IBM Integration Bus
iSeries Adapter Nodes

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This edition supports IBM Integration Bus and to all subsequent releases and modifications unless otherwise indicated in new editions.

Take Note!

Before using this report be sure to read the general information under "Notices".

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Acknowledgments

Acknowledgments

Summary of Amendments

Date	Changes
December 01st 2011	Initial release
August 06th 2012	Minor updates
	– Version 9.0 check
	– CCSID parameter added

August 28th 2013

Preface

This SupportPac supplies IBM Integration Bus plug-in nodes that allow connection to programs and data queues on IBM I (Power Systems including AS/400, iSeries, and System I).

The supplied version had been developed and tested on Linux 86 and Microsoft Windows XP .

POSSIBLE USES

This plug-in is designed for people who:

- need to implement integration scenarios between IBM Integration Bus and iSeries programs (ILE RPG or Cobol) and iSeries data queues.

SKILL LEVEL REQUIRED

To use the plug-in, you need to be familiar with IBM Integration Bus and IBM I.

Bibliography

http://pic.dhe.ibm.com/infocenter/wmbhelp/v9r0m0/index.jsp	IBM Integration Bus V7 InfoCenter
http://publib.boulder.ibm.com/infocenter/iadthelp/v6r0/index.jsp?topic=/com.ibm.iseries.xd.doc/html/javaapps.htm	Developing Java Applications
http://www-03.ibm.com/systems/i/software/toolbox/	IBM Toolbox for Java
ISBN: 193118206X	Java for RPG Programmers Authors: Coulthard P., Farr G.

Overview

Need for iSeries Adapter Nodes

Many companies run their business on packaged or home-grown applications deployed on a System i Application system. Some of these applications don't provide service interfaces to integrate them with other applications so there is still the need for some kind of adapters to enable these applications for service orientation.

IBM Integration Bus (IIB) provides a large set of functions that enables architects and developers to build interface logic and service bus functions and run them on the same infrastructure. This results in lower cost of ownership for the middleware infrastructure and reuse of development and administration skills.

This SupportPac delivers a set of IIB extension nodes which can be used to create integration scenarios between IIB message flows and iSeries applications without extensive coding.

Installing the Plug-in node

Plug-in contents

The supplied zip file should be unzipped in a temporary directory. The following files will be created:

<temp>\Iseries Adapter Nodes User Guide.pdf	This document
<temp>\runtime\jplugin <temp>\runtime\XSL	Runtime components to be placed on the server where IBM Integration Bus is installed
<temp>\toolkit\plugin	Build time component for the IBM Integration Toolkit
<temp>\toolkit\samples\iSeriesAdaptersamplesPI.zip	Project interchange file with sample projects that can be imported into IBM Integration Toolkit
<temp>\toolkit\samples\wmbsample.savf	Savefile containing an iSeries library containing the required objects for the sample project

Prerequisites

This plug-in provides a user defined node to be used with the IBM Integration Bus version 9 and above.

Required software

- IBM Integration Bus V9 and above.
  - http://www-03.ibm.com/software/products/us/en/integration-bus/
- IBM Toolbox for Java
  - http://www-03.ibm.com/systems/i/software/toolbox/

Supported Platforms

This plug-in has been developed and tested in a Microsoft Windows and Linux environment but it should run on any platform supported by IBM Integration Bus.

Installing the plug-in node on IBM Integration Bus system

The node implementation '**jar**' file should be installed by copying or moving the appropriate file to a directory that is listed in the LIL_PATH environment variable of the IBM Integration Bus installation.

On Windows that could be <IIB-Installation-Root>\jplugin or any other directory that you added to the LIL_PATH yourself.

On Linux and AIX the recommendation is to put the '**jar**' file into /var/mqsi/extensions, but here – as well as on Windows – you can use any directory that you added to the LIL_PATH

yourself.

The node implementation has a dependency to the IBM Toolbox for Java library(jt400.jar). This library is delivered as part of **IBM i Series Access**.
JTOpen is the open source version of the IBM Toolbox for Java licensed program.

- Go to: http://jt400.sourceforge.net/
- Download the latest version of JTopen
- Extract the compressed file to a temporary folder
- Copy jt400.jar to <Integration Bus Workpath>\shared-classes

You must stop and restart the integration bus to enable it to detect the existence of the new 'jar'.

The IseriesPcmlCall node uses XML style sheets to transform messages from and to PCML format. These style sheets needs to be placed in the *<Integration Bus Workpath>\XSL* directory. For Windows this path is by default:
    'C:\ProgramData\IBM\MQSI\XSL'
This SupportPac contains sample style sheets that can be copied from the *<temp>\runtime\XSL* folder.

Note: The node implementation 'jar' file and its dependencies must be installed on all IBM Integration Bus systems where message flows containing this plug-in node will be deployed.

Integrating the plug-in node into the IBM Integration Toolkit

The extension nodes for IBM Integration Toolkit come as a plug-in jar file.

Copy the .jar file that is contained in the Install/Toolkit/plugin subdirectory to the dropins/plugins directory that is part of your IBM Integration Toolkit installation.
By default, this will be the directory: <Toolkit_RootInstallDirectory>/dropins/plugins on the Windows or Linux workstation where the IBM Integration Toolkit is installed.
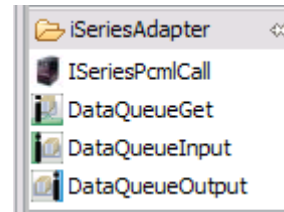
Start the Toolkit.

The iSeries Adapter Nodes should now be available for use as part of the Toolkit Node Palette.

Using the plug-in node

Description

This SupportPac contains four nodes:

- IseriesPcmlCall

- DataQueueGet

- DataQueueInput

- DataQueueOutput

The nodes can be found in the palette of the message flow editor under the category iSeriesAdapter.

IseriesPcmlCall Node

The IseriesPcmlCall node can call iSeries ILE programs and modules written in RPG or Cobol
It makes use of PCML program call documents to describe input and output parameter structures.
The PCML file needs to be generated by the iSeries programmer and transferred to the IBM Integration Toolkit (replace the program and file names with real values):
- Generate the PCML file:
    - Compile the program and specify the PGMINFO option:
      CRTBNDRPG PGM(LIBNAME/CUSTRPT) PGMINFO(*PCML) INFOSTMF('/home/custrpt.pcml')
- Transfer the generated PCML file from the System i integrated file system(IFS) to your workstation. This could be done with the System i Operations Navigator for instance.
- Import the PCML file into your IBM Integration Toolkit.
- Use the provided XML style sheet (*transformPcmlToXsd.xsl*) to transform the PCML file into a XML schema.
    - Right click on the style sheet and select: **Run-As>XSL Transformation**
    - Select the PCML file as source file and specify a target file name (for instance: *custrpt.xsd*)
    - Right click on the generated schema and select: **Validate**
    - There should be no error.
Note:
The IseriesPcmlCall node supports two types of program calls (PCML and XPCML calls).
Two different XML style sheets are provided to support the generation of XML schema files.

The generated XML schema can be used to create IIB message definitions by importing them into an XML enabled message set.

Note:
There are some data types not supported by PCML currently. See the restrictions at:
http://publib.boulder.ibm.com/infocenter/iadthelp/v7r0/index.jsp?
topic=/com.ibm.etools.iseries.pgmgd.doc/c0925076180.htm

The generated PCML file will have additional comments if there are not supported data types.

Data Queue Nodes

The nodes can send and retrieve messages from iSeries data queues. They support keyed and non-keyed data queues. The DataQueueInput node can start a message flow.
The nodes work on BLOB messages but MRM CWF parser or DFDL can be used to define data format.

For more details about iSeries data queues see the following links:

- http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp?topic=%2Frzaik%2Frzaikdqapitypuse.htm
- http://publib.boulder.ibm.com/infocenter/iadthelp/v7r5/index.jsp?topic=/com.ibm.etools.iseries.toolbox.doc/dtaq.htm

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Connectivity Parameters

Connectivity parameters are externalized using a User Defined Configurable Service.
This entry could be created by:

- command line using mqsicreateconfigurableservice
  - http://pic.dhe.ibm.com/infocenter/wmbhelp/v9r0m0/topic/com.ibm.etools.mft.doc/an37205_.htm
  - Example command:
    - mqsicreateconfigurableservice IIB9NODE -c UserDefined -o myIseries -n " \"iSeriesAddress\", \"iSeriesPassword\", \"iSeriesUser\", \"maxConnections\", \"maxUseTimeout\", \"minConnections\" " -v " \"ADDRESS\", \"PASSWORD\", \"USER\", \"5\", \"-1\", \"1\" "
- IBM Integration Explorer
  - right click on **Configurable Services** and select **New->Configarable Service**
  - scroll down in the **Type** drop down box and select **UserDefined**
- Drag and drop a XML file on a running Integration Node in IBM Integration Explorer
  - Example XML file:
    - ```
      <?xml version="1.0" encoding="UTF-8"?><configurableservice
      csName="myISeries" csType="UserDefined" iSeriesAddress="ADDRESS"
      iSeriesPassword="PASSWORD" iSeriesUser="USER" maxConnections="5"
   maxUseTimeout="-1" minConnections="1"/>
      ```

| Name | Value |
|---|---|
| iSeriesAddress | Network address of the iSeries server |
| iSeriesUser | User name |
| iSeriesPassword | User password |
| minConnections | Minimum number of pre-established connections for the connection pool |
| maxConnections | Maximum number of connections |
| maxUseTimeout | Timeout for returning connections to the pool |

**Plug-in node terminals**

| Terminal | Description |
| --- | --- |
| Failure | The output terminal which the message is routed to if failure is detected during the processing. |
| Out | The output terminal that outputs the generated message. |
| In | The input terminal which accepts a message (not available for the DataQueueInput Node) |

**IseriesPcmlCall Node properties**

These properties are displayed in the Properties view when you select one of the iSeries Adapter Node entries in the Message Flow Editor pane.
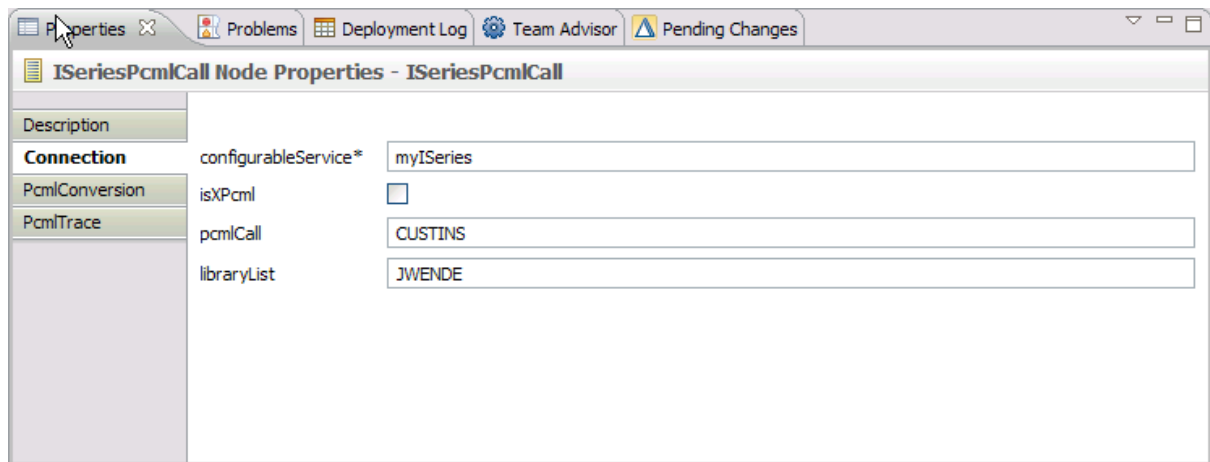


The tab with the title "Description" is the standard tab, that allows you to change the node's name in the flow , give a short and a long description of it's purpose in the message flow.

| Tab | Name | Usage |
| --- | --- | --- |
| Connection | configurableService | Name of a Userdefined Configurable Service |
| | isXPcml | Use XPCML syntax instead of PCML syntax |
| | pcmlCall | Name of the module or program to be called |
| | libraryList | Comma separated list of additional libraries required to run the program |
| | ccsid | The CCSID of the message. Defaults to 1208 (UTF 8) |

| Tab | Name | Usage |
|---|---|---|
| PcmlConversion | toPCML | XML stylesheet used to convert the inbound message to PCML format |
| | fromPCML | XML stylesheet used to convert the outbound PCML message |
| PcmlTrace | enable | IF selected the node will write trace data |
| | traceDirectory | location of the trace files |

The properties for the ISeriesPcmlCall node can be changed using LocalEnvironment overrides:

*ISeriesPcmlCall*
      *pcmlCall*
      *libraryList*
      *toPcml*
      *toXPcml*
      *fromXPcml*

## DataQueueInput Node and DataQueueGet properties

These properties are displayed in the Properties view when you select one of the iSeries Adapter Node entries in the Message Flow Editor pane.
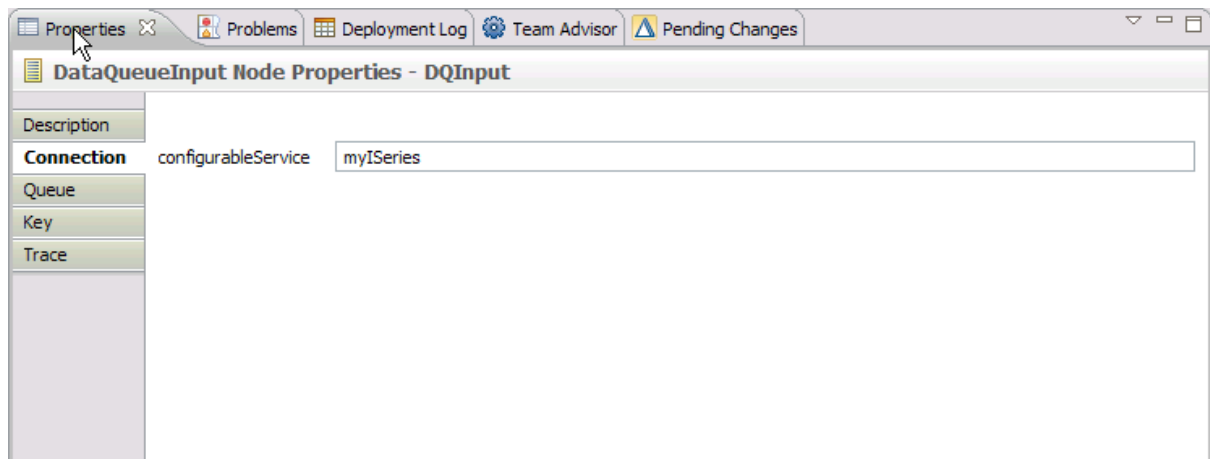


The tab with the title "Description" is the standard tab, that allows you to change the node's name in the flow , give a short and a long description of it's purpose in the message flow.

| Tab | Name | Usage |
|---|---|---|
| Connection | configurableService | Name of a Userdefined Configurable Service |

| Tab | Name | Usage |
|---|---|---|
| Queue | queueName | name of the dataqueue object |
| | library | library object where the dataqueue is stored in |
| | waitInterval | time to wait for a message |
| | type | DTAQ (fixed value) |
| Key | keyed | IF selected the node expects a keyed dataqueue |
| | key | key value to search a message for |
| | searchType | operation to be used for comparing the key during the search operation |
| Trace | enabled | IF selected the node will write trace data |
| | directory | location of the trace files |

The properties for the DataQueueGet node can be changed using LocalEnvironment overrides:

> *DataQueue*
> > *queueName*
> > *library*
> > *type*
> > *waitInterval*
> > *keyed*
> > *key*
> > *searchType*

**DataQueue Ouput Node properties**

These properties are displayed in the Properties view when you select one of the iSeries Adapter Node entries in the Message Flow Editor pane.
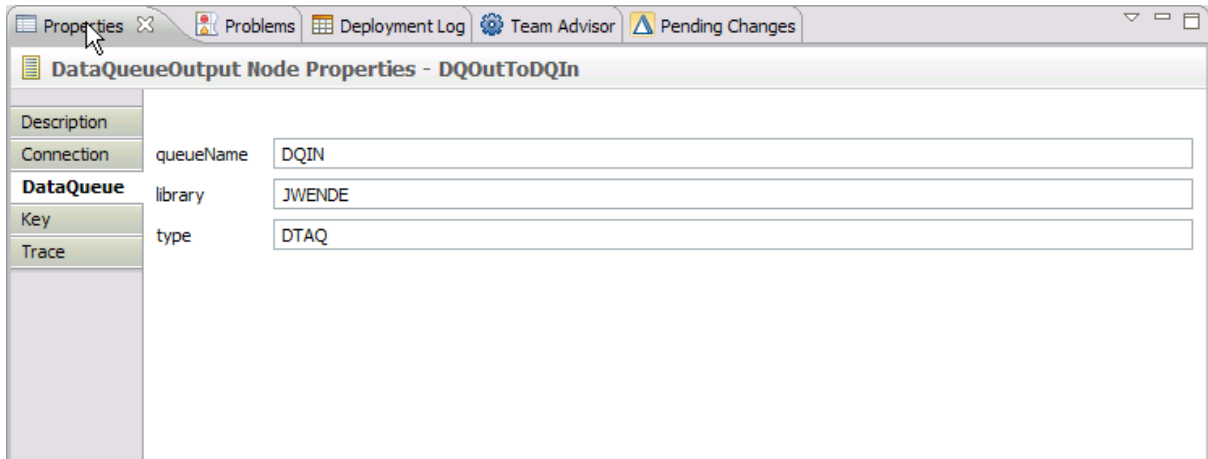
The tab with the title "Description" is the standard tab, that allows you to change the node's name in the flow , give a short and a long description of it's purpose in the message flow.

| Tab | Name | Usage |
| --- | --- | --- |
| Connection | configurableService | Name of a Userdefined Configurable Service |
| Queue | queueName | name of the dataqueue object |
| | library | library object where the dataqueue is stored in |
| | type | DTAQ (fixed value) |
| Key | keyed | IF selected the node expects a keyed dataqueue |
| | key | key value to search a message for |
| | searchType | operation to be used for comparing the key during the search operation |
| Trace | enable | IF selected the node will write trace data |
| | directory | location of the trace files |

The properties for the DataQueueOutput node can be changed using LocalEnvironment overrides:

> *DataQueue*
> > *queueName*
> > *library*
> > *type*
> > *keyed*
> > *key*

# Development using the iSeriesPCMLCall Node

The following sections describes an example development flow for the integration of a fictive iSeries application.

**Generate and Import the Application Interface Structure**

To support the definition of message structures and the development of mappings it is necessary to generate the PCML file and transfer it to the developer workstation.

- Generate the PCML file:
    - Compile the program and specify the PGMINFO option:
    *CRTBNDRPG PGM(\*CURLIB/CUSTRPT) PGMINFO(\*PCML) INFOSTMF('/home/custrpt.pcml')*
- Transfer the generated PCML file from the System i integrated file system(IFS) to your workstation. This could be done with the System i Operations Navigator for instance.
- The PCML file should like similar to this:

```
<pcml version="4.0">
   <!-- RPG program: CUSTRPT  -->
   <!-- created: 2011-03-25-08.14.53 -->
   <!-- source: xyzLib/QRPGLESRC(CUSTRPT) -->
   <!-- 5 -->
   <program name="CUSTRPT"
path="/QSYS.LIB/xyzLib.LIB/CUSTRPT.PGM">
      <data name="ID" type="int" length="4" precision="32"
usage="inputoutput" />
      <data name="BALANCE" type="packed" length="7"
precision="2" usage="inputoutput" />
   </program>
</pcml>
```

- Import the PCML file into your IBM Integration Toolkit.
- Use the provided XML style sheet (*transformPcmlToXSD.xsl)* to transform the PCML file into a XML schema.
    - Right click on the style sheet and select: **Run-As>XSL Transformation**
    - Select the PCML file as source file and specify a target file name (for instance: *custrpt.xsd*)
    - Right click on the generated schema and select: **Validate**
    - There should be no error.

Create the Message Definitions

A Message Set project is used by the toolkit to hold message definitions for a message flow. You will now create a Message Set project and define message formats.
- Select: **File->New->Message Set**
    - Specify a name for the message set (for instance: *custrptMsgDef*)
    - Click: **Finish**

- Right click on the XML schema file and select: **New->Message Definition From->XML Schema File**
- Select your message set and click: **Next**
- Select *pcml* as the root element for your message definition
- Click: **Finish**

Create and Configure the Message Flow

Now you are ready to start message flow development:
- Select: **File->New->Message Flow Project**
    1. Specify a name for the message flow project (for instance: *iSeriesMsgFlows*)
    2. Click**: Next**
    3. Select *custrptMsgDef* as a dependency for the message flow project
    4. Click: **Finish**
- Click on the message flow project and select: File->New->Message Flow
    6. Specify a name for the message flow project (for instance: *custrptFlow*)
    7. Click**: Finish**
- Add the following nodes to construct the flow:
    9. MQ Input Node
        10. Specify
    11. MQ Output Node
    12. Mapping Node
    13. ProgramCall Node
- Connect the nodes:
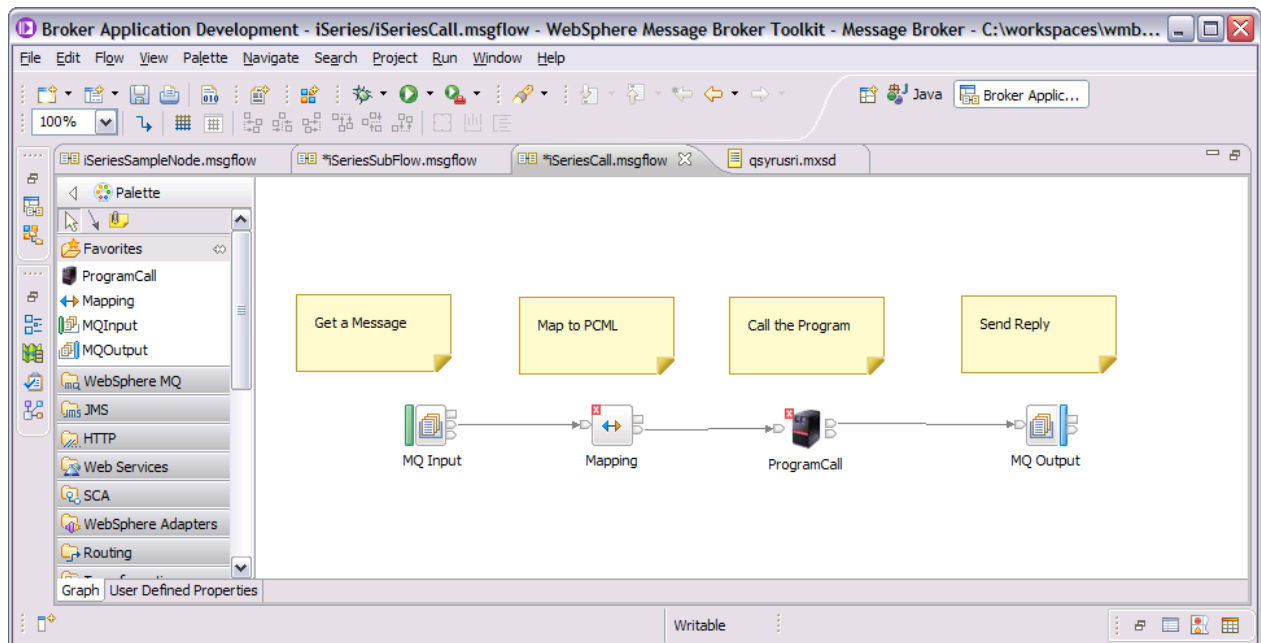
In the next required step you need to configure the processing

- ○ Configure the MQ Input Node to read a message from *iSeries.IN*
- ○ Configure the MQ Output Node to write a message to *iSeries.OUT*
- ○ Configure the ProgramCall Node:

- configurableServiceName: *myISeries*
- the configurable service will be created in the deployment section
- program: *custrpt*
- libraryList: <name of the library>
- multiple libraries could specified as a comma separated list
  - Double click on the mapping node to open the map editor
    - Select '*BLOB'* as your source message
    - Select '*pcml'* as your target message
    - Click: **OK**
    - Create a target mapping like in the following picture (Note: all fields of the target structure need to be created – this can be done by clicking on the top level field and select: **Insert Children**) :
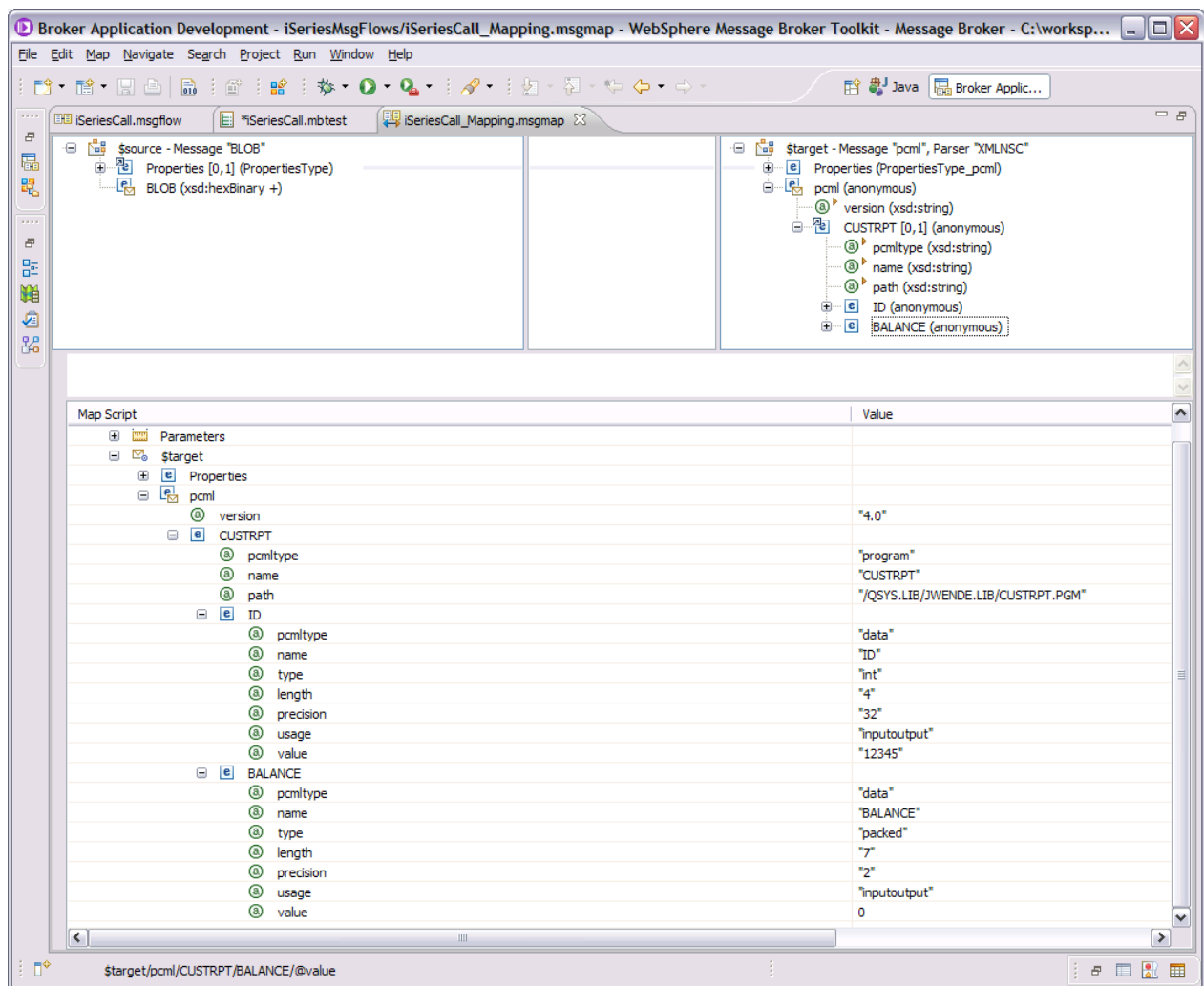
Save and close the mapping and save the flow. There should be no error marker!

Run the Message Flow

There are some steps required to run the configured flow. It is assumed that the deployment will be done on a local default configuration.

- Start the IBM Integration Explorer
- Create the two queues
  - iSeries.IN
  - iSeries.OUT
- Expand the default tree (MB7) and right click on: **Configurable Services**
- Select: New->**Configurable Service**
- Enter a name, for instance: myISeries (this name has to match with the value entered for the ProgramCall Node)
- Select '**UserDefined'** for the configurable service type
- Create three properties:
  - iSeriesAddress
    - this property holds the IP address of the System i
  - iSeriesPassword
    - this property holds the password for the System i
  - iSeriesUser
    - this property holds the name of the user for the System i
- Click: Finish

Switch back to the IBM Integration Toolkit.
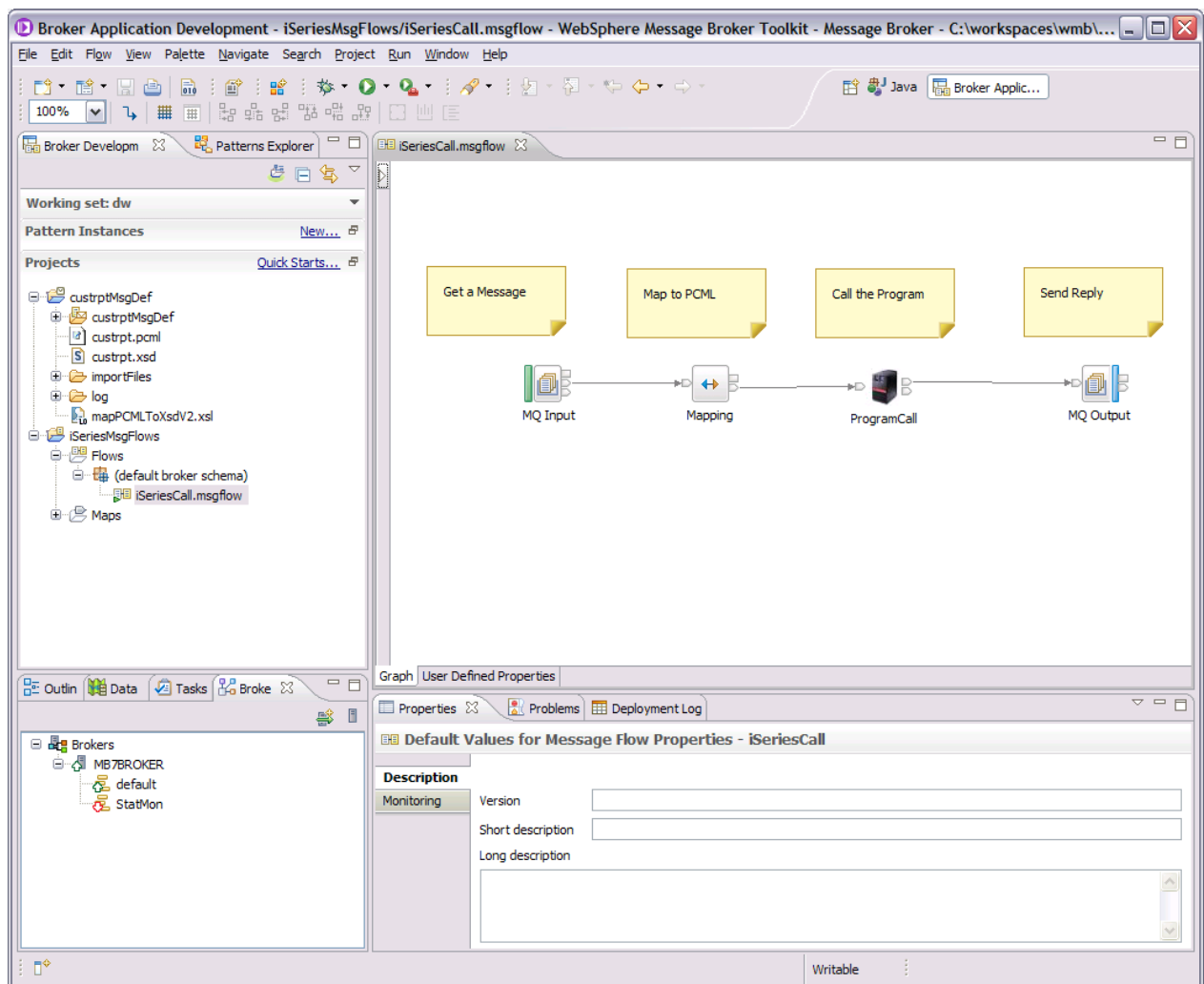
Now the deployed flow could be tested. This can be done directly from the IBM Integration Toolkit.

- Right click on the message flow and select: **Test Message Flow**
- Enter any value into the input message field
- Click: **Send Message**
- After a short time the test client should show a response message:

Using the samples

Requirements

To run the samples you need a connection to an iSeries server. Part of this SupportPac is an iSeries library containing sample programs and iSeries data queues.

Installation Steps

iSeries

- Download the SupportPac and unzip it to a temporary directory. The file is named IAM7.zip.

- On iSeries, create a library containing an empty save files to hold the uploaded file

  ○ To create the library and save file use the commands:

    ▪ CRTLIB LIB(WMBSAVEF)

    ▪ CRTSAVF WMBSAVEF/WMBSAMPLE

- Start an ftp session to your iSeries and upload the save file with the commands

    ○ ftp (your_iSeries)

    ○ cd WMBSAVF

    ○ bin

    ○ put wmbsample.savf WMBSAVEF/WMBSAMPLE

- Sign on to your iSeries machine

- Enter the RSTLIB command, specifying the install device as *SAVF and naming the save file containing the sample library.

    ○ RSTLIB LIB(WMBSAMP) DEV(*SAVF) SAVF(WMBSAVEF/WMBSAMP)

IBM Integration Toolkit

Start the IBM Integration Toolkit and import the provided sample project interchange file.

Integration Bus Runtime

- Create a UserDefined configurable service for your runtime environment:

    ○ mqsicreateconfigurableservice MB7 -c UserDefined -o myIseries -n
    " \"iSeriesAddress\", \"iSeriesPassword\", \"iSeriesUser\", \"maxConnections\", \"maxUseTimeout\", \"minConnections\" " -v
    " \"ADDRESS\", \"PASSWORD\", \"USER\", \"5\", \"-1\", \"1\" "

- Make sure that you followed the installation steps for the runtime plugin nodes

- Create the following queues:

    ○ def ql('TEST.PCML.IN')

    ○ def ql('TEST.PCML.OUT')

- ○ def ql('TEST.XPCML.OUT')
- ○ def ql('TEST.DQ.GET.IN')
- ○ def ql('TEST.DQ.GET.NOMESSAGE')
- ○ def ql('TEST.DQ.GET.OUT')
- ○ def ql('TEST.DQ.IN.OUT')
- ○ def ql('TEST.DQ.OUT.IN')
- ○ def ql('TEST.KEY.DQ.GET.IN')
- ○ def ql('TEST.KEY.DQ.GET.OUT')
- ○ def ql('TEST.KEY.DQ.GET.NOMESSAGE')
- ○ def ql('TEST.KEY.DQ.IN.OUT')
- ○ def ql('TEST.KEY.DQ.OUT.IN')

Understand the samples

Please review the content of the sample flows in the IseriesAdapterTest project to understand the usage of extension nodes provided by this SupportPac.

-- End of Document