

LDAP and workflow implementation with IBM DB2 Content Manager

Build workflow document-enabled applications using DB2 Content Manager V8.2

[Naveen Balani](#)
Technical Architect
Webify Solutions

20 October 2005

[Rajeev Hathi \(rajeev_hathi@hotmail.com\)](mailto:rajeev_hathi@hotmail.com)
Systems Analyst
Satyam

Learn how to set up and integrate LDAP with IBM® DB2® Content Manager for authentication and authorization. This tutorial walks you through the design of a sample claims workflow-based application and the assignment of user roles to work nodes using the DB2 Content Manager Client for Windows®.

Before you start

About this tutorial

This tutorial assists developers in the development and design of workflow-based applications using DB2 Content Manager. The demonstration includes:

- Setup and integration of LDAP with DB2 Content Manager for authentication and authorization
- Design of a sample claims workflow-based application
- Assignment of user roles to work nodes in the workflow

The workflow will be executed using DB2 Content Manger Client for Windows.

Prerequisites

This tutorial assumes that DB2 Content Manager V8.2 or above and DB2 Clients for Windows are already installed. Before you start working, make sure you have the following additional downloads:

- The [IBM Tivoli Directory Server 5.2](#).
- The sample claim document that accompanies this tutorial.

Installation of IBM Tivoli Directory Server is discussed in the *Set up LDAP server* section.

Introduction

An overview of DB2 Content Manager

DB2 Content Manager, the core of the IBM portfolio for enterprise content management, provides a single, open, and comprehensive platform for managing, sharing, reusing, and archiving all types of digitized content. The multi-tier, distributed architecture offers:

- Scalability to grow from a single department to a geographically dispersed enterprise
- Openness to support multiple operating systems, databases, applications, and resources
- An XML-ready data model
- Integration with mission-critical applications and middleware like Siebel, PeopleSoft, DB2 Records Manager, WebSphere® MQ Workflow and WebSphere Portal for Web content management

DB2 Content Manager V8.2 provides the ability to manage the 80% of business content for an enterprise that is not relational data.

Benefits of DB2 Content Manager

The following are the benefits of DB2 Content Manager:

- **Query language with integrated text search** -- Query of all aspects of the CM data model. The query language is easy to use due to total transparency of the system tables complexities. Cached data model definitions are used for efficient execution of queries. The query language also conforms to the XQuery path expressions (XQPE) specification.
- **Federated search** -- WebSphere Information Integrator for Content provides federated search and update for structured and unstructured information across disparate data sources. Different target data sources of any types can be configured easily in any combination. New data sources can be added and searched. The results obtained from a federated search are in a consistent data format (technically called *dynamic data objects*) regardless of the source.
- **Support for video assets** -- Archival and streaming video retrieval is supported by the video stream resource APIs. Since the content of a video stream object is usually large, persistent operations such as add, retrieve, and update are usually done using IBM Video Charger Server or a third-party video server using a standard protocol like file transfer protocol (FTP). Based on the related metadata, video assets can be searched and a session can be established to stream the content from the video server to the video player directly. Multi-Segment play lists are also supported.
- **Workflow and Document Routing** -- Document routing provides the integrated capability to route work along a predefined process. A process defines the way users perform the work and the route through which work progresses. Different routing alternatives include:
 - Sequential -- A sequential flow of steps

- Branching -- Conditional routing based on user action
- Ad hoc routing -- Work is not performed in a predefined manner

The workflow can be monitored for productivity, can analyze workload over time, or view the entire history of a specific item.

- **Integration with legacy systems and vertical industry applications** -- DB2 Content Manager provides an open, published, consistent object-oriented set of APIs for easy application integration. This makes it possible to connect and enable application types like Customer Relationship Management, Enterprise Resource Planning, Web applications, and legacy system applications.

An overview of Windows Client

The Windows Client is the desktop client for high-volume, high-performance applications. It fully exploits the client-server architecture with out-of-the-box capabilities for production-level document applications. The Windows client for Content Manager for Multi-platforms supports Windows 98, Windows NT 4.0, Windows 2000, Windows Millennium, and the Windows XP Operating Systems and a XML/HTML to manage structured documents and Web content. All document routing capabilities are available in Client for Windows.

Windows Client is used for testing in this claims workflow process. Process creation will be done through the System Administration Client.

DB2 document routing concepts

Each step of the workflow process is referred to as a work node. A work node can be either a work basket or a collection point. A work basket is more than just a virtual basket that has a pile of work stacked in it. A collection point is a special work node that waits for external documents to be collected in a folder; but it does not correspond to a business task. It merely collects required documents and sends them to another work node when it either completes a folder, or the time allotted to wait for the documents has expired. Document routing moves documents or folders from one work node to another.

Each work node belongs to one or more worklists. A worklist contains a list of work packages based on priority or state (such as suspend or notify).

A work package contains the information that a user needs to complete a task. The user is unaware of a work package because the user works on the item it references, not on the work package itself. A work package contains a set of information such as priority, state, resume time, process, and ItemID being routed. Content Manager supports a complex process, allowing you to create processes that determine what route a work package takes based on the actions or non-actions of the end users or the applications.

You need to create and manage processes. As part of creating processes, you define work baskets, collection points, and worklists. You must change processes to reflect changes to your business. You may have to force work through to the next step in a process, terminate a process, or suspend a process.

Process creation can be done through the System Administration Client in V8.2 and new Graphical workflow builder GUI in V8.3. We will be using System Administration Client for creating the workflow definition.

Setting up LDAP server

LDAP configuration

This section discusses the install and configure of the LDAP Server. IBM Tivoli® Directory Server (ITDS) V5.2 is our LDAP server of choice. The ITDS installation kit comes with the following:

- Client SDK (not needed for this article)
- Web Administration Tool (WAR file to be deployed)
- Directory Server (required)
- IBM WebSphere Application Server - Express V5.0.2 (Not needed; we will install it separately)
- DB2 UDB V8.1 (required)
- GSKit (not needed for this tutorial)

The details of the installation are not necessary, as it is fairly simple. Once the installation is done, you need to configure your directory server. Prior to that, make sure DB2 is installed and setup properly and that you are able to connect to the DB2 server.

Start the ITDS configuration tool. Follow the steps for each task configuration (see the image below):

Figure 1. LDAP configuration



The left panel shows different tasks to be configured. I will explain some of the mandatory tasks to be configured:

Task Administration DNpassword: This task allows you to set up the administrative user id and password for ITDS. Give user ID as **cn=root** (cn stands for Common Name and is a required attribute while configuring the user ID) and password as **admin**. **Note:** You can also give your own user ID and password.

Task Configure database: This task allows you to configure the LDAP database. It contains the following steps:

- Create the new database,
- Enter DB user ID and password. (For this article I will set up **db2admin** as the user ID and password for my DB2)
- Give the DB name and the drive where you will create the DB.

Note: It will create the DB2 instance with the same name as the DB user ID. If you need to provide a different instance name, then you will have to bypass the tool-based configuration and instead use the command line utility **ldapcfg.exe** with **-t** option.

Task Manage suffixes: This task allows you to add suffix for your directory. The suffix acts as an identifier to your directory. Add the suffix **o=ibm, c=us**.

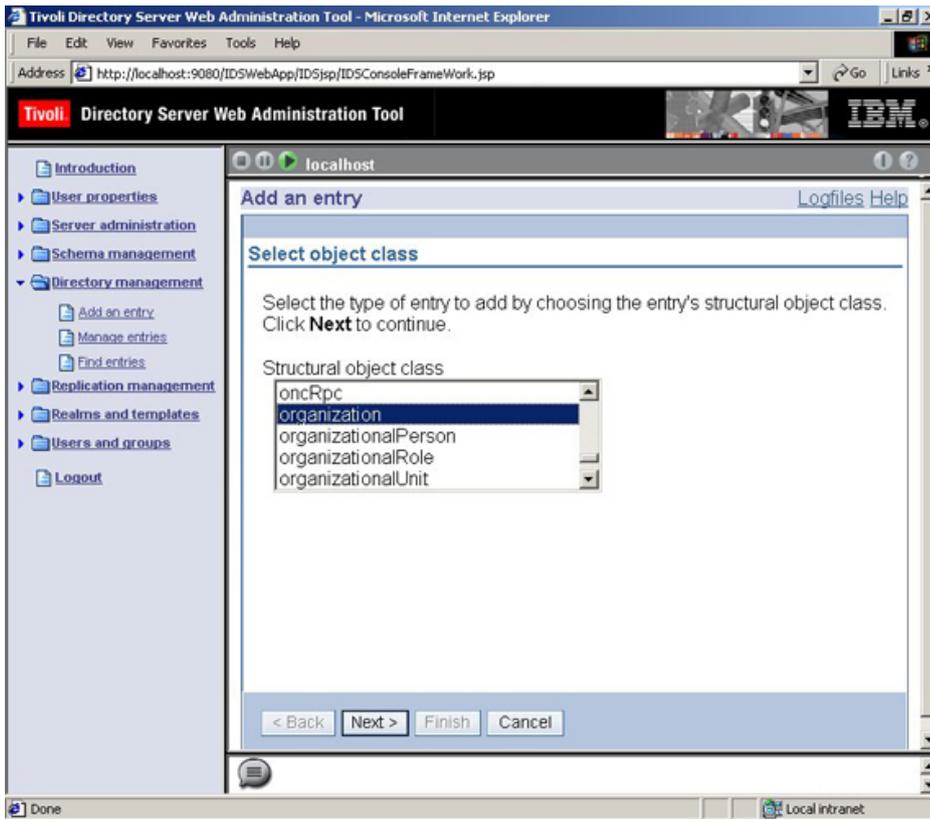
ITDS is now configured. Next you will create appropriate user entries into the server using the Web administration client tool. The said tool comes as a WAR file that needs to be installed explicitly if you intend to install WebSphere Application Server (Application Server) separately. For this article, I have installed it separately. The context root for the WAR file would be **/IDSWebApp**. Once the WAR file is installed, start the tool by entering the following URL into the browser: **http://localhost:9080/IDSWebApp/IDSjsp/login.jsp**

User creation

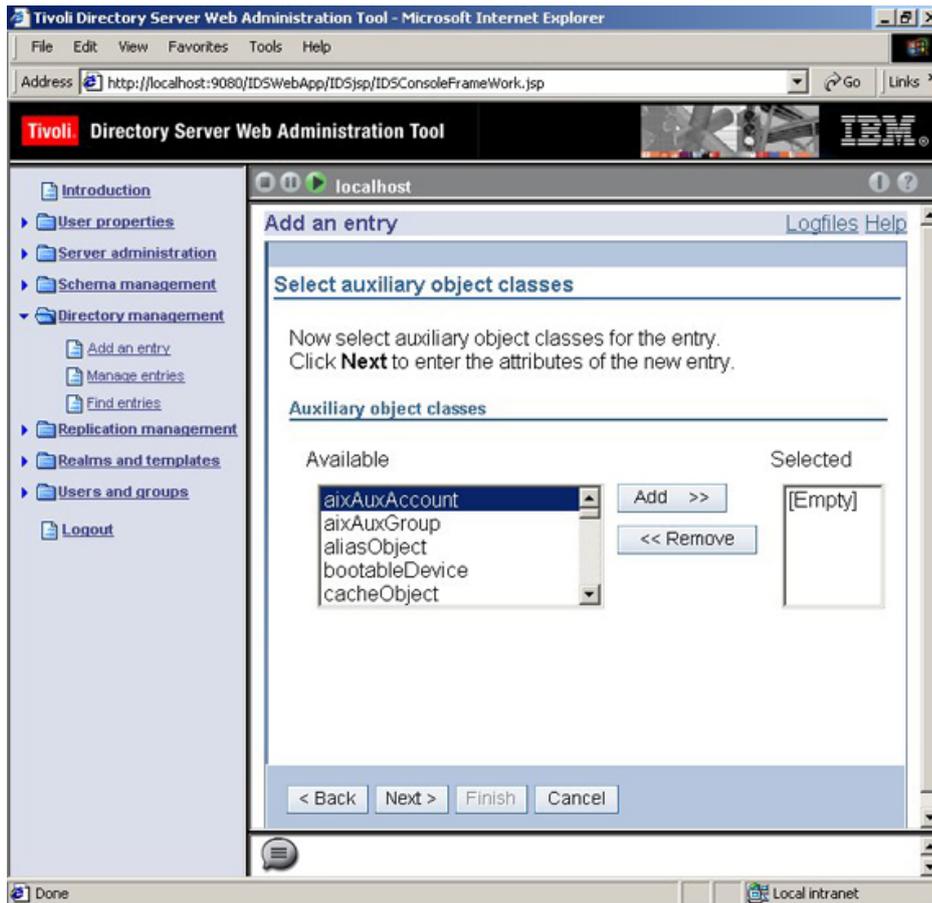
Once you log in to the Web administration client tool, you can perform various administrative routines. You will create three users as part of the Claims Processing workflow application. Name these users **agent**, **officer**, and **underwriter**. Follow these steps:

1. From the left panel, Select **Directory Management > Add an entry**
2. On the right side (content area), select **organization** as a structural object class.

Figure 2. Add structural object organization

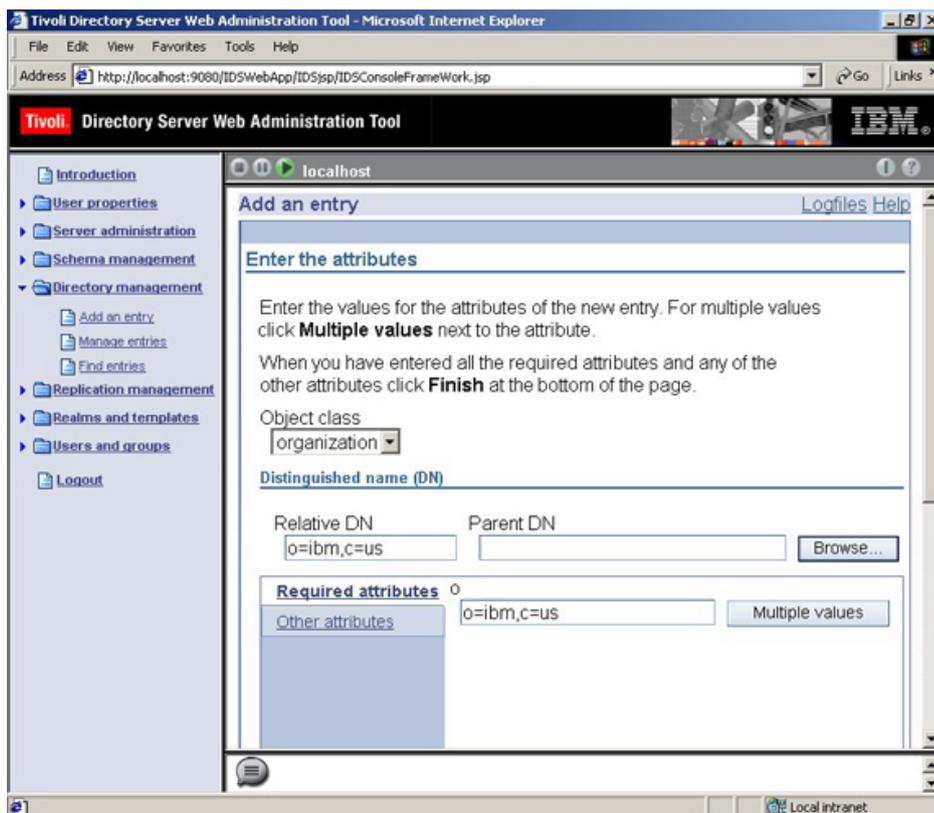


3. Keep auxiliary object class as empty.

Figure 3. Keep auxiliary object empty

4. Enter **o=ibm,c=us** as RDN, leave Parent DN blank, enter **o=ibm,c=us** as the value for the required attribute **o**.

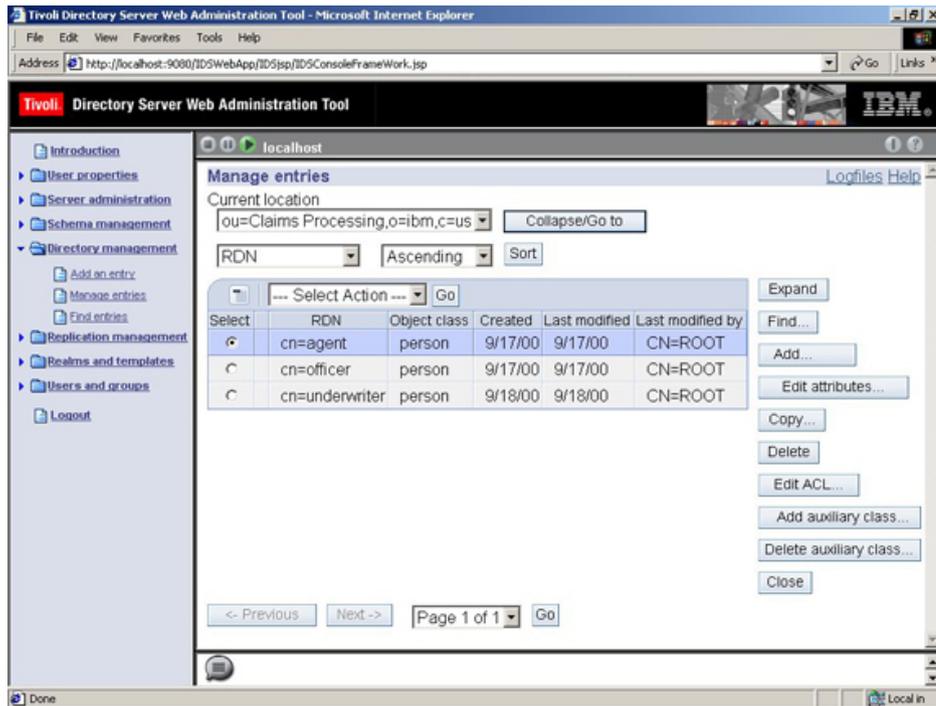
Figure 4. Enter RDN and attribute



Now you have created a

top-level parent entity **organization**. Next create Organization Unit as a child entity to the parent organization entity.

5. Select the entry created in the above step. Click **Add**.
6. Select **OrganizationUnit** as a structural object class.
7. Keep auxiliary object class as empty.
8. Enter **ou=Claims Processing** as RDN, enter **Claims Processing** as the value for the required attribute **ou**. You have created Organizational Unit as **Claims Processing**. Now add the user to that unit:
9. Select the entry created in the above step. Click **Add**.
10. Select **Person** as a structural object class.
11. Keep auxiliary object class as empty.
12. Enter **cn=agent** as RDN, enter **agent** for required attribute **cn**, enter **agent** for required attribute **sn**.
13. Click **other attributes** link, and enter the password for the user. For this article I will keep the password the same as user ID.

Figure 5. User list

You just created one user entry into ITDS. Repeat steps 9-13 to create another two users, **officer** and **underwriter**.

The next section will show you how to integrate the above created users with the DB2 Content Manager.

LDAP integration with DB2 Content Manager

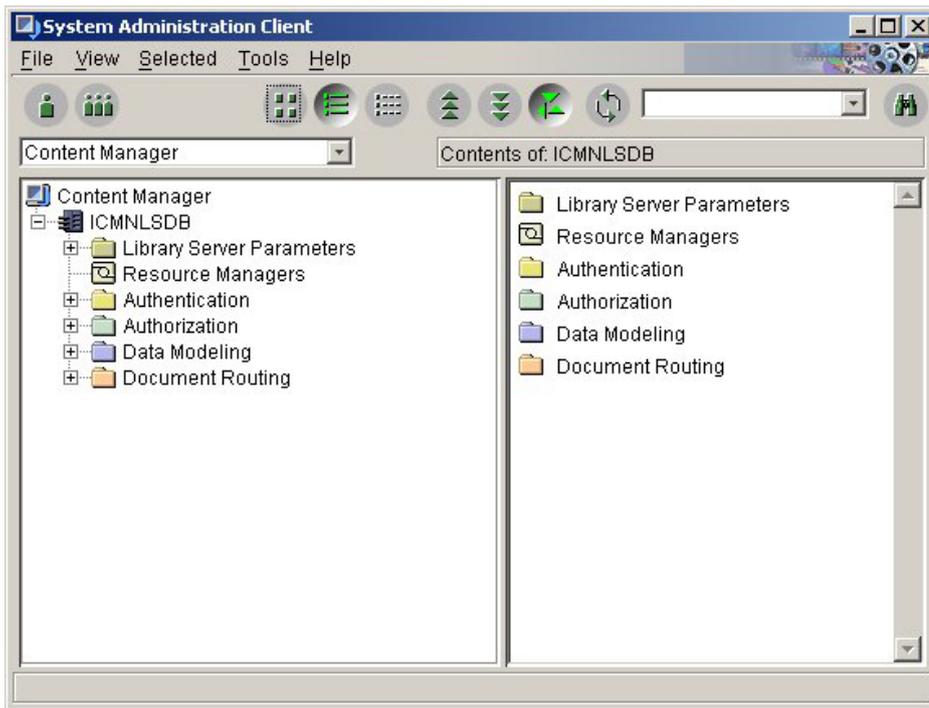
Configure for LDAP integration

What is the integration all about? What are you trying to achieve by integrating LDAP with DB2 Content Manager? It's simple -- users will log in to the Content Manager client and their credentials will be authenticated by the LDAP server. That means you can actually have user entries residing in a separate tier in a directory server and let Content Manager do content managing.

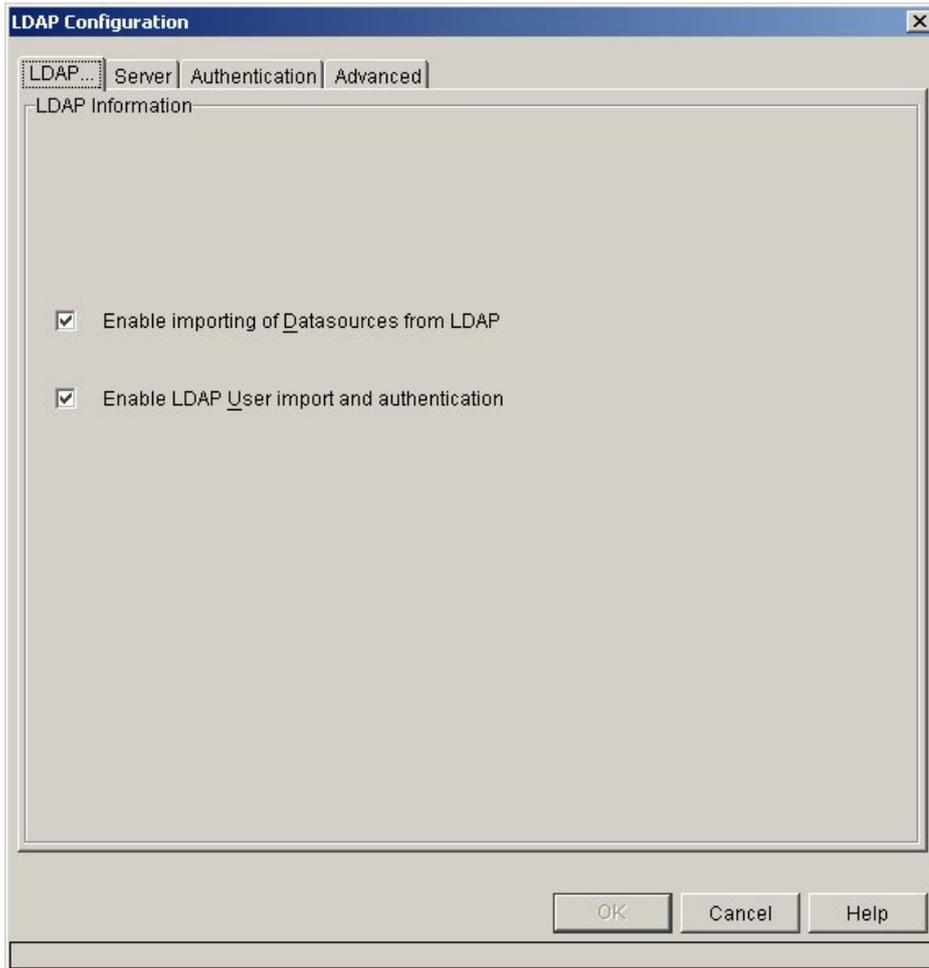
You should have successfully installed DB2 Content Manager V8.2 and all set for LDAP integration. The previous section showed you how to install and set up IBM Tivoli Directory Server (ITDS) as a LDAP server. Now you will integrate the same with DB2 Content Manager.

To perform the integration, start the System Administration Client. **Start > Programs > IBM DB2 Content Manager for Multiplatforms > System Administration**

Figure 6. System Administration Client



Click **Tools > LDAP Configuration** from the menu bar. This will bring up the LDAP configuration dialog. By default it will show the contents of the LDAP tab.

Figure 7. LDAP configuration The Java Beans view

Check the following checkboxes:

- **Enable importing of Datasources from LDAP**
- **Enable LDAP User import and authentication**

Go to the **Server** tab and perform the following:

- Select **LDAP** as Server type
- Enter **ldap://localhost** as LDAP server hostname
- Enter **389** as Port
- Click on **Lookup from Server** button
- Select **o=ibm,c=us** as Base DN
- Enter **cn** as User attribute
- Select **Use user DN** as Description attribute
- Select **Subtree** as Search scope
- Select **Ignore** as Referral
- Select **Simple** as Authentication scheme
- Enter **cn=root** as User name (Recall from previous section)

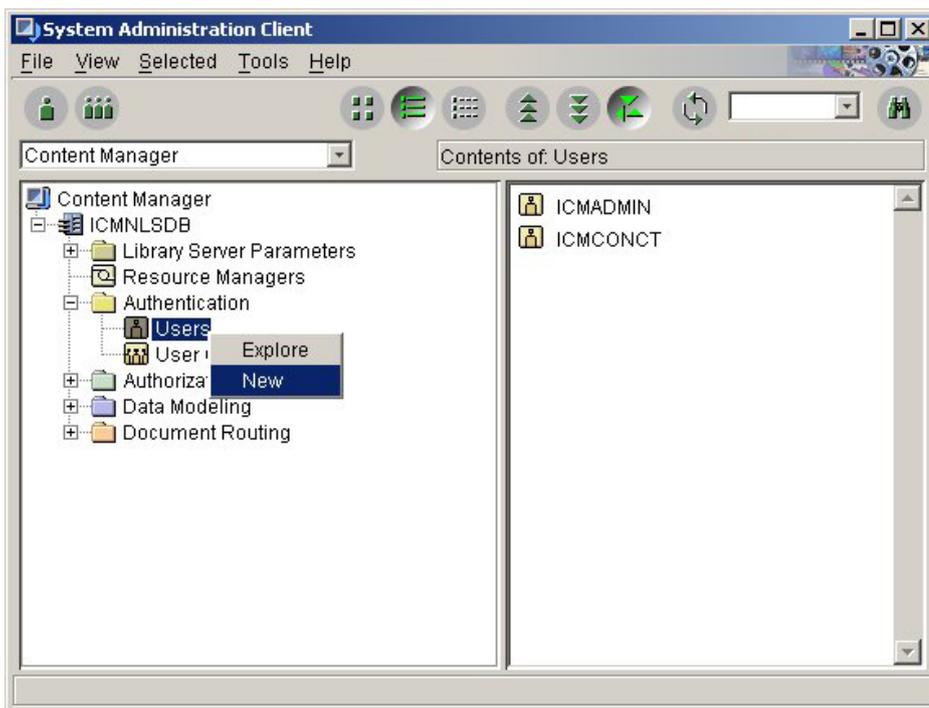
- Enter **admin** as Password
- Click **OK**

Retain the default values for tabs **Authentication** and **Advanced**.

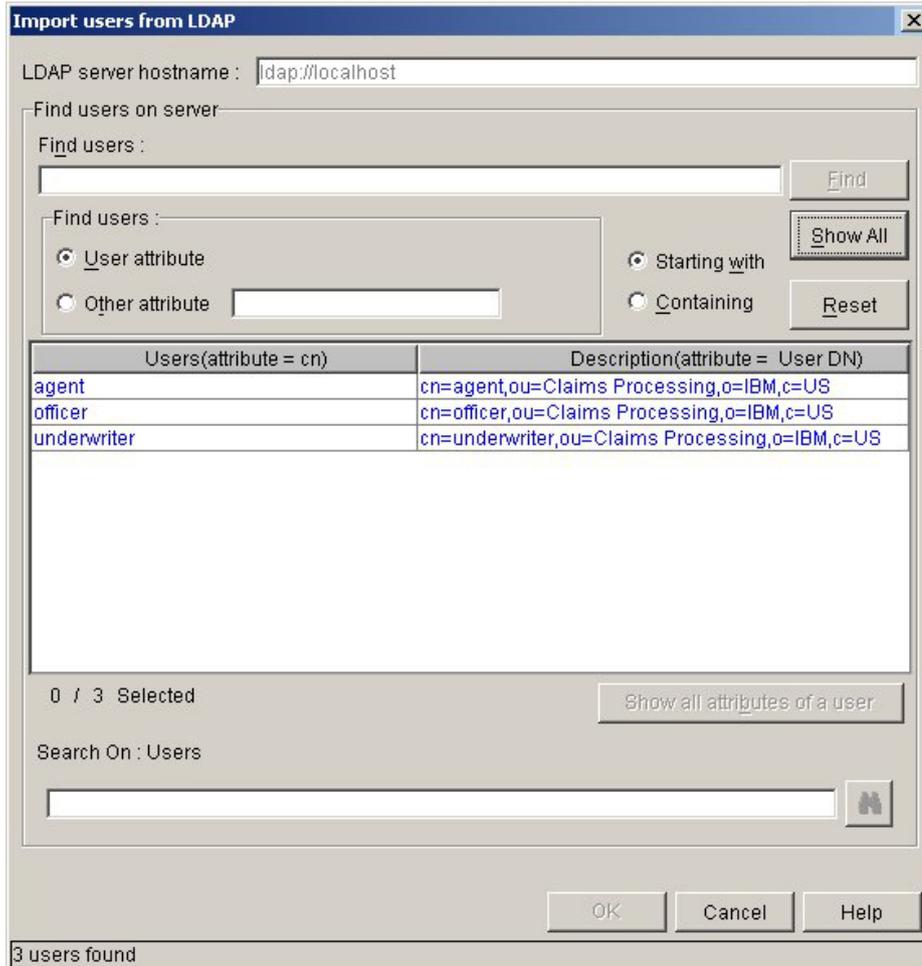
Integrate

Start the **System Administration Client**, and on the left panel expand **Authentication**. Select **User**, right-click and select **New**.

Figure 8. User authentication



In the Define Users tab of the New User panel, click on the **LDAP...** button. In the Import users from LDAP panel, click the **Show All** button.

Figure 9. LDAP user authentication

You will find the user IDs **agent**, **officer**, and **underwriter**, which were created on the LDAP server, in the search list. Select all the user IDs and click **OK**. What have you done? You have just integrated LDAP with DB2 Content Manager. How do you verify? Log in to the **Content Manager Client for Windows** with the said user ID, and it will be authenticated by the LDAP server. **Note:** The LDAP server, in our case ITDS, must be up and running.

Defining the workflow

Sample workflow application -- Claim process

In this section, you'll learn to build a sample workflow application called **Claim Process** using the document routing feature of DB2 Content Manager.

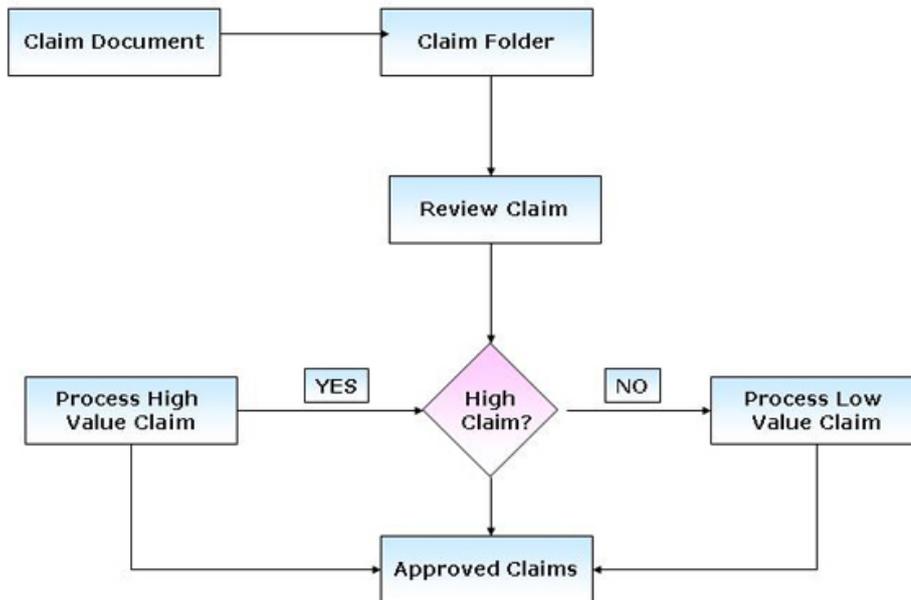
The Claim Process will typically contain the following work nodes:

- Input of claim documents
- Verify claim documents (whether low value or high value)
- Process claims

- Approve claims

The figure below shows the workflow Claim Process:

Figure 10. Claim process workflow



Workflow creation will be done in the following steps:

- Creating users
- Assigning privileges to the users
- Creating Access Control Lists
- Creating Attributes and Item Types
- Defining Workflow -- Document Routing

Creating users

If you recall the previous section, you created three users using LDAP integration. The users will be authenticated by the LDAP server and authorized by DB2 Content Manager. The three users created are:

- **Agent** --- Responsible for creating, submitting and reviewing claim documents.
- **Officer** --- Responsible for reviewing, approving and rejecting low value claim documents.
- **Underwriter** --- Responsible for reviewing, approving and rejecting claims (both high and low value). This user will have all the privileges to work upon the claim.

Assigning privileges to the users

Authorization will be done by means of privileges. **Privileges** grant users the right to access a specific object in a specific way. Privileges include rights such as creating, deleting, and selecting

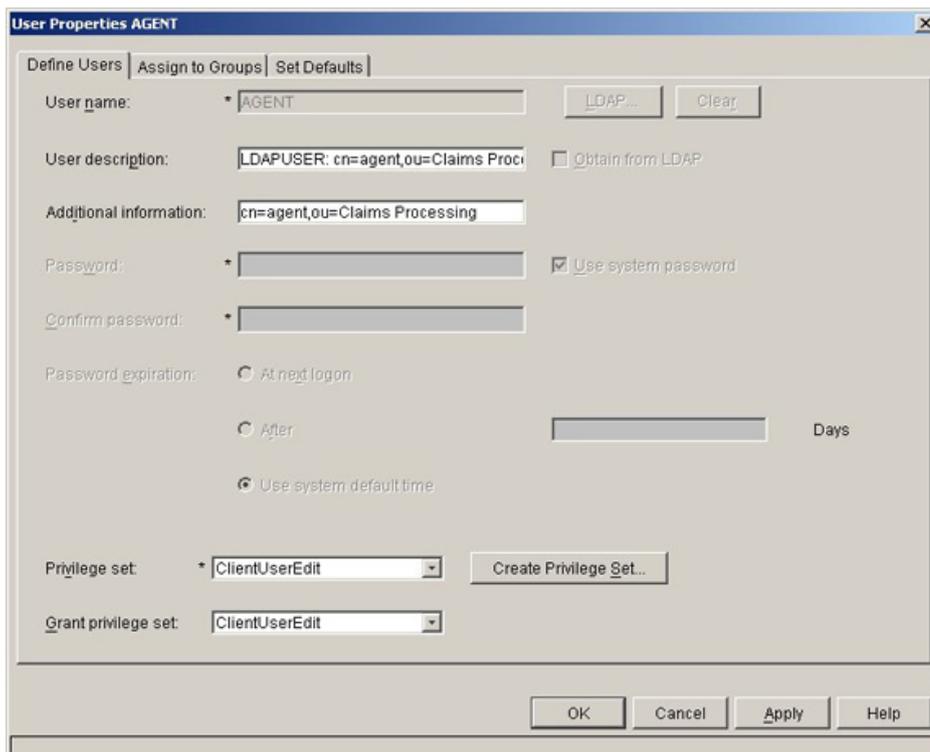
objects stored in the system. Privileges are grouped together to create convenient privilege groups, and to define user roles called **privilege sets**. The following predefined privilege set will be used:

Users	Privilege Sets	Description
Agent	ClientUserEdit	Update items, annotations, note logs and perform searches, view document, and print documents. These users can also perform foldering actions and process-related actions such as start and stop for document routing.
Officer	ClientUserEdit	Same as above
Underwriter	Continue	Search documents, perform process- and folder-related actions such as start and stop for document routing, import items, change attribute values, and update notes and annotations.

Agents receive and scan claims. They also need the flexibility to delete and re-scan claims if something goes wrong in the import process. Officers only need to view the actual claim. Underwriters have all access and control over the items involved in a claim. They need change or update claim cases as needed.

To assign privileges, click **Start > Programs > IBM DB2 Content Manager for Multiplatforms > System Administration Client**. Expand **Authentication** (left panel) and select **Users**. Select a user named **Agent** from the content area (right side), and right-click **Properties**.

Figure 11. Assign privileges



You can select the appropriate Privilege Set show in the above figure. Similarly you can assign it for users **officer** and **underwriter**.

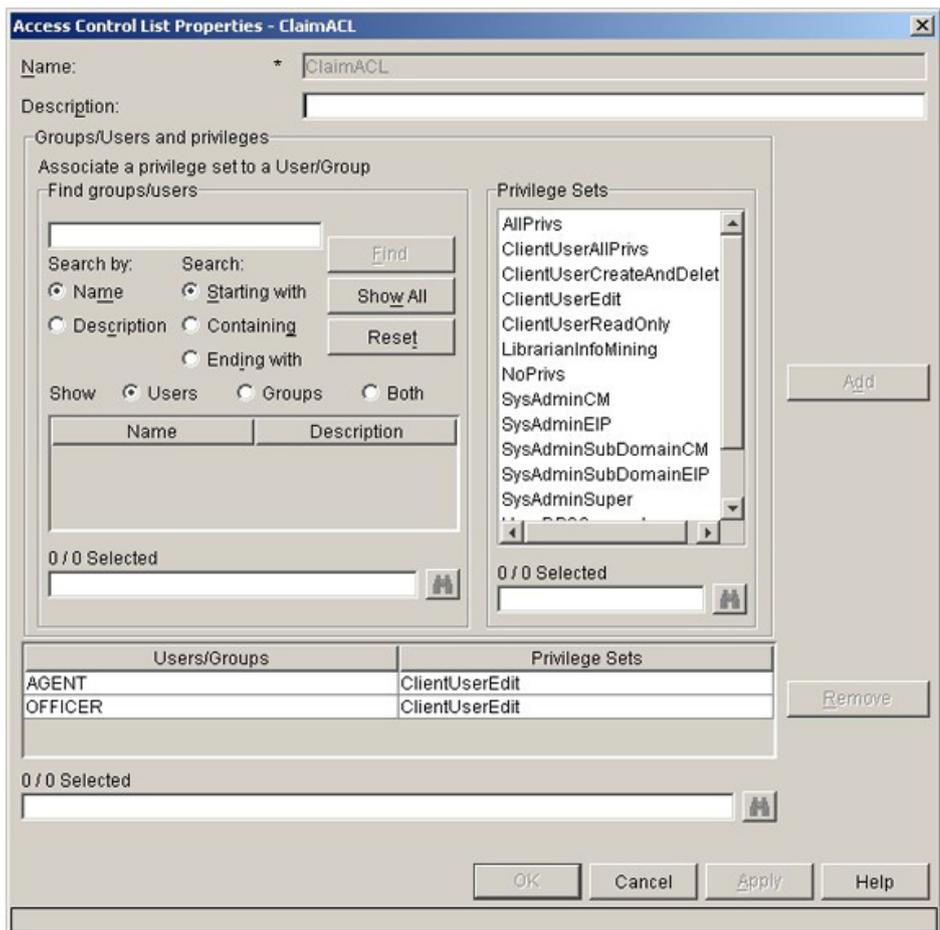
Creating access control lists

An access control list consists of one or more user IDs or user groups with a privilege set associated with each. The objects that can be associated with access control lists are: the data objects stored by users, item types and item type subsets, worklists, and processes. The following ACLS will be used in our Claim Process workflow:

ACL	Description
ClaimACL	Will contain agents, officers, and underwriters. This ACL will be associated to our Claim Process workflow.
LowValueClaimACL	Will contain officers and underwriters. This ACL will be associated to our Claim Process workflow.

To create ACL, start the **System Administration Client**. Expand **Authorization**, select **Access Control List**, and right-click **New**.

Figure 12. Create ACL



Enter **ClaimACL** as the Name. Enter **Description**. Click on the **Show All** button to list the users. Add the user with their respective privilege set. In this case, users will be **agent** and **officer**, and their privilege set will be **ClaimUserEdit**.

Similarly create **LowValueClaimACL** and add user **officer** to it.

Creating attributes and item types

Now for the creation of data objects known as item types. An item type is comprised of attributes, components, and other data that describes how items (actual instances of an item type) are handled by the system. When an item type is created, you can use a client application to manipulate the items in it. The following data model is very simple. Use these item types as data objects for this Claim Process workflow:

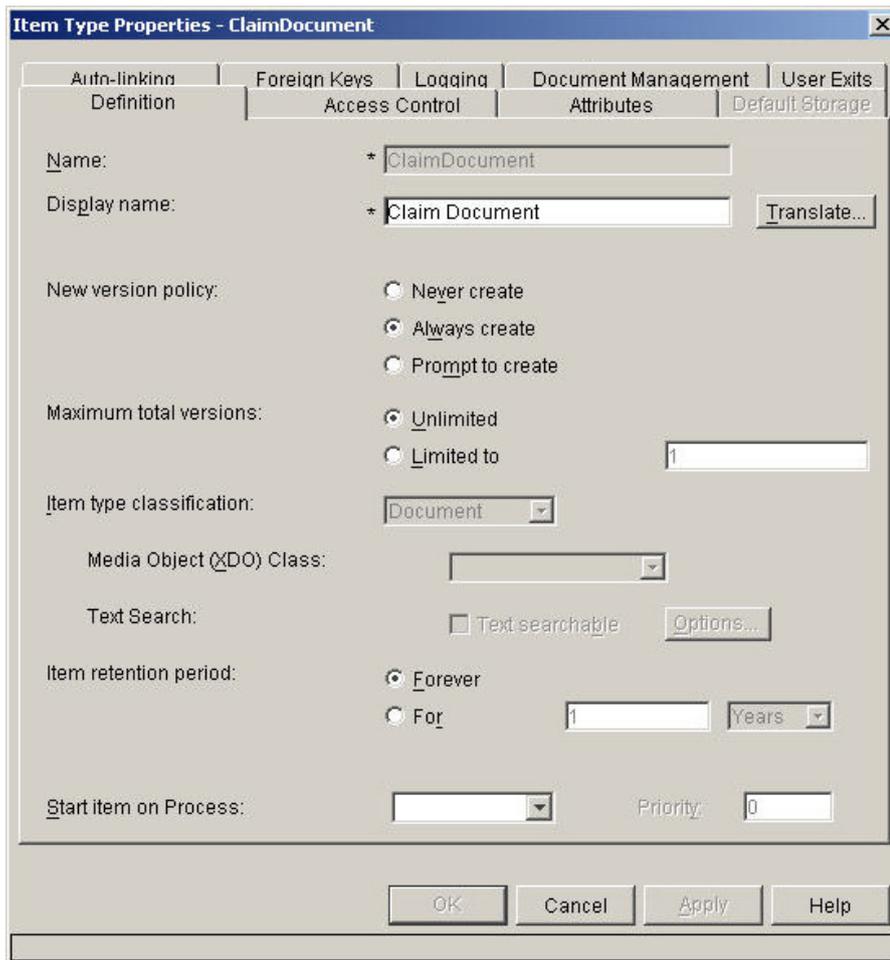
- **ClaimDocument** -- This is the main input document
- **ClaimFolder** -- This will hold the claim document

First create attributes for the above item types. Start **System Administration Client**. Expand **Data Modeling**, select **Attributes**, and right-click **New**. Enter the attribute name and type. For this workflow, create the following attributes:

- **ClaimNumber** -- Long Integer
- **PolicyNo** -- Long Integer
- **Insured Name** -- Character (Alphabetic)
- **Agent Name** -- Character (Alphabetic)
- **Claim Amount** -- Decimal

To create ItemType, start **System Administration Client**. Expand **Data Modeling**, select **ItemTypes**, and right-click **New**.

Figure 13. Create item type



Then enter the following details under the **Definition** tab for item types **ClaimDocument** and **ClaimFolder**:

Name	ClaimFolder	ClaimDocument
New version policy	Never create	Always create
Maximum total versions	N.A.	10
Item type classification	Document	Document
Text search	N.A.	N.A.
Item retention period	Forever	Forever
Start item on process	ClaimProcess (You will get this value only after you create the process. See document routing sub-section)	N.A.
Priority	1	N.A.

Under **Access Control** tab, select **ClaimACL** as Access Control List for both the item types. Under the **Attributes** tab, add all the attributes that were created in the above step for the item type **ClaimDocument**. Add attribute **ClaimNumber** for item type **ClaimFolder**. Under the **Auto-linking** tab, in item type **ClaimDocument**, select **ClaimFolder** as the item type and add

ClaimNumber as an attribute to link. Click on the **Add** button. This will add the link between item type **ClaimFolder** and **ClaimDocument** on an attribute **ClaimNumber**. Under the **Document Management** tab, enter the details as per the table below:

Item type	ClaimFolder	ClaimDocument
Part type	ICMBASE, ICMANNOTATION, ICMNOTELOG, ICMBASETEXT, ICMBASESTREAM	ICMNOTELOG
ACL	ClaimACL	ClaimACL
New version policy	Never Create	Always Create

You just created two item types **ClaimFolder** and **ClaimDocument** and assigned attributes to them.

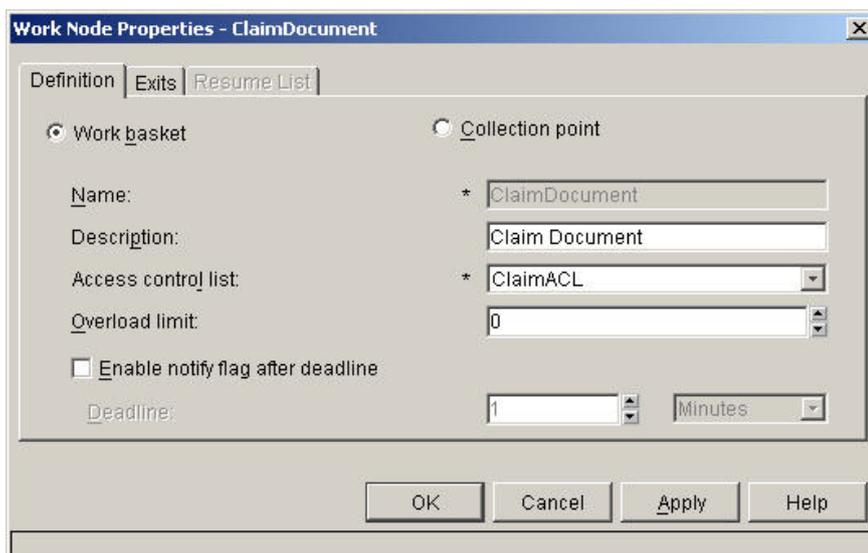
Defining workflow -- document routing

Document routing refers to a workflow process consisting of **work nodes** through which documents or folders are routed. These work nodes will be collaborated to form a **process**. After a process is defined, **worklists** are defined. Worklists contain workpackages for which users are authorized to work. Each worklist will be associated with one or more work nodes.

Document routing is defined with the creation of work nodes. Work nodes can be categorized into **workbaskets** and **collection points**. A workbasket is a business task or a step where the system keeps work packages that are in process or waiting to be processed. Collection point is a special work node that does not correspond to a business task, and to which users do not have access. It represents an area where a folder waits for specified items (either other folders or documents) to be collected before continuing.

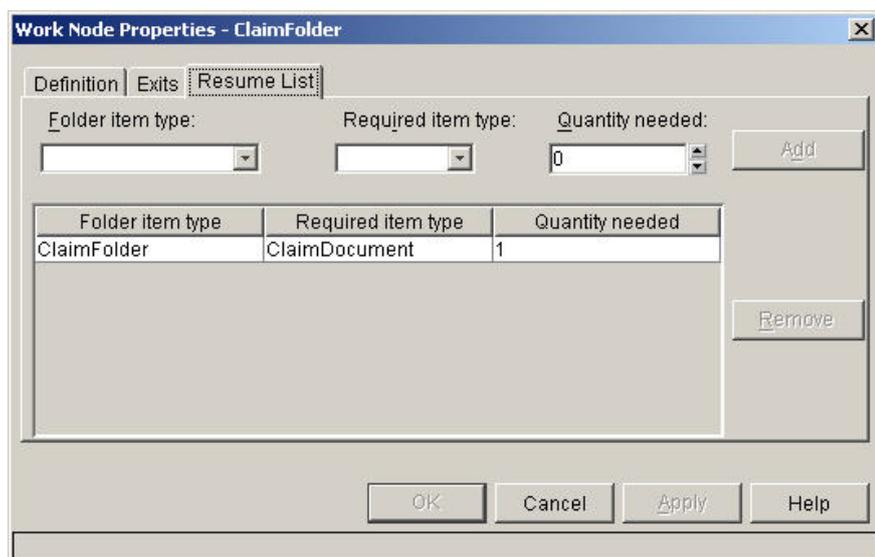
Create a work node named **ClaimFolder**. To create a work node, start System Administration Client. Expand **Document Routing** (left panel), select **Work Nodes**, and right-click **New**.

Figure 14. Create work node



Select **Collection Point**. **Note:** ClaimFolder is not a business node and just a container to hold the document and so it will be a collection point. Enter **ClaimFolder** as a Name. Enter Description. Select **ClaimACL** as the Access Control List. Go to the **Resume List** tab. Select **ClaimFolder** as the Folder Item type. Remember the item type we created in the previous sub-section? Select **ClaimDocument** as the Required Item type. Select **1** as the quantity needed. Click **Add**.

Figure 15. Collection point

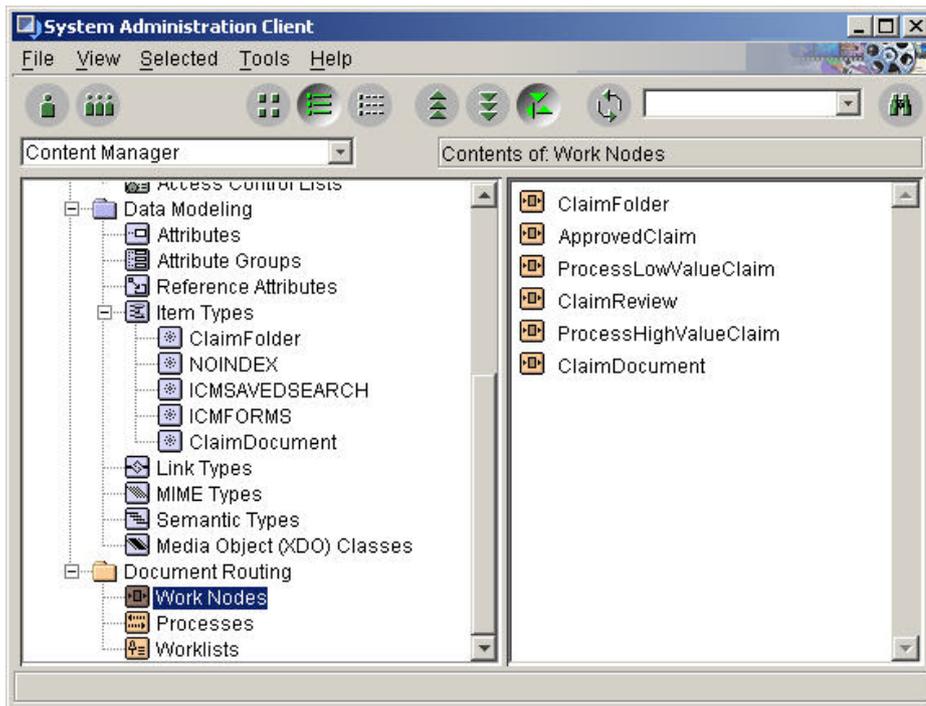


You just created a work node named ClaimFolder that will be associated with the Item type ClaimFolder (a physical folder) that will be created when the user imports a document into it.

Similarly, you can define the other work nodes as workbaskets. These work nodes will be a business nodes. For the Claim Process work flow define the following work nodes:

- ClaimFolder (Collection Point, you just created)
- ClaimDocument
- ClaimReview
- ProcessHighValueClaim
- ProcessLowValueClaim
- ApprovedClaim

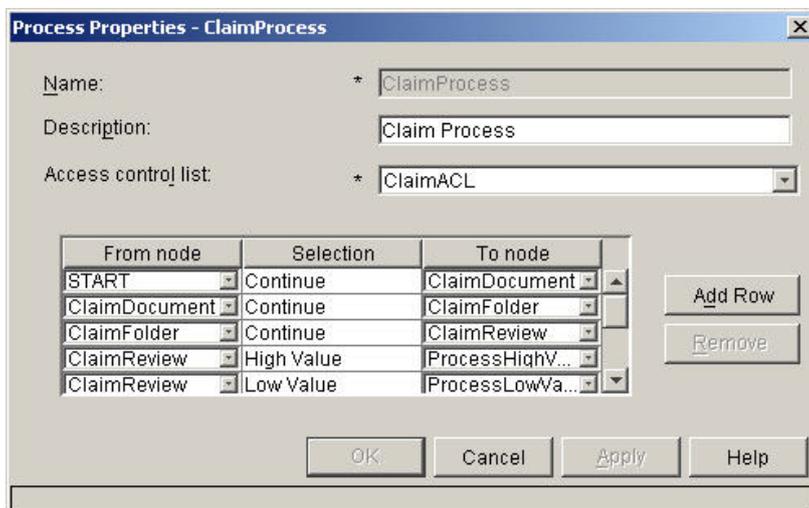
Figure 16. Work nodes



The next step is to create a **Process**. Now link these work nodes to form a process and name it **Claim Process**.

To create a process, start **System Administration Client**. Expand **Document Routing** (left panel), select **Processes**, and right-click **New**.

Figure 17. Create process



Enter **ClaimProcess** as Name. Enter Description. Select **ClaimACL** as Access Control List. Link the work nodes as follows:

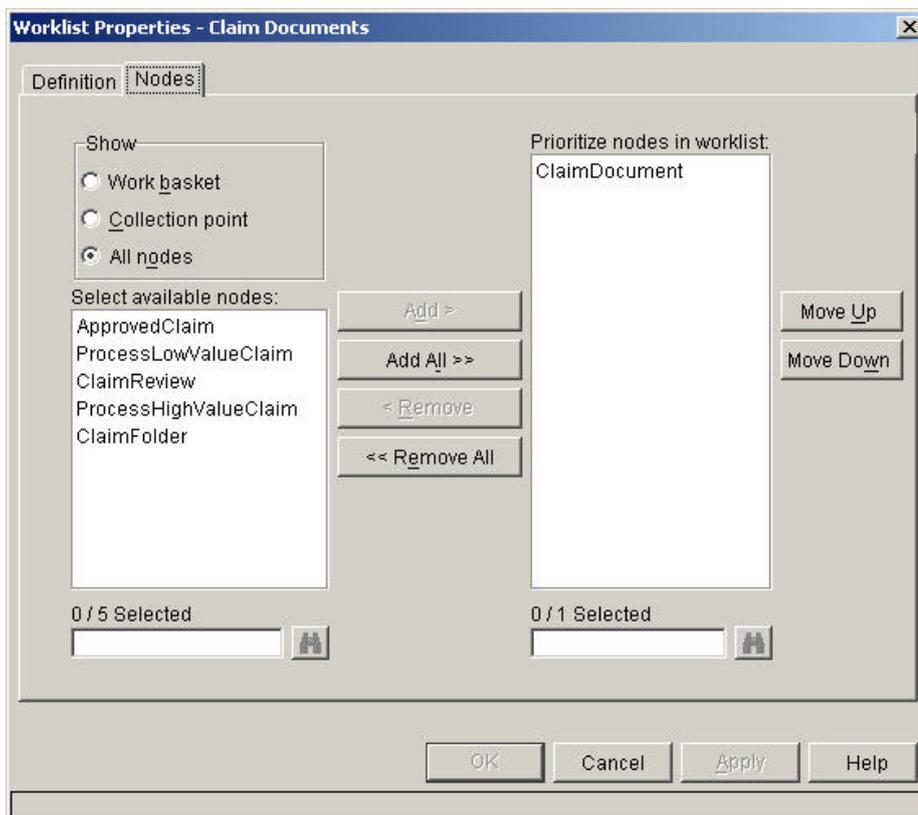
From node	Selection	To node
-----------	-----------	---------

START	Continue	ClamDocument
ClamDocument	Continue	ClamFolder
ClaimFolder	Continue	ClaimReview
ClaimReview	High Value	ProcessHighValueClaim
ClaimReview	Low Value	ProcessLowValueClaim
ProcessHighValueClaim	Approve	ApprovedClaim
ProcessLowValueClaim	Approve	ApprovedClaim
ProcessHighValueClaim	Reject	END
ProcessLowValueClaim	Reject	END
ApprovedClaim	Continue	END

The next step is to create worklists and add a work node to it. Worklists are like work area for the respective users based on their roles. So you need to create worklists based on user roles and responsibilities.

You will create worklist for every business work node. The reason is that every work node is a separate business process in itself. To create the worklist, start **System Administration Client**. Expand **Document Routing** (left panel), select **Worklists**, and right-click **New**.

Figure 18. Create work list



Enter **Claim Document** as Name. Enter **Description**. Select **ClaimACL** as Access Control List. Go to **Nodes** tab, and you will see all the work nodes created. Select the **ClaimDocument** work node and click **Add**. Click **OK**.

Similarly, you can define the other worklists and add respective work nodes to it. Create the the following worklists:

- Claim Documents (you just created)
- Review Claims (Assign ClaimACL as Access Control List)
- Process High Value Claims (Assign NoAccessACL as Access Control List)
- Process Low Value Claims (Assign LowValueClaimACL as Access Control List)
- Approved Claims (Assign NoAccessACL as Access Control List)

You just defined your workflow application Claim Process using the document routing feature. In the next section, you will execute this workflow using **Client for Windows**.

Running the workflow application

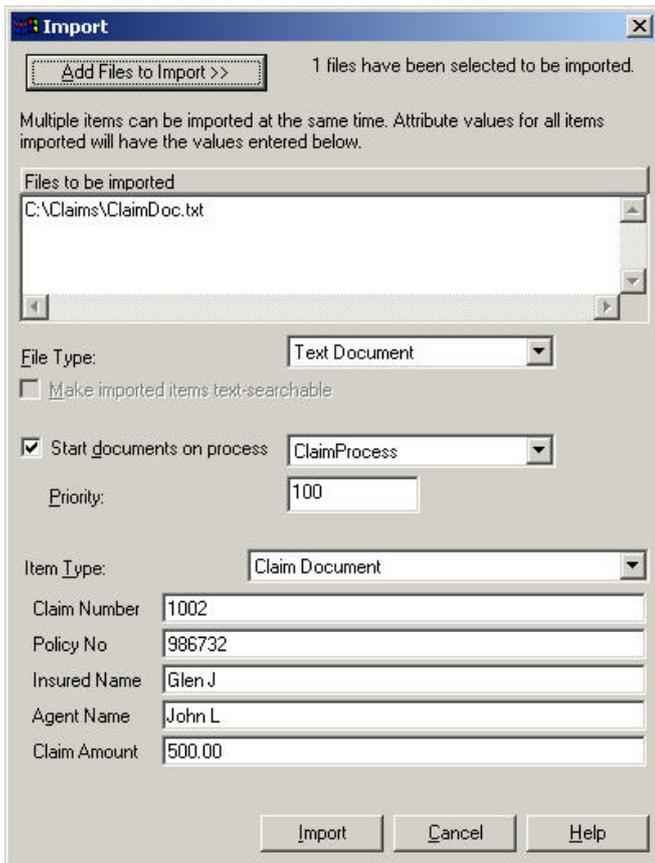
Import a document

This section shows you the documentation routing implementation using DB2 Content Manager Client for Windows. You will depict a sample Claim Process document routing defined in a previous section of this article.

Start DB2 Content Manager **Client for Windows**. Log in as **agent** (the user ID is *agent* and the password is *agent*). Remember that your role is an agent.

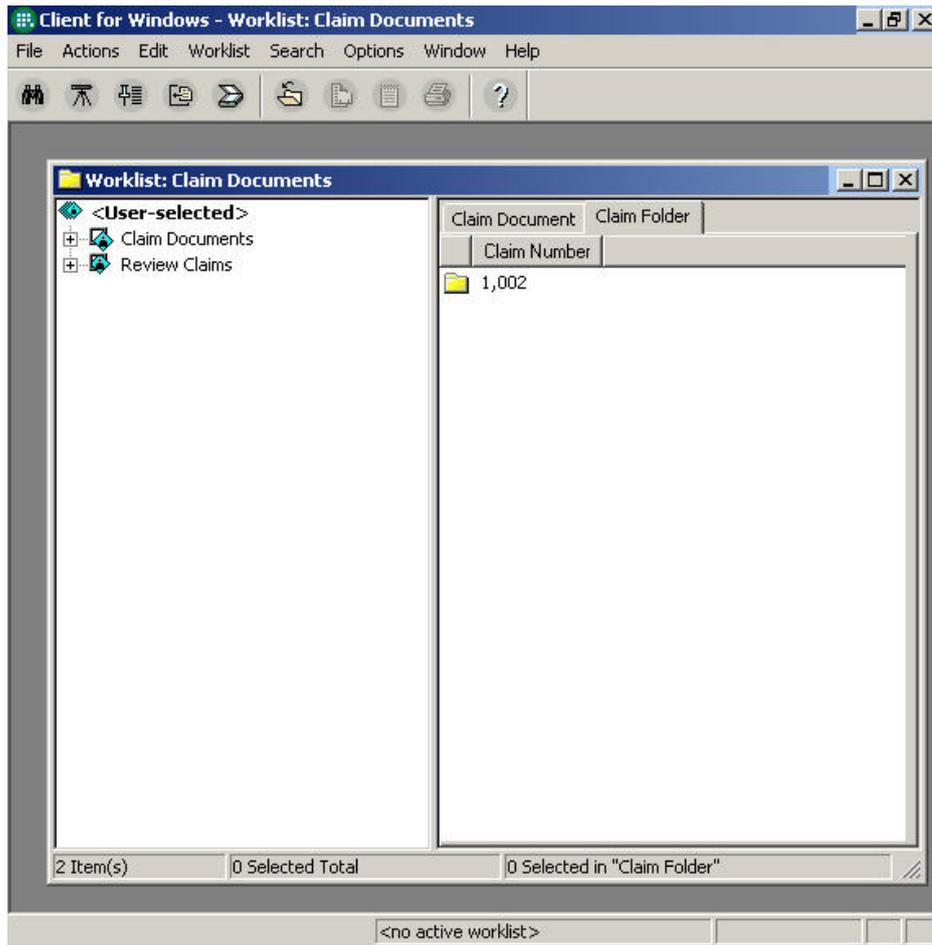
Start by importing a claim document in the **Claim Documents** worklist. Once the document is imported, the workflow process is initiated.

Figure 19. Import a document



Click **File > Import**.

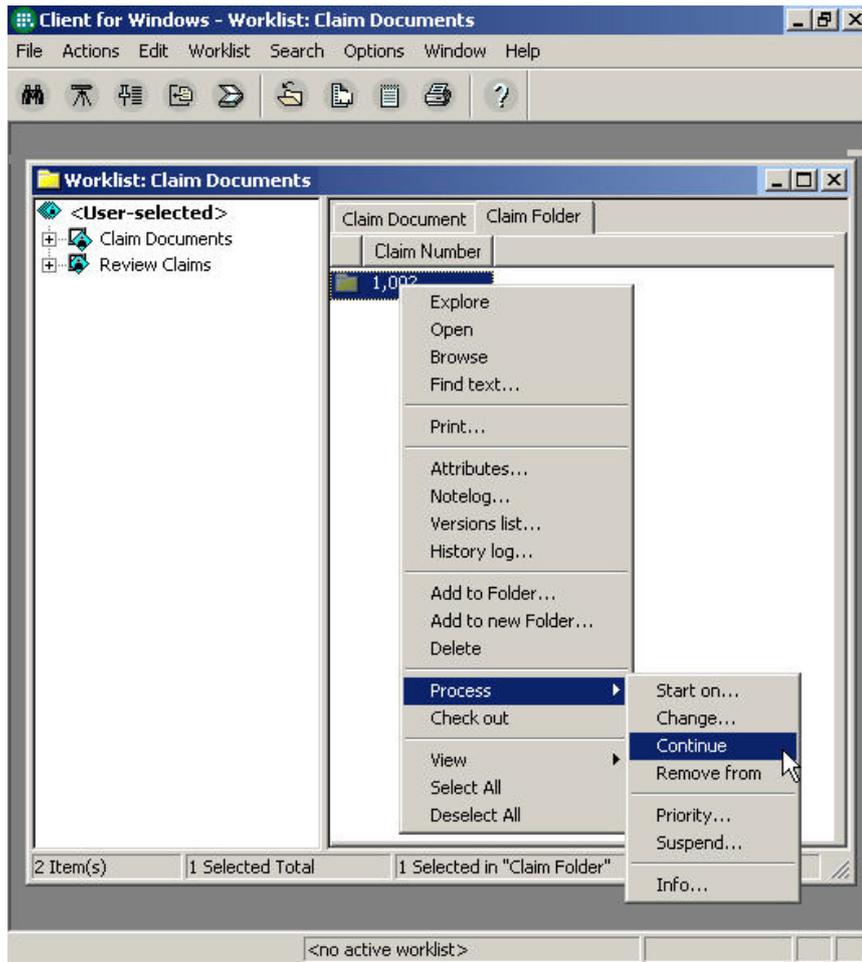
Select the file to import. Here you will import a text file containing claim details. You need to enter the value for the attributes. Once entered, click on the **Import** button. Once the document is imported, a folder containing the document will be created and you can see the folder in the **Claim Documents** worklist. **Note:** User, Agent only has access to the **Claim Documents and Review Claims** worklists. So Agent can view only those worklists.

Figure 20. Folder created

Now start the document routing.

Select **Claim Documents** worklist (left panel) and in the content area (on the right side) and right-click on the claim number folder.

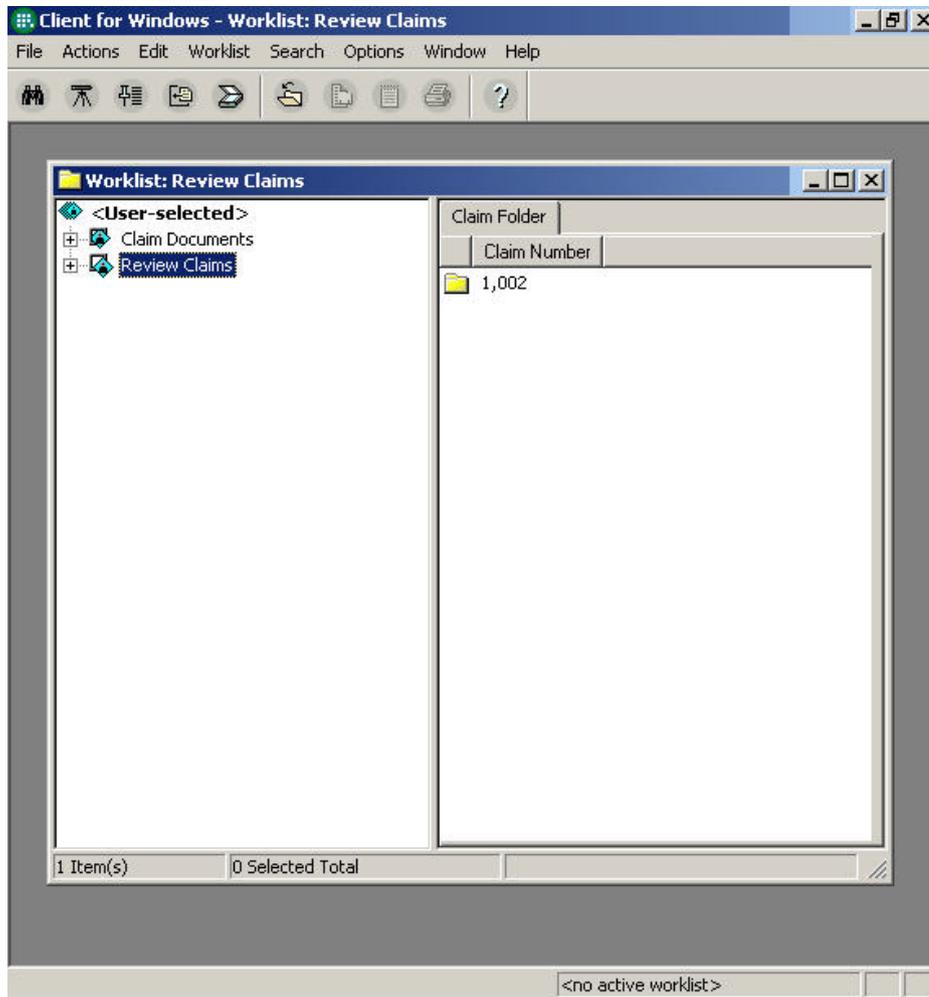
Figure 21. Route claim document



Select **Process > Continue**. The document will be routed to the **Review Claims** worklist for the necessary review. The document will be removed from the Claim Documents worklist.

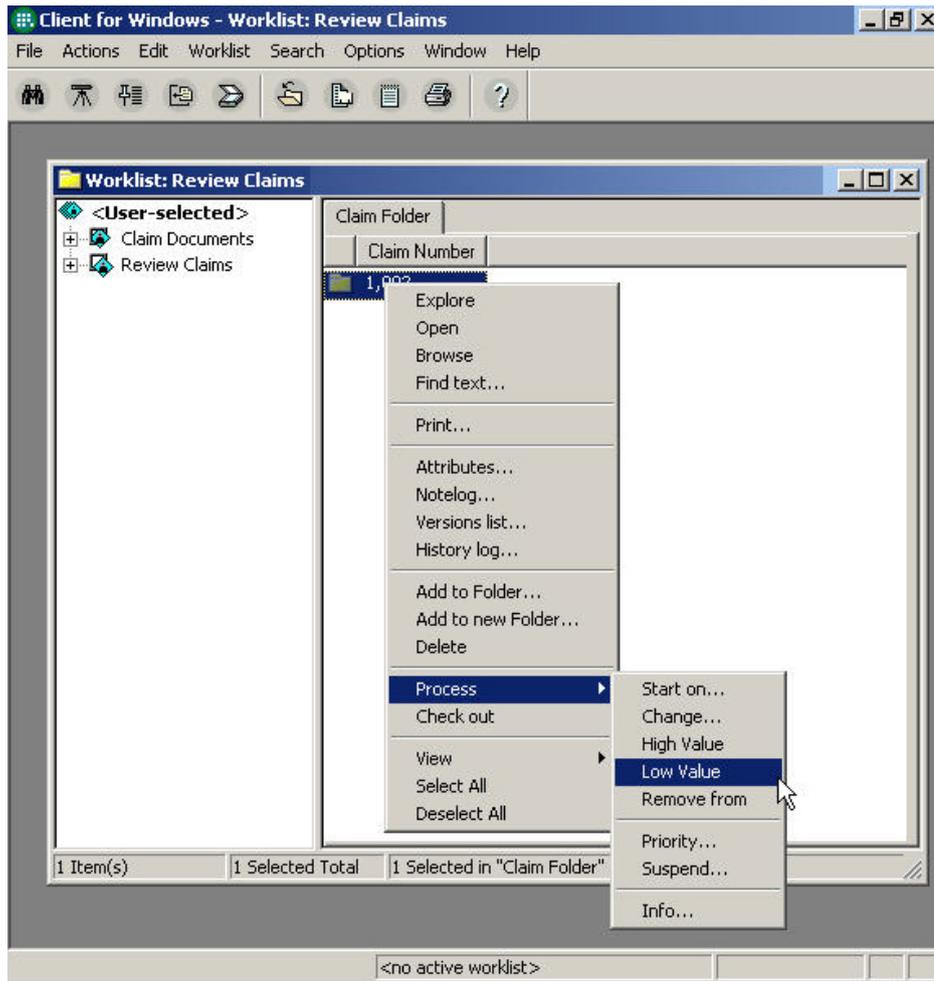
Routing the claim document

Figure 22. Folder in review claim worklist



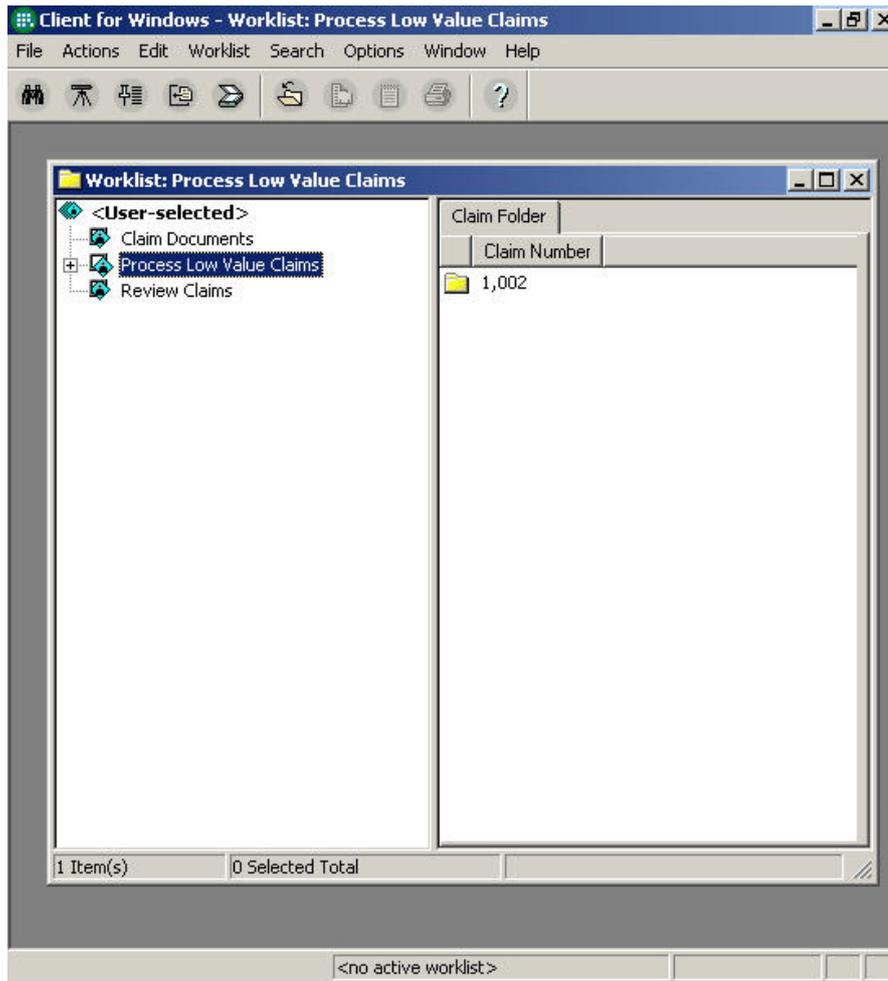
As you can see from the above figure, the claim number folder is moved to the Review Claims worklist. Next review the document and check whether it is a high-value claim or a low-value claim. After verifying the document, and verifying that it as a low-value claim (since the claim amount was \$500), right-click on the folder, and select **Process > Low Value**.

Figure 23. Low-value claim



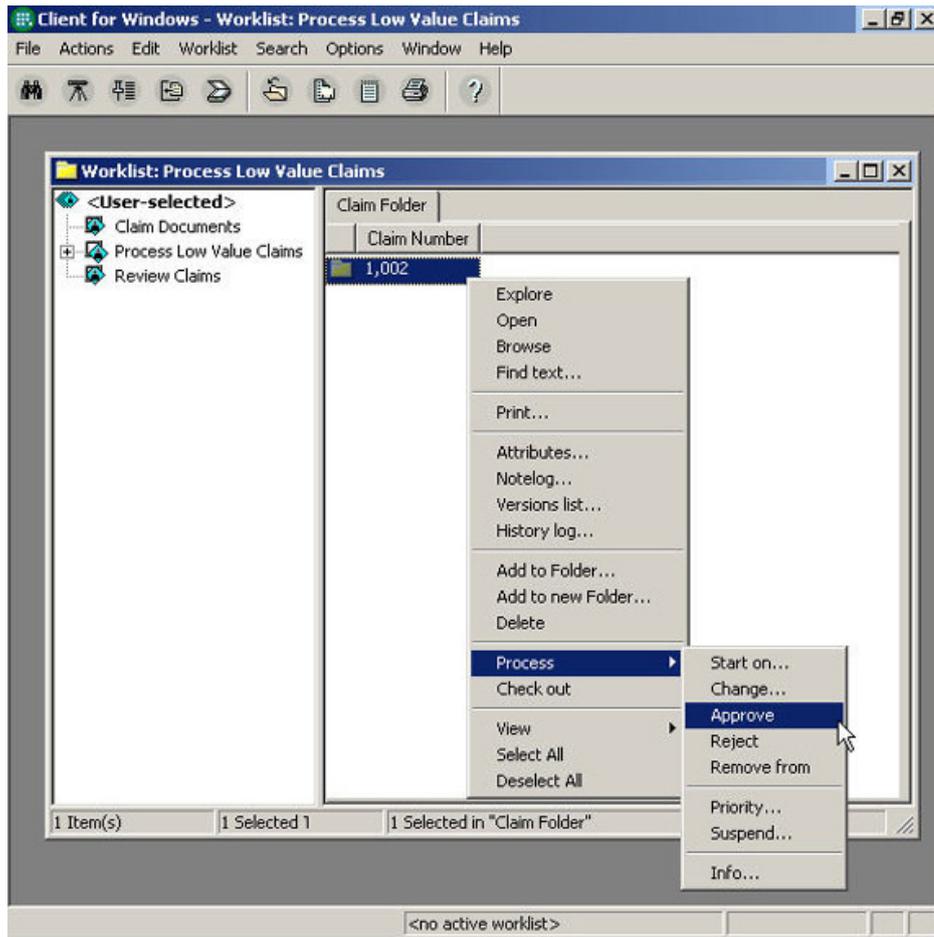
The document is then routed to the **Process Low-Value Claims** worklist for further process and removed from the **Review Claims** worklist. To process low-value claims, you will have to log in as **officer**. Exit Client For Windows and log in as **officer** (user: *officer* ,password: *officer*).

Now your role is an officer.

Figure 24. Folder in proces low-value claims worklist

The officer will have access to three worklists. You can see from the above figure that the folder has been moved to **Process Low Value Claims** worklist. Now assess the claim amount and approve the same. **Right click on the folder, select Process > Approve**

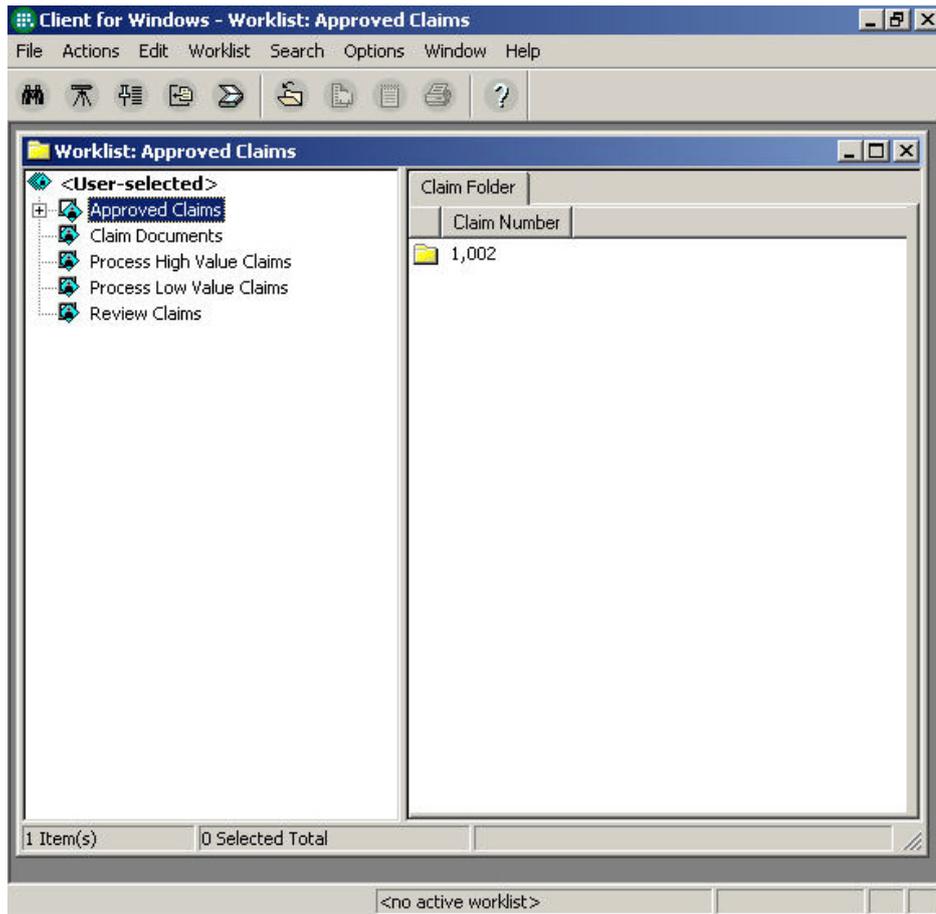
Figure 25. Approve claim



The document is then routed to the **Approved Claims** worklist for further process and removed from the **Process Low-Value Claims** worklist. To view the approved claims, you will have to log in as **underwriter**. Exit Client For Windows and log in as **underwriter** (user: *underwriter* ,password: *underwriter*).

Now your role is an underwriter.

Figure 26. Folder in approve claims worklist



As you can see from the above figure, an underwriter will have access to all the five worklists. You can see from the above figure that the folder has been moved to the **Approved Claims** worklist.

You just routed the document to its final destination!

Conclusion

This tutorial demonstrated how to integrate LDAP and DB2 Content Manager for document routing. You walked through the process of creating a workflow, assigning privileges to work nodes, and running the sample workflow application using DB2 Client for Windows through various users to route the documents to their final destination. This tutorial can serve as a basis for creating complex document workflow routing-based applications using DB2 Content Manager and enabling Single Sign On (SSO) through the use of LDAP.

Downloads

Description	Name	Size
Code samples for this tutorial	db2workflow-claimfile.zip (HTTP FTP)	1 KB

Resources

- Visit DB2 Content Management Site for more information: [DB2 Content Management](#).
- Visit DB2 Content Management Developers Zone for more DB2 Content Management articles and white papers: [DB2 Content Management Domain](#).
- Visit IBM Tivoli Directory Server for more information: [IBM Tivoli Directory Server](#)

About the authors

Naveen Balani

Naveen Balani spends most of his time designing and developing J2EE-based frameworks and products. He has written various articles for IBM developerWorks in the past, covering topics like SOA, JMS, WebServices Architectures, CICS, AXIS, J2ME, DB2 XML Extender, WebSphere Studio, MQSeries, Java Wireless Devices and DB2 Everyplace for Palm, J2ME, Java-Nokia, Visual Studio .NET, and wireless data synchronization.

Rajeev Hathi

Rajeev Hathi currently works as a Senior Systems Analyst for Satyam Computers Ltd. He spends his time designing and developing J2EE-based frameworks. He likes exploring new technologies and new fields of domains. His pastime hobbies are sports and music.

© [Copyright IBM Corporation 2005](#)

(www.ibm.com/legal/copytrade.shtml)

[Trademarks](#)

(www.ibm.com/developerworks/ibm/trademarks/)