough columns

The output mode is Aggregate all rows, which generates one output row unless there is a passthrough column. ZONE is the passthrough column, and the output column CUSTOMER uses the forward slash (/) as the Description property. Here are the input rows.

CUSTOMER	DIVISION	CITY	ZONE
Acme	Toys	Boston	East
Acme	Toys	New York	East
Acme	Chemical	Raleigh	East

CUSTOMER	DIVISION	CITY	ZONE
Acme	Chemical	St. Louis	Midwest

The root filename acme.xml is used because only one output column is involved in the transformation. XML Output generates two output files, acme.xml and acme_1.xml, because the ZONE value changes in the fourth input row. The ZONE values are written on the output link but not to the output files.

File paths on the output link

File paths are written on the output link when output is directed to the file system.

For information about the effect of engine tier host codepages on accessing a file through a file path, see Local codepages on engine tier hosts.

Processing NULLs and empty values

XML Output can replace NULLs with empty values, and replace empty values with NULLs.

For a NULL column (SQL NULL), you have two options:
- Generate no element or attribute. This is the default behavior.
- Replace the NULL with an empty element or attribute.

For an empty column (empty string), you have two options:
- Generate an empty element or attribute. This is the default behavior.
- Replace the empty string with no element or attribute.

The final node in the XPath expression determines whether an element or attribute is involved.

For examples using these replacements, see NULL and empty value processing.

For information about configuring replacements, see Transformation settings page.

Selecting items for the XML Output

The default XML output includes the following items:
- XML declaration
- Comment, which identifies the generation date and XML Output as the generator
- XML hierarchy

```
<?xml version="1.0" ?>
<!--
- Generated by IBM Corporation, InfoSphere DataStage - XMLOutput stage -
- Date
-->
<root>
...
</root>
```

Adding elements

Using the Document Settings options, you can add the following items to the generated output:
- Document type declaration
- Header elements
- Namespace declaration

- Nested XML chunk

The complete list is arranged in the following order:

```
<?xml version='1.0'>
<!-- comment -->
<document_type_declaration>
<header_elements>
<root namespace_declaration>
   <nested_XML_chunk>
</root>
```

About document type declarations and nested chunks

A valid XML document conforms to a DTD or XML schema. Using the document type declaration, you can specify a DTD. When using a nested chunk, which can contain any well-formed XML fragment, you can specify an inline schema.

About headers

Headers include comments and processing instructions, such as `xml-stylesheet`, that are inserted between the XML declaration and the root element. For example:

```
<?xml version='1.0'>
<?xml-stylesheet type="text/xsl" href="my.xsl"?>
<root>
```

About namespace declarations

In this context, the namespace declarations that you specify are inserted within the root element tag.

For more information about including these optional items in the final XML, see Document settings page.

Excluding the generated comment

You can exclude generated comment from the output. For more information, see Document settings page.

Generating XML fragments

You can generate an XML fragment, which excludes the XML declaration, the generated comment, headers, and document type declarations. This is useful when your generated XML needs to be combined with other documents.

For information about generating an XML fragment, see Document settings page.

Setting the format of the XML output

You can control the format of the XML output in the following ways:

- Empty element style: single opening/closing tag or separate opening and closing tags.
- Indenting output: spaces or a tab character.
- New line style: operating system defaults, such as line feed (UNIX style) and carriage return/line feed (DOS style).

For information about setting the empty element style, see Transformation Settings Page.

For information about indenting output and setting the new line style, see Options page.

Controlling the repetition of nested elements

In a given XML hierarchy, nested elements may repeat. The following example contains a list of cities in which a customer operates.

```
<directory>
   <customer name="Acme">
      <city>Boston</city>
      <city>Chicago</city>
      <city>New York</city>
```

On the input link, city values map to the hierarchy using the following XPath expression:

`/directory/customer/city/text()`

To enable the `<city>` element to repeat within the `<customer>` node, you need to define this XPath expression as the repetition path. To do this, identify the associated input column as the key.

Repetition applies to each node beneath the root element. Therefore, the `<customer>` element can also repeat. The final output typically depends on the repetition path and the order of the input rows. Two repetition paths can produce the same results.

How repetition paths work

The repetition path works by comparing values between input rows. The following rules apply:

Rule 1

A change in an input column value triggers the closing of at least one element and the opening of at least one element.

Rule 2

When a single input column value changes, the repetition path applies as follows:

Every opened element is closed up to and including the first element that is part of the repetition path.

Repetition path: `/w/x/y/z`

XPath of the affected column: `/w/x/y/a/b`

The `y` element is closed.

New elements are opened, down to the last element of the XPath expression of the column for which the value has changed.

Rule 3

When more than one column changes values, elements are closed and opened, starting with the element that is closest to the root element.

Examples

The input data consists of four rows, ordered by division:

CUSTOMER	DIVISION	CITY
Acme	Toys	Boston
Acme	Toys	New York
Acme	Chemical	Boston
Acme	Chemical	New York

The XPath expressions for each column are as follows:

Column	XPath expression
CUSTOMER	/directory/customer/@name
DIVISION	/directory/customer/division/text()
CITY	/directory/customer/city/text()

Making /directory/customer/@name the repetition path

When `/directory/customer/@name` is the repetition path, Rule 2 applies.

The first input row generates the following fragment:

```
<directory>
   <customer name="Acme">
      <division>Toys</division>
      <city>Boston</city>
```

In the second row, the `CITY` value changes. Based on Rule 2, the `<customer>` element must close, and a new `<customer>` element must open.

```
   </customer>
   <customer name="Acme">
```

In subsequent rows, the `CITY` or `DIVISION` value changes. The full XML output is as follows:

```
<directory>
   <customer name="Acme">
      <division>Toys</division>
      <city>Boston</city>
   </customer>
   <customer name="Acme">
      <division>Toys</division>
      <city>New York</city>
   </customer>
   <customer name="Acme">
      <division>Chemical</division>
      <city>Boston</city>
   </customer>
   <customer name="Acme">
      <division>Chemical</division>
      <city>New York</city>
   </customer>
</directory>
```

Making /directory/customer/city/text() the repetition path

When `/directory/customer/city/text()` is the repetition path, Rules 2 and 3 apply.

Rule 2 forces a new `<city>` element that contains the New York value to be written immediately after the `<city>` element that contains the Boston element. This happens because the changed value corresponds to the last element in the repetition path.

In row 3, both the `DIVISION` and `CITY` values change. This invokes Rule 3, which closes the `<customer>` element, which is common among the XPath expressions for the affected columns.

The full XML output is as follows:

```
<directory>
   <customer name="Acme">
      <division>Toys</division>
      <city>Boston</city>
      <city>New York</city>
   </customer>
   <customer name="Acme">
      <division>Chemical</division>
      <city>Boston</city>
      <city>New York</city>
   </customer>
</directory>
```

Making /directory/customer/division/text() the repetition path

When `/directory/customer/division/text()` is the repetition path, Rules 2 and 3 apply.

Because the city value changes between rows, the `<division>` element does not repeat within a customer node. The result is the same output as what the repetition path `/directory/customer/@name` yields.

```
<directory>
   <customer name="Acme">
      <division>Toys</division>
      <city>Boston</city>
   </customer>
   <customer name="Acme">
      <division>Toys</division>
      <city>New York</city>
   </customer>
   <customer name="Acme">
      <division>Chemical</division>
      <city>Boston</city>
   </customer>
   <customer name="Acme">
      <division>Chemical</division>
      <city>New York</city>
   </customer>
</directory>
```

If you order the input rows by city, the division element repeats in the customer node.

Here is the reordered input:

CUSTOMER	DIVISION	CITY
Acme	Toys	Boston
Acme	Chemical	Boston
Acme	Toys	New York
Acme	Chemical	New York

Here is the final output:

```
<directory>
   <customer id="Acme">
      <division>Toys</division>
      <division>Chemical</division>
      <city>Boston</city>
   </customer>
   <customer id="Acme">
      <division>Toys</division>
      <division>Chemical</division>
      <city>New York </city>
   </customer>
</directory>
```

Controlling the order of elements

If you want the XML document to conform to a schema that stipulates the sequence of elements (`<xs:sequence>`), you must order the XPath expressions on the input link accordingly. XML Output sets the position of an element based on its first occurrence in the set of XPath expressions.

Examples

The repetition path `/directory/customer/city/text()` is in effect, and the order of XPath expressions is as follows. Notice that the first occurrence of the node `division` precedes the first occurrence of the node `city`.

Column	XPath expression
CUSTOMER	/directory/customer/@name
DIVISION	/directory/customer/division/text()
CITY	/directory/customer/city/text()

The input data consists of four rows:

CUSTOMER	DIVISION	CITY
Acme	Toys	Boston
Acme	Toys	New York
Acme	Chemical	Boston
Acme	Chemical	New York

Because the node `division` precedes `city`, the output is as follows:

```
<directory>
   <customer name="Acme">
      <division>Toys</division>
      <city>Boston</city>
      <city>New York</city>
   </customer>
   <customer name="Acme">
      <division>Chemical</division>
      <city>Boston</city>
      <city>New York</city>
   </customer>
</directory>
```

If you reorder the XPath expressions, the result changes. For example, the XPath expression for `CITY` is now in the middle position:

Column	XPath expression
CUSTOMER	/directory/customer/city/text()
CITY	/directory/customer/city/text()
DIVISION	/directory/customer/division/text()

This reordering generates the following output:

```
<directory>
   <customer name="Acme">
      <city>Boston</city>
      <city>New York</city>
      <division>Toys</division>
         </customer>
   <customer name="Acme">
      <city>Boston</city>
      <city>New York</city>
      <division>Toys</division>
         </customer>
</directory>
```

Using XML Meta Data Importer

About this task

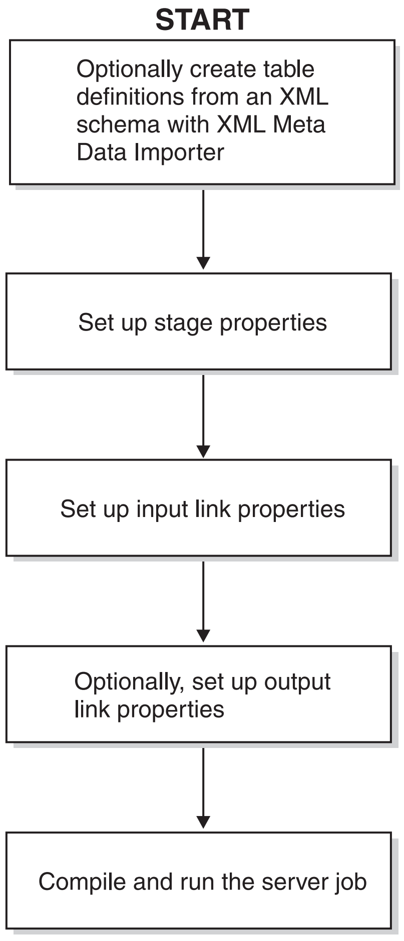
To ensure that the XML document conforms to a schema:

Procedure

1. Use the XML Meta Data Importer to generate XPath expressions from the schema.
2. Load the table definition that contains the XPath expressions. For more information about loading the table definition, see Input link properties.

Getting started with XML Output

The following diagram outlines setting up an XML Output stage within a server job.


START
Optionally create table definitions from an XML schema with XML Meta Data Importer
Set up stage properties
Set up input link properties
Optionally, set up output link properties
Compile and run the server job

Creating table definitions with XML Meta Data Importer

For information about creating table definitions using XML Meta Data Importer, see Using the XML Meta Data Importer.

Adding an XML Output stage to your server job

About this task

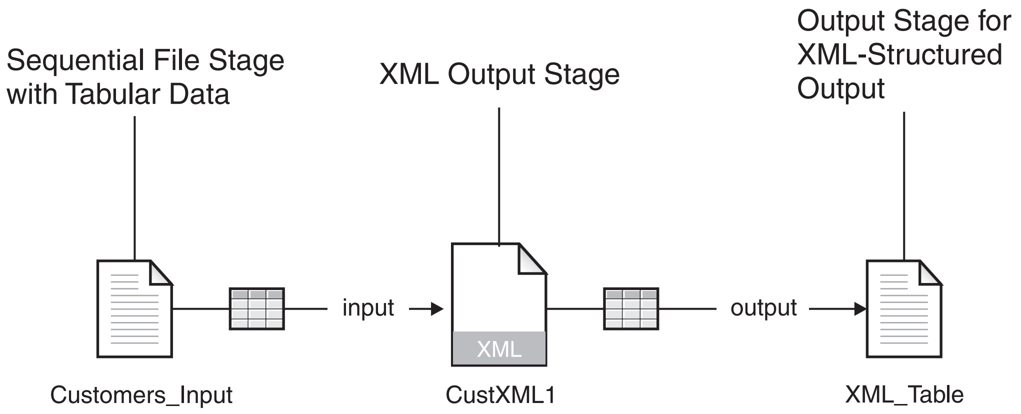
Using the InfoSphere DataStage Designer Client, add an XML Output stage to a server job diagram.

Procedure

1. Select the Real Time category in the Palette pane.
2. From the Palette pane, drag the XML Output icon onto the canvas.
3. Click the Link icon, and connect two stages in your diagram.
4. Repeat Step 2 as needed.

Results

The following diagram shows a completed server job diagram, with renamed stage labels.


Sequential File Stage with Tabular Data
XML Output Stage
Output Stage for XML-Structured Output
input
XML
output
Customers_Input
CustXML1
XML_Table

Setting up properties for the XML Output stage

About this task

To set up properties, double-click the XML Output icon on your server job diagram.

Stage properties

The Stage properties are defined on four pages:

- Document Settings
- Transformation Settings
- Validation Settings
- Options

Note: When there is one output link, use the Output link page to modify the properties for Document Settings, Transformation Settings, and Options. Use the Stage page to modify properties in Validation Settings.

Document settings page

About this task

This page includes up to five tabs, which control the inclusion of following items in the output:

- Comment
- Header
- Namespace declaration
- Document type declaration
- Nested chunk

Generating XML fragments

To indicate that the generated XML includes only XML fragments, select the Generate XML Chunk box.

The number of tabs depends on whether the Generate XML Chunk box is selected. If not selected, all five Document Settings tabs are present. If selected, the tabs include only Comment, Namespace Declaration and Nested Chunk.

Comment Tab

Use this tab to toggle the inclusion of the following XML comment in the generated XML. The comment is inserted after the XML declaration.

```
<!--
- Generated by IBM Corporation, InfoSphere DataStage - XMLOutput stage -
- Date
-->
```

Header tab:
About this task

Use this tab to insert processing instructions, comments, and other information between the XML declaration and the root element in the generated XML.

You can access a header from the InfoSphere DataStage client or from the engine tier. In addition, you can type tags in the text box.

To specify a header on the engine tier host::
Procedure

1. Click the **Include** box.
2. Click the **File Path** button.
3. Click the **Load (server)** button.
   The Browse File dialog box opens.
4. Locate the file and click **OK**.
   The file path appears in the text box.

To specify a header on the InfoSphere DataStage client workstation::
Procedure

1. Click the **Include** box.
2. Click the **Text** button.
3. Click the **Load (client)** button.
   The Open dialog box opens.
4. Locate the file and click **OK**.

The header tags appear in the text box.

Namespace Declaration tab:
About this task

Use this tab to insert a space-delimited list of namespace declarations within the generated root element tag.

The syntax is: `xmlns:<prefix>="<namespace_url>"`

You can load namespace declarations from only table definitions that XML Meta Data Importer generates. If you did not use XML Meta Data Importer, type the declarations in the text box.

To load namespace declarations:

Procedure

1. Click the **Include** box.
2. Click the **Load** button.
   The Table Definitions dialog box opens.
3. Locate the table definition containing the namespace declarations and click **OK**.
   The namespace declarations appear in the text box.

Document type tab:
About this task

Use this tab to insert a document type declaration in the generated XML.

You can access a document type declaration from the InfoSphere DataStage client or engine tier host. In addition, you can type the declaration in the text box.

To specify a document type declaration on the engine tier workstation::
Procedure

1. Click the **Include** box.
2. Click the **File Path** button.
3. Click the **Load (server)** button.
   The Browse File dialog box opens.
4. Locate the file and click **OK**.
   The file path appears in the text box.

To specify a document type declaration on the InfoSphere DataStage client workstation::
Procedure

1. Click the **Include**box.
2. Click the **Text** button.
3. Click the **Load (client)** button.
   The Open dialog box opens.
4. Locate the file and click **OK**.
   The document type declaration appears in the text box.

Nested Chunk tab:
About this task

Use this tab to insert a nested chunk in the generated XML.

You can access a nested chunk from the InfoSphere DataStage client or engine tier host, or from a web site. In addition, you can type the nested chunk in the text box.

To specify a nested chunk on the engine tier host::
Procedure

1. Click the **Include** box.
2. Click the **File Path** button.
3. Click the **Load (server)** button.
   The Browse File dialog box opens.
4. Locate the file and click **OK**.
   The file path appears in the text box.

To specify a nested chunk on the InfoSphere DataStage client workstation::
Procedure

1. Click the **Include** box.
2. Click the **Text** button.
3. Click the **Load (client)** button.
   The Open dialog box opens.
4. Locate the file and click **OK**.
   The nested chunk appears in the text box.

Transformation settings page

Use this page to:

- Replace NULLs with empty values.
- Replace empty values with NULLs.
  For examples using these replacements, see NULL and empty value processing.
- Select an empty tag style:
  - `<tag></tag>`
  - `<tag/>`
- Select a mode for generating output rows:
  - Generate one XML document for all rows (**Aggregate all rows** mode).
  - Generate one XML document per input row (**Single row** mode).
  - Trigger a new output row when the value of an input column changes (**Use trigger column** mode).

Validation settings

These properties control:

- Validating the output XML against the XML schema referenced in the XML document.
- Setting the schema validation level.
- Caching a schema grammar for another XML document that uses the same schema.
- Logging rejection errors for an output row into the job log.
- Mapping transformation error messages to InfoSphere DataStage error levels. These include fatal, error (non-fatal), and warning messages.

Options page

Use this page to control processing of the following items:

- Output file. Determines whether an output file is written, and provides the file path.
  For more information about output files, see Writing output to your file system.
- Indentation character. Character to use for indenting nested elements.
- New line style. Choose a new line character from among operating system defaults.

- Output encoding for NLS installations. For non-NLS installations, UTF-8 is used. NLS installation, select the encoding from the XML output encoding list. The default encoding is UTF-8.

Input link properties

About this task

Use the standard InfoSphere DataStage grid on the Columns page to describe the data that is extracted from your tabular source. Use the Description property to specify XPath expressions for the XML transformation.

To load XPath expressions from the table definition that the XML Meta Data Importer generates:

Procedure

1. Click the **Load** button.

   The Table Definitions dialog box opens.
2. Double-click the generated table definition.

   The Select Columns dialog box opens.
3. Click **OK** to select all the columns.

Output link properties

The Output link properties are defined on five pages:

- General
- Document Settings: for more information, see Document settings page.
- Transformation Settings: for more information, see Transformation settings page.
- Options: for more information, see Options page.
- Columns

Columns page

Use the standard InfoSphere DataStage grid to describe the output columns. Use the Description property to specify XPath expressions that populate columns with generated XML output.

General

Use this page to set the following properties:

- Define an output link as a Reject link.
- Specify, for Reject links, the column that will contain rejection errors.

Chapter 5. Using XML Transformer

You can convert an XML document to another XML hierarchical format using the XML Transformer stage.

XML Transformer supports one input link and zero or more output links.

About transforming XML documents

XML Transformer converts documents using an XSLT stylesheet that you specify.

Identifying XML sources

An input column can contain an XML document, or its URL or file path.

For more information about identifying the XML source, see Input link properties.

For information about the effect of engine tier host codepages on accessing a file through a file path, see Local codepages on engine tier hosts.

Identifying XSLT stylesheets

You specify the XSLT stylesheet by its file path or URL.

For more information about identifying the XSLT stylesheet, see Transformation settings.

About National Language Support (NLS)

You can use character encodings for the input and output links.

Input link

The input link supports XML documents that are encoded using any Internet Assigned Numbers Authority (IANA) character sets. For a complete list of character sets, visit the following IANA web page:

```
http://www.iana.org/assignments/character-sets
```

Output link

XML Transformer supports all Internet Assigned Numbers Authority (IANA) character sets. For a complete list of character sets, visit the following IANA web page:

```
http://www.iana.org/assignments/character-sets
```

In your XSLT stylesheet, specify the encoding of the output document using the `<xsl:output>` element. For example:

```
<xsl:output encoding="ISO-10646-J-1"/>
```

InfoSphere DataStage in NLS mode

This section applies only to running InfoSphere DataStage in NLS mode.

Preserving the encoding of input documents

The engine can corrupt well-formed XML documents through transcoding the contents. Transcoding involves applying an encoding scheme that may be incompatible with the one that is listed in the XML declaration.

To prevent transcoding, perform one of the following steps:
- Set the stage map to `NONE` in each upstream stage.

- Set the map for the column that contains the XML input to `NONE` in each upstream stage.
- Set the SQL type for the column that contains the XML input to `VarBinary` in each upstream stage and on the input link of the XML Transformer stage.

Using XSLT stylesheets

If you want to paste a stylesheet through the Transformation Settings tab of the Stage page, follow these guidelines:

- Make sure that the encoding for the stylesheet matches the InfoSphere DataStage client map.
- Do not specify the XML declaration in the stylesheet header.

Preserving output encoding

To preserve the output encoding when the document is written to the output link, you must set the SQL type of the target column to a binary type. If you use a character type, the document is written in UTF-8.

Writing XML output

If the XML Transformer stage has only an input link, the XML output is written only to the file system.

Naming output files

The output filename that you specify as a Stage property works as a root name. If the input consists of multiple rows, XML Transformer creates a file for each input row. XML Transformer appends a row index to the filename. The first index number, zero (0), is omitted from the file for the first row. The second index number, one (1), is appended as `_1`.

Examples

Three output files are generated using the root name `myfile.xml`:

- First row file is `myfile.xml`
- Second row file is `myfile_1.xml`
- Third row file is `myfile_2.xml`

For information about setting the filename as a Stage property, see Transformation settings.

Using output links

If the XML Transformer stage has an output link, you can select one of these output choices:

- Write the generated XML to output files, and send the file paths to an output column.
- Send the generated XML to an output column.

For more information about directing output as an Output property, see Output settings.

Validating documents and schemas

XML Transformer performs two XML validations when the server job runs:

- Checks for well-formed XML.
- Optionally checks that elements and attributes conform to any XML schema that is referenced in the document. You control this option.

Validation against an XML schema is required when you want default values for elements and attributes that are specified in the schema to be written to an output row. To refer to a schema in your XML document, use the `schemaLocation` attribute within the root element tag.

For information about activating validation against a schema, see Stage properties.

Setting XML schema options

The XML parser compiles the validating schema to create a schema grammar. While validating the grammar, the parser can apply extra steps called full schema constraint checking, which may increase processing time and be memory-intensive. To enable this checking, use the Strict option. To disable this type of validation, use the Default option.

If your job processes two or more XML documents that use the same schema, you can avoid recompiling the schema by caching the grammar.

For information about activating schema validation, see Stage properties.

Mapping transformation errors to InfoSphere DataStage errors

The XML parser reports three types of conditions: fatal, error, and warning.

- Fatal errors are thrown when the XML is not well-formed.
- Non-fatal errors are thrown when the XML violates a validity constraint. For example, the root element in the document is not found in the validating XML schema.
- Warnings may be thrown when the schema has duplicate definitions.

For more information about these conditions, consult the XML and XML Schema specifications on the Worldwide Web Consortium web site.

By mapping parsing messages to InfoSphere DataStage error levels, you decide how parsing messages and faulty XML documents are processed.

The following table describes how each InfoSphere DataStage error level is processed.

InfoSphere DataStage error level	Result
Reject	Faulty document rows and messages can be written to a Reject link, if one exists. You can also send the messages to the job log. For more information about processing messages and documents, see Using reject links.
Fatal	The server job terminates, and the messages are written to the job log.
Warning	A warning message is written to the job log.
Info	An information message is written to the job log.
Trace	If the job runs with tracing set on, debug and monitoring information is written to the job log.

For more information about mapping errors and logging them, see Stage properties.

Using Reject links

XML Transformer supports one Reject link, which can store rejection messages and rejected rows.

Writing rejection messages to the link

About this task

To write rejection messages to a Reject link:

Procedure

1. Add a column on the Reject link.
2. Using the General page of the Output Link properties, identify the column as the target for rejection messages.

Writing rejected rows to the link

About this task

To write rejected rows to a Reject link, add a column on the **Reject** link that has the same name as the column on the input link that contains or references the XML document. This is a passthrough operation. Column names for this operation are case-sensitive.

Passthrough is available for any input column.

For information about setting up a Reject link, see Output link properties.

Writing rejection messages to the job log

About this task

To write rejection messages to the job log:

On the General page of the Stage properties, select the Log Reject errors box.

For more information about the General page, see Stage properties.

Passing data from input to output links

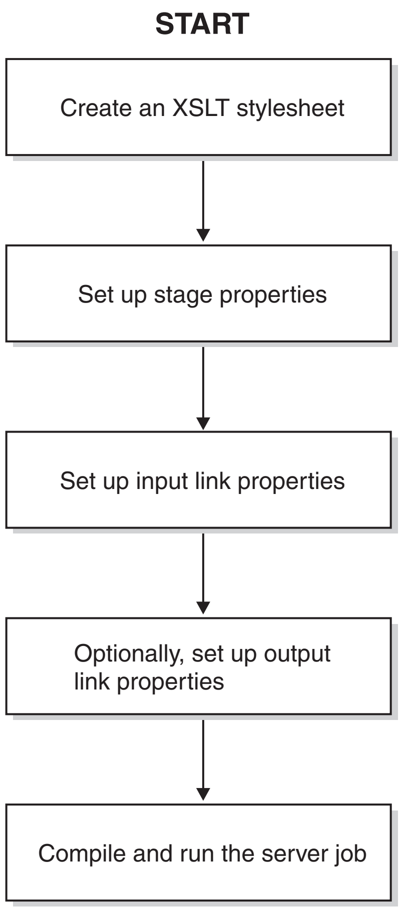
Each output link supports a passthrough mechanism by which data is copied without modification from the input link to the output link. This mechanism works with an output column that is not the target for the transformation.

Passthrough requires an exact match between column names specified in both the output link and the input link. Also, column names are case-sensitive.

Note: When using passthrough in a parallel job, the output link column must be a string if the corresponding input link column is a string. Passthrough from a string type to a Unicode string type is not supported.

Getting started with XML Transformer

The following diagram outlines setting up an XML Transformer stage within a server job.


START
Create an XSLT stylesheet
Set up stage properties
Set up input link properties
Optionally, set up output link properties
Compile and run the server job

Adding an XML Transformer stage to your server job

About this task

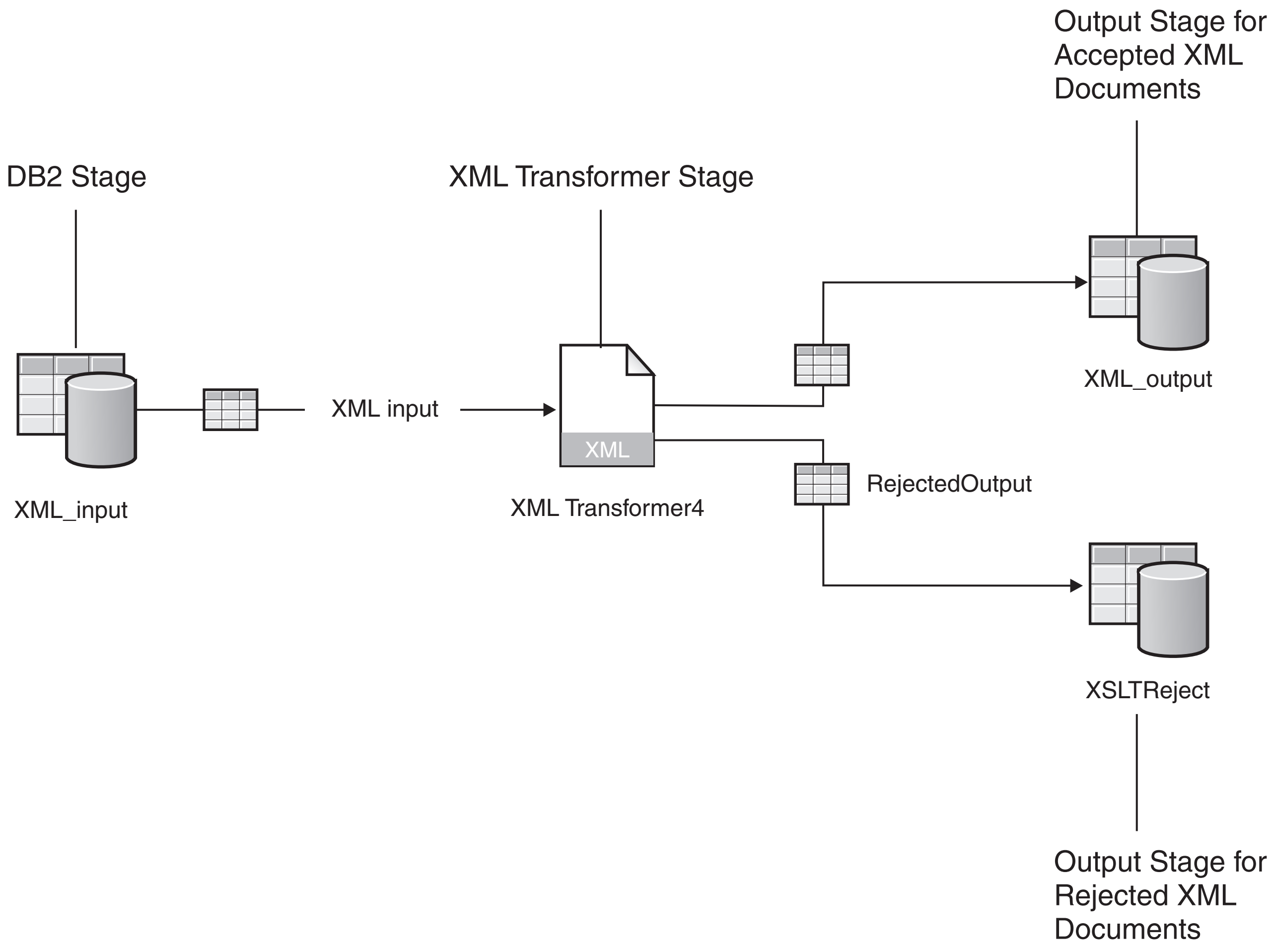
Using the InfoSphere DataStage Designer Client, add an XML Transformer stage to a server job diagram.

Procedure

1. Select the Real Time category in the Palette pane.
2. From the Palette pane, drag the XML Transformer icon onto the canvas.
3. Click the Link icon, and connect two stages in your diagram.
4. Repeat Step 2 as needed.

Results

The following diagram shows a sample server job diagram, with renamed stage labels.



Setting up properties for the XML Transformer stage

About this task

To set up properties, double-click the XML Transformer icon on your server job diagram.

Stage properties

The Stage properties are defined on two pages:

- General
- Transformation Settings

General

These properties control:

- Validating the input XML against the XML schema referenced in the XML document.
- Setting the schema validation level.
- Caching a schema grammar for another XML document that uses the same schema.
- Logging rejection errors for an input row into the job log.

- Mapping transformation error messages to InfoSphere DataStage error levels. These include fatal, error (non-fatal), and warning messages.

Transformation settings

About this task

These properties control the default values that can be shared by multiple output links.

Use the Transformation Settings page to specify:

- Output path for the target XML document. The filename is used as naming pattern when XML Transformer generates multiple output files.
- XSLT stylesheet used in the transformation.

To use these values with a specific output link, click the Inherit properties from stage box on the General page of the output link.

Specifying the stylesheet

You can specify a stylesheet in these ways:

- Load the content or path of a stylesheet that is stored on an engine tier host.
- Type the stylesheet.
- Paste the stylesheet.
- Type the URL or file path of the stylesheet.

  For information about the effect of engine tier host codepages on accessing a file through a file path, see Local codepages on engine tier host.

To specify a stylesheet on the engine tier host workstation::
Procedure

1. Click the **URL/File Path**button.
2. Click the **Load (server)** button.

   The Browse File dialog box opens.
3. Locate the file and click **OK**.

   The file path appears in the **Stylesheet**box.

To specify a stylesheet on the InfoSphere DataStage client workstation::
Procedure

1. Click the **Text**button.
2. Click the **Load (client)**button.

   The Open dialog box opens.
3. Locate the file and click **OK**.

   The stylesheet appears in the Stylesheet box.

To paste a stylesheet::
Procedure

1. Make sure that the encoding for the stylesheet matches the InfoSphere DataStage client map.
2. Click the **Text** button.
3. Paste a copied stylesheet in the Stylesheet box.
4. Remove the XML declaration from the stylesheet header.

To type a URL or file path::

Procedure

1. Click the **URL/File path** button.
2. Type the URL or file path in the text box.

Input Link properties

The Input Link properties are defined on two pages:

- XML Source
- Columns

XML source

Use this page to specify the input column that contains the XML document, its URL, or file path.

Columns

Use this standard InfoSphere DataStage grid to describe the input columns.

Output Link properties

The Output Link properties are defined on four pages:

- General
- Stylesheet Settings
- Output Settings
- Columns

General

Use this page to set the following properties:

- Define an output link as a Reject link.
- For Reject links, specify the column that will contain rejection messages.
- Indicate that the output link inherits properties from the Stage page.

  Note: The Inherit properties from stage box is not available when the output link is a Reject link.

Stylesheet settings

Use this page to identify an XSLT stylesheet (text or URL) that you will use to convert the XML source. For information about identifying the stylesheet, see Specifying the stylesheet.

Note: All controls are not available if the properties are inherited from the Stage page.

Output settings

About this task

Use this page to direct the XML output to a file or an output column. If you direct the XML output to a file, the output column receives a file path.

To direct the XML output to an output column::
Procedure

1. In the Target column list, select the output column.
2. Click the **Text** button.

To direct the XML output to a file::
Procedure

1. In the Target column list, select the output column that receives the file path.
2. Click the **URL/File path** button.
3. Type the file path in the Output file path box.

Note: The Output file path box is not available when the output link inherits properties from the Stage page.

Columns

Use this standard InfoSphere DataStage grid to describe the output columns, including the one to contain the XML text, URL, or file path.

If a column name exactly matches an input column name and the output column is not the target for the transformation, the output column is a passthrough column.

XML Transformer copies the contents from the input column as is to the passthrough column.

Chapter 6. XML to SQL data type conversions

The following table indicates how XML data types are converted to SQL data types.

XML data type	SQL data type
anyURL	VarChar
base64Binary	LongVarBinary
Boolean	VarChar
byte	SmallInt
date	Timestamp
decimal	Decimal
default	Unknown
double	Double
ENTITIES	LongVarChar
ENTITY	VarChar
float	Float
gDay	Timestamp
gMonthDay	Timestamp
gYear	Timestamp
gYearMonth	Timestamp
hexBinary	LongVarBinary
ID	VarChar
IDREF	VarChar
IDREFS	LongVarChar
int	Integer
integer	Decimal
language	VarChar
long	Numeric
Name	VarChar
NCName	VarChar
negativeInteger	Decimal
NMTOKEN	VarChar
NMTOKENS	LongVarChar
nonNegativeInteger	Decimal
nonPositiveInteger	Decimal
normalizedString	VarChar
NOTATION	VarChar
positiveInteger	Decimal
QName	VarChar
short	Numeric
string	VarChar

XML data type	SQL data type
time	Timestamp
token	VarChar
unsignedByte	SmallInt
unsignedInt	numeric
unsignedLong	numeric
unsignedShort	numeric

Chapter 7. Advanced transformations

To transform the XML document to columns and rows, XML Input uses an XSLT stylesheet that it generates from the XPath expressions that are specified on the input link.

If the XML document contains nodes whose relationships are not explicit, XML Input may not be able to automatically perform the transformation. As an alternative to the generated XSLT stylesheet, you can substitute your own stylesheet.

The following provides the following information about transforming XML documents using custom XSLT stylesheets in the XML Input stage:

- Document Type Definition (DTD) to which the output of an XSLT stylesheet must conform
- Procedure for accessing the generated XSLT stylesheet
- Sample input document for which you might use a custom XSLT stylesheet
- Sample XSLT stylesheet that converts the input document to an XML document that conforms to the required DTD
- Generated internal XML document
- Generated output rows, which are available on an output link

Required DTD

The output of your custom XSLT stylesheet must conform to the following DTD:

```
<!ELEMENT table     (row*)>
<!ELEMENT row       (column*)>
<!ELEMENT column    (#PCDATA | NULL)>
<!ATTLIST column
   name            CDATA #REQUIRED
>
<!ELEMENT NULL>
```

The declaration `<!ELEMENT NULL>` is used to set an output column to `NULL`.

Accessing the generated XSLT stylesheet

About this task

You can access the generated XSLT stylesheet through the job log. This stylesheet is a good starting point for creating your own.

To write the internal stylesheet to the log:

Procedure

1. Open the InfoSphere DataStage Director.
2. In the Job Run Options dialog box, select the **Tracing** tab.
3. In the Stage names list, select the XML Input stage for the job.
4. Select the **Subroutines calls** box.

Results

To access the stylesheet:

In the Job Log view, open event entries that start with an XML declaration.

Sample input XML document

In the following example, the relationship between orders and addresses is not explicit. If you want to associate each order with every address, use a custom stylesheet. This creates a cross-product.

```
<?xml version="1.0" ?>
<customers>
   <customer id="1" name="Acme, Inc.">
      <orders>
         <order order_no="1">
            <items>
               <item item_no="1" quantity="10" />
               <item item_no="2" quantity="2" />
               <item item_no="3" quantity="1" />
            </items>
         </order>
         <order order_no="2">
            <items>
               <item item_no="123" quantity="2" />
               <item item_no="123" quantity="2" />
               <item item_no="321" quantity="3" />
            </items>
         </order>
      </orders>
      <addresses>
         <address street="192 Prospect St" city="Auburn" state="MA" zip="01501" />
         <address street="50 Washington St" city="Westborough" state="MA" zip="01581" />
      </addresses>
   </customer>
   <customer id="2" name="Bubba Gump Shrimp Co, Inc.">
      <orders>
         <order order_no="3">
            <items>
               <item item_no="654" quantity="1" />
            </items>
         </order>
      </orders>
      <addresses>
         <address street="1099 18th St, Suite 2500" city="Denver" state="CO" zip="80202" />
      </addresses>
   </customer>
</customers>
```

Sample XSLT stylesheet

The following XSLT stylesheet forces a relationship between orders and addresses by computing all combinations. The output document conforms to the required DTD.

Note: If you use an XSLT stylesheet that generates an XML document that does not conform to the required DTD, XML Input may produce unusable rows or no rows at all.

```
<?xml version="1.0" ?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">
   <xsl:output method="xml" indent="yes" />
   <xsl:template match="/">
      <table>
         <xsl:apply-templates select="/customers/customer/orders/order" />
      </table>
   </xsl:template>
   <xsl:template match="order">
      <xsl:variable name="id" select="../../@id" />
      <xsl:apply-templates select="/customers/customer/addresses/address[../../@id =$id]">
         <xsl:with-param name="id" select="$id" />
         <xsl:with-param name="order_no" select="@order_no" />
      </xsl:apply-templates>
   </xsl:template>
   <xsl:template match="address">
      <xsl:param name="id" />
      <xsl:param name="order_no" />
      <row>
         <column name="CUSTOMER_ID">
            <xsl:value-of select="$id" />
         </column>
         <column name="ORDER_NO">
            <xsl:value-of select="$order_no" />
         </column>
         <column name="STREET">
            <xsl:value-of select="@street" />
         </column>
         <column name="CITY">
            <xsl:value-of select="@city" />
         </column>
         <column name="STATE">
            <xsl:value-of select="@state" />
         </column>
         <column name="ZIP">
            <xsl:value-of select="@zip" />
         </column>
      </row>
   </xsl:template>
</xsl:stylesheet>
```

Generated XML document

The sample XSLT stylesheet transforms the input document into the following output document, which conforms to the required DTD. Use this example as a guide in testing your stylesheet before using it in the XML Input stage.

```
<?xml version="1.0" encoding="UTF-8" ?>
<table>
   <row>
        <column name="CUSTOMER_ID">1</column>
        <column name="ORDER_NO">1</column>
        <column name="STREET">192 Prospect St</column>
        <column name="CITY">Auburn</column>
        <column name="STATE">MA</column>
        <column name="ZIP">01501</column>
   </row>
   <row>
        <column name="CUSTOMER_ID">1</column>
        <column name="ORDER_NO">1</column>
        <column name="STREET">50 Washington St</column>
        <column name="CITY">Westborough</column>
        <column name="STATE">MA</column>
        <column name="ZIP">01581</column>
   </row>
   <row>
        <column name="CUSTOMER_ID">1</column>
        <column name="ORDER_NO">2</column>
        <column name="STREET">192 Prospect St</column>
        <column name="CITY">Auburn</column>
        <column name="STATE">MA</column>
        <column name="ZIP">01501</column>
   </row>
   <row>
```

```
        <column name="CUSTOMER_ID">1</column>
        <column name="ORDER_NO">2</column>
        <column name="STREET">50 Washington St</column>
        <column name="CITY">Westborough</column>
        <column name="STATE">MA</column>
        <column name="ZIP">01581</column>
    </row>
    <row>
        <column name="CUSTOMER_ID">2</column>
        <column name="ORDER_NO">3</column>
        <column name="STREET">1099 18th St, Suite 2500</column>
        <column name="CITY">Denver</column>
        <column name="STATE">CO</column>
        <column name="ZIP">80202</column>
    </row>
</table>
```

Output table

The following output rows are generated using the output XML document:

CUSTOMER _ID	ORDER_NO	STREET	CITY	STATE	ZIP
1	1	192 Prospect St	Auburn	MA	01501
1	1	50 Washington St	Westborough	MA	01581
1	2	192 Prospect St	Auburn	MA	01501
1	2	50 Washington St	Westborough	MA	01581
1	2	1099 18th St, Suite 2500	Denver	CO	80202

Chapter 8. NULL and empty value processing

The XML Input and XML Output stages process input NULLs and empty values based on property settings.

XML Input

Sample input XML

```
<customers>
   <customer id="0">
      <name>IBM Corporation</name>
      <address city="">
         <street>50 Washington St</street>
      </address>
   </customer>
   <customer id="1">
      <name>Acme, Inc.</name>
      <address>
         <street>10 Broadway</street>
      </address>
   </customer>
   <customer id="2">
      <name>ABC, Corp.</name>
      <address city="Denver">
         <street>1234 Main St</street>
      </address>
   </customer>
</customers>
```

Output columns

The sample input XML maps to four output columns:

Column	XPath
CUST_ID	/customers/customer/@id
NAME	/customers/customer/name/text()
STREET	/customers/customer/address/street/text()
CITY	/customers/customer/address/@city

Repetition path: `/customers/customer/@id`

Processing NULLs and empty values

There are four possible combinations for setting two properties:

- Replace NULLs with empty values
- Replace empty values with NULLs

You set these properties on the Transformation Settings page in the XML Input Stage dialog box.

One: Replace NULLs (unselected). Replace empty values (unselected)

CUST_ID	NAME	STREET	CITY
0	IBM Corporation	50 Washington St	

CUST_ID	NAME	STREET	CITY
1	Acme, Inc.	10 Broadway	NULL
2	ABC, Corp.	1234 Main St	Denver

Two: Replace NULLs (selected). Replace empty values (unselected)

CUST_ID	NAME	STREET	CITY
0	IBM Corporation	50 Washington St	
1	Acme, Inc.	10 Broadway	
2	ABC, Corp.	1234 Main St	Denver

Three: Replace NULLs (unselected). Replace empty values (selected)

CUST_ID	NAME	STREET	CITY
0	IBM Corporation	50 Washington St	NULL
1	Acme, Inc.	10 Broadway	NULL
2	ABC, Corp.	1234 Main St	Denver

Four: Replace NULLs (selected). Replace empty values (selected)

CUST_ID	NAME	STREET	CITY
0	IBM Corporation	50 Washington St	NULL
1	Acme, Inc.	10 Broadway	
2	ABC, Corp.	1234 Main St	Denver

XML Output

Sample input

CUST_ID	NAME	STREET1	STREET2
0	IBM Corporation	50 Washington St	
1	Acme, Inc.	10 Broadway	NULL
2	ABC, Corp.	1234 Main St	Suite 4321

Input columns

The sample input XML maps to four output columns:

Column	XPath
CUST_ID	/customers/customer/@id
NAME	/customers/customer/name/text()
STREET1	/customers/customer/address/street1/text()
STREET2	/customers/customer/address/street2/text()

Repetition path: `/customers/customer/@id`

Processing NULLs and empty values

There are four possible combinations for setting two properties:

- Replace NULLs with empty values
- Replace empty values with NULLs

You set these properties on the Transformation Settings page in the XML Output Stage dialog box.

One: Replace NULLs (unselected). Replace empty values (unselected)

```
<customers>
   <customer id="0">
      <name>IBM Corporation</name>
      <address>
         <street1>50 Washington St</street1>
         <street2/>
      </address>
   </customer>
   <customer id="1">
      <name>Acme, Inc.</name>
      <address>
         <street1>10 Broadway</street1>
      </address>
   </customer>
   <customer id="2">
      <name>ABC, Corp.</name>
      <address>
         <street1>1234 Main St</street1>
         <street2>Suite 4321</street2>
   </address>
   </customer>
</customers>
```

Two: Replace NULLs (selected). Replace empty values (unselected)

```
<customers>
   <customer id="0">
      <name>IBM Corporation</name>
      <address>
         <street1>50 Washington St</street1>
         <street2/>
      </address>
   </customer>
   <customer id="1">
      <name>Acme, Inc.</name>
      <address>
         <street1>10 Broadway</street1>
         <street2/>
      </address>
   </customer>
      <customer id="2">
         <name>ABC, Corp.</name>
         <address>
            <street1>1234 Main St</street1>
            <street2>Suite 4321</street2>
         </address>
      </customer>
</customers>
```

Three: Replace NULLs (unselected). Replace empty values (selected)

```
<customers>
   <customer id="0">
      <name>IBM Corporation</name>
      <address>
```

```
         <street1>50 Washington St
         </street1>
      </address>
   </customer>
   <customer id="1">
      <name>Acme, Inc.</name>
      <address>
         <street1>10 Broadway</street1>
      </address>
   </customer>
   <customer id="2">
      <name>ABC, Corp.</name>
      <address>
         <street1>1234 Main St</street1>
         <street2>Suite 4321</street2>
      </address>
   </customer>
</customers>
```

Four: Replace NULLs (selected). Replace empty values (selected)

```
<customers>
   <customer id="0">
      <name>IBM Corporation</name>
      <address>
         <street1>50 Washington St
         </street1>
      </address>
   </customer>
   <customer id="1">
      <name>Acme, Inc.</name>
      <address>
         <street1>10 Broadway
         </street1>
         <street2/>
      </address>
   </customer>
   <customer id="2">
      <name>ABC, Corp.</name>
      <address>
         <street1>1234 Main St</street1>
         <street2>Suite 4321</street2>
      </address>
   </customer>
</customers>
```

Chapter 9. Local codepages on engine tier hosts

Data is encoded using the local codepage of the engine tier host when:

- The engine runs in non-NLS mode. This applies to reading from an XML file and to writing to an XML file.
- A file that resides on an engine tier host machine is accessed through a file path. This applies to both NLS modes.

To ensure uniform and expected results when using the XML Pack, the local codepage of the engine tier host should be set for the locale that you want.

Setting the local codepage

The system administrator sets the codepage for the locale on the engine tier host.

The method used to select the local codepage depends upon the operating system on which engine is running. Consult your system administrator.

Setting a locale in a POSIX system

This section describes the method for setting a local codepage in a POSIX system, and provides an example.

Method

About this task

- Set the locale using the `LANG` environment variable. This variable is typically in the `dsenv` file.
- To display the current locale, use the `locale` command.
- To display a list of available locales (possible values for the `LANG` variable), use the following command: `locale -a`

Example of setting the locale

The locale is set to `UTF-8`:

```
set LANG=en_US.UTF-8
```

Character data are interpreted as UTF-8 values.

Sample File Path

```
/tmp/data/direcci\179\195n
```

where:

`\179\195` is interpreted as ó (letter o with an acute accent).

The complete path is interpreted as:

```
/tmp/data/dirección
```

If you change the locale to `ISO-8859-1`, the sequence `\179\195` is interpreted as ³Ã (superscript 3 followed by a capital A with a tilde)

Note: Not all characters have representations in all character sets. For example, values above `\127` have no equivalents in the ASCII character set (`en_US`).

Appendix A. Product accessibility

You can get information about the accessibility status of IBM products.

The IBM InfoSphere Information Server product modules and user interfaces are not fully accessible.

For information about the accessibility status of IBM products, see the IBM product accessibility information at http://www.ibm.com/able/product_accessibility/index.html.

Accessible documentation

Accessible documentation for InfoSphere Information Server products is provided in an information center. The information center presents the documentation in XHTML 1.0 format, which is viewable in most web browsers. Because the information center uses XHTML, you can set display preferences in your browser. This also allows you to use screen readers and other assistive technologies to access the documentation.

The documentation that is in the information center is also provided in PDF files, which are not fully accessible.

IBM and accessibility

See the IBM Human Ability and Accessibility Center for more information about the commitment that IBM has to accessibility.

Appendix B. Contacting IBM

You can contact IBM for customer support, software services, product information, and general information. You also can provide feedback to IBM about products and documentation.

The following table lists resources for customer support, software services, training, and product and solutions information.

Table 2. IBM resources

Resource	**Description and location**
IBM Support Portal	You can customize support information by choosing the products and the topics that interest you at www.ibm.com/support/entry/portal/Software/Information_Management/InfoSphere_Information_Server
Software services	You can find information about software, IT, and business consulting services, on the solutions site at www.ibm.com/businesssolutions/
My IBM	You can manage links to IBM Web sites and information that meet your specific technical support needs by creating an account on the My IBM site at www.ibm.com/account/
Training and certification	You can learn about technical training and education services designed for individuals, companies, and public organizations to acquire, maintain, and optimize their IT skills at http://www.ibm.com/training
IBM representatives	You can contact an IBM representative to learn about solutions at www.ibm.com/connect/ibm/us/en/

Appendix C. Accessing the product documentation

Documentation is provided in a variety of formats: in the online IBM Knowledge Center, in an optional locally installed information center, and as PDF books. You can access the online or locally installed help directly from the product client interfaces.

IBM Knowledge Center is the best place to find the most up-to-date information for InfoSphere Information Server. IBM Knowledge Center contains help for most of the product interfaces, as well as complete documentation for all the product modules in the suite. You can open IBM Knowledge Center from the installed product or from a web browser.

Accessing IBM Knowledge Center

There are various ways to access the online documentation:

- Click the **Help** link in the upper right of the client interface.
- Press the F1 key. The F1 key typically opens the topic that describes the current context of the client interface.

  Note: The F1 key does not work in web clients.
- Type the address in a web browser, for example, when you are not logged in to the product.

  Enter the following address to access all versions of InfoSphere Information Server documentation:

  ```
  http://www.ibm.com/support/knowledgecenter/SSZJPZ/
  ```

  If you want to access a particular topic, specify the version number with the product identifier, the documentation plug-in name, and the topic path in the URL. For example, the URL for the 11.3 version of this topic is as follows. (The ⇒ symbol indicates a line continuation):

  ```
  http://www.ibm.com/support/knowledgecenter/SSZJPZ_11.3.0/⇒
  com.ibm.swg.im.iis.common.doc/common/accessingiidoc.html
  ```

  Tip:

  The knowledge center has a short URL as well:

  ```
  http://ibm.biz/knowctr
  ```

  To specify a short URL to a specific product page, version, or topic, use a hash character (#) between the short URL and the product identifier. For example, the short URL to all the InfoSphere Information Server documentation is the following URL:

  ```
  http://ibm.biz/knowctr#SSZJPZ/
  ```

  And, the short URL to the topic above to create a slightly shorter URL is the following URL (The ⇒ symbol indicates a line continuation):

  ```
  http://ibm.biz/knowctr#SSZJPZ_11.3.0/com.ibm.swg.im.iis.common.doc/⇒
  common/accessingiidoc.html
  ```

Changing help links to refer to locally installed documentation

IBM Knowledge Center contains the most up-to-date version of the documentation. However, you can install a local version of the documentation as an information center and configure your help links to point to it. A local information center is useful if your enterprise does not provide access to the internet.

Use the installation instructions that come with the information center installation package to install it on the computer of your choice. After you install and start the information center, you can use the **`iisAdmin`** command on the services tier computer to change the documentation location that the product F1 and help links refer to. (The ⇒ symbol indicates a line continuation):

Windows

```
IS_install_path\ASBServer\bin\iisAdmin.bat -set -key ⇒
com.ibm.iis.infocenter.url -value http://<host>:<port>/help/topic/
```

AIX® Linux

```
IS_install_path/ASBServer/bin/iisAdmin.sh -set -key ⇒
com.ibm.iis.infocenter.url -value http://<host>:<port>/help/topic/
```

Where `<host>` is the name of the computer where the information center is installed and `<port>` is the port number for the information center. The default port number is 8888. For example, on a computer named `server1.example.com` that uses the default port, the URL value would be `http://server1.example.com:8888/help/topic/`.

Obtaining PDF and hardcopy documentation

- The PDF file books are available online and can be accessed from this support document: https://www.ibm.com/support/docview.wss?uid=swg27008803&wv=1.
- You can also order IBM publications in hardcopy format online or through your local IBM representative. To order publications online, go to the IBM Publications Center at http://www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss.

Appendix D. Providing feedback on the product documentation

You can provide helpful feedback regarding IBM documentation.

Your feedback helps IBM to provide quality information. You can use any of the following methods to provide comments:

- To provide a comment about a topic in IBM Knowledge Center that is hosted on the IBM website, sign in and add a comment by clicking **Add Comment** button at the bottom of the topic. Comments submitted this way are viewable by the public.
- To send a comment about the topic in IBM Knowledge Center to IBM that is not viewable by anyone else, sign in and click the **Feedback** link at the bottom of IBM Knowledge Center.
- Send your comments by using the online readers' comment form at www.ibm.com/software/awdtools/rcf/.
- Send your comments by e-mail to comments@us.ibm.com. Include the name of the product, the version number of the product, and the name and part number of the information (if applicable). If you are commenting on specific text, include the location of the text (for example, a title, a table number, or a page number).

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Table 3. Use of cookies by InfoSphere Information Server products and components

Product module	Component or feature	Type of cookie that is used	Collect this data	Purpose of data	Disabling the cookies
Any (part of InfoSphere Information Server installation)	InfoSphere Information Server web console	• Session • Persistent	User name	• Session management • Authentication	Cannot be disabled
Any (part of InfoSphere Information Server installation)	InfoSphere Metadata Asset Manager	• Session • Persistent	No personally identifiable information	• Session management • Authentication • Enhanced user usability • Single sign-on configuration	Cannot be disabled
InfoSphere DataStage	Big Data File stage	• Session • Persistent	• User name • Digital signature • Session ID	• Session management • Authentication • Single sign-on configuration	Cannot be disabled
InfoSphere DataStage	XML stage	Session	Internal identifiers	• Session management • Authentication	Cannot be disabled
InfoSphere DataStage	IBM InfoSphere DataStage and QualityStage® Operations Console	Session	No personally identifiable information	• Session management • Authentication	Cannot be disabled
InfoSphere Data Click	InfoSphere Information Server web console	• Session • Persistent	User name	• Session management • Authentication	Cannot be disabled
InfoSphere Data Quality Console		Session	No personally identifiable information	• Session management • Authentication • Single sign-on configuration	Cannot be disabled

Table 3. Use of cookies by InfoSphere Information Server products and components (continued)

Product module	Component or feature	Type of cookie that is used	Collect this data	Purpose of data	Disabling the cookies
InfoSphere QualityStage Standardization Rules Designer	InfoSphere Information Server web console	• Session • Persistent	User name	• Session management • Authentication	Cannot be disabled
InfoSphere Information Governance Catalog		• Session • Persistent	• User name • Internal identifiers • State of the tree	• Session management • Authentication • Single sign-on configuration	Cannot be disabled
InfoSphere Information Analyzer	Data Rules stage in the InfoSphere DataStage and QualityStage Designer client	Session	Session ID	Session management	Cannot be disabled

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