

IBM InfoSphere DataStage and QualityStage  
Version 11 Release 3

*Guide to Integrating Streams  
Applications*





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Applications*



**Note**

Before using this information and the product that it supports, read the information in “Notices and trademarks” on page 29.

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## Integrating InfoSphere Streams Applications (InfoSphere Streams connector)

The InfoSphere Streams connector enables integration between InfoSphere Streams and InfoSphere DataStage. You can use the InfoSphere Streams connector to send data from an InfoSphere DataStage job to an InfoSphere Streams job, and also to send data from an InfoSphere Streams job to an InfoSphere DataStage job.

By sending data to InfoSphere Streams from the InfoSphere DataStage jobs, InfoSphere Streams can perform near real-time analytic processing (RTAP) in parallel to the data being loaded into a warehouse by InfoSphere DataStage. Alternatively, when sending data from InfoSphere Streams to InfoSphere DataStage, the InfoSphere Streams job performs RTAP processing, and then forwards the data to InfoSphere DataStage to enrich, transform, and store the details for archival and lineage purposes.

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## Importing metadata from InfoSphere Streams applications by using the InfoSphere Metadata Asset Manager

You can import endpoints into the metadata repository of InfoSphere Information Server. You can use the endpoints in InfoSphere DataStage and QualityStage jobs.

You can import endpoints from multiple applications. The imported endpoints contain tuples and tuple attributes. Tuples can contain multiple tuple attributes. Tuple attributes are the equivalent of InfoSphere DataStage column definitions. A tuple attribute can also be a tuple, in which case it can contain other tuple attributes. Application name and application scope are properties of the imported endpoint. Not all endpoints have an application scope.

For details on how to import metadata by using InfoSphere Metadata Asset Manager, see the *IBM Information Center* or in the *IBM InfoSphere Information Server Guide to Managing Common Metadata*.

## Managing InfoSphere Streams metadata by using the `istool` command

You can move endpoints from one InfoSphere Information Server environment to another by using the `istool` command line. For example, you can move endpoints from a development environment to a test or production environment.

For more information on the `istool` command line and how to migrate the InfoSphere Streams assets see the *IBM Information Center* or in the *IBM InfoSphere Information Server Administration Guide*.

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## Designing jobs (InfoSphere Streams connector)

You can use the Streams connector to develop jobs that receive and send data.

### Procedure

1. Define an InfoSphere Streams connector job.
2. Configure the connection properties to connect to InfoSphere Streams name server.

3. Set up the Streams connector as a source to receive data.
4. Set up the Streams connector as a target to send data.
5. Compile and run the job.

## Defining an InfoSphere Streams connector job

Use the InfoSphere® DataStage® and QualityStage® Designer client to define a job by using the InfoSphere Streams connector.

### Procedure

1. From the Designer client, select **File > New** from the menu.
2. In the New window, select the **Sequential Job** or **Server Job** icon, and click **OK**.
3. In the Designer client from the Palette menu, select the **Real time** category.
4. Locate **Streams Connector** in the list of available databases.
5. Drag the **Streams Connector** stage icon to the job design canvas.
6. Enter or modify the following attributes:
  - **Name of the Streams Connector stage or link:** Modify the default name of the connector or the link. You can enter up to 255 characters. Alternatively, you can modify the name of the stage or link in the job design canvas.
  - **Description:** Enter an optional description of the stage or link.
7. Optional: Click **Configure...** to define additional configuration properties and select the endpoint metadata. For details see, "Selecting endpoint metadata in the InfoSphere Streams connector stage GUI."
8. Click **Save**.

### What to do next

Define properties to use InfoSphere Streams connector as a source.

### Selecting endpoint metadata in the InfoSphere Streams connector stage GUI

When designing a job in InfoSphere Streams connector, for additional configuration, Streams connector provides a wizard that contains a set of configuration panels.

### Procedure

1. On the job design canvas, double-click the **Streams Connector** icon.
2. Click the **Configure** button for defining the additional configuration properties. The **InfoSphere Streams endpoint selection** window is displayed.
3. In the **InfoSphere Streams endpoint selection** window, select an endpoint and click **OK**.
  - If the InfoSphere Streams connector is defined as a source with a single output link, any columns currently defined for the link are deleted and replaced by the columns defined by the tuple definition.
  - If the InfoSphere Streams connector is defined as a target with a single input link, the columns defined by the tuple are added to the columns of the input link.

## Configuring the connection properties to connect to InfoSphere Streams name server (InfoSphere Streams connector)

The InfoSphere Streams connector attempts to access the name server when the InfoSphere DataStage job starts. The InfoSphere Streams connector uses the InfoSphere Streams Web Server (SWS) name server service to request the Streams Application connection information.

The InfoSphere Streams connector looks up the host and the port, to connect to the Streams application, from the Streams name service. The InfoSphere Streams connector must be configured to use the Streams name server to resolve the endpoint host and port. Once the host and the port of the endpoint have been established, then the InfoSphere Streams connector attempts to make a client connection to the InfoSphere Streams job.

You need to define the following connection properties as input arguments for the name server service lookup:

- Endpoint name
- Application scope
- Name server host
- Name server port
- Username
- Password
- Keystore certificate

The InfoSphere Streams name server returns the following two values as a result of the successful lookup:

- Application host name
- Application port number

The InfoSphere Streams connector uses the **Application host name** and **Application port number** values to connect to the InfoSphere Streams Application DSSource or DSSink operators.

### Authenticating the InfoSphere Streams name server (InfoSphere Streams connector)

You need to set up the InfoSphere Streams connector to authenticate against the InfoSphere Streams name server. The InfoSphere Streams connector uses the InfoSphere Streams name server to lookup the host and port that it wants to connect to. Use the connection properties of the InfoSphere Streams connector to define the connection to the name server.

The InfoSphere Streams name server host is the host name of the system that runs the InfoSphere Streams SWS name server service. If you do not know the name server host name, consult your InfoSphere Streams administrator to help you identify the system that runs the InfoSphere Streams SWS name server service.

For more information about the InfoSphere Streams concepts and commands, see the *InfoSphere Streams Installation and Administration guide*.

To identify the InfoSphere Streams name server port use the **geturl streamtool** command. Execute the **geturl** command on the system that hosts the Streams SWS name server service, for example:

```
streamtool geturl -i myStreamsInstance
```

Communication with the name server is via HTTPS which requires that the self-signed certificate of the Streams server is available in a keystore file on the player node that is hosting the Streams connector stage.

The server keystore file `ibmjss2.jks` can be found in the home directory of the Streams instance owner directory:

```
<Streams Instance Owner Home Directory>/streams/instances/[instanceid]/sws/security/keystore
```

You can export the keystore certificate from the InfoSphere Streams name server and import into a new or existing keystore file stored on the player node that is hosting the InfoSphere Streams connector stage. If the server certificate is replaced by a new one, the following procedures and steps need to be repeated to update the keystore on the client side.

### Exporting the Streams Certificate

To export the Streams Certificate, use the **keytool** command that is provided in the `jre` directory of the InfoSphere Streams server installation as follows:

```
<Streams>/jre/bin/keytool -keystore ~/.streams  
/instances/[instanceid]/sws/security/keystore/ibmjss2.jts  
-export -alias lwiks -file <certificate-file>
```

The alias is always **lwiks**; which is defined by InfoSphere Streams and cannot be configured. This command exports the certificate that is associated with the alias **lwiks** to the specified certificate file. The command prompts for the password of the truststore file. By default, the password is `ibmpassw0rd`.

### Importing the Streams Certificate

To import the Streams Certificate, use the **keytool** command that is provided under the `ASBNode` or `ASBServer` directories of the InfoSphere DataStage engine install. Before running the command, copy the certificate file exported from InfoSphere Streams to the InfoSphere DataStage engine server. If the keystore file exists, then you are prompted to enter the password for the file. If the file does not exist, then you are prompted to create a password for the file. Click **Yes** if asked whether to trust the certificate.

Use the command as follows:

```
<InformationServer>/jdk/jre/bin/keytool  
-import -alias lwiks -file <certificate-file> -keystore <keystore-file>
```

### Client Authentication (InfoSphere Streams connector)

To provide additional security, you can configure client authentication to restrict Streams Web Server (SWS) connections to specified clients only.

By default, client authentication is not enabled for the InfoSphere Streams Console. If you enable and configure client authentication, the InfoSphere Streams Console allows HTTPS connections from trusted clients only. Otherwise, any user who is authorized to use the InfoSphere Streams instance and has access to the server and port that the InfoSphere Streams Console is running on, can log in using a valid user ID and password.

## Receiving data

To receive data from a Streams application by using the InfoSphere Streams connector, you need to configure the InfoSphere Streams connector as a data source. The InfoSphere Streams connector connects to the Streams application endpoint that is defined by the Streams application DSSink operator, and receives data from that operator.

The following figure shows an example of using the InfoSphere Streams connector to receive data. In this case, the InfoSphere Streams connector **Streams\_Connector\_0** receives data from the InfoSphere Streams server and then the sequential file stage writes it to the file **Sequential\_File\_1**. When you configure the InfoSphere Streams connector to receive data, you create only one output link, **DSLInk2**, which is shown in the figure below transferring rows from **Streams\_Connector\_0** to **Sequential\_File\_1**.

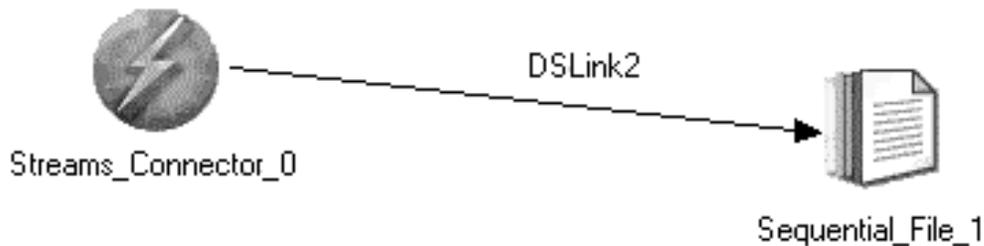


Figure 1. Example of receiving data

### Configuring InfoSphere Streams connector as a source

You can configure the InfoSphere Streams connector to process data as a source for 1 output link.

#### Procedure

1. On the job design canvas, double-click the **Streams Connector** icon.
2. In the top left corner of the stage editor, select the output link that you want to edit. By editing the output link you are setting up **Streams Connector** to be the source.
3. Specify the **Link** and **Description** properties.
4. Optional: Click **Configure** to configure additional properties. Select one endpoint from the displayed list of application names together with endpoint names that are imported into the repository. Click **OK**. The tuple definition of the endpoint is loaded into the list of columns on the output link and the columns currently defined for the link are deleted and replaced by the columns defined by the tuple definition.
5. Specify additional details in the **Properties** tab, the **Columns** tab, and the **Advanced** tab.
6. Click **OK** to save the connection settings.

## Setting up column definitions on a link

Column definitions, which you set on a link, specify the format of the data records that the connector reads from a database or writes to a database.

### Procedure

1. From the job design canvas, double-click the connector icon.
2. Use one of the following methods to set up the column definitions:
  - Drag a table definition from the repository view to the link on the job canvas. Then, use the arrow buttons to move the columns between the **Available columns** and **Selected columns** lists.
  - On the **Columns** page, click **Load** and select a table definition from the metadata repository. Then, to choose which columns from the table definition apply to the link, move the columns from the **Available columns** list to the **Selected columns** list.
3. Configure the properties for the columns:
  - a. Right-click within the columns grid, and select **Properties** from the menu.
  - b. Select the properties to display, specify the order in which to display them, and then click **OK**.
4. Optional: Modify the column definitions. You can change the column names, data types, and other attributes. In addition, you can add, insert, or remove columns.
5. Optional: Save the new table definition in the metadata repository:
  - a. On the **Columns** page, click **Save**, and then click **OK** to display the repository view.
  - b. Navigate to an existing folder, or create a new folder in which to save the table definition.
  - c. Select the folder, and then click **Save**.

## Defining properties for receiving data (InfoSphere Streams connector)

You must configure how the InfoSphere Streams connector operates in a job when receiving data by defining the usage properties.

### Before you begin

You must configure a connection (as a source) for the InfoSphere Streams connector.

### Procedure

1. On the job design canvas, double-click the **Streams Connector** icon.
2. Click the **Properties** tab.
3. On the **Properties** tab define the properties in the **Usage** section to specify how the connector operates in a job.
4. Click **OK** to save your changes.

## Sending data (InfoSphere Streams connector)

To send data to a Streams application by using the InfoSphere Streams connector, you need to configure the InfoSphere Streams connector to process data as a target. The InfoSphere Streams connector connects to the external Streams application endpoint that is defined by the Streams DSSource operator and sends data to that operator.

The following figure shows an example of using the InfoSphere Streams connector to send data. In this case, the sequential file reads data from the file **Sequential\_File\_1** and then the InfoSphere Streams connector sends data to the Streams application endpoint.

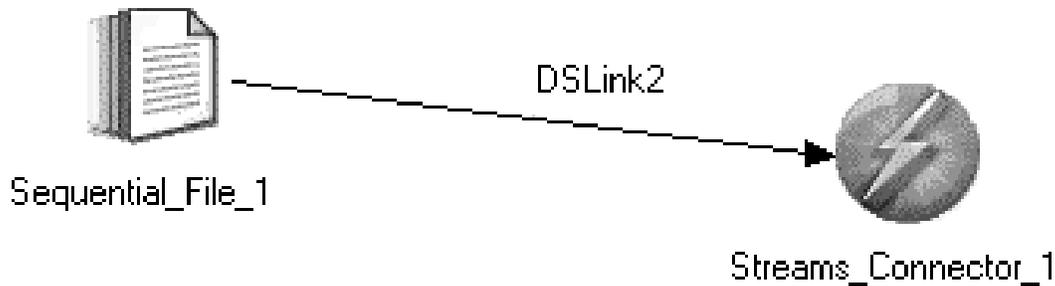


Figure 2. Example of sending data

### Configuring InfoSphere Streams connector as a target

You can configure the InfoSphere Streams connector to process data as a target for 1 input link.

#### Procedure

1. On the job design canvas, double-click the **Streams Connector** icon.
2. In the stage editor, select the input link that you want to edit. By editing the input link you are setting up Streams connector to be the target.
3. Specify the **Link** and **Description** properties.
4. Optional: Click **Configure** to configure additional properties. Select one endpoint from the displayed list of application names together with endpoint names that are imported into the repository. Click **OK**. The tuple definition of the endpoint is loaded into the list of columns on the output link and the columns currently defined for the link are deleted and replaced by the columns defined by the tuple definition.
5. Specify required details in the **Properties** tab, the **Columns** tab, the **Advanced** tab, and the **Partitioning** tab.
6. Click **OK** to save the settings.

### Setting up column definitions on a link

Column definitions, which you set on a link, specify the format of the data records that the connector reads from a database or writes to a database.

#### Procedure

1. From the job design canvas, double-click the connector icon.
2. Use one of the following methods to set up the column definitions:

- Drag a table definition from the repository view to the link on the job canvas. Then, use the arrow buttons to move the columns between the **Available columns** and **Selected columns** lists.
  - On the **Columns** page, click **Load** and select a table definition from the metadata repository. Then, to choose which columns from the table definition apply to the link, move the columns from the **Available columns** list to the **Selected columns** list.
3. Configure the properties for the columns:
    - a. Right-click within the columns grid, and select **Properties** from the menu.
    - b. Select the properties to display, specify the order in which to display them, and then click **OK**.
  4. Optional: Modify the column definitions. You can change the column names, data types, and other attributes. In addition, you can add, insert, or remove columns.
  5. Optional: Save the new table definition in the metadata repository:
    - a. On the **Columns** page, click **Save**, and then click **OK** to display the repository view.
    - b. Navigate to an existing folder, or create a new folder in which to save the table definition.
    - c. Select the folder, and then click **Save**.

### Defining properties for sending data (InfoSphere Streams connector)

You must configure how the InfoSphere Streams connector operates in a job when sending data.

#### Before you begin

You must configure a connection (as a target) for the InfoSphere Streams connector.

#### Procedure

1. On the job design canvas, double-click the **Streams Connector** icon.
2. Click the **Properties** tab.
3. On the **Properties** tab define the properties in the **Usage** section to specify how the connector operates in a job.
4. Click **OK**.

### Runtime column validations (InfoSphere Streams connector)

You can validate extra columns when the InfoSphere Streams connector is used as a source or as a target using the **Schema reconciliation** property.

#### Validating extra columns when used as a source stage

- If there are any additional columns on the link that do not map to attributes of the tuple, the connector might issue a warning at initialization time that link has unmatched columns, or it might fail the job. The property **Usage > Schema reconciliation > Unmatched columns** determines whether this conditions is ignored, or results in a warning or job failure. The connector drops any unmatched column from the schema.
- If there are attributes in the tuple that do not match to columns, the connector might issue a warning message at initialization time that the attributes are ignored, or it might fail the job. The property **Usage > Schema reconciliation > Unmatched attributes** determines whether this condition is ignored, or results in

a warning or job failure. This feature allows a user to ignore tuple attributes that are not of interest by excluding them from the design schema, and hence to improve the performance of the job.

- If there are attributes in the tuple that do not match to columns, the connector does not issue a warning message at initialization time and all attributes of the tuple are sent to the output link.

#### Validating extra columns when used as a target stage

- If there are additional columns on the link that do not map to attributes of the tuple, the connector might generate a warning at initialization time that the link has extra columns, or it might fail the job. The property **Usage > Schema reconciliation > Unmatched columns** determines whether this conditions is ignored, or results in a warning or job failure.
- If there are attributes in the tuple that do not match to columns, the connector might issue a warning message at initialization time that there are unmatched attributes, or it might fail the job. The property **Usage > Schema reconciliation > Unmatched attributes** determines whether this conditions is ignored, or results in a warning or job failure.

## Data type conversions (InfoSphere Streams connector)

IBM® InfoSphere DataStage supports a set of data types that are different from InfoSphere Streams data types.

The InfoSphere Streams connector supports the following :

- Data type mapping during Streams Processing Language (SPL) code generation by the Streams Processing Language (SPL) Code generator (in InfoSphere Streams) process from the InfoSphere DataStage jobs that contain the InfoSphere Streams connector.
- Data type mapping when importing the InfoSphere Streams metadata by using the InfoSphere Streams Metadata Bridge in InfoSphere Metadata Asset Manager.

### Data type conversions from InfoSphere DataStage to InfoSphere Streams

The following table defines data type mapping during SPL code generation by the SPL Code generator (in InfoSphere Streams) that processes the data streams from the InfoSphere DataStage jobs that contain the InfoSphere Streams connector.

*Table 1. InfoSphere DataStage data types and their equivalent InfoSphere Streams data types*

InfoSphere DataStage data types	InfoSphere Streams data types
TinyInt	int8
TinyInt (Unsigned)	uint8
SmallInt	int16
SmallInt (Unsigned)	uint16
Integer	int32
Integer (Unsigned)	uint32
BigInt	int64
BigInt (Unsigned)	uint64
Float, Real	float32
Double	float64

Table 1. InfoSphere DataStage data types and their equivalent InfoSphere Streams data types (continued)

InfoSphere DataStage data types	InfoSphere Streams data types
Decimal, Numeric	decimal32, decimal64, decimal128 <b>Note:</b> Streams SPL Code generator will map DataStage decimal and numeric data types into Streams data types depending on the defined decimal number precision of data stage data types: <ul style="list-style-type: none"> <li>• precision &lt;= 7 -&gt; decimal32</li> <li>• 7 &lt; precision &lt;= 16 -&gt; decimal64</li> <li>• precision &gt; 16 -&gt; decimal128</li> </ul> if precision is not specified, default is decimal64.
Unknown, Char, VarChar, LongVarChar	rstring, rstring[n] <b>Note:</b> If the DataStage type has a maximum length specified, then the type will be mapped to rstring[n], otherwise it will be mapped to rstring.
NChar, NVarChar, LongNVarChar	ustring
Binary, VarBinary, LongVarBinary	blob
Bit	boolean
Time	timestamp. The date component of the timestamp is set to 1970-01-01 (the Epoch date).
Date	timestamp. The time component of the timestamp is set to 0.
Timestamp	timestamp

## Data type conversions from InfoSphere Streams to InfoSphere DataStage

The following table defines data type mapping when importing the InfoSphere Streams metadata by using the InfoSphere Streams Metadata Bridge in InfoSphere Metadata Asset Manager.

Table 2. InfoSphere Streams data types and their equivalent InfoSphere DataStage data types

InfoSphere Streams data types	InfoSphere DataStage data types
boolean	Bit (0 or 1)
int8	TinyInt
uint8	TinyInt (Unsigned)
int16	SmallInt
uint16	SmallInt (Unsigned)
int32	Int
uint32	Int (Unsigned)
int64	BigInt
uint64	BigInt (Unsigned)
float32	Float

Table 2. InfoSphere Streams data types and their equivalent InfoSphere DataStage data types (continued)

InfoSphere Streams data types	InfoSphere DataStage data types
float64	Double
decimal32	VarChar or Decimal/Numeric <b>Note:</b> There is no DataStage equivalent type to the streams floating decimals, the safest type that preserves precision is character representation of floating decimals, the character format of the number is in the normalized scientific presentation.
decimal64	VarChar
decimal128	VarChar
complex32	2 Float columns: real followed by imaginary parts.
complex64	2 Double columns: real followed by imaginary parts.
rstring	VarChar
ustring	NVarChar
XML	LongVarBinary
timestamp	Timestamp (potential loss of precision)
blob	LongVarBinary
enum	Integer. The value is the integral enumerated code value defined by the Streams type.
tuple	Tuples are supported, but the hierarchy is flattened in the link metadata. See note at the end of the table for more information.
collections	VarChar, (if the Streams collection type has no elements of type ustring, the Streams collection type is mapped to DataStage varchar type), NVarChar, (if the Streams collection type has at least one element of type ustring, the Streams collection type is mapped to NVarChar DataStage type).

**Note:** The import of InfoSphere Streams metadata into InfoSphere Metadata Asset Manager has no limitations. All tuples, nested tuples, collections, enum types and primitive types can be imported. Specific limitations are:

#### Nested tuples

Data types tuple<int32 id, tuple<float64 long, float64 lat> location, rstring name> is supported because the data is effectively flat. The metadata is represented on the link as 4 columns: id, long, lat & name. The name of the tuple attribute, location, is not included in the column name, but the description of the field needs to be set to include the path of the field (for example: "location.long", "location.lat").

#### Collections

The InfoSphere Streams connector supports all Streams collection types: list, set and map, by flattening them to an XML string. The connector supports sending and receiving of collection types, and supports bounded and unbounded collections. The column carrying the XML can be any

string type including native and Unicode strings. The InfoSphere Streams connector supports only collections of primitive types, collections of nested collections is not supported.

The following XSD describes the XML format used to pass the collection data.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:ccstreams="http://com.ibm.iis.streams"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  attributeFormDefault="unqualified"
  elementFormDefault="unqualified"
  ccstreams:hdISchemaVersion="1.0"
  targetNamespace="http://com.ibm.iis.streams">
  <xs:element name="List" type="ccstreams:ListOrSetCollection"/>
  <xs:element name="Set" type="ccstreams:ListOrSetCollection"/>
  <xs:element name="Map" type="ccstreams:MapCollection"/>
  <xs:complexType name="ListOrSetCollection">
    <xs:sequence minOccurs="0" maxOccurs="unbounded">
      <xs:element name="V" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="MapCollection">
    <xs:sequence minOccurs="0" maxOccurs="unbounded">
      <xs:element name="E" type="ccstreams:MapEntry"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="MapEntry">
    <xs:sequence minOccurs="0" maxOccurs="1">
      <xs:element name="K" type="xs:string"/>
      <xs:element name="V" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

An example of the XML for a list `<rstring>` containing 3 elements is as follows:

```
<?xml version="1.0" ?>
<cs:List xmlns:cs="http://com.ibm.iis.streams">
  <V>Cat</V>
  <V>Dog</V>
  <V>Mouse</V>
</cs:List>
```

An example of the XML for a map `<int32, rstring>` containing 3 elements is as follows:

```
<?xml version="1.0" ?>
<cs:Map xmlns:cs="http://com.ibm.iis.streams">
  <E><K>100</K><V>Badger</V><E>
  <E><K>200</K><V>Skunk</V><E>
  <E><K>300</K><V>Hamster</V><E>
</cs:Map>
```

E is an abbreviation for 'entry', K is an abbreviation for 'key' and V is an abbreviation for 'value'. These short names are used to minimize the length of the XML string. XML is used since it can be readily built and parsed by the XML stage.

All element values are represented as a string within the XML. The expected format is as mentioned in the following table:

Type	Format
decimal	A decimal string, e.g. "123.456", "1.23e+10".
timestamp	"YYYY-MM-DD MI:SS:YY[.FFFFFFFFF]"
complex	Two decimal strings separated by a comma. The decimal strings may optionally be in scientific notation, e.g. "123.4,874.2" or "1.23e5,4.56e-19".
blob	A hexadecimal string, e.g. "04F2B05005" represents the decimal byte values 4, 242, 176,80, 5.

### Bounded collections

When passing a bounded collection from InfoSphere DataStage to InfoSphere Streams, the XML data that is sent must include values for all elements of the collection including the unused elements of the collection. If the number of elements passed in the XML string is less than the bounded size, then Null values as defined by the connector properties **Usage > Null** values are sent for the unused elements of the collection.

---

## Compiling and running InfoSphere Streams connector jobs

You can compile InfoSphere Streams connector jobs into executable scripts that you can schedule and run.

### Procedure

1. In the InfoSphere DataStage and QualityStage Designer client, open the job that you want to compile.
2. Click **Compile**.
3. If the Compilation Status area shows errors, edit the job to resolve the errors. After resolving the errors, click **Re-compile**.
4. When the job compiles successfully, click **Run**, and specify the job run options:
  - a. Enter the job parameters as required.
  - b. Click **Validate** to verify that the job will run successfully without actually extracting, converting, or writing data.
  - c. Click **Run** to extract, convert, or write data.
5. To view the results of validating or running a job:
  - a. In the Designer client, select **Tools > Run Director** to open the Director client.
  - b. In the Status column, verify that the job was validated or completed successfully.
  - c. If the job or validation fails, select **View > Log** to identify any runtime problems.
6. If the job has runtime problems, fix the problems, recompile, validate (optional), and run the job until it completes successfully.

---

## Troubleshooting (InfoSphere Streams connector)

When you use the InfoSphere Streams connector, you might encounter errors that can be fixed by troubleshooting, adjusting values for properties or configuration. The most common types of errors that you might encounter are Name Server Authorization errors, runtime errors, and GUI errors.

## Name Server Authorization errors

If there are problems with the HTTPS communication when you are accessing the InfoSphere SWS Streams name server service, you might encounter **any one** of the following authorization errors:

Table 3. Authorization errors

Error details	Troubleshooting details
<b>Invalid keystore file:</b> Streams_Stage_0,0: Failed to lookup the name from the name server: java.lang.Exception: Truststore file does not exist: C:\KeyStore\badname.jks	<p>If the errors occur when you are testing the connection by using the test link in the InfoSphere Streams connector stage user interface, to correct the error, verify, and configure the name server authentication and client authentication as required.</p> <p>If the error persists, verify that the ASB agent is working and if required restart the ASB agent on your server that hosts the Information Server engine tier.</p> <p><b>Note:</b> For details about the InfoSphere Streams SWS security settings, see the <i>InfoSphere Streams Installation and Administration Guide</i>.</p>
<b>Invalid client certificate file:</b> Streams_Stage_0,0: Failed to lookup the name from the name server: java.security.KeyStoreException: IBMKeyManager: Problem accessing key store java.lang.Exception: Keystore file does not exist: bad.p12	
<b>Invalid client certificate password:</b> Streams_Stage_0,0: Failed to lookup the name from the name server: java.security.KeyStoreException: IBMKeyManager: Problem accessing key store java.io.IOException: Unable to verify MAC.	
<b>Client authentication is enabled  in the Streams Name Server  but not configured in the  Streams Connector:</b> Streams_Stage_0,0: Failed to lookup the name from the name server: Software caused connection abort: socket write error	
<b>Server certificate is updated  on the Streams server, but the  client keystore is out of date  with respect to the server certificate:</b> Streams_Stage_0,0: Failed to lookup the name from the name server: com.ibm.jsse2.util.g: PKIX path building failed: java.security.cert. CertPathBuilderException: unable to find valid certification path to requested target	

## Runtime errors

You might encounter the following error when you are running an InfoSphere Streams job:

Table 4. Runtime errors

Error details	Troubleshooting details
Streams_Stage_5, 0: End point name <endpoint name> was not found.	<p>This error occurs when the InfoSphere Streams application that contains the specific endpoint is not registered with the InfoSphere Streams Name Server, either because the InfoSphere Streams application is not running, or because it is in invalid state.</p> <p>To check the status of the InfoSphere Streams job, log in to the InfoSphere Streams server, run the streams toolkit command <b>lsjobs</b>, and then verify the Healthy status of the listed job, for example:</p> <pre>\$ streamtool lsjobs -i &lt;My Streams Instance name&gt; Instance:&lt;My Streams instance name&gt; Id State <b>Healthy</b> User 2 Running <b>no</b> dsadm Date 2012-06-19T00:44:53+0530 Name &lt;My Streams job name&gt;</pre>
Streams_Connector_4,0: java.lang.Exception: Login to host <hostname:port_number> with user <user name> failed.	<p>This error occurs when the LDAP password of InfoSphere Streams server user account is changed.</p> <p>To correct this error, you must re-create the InfoSphere Streams instance and update the InfoSphere Streams name server password in DataStage jobs.</p> <p><b>Note:</b> For more information about the Streams concepts, see the InfoSphere Streams documentation.</p>

## GUI errors

When you click **Configure** on the InfoSphere Streams connector stage user interface to select an endpoint, either the user interface might hang, or nothing happens, or you might encounter the following error:

Table 5. GUI errors

Error details	Troubleshooting details
Failed to instantiate the resource wrapper class.	<p>This error occurs because of a problem in communication between the InfoSphere Streams connector stage user interface and the ASB agent.</p> <p>To correct the error, you must restart the ASB agent service on your server that hosts the Information Server engine tier, and try again to select the endpoint.</p>

Table 5. GUI errors (continued)

Error details	Troubleshooting details
<p>Testing the connection by using the test link in the InfoSphere Streams connector stage is not working as expected. The error is as follows:</p> <ul style="list-style-type: none"> <li>• Testing the connection by using the test link in the InfoSphere Streams connector stage works successfully even after you have set invalid Keystore file, invalid Client certificate, or invalid Certificate password properties. In this error, if the first connection by using the test link in the InfoSphere Streams connector stage is successful, the following test connections are successful regardless of the values for the Keystore file, Client certificate, or Certificate password properties.</li> <li>• Testing the connection by using the test link in the InfoSphere Streams connector stage does not work successfully even after you have set valid Keystore file, valid Client certificate, and valid Certificate password properties. In this error, if the first connection by using the test link in the InfoSphere Streams connector stage is unsuccessful, the following test connections are unsuccessful regardless of the values for the Keystore file, Client certificate, or Certificate password properties.</li> </ul>	<p>This error occurs because the InfoSphere Streams connector is loaded by the ASB Server, and the keystore and client certificate properties are set as system properties of JVM loaded by the ASB Server at the time when the test connection call is issued. Once the JVM system properties are set they cannot be changed until JVM is reloaded, that is, ASB Server is restarted. Because the other connectors depend on ASB server, ASB Server JVM cannot be reloaded on CC Streams test connection call.</p> <p>To correct the error, modify the InfoSphere Streams connector connection properties (Keystore file, Client certificate, or Certificate password properties), then restart the ASB agent service on your server that hosts the Information Server engine tier, and, try again to test the InfoSphere Streams connection.</p>

---

## 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](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. Reading command-line syntax

This documentation uses special characters to define the command-line syntax.

The following special characters define the command-line syntax:

- [ ] Identifies an optional argument. Arguments that are not enclosed in brackets are required.
- ... Indicates that you can specify multiple values for the previous argument.
- | Indicates mutually exclusive information. You can use the argument to the left of the separator or the argument to the right of the separator. You cannot use both arguments in a single use of the command.
- { } Delimits a set of mutually exclusive arguments when one of the arguments is required. If the arguments are optional, they are enclosed in brackets ([ ]).

**Note:**

- The maximum number of characters in an argument is 256.
- Enclose argument values that have embedded spaces with either single or double quotation marks.

For example:

```
wsetsrc[-S server] [-l label] [-n name] source
```

The *source* argument is the only required argument for the **wsetsrc** command. The brackets around the other arguments indicate that these arguments are optional.

```
wlsac [-l | -f format] [key... ] profile
```

In this example, the -l and -f format arguments are mutually exclusive and optional. The *profile* argument is required. The *key* argument is optional. The ellipsis (...) that follows the *key* argument indicates that you can specify multiple key names.

```
wrb -import {rule_pack | rule_set}...
```

In this example, the *rule\_pack* and *rule\_set* arguments are mutually exclusive, but one of the arguments must be specified. Also, the ellipsis marks (...) indicate that you can specify multiple rule packs or rule sets.



---

## Appendix C. How to read syntax diagrams

The following rules apply to the syntax diagrams that are used in this information:

- Read the syntax diagrams from left to right, from top to bottom, following the path of the line. The following conventions are used:
  - The >>--- symbol indicates the beginning of a syntax diagram.
  - The ---> symbol indicates that the syntax diagram is continued on the next line.
  - The >--- symbol indicates that a syntax diagram is continued from the previous line.
  - The --->< symbol indicates the end of a syntax diagram.
- Required items appear on the horizontal line (the main path).



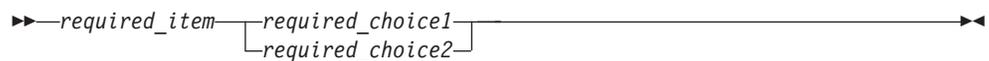
- Optional items appear below the main path.



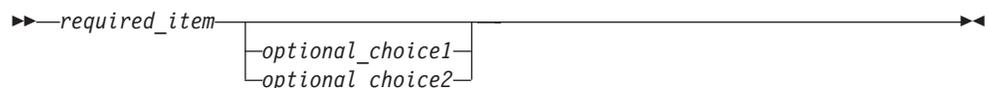
If an optional item appears above the main path, that item has no effect on the execution of the syntax element and is used only for readability.



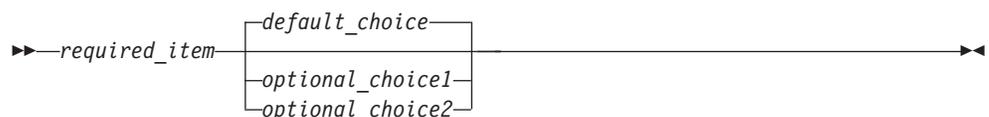
- If you can choose from two or more items, they appear vertically, in a stack. If you must choose one of the items, one item of the stack appears on the main path.



If choosing one of the items is optional, the entire stack appears below the main path.



If one of the items is the default, it appears above the main path, and the remaining choices are shown below.



- An arrow returning to the left, above the main line, indicates an item that can be repeated.



If the repeat arrow contains a comma, you must separate repeated items with a comma.



A repeat arrow above a stack indicates that you can repeat the items in the stack.

- Sometimes a diagram must be split into fragments. The syntax fragment is shown separately from the main syntax diagram, but the contents of the fragment should be read as if they are on the main path of the diagram.



**Fragment-name:**



- Keywords, and their minimum abbreviations if applicable, appear in uppercase. They must be spelled exactly as shown.
- Variables appear in all lowercase italic letters (for example, *column-name*). They represent user-supplied names or values.
- Separate keywords and parameters by at least one space if no intervening punctuation is shown in the diagram.
- Enter punctuation marks, parentheses, arithmetic operators, and other symbols, exactly as shown in the diagram.
- Footnotes are shown by a number in parentheses, for example (1).

---

## Appendix D. 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 6. IBM resources*

<b>Resource</b>	<b>Description and location</b>
IBM Support Portal	You can customize support information by choosing the products and the topics that interest you at <a href="http://www.ibm.com/support/entry/portal/Software/Information_Management/InfoSphere_Information_Server">www.ibm.com/support/entry/portal/Software/Information_Management/InfoSphere_Information_Server</a>
Software services	You can find information about software, IT, and business consulting services, on the solutions site at <a href="http://www.ibm.com/businesssolutions/">www.ibm.com/businesssolutions/</a>
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 <a href="http://www.ibm.com/account/">www.ibm.com/account/</a>
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 <a href="http://www.ibm.com/training">http://www.ibm.com/training</a>
IBM representatives	You can contact an IBM representative to learn about solutions at <a href="http://www.ibm.com/connect/ibm/us/en/">www.ibm.com/connect/ibm/us/en/</a>



---

## Appendix E. 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 F. 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/](http://www.ibm.com/software/awdtools/rcf/).
- Send your comments by e-mail to [comments@us.ibm.com](mailto: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 7. 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	<ul style="list-style-type: none"> <li>• Session</li> <li>• Persistent</li> </ul>	User name	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> </ul>	Cannot be disabled
Any (part of InfoSphere Information Server installation)	InfoSphere Metadata Asset Manager	<ul style="list-style-type: none"> <li>• Session</li> <li>• Persistent</li> </ul>	No personally identifiable information	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> <li>• Enhanced user usability</li> <li>• Single sign-on configuration</li> </ul>	Cannot be disabled

Table 7. 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 DataStage	Big Data File stage	<ul style="list-style-type: none"> <li>• Session</li> <li>• Persistent</li> </ul>	<ul style="list-style-type: none"> <li>• User name</li> <li>• Digital signature</li> <li>• Session ID</li> </ul>	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> <li>• Single sign-on configuration</li> </ul>	Cannot be disabled
InfoSphere DataStage	XML stage	Session	Internal identifiers	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> </ul>	Cannot be disabled
InfoSphere DataStage	IBM InfoSphere DataStage and QualityStage Operations Console	Session	No personally identifiable information	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> </ul>	Cannot be disabled
InfoSphere Data Click	InfoSphere Information Server web console	<ul style="list-style-type: none"> <li>• Session</li> <li>• Persistent</li> </ul>	User name	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> </ul>	Cannot be disabled
InfoSphere Data Quality Console		Session	No personally identifiable information	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> <li>• Single sign-on configuration</li> </ul>	Cannot be disabled
InfoSphere QualityStage Standardization Rules Designer	InfoSphere Information Server web console	<ul style="list-style-type: none"> <li>• Session</li> <li>• Persistent</li> </ul>	User name	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> </ul>	Cannot be disabled
InfoSphere Information Governance Catalog		<ul style="list-style-type: none"> <li>• Session</li> <li>• Persistent</li> </ul>	<ul style="list-style-type: none"> <li>• User name</li> <li>• Internal identifiers</li> <li>• State of the tree</li> </ul>	<ul style="list-style-type: none"> <li>• Session management</li> <li>• Authentication</li> <li>• Single sign-on configuration</li> </ul>	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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