# **DB2 Content Manager / Process Choreographer Integration Quick Start**

## **Revision1**

*DB2 Content Manager Enterprise Edition Version 8.3* introduced a tutorial and sample code "Integrating with business processes" using the Process Choreographer component of *WebSphere Business Integration Server Foundation V5.1.1.*. This Integration Quick Start Guide replaces the tutorial and describes Revision 1 of this integration based on the following chapters:

- 1. Introduction
- 2. Setting up the Development Environment and Testing the Sample Process
- 3. A Tour of the Sample Process
- 4. Developing a Custom Content Manager / Process Choreographer Integration Solution
- 5. Deploying an Integrated Solution on a Production Simulation Environment
- 6. Hints and Troubleshooting
- 7. Further Reading

## 1. Introduction

*DB2 Content Manager Enterprise Edition V8.3* includes a high-performance document routing engine to manage the lifecycle of content objects. For complex process environments that involve a variety of applications and services in a heterogenous IT and business environment *WebSphere Business Integration Server Foundation Version 5.1.1* is the process management environment of choice as it provides a rich infrastructure for intra-enterprise and inter-enterprise services based on the WebSphere Application Server. These processes can involve both human and IT resources. The types of processes can vary greatly, ranging from Web services or Web page navigation to business transaction support. Processes can be based on automated steps that together constitue a single transaction of they can involve human interaction any may run for days weeks or months.

The Content Manager / Process Choreographer (CM/PC) Integration Quick Start provides some key ingredients for the creation of content-centric processes. The term content-centric process refers to a process in which a content object stored in the Enterprise Content Management system plays an important role. This typically means that the content object may be investigated at human-activities and that it is modified throughout the process. This content object (a Content Manager item) which typically is a container of content objects (a folder) is said to be *routed through the process or (work)flow*. Modifying it can mean a number of things such as adding or removing objects from it (if it is a folder), changing attribute values, modfying access rights, adding annotations, signatures, or watermarks, etc.

The main purpose of the Integration Quick Start is to provide best practices and pre-assembled building blocks that support the creation and management of content-centric processes based on the Process Choreographer environment.

## 1.1 What's New in Revision 1

Revision 1 of the Content Manager / Process Choreographer Integration Quick Start consists of the following elements:

- Integration Toolkit
- Quick Start Client
- Auto Claims Process

The Integration Toolkit is a collection of service components (Java classes, EJBs) that implement the following interaction patterns between the content management and process management system:

- Content Event Handling ... item creation or deletion events in Content Manager trigger corresponding actions in Process Choreographer
- Collection Point ... let a process instance wait until the folder that is routed through the process contains a certain number of items of a certain type or until a timeout or exception occurs.
- Content Attribute Access ... efficiently access the value of content attributes from within the business process, e.g. to enable content-specific decisions (Decision points)
- Folder Service ... add the item routed through the process to a retrieved folder or add a retrieved item to the folder routed through the process
- Combined Query ... efficiently retrieve process information from Process Choreographer and associated content attribute values from Content Manager
- Common Staff Repository ... map Content Manager user and group definitions to the Process Choreographer staff resolution facility based on a WebSphere® custom user registry

The Quick Start Client is a Web application that enables process users to see work that is assigned to them, fetch work items and work with content objects in DB2® Content Manager Enterprise Edition V8.3. Though the Quick Start Client is customized for use with the Auto Claims Process it provides generic out of the box capabilities and can easily be adjusted to the needs of other processes.

The Auto Claims Process illustrates how the Integration Toolkit can be used to create a content-aware process. This process involves human-based activities that can be performed using the Quick Start Client, services provided by the Integration Toolkit and some simulated internal or external Web services that may involve legacy applications or B2B transactions.

Both, the Integration Toolkit and the Quick Start Client are provided as sample code. They also serve as educational resources for learning how to integrate the two products. The Quick Start Guide that can be downloaded below describes how the source code can be modified to meet specific requirements of a custom integration solution. See the license statements in the documentation or source files for details.

#### 1.2 Notices, License and Support Terms

Note that the following statements apply to the source code of the Content Manager / Process Choreographer Integration Quick Start:

Licensed Materials - Property of IBM IBM DB2 Content Manager Enterprise Edition V8 (program number 5724-B19) (c) Copyright IBM Corp. 1994, 2005. All Rights Reserved. US Government Users Restricted Rights Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp. DISCLAIMER OF WARRANTIES : Permission is granted to copy and modify this Sample code, and to distribute modified versions provided that both the copyright notice, and this permission notice and warranty disclaimer appear in all copies and modified versions. This software is provided "AS IS." IBM and its Suppliers and Licensors expressly disclaim all warranties, whether EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY FITNESS FOR A PARTICULAR PURPOSE OR WARRANTY OF NON-INFRINGEMENT. IBM AND ITS SUPPLIERS AND LICENSORS SHALL NOT BE LIABLE FOR ANY DAMAGES SUFFEREDBY LICENSEE THAT RESULT FROM USE OR DISTRIBUTION OF THE SOFTWARE OR THE COMBINATION OF THE SOFTWARE WITH ANY OTHER CODE. IN NO EVENT WILL IBM OR ITS SUPPLIERS AND LICENSORS BE LIABLE FOR ANY LOST REVENUE, PROFIT OR DATA, OR FOR DIRECT, INDIRECT, SPECIAL, CONSEQUENTIAL, INCIDENTAL OR PUNITIVE DAMAGES, HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF THE USE OF OR INABILITY TO USE SOFTWARE, EVEN IF IBM HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Note that the integration toolkit requires a DB2 Universal Database-based library server and that it does not support WebSphere Process Server V6, the z/OS or i5/OS environments, nor clustered environments.

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#### **1.3 Software Requirements**

For both the development and runtime environments, the Content Manager library server needs to be based on a *DB2 Universal Database V8.2*. The integration toolkit only supports a DB2 Universal Database-based library server.

#### The following system configuration is required for the development and test environment (chapter 3):

- a. Development workstation A hosts:
  - WebSphere Studio Application Developer Integration Edition V5.1.1

- DB2 Universal Database V8.2 Runtime Client
- DB2 Content Manager V8.3 Client for Windows
- DB2 Information Integrator for Content V8.3 Content Manager version 8 connector and Java connector toolkit
- b. Repository server B with:
  - DB2 Content Manager Enterprise Edition V8.3

## For simulating a production environment (chapter 5) the repository server B additionally requires:

- WebSphere Business Integration Server Foundation V5.1.1
- Tivoli Directory Server V5.2.2 or V5.3

The development workstation as well as the server should have at least 1 GByte of main memory. However, recommended are at least 2 GByte.

This guide uses Windows platform conventions for path names. Before proceeding we recommend that you look up the install directories of the following products as they will be used later in this guide:

<ibmcmroot></ibmcmroot>	=	Content Manager installation folder (e.g. c:\Program Files\IBM\db2cmv8 or /usr/db2cmv8)
<db2home></db2home>	=	home folder of the DB2 instance which hosts the Content Manager library server (e.g. c:\Program Files\IBM\sqllib or /home/db2inst1/sqllib)
<wsadie_ HOME&gt;</wsadie_ 	=	WebSphere Studio Application Developer Integration Edition install folder (e.g. c:\Program Files\IBM\Websphere Studio\Application Developer IE\v5.1.1)
<was_home></was_home>	=	WebSphere Application Server install folder (e.g. c:\Program Files\IBM\Websphere\Appserver)

## 1.4 A guideline for reading this document

We recommend starting with <u>2. Setting up the Development Environment and Testing the Sample Process</u> as this lays the foundations for further explorations in the area of integrating content and workflow. This chapter describes how to set up the infrastructure to build and test integrated workflows. You may want to take a tour of the sample process as described in <u>3. A</u> <u>Tour of the Sample Process</u> and continue either with <u>4. Developing a Custom Content Manager / Process Choreographer</u> <u>Integration Solution</u> to understand what it means to create a custom CM /PC integration solution based on the Integration Toolkit and Quick Start Client or to <u>5. Deploying an Integrated Solution on a Production Simulation Environment</u> which explains how the sample process can be deployed on a production environment. <u>6. Hints and Troubleshooting</u> provides some hints and tips which may be useful when working with the sample. <u>7. Further Reading</u> provides links to product documentation, Redbooks and Support pages.

## 2. Setting up the Development Environment and Testing the Sample Process

This chapter describes the steps needed to set up a development environment for the Integration Quick Start. At the end of this chapter the Quick Start Client can be used to work the sample process and to explore the results of running the server-side integration functions. Depending on the reader's previous experience with the WebSphere Studio Application Developer environment completing this paragraph will take approximately 1-2 hours.

## 2.1 Prerequisites and Installation Hints

Detailed instructions on how to install and configure the required software can be found in the product documentation. See <u>7.</u> <u>Further Reading</u> at the end of this document. This section gives some hints about configuration settings that are specific to the use of these products in the context of the Integration Quick Start. See <u>1.3 Software Requirements</u> for details on the system configuration required for chapter 1.

## Installation hints for Information Integrator for Content

In each of the following installation windows, perform the described task:

- Installation Destination Verify that the target directory is set to <IBMCMROOT>.
- Setup Type Select Custom.
- Select the components that you want to install Select DB2 Content Manager Version 8 connector and DB2 Content Manager Version 8 Java connector toolkit.

- Working Directory Keep the default <IBMCMROOT>.
- Server Connection Configuration
- Select **Configure RMI for remote connection to the above selected servers** to set up the connection from the Development Workstation to the Content Manager server.

### Installation hints for WebSphere Application Developer Integration Edition

• No special hints are required: follow the steps described in the product documentation.

Note that WebSphere Business Integration Server Foundation and Tivoli Directory Server are not required in the development and test environment.

#### 2.2 Preparing the Content Manager Sample Data for use with the Sample Process

The Quick Start sample process is based on a modified version of the Content Manager sample data. This step describes how to load the sample data and adjust it for use with the sample process. The sample process uses a new attribute XYZ\_ ClaimAmount to distinguish 'cheap' cases for which a high process throughput is desirable from 'expensive' cases for which additional research is required. Furthermore, two new attributes WF\_OnCreate and WF\_OnDelete are required to enable creation and termination of process instances based on content events (see <u>Content Event Handling</u> for details).

- Start the Content Manager First Steps program.
- If you have worked with the sample data before, click Remove Sample Data to ensure all data is in a clean state.
- Click Load Sample Data.
- Wait until the sample data creation completes.
- Click Work with Sample Data to start the Content Manager Administration client.
- Log on to the administration client with your library server administrator userid and password.
- Select Data Modelling, right-click Attributes, select New to define a new attribute XYZ\_ClaimAmount with the properties shown below:

New Attribute		×
New Attribute         Name:       *         Display name:       *         Claim Amount         Attribute type         Character         Yariable character         Yariable character         Short integer         Long integer         Decimal         Double         Date         Time stamp	nt Decimal length Tota <u>i</u> : [12 Fi <u>x</u> ed places: [2]	Translate
O CLOB		
[	OK Cancel <u>A</u> ppl	y Help

• Click **OK** to store the new attribute.

• Right-click Attributes, select New to define a new attribute WF\_OnCreate with the properties shown below and click OK to store the new attribute:

	SubmitClaimRequest CollectionPointRequest CollectionPointResponse CollectionPointStatus CheckFraudHistoryRequest CheckFraudHistoryResponse	SubmitClaim InitializeProcessProperties AddPolicyToFolder
Description Implementation Documentation Join Behaviour Server	// Store the itemPid a String itemPid = getSu ContentManager.initial	<pre>.nd its constituents in custom properties of the process instance bmitClaimRequest().getItemPid(); izeCustomProperties(this, itemPid);</pre>

- Repeat the previous step to define a new attribute WF\_OnDelete with the same characteristics as WF\_OnCreate.
- In the Data Modelling view, expand Item Types, right-click on XYZ\_ClaimFolder, right-click Properties, open the Attributes tab and add two new attributes: WF\_OnCreate and WF\_OnDelete both with the default value ClaimsHandlingProcess

Name: * VVF_OnCreate			
Display name: * WF_OnCreate			<u>T</u> ranslate
Attribute type Character Variable character Short integer Long integer Decimal Double Date Time Time stamp BLOB CLOB	Character type Alphabetic Numeric (2) Alphanume Extended a Other (5) -Character length Minimum: Maximum:	(1) ric (3) Iphanumeric (4 0 254	

- Right-click XYZ\_AdjReport and select Properties.
- On the definition tab change the New version policy for attributes to Never create.
- Switch to the Attributes tab and add the attribute XYZ\_ClaimAmount to this item type:

Item Type Properties - XYZ_AdjReport		×
Item Type Properties - XYZ_AdjReport  Default Storage Auto-linking Definition  Available attributes or groups  Available attributes or groups  CompleteQuery	Foreign Keys       Logging         Access Control       S         Add >       S         Add/New Child >       S         < Remove	
1 / 46 Selected		Maximum value:     0       Default value:

- Close the System Administration Client.
- Close the First Steps program.
- Start the DB2 Content Manager Client for Windows and log on as library server administrator (icmadmin). Note that if the Content Manager Client for Windows was already started while you changed the sample data definitions in the previous step you need to close and restart it so the new definitions are available.
- Select Search -> Basic and locate all instances of item type Adjuster Report (Content Manager v8.1 Sample Item Type).
- Right-click on each of the three entries in the result list, select **Attributes** and enter different Claim Amount values to the three items: for example 1000 (small claim), 10000 (large claim), 2000 (small claim) as shown below. The sample process introduced later will handle documents with a small claim amount (i.e. less than or equal to \$5000) differently:



• Close the DB2 Content Manager Client for Windows.

## 2.3 Setting up the Test Environment

This section copies the files that are required for the build environment to the appropriate locations of the development workstation's file system. Two JAR files need to be located in the **lib** directory of the application server in order to be accessible from Java snippets in business processes. The build environment uses a file-based custom user registry for authentication with the process environment (via the application server). This user registry stores userIDs and passwords of the process staff in two files that need to be placed into a folder in the application server install directory. The settings in the password file (especially for userID icmadmin) need to be adapted to the settings of the Content Manager server. Note that the runtime environment uses a common LDAP-based user repository for both Content Manager and the process environment so there will be no duplication of credentials and passwords will not be stored in readable form when moving to the runtime environment. The file-based approach is only used for the development environment.

- Unzip quickStartSampleRev1wbi.zip into a temporary folder <TMP>.
- Copy the files bpecm.jar and bpecmutil.jar from <TMP>\runtime to <WSADIE\_HOME>\runtime\ee\_v51\lib.
- Open <TMP>\rumtime\bpecm.properties in an editor and make sure the propertyContentManagerAuthenticationPwd=... contains the password of the library server administrator (icmadmin). Note that a simple encryption method referred to as ROT13 can be used to avoid storing the password unencrypted. Apply ROT13 encryption by adding a decimal 13 to the numeric character representation of each character in the password string, e.g. ABC would become NOP. Set ContentManagerAuthenticationPwdEncryption to 1 to enable the use of ROT13 encryption. Note that the proposed encryption is for demo purposes only. If you plan to use the code in a production environment you might want to choose a more enhanced encryption method.
- Copy the file bpecm.properties from <TMP>\runtime to <WSADIE\_HOME>\runtimes\ee\_v51\properties.
- Open <TMP>\runtime\users.prop in an editor, locate the line icmadmin:passw0rd:2:2: and replace passw0rd with the password of the library server administrator (icmadmin) on your system.
- Create a folder security under <WSADIE\_HOME>\runtimes\ee\_v51 and copy the files users.prop and groups.prop from <TMP>\runtime to this new directory.
- Create a folder in your file system that will server as the workspace folder for WebSphere Application Developer Integration Edition referred to as <WORKSPACE\_FOLDER> later in this document.
- Recursively copy all contents of <TMP>\projects\ into this directory so that it contains the folders ClaimsHandlingProject, ContentManagerIntegration, etc. and all files located in these folders.

#### 2.4 Configuring the Build environment and Importing the Sample Projects

This step adjusts compiler settings and makes the project files available to the build environment. We recommend setting the browser configuration so it opens the Web browser in a new window which provides more flexibility when watching project contents and running the Web client at the same time.

- Start WebSphere Studio Application Developer Integration Edition and specify the folder created in the previous step as your workspace. If not prompted for a workspace, start it from the command line as follows: %WSADIE\_HOME% \wsappdevie.exe -setworkspace.
- Select Window > Preferences. The Preferences window opens.
- Select Java > Classpath Variables and click the button labeled New. The 'New Variable Entry' window opens.
- Enter IBMCMROOT into the 'Name' field and the value of <IBMCMROOT> into the 'Path' field.

4	Preferences						<u>_0×</u>
	Classpath	Variables		Classpath Variables			
	Code Form Code Gene Compiler ⊕ Debug ⊕ Editor	atter eration		A classpath variable can be define the location of a JAF class path variables JRE_LI depending on the JRE setti Defined classpath variables	added to a projec file that isn't part B, JRE_SRC, JRE_ ng.	t's class path. It ca of the workspace. SRCROOT are set	an be used to The reserved internally
	··· Installed :	🕀 New	Variab	le Entry	,.	×	New
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	Logging ⊕ LPEX Editor						
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• Select Java > Compiler, click the Compliance and Classfiles tab and change the Compiler compliance level from default 1.3 to 1.4

Preferences		<u> </u>
🗐 Java	Compiler	
Appearance     Classpath Variables     Code Formatter	Options for the Java compiler: Note that a full rebuild is required to make changes effective.	
Code Generation	Problems Style Compliance and Classfiles Build Path	
Compiler	_ JDK Compliance	
⊕ Debug     Editor	Compiler compliance level: 1.4	
- Installed JREs	✓ Use default compliance settings	
Javadoc JUnit	Generated .class files compatibility; 1.4	
New Project	Source compatibility:	
Refactoring	Report 'assert' as identifier:	
	Classfile Generation	
Logging	Restore <u>D</u> efaults	Apply
Import Export	ОК	Cancel

• Select Java > Installed JREs and change the JVM from default Eclipse to WebSphere v5.1 EE JRE

Java	<ul> <li>Installed Java I</li> </ul>	Runtime Environments	
Appearance     Classpath Variables     Code Formatter     Code Generation     Compiler     Compiler     Debug	Create, remove or The checked JRE w	edit JRE definitions. ill be used by default to build and run Java pro	grams.
Editor	JRE Type	Name	<u>A</u> dd
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JUnit	Standard VM	WebSphere v5 EE JRE	Deserves
New Project	Standard VM	WebSphere v5 Express JRE	Remove
···· Organize Imports	Standard VM	WebSphere v5 JRE	Search
Refactoring	Standard VM	WebSphere v5.1 EE JRE	<u></u>
···· Task Tags	Standard VM	WebSphere v5.1 Express JRE	
····· Visual Editor	Standard VM	WebSphere v5.1 JRE	
Logging	- 4		<b>F</b>

- Recommended: select **Web Browser** and click **Use external Web Browser** and make sure the **Location** field points to the browser executable.
- Click **OK** in the preferences window to make the changes permanent. On the pop-up window 'The compiler settings have changed. A full rebuild is required...' click **No** as there are no projects yet that need to be rebuilt.
- Perform the following steps on the folders ClaimsHandlingProject, ContentManagerIntegration, ContentManagerIntegrationEjb, ContentManagerIntegrationJar, QuickStartClient, Servers located in your workspace. Any errors or warnings that might show up in the task view may temporarily be ignored. They should disappear when the deploy code has been generated by the end of this task.
  - Select File > Import from the main menu. The Import window opens.
  - Select Existing Project into Workspace. Click Next. The Import window opens.
  - Click Browse..., select the appropriate project folder and click OK.
  - Click Finish.
- Switch to the Services view of the business integration perspective.
- Expand Deployable Services, right-click ContentManagerIntegrationEjb, and select Generate > Deployment and RMIC Code. This opens the 'Generate Deployment and RMIC Code' window, On this window choose Select All and click Finish.
- On the menu select **Project > Rebuild All**.
- The three information messages CHKJ2500I ... must be serializable at runtime can safely be ignored.
- In the Services view expand Service Projects > ClaimsHandlingProject > com.ibm.bpe.cm.sample, right-click
   ClaimsHandlingProcess.bpel and select Enterprise Services > Generate Deploy Code. The 'Generate BPEL Deploy Code' window opens.
- Click **OK** to start deploy code generation. Wait until the progress information window disappears.
- The 9 remaining messages in the task view (IWAE0034W EJB link element ... is unresolvable in

module...) can safely be ignored. Alternatively, they may be filtered by clicking the **Filters** button (F) in the task view menu, selecting does not contain in the box following Where description and entering IWAE0034W in the input field.

🕀 Filter Tasks	×
Limit visible items to: 2000	
Show items of type:	
✓ XML Schema Problem ✓ XML Schema Problem ✓ XSL Compilation errors: ✓ Task ✓ Java Task ✓ JUnit Task	
Rejected Patch	<b>_</b>
On any resource	
On any resource in same project	
On selected resource only	
On selected resource and its children	
On working set: <no sele<="" set="" td="" working=""><td>cted&gt;</td></no>	cted>
Select	
Where description does not contain	IWAE0034W
Where problem severity is:	🗖 Error 🗖 Warning 🗖 Info
Where task priority is:	☐ High
Where task stat <u>u</u> s is:	Completed Not Completed
	<u>R</u> estore Defaults
	OK Cancel

If **Fix Pack 1** of DB2 Content Manager Enterprise Edition V8.3 is installed we recommend taking the step <u>Upgrading the content</u> <u>viewer applet to Fix Pack 1 or (re-)creating the content viewer applet</u> to upgrade to the latest version of the content viewer applet.

You may now want to spend a moment and investigate the process and its elements. Useful resources are the process definitions (ClaimsHandlingProcess.bpel, ClaimsHandlingProcess.wsdl, ClaimsHandlingProcess.component) located in the Service Project ClaimsHandlingProject.

## 2.5 Enabling Content Manager for Single Sign On

The Quick Start Client uses Single Sign On (SSO) so users need to authenticate only once instead of having to logon to the process environment and to the Content Manager server. This step configures Content Manager so it can use the credentials provided by the application server to authenticate a user. Note that some of these settings are global (allow trusted logon, password not required for all users) so it is important to understand their potential impact on other Content Manager-based applications.

- Start the DB2 Content Manager System Administration Client and log on as library server administrator (i.e. icmadmin).
- In the navigation panel, click Library server parameters > Configurations.
- Right-click Library Server Configuration in the configuration window on the right and select Properties.
- Set Max user action to Allow logon without warning and select the Allow trusted logon check box

Library Server name:	icmnlsdb	
<u>M</u> aximum logon attempts:	0	<b>A</b>
Password duration (days):	180	• •
Max <u>u</u> sers:	0	×
Ma <u>x</u> user action:	Allow logon without warning	•
_anguage:	US_ENGLISH	-
Database type:	DB2	
Operating system:	Windows	
Allow trusted logon		
Public access enabled		
Refresh encryption key		
		Holp

- Click **OK** to save the changes.
- Select Tools > Manage Database Connection ID > Change Database Shared Connection ID from the menu. The Change Shared Database Connection ID and Password window opens.
- Enter the connection user password (The default connection user is icmconct). Clear the **Password is required for all users** check box.
- Click **OK** to save the change.
- Click Authorization > Privilege Sets. A list of privilege sets shows up in the right pane.
- Right-click **ClientUserAllPrivs** and select **Copy > Advanced**. The Copy Privilege Set window opens.
- Enter the name ClientUserAllPrivsSSO, select AllowTrustedLogon in the Privileges field and click OK to save the new privilege set.

	iced) - ClientUserAllPrivs	×
Name: *	ClientUserAllPrivsSSO	
Description:	ems, change attribute values, and update notes and annotations.	
Privilege groups:	Privileges:	
ALL	Select all	
AdministerDataModel	🖉 🔽 AllowTrustedLogon ( Allow Content Management use 🔼	
AdministerEIP	ClientAddNewBasePart ( Add a new base document 🗐	
AdministerPrivsAndAC	ClientAddToNoteLog ( Add a note to the note log with	
AdministerRMServer	ClientAdvancedSearch (Perform advanced searches	
AdministerSubDomain	✓ ClientDeleteBasePart ( Delete a base document part w -	
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- In the navigation panel click **Authentication > Users**. The right pane now shows the list of DB2 Content Manager users currently defined.
- For the each of the users Agent1, Agent2, Adjuster1, Adjuster2, Underwriter1, Underwriter2, UnderwriterAssistant1, and UnderwriterAssistant1 double-click the name to open the properties window and replace the value in the Maximum Privilege set field with ClientUserAllPrivsSSO

User Properties UNDERWR	LITER1		×
Define Users Assign to Gr	roups   Set Defaults		
User <u>n</u> ame:	* UNDERWRITER1	LDAP Clear	
User description:	Reviews all incident information a	Dbtain from LDAP	
Additional information:			
Pass <u>w</u> ord:	* *****		
<u>C</u> onfirm password:	* ****	☐ ∐se system password	
Password <u>e</u> xpiration:	C At ne <u>x</u> t logon		
	After	30 Days	
	⊂ Use systౖem default		
	C Never_expires		
Maximum pri <u>v</u> ilege set:	* UWAssistPrivsSSO	Create Privilege Set	
		OK Cancel <u>A</u> pply Help	

• Close the System Administration client.

## 2.6 Configuring and Starting the Test Server

The Server project imported with the previous step configures a test server that can be used to run the sample process within *WebSphere Studio Application Developer Integration Edition*. The test server configuration points to the *WebSphere Business Integration Server Foundation* located in <wshlfpmlweslee\_v51 (note that it was formely named Enterprise Edition). This step adjusts the environment and security settings of the test server configuration to the settings of your Content Manager Server.

- In WebSphere Studio Application Developer Integration Edition switch to the Server perspective by clicking Window > Open Perspective > Server or using the shortcut in the toolbar.
- In the Server Configuration view, expand **Servers** and double-click **IntegrationTestServer** to open the Server Configuration editor.
- Click the Variables tab and verify that the following two variables point to the appropriate locations in your file system:
  - In the section Node settings ensure that DB2\_JDBC\_DRIVER\_PATH points to <DB2HOME>\java
  - In the section Server settings ensure that IBMCMROOT points to <IBMCMROOT>

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	Server Configuration 💌 🗙	OS400_NATTVE_JDBC       OS400_TOOLBOX_JDB       ✓       Server Settings       Modify the substitution variables in the Defined variables:       Name     Value       SERVER_LOG_ROOT     \${LOG_I \${ERVER_TEMP_DIR}\${SERVER_TEMP_DIR}\${SERVER_TEMP_DIR}\${SERVER_TEMP_OR	The directory that c The directory that c server. BOOT}/server1 The filesystem path to RTEMP_DIR_PATH The directory that cont	Add Edit
e - C	Servers     IntegrationTestServer	Server , Configuration , Environment , We	ah Data source Ports Variables Trace Security F18 .	2C : 1MS : Annications : Extended
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• Click the **Ports** tab and ensure that the ports used by the test server (9046, 9093, 11605...11607) do not conflict with port settings on your system. Change the ports in case of a conflict. Note that in this case the link that opens the initial page of the Quick Start Client shown in the next section might not work since it assumes the port number is 11605.

<b>\$</b> 5	erver - IntegrationTestServer - WebSphere Studio A	pplication Develope	r Integration	Edition				×
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	CalinsHandlingProject     CalinsHandlingProject     CalinsHandlingProjectEAR     CalinsHandlingProjectEAB     ContentManagerIntegration     ContentManagerIntegrationEjb     ContentManagerIntegrationJar     Servers	Server Ports Scope: localhost/ Cell Settings Modify the host alia Host alias list: Host name * * Admin host port: Server Setting Modify the HTTP tr	9093 server	1  1  Port  11605  11605  11606  er port numbers.		Add Edit Remove	-	•
		Host name	Port	Enable SSI	External			
		Tioscridine	11605	false	false	Add		
			11606	true	false	Edit		
		*	9093	false	false			
		*	9046	true	false	Remove		
	Server Configuration     X       C     Servers       E     IntegrationTestServer	Advanced ports:	Environment	/eb ¡Data source Ports	Variables   Trace	Security   EJB   J2C   JMS   Ap	oplications ; Extended ; Object Pools ; Scheduler ; Staff ; Work Ma	<b>•</b>
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- Click the Security tab and specify the following authentication settings:
  - In the **Current Active Authentication Settings** section enter the userid/password of the CM library server administrator (icmadmin) into the Server ID/Server password fields

• In the JAAS Authentication Entries section click edit for the two fields <code>localhost/BPEAuthDataAliasEmb\_</code> <code>localhost\_server1</code> and <code>localhost/ICMNLSDBAuthDataAlias</code> and enter the userid/password of the CM library server administrator

\$	Server - IntegrationTestServer - WebSphere Studio	Application Developer Integra	tion Edition				- O ×
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5	ClaimsHandlingProject     ClaimsHandlingProjectEAR     ClaimsHandlingProjectEJB     ClaimsHandlingProjectEJB     ClaimsHandlingProjectEJB	Scope: localhost/localhost/s	erver 1				<u> </u>
	E ContentManagerIntegration	Cell Settings			🕀 Edit JAA	AS Authentication Entry	
	ContentManagerIntegrationEjb	Enable and setup security.			Aliace	ocalhost/BPEAuthDataAliasEmb localhost serv	
		Enable security (Not sup	ported on Windows 98 and Wind	dows ME)	Allas,		
		Current active authenti	cation settings:		User ID:		
		Server ID:	icmadmin		Password:	********	
		Confirmed password:	*******		Description	: Authorization Alias for Process Choreographer	
		Enforce Java 2 security  JAAS Authentication Entries  Alias  localhost/BPEAuthDataAlias localchost/ICMNLSDBAuthDataAlias	: User ID Desc E icmadmin Auth	ription Iorization Alias for Proc Administrative User	Add Edit	OK Cancel	
	Image: Server Configuration     ▼ ×       Image: Servers     Image: Servers       Image: Servers     Image: Servers	SSL Configuration Repertoin	es:		Add		-
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		해 Servers				口合萝克族	₩ 🖷 🗙
		Server		Status		Server State	
		5.1 IntegrationTestServer		Stopped		The server should be republish	hed
		Servers Console					

- Save your changes by pressing CTRL-S and close the editor for the IntegrationTestServer, because this editor must be closed before deploying projects later on.
- Right-click the Server Configuration IntegrationTestServer in the Server Configuration view and select Add and remove projects. On the Add and Remove Projects window select Add All >> and click Finish

Add and Remove Project Add and Remove Projects Modify the projects that are co	nfigured on the server	
Move projects to the right to on <u>Available projects</u> :	configure them on the server	Configured projects:
	A <u>d</u> d >	ContentManagerIntegratic     GaimsHandlingProjectEAR
	Add All >>	1
	< <u>R</u> emove	]
	<< Remove All	1
J		
		<u>Finish</u> Cancel

• Right-click the Server Configuration IntegrationTestServer in the Server Configuration view and select Create Tables and Data Sources. The result window looks as follows:

🕀 Tabl	e and Data So	ource Creator	×
٩	Project: Vendor: Backend ID: Tables: Data Sources:	ClaimsHandlingProjectEJB Cloudscape v5.1 CLOUDSCAPE_V51_1 Generated from the top down maps without errors. No new data sources were added.	•
RDBEX RDBEX	portMessage: C portMessage: A	REATE TABLE CLAIMSHANDLINGPROCESS20030101T000000EB:PASS [5 LTER TABLE CLAIMSHANDLINGPROCESS20030101T000000EB:PASS [Su	Successful] Iccessful]
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			UK

Click **OK** to close this window.

- In the Server view select the **Servers** tab, right click **IntegrationTestServer** and select **Start**. This publishes the project definitions to the server and then starts it.
- Wait until the message "Server server1 is ready for e-business" shows up in the console tab. The end of the console output should look similar to the one shown below:

🏶 Server - WebSphere Studio Application Developer In	tegration Edition	
Eile Edit Navigate Search Project Run Window Help		
] Š • 🛛 🔍 A   🏔 🚯 K 🗞   🐗 • ] 🧶	] 🗐    🛠 •    🖋    🏷 🗢 • ↔ •	
🖺 🔂 Navigator 🗇 🕀 💥 🕹 🕶 🗙		
ClaimsHandlingProject	Console [IntegrationTestServer (WebSohere v5 1)]	
ClaimsHandlingProjectE1B		
ClaimsHandlingProjectWeb	[8/12/05 11:55:49:781 CEST] 30c7336e ApplicationMg A WSVR02211:	Application started: query
E 🚰 ContentManagerIntegration	[8/12/05 11:55:49:851 CES1] 30c7336e Applicationmg A WSVR02001:	Starting application: ContentManagerintegra
🗉 😁 ContentManagerIntegrationEjb	[8/12/05 11:55:49:061 CESI] 30073360 EUBCONCAINERI I WSVR020/1:	Starting EJP isr. ContentManagerIntegration
🕀 🔂 ContentManagerIntegrationJar	[8/12/05 11:55:50:052 CEST] 3007336e EUBCONCATHERT 1 WSVR005/1:	Manager Startum Bean called
🗄 🖼 Servers	[8/12/05 11:55:50:633 CEST] 30c7336e MDBListenerTm I WMSG00421:	MDB Listener SenderOListenerPort started su
	[8/12/05 11:55:50:633 CEST] 30c7336e ApplicationMg & WSVB02211:	Application started: ContentManagerIntegrat
	[8/12/05 11:55:50:633 CEST] 30c7336e ApplicationMg A WSVR02001:	Starting application: ClaimsHandlingProject
	[8/12/05 11:55:50:653 CEST] 30c7336e EJBContainerI I WSVR0207I:	Preparing to start EJB jar: ClaimsHandlingP
	[8/12/05 11:55:51:033 CEST] 30c7336e EJBContainerI I WSVR0037I:	Starting EJB jar: ClaimsHandlingProjectEJB.
	[8/12/05 11:55:51:143 CEST] 378f7366 WSRdbDataSour I DSRA8203I:	Database product name : DB2/NT
	[8/12/05 11:55:51:143 CEST] 378f7366 WSRdbDataSour I DSRA8204I:	Database product version : 08.02.0001
	[8/12/05 11:55:51:163 CEST] 378f7366 WSRdbDataSour I DSRA8205I:	JDBC driver name : IBM DB2 JDBC 2.0 Type 2
	[8/12/05 11:55:51:163 CEST] 378f7366 WSRdbDataSour I DSRA8206I:	JDBC driver version : 08.02.0001
	[8/12/05 11:55:51:193 CEST] 30c7336e WebContainer A SRVE0169I:	Loading Web Module: ClaimsHandlingProjectWe
	[8/12/05 11:55:51:253 CEST] 30c7336e WebGroup I SRVE0180I:	[ClaimsHandlingProjectWeb] [/ClaimsHandling
	[8/12/05 11:55:51:263 CEST] 30c7336e WebGroup I SRVE0180I:	[ClaimsHandlingProjectWeb] [/ClaimsHandling
	[8/12/05 11:55:51:263 CEST] 30c7336e WebGroup I SRVE0180I:	[ClaimsHandlingProjectWeb] [/ClaimsHandling
	[8/12/05 11:55:51:263 CEST] 30c7336e WebGroup I SRVE0180I:	[ClaimsHandlingProjectWeb] [/ClaimsHandling
	[8/12/05 11:55:51:273 CEST] 30c7336e WebGroup I SRVE0180I:	[ClaimsHandlingProjectWeb] [/ClaimsHandling
	[8/12/05 11:55:51:283 CEST] 30c7336e ApplicationMg A WSVR0221I:	Application started: ClaimsHandlingProjectE
	[8/12/05 11:55:51:303 CEST] 30c7336e StaffServiceI I STFF0032I:	The Staff Service started successfully.
	[8/12/05 11:55:51:494 CEST] 30c7336e HttpTransport A SRVE01711:	Transport http is listening on port 11,605.
Server Configuration	[8/12/05 11:55:51:624 CEST] 30C/336e HttpTransport A SRVE01/11:	Transport https is listening on port 11,606
	[8/12/05 11:55:51:634 CESI] 30C/3368 Http:ransport A SkVE01/11:	Transport nttp is listening on port 9,093.
E-4 Servers	[8/12/05 11:55:51:694 CESI] 30073360 Http://ansport A SkyE01/11:	The Scheduler Service is starting
thegration restServer	[8/12/05 11:55:51:724 CEST] 30c7336e SchedulerServ I SCHD00311: [8/12/05 11:55:52:485 CEST] 30c7336e SchedulerServ I SCHD00321:	The Scheduler Instance BDEScheduler is star
	[8/12/05 11:55:52:505 CEST] 30c7336e SchedulerBerv I SCHD00321:	The Scheduler Deemon for instance BDESchedu
	[8/12/05 11:55:52:525 CEST] 30c7336e SchedulerServ I SCHD0033I:	The Scheduler Instance BPEScheduler has sta
	[8/12/05 11:55:52:525 CEST] 30c7336e SchedulerServ I SCHD00011:	The Scheduler Service has started.
	[8/12/05 11:55:52:736 CEST] 30c7336e RMIConnectorC A ADMC0026I:	RMI Connector available at port 11604
	[8/12/05 11:55:52:856 CEST] 30c7336e WsServer A WSVR0001I:	Server server1 open for e-business
		- F
	Servers Console	
42		
Integration Test Environment v5.1 (Servers/Integration	festServer.wsi)	

Note that the output says **\*\*** Content Manager startup bean called which indicates that the initialization step of the integration component has been passed successfully.

## 3. A Tour of the Sample Process

A note on the new sample process: the integration sample process provided with *DB2 Content Manager Enterprise Edition V8.3* was designed to be compatible with the sample process used to illustrate **document routing** (*DB2 Content Manager Enterprise Edition V8.3* includes a document routing engine for use with document lifecycle management within Content Manager).

The new sample process provided with CM / PC Integration Quick Start focuses on the integration of different services both human-based and automatic. Automated services such as retrieval of the insurance policy or the fraud history check illustrate the inclusion of third party applications or B2B transactions with external service providers.

This is a more natural way of demonstrating the use of Process Choreographer since the Content Manager Enterprise Edition V8.3 sample process is a simple human-centric document flow example that can easily be implemented on the basis of Document Routing.

## 3.1 The sample process

The sample process provided with the CM / PC Integration Quick Start implements a simplified Claims Handling Process. Though it uses some insurance terminology and corresponding sample data it can be seen as an example of a more abstract review and approval process.

Click this link: <u>http://localhost:11605/QuickStartClient</u> to display the initial page of the Quick Start Client. This page shows an abstract representation of the process outlining important steps and roles. You may want to bookmark this link so you can easily launch the client without reference to this documentation. Note that you have to adapt the port number in the link to the Quick Start Client if you have changed it during configuration (see <u>Configure and Start the Test Server</u>)



- The blocks that have a schematic representation of a person in their top right corner represent staff activities. The other blocks represent (automated) services. Diamonds represent decisions and the rounded rectangles indicate the beginning and end of a process instance's lifetime (the process is configured such that process instances are deleted as soon as they terminate.
- You can move the cursor over the graphical elements to see a brief description of their purpose.
- The **Mailroom** represents an activity that is outside the scope of the process. This activity is responsible for adding incoming documents to the Content Management System. Note that the functions of the Mailroom could also be performed with a Content Manager client such as the *DB2 Content Manager Client for Windows*.
- The process enclosed by rounded rectangles consists of three sections: 1. data validation, 2. approval or rejection, 3. notification.
  - 1. Data validation ensures all information needed to review the case is available. It consists of an automated step (RetrievePolicy), a staff-based one (Validate and Adjust) and a so-called Collection Point. Retrieve Policy uses the Folder Management service provided by the Integration Toolkit to locate the insurance policy for the claim. The staff-based activity Validate and Adjust assumes that additional information may be required as input for the review such as an Adjuster Report. Members of the AdjustersGroup are responsible for pre-assessing the case and making sure all required information that is needed to decide on the case is available. The collection point is a service provided by the Integration Toolkit that lets a process instance wait until a certain number of specified items is in the claim folder. The members of the AdjustersGroup can modify these conditions to a certain degree (such as removing the dependency on a Police Report). The collection point service performs regular checks on the condition and lets the process instance continue if all required documents are in the folder. A timeout occurs if the required documents are not available in a specified time frame. In this case process execution loops back to the Validate and Adjust activity where a reminder count keeps track of the number of timeout cycles that happened so far. At this activity staff personnel can act accordingly by requesting the required documents or weakening the collection point condition. See the section <u>The collection point service</u> for details on the collection point service.

- 2. The Approval or rejection section of the process begins with a switch activity (also called a decision point) where one of two paths is taken depending on the value of the Claim Amount attribute. For small claims members of the UnderwritersGroup investigate the documents in the folder and complete the review activity by approving or rejecting the claim. For large claims (Claim Amount > \$5000) a FraudHistory service assesses the trustworthiness of the claimant and might check certain criteria of the case. The result of this service is made available to members of the UnderwritersGroup who are entitled to review either small or large claims. Only members of the UnderwritersGroup can approve or reject large claims.
- 3. The **Notification** section of the process evaluates the result of the review and either sends an approval letter and pays the claim amount or sends a rejection letter. Note that sending of the approval letter and payment (which we assume to be a sub-process) can run in parallel. The CheckFraudHistory service and the three services involved in the notification section are implemented as simple Java methods that write a message to the server's standard output since illustrate the use of internal or external services but are beyond the scope of the sample. These methods can be found in <WORKSPACE\_

FOLDER>\ClaimsHandlingProject\com\ibm\bpe\cm\sample\ClaimsHandlingUtilities.java.

- Moving the cursor over the boxes of the process diagram displays a brief description of the purpose of the corresponding element.
- To perform a staff-based activity, click on a box that represents a human activity and log on as a member of the group displayed in italics right below the box title. The following table shows the mapping of actions to group names and group members:

	Group	Group members
Mailroom	AgentsGroup	Agent1, Agent2
ValidateAndAdjust	AdjustersGroup	Adjuster1, Adjuster2
ReviewSmallClaim	UnderwriterAssistantsGroup	UnderwriterAssistant1, UnderwriterAssistant2
ReviewLargeClaim	UnderwritersGroup	Underwriter1, Underwriter2

If your library server name is not icmnlsdb you need to open <WORKSPACE\_

FOLDER>\QuickStartClient\JavaSource\com\ibm\bpe\cm\util\ProcessData.java in WebSphere Application Developer Integration Edition, change the value of CM\_DATASTORE\_NAME accordingly, and re-build the project QuickStartClient. Note that the update is enabled in the active Web project on the fly so the server does not need to be re-started.

## 3.2 Process initiation

This section explains the different ways to create process instances corresponding to a variety of options to import documents into the Content Manager server. The key distinction is if process instances are created explicitly by an application or implicitly based on events. The former option may be preferred if the application that manages incoming documents is within the control of your organization so that code can be added to explicitly create process instances where needed. The code used to create instances based on existing items may be investigated to see how this works. The latter option may be preferred in cases where document import is treated as a black box or the corresponding application is not within the control of your organization.

- Click the box titled **Mailroom** and log on as Agent1 with password password (which by default is the same for all roles of the sample process).
- The Mailroom user's initial page contains three sections titled Create documents, Import predefined documents, and Create process instances for existing items

YZ_Insurance       Quick Start Client       WebSphere       Business Integration Server Foundation       DB2       Content Manager Enterprise Edition       Image: Teal         Help       UserID Agent1       Logout         Create documents       Create Adjuster Report       Create Create         Adjuster Report       Create Create	<b>₹</b> ₀
Help         UserID Agent1 Logout           Create documents         Create           Claim Form         Create           Adjuster Report         Create           Police Report         Create	
Create documents       Claim Form     Create       Adjuster Report     Create       Police Report     Create	
Claim Form         Create           Adjuster Report         Create           Police Report         Create	
Import predefined documents	
Claim Forms Mary Twain Claim Number: 3-742019 Store	
Alexander Churchill Claim Number: 3-501699 Store	
Adjuster Reports         Adjuster Report for Mary Twain's case         Claim Number:         3-742019         Claim Amount:         \$10000 T	
Adjuster Report for Alexander Churchill's case Claim Number: 3-501699 Claim Amount: \$1000 Store	
Police Reports Mary Twain Claim Number: 3-742019 Store	
Alexander Churchill Claim Number: 3-501699 Store	
Create process instances for existing items	
Content Manager Query /XYZ_ClaimFolder Submit	

- The section titled **Create documents** can be used to create instance of the three item types XYZ\_ClaimForm, XYZ\_ AdjReport, and XYZ\_PolReport. Since each of these is linked to a XYZ\_ClaimFolder that has the attribute WF\_OnCreate with a default value of ClaimsHandlingProcess creating an instance of any of these creates an instance of an enclosing XYZ\_ClaimFolder which is started on a ClaimsHandlingProcess instance.
- Since creating an item may involve entering many mandatory values the section Import predefined documents can be used to create items of the three types based on pre-defined attribute values. These values refer to the Content Manager first steps sample data and are expliticly stored in startProcessInstances.jsp. The ClaimNumber is displayed in an input field to enable simple creation of new cases. Note that the Claim Number is the attribute that uniquely defines a case. Set the value in the Claim Number appropriately to trigger the creation of a new claim folder or to ensure proper linkage of documents to an existing claim folder. For items of type Adjuster Report the claim amount can be specified to be either small (\$1000) or large (\$10000, \$50000) based on pre-defined values. Click Store to create a new item in Content Manager and store the predefined / modified attribute values. Note that the actual document files need to be added in a separate step by clicking Add Part on the 'edit attributes and parts' dialogue.
- The section Create process instances for existing items can be used to create process instances based on the sample data already importet into Content Manager during the 'Create Sample Data' step of the Content Manager First Steps application. Click Submit to run the default query /XYZ\_ClaimFolder which locates all instances of XYZ\_
   ClaimFolder and creates instances of the ClaimsHandlingProcess for each element of the result list. By adding additional conditions (as for example /XYZ\_ClaimFolder/OUTBOUNDLINK[@LINKTYPE = "DKFolder"]/@TARGETITEMREF
   => XYZ\_ClaimForm[@ClaimLName = "Twain"]) the query can be refined to restrict the items for which process instances should be created to e.g. all claim forms submitted by a person with family name Twain.
- This tour starts with the section **Import predefined documents** since this illustrates the use of content event handling and is based on existing data.
- Click the **Store** link for Mary Twain's claim form in the **Import predefined documents** section to create an instance of the XYZ\_ClaimForm item type in Content Manager. Due to auto foldering this triggers the creation of a corresponding XYZ\_ClaimFolder. Since the XYZ\_ClaimFolder item type has the attribute WF\_OnCreate defined and pointing to a default value of ClaimsHandlingProcess this triggers the creation of a process instance.
- The console output of the test server confirms the creation of an item (-> Item created) and completion of the first step in the process (>> Number of matching insurance policies: 1).
- Click Add part on Agent1's activity page to attach the actual document to the item.

CM/BPC Quick Start Client - Attributes - Microsoft Internet Explorer      X         Ele       Edit       Yew       Favorites       Tools       Help						
XYZ_lr	SUFANCE Quick Start Client	WebSphere Business Integration Server Foundation	OB2 Content Manager Enterprise Edition	IBM.		
Help Create Item			UserID Ager	nt1 Logout		
Edit attributes						
Item name	Attribute name	Attribute value		Action		
Mary	*Claimant First Name	Mary		Save		
	Claimant Last Name	Twain				
	*Claim Number	3-742019				
	*Driver's License Number	B54673210				
	"Incident Date	2005-09-09				
	*Insured First Name	Gregory				
	"Insured Last Name	Twain				
	*Policy Number	10452136412				
Edit parts						
Part No	Part type	Mime type		Action		
				Add Part		

• Locate the TIFF image of a scanned claim form in <IBMCMROOT>\firststeps\data\4-852369.tif and click Import to add it to the new item. Note that the console output confirms the upload with a message (-> imported file of length: 27688 mime type: image/tiff)

CM/BPC Quick Start Client - Import Part - Microsoft Internet Explorer     Ele Edit View Favorites Iools Help			LOX A
XYZ_Insurance Quick Start Client	WebSphere Business Integration Server Foundation	DB2. Content Manager Edition	iv.
Help Create Item		UserID Agent1 Logo	out
Add part			
Part type, Mime type, and Location		Action	
ICMBASE Defined by extension C:\Program Files\db2cmv8\firststeps\data\4-852369.tit	Browse	Import	
			<u>_</u>

• You can click **Create item** to get back to the Mailroom home page and create further items. For now we log out Agent1 by clicking **Logout** at the right hand side of the menu bar.

#### 3.3 Data validation

- The message >> Number of matching insurance policies: 1 in the server console confirms that an appropriate insurance policy has been located in content manager which has the policy number as entered in the claim form. The RetrievePolicy service has retrieved this item from Content Manager and added it to the folder that is routed through the process.
- On the process diagram click the box Validate and Adjust and log on as Adjuster1.
- The adjuster's initial page shows the adjuster's worklist. It contains a single work item corresponding to the process instance that has been created in the previous step (Mary Twain's claim form). The worklist might be empty due to the process being in the 'Retrieve Policy' state. In this case the **Refresh** may need to be clicked to update the worklist to its

most recent state. Note that the worklist display results from a combined query that returns item attributes (Date of Incident, Claim Number, etc.) as well as process properties (Activated, Work Item State). The console output shows the Content Manager query in the form <code>query= /XYZ\_ClaimFolder[@ITEMID IN ....]</code>

CM/BPC Quick Start Client	t - Work List - Microsoft Interr	iet Explorer			_O×
Ele Edit View Favorite	s Iools Help				
XYZ_Insu	II'ANCE Quick S	tart Client	WebSphere Business Integration Server Foundation	OB2 Content Manager Enterprise Edition	
Help Refresh				UserID Adjuster	1 Logout
Worklist					
Date of Incident	Claim Number	Insured	Activated	Work Item State	Action
2005-09-09	3-742019	Twain	2005-10-28T12:32:26	Ready	Fetch
					-

• Click Fetch to check out this work item. This makes it unavailable for any other member of the AdjustersGroup and brings up the work item view. The console output confirms that the work item has been checked out with the message-> Work item claimed

CM/BPC Quick Start Clie	nt - Work - Microsoft Internet Explorer			
j pie gait new ravon	ies Toois Ücib	Ducinoce I	nteeration Contra	ant Managor
XYZ_Inst	Urance Quick Start Clie	nt WebSphere Server Fou	indation DB2. Enter	prise Edition
Help My ToDos				UserID Adjuster1 Logout
Process activity				
ValidateAndAdjust				Actions
Contract retrieved Reminder count:0	Required documents Adjuster Report Police Report Auto Photo	nt 1 Remind me in 1	10 💌 seconds	Complete Cancel
Folder				
Folder Name 3-742019	Type / Parts Claim Application Folder	Attribute name Claim Number	Attribute value 3-742019	Actions Edit Add Adjuster Report Add Photo
Items in folder				
Item Name	Type / Parts	Attribute name	Attribute value	Actions
Mary	Auto Claim Form	Claimant First Name Claimant Last Name Claim Number Driver's License Number Incident Date Insured First Name Insured Last Name Policy Number	Mary Twain 3-742019 B54673210 2005-09-09 Gregory Twain 10452136412	Edit Delete
10452136412	Insurance Policy	Policy Number Street State City ZIP Code XYZ_Insured Insured First Name Insured Last Name XYZ_Insured Insured First Name Insured Last Name XYZ_VIN Vehicle Identification Number XYZ_VIN Vehicle Identification Number XYZ_VIN Vehicle Identification Number	10452136412 258 Green Rd. CA Ocean 90060 Gregory Twain Mary Twain 1HOME10R4KL987258 3CASA55R4KL987500 blurx	Edit Delete
	Part 0	ICMBASE	image/tiff	View
				<u>*</u>

- Note that the work item page contains three sections titled **Process activity**, **Folder**, and **Items in Folder**. The **Process activity** section basically displays the in- and output message of the staff activity that consists of the relevant process properties (input message) and of the controls which the Adjuster needs to work with to complete this step of the process. The **Folder** and **Items in folder** section display the content-related information. The first column shows the folder or item name as specified by the 'represents item' property of the corresponding item type. The second column shows the item type or part number and the third/fourth column display attribute value pairs of the corresponding item or folder.
- Optional: at this point you may want to explore how a user would modify attribute values. You can do so by clicking Edit and for example change the value of the Street field in the address to 259 Blue Rd.. When clicking Save you will see the effect of the modification on the updated work item page.
- Click **View** to open the viewer in a separate window. Create an annotation (you may highlight a part of the document or put a note on it) which may be used to communicate important information to a human role (e.g. Underwriter) later in the process.
- Note that the Insurance Policy has been retrieved and added to the folder by the first activity of the process.
- Click the Add Report action in the folder section to add an item of type Adjuster Report. This opens the Edit attributes and parts page. Note that the claim number is already instantiated to the claim number of the folder. Enter values for the mandatory fields (marked by a red asterisk) as shown below and click **Save** to store the adjuster report in Content Manager.

CM/BPC Quick Start Clien	t - Attributes - Microsoft Internet Explorer is <u>T</u> ools <u>H</u> elp			rota M
XYZ_Insu	IFANCE Quick Start Client	WebSphere Business Integration Server Foundation	DB2. Content Manager Enterprise Edition	ien.
Help <u>My ToDos</u>			UserID Adjuster	1 Logout
Edit attributes				
Item type	Attribute name	Attribute value		Action
XYZ_AdjReport	*Adjustment Date	2005-09-10		Save
	*Adjuster First Name	Mike		
	*Adjuster Last Name	Reed		
	*Claimant First Name	Mary		
	*Claimant Last Name	Twain		
	Claim Number	3-742019		
	*Incident Date	2005-09-09		
	"License Plate Number	4IBM134		
	*Policy Number	10452136412		
	Claim Amount	10000		
Edit parts				-
Part No	Part type	Mime type		Action
				7

• Click Add part and import <IBMCMROOT>\firststeps\data\4-852369\_adjustment.tif. Click Work Item in the menu bar to return to the Work Item View and note that the Adjuster Report is now a member of the claim folder.

CM/BPC Quick Start Client - Import Part - Microsoft Internet Explorer     Ele Edit View Favorites Iools Help		LON N
XYZ_Insurance Quick Start Client WebSphere Business Integration Server Foundation	DB2 Content Manager Enterprise Edition	INV.
Help My ToDos > Work Item	UserID Adjuster1	Logout
Add part		
Part type, Mime type, and Location	Action	
ICMBASE  Defined by extension C:\Program Files\IBM\db2cmv8\firststeps\data\4-852369_adjustment.tif Browse	Import	
		<u>-</u>

- Note that the collection point conditions require an additional Police Report before the process can continue. Click **Complete** in the 'Process activity' section to move the folder to the next step in the process to experience the effect of a collection point timeout.
- After 10 seconds (depending on the 'Remind me' setting) the following message shows up in the console view: Reminder: submit remaining documents for claim number 3-742019 iteration (1). Click Refresh in the menu bar of the Quick Start Client to refresh the adjuster's worklist. Notice that it again contains an entry referring to case 3-742019.
- Notice that the 'Reminder count' now has the value 1 since this is the first time the process has cycled back to the ValidateAndAdjust activity due to the collection point conditions not being met.
- In the 'Process activity' section set the number of required documents of type Police Report to 0 assuming that the police report is not required for a decision later in the process. This shows how collection point conditions can be set dynamically on a process instance.

CM/BPC Quick Start Clie	nt - Work - Microsoft Inte	met Explorer						-OX
Ele Edit View Favori	tes <u>T</u> ools <u>H</u> elp							27
XYZ_Inst	<i>Ulrance</i> Quid	ck Start Client	WebSphere	Business Ir Server Fou	ntegration Indation	D82.	Content Manager Enterprise Edition	iew.
Help My ToDos							UserID Adjuster	1 Loqout
Process activity								
ValidateAndAdjust							Action	s
Contract retrieved	Required documents	Adjuster Report	1 Remi	nd me in 🛛 🚺	10 💌 second	s		
Reminder count:1		Police Report	0 -				Comple	ete
		Auto Photo	0 -				Galicel	L
Falder								
Folder	Ture / Durin		A station of the state of the s		A		A	
Folder Name	Type / Parts		Attribute name		Attribute va	lue	Action	s •1
3 740010	Claim Annlicatio	n Foldor	ALC: NO D		-		EAD	<u></u>

- Click **Complete** to complete the adjuster's activity and forward the work item to the next step in the process. The console output displays the message -> Work item completed to confirm successful completion of this step.
- Since Adjuster1 has changed the number of required Police Reports to 0 the collection point condition is now met by the folder since it contains the three required documents: a ClaimForm, an Insurance Policy, and an Adjuster Report. The console output confirms that the collection point has been passed successfully with the message >> Documents are ready for claim number 3-742019. It further displays the following two messages: >> Claim Amount is large (10000.00) and >> Fraud report for Mary Twain is good that result from the decision point and the Check Fraud History service respectively.
- Log out Adjuster1.

#### 3.4 Approval or rejection

- Since the adjuster report created in the previous step lists a claim amount of \$10000 the claim is considered a large claim by the decision at the beginning of this section which moves it along the path with the two activities **CheckFraudHistory** and **ReviewLargeClaim**.
- The **CheckFraudHistory** service is a service that decides based on some data extracted from the relevant documents if the claimant's fraud history is good or bad. This could be realized by a BI tool that investigates certain company-internal data bases such as statistics about incident locations, customer credibility, etc. Alternatively it could be an external service provided by some sort of agency with which the insurance company shares a contract. The sample implements this as a Java-based service that returns a bad fraud history if the initial letter of the claimant is in the range 'A'...'L' and returns good otherwise.
- On the process diagram click the box Review Large Claim and log on as Underwriter1.
- The home page of the underwriter activity shows the Underwriter's worklist. It contains a single work item corresponding to case number 3-742019. Note that the columns in the work list differ from the adjuster's worklist in that they now contain the name of the current activity (members of the group UnderwritersGroup may perform either the ReviewSmallClaim or the ReviewLargeClaim activity) and the creation date of the adjuster report.

CM/BPC Quick Start Clie	ent - Work List - Microsoft Ini ites _lools _Help	ternet Explorer				
XYZ_Ins	<i>Ul'ANCE</i> Quick	Start Client	WebSphere Ser	siness Integration rver Foundation	DB2. Content Manager Enterprise Edition	IRM.
Help Refresh					UserID Underwriter	1 Logout
Worklist						
Activity	Date of Incident	Claim Number	Insured	Adjuster Report	Work Item State	Action
ReviewLargeClaim	2005-09-09	3-742019	Twain	2005-01-01	Ready	Fetch
						¥

• Click Fetch to check out this work item and open the work item page

- Chipare Quick Start Calent	tork - Alcrosoft Internet Explorer			-DX
Ele Edit View Favorites	Iools Help			
XYZ_Insura	<b>ANCE</b> Quick Start Client	WebSphere Business Integration Server Foundation	DB2. Content Manager Enterprise Edition	IBM.
Help My ToDos			UserID Underwriter	1 Logout
Process activity				
ReviewLargeClaim				Actions
Fraud report for Mary Twair	n is good C Approve the claim.	Justify decision:	X	Complete Cancel
Folder				
Folder Name	Type / Parts	Attribute name	Attribute value	Actions
3-742019	Claim Application Folder	Claim Number	3-742019	Edit
Items in folder				
Item Name	Type / Parts	Attribute name	Attribute value	Actions
Mary	Auto Claim Form	Claimant First Name Claimant Last Name Claim Number Driver's License Number Incident Date Insured First Name Insured Last Name Policy Number	Mary Twain 3-742019 B54673210 2005-09-09 Gregory Twain 10452136412	Edit Delete
	Part 0	ICMBASE	image/tiff	View
10452136412	Insurance Policy	Policy Number Street State City ZIP Code XYZ_Insured Insured First Name Insured Last Name XYZ_VIN Vehicle Identification Number XYZ_VIN Vehicle Identification Number	10452136412 258 Green Rd. CA Ocean 90060 Gregory Twain 1HOME10R4KL987258 3CASA55R4KL987500	Edit Delete
	Part 0	ICMBASE	image/tiff	View
2005-01-01	Adjuster Report	Adjustment Date Adjuster First Name Adjuster Last Name Claimant First Name Claimant Last Name Claim Number Incident Date License Plate Number Policy Number Claim Amount	2005-01-01 John Smith Heinz Rühmann 3-742019 2005-01-01 ABC3 12345 8000.00	Edit Delete
	Part 0	ICMBASE	image/tiff	View

- The **Process activity** section displays the result returned by the Check Fraud History service and the controls for approving or rejecting the claim and adding a justification. The justification is stored in a process variable and not in Content Manager. Thus it is available throughout the process and potentially stored in the process log but not made persistent in the content repository.
- Click **View** in the Actions column for the Auto Claim Form and investigate the annotations which the Adjuster has added to the document.
- Select **Approve** leave the justification field empty and click **Complete**.
- Notice the messages >> Paying for claim number 3-742019 and >> Sending approval letter for claim number 3-742019 that signal successful completion of the process.

## 3.5 Exploring alternative options

- Use the Mailroom activities to create adjuster reports and police reports. Ensure that the claim numbers of these reports are correct so auto foldering assigns them to the appropriate folders.
- Create process instances explicitly based on the claim folders in DB2 Content Manager (using the query option).

- Set Claim Amount to 1000 to explore the 'small claim' path. In this case log on as UnderwriterAssistant1.
- Reject a claim and notice the message >> Sending rejection letter for claim number etc...
- Note that the availability of operations in the right-most column of a staff activity (for example Edit, View, Delete) depends on the access rights members of this user group have for the corresponding item type. Remove rights to see the action list changes accordingly.
- Import parts with different mime types (note that when importing files with extension .jpg or .jpeg mime the mime type should be selected explicitly).
- Explore the capabilities of the viewer applet.

## 4. Developing a Custom Content Manager / Process Choreographer Integration Solution

This chapter describes the elements of the Integration Toolkit and outlines how they can be combined to create a custom integration solution.

## 4.1 How a CM/PC integration workspace is organized

The following sections assume a basic familiarity with *DB2 Content Manager Enterprise Edition V8.3*, *WebSphere Studio Application Developer Integration Edition V5.1.x*, and *WebSphere Business Integration Server Foundation V5.1.x*. They focus on the concepts that are specific to an integration solution based on the Integration Toolkit and Quick Start Client. Valuable resources to get familiar with the environment are the redbooks and documentation referenced in the literature section at the end of this document. From the point of view of business process creation we recommend the business process samples that can be found in *WebSphere Application Developer Integration Edition* under **New > Other > Examples > business integration > scenarios > BPEL**. We recommend working through at least one of the 'build it yourself' style samples and taking the time to look up new concepts in the redbooks or documentation.

A workspace of a custom solution that integrates DB2 Content Manager with Process Choreographer typically consists of the following projects:

- Service project(s) that host(s) one or more processes. A useful convention may be to use a name ending with 'Process' to distinguish it from the other projects in the workspace.
- Integration Toolkit (ContentManagerIntegration, ContentManagerIntegrationJar, ContentManagerIntegrationEjb).
- Quick Start Client adjusted to the needs of the custom process.

In the following we describe the elements of an integration solution based on the three types of projects and their interaction.

## 4.2 The Integration Toolkit

The Integration Toolkit is a set of Java classes and EJBs that support the creation of content-centric processes. See the figure below for a schematic representation of the Quick Start architecture:



The three red blocks mark the three elements of the Content Manager / Process Choreographer Integration Quick Start: the Quick Start Client, the claims handling sample process and the Integration Toolkit.

The Integration Toolkit methods are implemented within a stateless session bean context that permits the current global transaction to be suspended while invoking the Content Manager API. This enables efficient use of Content Manager within the WebSphere Application Server environment. A Java class named ContentManager provides static methods that simplify programmatic exploitation of underlying services, including EJB access. This class is especially useful in the Process Choreographer Java Snippet environment, where process designers may have limited Java skills.

The API documentation for the static methods in ContentManager can be found in ContentManagerIntegrationJar\doc\index.html

**Startup beans** are WebSphere-specific stateful session beans that are automatically notified when a WebSphere application is started or stopped. A bean is designated as a startup bean by implementing special home and remote interfaces. When WebSphere starts an application, it looks for beans that implement these special startup bean interfaces. If it finds any, it arranges to invoke the beans start() and stop() methods on application initialization and termination. The Integration Toolkit uses the startup bean to start and stop the asynchronous bean described below.

**Asynchronous** beans are WebSphere-specific enterprise beans that are executed asynchronously and provide support for application threading within a J2EE environment. There are three types of asynchronous beans:

- Worker Beans
- Alarm Listener Beans
- Event Listener Beans

The Integration Toolkit uses a worker asynchronous bean. A worker asynchronous bean is like a Windows service or a Unix/ Linux daemon process. It runs until asked to terminate. The integration asynchronous bean runs in a loop, doing its work and then sleeping for a period of time before waking up and repeating the process. When started by the startup bean, the asynchronous bean used by the Integration Toolkit invokes methods in the Content Manager Integration Stateless Session Bean to perform the following operations:

- Check for satisfied collection point criteria
- Process content manager events that require process initiation or termination actions (content event handling)

The asynchronous bean loops until its stop method is invoked by the startup bean at application termination.

The **Collection Point MDB** (Message Driven Bean) is invoked in response to messages from Collection Point activities in content-centric processes. In other words, when such a process encounters an Invoke activity which is bound to the Collection

Point service, it puts a message on a specific Java Message Service (JMS) queue (CollectionPointQueue). When that message reaches the head of the queue, an associated listener gets the message from the queue and WebSphere invokes the Collection Point MDB. The Collection Point MDB retrieves the elements of the request (item id, name and quantity of items to wait for) and invokes a method in the Content Manager Integration Stateless Session Bean to register the collection point for subsequent processing by the Content Manager Integration Asynchronous Bean, which sends a reply message back to the business process when the collection point condition is satisfied.

You can invoke an asynchronous service (e.g. bound to a JMS implementation) with a single invoke activity or use a invoke/ receive pair in the BPEL process to communicate asynchronously with a partner. In the first case a correlation set needs to be maintained to locate the process instance to which the response should be sent. With JMS binding locating the appropriate process instance can more easily be done based on the JMS message ID.

The **Content Manager Integration Stateless Session Bean** does most of the work. Note that the implementation of most of these functions can be found in the com.ibm.bpe.cm.util package of the ContentManagerIntegrationJar project.

At the level of content / workflow interaction patterns the Integration Toolkit offers the following functions:

- Content Event Handling item creation or deletion events in Content Manager trigger corresponding actions in Process Choreographer
- Collection Point let a process instance wait until a certain number of items of a certain type are in a folder (or a timeout or exception occurs)
- Content Attribute Access efficient means to access the value of content attributes from within the business process, e.g. to enable content-specific decisions
- Folder Service add the item routed through the flow to a retrieved folder or add a retrieved item to the folder routed through the flow
- Combined Query efficiently retrieve process information from Process Choreographer and associated business attributes from Content Manager
- Common Staff Repository the Integration Toolkit includes a WebSphere User Registry that leverages the Process Choreographer staff resolution facility to map Content Manager user and group definitions to the role / verb model used to identify user access for a work item

A process that uses any of the toolkit functions needs to comply with the following conventions:

- It has a single receive activity.
- The input message definition (WSDL) of the process contains a part with the name itemPid and type (xsd:string).
- The receive activity is followed by a Java snippet which performs the following initialization:

ContentManager.initializeCustomProperties(this, get<ProcessRequestVariableName>
().getItemPid());

When creating a new CM/PC integration project make sure that ContentManagerIntegrationJar is included in the list of project references of the corresponding service project. The initial Java snippet copies the itemPid value of the input message to process properties where they are available e.g. for combined query evaluation. The Integration Toolkit stores an item's unique identifier as both a fully specified itemPid and as a triple <ITEMID, COMPONENTID, VERSIONID>. When starting a process instance based on content event handling, only the triple-based information is available. During initialization of the process, the method initializeCustomProperties() retrieves the fully specified item PID that contains among other information the library server name and item type.



## 4.3 Content Event Handling

With content event handling, activities in DB2 Content Manager generate events that can be handled by the business process management system. The Integration Toolkit provides an implementation of content event handling that deals with item creation and deletion events. If defined properly, an item creation event triggers the creation of a process instance as soon as an item of a certain type is stored in DB2 Content Manager. The newly created process instance contains a reference to the item just created. If capturing of deletion events is specified, the deletion of an item in DB2 Content Manager triggers the removal of any process instances 'carrying' it.

### How to use Content Event Handling

The administrator specifies which items trigger creation or deletion events based on the custom attributes  $WF_OnCreate$  and  $WF_OnDelete$  that need to be assigned to the item types for which content event handling should be enabled. Both attributes need to be defined as a variable length character string with a minimum length of zero and a maximum length of 254 as shown below:

Attribute Properties - WF_OnCreate					
Name: * WF_OnCreate Display name: * WF_OnCreate Attribute type C Character	Character type		<u>T</u> ranslate		
<ul> <li>Oragineter</li> <li>Variable character</li> <li>Short integer</li> <li>Long integer</li> <li>Decimal</li> <li>Double</li> <li>Date</li> <li>Time</li> <li>Time stamp</li> </ul>	<ul> <li>Alphabetic (1)</li> <li>Numeric (2)</li> <li>Alphanumeric (3)</li> <li>Extended alphanumeric (4)</li> <li>Other (5)</li> </ul> Character length Minimum: 0 4				
	OK Cancel	Apply	Help		

To enable an item type for content event handling add WF\_OnCreate or WF\_OnDelete to its list of attributes and enter the template name of the process to be notified as the default value.

Definition	Foreign Keys   Logging   Access Control	Document Management I User Exits Attributes
Available attributes or groups	Add > Add > Add/New Child >	attributes and components   XYZ_ClaimFolder   XYZ_ClaimNumber   WF_OnCreate   WF_OnDelete     WF_OnDelete     Reguired   Regresents item   Urigue     Text searchable   pimum value:
1 / 59 Selected	De	fault value: ClaimsHandlingProcess

The value of the attribute WF\_OnCreate specifies the name of a process to start whenever the corresponding event occurs. So, for example, if the WF\_OnCreate attribute for the XYZ\_ClaimFolder item type is set to ClaimsHandlingProcess, then whenever a user creates a new item of type XYZ\_ClaimFolder, a new instance of the ClaimsHandlingProcess is started with a reference to this item in its input message. Note that this assumes a certain definition of the input message for these processes, in particular the message must contain at least a String part named itemPid. If multiple versions of this process are deployed, the most recent process with respect to the Valid From date is selected. If the attribute WF\_OnDelete is present in the definition of the item type XYZ\_ClaimFolder with a default value of ClaimsHandlingProcess, deleting an item of this type terminates all instances of the ClaimsHandlingProcess that carry this item.

With this create and delete linkage, content event handling enables some degree of referential integrity between the content repository and the process management system in the sense that document creation or deletion causes corresponding action in the process management system in order to keep the two systems synchronized.

## How Content Event Handling is implemented

Item type definitions that have a WF\_OnCreate or WF\_OnDelete attribute are registered in a table BPECONTENTENVENTS that the Integration Toolkit creates in the library server database. Each row in the BPECONTENTEVENTS table constitutes a content event request. The method checkContentEvent() of the stateless session bean is called regularly from the asynchronous bean to see if a new process instance should be created or if process instances should be deleted. It scans the BPECONTENTEVENTS table in the order and performs the corresponding creation or deletion operations in the order in which requests have been added to the table deleting the rows as soon as the corresponding action has been performed successfully. If an action fails, an error message is written to the log the row remains in the table and the event is retried during the next cycle of the asynchronous bean. The BPECONTENTEVENTS table is created during server startup if it does not exist yet.

The BPECONTENTEVENTS table has the following structure:

CREATETS	TIMESTAMP
ITEMID	CHAR(26)
COMPONENTID	CHAR(18)
VERSIONID	SMALLINT
REQUEST	SMALLINT
PROCESSNAME	VARCHAR (254)

The CREATETS column is the creation date and time of the content event. It ensures that content events are processed in the order in which they are received. The ITEMID, COMPONENTID and VERSIONID columns are the key values of the corresponding itemPid the creation or deletion of which triggered the event. The REQUEST column indicates the type of CM event: 1 for creation, 2 for deletion. The PROCESSNAME column indicates the name of the process to be created in case of creation events. Rows are written to the BPECONTENTEVENTS table using database triggers. These triggers are automatically created by the Asynchronous Bean for Content Manager item types that contain the custom attributes WF\_OnCreate or WF\_OnDelete. The trigger is created on the underlying Content Manager Component Table (a table of the form ICMUTnnnnsss). Once the trigger is created, create and delete operations for the item type result in requests being written to the BPECONTENTEVENTS table. This has the benefit of decoupling the Content Manager transaction from the subsequent Check Content Event transaction so that the performance impact to the Content Manager transaction is minimal. The BPECONTENTEVENTS table is created (if it doesn't already exist) via the ejbCreate method, the first time the Content Manager Integration Stateless Session Bean is created.

Apart from this specific mechanism content event handling can also be viewed as specific instance of a more general concept that may be applied to other special processing, as needed.

Examples might be:

- Notify process instances if the item they are referring to is updated
- Trigger a 'review process' within a certain period of time after a document has been created
- Trigger a process if a document is moved to a different storage system
- etc.

## 4.4 The Collection Point Service

A collection point can be used where the item that is routed through the process is a folder. A collection point is an activity in the process which waits until a certain folder condition is valid. This condition is expressed in terms of <ITEMTYPE, QUANTITY> pairs. A set of such pairs specifies how many instances of the named item types need to be in the folder for the process instance to resume execution. <1, XYZ\_ClaimForm>, <2, XYZ\_AdjReport>, <1, XYZ\_PolReport> is an example that lets the process instance wait until one claim form, two adjuster reports, and one police report are available in the claim folder that is routed through the process.

#### How to use the Collection Point Service

A collection point is modeled by two activities, a Java Snippet that defines the collection point conditions and an invoke activity that calls the collection point service provided by the Integration Toolkit. Note that a process using a collection point must be defined as long running since the availability of documents usually depends on some external conditions that are beyond the control of the process and typically person-based. Furthermore, a timeout may be specified to ensure the process instance resumes execution in lack of the required documents. In most cases, the timeout triggers a reminder or corrective action to ensure the process instance does not wait forever.

The collection point service takes an input message consisting of two arrays with the item type names and their respective quantities and a numeric part for the timeout. It returns a numeric status value that represents one of the following situations:

- Success in this case the condition is met by the folder content
- *Timeout* the condition has not been met within the number of milliseconds specified by the timeout parameter of the input message
- Folder has deleted the folder that is routed through the process (on which the collection point condition is defined) has been deleted
- Failure an exception has occurred while the process instance was waiting for the collection point condition to be met

A typical implementation of the collection point looks as shown below:



The Java snippet InitializeCollectionPoint instantiates the input message of the collection point service. It stores the item PID of the folder, and defines the collection point condition and timeout value as shown above. A decision inside the loop evaluates the return value of the collection point service and triggers corresponding actions such as sending a notification in case of a timeout or terminating the process instance in case of a failure.



A collection point service can be added to a process definition by dragging the CollectionPoint.wsdl from

ContentManagerIntegrationJar/com.ibm.bpe.cm/ and dropping it into the appropriate location of the process diagram. Since the collection point condition is specified by the input message of the collection point service, it can be read and modified at process runtime. The ValidateAndAdjust activity of the sample process demonstrates how a person with this role can adjust the collection point conditions within a certain range.

## How the Collection Point Service is Implemented

Invoking a collection point service produces a JMS message that triggers the registration of a collection point. For each message, registerCollectionPoint() retrieves the parameters initialized by the process and writes them to a table BPECOLLECTIONPOINTITEMTYPES in the Content Manager library server using JDBC.

The Content Manager library server database contains two tables for collection point support provided by the Integration Toolkit.

The table BPECOLLECTIONPOINTITEMTYPES contains one row for each item type and quantity specified in the collection point request. It is defined as follows:

CORRELATIONID	VARCHAR(254)
ITEMTYPENAME	VARCHAR (254)
ITEMTYPEQUANTITY	INTEGER

The CORRELATIONID column contains the JMS Correlation ID of the original message. The ITEMTYPENAME column contains the name of the item type to wait for. ITEMTYPEQUANTITY specifies the number of items of type ITEMTYPENAME to wait for.

The table **BPECOLLECTIONPOINTS** contains one row for each active collection point request. It is defined as follows:

CREATETS	TIMESTAMP
CORRELATIONID	VARCHAR(254)
ITEMID	VARCHAR(254)

The CREATETS column is the creation date and time of the collection point request. It ensures that collection point requests are processed in the order in which they are created. The CORRELATIONID column is the JMS Correlation ID of the original message. Process Choreographer uses it to correlate the response message with the request message so that the Invoke activity in the process completes. The ITEMID column is the Item ID of the folder to be checked.

There is a one-to-many relationship between BPECOLLECTIONPOINTS and BPECOLLECTIONPOINTITEMTYPES, based on the CORRELATIONID. Any of these tables is created during server startup if it does not already exist.

The method checkCollectionPoint() uses JDBC to perform an SQL guery which returns a list of collection points that are satisfied. For each satisfied collection point, it deletes the collection point request from the BPECOLLECTIONPOINTS table and sends a response message back to the Collection Point Invoke activity of the process. A request is also removed if the folder that is routed through the process has been deleted before the collection point condition is satisfied. Each row in the BPECOLLECTIONPOINTS table represents a collection point, and each row in the BPECOLLECTIONPOINTITEMTYPES table represents an item type condition for a collection point. checkCollectionPoint() joins these tables with the Content Manager Links, Items and NLS Keywords tables to efficiently identify all satisfied collection points in a single request to the library server database. checkCollectionPoint() uses the "Folder Contains" link type to determine the contents of folders. It sums the items for the specified Content Manager folder, and if the resulting counts are greater than or equal to the quantities specified in the collection point conditions, then the collection point is considered to be satisfied. The NLS Keywords table maps the Content Manager item type names to numeric Item Type ID's using the base name for the item type, which may be expressed in any language. However, to avoid a potential cross product, the join is limited to ENU, which must be present (though not necessarily in use). The collection point tables are created (if they don't already exist) via the ejbCreate() method, the first time the Content Manager Integration Stateless Session Bean is created. Rows are written to the BPECOLLECTIONPOINTITEMTYPES by registerCollectionPoint(). checkCollectionPoint() is invoked from the Content Manager Integration Asynchronous Bean.

#### 4.5 Content Attribute Access

There are a number of situations in which there is a need to access the attribute values of the item that is routed through the process or of items in the folder that is routed through the process. Typical situations are conditions on links in a parallel section (flow) of the process or on switch statements in a 'case' section that determine the path to be taken depending on the value of an attribute. Another typical situation is instantiating the input message of a staff activity or other service by extracting attribute values from the folder or from an item in the folder and placing them into parts of the input message to make them available as input parameters to the service. The integration toolkit offers the following methods to extract attribute values from items or to evaluate conditions over attributes:

Object ContentManager.getContentAttribute(processBean, attributeSpec)
Object[] ContentManager.getContentAttributes(processBean, attributeSpec)
Object ContentManager.getFolderContentAttribute(processBean, attributeSpec)

Object[] ContentManager.getFolderContentAttributes(processBean, attributeSpec) boolean ContentManager.evaluateCondition(String xPath) boolean ContentManager.evaluateCondition(ProcessBean bean, String xPath)

Each of these methods takes a reference to the process bean and an attribute specification as input parameters. The attribute specification is an array of Strings of the form <itemTypeName>/<attributePath>, where <itemTypeName> specifies the type of item that holds the attribute value of interest (the same attribute may be defined for many different items). <attributePath> can be an atomic attribute name or a sequence of attribute names separated by '/' in case of an attribute hierarchy (as for example in customer/address/city).

getContentAttribute() and getFolderContentAttribute() can be used if no more than a single value can be returned from the query (if the queried attribute is single-valued and no more than a single item of this type is contained in the folder). getContentAttributes() and getFolderContentAttributes() return arrays of objects and are thus capable of returning multiple values.

Decision points are an example for using attribute value access. Many business processes contain conditional processing, in which the path through the process is controlled by the value of attributes or variables in the process. Furthermore, the links between activities in a parallel section (flow) can be conditional, meaning that the link is only followed if the condition is true. These conditions can be specified in a variety of ways, including Java expressions. To use a decision point, a process designer adds a link between activities, specifies the value of the condition as Expression, and enters a Java expression that uses one of the methods listed above to evaluate the condition.

Here is an example of a Decision Point condition based on getFolderContentAttribute(). The condition verifies if the value of the attribute XYZ\_ClaimAmount exceeds a certain limit. The query looks for this value in items of type XYZ\_ AdjReport located in the folder which is routed through the process. If the attribute would be multi-valued or more than one item of this type could be part of the folder, getFolderContentAttribute() should be used instead because getFolderContentAttribute() accesses only the first element of the result set.



evaluateCondition() is based on a different concept to implement conditions on links or switch statements. When called with the process bean and an XPath expression as parameters, it returns true if the result of the query is non empty. The evaluateCondition(ProcessBean bean, String xPath) form of this method supports the following substitutable parameters, which can be included in XPath expressions to further qualify the results:



These substitutable parameters are replaced with the values of the Item ID, Component ID and Version ID (respectively) of the CM item associated with the process (typically a folder). The Item ID and Component ID parameters are character strings, and the substituted values include quotes to produce a valid XPath expression. The Version ID parameter is a number, which can be used in numeric expressions (e.g. %VERSIONID% > 3). Note that use of these substitutable parameters is optional and that the XPath expression is not limited to querying attributes of items associated with the process.

Here is an example of a Process Choreographer conditional link expression that checks to see if the mortgage amount exceeds \$333,700:



This Java expression uses the *%ITEMID*<sup>%</sup> substitutable parameter to get the CM Item ID associated with the process. This Item ID qualifies the search so that it only applies to the CM item associated with the current process. In this example, the item type is Mortgage and the name of the CM attribute is Amount. If the mortgage amount exceeds \$333,700 for the item associated with the current process instance, then the link will be followed and the next activity on that link will be executed.

### 4.6 Folder Service

The folder service adds one or more items to a folder. The two available operations are addFlowItemToFolder and addItemToFlowFolder. Both operations take the itemPid of the item that is routed through the folder and an XPath query as input and return a numeric value that represents the size of the result list obtained from running the XPath query. The operations differ as follows:

#### addFlowItemToFolder

In this case the XPath query needs to return a folder. This operation adds the item that is routed through the process to this folder. If the item routed through the process is itself a folder this will create a nested folder structure.

#### addItemToFlowFolder

In this case the item routed through the process needs to be a folder. This operation adds the items returned by the XPath query to the folder that is routed through the process.

#### 4.7 Combined Query

Typically, end users are not aware of underlying technologies and need not be concerned with whether they are using a process management system or a content repository. Ideally, these users have a single user interface that enables them to efficiently search for information, regardless of how that information is stored. In order for this to be the case, the Integration Toolkit provides a combined query capability that efficiently searches for information in both the Content Manager library server and the process engine database (i.e. not only content and its attributes, but also properties of the enclosing process instance). This query capability utilizes search criteria for both systems (the "where" clause) as well as attributes (the "select" clause). Combined query results only include items to which the caller has access. This means that the item must exist in a work list, and that the caller be authenticated as a user who has access to the work item.

To take advantage of this combined query capability, a Web programmer uses the combinedQuery method of the Integration Toolkit which has the following interface:

```
public QueryResultSet combinedQuery(
   String selectClauseWorkflow,
   String flowItemTypeNameContent,
   String flowItemTypeAttributesContent,
   String additionalAttributesContent,
   String whereClauseWorkflow,
   String xPathContent,
   String orderByClauseWorkflow,
   java.util.TimeZone timezoneWorkflow);
```

The combinedQuery method returns a com.ibm.bpe.api.CombinedQueryResultSet which enables a programmer to access the combined query results. This interface is designed to be used e.g. in a Web application. The Integration Sample Client implements the concept of user work lists based on the combined query capability of the Integration Toolkit. below.

#### 4.8 Staff Resolution

As work flows through a process management system, it is acted on by a variety of automated and manual steps. When a work item arrives at a manual step, the process management system must decide which users should have access to the item. This is referred to as staff resolution. Process Choreographer provides a highly configurable staff resolution facility that uses a role / verb model to identify user access for a work item. These are the predefined roles that describe the types of access supported:

• Administrators - People response for upper level administrative tasks

- Potential Owners People who may claim the item, perform the activity, and complete it
- Editors People who may update the item, but not complete the activity
- *Readers* People who may only view the activity, but not work on it

Process Choreographer uses staff verbs to assign users to these staff roles. The staff verbs are configurable queries to an underlying directory service, and are limited only by the power and flexibility of that service. For example, if the directory service supports a "manager of" relationship, then the staff verb can utilize that relationship to resolve a role to a manager of a user. Process Choreographer utilizes a pluggable interface to the underlying staff repository, and comes preconfigured with interfaces for LDAP, the WebSphere User Repository and a System directory.

The Integration Toolkit includes a WebSphere User Registry implementation for DB2 Content Manager. This uses the Content Manager user and group definitions to support group membership. This means that users only need to be defined once, using the Content Manager system administration interface, and that staff resolution can be performed at the group level. Alternatively an LDAP server can be used as a centralized repository for user and group definitions as will be done in <u>Chapter 5</u> of this document.

Note that the WebSphere user registry for DB2 Content Manager provided by the Integration Toolkit can not be used to implement Single Sign On (SSO) since enabling Content Manager for SSO requires disabling of the password checks. When used with an SSO-enabled application server this would bypass password checking and allow users to log on with an arbitrary password. The preferred way to implement SSO is by using a simple file-based user registry in the build environment (based on the files users.prop and groups.prop) and to use an LDAP system such as the Tivoli Directory Server for the runtime environment.

Note: Using a custom WebSphere User Registry affects all application running on the Application Server such as the Administrative Console. With a dedicated WAS installation for Content Manager and Process Choreographer (potentially also hosting the Resource Manager application) this should typically not be a problem as we recommend to use the library server userid (icmadmin) as Application Server and process administrator. If the Application Server is intended to host other applications as well, potential side effects when using a custom user registry need to be well-understood.

## 4.9 Customizing the Quick Start Client

The Quick Start Client is a generic DB2 Content Manager and Process Choreographer client that does not cover the full range of capabilities offered by DB2 Content Manager and Process Choreographer but it provides what can be thought of as a reasonable set of the most typically used functions and since it is available as source code it can be adjusted to the specific needs of your application.

The process-specific information is stored in

QuickStartClient\JavaSource\com\ibm\bpe\cm\util\ProcessData.java. The following settings may need to be adjusted:

#### **Global constants**

- CM\_DATASTORE\_NAME ... the name of the library server database (e.g. icmnlsdb)
- AUTO\_LINK\_ATTRIBUTE ... the name of the attribute that defines folder membership if a folder is routed through the process

QuickStartClient\JavaSource\com\ibm\bpe\cm\util\Helpers.java contains a method prepareName() that can be used to map a display name to some potentially truncated form that displays well on the client pages. For the First Steps sample data this means cutting off the comment in parenthesis: (Content Manager V8.1 Sample Item Type) or to truncate the display name of the XYZ\_ClaimFolder Claim Application Folder to contain other claim related documents (e.g. adjuster report, auto photos, claim form, etc) and linked by Claim Number at character position 24. This method may be helpful in cases like this where the display name serves as a 'description' of the item type in addition to being the (localizable) name that is displayed to users. prepareName() assumes display names have the form <actual display name > (<description>) where <actual display name is the name to be shown in the client and (<description>) is the comment that describes the item type in more detail. The constants DISPLAY\_NAME\_SIZE\_LIMIT and DISPLAY\_NAME\_TRUNCATION\_POS can be used additionally to truncate long names (those the length of which exceeds DISPLAY\_NAME\_SIZE\_LIMIT) to a maximum size of DISPLAY\_NAME\_TRUNCATION\_POS. Note that specific rules may need to be applied depending on the locale (see the section on Globalization and Accessibility Considerations for more details on this topic).

#### Roles

Roles define certain aspects of the client's look and feel. A user who logs on to the client gets a role ID assigned by one of the following two mechanisms:

a. it is passed as a parameter to listWorkItems.jsp with a URL such as http://localhost:11605/ QuickStartClient/listWorkItems.jsp/role=5. This is the preferred option used with the ClaimsHandlingProcess sample.

b. a map translates user IDs into role IDs (see the comments in header.jsp for an example of how this could be done)

Role IDs are used as an index into three arrays: workListStyleMap, addToFolderActionItemTypes, and addToFolderActionNames. They should be defined using symbolic constants as in the following example:

```
static public final int USER1_ROLE = 0;
static public final int USER2_ROLE = 1;
static public final int NUM_OF_ROLES = 2;
static public final int DEFAULT_ROLE = USER1_ROLE;
```

The workListStyleMap defines the columns of a worklist for this role in terms of process properties and item attributes. A WorkListStyleMap defines the parameter of the combined query to be run when retrieving work items for this role.

addToFolderActionItemTypes and addToFolderActionNames define which documents a user with this role can add to the folder that is routed through the flow. For example

```
addToFolderActionItemTypes[USER1_ROLE] = { "AdjReport", "FraudReport",
"ReliabilityStudy" };
addToFolderActionNames[USER1_ROLE] = { "Adjuster Report", "Fraud Report",
"Reliability Study" };
```

...means that a user with role USER1\_ROLE may add instande of the item types AdjReport, FraudReport, ReliabilityStudy to the folder that is routed through the flow. The action column of the work page will refer to these actions by 'Add Adjuster Report', 'Add Fraud Report', 'Add Reliability Study' based on the elements of addToFolderActionNames.

#### **User Actions**

The method staffActions(String activityName, WSIFDefaultMessage inputMsg) defines the display elements for the 'Process activity' section of the work page. This section is defined as a table segment spanning four columns. There is no limit on the number of rows. The final column always contains the available actions (Complete and Cancel). This section typically displays some parts from the input message of this staff activity (2nd parameter) and contains form elements that can be used to instantiate its output message. The name of the form element needs be of the form msgpart.xxx where xxx is the name of the corresponding message part. If all parts of the output message are of type String, no custom logic needs to be added to the servlet CompleteWorkServlet that maps the form values to the output message. If non-string-typed variables are involved, either output message parts are mapped to the target type by a Java snippet in the process or custom logic needs to be added to the CompleteWorkServlet

Here a simple example of a 'review activity' with an input message that contains the text to be reviewed and an output message consting of a rating in the range 1..5.

## 4.10 The project structure of a custom integration solution

To create a custom integration solution the following projects need to be import from quickStartSampleRev1wbi.zip:

- ContentManagerIntegration
- ContentManagerIntegrationEjb
- ContentManagerIntegrationJar
- QuickStartClient
- Server

Make sure that the properties of the service project that hosts the custom process includes

ContentManagerIntegrationJar in the list of project references and in the list of projects that participate in the build path. CollectionPoint or FolderManagement services can be added to the process definition by dragging their .wsdl file from ContentManagerIntegrationJar\com\ibm\bpe\cm and dropping at the appropriate position of the process flow and adding the corresponding Java snippets or assign activities that create and interpret in- and output messages of the service. When generating deploy code for the process the corresponding XXXService.wsdl files need to be located in the 'Referenced Partners' section of the **Generate Deploy Code** window. See the section on how to <u>Resolve BPEL references by binding</u> services to port types for details.

#### 4.11 Globalization and accessibility considerations

All Web pages of the Quick Start Client use UTF8 encoding. The static content can easily be localized by creating translated versions of these pages. To avoid code duplication for JSPs we recommend using a different approach for most of the JSPs except help.jsp, namely using Java Resource Bundles since most JSPs only contain small portions of static text such as banner or column titles. A similar approach needs to be taken to internationalize messages of the Integration Toolkit such as those thrown in case of an IntegrationException.

Note that using images to represent the process flow as in index.jsp requires a corresponding text-only version to meet accessibility requirements.

## 5. Deploying an Integrated Solution on a Production Simulation Environment

This chapter describes the steps needed to set up a stand-alone environment that can be used to simulate and test the process in a system configuration that matches a production environment. This is done by deploying the process, Integration Toolkit runtime and Quick Start client on a WebSphere Business Integration Server Foundation, using an LDAP server as a common user repository and storing the Process Choreographer data in a DB2 database. Depending on previous experience with LDAP and the WebSphere server environment completing this paragraph will take about 2 hours.

## 5.1 Prerequisites and Installation Hints

See <u>1.3 Software Requirements</u> for details on the system configuration required for chapter 5.

## Configuring the business process container

The Quick Start Integration assumes both, the Content Manager data and Process Choreographer data reside in DB2. Therefore the business process container has to be configured to use the DB2 Universal Database.

- $\bullet\,$  Make sure DB2 is installed and  ${\tt server}\,$  1 is running.
- Optionally: investigate the process choreographer documentation about information on table spaces for the Process Choreographer database. Creating a custom tablespace for Process Choreographer may be an advantage from a performance optimization perspective.

In <WAS\_HOME> run bin\wsadmin -f ProcessChoreographer\sample\bpeconfig.jacl. If you want to unconfigure an existing configuration, you may need to use bpeunconfig.jacl first. If security is active you need to add the parameters -user <ICMADMIN> -password <ICMADMINPW>.



- Make sure Process Choreographer is configured on server1 since more than one server may be present (e.g. icmrm).
- Defaults are appropriate except for the following settings:

Name	Value
Server where Process Choreographer is configured	serverl
BPESystemAdministrator	icmadmin
JMSAPIUser	icmadmin
database	DB2
Server of Process Choreographer to connect to	serverl
DB2 user ID	depending on your system
JMSAPIUser	icmadmin
WebSphere MQ user ID	icmadmin
Enable global security using the Local OS user registry	no (this will be done manually later)
Enforce Java 2 security	no

- Optionally: investigate <WAS\_HOME>\logs\bpeconfig.log to ensure the settings are correct.
- (Re)start server1.

#### 5.2 Setting up LDAP

Refer to the product documentation (DB2 Content Manager V8.3 Information Center) and follow the instructions Planning and Installing Your Content Management System > After-installation configuration and setup procedures > Integrating with business processes > Part2: Setting up a production environment > Preparing a common organizational directory to perform the following steps:

- Import the directory data into Tivoli Directory Server.
- Configure DB2 Content Manager for LDAP. For this topic we recommend the section Planning and Installing Your Content Management System > Using DB2 Content Manager after-installation programs and procedures > Enabling LDAP.

- Configure WebSphere Application Server for LDAP.
- Configure the LDAP staff plug-in for Process Choreographer.
- Follow the steps in *Planning and Installing Your Content Management System > After-installation configuration and setup procedures > Part2: Setting up a production environment > Configure the business process for use in the production environment > Enable the business process for LDAP.* Note that the name of the business process is now ClaimsHandlingProcess instead of WPCAutoClaimsProcessing.

#### 5.3 Configure the server environment

- Launch the WebSphere Administrative console by loading <http://<HOSTNAME>:9090/admin in your browser and log on as administrator.
- In the navigation panel select Environment > Manage WebSphere Variables and set the scope to server1.
- Ensure that the variable DB2\_JDBC\_DRIVER\_PATH is present and that it points to <DB2HOME>/java

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	CONNECTIDEC JDEC DRIVER PATH		cells:triangle:nodes:triangle					
	CONNECTOR INSTALL ROOT	\${USER_INSTALL_ROOT}/installedConnectors	cells:triangle:nodes:triangle					
	DB2390 JDBC DRIVER PATH		cells:triangle:nodes:triangle					
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• Click New, enter IBMCMROOT into the Name field, <IBMCMROOT> into the Value field, and click OK

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- In the navigation panel select Servers > Application Servers, click server1 and follow the Additional Properties to Process Definition > Java Virtual Machine.
- Enter \${IBMCMROOT}/cmgmt into the Classpath field and click Apply

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- In the Additional Properties section select Custom Properties.
- In the Custom Properties section add the following entries by clicking New entering the data and clicking OK:
  - ws.ext.dirs ws.ext.dirs

\${IBMCMROOT}/lib
\${DB2\_JDBC\_DRIVER\_PATH}/db2java.zip

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• Click **Save** on top of the window to open the **Save to Master Configuration** window. Click **Save** to make the changes permanent.

## 5.4 Configure JDBC connections and data sources

- In the navigation panel select Security > JAAS Configuration > J2C Authentication Data.
- Verify the existence of the authentication alias <HOSTNAME>/BPEAuthDataAliasEmb\_<HOSTNAME>\_server1 that has been created during process container configuration.
- Click **New**, add the following entries and click **OK**

Password	icmadmin's password
User ID	icmadmin
Alias	ICMNLSDBAuthDataAlias

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JAAS Configuration	General Propert	ies			
Application Logins System Logins	Alias	* CMNLSDBAuthDataAlias		Specifies the name of the data entry.	authentication
J2C Authentication Data	User ID	* icmadmin		Specifies the J2C authent ID.	tication data user
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- In the navigation panel select Resources > JDBC Providers. Ensure the scope is on server1.
- Verify the existence of the JDBC driver DB2 Legacy CLI-based Type 2 JDBC Driver (XA) that has been created during process container configuration. Click on it.
- In the Additional Properties section of the configuration panel select **Data Sources**, Verify the existence of the data source BPEDataSourceDb2 that has been created during process container configuration.
- Select **New** to create a new data source based on the following information:

Name	<pre>replace DB2 Legacy CLI-based Type 2 JDBC Driver XA Data Source with icmnlsdb</pre>							
JNDI Name	jdbc/ICMNLSDB							
Component-managed Authentication Alias	<pre>select <hostname>/ICMNLSDBAuthDataAlias from the list</hostname></pre>							
Container-managed Authentication Alias	select < HOSTNAME > / ICMNLSDBAuthDataAlias from the list							
Description	CM library server data source for CM/PC Integration Quick Start							

• Click **OK** to save the data source definition.

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Resources	JDBC Providers > DB2 Legacy CLI-bas	ed Type 2 JDBC Driver (XA) >		
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VebSphere JMS Provider	specific JDBC driver implementation class	access the data from the database.	A data source is created under a JD	be provider which provides the
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Scheduler Configuration	BPEDataSourceDb2	jdbc/BPEDB	DataSource for Process	
Staff Plugin Provider			Choreographer	
Work Manager	icmnisdb	jdbc/ICMNLSDB	CM library server data source for CM/BBC Integration Quick Start	
VebSphere Business Integration Adap			CM/DFC Integration watck Start	
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• Click on the new **icmnlsdb** data source definition and in the Additional Properties section select **Custom Properties** and click **sample** in the value column of the Custom Properties page.

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T Servers	IDBC Drouidoro > DP3 Logoov	CLI based Type 2, IDPC Briver (X&) >	Data Coursee >			
FI Applications	Custom Properties	CEPBased Type 2 JDbC Driver (XM) >	Data Sources			
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JDBC Providers	Custom properties that may be re	equired for Resource Providers and Reso	urce Factories. For example, most datab	ase vendors require additional		
Generic JMS Providers	custom properties for data source	es that will access the database. 🖬				
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Object Pools		sample	This is a required property. The database name. For example.	true		
Scheduler Configuration			enter sample to make your Data			
Staff Flugin Provider			Source point to idbo:db2:sample			
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⊡ Security	portNumber	-	The TCP/IP port number where	false		
Environment			the jdbc Provider resides.			
		cursorhold=0_	The connection attributes. Refer to the DB2 reference for the list	false		
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- Replace the default value sample in the Value field with icmnlsdb and click OK.
- Click **Save** on top of the window to open the **Save to Master Configuration** window. Click **Save** to make the changes permanent.
- Select Resources > JDBC Providers on the navigation panel and ensure the scope is on server1.
- Click on DB2 Legacy CLI-based Type 2 JDBC Driver (XA), scroll down to the Additional Properties section, click on Data Sources and perform the following steps:
  - Select the check box left of icmnlsdb.
  - Click Test Connection.
  - Verify that the information message on top of the page says Test Connection for datasource icmnlsdb on server server1 at node <HOSTNAME> was successful.

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Ervers				
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E Resources	Data Sources			
<u>JDBC Froviders</u> <u>Generic JMS Providers</u> <u>WebSchere JMS Provider</u>	Data Source is used by the application to specific JDBC driver implementation clas	oaccess the data from the data s. <mark>ii</mark>	base. A data source is created under a JD	BC provider which provides the
WebSchere MQ JMS Provider Mail Providers Resource Environment Providers URL Providers	Total: 2 ⊡ Filter ⊡ Preferences			
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## 5.5 Configure connection factories, queues, and consumers

- In the navigation panel select Resources > WebSphere JMS Provider and set the scope to server1.
- In the Additional Properties section select **WebSphere Queue Connection Factories** and verify the existence of the two queue connection factories BPECF and BPECFC that have been created during process container configuration.
- Click New to create a new queue connection factory based on the following information:

Name	CollectionPointQCF				
JNDI Name	jms/CollectionPointQCF				
Component-managed Authentication Alias	select <hostname>/ICMNLSDBAuthDataAlias from the list <math display="inline">% \mathcal{A} = \mathcal{A} = \mathcal{A} = \mathcal{A} = \mathcal{A}</math></hostname>				
Container-managed Authentication Alias	select <hostname>/ICMNLSDBAuthDataAlias from the list <math display="inline">% \mathcal{A} = \mathcal{A} = \mathcal{A} = \mathcal{A} = \mathcal{A}</math></hostname>				
Mapping-Configuration Alias	select DefaultPrincipalMapping from the list				
Description	<b>optionally</b> :Queue connection factory for the CM/PC Integration Quick Start				

• Click **OK** to save the queue connection factory definition.

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triangle	⚠ Changes have been made to your la ☐ The server may need to be restarted	ocal configuration. Click <u>Save</u> to apply d for these changes to take effect.	changes to the master configuration.				
	WebSphere JMS Provider >						
JDBC Providers Generic JMS Providers WebSphere JMS Provider WebSphere Mg JMS Provider	WebSphere Queue Conne A queue connection factory is used to Use WebSphere Queue Connection Fa	ction Factories create connections to the associated ctory administrative objects to manage	JMS provider of JMS queue destinatic queue connection factories for the in	ons, for point-to-point messaging. nternal WebSphere JMS provider. I			
Resource Environment Providers URL Providers Resource Adapters Cache Instances Extended Messering Provider	Total: 3						
Object Pools	🗖 Name 🕏	JNDI Name 🗘	Description \$	Category 🗘			
Scheduler Configuration	BPECF	jms/BPECF					
Staff Plugin Provider		jms/BPECFC					
WebSphere Business Integration Adag	CollectionPointQCF	jms/CollectionPointQCF	Queue connection factory for the CM/BPC Integration Quick Start				
Environment							
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- Navigate back to the **WebSphere JMS Provider** page and click **WebSphere Queue Destinations** in the Additional Properties section.
- Verify the existence of the four queue destinations BPEApiQueue\_<SERVERNAME>, BPEHidQueue\_<SERVERNAME>, BPEIntQueue\_<SERVERNAME>, and BPERetQueue\_<SERVERNAME> that have been created during process container configuration.
- Click New to create a new queue destination based on the following information:

Name	CollectionPointQueue							
JNDI Name	jms/CollectionPointQueue							
Description	optionally: Queue	destination	for	the	CM/PC	Integration	Quick	Start

- Click **OK** to save the queue destination definition.
- Repeat the previous steps to create a new queue destination with name receiverQ and JNDI name jms/receiverQ.

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VebSphere JMS Providers VebSphere JMS Provider WebSphere MQ JMS Provider Mail Providers Resource Environment Providers URL Providers	Total: 6					
Resource Adapters		Name 🕏	JNDI Name 🗘	Description 🗘	Category 🗘	
Cache Instances		BPEApiQueue_server1_	jms/BPEApiQueue			
Object Pools		BPEHIdQueue server1	jms/BPEHldQueue			
Scheduler Configuration		BPEIntQueue server1	jms/BPEIntQueue			
Staff Flugin Provider		BPERetQueue server1	ims/BPERetQueue			
Work Manager WebSphere Business Integration Adag			jms/CollectionPointQueue	Queue destination for the CM/BPC Integration Quick Start		
Environment		receiverQ_	jms/receiverQ			
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- In the navigation panel select Servers > Application Servers, click server1 and follow the Additional Properties to Message Listener Service > Listener Ports.
- Verify the existence of the three listener ports BPEApiListenerPort, BPEHoldListenerPort, and BPEInternalListenerPort that have been created during process container configuration.
- Click New to configure a new listener port for server1 as follows:

Name	CollectionPointQListenerPort			
Description	optionally Listener port for the CM/PC Integration Quick Start			
Connection factory JNDI Name	jms/CollectionPointQCF			
Destination JNDI Name	jms/CollectionPointQueue			

• Click **OK** to save the listener port definition.

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Servers	1	isten	er Ports					
Application Servers	-							
	Li	istener	ports for Message Driven Be	eans to listen upon for messa	ges. Each port specifies the JMS Con	nection Factory and JMS Dest	ination that an	
Resources	IVI	iDD, dep	pioyed against that port, will i	listen upon. 🛄				
JDBC Providers								
Generic JMS Providers		Total: 4	4					
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Cache Instances			3PEApiListenerPort	API Listener Port for Process Choreographer	jms/BPECF	jms/BPEApiQueue	€>	
Extended Messaging Provider Object Pools			BPEHoldListenerPort	Hold Listener Port for Process Choreographer	jms/BPECF	jms/BPEHIdQueue	€	
Scheduler Configuration			3PEInternalListenerPort	Internal Listener Port for	jms/BPECF	jms/BPEIntQueue	€	
Staff Plugin Provider			CollectionPointQListenerPort	Listener port for the	ims/CollectionPointQCF	ims/CollectionPointQueue	8	-
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- In the navigation panel select Servers > Application Servers, click server1 and follow the Additional Properties to Server Components > JMS Servers.
- Verify that the Queue names field lists the four queues BPEIntQueue\_<SERVERNAME>, BPEApiQueue\_ <SERVERNAME>, BPEHidQueue\_<SERVERNAME>, and BPERetQueue\_<SERVERNAME> that have been added during process container configuration.
- Add CollectionPointQueue and receiverQ to the list of Queue names and click OK

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triangle □ Servers	The JMS functions on a node with panel to view or change the config	in the WebSphere Application Server administration domain are s guration properties of the selected JMS server. [i]	served by the JMS server on that node. Use this			
Application Servers	Configuration					
Applications						
DBC Providers	General Properties					
Generic JMS Providers	Name	Internal JMS Server	The name of the server.			
WebSphere JMS Provider	Description	Internal WebSphere JMS Server	A description of the JMS server, for administrative purposes.			
WebSphere MQ JMS Provider Mail Providers	Number of threads	1	The number of concurrent threads to be used by the Pub/Sub matching engine.			
Resource Environment Providers	Queue names	BPEApiQueue_server1	The names of queues hosted by this JMS			
Resource Adapters		BPERetQueue_server1				
Cache Instances		CollectionPointQueue				
Extended Messaging Provider	Initial State	Started V	I The component execution state requested			
Scheduler Configuration			when the server is first started.			
Staff Plugin Provider	Apply OK Reset C	ancel				
Work Manager						
WebSphere Business Integration Adag	Additional Properties					
	Security Port Endpoint The TO	Security Port Endpoint The TCP/IP port number of the listener port used internally by the JMS server.				
Environment	Custom Properties Additional custom properties for this runtime component. Some components may make use of custom configuration					
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• Click Save on top of the window to open the Save to Master Configuration window. Click Save to make the changes permanent.

## 5.6 Configure security

- Double-check the security settings in Security > Global Security that have been configured during LDAP enablement:
  - The Enabled checkmark is checked
  - Enforce Java 2 Security is unchecked
  - The Active User Registry is set to LDAP
- Double-check the LDAP settings in Security > User Registries > LDAP:
  - Server User ID and Server Password are set to the library server credentials.
  - Type is set to Custom.
  - The Hostname and Port are correct.
  - The Base Distinguished Name is o=XYZInsurance.
  - Click Advanced LDAP Settings and ensure the UserFilter is set to (&uid=%v)(objectlass=person)).
- In the navigation panel select Security > Authentication Mechanisms > LTPA.
- Enter icmadmin's password into the Password and Confirm Password fields (any other password will do as well).
- Click Apply.
- Verify that Single Sign on is enabled by clicking Single Sign (SSO) in the Additional Properties section and validate if the Enabled check-box is checked.
- In the navigation panel select Security > Global Security.
- Ensure the Enabled check box is checked and the Enforce Java 2 Security check box is unchecked.

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WebSphere Application Server Version 5	WebSphere Application Server Administrative Console					
Upor ID: incodein						
User IU: icmadmin triangle	LTPA > Single Signon (SSO) Specifies the configuration values for single sign-of Configuration	on. []				
SSL	General Properties					
Authentication Mechanisms TPA	Enabled		When checked, specifies that Single Sign- on is enabled.			
<ul> <li>☑ User Registries</li> <li>☑ JAAS Configuration</li> </ul>	Requires SSL		When checked, specifies that single signon is enabled only when requests are over HTTPS Secure Socket Layer connections.			
<ul> <li>Authentication Protocol</li> <li>Environment</li> <li>System Administration</li> <li>Troubleshooting</li> </ul>	Domain Name		The domain name (ibm.com, for example) which specifys the set of all hosts to which single sign-on applies. If this field is not defined, the web browser will default the domain name to the host name where the web application is running. This means Single Sign On will be restricted to that application server host name and will not work with other application server host names in the domain.			
	Interoperability Mode		Specifies that an interoperable cookie is sent to the browser to support back-level servers.			
	Web Inbound Security Attribute Propagation		i When Web inbound security attribution			
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- Select LTPA (Light weight Third Party Authentication) from the list of values for the field Active Authentication Mechanism and Custom from the list of values for the field Active User Registry.
- Click **Save** on top of the window to open the **Save to Master Configuration** window. Click **Save** to make the changes permanent.

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Applications			domain.			
<ul> <li>H Resources</li> <li>Global Security</li> </ul>	Enforce Java 2 Security		<ul> <li>If Java 2 Security is enabled and the application policy file is not set up correctly, the application may fail to run.</li> </ul>			
SSL Authentication Mechanisms	Use Domain Qualified User IDs		When true, user names returned by methods such as getUserPrincipal() will be qualified with the security domain in which they reside.			
	Cache Timeout	* 600	i Timeout value for security cache in seconds.			
Authentication Protocol     Environment	Issue Permission Warning		When enabled, a warning will be issued during application installation, if an application requires a Java 2 Permission that normally should not be granted to an application.			
Troubleshooting	Active Protocol	CSI and SAS -	Specifies the active security authentication protocol when security is enabled. Possible values are CSI (CSIv2), or CSI and SAS.			
	Active Authentication Mechanism	LTPA (Light weight Third Party Authentication)	Specifies the active authentication mechanism when security is enabled.			
	Active User Registry	Custom	Specifies the active user registry when security is enabled. LDAP or Custom is required when running as a Unix non-root user or in a multi-node environment.			
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• Stop and re-start server1.

## 5.7 Deploying an Integrated Solution on WebSphere Business Integration Server Foundation

Though the title of this section refers to the sample process the same set of steps needs to be performed when installing a custom Content Manager / Process Choreographer Integration solution. Note that connection factory and queue definitions may not be needed if the solution does involve Content Event Handling or the Collection Point Service. In this case the corresponding dependencies need to be disabled in the Integration Toolkit (e.g. the Asynch Bean).

- Start WebSphere Studio Application Developer Integration Edition with the workspace created in chapter 1.
- In the Services view of the Business Integration perspective expand Deployable Services, right-click ClaimsHandlingProjectEJB and select Generate > EJB to RDB Mapping.
- Click Create a new backend folder and click Next.
- On the page Create new EJB/RDB Mapping keep the default Top down and click Next.
- On the page Select Top Down Mapping Options select DB2 Universal Database V8.1 from the list of values for the Target Database field and enter BPEDB into the Database name field.

🌐 EJB to RDB Map	ping				×
Create new EJB/RC	)B Mapping				
Select Top Down Map	oping Options:				
Target Database:					
DB2 Universal Data	base V8.1				•
Database name:					
BPEDB					
Schema name:					
NULLID					
Generate DDL WebSphere 3 Advanced Options fo Click next to go t	.x Compatible or Inheritance: the Advanced C	ptions Page.			
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- Click **Finish** to create the mapping. The right hand window now displays the database mapping editor with the enterprise beans that are associated with the process. Close this window.
- In the Services view expand Service Projects > ClaimsHandlingProject > com.ibm.bpe.cm.sample, right-click ClaimsHandlingProcess.bpel and select Enterprise Services > Generate Deploy Code.
- Click **OK** in the **Generate BPEL Deploy Code** window to initiate the deploy code generation.
- Wait until the progress information window disappears which indicates completion of this step.
- Create a target folder in your file system where the EAR files will be stored.
- On the menu bar select File > Export. From the list of export formats select EAR file.
- Export the two projects ClaimsHandlingProjectEAR and ContentManagerIntegration by selecting the project from the list, entering the target folder with the project name followed by .ear into the Destination field and clicking Finish.

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EAR Export Export Enterprise Application project	to the local file system.			, Ē
Enterprise Application project name: Destination:	ContentManagerIntegr Resources\deploy\Cþnl	ation :entManagerIntegra	▼ ation.ear ▼	Browse
<ul> <li>Export source files</li> <li>Overwrite existing files without of Advanced</li> </ul>	warning			
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- Launch the WebSphere Administrative Console and logon as icmadmin.
- In the navigation panel select Applications > Install New Application.
- Select Browse to locate ContentManagerIntegration.ear and click Next.
- On the panel for default binding and mapping generation click Next.
- On the panel Step 1: Provide options to perform the installation check Deploy EJBs and click Next

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User ID: ICMADMIN	Install New Application				
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Applications	→ Step 1: Provide options to perform the installation				
Enterprise Applications	Specify the various options available to prepare and install your ap	oplication.			
Resources	AppDeployment Options	Enable			
	Pre-compile JSP				
Environment	Directory to Install Application				
System Administration	Distribute Application				
	Use Binary Configuration				
	Deploy EJBs				
	Application Name	ContentManagerIntegration			
	Create MBeans for Resources				
	Enable Class Reloading				
	Reload Interval in Seconds				
	Deploy WebServices				
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- On the panel Step 2: Provide options to perform the EJB Deploy verify that the value of the field Deploy EJBs Option Database Type is set to DB2UDB\_V81.
- Go to panel Step 13: Summary, verify the settings, and click Finish.

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	Options	Values		
Applications	Deploy EJBs Option - RMIC			
Install New Application	Deploy EJBs Option - Classpath			
Resources	Distribute Application	Yes		
⊡ Security	Use Binary Configuration	No		
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	Enable Class Reloading	No		
	Create MBeans for Resources	Yes		
	Deploy EJBs	Yes		
	Reload Interval in Seconds			
	Application Name:	ContentManagerIntegration		
	Directory to Install Application			
	Deploy EJBs Option - Database Type	DB2UDB_V81		
	Pre-compile JSP	No		
	Application Name	ContentManagerIntegration		
	Deploy EJBs Option - Database Schema			
	Deploy WebServices	No		
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- Wait for the message Application ContentManagerIntegration installed successfully (you may need to scroll down the panel content to see it).
- Select the link Save to master configuration and click Save to make the update permanent.



- In the navigation panel select Applications > Enterprise Applications, check the checkmark left of ContentManagerIntegration and click Start. The Status of this application should then turn into a green arrow indicating that the application has been started successfully.
- In the navigation panel select Applications > Install New Application.
- Select Browse to locate ClaimsHandlingProjectEAR and click Next.
- On the panel for default binding and mapping generation click Next.
- On the panel Step 1: Provide options to perform the installation check Deploy EJBs and click Next.
- On the panel Step 2: Provide options to perform the EJB Deploy verify that the value of the field Deploy EJBs Option - Database Type is set to DB2UDB\_V81 and click Next.
- On the panel Step 3: Select current backend ID verify that the value of the column CurrentBackendId is set to DB2UDBNT\_V8\_1 and click Next.
- Go to panel Step 13: Automatically create database tables for Business Process entity beans and check Enable.
- Go to panel Step 14: Summary, verify the settings, and click Finish.

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⊞ Servers	Deploy EJBs Option - RMIC					
Applications	Deploy EJBs Option - Classpath					
Enterprise Applications	Distribute Application	Yes				
Install New Application	Use Binary Configuration	No				
	Cell/Node/Server	Click here				
	Enable Class Reloading	No				
	Create tables	Yes				
	Create MBeans for Resources	Yes				
	Deploy EJBs	Yes				
	Reload Interval in Seconds					
	Application Name:	ClaimsHandlingProjectEAR				
	Directory to Install Application					
	Deploy EJBs Option - Database Type	DB2UDB_V81				
	Pre-compile JSP	No				
	Application Name	ClaimsHandlingProjectEAR				
	Deploy EJBs Option - Database Schema					
	Deploy WebServices	No				
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- Wait for the message Application ClaimsHandlingProjectEAR installed successfully (you may need to scroll down the panel content to see it).
- Select the link Save to master configuration and click Save to make the update permanent.

## 5.8 Install the runtime files, start the server and run the sample

- Copy the files bpecm.jar and bpecmutil.jar from <WSADIE\_HOME>\runtimes\ee\_v51\lib to <WAS\_ HOME>\lib.
- Copy the file bpecm.properties from <WSADIE\_HOME>\runtimes\ee\_v51\properties to <WAS\_ HOME>\properties.
- In the navigation panel of the WAS administrative console select Applications > Enterprise Applications, check the checkmark left of **ClaimsHandlingProjectEAR** and click **Start**. The Status of this application should then turn into a green arrow indicating that the application has been started successfully.

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• Now you should be able to access the application through your browser.

## 6. Hints and Troubleshooting

## Traps when working with the sample

- When opening a new case the claim form needs to be the first document that is imported and it needs to have claim number that has not yet been used. In case of doubt you can use the *Client for Windows* to find all instances of XYZ\_ClaimFolder and check their values for XYZ\_ClaimNumber.
- If an adjuster or police report with a new claim number is stored in DB2 Content Manager this triggers the creation of a corresponding folder and process instance. Since neither of these items has a policy insurance number assigned, the 'RetrievePolicy' service fails but the process continues as usual.
- If two claim forms with the same claim number exist, creating the second one causes an error message to show up in the console output since the 'RetrievePolicy' services tries to add the insurance policy to the folder. The document can not be added to a folder twice.

## Resolve BPEL references by binding services to port types

If a project has been deleted and needs to be re-installed the references may need to be re-bound as follows.

- In the Generate BPEL Deploy Code window select Referenced Partners > CollectionPoint in the navigation pane on the left, click Browse on the right hand side, locate the file ContentManagerIntegrationJar\com\ibm\bpe\cm\CollectionPointJMSService.wsdl in your workspace and click OK to link the port type to this service.
- Select Referenced Partners > FolderManagement in the navigation pane on the left, click Browse on the right hand side, locate the file

ContentManagerIntegrationJar\com\ibm\bpe\cm\FolderManagementJavaService.wsdl in your workspace and click **OK** to link the port type to this service.

## Clean up the process environment

• Stop the test server.

- Run the following advanced query in the DB2 Content Manager Client for Windows: /\*[<Claim Number (Content Manager V8.1 Sample Attribute)> LIKE "3-%"] to identify all items created when running the Quick Start Client.
- Delete all items of the result list.
- Connect to icmnlsdb as icmadmin and drop the three tables bpecontentevents, bpecollectionpoints, bpecollectionpointitemtypes.
- Restart the test server. This re-creates the three tables.

## Upgrading the content viewer applet to fix pack 1 or (re-)creating the content viewer applet

The Quick Start Client uses a modified version of the Content Manager viewer applet to display document content. This applet and the required resources need to be placed into a specific directory where the files are available for download by the client. This step copies the required resources from the Content Manager install directory and (re-)creates the JAR file for the modified viewer applet. This step should be performed when Fix Pack 1 is used or when the code in TViewerApplet.java has been changed (See <u>DB2 Content Manager Enterprise Edition (multiplatform) Support</u> for Fix Pack downloads, etc.).

**Important:** (Re-)creating the applet viewer requires *DB2 Content Manager Enterprise Edition V8.3 Fix Pack 1* to be installed. If Fix Pack 1 is installed we recommend to (re-)create the viewer applet to take advantage of the latest changes in the viewer code.

- Switch to the Services view of the business integration perspective.
- Expand Deployable Services > QuickStartClient > WebContent.
- Perform the following steps to import cmbview81.jar into this folder.
  - From the workspace menu select File > Import. The 'Import' window opens.
  - Select File system and click Next >.
  - Click the Browse button to the right of the From directory: field, locate the folder <IBMCMROOT>\lib, and click OK.
  - In the field to the right select cmbview81.jar.
  - Enter QuickStartClient/WebContent/appletViewer in the Into folder: field.
  - Click Finish.
- In the 'Services' view right-click QuickStartClient/WebContent/appletViewer/cmbview81.jar and select Refresh.
- Switch to the 'Package Explorer' view and perform the following steps to create the JAR file for the viewer applet. You need to re-run these steps if you have modified the source code of the viewer applet:
  - Right-click ContentViewerApplet and select Export. The 'Export' window opens.
  - Select **JAR file** and click **Next>** which switches to the 'JAR Package Specification' dialogue.
  - In the 'Select the export destination' field click Browse and locate the folder <WORKSPACE\_ FOLDER>\QuickStartClient\WebContent\appletViewer. Type appletViewer. jar into the File name: field and click Save.
  - Check 'Overwrite existing files without warning' and click Finish.
- In the 'Package Explorer' view right-click QuickStartClient/WebContent/appletViewer/appletViewer.jar and select Refresh.

## Creating and deploying a new Integration Toolkit library

- Stop the test server.
- Back up the current version of <WSADIE\_ROOT>/runtimes/ee\_v51/lib/bpecm.jar.
- Click ContentManagerIntegrationJar in the navigation pane and select Project > Rebuild All on the menu to make sure all files of the project are up-to-date.
- Right-click ContentManagerIntegrationJar in the navigation pane and select Export. The Export window opens.
- Select Jar file and click Next >. On the Jar Package Specification window verify that it looks as follows:

AR Package Specification	_
Define which resources to package into which JAR.	
Select the resources to export:	
ClaimsHandlingProject     ClaimsHandlingProjectEJB     ClaimsHandlingProjectWeb     ContentManagerIntegrationEjb     ContentManagerIntegrationJar     QuickStartClient	<ul> <li>✓ ■ .classpath</li> <li>✓ ■ .project</li> <li>✓ ■ .server</li> </ul>
Export generated class files and resources Export java source files and resources	
Select the export destination:	
JAR file:   nere Studio \Application Developer IE \v5.1	
Options: Compress the contents of the JAR file Overwrite existing files without warning	

- Click browse to locate <WSADIE\_ROOT>/runtimes/ee\_v51/lib and enter the file name bpecm.jar.
- When asked if you want to overwrite the existing file click Yes.
- Upon completion, a JAR Export window might pop up that says JAR export finished with warnings. See details for additional information. The details say /ContentManagerIntegration/META-INF/ MANIFEST.MF was replaced by the generated MANIFEST.MF and is no longer in the JAR. This can safely be ignored. Click OK to close the JAR export window.

## 7. Further Reading

## Product documentation

- DB2 Content Manager V8.3 Infocenter on the Web
- <u>WebSphere Application Server Version 5.1.x information center</u> on the Web (also covering WebSphere Business Integration Server Foundation, Version 5.1.x)

## Background information and documents on specific topics

- WebSphere Business Integration Server Foundation V5.1 Handbook (IBM redbook SG24-6318)
- BPEL4WS Business Processes with WebSphere Business Integration: Understanding, Modelling, Migrating (IBM redbook SG24-6381)
- WebSphere Business Integration Server Foundation Using the programming API and the Common Event Infrastructure (IBM Redpaper REDP-3915)

## **Product support Web sites**

- WebSphere Studio Application Developer Integration Edition Support
- WebSphere Business Integration Server Foundation Support
- DB2 Content Manager Enterprise Edition (multiplatform) Support

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