

# IBM Support Tools portlet for IBM Web Content Manager: Empowering you!

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**Abstract:** The IBM Support Tools portlet for IBM Web Content Manager (WCM) is one of the most widely used applications to troubleshoot issues related to Java Content Repository nodes. The tool does not ship with the WCM product, however, and lacks detailed documentation for users. This white paper explains how to install, set up, and use the Support Tools portlet.

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## 1 Introduction

IBM® Web Content Manager™ (WCM) items are stored in the Java™ Content Repository (JCR) repository against a complex schema of interrelated tables. Each item is represented as a node, which is modeled through a graph of information stored across multiple tables.

For this reason, deleting a node is not as simple as removing one row from a table in the database. The interrelated connections among all the tables must be handled; in many cases, the level of logic required is not encoded in any singular SQL command that can be sent to the database.

The IBM JCR/WCM Support team has developed a tool called IBM Support Tools portlet for WCM that enables administrators to browse through those nodes and perform various operations directly on the JCR repository through the tool's user interface.

This portlet includes tools to view the JCR repository for WCM content, run an XPath query and view results, and directly execute various support JavaServer Pages (JSPs). These tools are commonly provided by Support on a case-by-case basis to gather information specific to customers' environment and content. Installing this portlet on the WCM system helps expedite the troubleshooting process.

This white paper explains how to use the WCM Support Tools portlet with IBM WebSphere® Portal 7. The functions within the portlet vary among WebSphere Portal releases (for example, "Generate WCM Search URL" is only visible in v7, and the JCR text search utilities are only visible on v6.1), so the v6.1-specific utilities in the WCM Support portlet have been marked as such in this document.

## **2 Download and install WCM Support portlet**

The portlet is available for download from the IBM Lotus and WebSphere Portal [Business Solutions Catalog](#) for v6.0.1.X, v6.1.X and v7.0 of WebSphere Portal, and can be used only on Portal servers on which WCM is installed.

The WCM Support portlet is installed just like any other portlet:

1. Log into WebSphere Portal and navigate to the Administration portlet.
2. Under "Portlet Management" select Web Modules.
3. Click Install, and browse to the location of the WCM Support Tool portlet .war file.
4. Click Finish.

Now that the .war file is installed, you can create a new page and add the WCM Support portlet:

1. While in the Administration Portlet, click Manage Pages under "Portal User Interface".
2. Click Content Root, click Web Content, and then "New Page".
3. Add a title to the page and click Finish.

The new page should be listed in the Administration portlet:

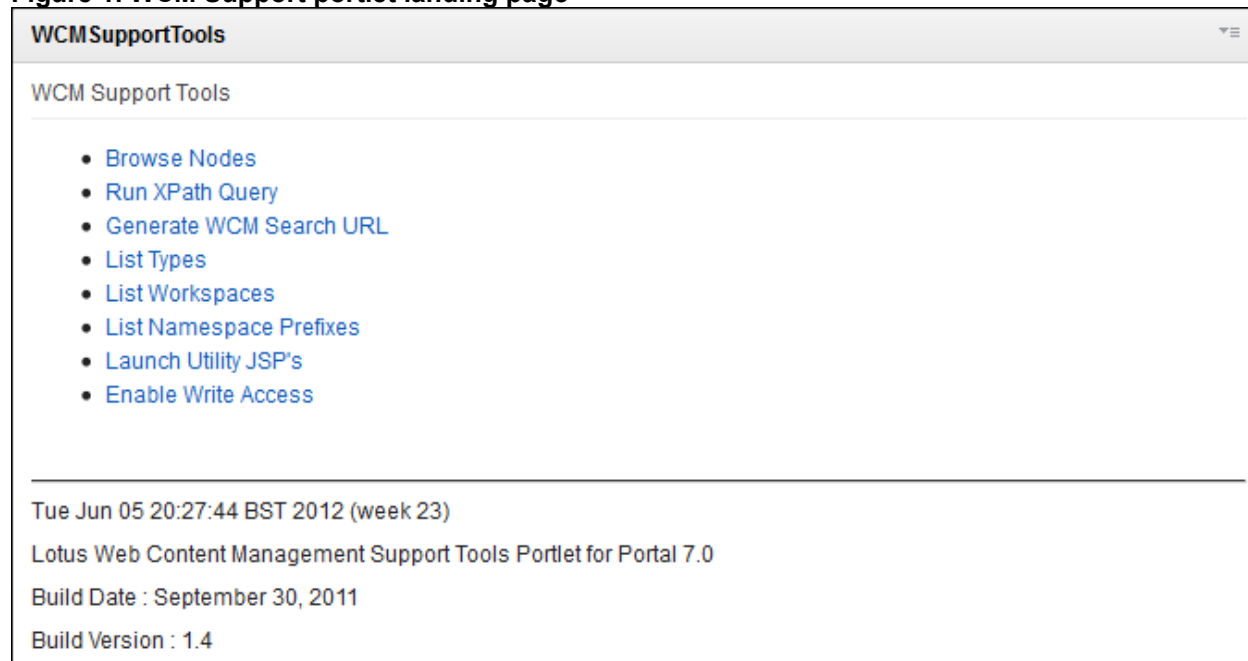
1. Click the Edit Page Layout button for the WCM Support portlet page.
2. Click Add Portlet, and search for the WCM Support portlet.
3. Click OK and click Done.

The WCM Support portlet is now installed.

## **3 WCM Support portlet capabilities**

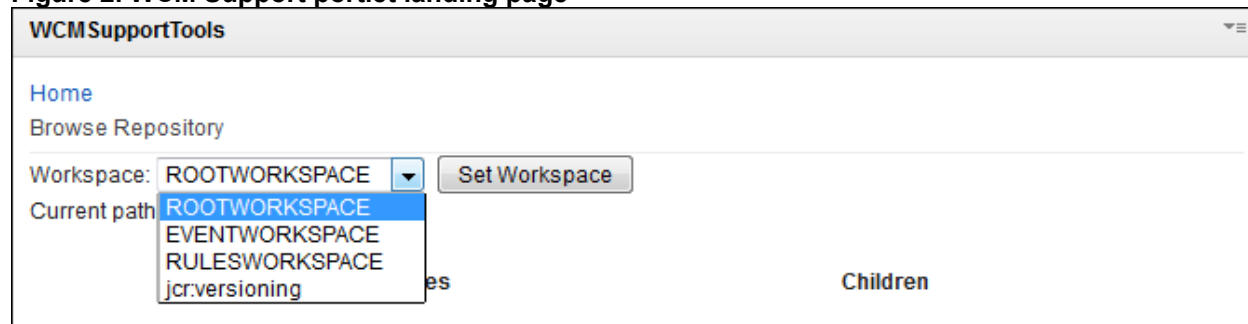
The WCM Support portlet provides an assortment of tools that are useful in troubleshooting content-related issues. When you open the portlet, you see links to various support tools in the body. In the footer, you will find the time stamp of when the portlet is accessed, the version of WCM for which portlet is installed, and the build version of the portlet (see figure 1).

**Figure 1. WCM Support portlet landing page**



Before further browsing a node, you must select a workspace as shown in figure 2; the default is ROOTWORKSPACE, where WCM libraries are stored (more details on this are provided in Section 3.5, List Workspaces, below.)

**Figure 2. WCM Support portlet landing page**



The content repository is divided into the following hierarchy:

- Repository: Container for workspaces
- Workspace: Container for nodes
- Node: Container for properties
- Property: Attribute of a node

Within the JCR specification, the concept of a workspace is defined to be a container for a collection of nodes. All work in the repository is done by way of a workspace. When a user logs into the repository, he is given a "ticket", through which he requests a workspace. It is through the workspace that all interaction with the nodes, or content, is performed.

All modifications to nodes within a workspace is transient until a Save operation. The workspace Save operation persists all changes made to the nodes within the workspace to permanent storage, the database.

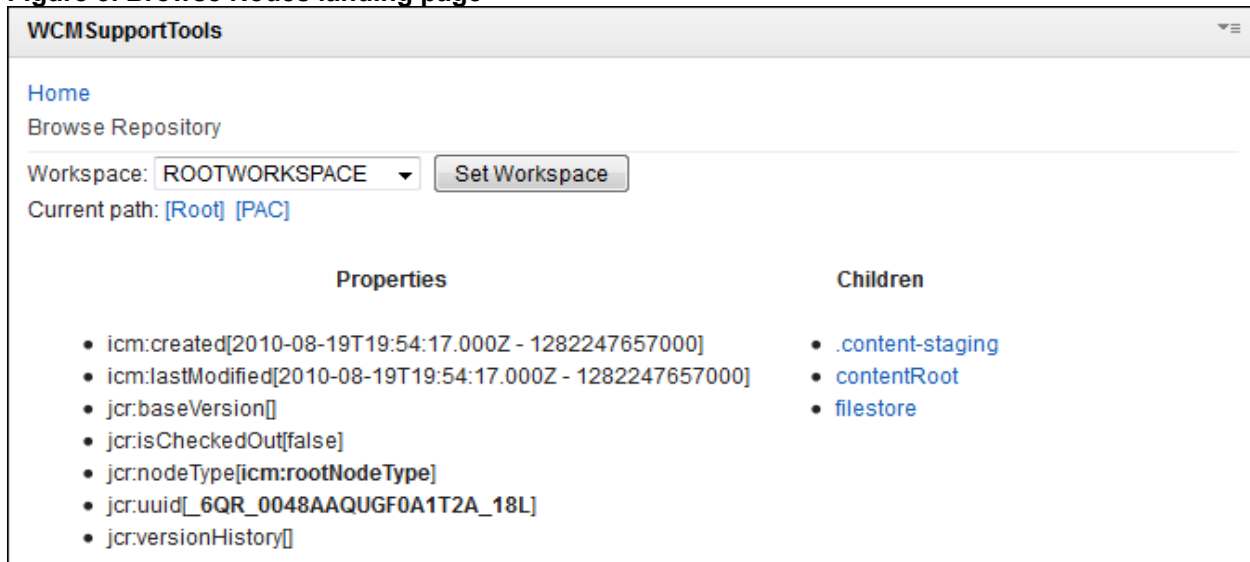
### 3.1 Browse Nodes

The most useful tool is "Browse Nodes", which shows the internal structure (JCR) of WCM. You can search the node (WCM item) by UUID, which can resolve many permission issues since most of the WCM exception only contains UUID.

- The WCM Support portlet can be used in two ways to browse a node: You can either enter the UUID/IID of an object, if known, or you can browse through the JCR hierarchy to find an item.
- You can achieve browsing by using links, located on the right-hand side of the portlet.

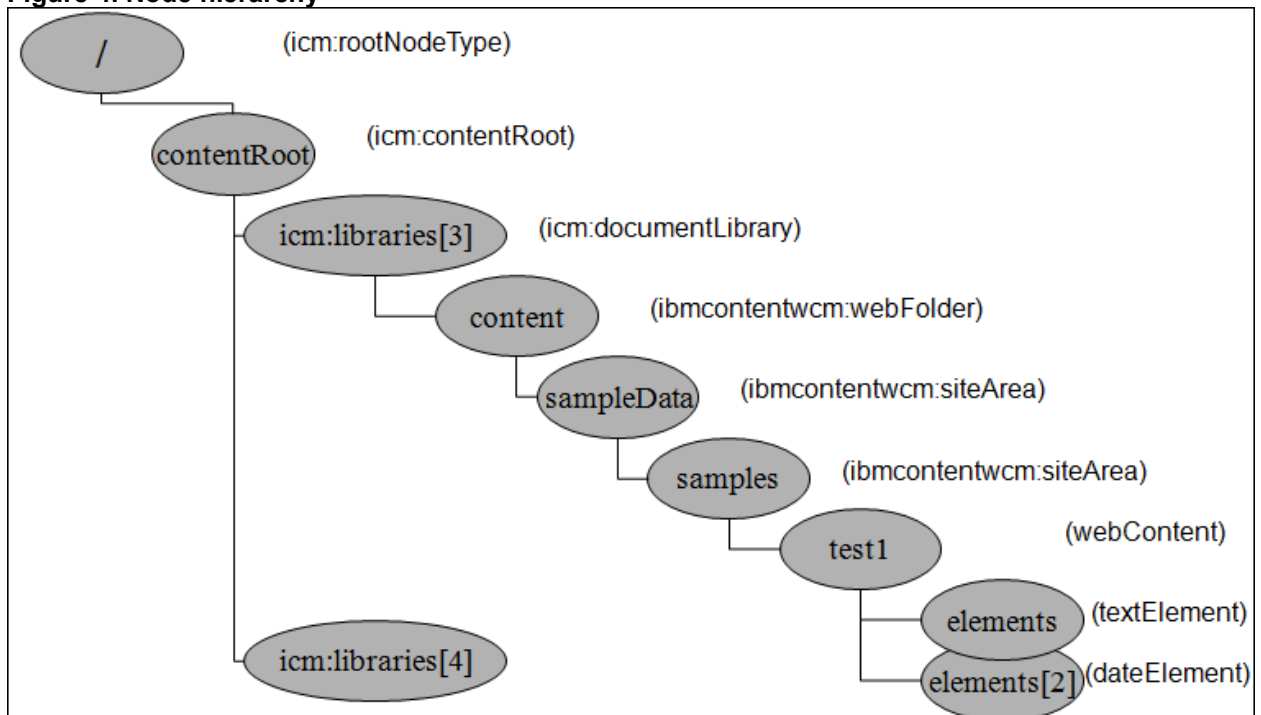
WCM library items are stored under “**contentRoot**” by default. If you have configured a Web content staging environment, you can browse by clicking “.content-staging”. The “filestore” has information about themes, skins, CSS, etc. (see figure 3). We will discuss all items under contentRoot.

**Figure 3. Browse Nodes landing page**



Within the JCR repository, the nodes are stored in a hierarchy that can be browsed (see figure 4).

**Figure 4. Node hierarchy**



Clicking “Browse Nodes” and then selecting contentRoot displays a new window (figure 5) that includes a list of all libraries on the right-hand side. The information on the portlet displays properties about the contentRoot node of the JCR.

**Figure 5. List of WCM libraries under contentRoot**

**WCMSupportTools**

[Home](#)

Browse Repository

Workspace: ROOTWORKSPACE Set Workspace

Current path: [\[Root\]/contentRoot](#)

Properties	Children
<ul style="list-style-type: none"><li>• icm:created[2010-08-19T20:28:35.380Z - 1282249715380]</li><li>• icm:label[contentRoot]</li><li>• icm:lastModified[2010-08-19T20:28:35.380Z - 1282249715380]</li><li>• jcr:created[2010-08-19T20:28:35.380Z - 1282249715380]</li><li>• jcr:lastModified[2010-08-19T20:28:35.380Z - 1282249715380]</li><li>• jcr.nodeType[icm:contentRoot]</li><li>• jcr.uuid[0ad59d7d-02ad-4236-a99b-ccf90ed97bf4]</li></ul>	<ul style="list-style-type: none"><li>• <a href="#">icm:libraries</a> (Document Manager)</li><li>• <a href="#">icm:libraries[2]</a> (pvsLabel)</li><li>• <a href="#">icm:libraries[3]</a> (WebContent Syndication)</li><li>• <a href="#">icm:libraries[4]</a> (web content)</li><li>• <a href="#">icm:libraries[5]</a> (web resources v70)</li><li>• <a href="#">icm:libraries[6]</a> (blog template v70)</li><li>• <a href="#">icm:libraries[7]</a> (wiki template v70)</li><li>• <a href="#">icm:libraries[8]</a> (blog solo template v70)</li><li>• <a href="#">icm:taxonomy</a></li></ul>

**Node Locks:**

**Node Information:**

Count children

Get IID

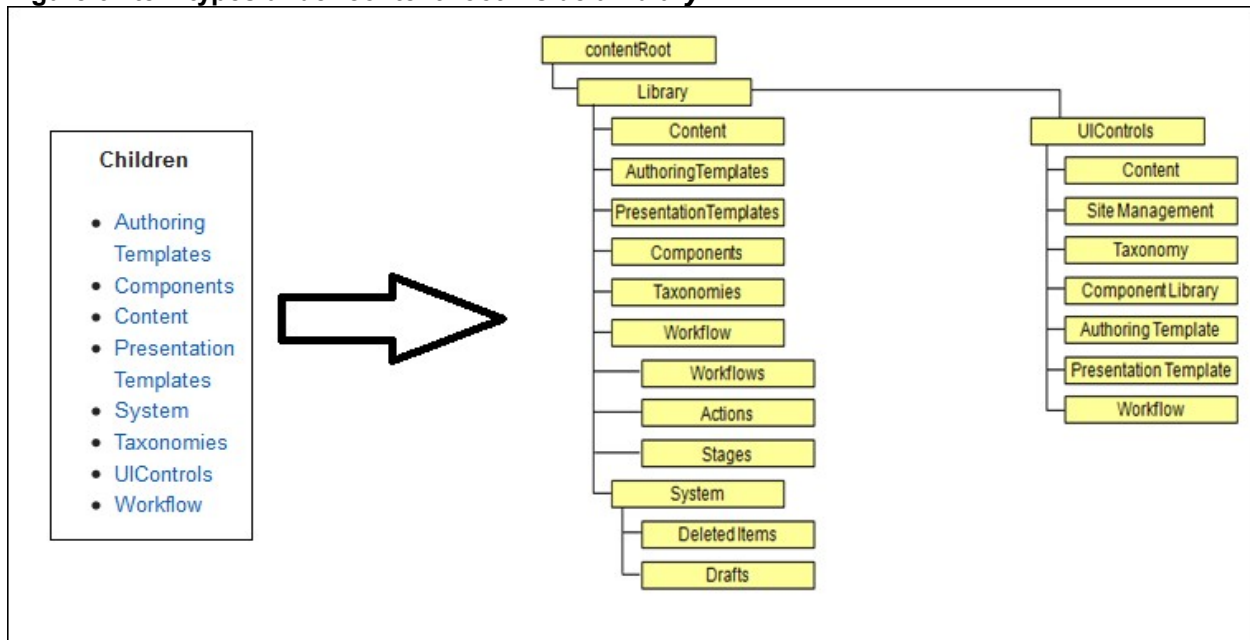
Get References ☐ Recursive

**Node Actions:**

Enter UUID or IID from this workspace to browse:  Lookup

When you select a library, you have a list of different item types on the right-hand side, just as you see inside the Authoring portlet (see figure 6). Each library is given a unique index; for example, Web Content library is given index 4, written as `icm:libraries[4]`.

**Figure 6. Item types under contentRoot inside a library**



It is exactly mapped to the Authoring portlet view (see figure 7).

**Figure 7. Item types inside Authoring portlet**

The screenshot shows the "Library Explorer" interface. At the top, there is a breadcrumb trail: "You are in: Libraries > Web Content >". Below this, there are buttons for "New", "Read", "Edit", "Delete", "Preview", and "More Actions". The main content area is a table with three columns: "Type", "Name", and "Description". The table lists several item types with their corresponding icons and descriptions.

Type	Name	Description
Content	Content	Use this view to explore lists of site areas and content items
Categories	Categories	Use this view to explore lists of taxonomies and categories
Components	Components	Use this view to explore lists of components
Authoring Templates	Authoring Templates	Use this view to explore lists of authoring templates
Presentation Templates	Presentation Templates	Use this view to explore lists of presentation templates
Workflow Items	Workflow Items	Use this view to explore lists of workflows, workflow stages and workflow actio...

At the bottom of the table, there is a pagination bar that says "Show 10 | 25 | 50 items per page."

You can browse through different types of items and find relevant information like Name, Type, Creation Date, UUID and many more. While browsing through the links, a bread crumb trail of the current path is listed in the portlet (see figure 8).

**Figure 8. Current path of a node**

Current path: [\[Root\]/contentRoot/icm:libraries\[4\]/Content/articles/sample article/ibmcontentwcm:elements](#)

The bread crumb trail (for content items) corresponds to the path of the item in WCM.

**Node Locks.** This displays the locked node. You should be able to unlock it when the unlock access code is entered. A user name displays in this section next to the item that is locked, in this case, wpsadmin (see figure 9).

**Figure 9. Node Locks**

**Node Locks:**

- wpsadmin

**Node Information.** Node information has three elements (see figure 10):

- Count children: Displays the total number of children that particular node has.
- Get IID: Displays the IID (Item ID) of the item.
- Get References: Provides a list of all references to the library.

**Figure 10. Node Information**

**Node Information:**

Count children

Children Count: 9

Get IID

IID:

AB001001N10H19B63400003925

Get References

☒ Recursive

**Node References:**

Total References: 2

Accessible References: 2

Seq.	UUID	Property
1	<a href="#">2de16e74-e7d1-4ce6-8e7f-67df7f7f98f</a>	<a href="#">/contentRoot/icm:libraries[4]/Components/mymenucomponent/ibmcontentwcm:elements/ibmcontentwcm:siteAreas</a>
2	<a href="#">614e320e-d448-4f2e-ad42-df73d631adee</a>	<a href="#">/contentRoot/icm:libraries[16]/Content/search/sample article 2/ibmcontentwcm:reference</a>

**Node Actions.** This section has additional buttons (see figure 11) when access codes are enabled (more on this in Section 4 below).



**Figure 11. Node Actions**

A rectangular panel titled "Node Actions:" containing three buttons: "EDIT THIS NODE", "SET SYSTEM CREDENTIALS", and "DELETE THIS NODE".

**Node Actions:**

EDIT THIS NODE

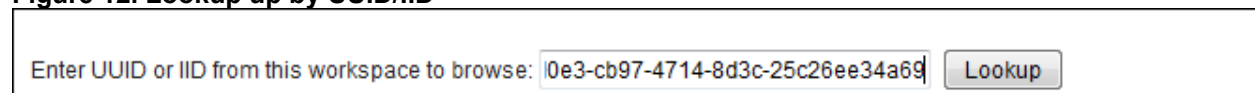
DELETE THIS NODE

SET SYSTEM CREDENTIALS

**Search by UUID or IID.** You can search for a node using UUID (normally in logs) or IID (see figure 12):

- UUID is the external reference
- IID is internal reference
- The JCR database tables are linked by IID values
- IID-to-UUID mapping is in the ICMSTJCRWSNODES table

**Figure 12. Lookup up by UUID/IID**

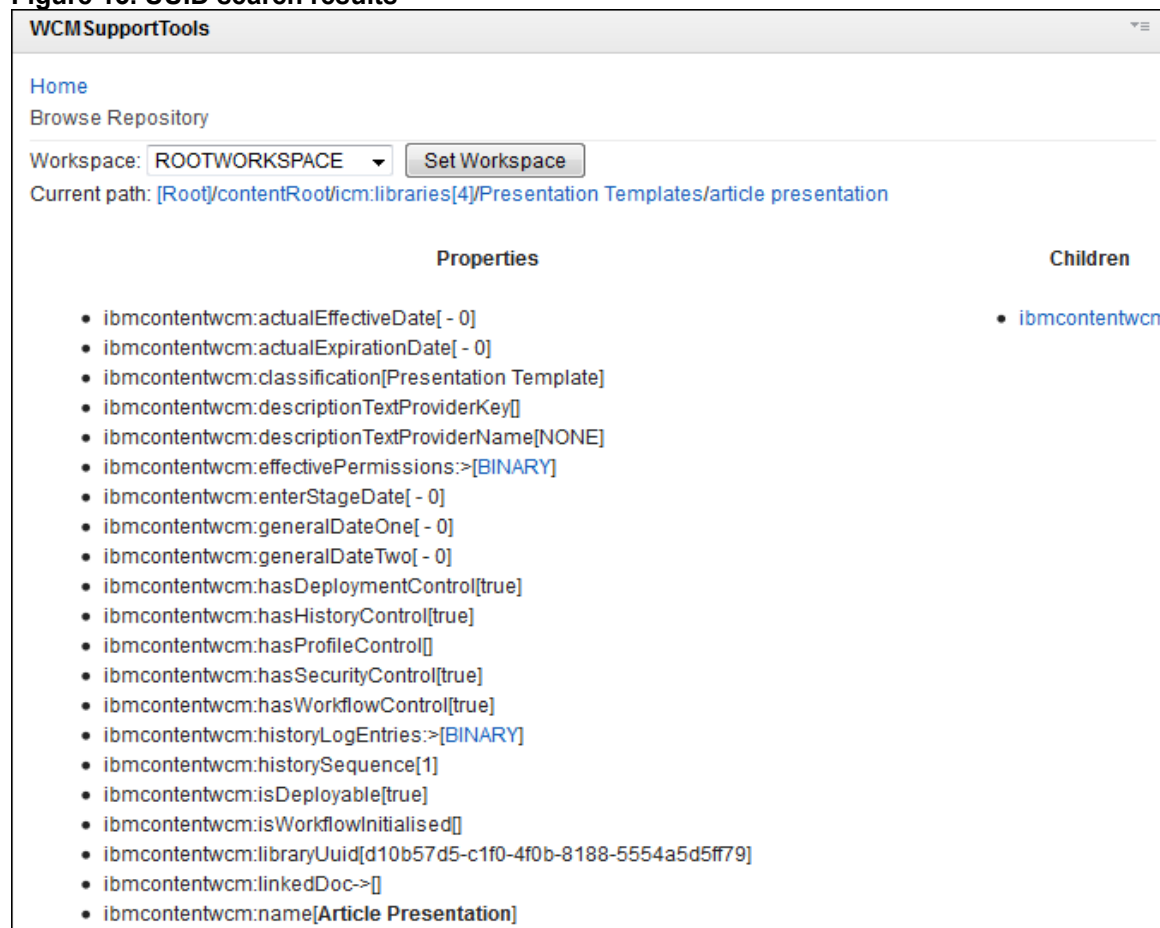
A form with a text input field containing the UUID "0e3-cb97-4714-8d3c-25c26ee34a69" and a "Lookup" button.

Enter UUID or IID from this workspace to browse: 0e3-cb97-4714-8d3c-25c26ee34a69

Lookup

After you click the Lookup button, the details of the item are displayed (see figure 13); in this case, "Presentation Templates" is returned from the above UUID search, and the full path is seen in the bread crumb trail.

**Figure 13. UUID search results**



### 3.2 Run Xpath Query

JCR uses [XPath](#) to search the node hierarchy. XPath is translated to SQL for the specific database. "Run XPath Query" returns the result from JCR by using XPath without WCM manipulation, which can help to isolate a problem (JCR or WCM), as shown in figure 14.

**Figure 14. Run XPath Query**

The screenshot shows the 'WCM Support Tools' application window. At the top is a 'Home' link. Below it is the 'XPath Query Analyzer' section. A dropdown menu for 'Select a Workspace' is set to 'ROOTWORKSPACE'. A text area for 'Enter your query here:' contains the following XPath query: `//element(*, ibmcontentwcm:webFolder)[@jcr:uuid = 'c7f9e3aa-f51c-4e04-a716-a7f9ee257be0']/element(*, ibmcontentwcm:siteArea)[(@ibmcontentwcm:workflowStatus = 0 ) or (@ibmcontentwcm:workflowStatus = 1 ) or (@ibmcontentwcm:workflowStatus = 2 )] order by @ibmcontentwcm:position ascending`. Below the text area is a 'Pagination' section with a checkbox, 'Page Size' set to 100, 'Number of pages' set to 1, and 'Starting page' set to 1. At the bottom is an 'ExecuteQuery' button.

The result of XPath Query search is shown in figure 15, including information on how long it took to run the query, which is useful in determining SQL-related performance issues.

**Figure 15. XPath Query result**

The screenshot shows the 'WCM Support Tools' application window displaying the results of the XPath query. At the top is an 'ExecuteQuery' button. Below it is the 'Query History' section, which lists the query: `//element(*, ibmcontentwcm:webFolder)[@jcr:uuid = 'c7f9e3aa-f51c-4e04-a716-a7f9ee257be0']/element(*, ibmcontentwcm:siteArea)[(@ibmcontentwcm:workflowStatus = 0 ) or (@ibmcontentwcm:workflowStatus = 1 ) or (@ibmcontentwcm:workflowStatus = 2 )] order by @ibmcontentwcm:position ascending`. Below the query history is the 'Query results' section, which states: '1 results have been retrieved in 58 ms query execution time.' Below this text is a table with three columns: 'Seq.', 'UUID', and 'Node'. The table contains one row with the following values: '1', 'ddccb7ed-8485-48c8-b875-31d17d9da65b', and '/contentRoot/icm:libraries[4]/Content/articles'.

Seq.	UUID	Node
1	ddccb7ed-8485-48c8-b875-31d17d9da65b	/contentRoot/icm:libraries[4]/Content/articles

### 3.3 Generate WCM Search URL

This option helps you generate a WCM Seed List URL to be used within a content source (see figure 16). You can select a type of site for your environment from the four button options, Stand-alone, Cluster, Virtual Portal, or Virtual Portal With Unique URL.

**Figure 16. WCM Seed List Generator**

The screenshot shows a web application window titled "WCM Support Tools". Below the title bar, there is a "Home" link and the text "Portal Search Engine WCM Seed List Generator". A prompt says "Please select the type of site that you're generating a search URL for:". Below this prompt are four buttons: "Stand-alone", "Cluster", "Virtual Portal", and "Virtual Portal With Unique URL".

You can select a single library, or add multiple libraries, and select a SiteArea to generate the URL (see figure 17).

**Figure 17. Selecting libraries and SiteArea in Seed List Generator**

The screenshot shows the same web application window as Figure 16, but with more options. Below the "Virtual Portal With Unique URL" button, there is a "Get Libraries" button, a dropdown menu showing "web content", and an "Add this additional library" button. Below these, it says "These libraries are selected to be crawled: web content". There is a "Get SiteAreas" button, a dropdown menu showing "Articles", a "Generate URL" button, and a "Reset entire portlet" button.

The result is displayed as shown in figure 18.

**Figure 18. Generated Seed List URL**

The screenshot shows the same web application window as Figure 17, but with the "Generate URL" button clicked. Below the "Reset entire portlet" button, the text "URL is: http://Noushad.ie.ibm.com:10039/seedlist/myserver?SeedlistId=web+content/Articles&Source=com.ibm.workplace.wcm.plugins.seedlist.retriever.WCMRetrieverFactory&Action=GetDocuments" is displayed. Below this, there is a message: "Copy and paste this URL into newly created content source for a 'WCM Site' type. Be sure to populate the 'User Name' and 'Password' in the security tab of the content source." Below this message is a "Reset URL" button.

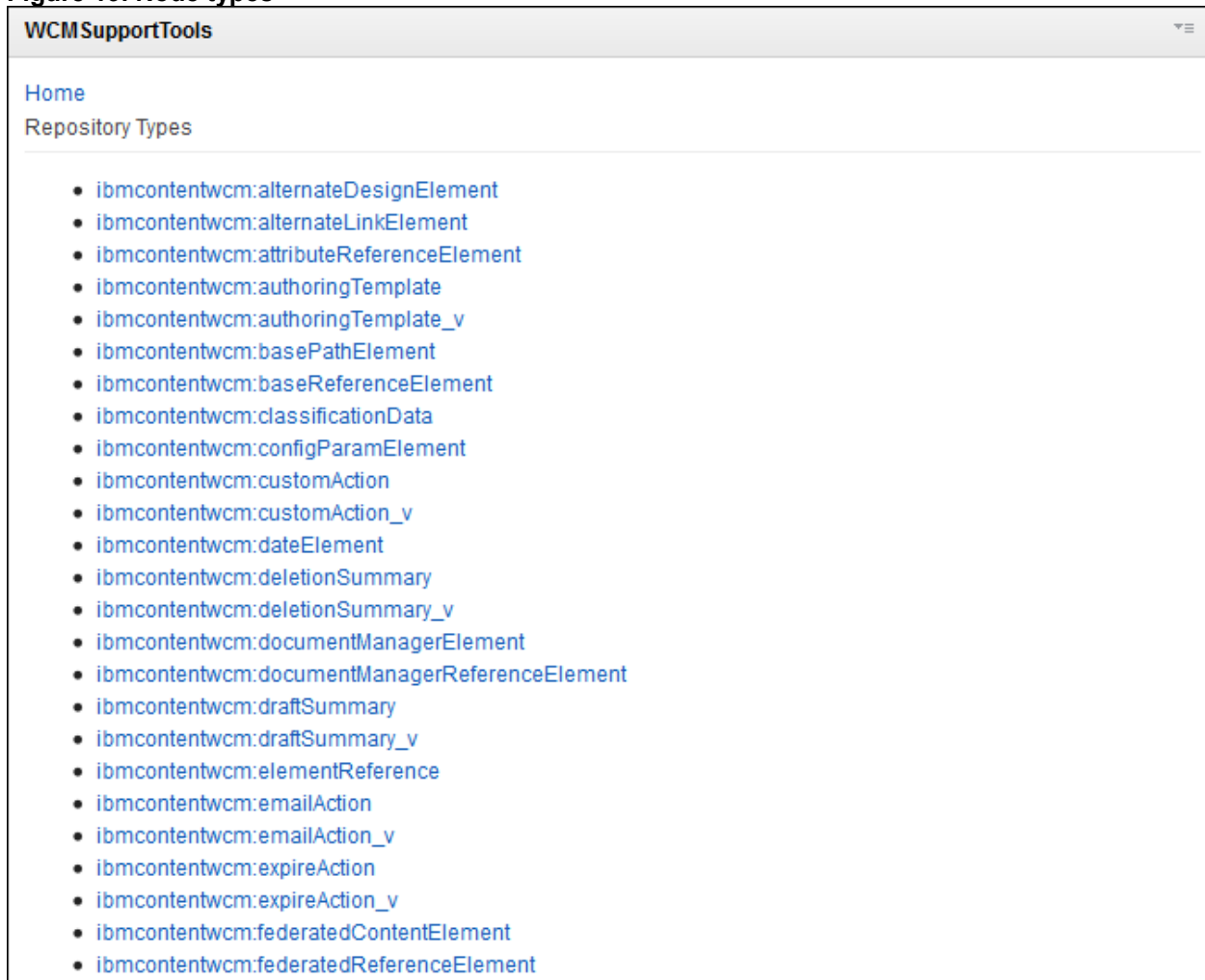
For further details, refer to the WebSphere Portal Family wiki article, "[Using the Generate WCM Search URL portlet in WCM Support Tools.](#)"

### 3.4 List types

WCM has defined several JCR nodetypes to represent its data structure (see figure 19). Each nodetype defines the properties and child nodes required for the WCM data object it represents, for example:

- Content Item: `ibmcontentwcm:webContent`
- Site Area: `ibmcontentwcm:siteArea`

**Figure 19. Node types**



When you click on any of the links in figure 19, you see child types and properties of a node (see figure 20).

**Figure 20. Child types and properties of node**

Figure 26: Child types and properties of Node

WCMSupportTools

Home

Type List

Type Information

Type: **ibmcontentwcm:webContent**

Parent types

- [ibmcontentwcm:positionData](#)
- [nt:base](#)
- [ibmcontentwcm:webComponent](#)

Child types

Name	OnVersion	Default NT	Required NT	Aut
ibmcontentwcm:permissions	COPY	ibmcontentwcm:permissionEntry	ibmcontentwcm:permissionEntry	N
ibmcontentwcm:workflowActions	COPY	ibmcontentwcm:workflowActionEntry	ibmcontentwcm:workflowActionEntry	N
ibmcontentwcm:elements	COPY	ibmcontentwcm:webElement	ibmcontentwcm:webElement	N
ibmcontentwcm:effective	COPY	ibmcontentwcm:permissionEntry	ibmcontentwcm:permissionEntry	N
ibmcontentwcm:history	IGNORE	ibmcontentwcm:historyLogEntry	ibmcontentwcm:historyLogEntry	N

Defined Properties

Name	OnVersion	Type	Default	Constraint	AutoCreate	Mandatory	Multiple
ibmcontentwcm:contentType	COPY	String	null	N	N	N	N
ibmcontentwcm:authoringTemplate	COPY	Reference	null	N	N	N	N
ibmcontentwcm:resourceTypeComponentName	COPY	String	null	N	N	N	N
ibmcontentwcm:categoriesUuids	COPY	String	null	N	N	Y	Y
ibmcontentwcm:isPrototype	COPY	Boolean	null	N	N	N	N
ibmcontentwcm:authoringTemplateUuid	COPY	String	null	N	N	N	N

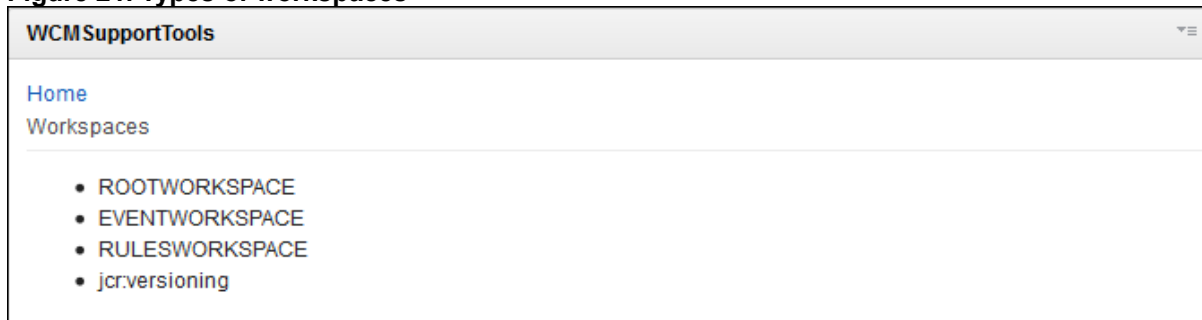
### 3.5 List workspaces

The workspace is the heart of the WCM Support portlet and is basically an interface to WCM that is associated with a user, in which items are created, saved, deleted, and searched for:

- Divisions within the repository:
  - Stable workspaces: Data is copied
  - Dynamic workspaces: Data is calculated
  - Default: ROOTWORKSPACE
- Standard workspaces:
  - ROOTWORKSPACE (All libraries)
  - jcr:versioning (All versions)
  - Dynamic workspaces (WCM Drafts, Personalization work)

Figure 21 shows the different types of workspaces.

**Figure 21. Types of workspaces**

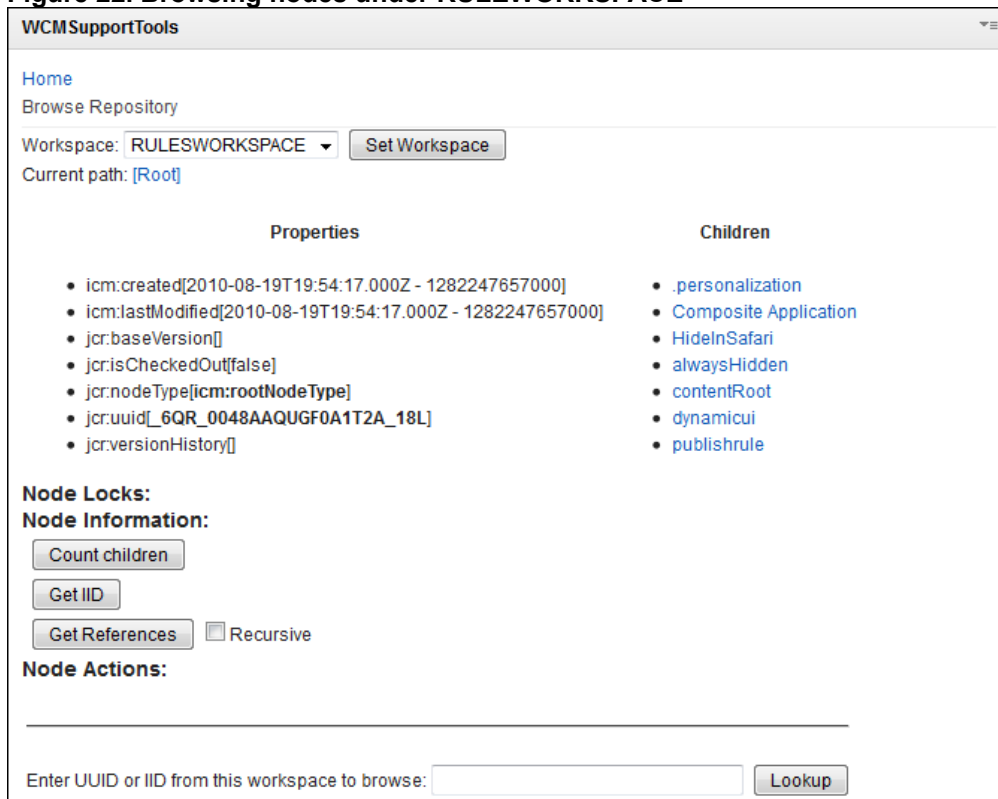


Every workspace in the repository is identified by a unique name. Usage of named workspaces by the various applications varies, depending on the exact WebSphere Portal release; for v7.0, the following workspace instance-to-application usage exists:

- WCM => ROOTWORKSPACE
- PZN => RULESWORKSPACE
- PZN => EVENTWORKSPACE
- Versions => jcr:versioning

**RULEWORKSPACE.** Browse through personalization items when this workspace is selected.

**Figure 22. Browsing nodes under RULEWORKSPACE**

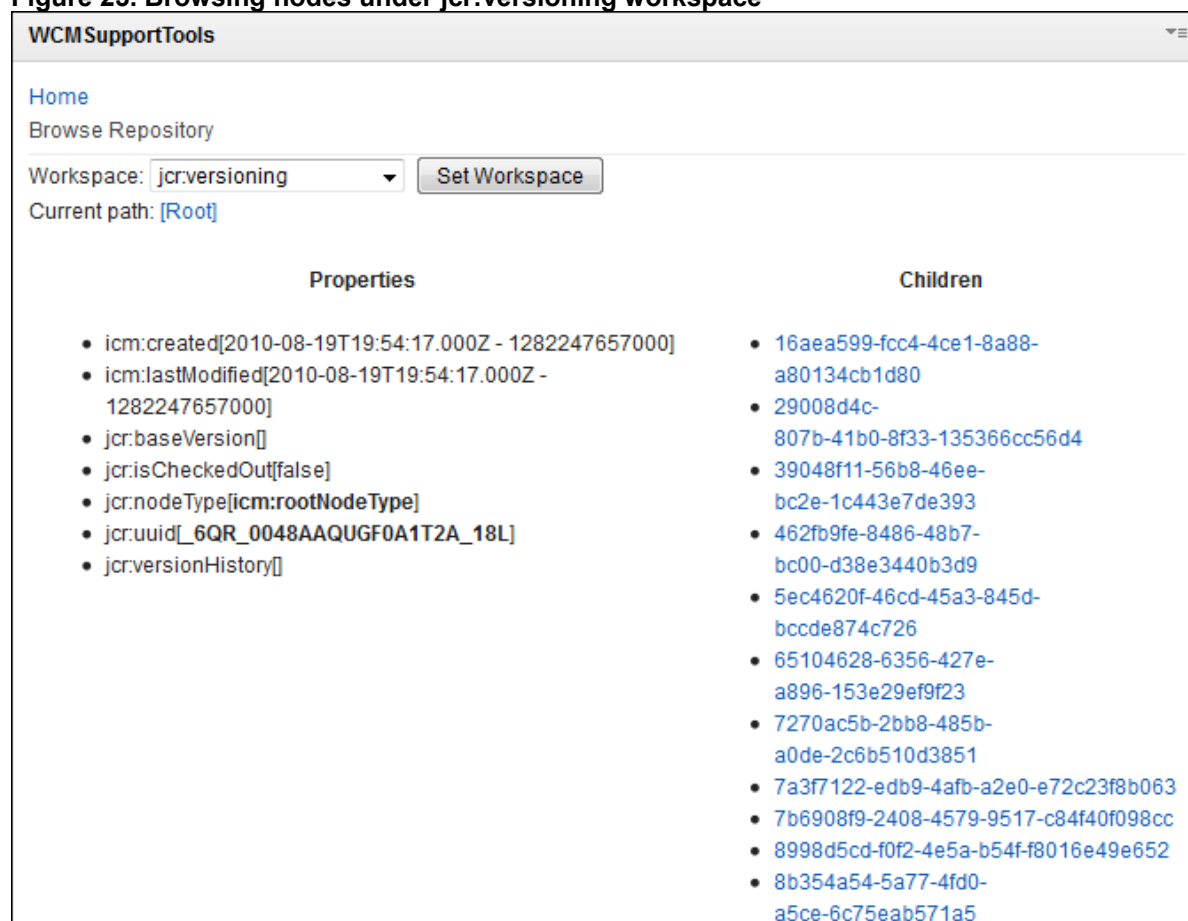


Note that we do not cover details of RULEWORKSPACE and EVENTWORKSPACE in this document.

**jcr:versioning.** You can configure your system to either automatically save a version of an item each time it is published, or allow users to select when to save a version of an item. You can also restore items individually, or choose to restore a set of items within a library that either have the same label or were versioned at, or before, a specified date and time.

Then you should be able to find them inside jcr:versioning workspace as shown in figure 23. This list shows the UUID of the version container.

**Figure 23. Browsing nodes under jcr:versioning workspace**



If you follow a link on right-hand side, you will reach an actual versioned item in the repository (see figure 24).



**Figure 24. Versioned nodes**

**WCM Support Tools**

[Home](#)

Browse Repository

Workspace:

Current path: [\[Root\]/16aea599-fcc4-4ce1-8a88-a80134cb1d80](#)

Properties	Children
<ul style="list-style-type: none"><li>• icm:branchingAllowed[true]</li></ul>	<ul style="list-style-type: none"><li>• 0</li></ul>
<ul style="list-style-type: none"><li>• icm:created[2012-04-24T20:52:20.808Z - 1335300740808]</li></ul>	<ul style="list-style-type: none"><li>• 1</li></ul>
<ul style="list-style-type: none"><li>• icm:lastModified[2012-04-25T15:48:59.621Z - 1335368939621]</li></ul>	<ul style="list-style-type: none"><li>• 2</li></ul>
<ul style="list-style-type: none"><li>• icm:versionNumber[5]</li></ul>	<ul style="list-style-type: none"><li>• 3</li></ul>
<ul style="list-style-type: none"><li>• icm:versionablePath[]</li></ul>	<ul style="list-style-type: none"><li>• 4</li></ul>
<ul style="list-style-type: none"><li>• icm:versionableUuid[]</li></ul>	<ul style="list-style-type: none"><li>• 5</li></ul>
<ul style="list-style-type: none"><li>• jcr:nodeType[nt:versionContainer]</li></ul>	
<ul style="list-style-type: none"><li>• jcr:uuid[2a8f7c12-2fe7-42fe-ae0d-f7e6ec077bfa]</li></ul>	

**Node Locks:**

**Node Information:**

☐ Recursive

**Node Actions:**

---

Enter UUID or IID from this workspace to browse:

For example, figure 25 shows the third version of a site area named “My second Content by Admin”.

**Figure 25. A version of a SiteArea node**

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[Home](#)

Browse Repository

Workspace: jcr.versioning Set Workspace

Current path: [Root/16aea599-fcc4-4ce1-8a88-a80134cb1d80/3/jcr:versionedNode/icm:copiedValues]

Properties

Children

- ibmcontentwcm.actualEffectiveDate[- 0]
- ibmcontentwcm.actualExpirationDate[- 0]
- ibmcontentwcm.classification[Site Area]
- ibmcontentwcm.defaultContent->[1f8dae77-03e1-42c8-893e-8265ddc5172a]
- ibmcontentwcm.descriptionTextProviderKey[]
- ibmcontentwcm.descriptionTextProviderName[]
- ibmcontentwcm.effectivePermissions->[BINARY]
- ibmcontentwcm.enterStageDate[- 0]
- ibmcontentwcm.generalDateOne[- 0]
- ibmcontentwcm.generalDateTwo[- 0]
- ibmcontentwcm.hasDeploymentControl[true]
- ibmcontentwcm.hasHistoryControl[true]
- ibmcontentwcm.hasProfileControl[]
- ibmcontentwcm.hasSecurityControl[true]
- ibmcontentwcm.hasWorkflowControl[true]
- ibmcontentwcm.historyLogEntries->[BINARY]
- ibmcontentwcm.historySequence[3]
- ibmcontentwcm.isDeployable[true]
- ibmcontentwcm.isWorkflowInitialised[]
- ibmcontentwcm.libraryUuid[d10b57d5-c1f0-4f0b-8188-5554a5d5ff79]
- ibmcontentwcm.linkedDoc->[]
- ibmcontentwcm.name[My Second Content by Admin]
- ibmcontentwcm.position[2.871829437568219]
- ibmcontentwcm.projectPublishErrorCode[0]
- ibmcontentwcm.projectUuid[]

- ibmcontentwcm.workflowStage->[1f8dae77-03e1-42c8-893e-8265ddc5172a]
- ibmcontentwcm.workflowStatus[1]
- ibmcontentwcm.workflowVersion[0]
- icm:authors[uid=wpsadmin,o=defaultVIMFileBasedRealm]
- icm:created[2012-04-24T20:52:20.804Z - 1335300740804]
- icm:creator[uid=wpsadmin,o=defaultVIMFileBasedRealm]
- icm:description[]
- icm:effectiveDate[- 0]
- icm:expirationDate[- 0]
- icm:isdoc[true]
- icm:language[en]
- icm:lastModified[2012-04-24T20:57:22.353Z - 1335301042353]
- icm:lastModifier[uid=wpsadmin,o=defaultVIMFileBasedRealm]
- icm:owners[uid=wpsadmin,o=defaultVIMFileBasedRealm]
- icm:searchable[true]
- icm:title[My First Content by Admin Updated]
- jcr:baseVersion[ce55a800-fc82-4f73-a84b-54aeee89bf74]
- jcr:created[2012-04-24T20:52:20.793Z - 1335300740793]
- jcr:lastModified[2012-04-24T20:57:22.349Z - 1335301042349]
- jcr:nodeType[ibmcontentwcm:siteArea\_v]
- jcr:uuid[354b2034-3b47-4d4b-9a2e-46e8d8e83b9e]
- jcr:versionHistory[41bf9eb5-9768-405a-bb15-2e2b0d6f7c14]

Node Locks:

Node Information:

Count children

Get IID

Get References

☐ Recursive

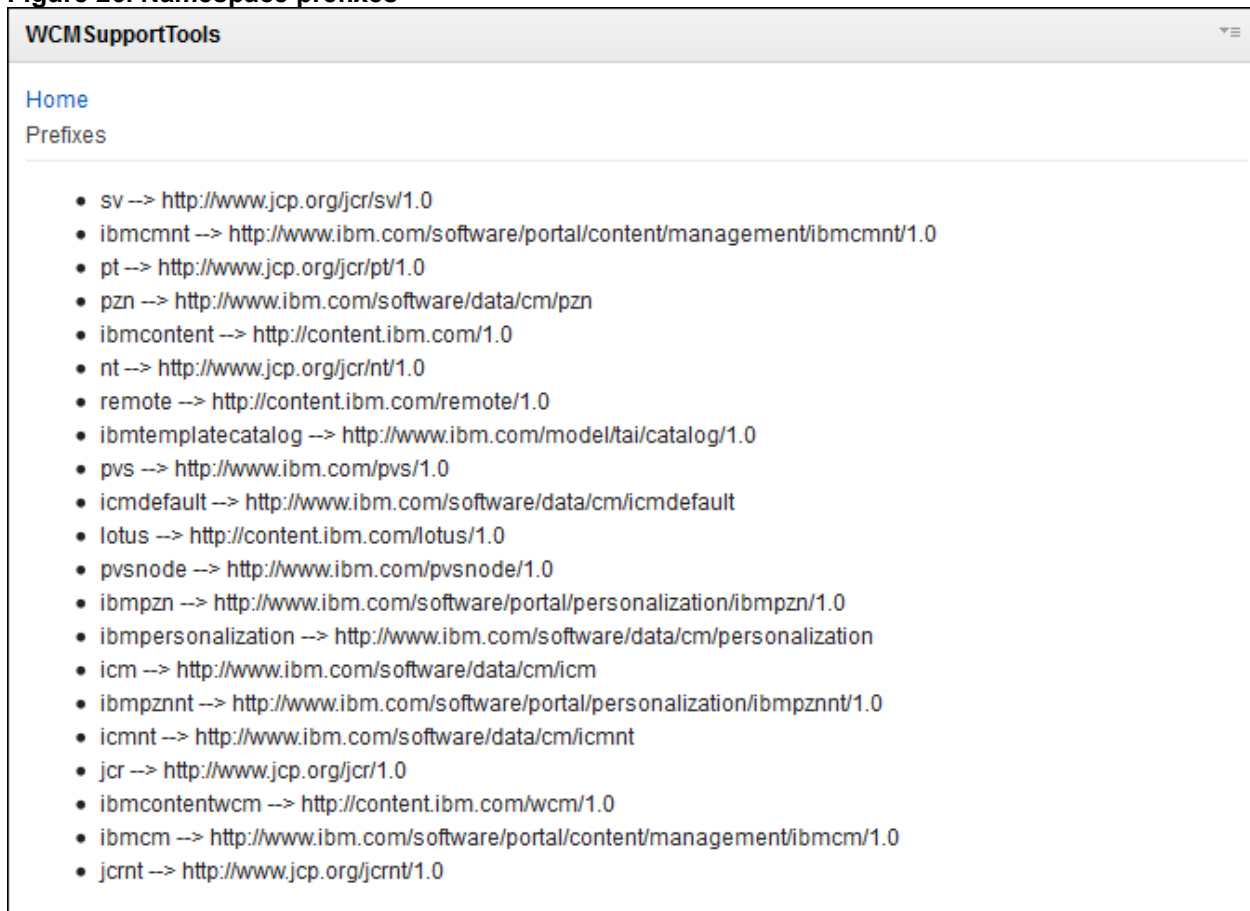
Node Actions:

Enter UUID or IID from this workspace to browse:  Lookup

### 3.6 List namespace prefixes

A useful but often overlooked feature of the Repository model is its support for namespaces. Namespaces prevent naming collisions among items and node types that come from different sources and application domains. They are defined with a prefix, delimited by a single “:” (colon) character (see figure 26).

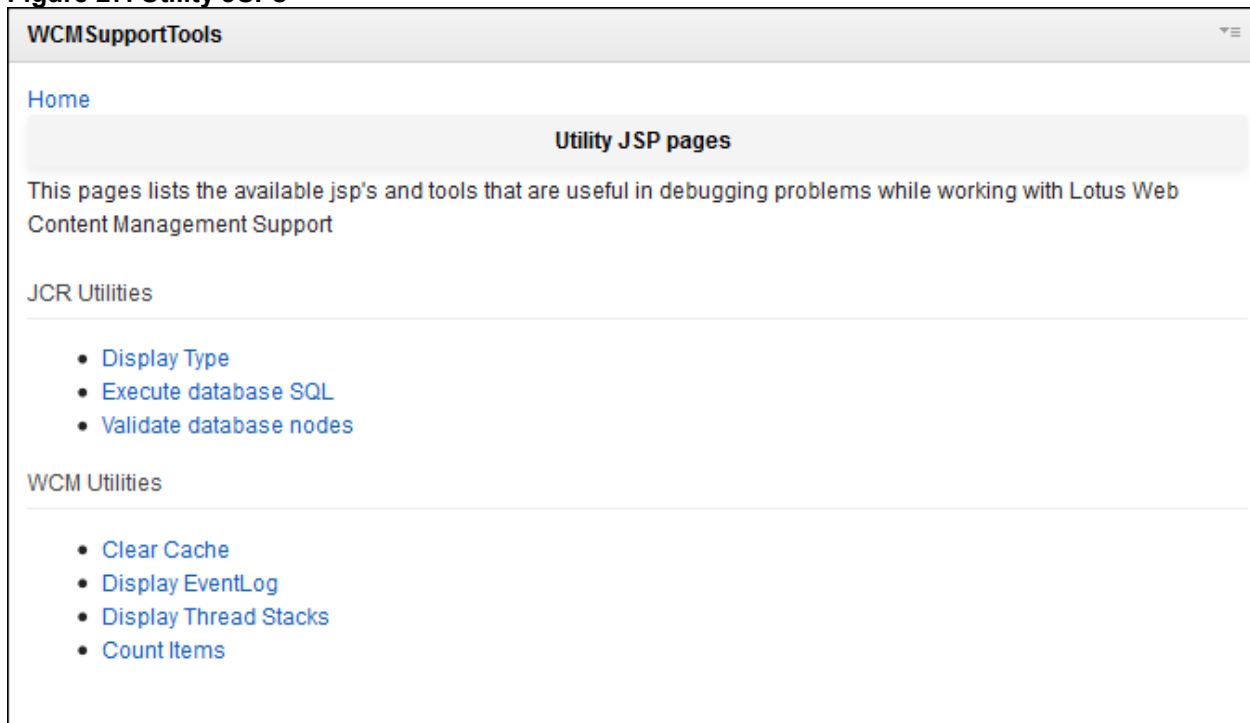
**Figure 26. Namespace prefixes**



### **3.7 Launch Utility JSPs**

"Launch Utility JSP's" has seven useful tools in the current WCM Support portlet (see figure 27).

**Figure 27. Utility JSPs**



These JSPs are divided into two types, JCR and WCM, each of which are explained as follows:

**Display type.** This is similar to the List Type seen above. You can display a type and corresponding properties, as shown in figure 28.

**Figure 28. Node types and properties**

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**Display Node Type information**

Select the Node Type you would like to display:

ibmcontentwcm:syndicatorComponent

ibmcontentwcm:tagData

ibmcontentwcm:taxonomyElement

ibmcontentwcm:textElement

ibmcontentwcm:textSelectionElement

ibmcontentwcm:userSelectionElement

ibmcontentwcm:usernameElement

ibmcontentwcm:webCategory

ibmcontentwcm:webComponent

**ibmcontentwcm:webContent**

Display Type

**Node Type: ibmcontentwcm:webContent**

Property Defs

- ibmcontentwcm:actualEffectiveDate
- ibmcontentwcm:actualExpirationDate
- ibmcontentwcm:additionalViewers
- ibmcontentwcm:approvalReceived
- ibmcontentwcm:approvalRequired
- ibmcontentwcm:authoringTemplate
- ibmcontentwcm:authoringTemplateUuid
- ibmcontentwcm:categoriesUuids

**Super Types**

- ibmcontentwcm:classificationData
- ibmcontentwcm:positionData
- ibmcontentwcm:webComponent
- icm:auditData
- icm:base
- icm:categoryData
- icm:component
- icm:compositeComponent
- icm:content
- icm:descriptionData
- icm:item
- icm:metadata
- icm:namedData
- icm:peopleData
- icm:publishData
- icm:standardData
- icm:textsearch
- nt:base
- ntnhierarchyItem
- ntreferenceable
- ntversionable

Search for type ibmcontentwcm:webContent Completed.

**Execute Database SQL.** You can run SQL queries directly (see figure 29), and the result will display the table along with time it takes to complete (see figure 30). This helps in troubleshooting performance-related issues and validates the accuracy of the SQL and corresponding results.

**WCM Support Tools**

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---

Execute an SQL

Database User:

Database Password:

Enter the SQL Query you wish to display:

```
SELECT DISTINCT Links_4.TIID , 1 WSID , NodesTab_7.VID , NodesTab_7.CTID , NodesTab_7.UUID , NodesTab_7.COM
FROM jcr.ICMSTJCRLV00001 Links_4, jcr.ICMSTJCRLV00001 Links_1, jcr.ICMSTJCRLV00001 NodesTab_7, (SELECT ibmcontentwcm_8.VERSIONID , ibmcontentwcm_8.ATTR0000001305 PROPVAL FROM jcr.ICMUT01668001 ibmcontentwcm_8 WHERE ((Links_1.TCTID = 1230) AND (EXISTS (SELECT CAST(NULL AS CHAR(1)) FROM (SELECT ibmcontentwcm_2.ATTR0000001001 PROPVAL FROM jcr.ICMUT01230001 ibmcontentwcm_2) Properties_3 WHERE ((Properties_3.VERSIONID = Links_1.TVID)) AND (Properties_3.PROPVAL = 'c7f9e3aa-f51c-4e04-a716-a7f9ee257be0')))) (SELECT CAST(NULL AS CHAR(1)) FROM (SELECT ibmcontentwcm_5.ITEMID , ibmcontentwcm_5.VERSIONID , ibmcontentwcm_5.ATTR0000001129 PROPVAL2 , ibmcontentwcm_5.ATTR0000001129 PROPVAL3 FROM jcr.ICMUT01668001 ibmcontentwcm_5 WHERE ((Properties_6.ITEMID = Links_4.TIID) AND (Properties_6.VERSIONID = Links_4.TVID)) AND (((Properties_6.PROPVAL1 = Properties_6.PROPVAL3 = 2)))) AND (Links_4.TIID = NodesTab_7.IID)) AND ((Properties_9.ITEMID = Links_4.TIID) AND (Properties_9.PROPVAL1 = 1)) BY ORDERVAL10 ASC
```

**Figure 30. SQL execution results**

Execute SQL

- DB Driver: org.apache.derby.jdbc.EmbeddedDriver
- DB URL: jdbc:derby:wpsdb;
- DB User: db2admin
- Query: SELECT DISTINCT Links\_4.TIID , 1 WSID , NodesTab\_7.VID , NodesTab\_7.CTID , NodesTab\_7.UUID , NodesTab\_7.COMPID , Properties\_9.PROPVAL ORDERVAL10 FROM jcr.ICMSTJCRLV00001 Links\_4, jcr.ICMSTJCRLV00001 Links\_1, jcr.ICMSTJCRN00001 NodesTab\_7, (SELECT ibmcontentwcm\_8.ITEMID , ibmcontentwcm\_8.VERSIONID , ibmcontentwcm\_8.ATTR0000001305 PROPVAL FROM jcr.ICMUT01668001 ibmcontentwcm\_8 ) Properties\_9 WHERE (((((Links\_4.TCTID = 1668) AND ((Links\_1.TCTID = 1230) AND (EXISTS (SELECT CAST(NULL AS CHAR(1)) FROM (SELECT ibmcontentwcm\_2.ITEMID , ibmcontentwcm\_2.VERSIONID , ibmcontentwcm\_2.ATTR0000001001 PROPVAL FROM jcr.ICMUT01230001 ibmcontentwcm\_2 ) Properties\_3 WHERE ((Properties\_3.ITEMID = Links\_1.TIID) AND (Properties\_3.VERSIONID = Links\_1.TVID))) AND (Properties\_3.PROPVAL = 'c7f9e3aa-f51c-4e04-a716-a7f9ee257be0')))) AND (Links\_4.SIID = Links\_1.TIID)) AND (EXISTS (SELECT CAST(NULL AS CHAR(1)) FROM (SELECT ibmcontentwcm\_5.ITEMID , ibmcontentwcm\_5.VERSIONID , ibmcontentwcm\_5.ATTR0000001129 PROPVAL1 , ibmcontentwcm\_5.ATTR0000001129 PROPVAL2 , ibmcontentwcm\_5.ATTR0000001129 PROPVAL3 FROM jcr.ICMUT01668001 ibmcontentwcm\_5 ) Properties\_6 WHERE ((Properties\_6.ITEMID = Links\_4.TIID) AND (Properties\_6.VERSIONID = Links\_4.TVID)) AND (((Properties\_6.PROPVAL1 = 0) OR Properties\_6.PROPVAL2 = 1) OR Properties\_6.PROPVAL3 = 2)))) AND (Links\_4.TIID = NodesTab\_7.IID)) AND ((Properties\_9.ITEMID = Links\_4.TIID) AND (Properties\_9.VERSIONID = Links\_4.TVID)) ORDER BY ORDERVAL10 ASC

TIID	WSID	VID	CTID	UUID
AB001001N10H19B63400003A25	1	1	1668	64646363623765642d383438352d343863382d623837352d3331

Rows returned: 1

Query execute time: 6 ms

Total execute time: 6 ms

Search Completed.

**Validate database nodes.** You can validate a database node for a given IID, to confirm whether the node is valid or corrupt. It can display information of various JCR database tables like links, locks etc.

**Common tables in JCR database:**

- ICMSTJCRWSNODES: All nodes in the repository, by UUID and IID
- ICMSTJCRLINKS: Parent--child relationships between nodes; used to build the path of the node.
- ICMSTJCRNODELOCKS: Track all locks in the database:
  - External: Locked by a specific user
  - Internal: Locked by a workspace or a running process
- ICMSTJCRNODETYPES: All node types in the repository.
- ICMSTJCRPROPDEFS, ICMSTJCRGLBLPROPS: All property definitions.
- ICMSTJCRNSPREFIXES: Namespace prefixes.
- ICMSTJCRWS: Workspaces in the repository.

### Data tables in JCR database:

- The data contents are stored in the ICMUT\* tables; for example:
  - Table: ICMUT01097001
  - Column: ATTR0000001097
- Single-value properties for a node are stored in a single row in the ICMUT\* table:
  - Table name is defined by the NODETYPECOMPTYPEID column in the ICMSTJCRNODETYPES table.
- The multi-value properties are stored in a separate ICMUT\* table:
  - Table name is defined by the MULTIVALCOMPTYPEID column in the ICMSTJCRPROPDEFS table
- Column name is defined by the ATTRIBUTEID column in the ICMSTJCRPROPDEFS table.

You enter the IID of an item to validate the database (see figure 31).

**Figure 31. Validate database node**

The screenshot shows a web application window titled "WCM Support Tools". Inside, there is a navigation menu with "Home" and "Launch Utility JSP's". The main section is titled "Validate Nodes" and contains the following fields and controls:

- "Database User:" with a text input field containing "db2inst1".
- "Database Password:" with a password input field showing masked characters (dots).
- A label: "Enter the IIDs of the nodes you wish to validate (separated by spaces):".
- A large text input area containing the IID "AB001001N10H19B63400003E25".
- A "Validate Nodes" button at the bottom left.

It displays information about the database---userid, schema, etc.---in the first section (see figure 32).



**Figure 32. Database information**

Validate Nodes

- DB Driver: com.ibm.db2.jcc.DB2Driver
- DB URL: jdbc:db2://wpdb:50000/wpsdb:returnAlias=0;
- DB User: db2inst1
- DB Schema: jcr
- IID List: AB001001N10H19B63400003E25

Results are displayed in six parts based on the different types of tables, as shown in figure 33.

**Figure 33. Validate database results**

Validating node AB001001N10H19B63400003E25

1. Validate ICMSTJCRWSNODES  
select wsid,uuid,iid,vid,ctid,baseversioniid from jcr:ICMSTJCRWSNODES where iid in ('AB001001N10H19B63400003E25')

WSID	UUID	IID
1	33643236643461362d613332612d343839332d613866342d62653262386535644633033	AB001001N

2. Validate ICMSTJCRLINKS  
select wsid,lid,tnsid,siid,tid,ctid,tx,txname from jcr:ICMSTJCRLINKS where tiid in ('AB001001N10H19B63400003E25')

WSID	LID	TNSID	SIID	TIID	TCTID
1	0000000000003a11	6	AB001001N10H19B63400003A25	AB001001N10H19B63400003E25	1331

3. Validate Children  
select wsid,lid,tnsid,siid,tid,ctid,tx,txname from jcr:ICMSTJCRLINKS where siid in ('AB001001N10H19B63400003E25')

WSID	LID	TNSID	SIID	TIID	TCTID
1	0000000000003b11	12	AB001001N10H19B63400003E25	AB001001N10H19B63400003F25	1272
1	0000000000003c11	12	AB001001N10H19B63400003E25	AB001001N10H19B63400004025	1240

**WARNING!** Child nodes will need to be processed afterward.

4. Display Locks  
SELECT bswsid,wsid,useriid,lid from jcr:ICMSTJCRNODELOCKS where iid in ('AB001001N10H19B63400003E25')

0 Results found.

5. Validate PAC  
SELECT RES\_TYPE,EXTERNAL\_UID FROM jcr:PROT\_RES WHERE EXTERNAL\_UID IN (SELECT UUID FROM jcr:ICMSTJCRWSNODES where iid in ('AB001001N10H19B63400003E25'))

RES_TYPE	EXTERNAL_UID
7003	3d26d4a6-a32a-4893-a8f4-be2b8e5ddc03

6. Validate Data Tables  
select ctid from jcr:ICMSTJCRWSNODES where iid in ('AB001001N10H19B63400003E25')  
SELECT MULTIVALCOMPYPEID from jcr:ICMSTJCRPROPDEFS WHERE nodetypecompypeid=1331 and MULTIVALCOMPYPEID > 0  
select \* from jcr:ICMUT01332001 where ITEMID IN ('AB001001N10H19B63400003E25')  
0 Results found.  
Empty Table.  
select \* from jcr:ICMUT01333001 where ITEMID IN ('AB001001N10H19B63400003E25')  
0 Results found.  
Empty Table.  
select \* from jcr:ICMUT01334001 where ITEMID IN ('AB001001N10H19B63400003E25')  
0 Results found.  
Empty Table.  
select \* from jcr:ICMUT01335001 where ITEMID IN ('AB001001N10H19B63400003E25')  
0 Results found.  
Empty Table.  
select \* from jcr:ICMUT01341001 where ITEMID IN ('AB001001N10H19B63400003E25')  
0 Results found.  
Empty Table.  
select \* from jcr:ICMUT01331001 where ITEMID IN ('AB001001N10H19B63400003E25')

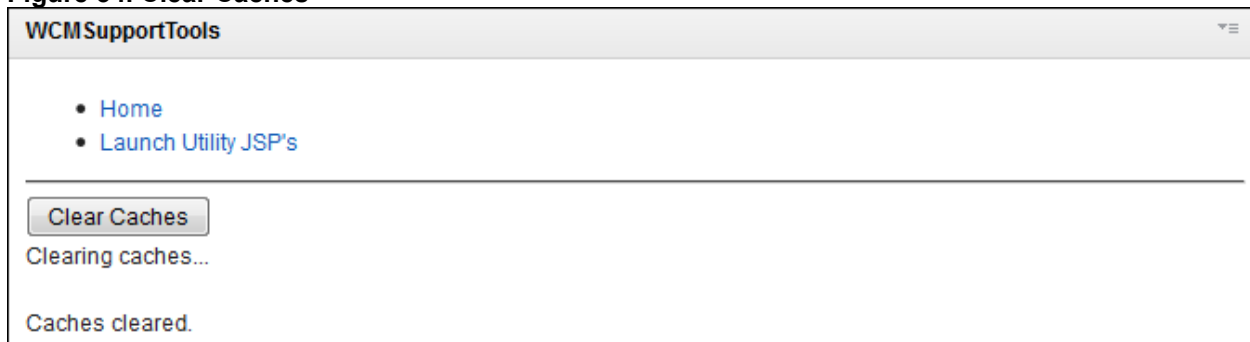
COMPCUSTERID	COMPONENTID	ITEMID	VERSIONID	ACLCODE	SEMANT
0	N10H19B63400006126	AB001001N10H19B63400003E25	1	1	0

Query execute time: 1389 ms  
Total execute time: 1389 ms  
Search Completed.

**Clear Caches.** "Clear Caches" (see figure 34) clears the following WCM Dynacache:

"services/cache/iwk/strategy", "services/cache/iwk/global", "services/cache/iwk/module", "services/cache/iwk/processing", "services/cache/iwk/site", "services/cache/iwk/session", "services/cache/iwk/summary", "services/cache/iwk/abspathreverse", "services/cache/iwk/menu", "services/cache/iwk/nav", "services/cache/iwk/abspath"

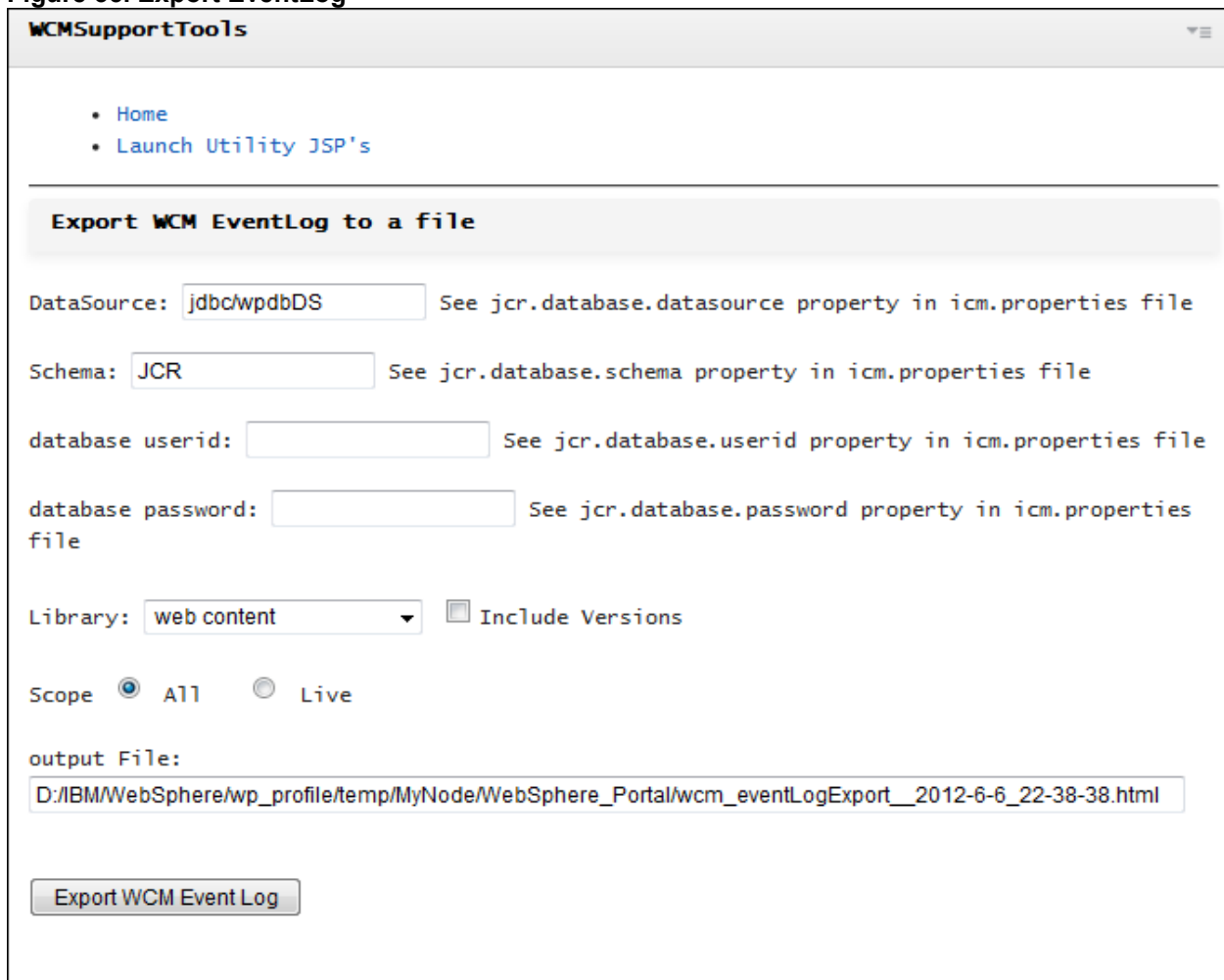
**Figure 34. Clear Caches**



The screenshot shows the 'WCM Support Tools' window. At the top, there is a navigation menu with 'Home' and 'Launch Utility JSP's'. Below the menu is a 'Clear Caches' button. Underneath the button, the text 'Clearing caches...' is displayed, followed by 'Caches cleared.' on the next line.

**Display EventLog.** "Display EventLog" exports the event log (database table that traces WCM items for syndication), as shown in figure 25.

**Figure 35. Export EventLog**



The screenshot shows the 'WCM Support Tools' window with the 'Export WCM EventLog to a file' section active. It contains several input fields and options:

- DataSource:** A text box containing 'jdbc/wpdbDS' with a hint 'See jcr.database.datasource property in icm.properties file'.
- Schema:** A text box containing 'JCR' with a hint 'See jcr.database.schema property in icm.properties file'.
- database userid:** An empty text box with a hint 'See jcr.database.userid property in icm.properties file'.
- database password:** An empty text box with a hint 'See jcr.database.password property in icm.properties file'.
- Library:** A dropdown menu set to 'web content' and a checkbox labeled 'Include Versions' which is currently unchecked.
- Scope:** Two radio buttons, 'All' (which is selected) and 'Live'.
- output File:** A text box containing the path 'D:/IBM/WebSphere/wp\_profile/temp/MyNode/WebSphere\_Portal/wcm\_eventLogExport\_\_2012-6-6\_22-38-38.html'.

At the bottom of the form is an 'Export WCM Event Log' button.

The output is stored in a html file and saved in /wp\_profile/temp/<node>/WebSphere\_Portal directory (see figure 36).

**Figure 36. EventLog exported to a file**



output File:

D:/IBM/WebSphere/wp\_profile/temp/MyNode/WebSphere\_Portal/wcm\_eventLogExport\_\_2012-6-6\_22-39-49.html

Export WCM Event Log

Total Items found in eventlog 0

Send eventlog export file D:/IBM/WebSphere/wp\_profile/temp/MyNode/WebSphere\_Portal/wcm\_eventLogExport\_\_2012-6-6\_22-39-49.html to IBM support.

End time Wed Jun 06 22:39:49 BST 2012

**Display Thread Stacks.** "Display Thread Stacks" displays the JVM stack traces and information (see figure 37). You can display a specific thread by searching through the thread ID, if you know it already, or you can display all threads by selecting state.

Figure 37. Display Thread Stack

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**This utility displays Thread stack Traces in current JVM**

Select the Thread State(s) to display

☐ NEW ☐ RUNNABLE ☐ BLOCKED ☐ WAITING ☐ TIMED\_WAITING ☐ TERMINATED ☐

WebContainer

Enter Thread Id

JVM Information

JVM Information

JVM start time: Mon Jun 04 20:07:54 BST 2012

JVM Uptime in milliseconds: 182090679

JVM available Processors: **4**

JVM Total Memory: **850 mb**

Max Memory JVM will attempt to Use: **1024 mb**

JVM Free Memory: **178 mb**

Heap memory usage: init = 52428800(51200K) used = 704191136(687686K) committed = 891426816(870534K) max = 1073741824(1048576K)

Non-heap memory usage: init = 0(0K) used = 390631256(381475K) committed = 552832372(539875K) max = -1(-1K)

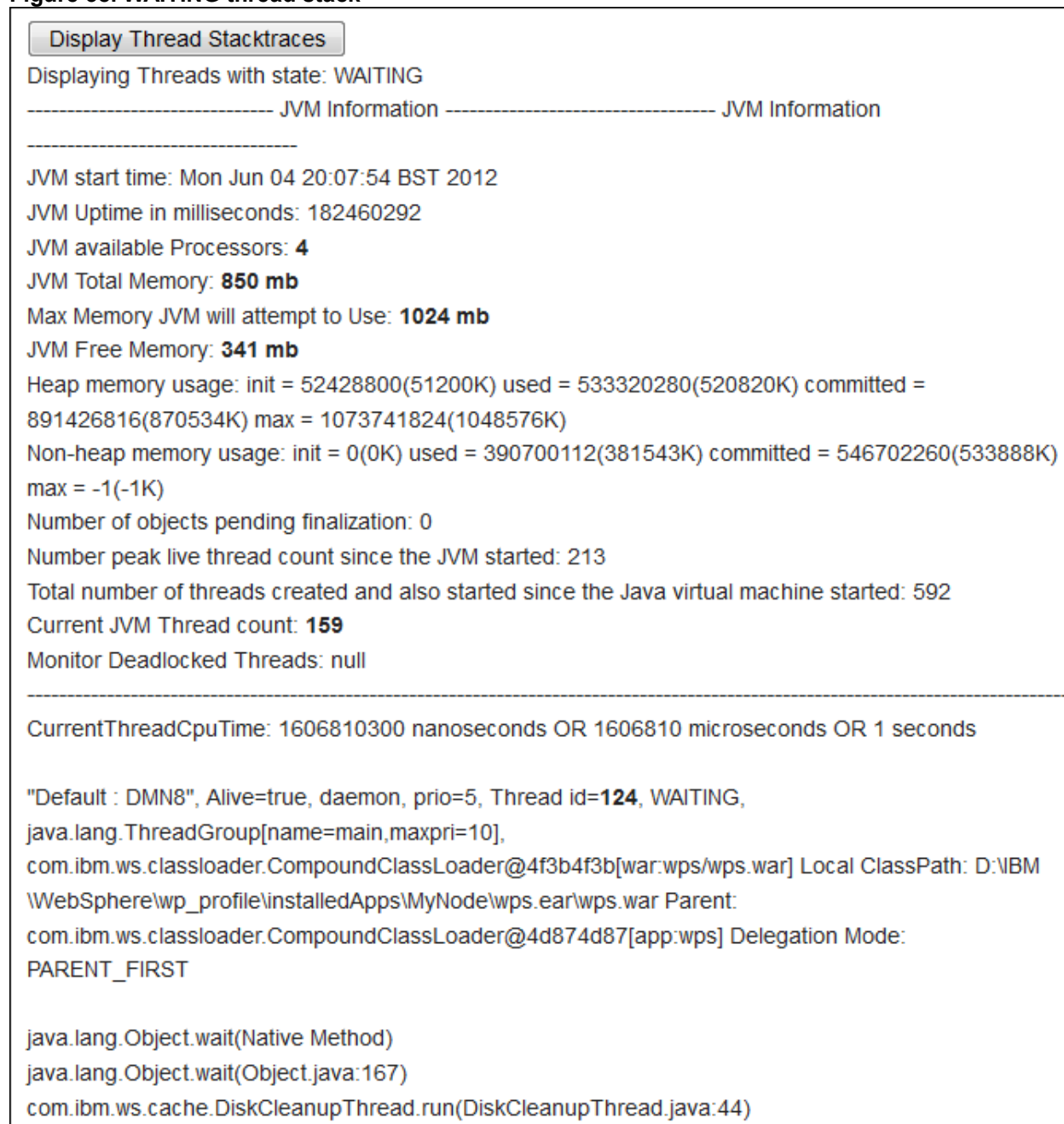
Number of objects pending finalization: 0

Number peak live thread count since the JVM started: 213

Total number of threads created and also started since the Java virtual machine started: 591

If you search for a WAITING thread, for example, you see the thread information in figure 38.

**Figure 38. WAITING thread stack**



**Count Items.** This utility counts the total number of WCM content items in a library (see figure 39). You can see different item types and corresponding counts.

**Figure 39. Count Items**

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---

If counting a large number of items, you may need to increase the session timeout setting of your server. This can be done using the WebSphere Application Server administration console. Go to:

Application Servers > WebSphere\_Portal > Container Settings > Web Container Settings > Session Management.

If the browser session times out, check systemout.log for a summary report of the counted items.

Library to count:

If you select a library and click the Count Items button, you will see counts of all items except Custom Workflow, as shown in figure 40.

**Figure 40. Item counts for a library**

This utility will count all items except custom workflow items	Workflow item = Three Stage Workflow
*****	Workflow item = Express Workflow
Items for library: web content	Total Workflow Items = 2
Content item = Sample Article 2	WorkflowStage item = Expire Stage
Content item = Sample Article	WorkflowStage item = Publish Stage
Content item = MyNewContent	WorkflowStage item = Draft Stage
Content item = Frist Content By Admin New	Total WorkflowStage Items = 3
Content item = Second Content By Admin New	Total ContentLink Items = 0
Content item = Third Content by Admin	
Content item = Search Content	
Total Content Items = 7	
SiteArea item = Articles	Total Category Items = 0
SiteArea item = PMR_SiteArea_Contents	
Total SiteArea Items = 2	Total Taxonomy Items = 0
PresentationTemplate item = Article Presentation	Total Publish-Action Items = 0
Total PresentationTemplate Items = 1	
AuthoringTemplate item = Article	Total Expire-Action Items = 0
AuthoringTemplate item = TestAT	
Total AuthoringTemplate Items = 2	Total Scheduled-Move-Action Items = 0
LibraryComponent item = Article toolbar	
LibraryComponent item = Articles List	*****
LibraryComponent item = MyHTMLComponent	Total items for library "web content" = 23
LibraryComponent item = MySearchForm	
LibraryComponent item = MySearchComponent	
LibraryComponent item = MyMenuComponent	
Total LibraryComponent Items = 6	

**Display Node (WebSphere Portal 6.1 only).** You can search a node with different options like UUID, path, or query, and can display its children, properties, locks, access control, and references (see figure 41).

**Figure 41. Display node**

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Display JCR Node and its data

Select the Workspace you would like to display nodes from:

ROOTWORKSPACE ▾

Enter the node UUID, Path, or JCR Query you wish to display:

☒ Search by UUID

☐ Search by path (i.e. /contentRoot/icm:libraries[x]/Content/site/sitearea/content)

☐ Search by query (i.e. //element(\*, icm:documentLibrary))

☐ Show Node's Children

☐ Show Node's Properties

☐ Show Node's Locks

☐ Show Node's Access Control

☐ Show Node's References

Display Nodes Enter valid UUID, Path or JCR Query

**Clear Persistence Service Table (Portal 6.1 only).** You can clear the persistence service table with this option, which drops all indexes available on persistence tables (see figure 42). This is equivalent to the ConfigEngine task “remove-wcm-persistence-tables”.

**Figure 42. Clear Persistence Service Table**

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Clear Persistence Service Table

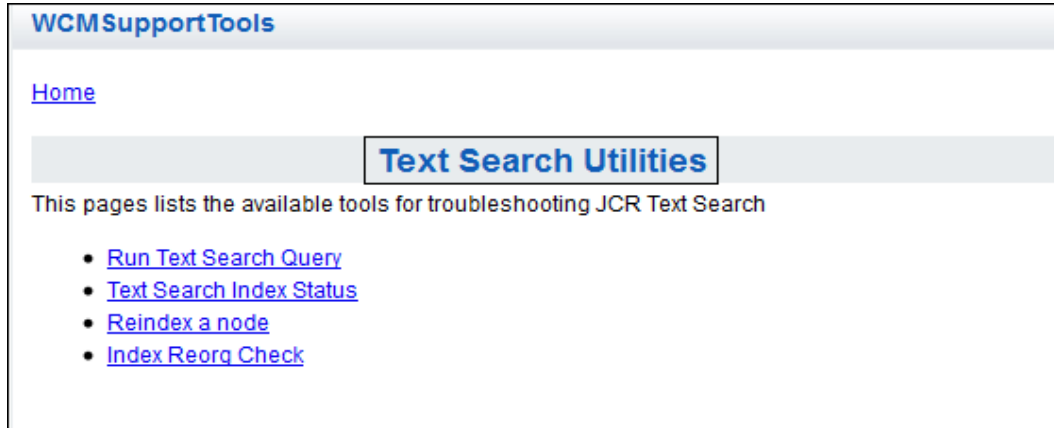
No objects found in WCM Persistence Service Table



## 4 Launch Text Search Utilities

You can launch JCR text search utilities inside the WCM Support portlet (**WebSphere Portal 6.1 only**).

Figure 43. Launch Text Search Utilities



**Run text search query.** You can search text within the WCM Support portlet to determine whether you have same results as that of Authoring portlet search. For example, if you search for the text “content”, you get results as seen in figure 44.

**Figure 44. Text Search Analyzer**

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**Text Search Analyzer:**

search text:

Language:

**Search History**

- [content](#)
- [sample](#)
- [content](#)

**Search results**

15 results have been retrieved in 290 ms query execution time.

Seq.	IID	Node	Score
1	<a href="#">AB001001N09K07B91400000061</a>	/contentRoot/icm:libraries[3]	100.0
2	<a href="#">AB001001N10B11B2570002A64D</a>	/contentRoot/icm:libraries[8]/Content/blog/central/list of blogs	91.68848271581119
3	<a href="#">AB001001N10B11B25600003D4D</a>	/contentRoot/icm:libraries[6]/Components/menu - blogs home - all blogs	91.68391011165977
4	<a href="#">AB001001N10B11B2570002AA4D</a>	/contentRoot/icm:libraries[8]/Content/blog/central/latest blog posts	91.32914588133764
5	<a href="#">AB001001N09K07B911000000C9</a>	/contentRoot/icm:taxonomy/.system/webContent	90.74506883551662
6	<a href="#">AB001001N09K07B911000001C9</a>	/contentRoot/icm:taxonomy/.system/webContentSyndication	90.51580056533857
7	<a href="#">AB001001N10B11B25600016A4D</a>	/contentRoot/icm:libraries[6]/Authoring Templates/home template	89.95137375624131

**TextSearch Index Status.** This gives you the status of the search index, last run, and index directory (see figure 45).

**Figure 45. TextSearch Index Status**

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**TextSearch Index Maintenance Status :**

Index Directory: /zippy/portal/WebSphere/wp\_profile/PortalServer/jcr/search

Workspace ID : 1

Workspace name : ROOTWORKSPACE

Status : Index Maintenance is in SLEEP State

Last Indexed at : 2011-10-03 17:03:49.776

Refresh

**Reindex a node.** You can browse a node and reindex it (see figure 46).

**Figure 46. Reindex a node**

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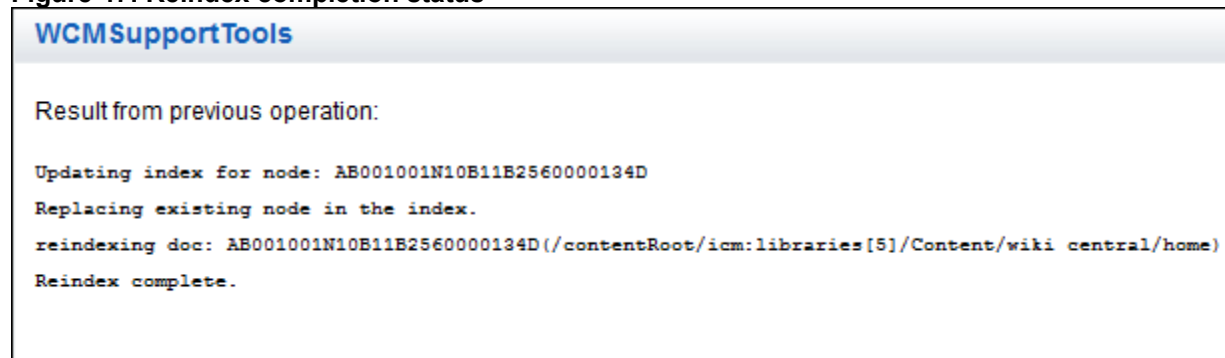
**Reindex a node**

Browse to the node that you want to reindex and select the button labeled, **REINDEX THIS NODE**.

[Browse Nodes](#)

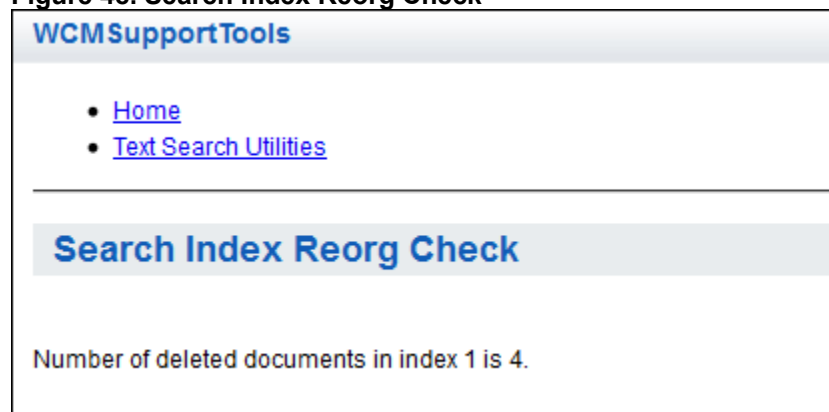
When the reindex has completed successfully, you will receive message such as that shown in figure 47.

**Figure 47: Reindex completion status**



**Search Index Reorg Check.** You can find the number of documents deleted from an index (see figure 48).

**Figure 48. Search Index Reorg Check**



This is further explained in the wiki article, "[Java content repository TextSearch Support tools for IBM WebSphere Portal: Overview and usage.](#)"

## 5 Enable access code

There may be times when you need to use the WCM Support portlet to repair a broken state of the WCM database, in which case, WCM Support Engineers may give you an access code in order to unlock update features within the Support Tools portlet.

These access codes are temporary and should be used only to repair the database problems as directed by the Support Engineer. Any other updates to the database should be done through either WebSphere Portal administration or WCM Authoring.

Once you receive the access code, for example, for write\_all, and enable it, you will see a message like "Write Access Enabled: write\_all" if the code is valid and accepted (see figure 49). Support will then provide more information on the specific task.

**Figure 49. Write Access code for ALL**

The screenshot shows a web application window titled "WCM Support Tools". Inside, there is a section "Result from previous operation:" followed by the text "Write Access Enabled: write\_all". Below this is a link labeled "Home" and a button labeled "Enable Write Access". A horizontal line separates this from the "Current Write Access:" section, which contains a bulleted list: "update", "pac", "unlock", "workspace", and "write\_all". At the bottom, there is a text input field with the placeholder "Enter the support code to enable write access (empty value clears all access):" and an "Enter" button next to it.

## 6 Conclusion

Every new version of the WCM Support portlet comes with new features and options, so you should keep your portlet updated with the latest version to get the newer and additional capabilities. The latest build (1.4) has been enhanced with the following functions, as we have seen in this article:

- Updated URL generation for WCM Seed List (v7.0 only)
- Utility JSP to count WCM items
- Removal of access-code requirement for the following utility JSP's:
  - Execute Database SQL
  - Validate database nodes

### NOTE:

- When you log out from WebSphere Portal, your access codes are no longer valid; you must enter the code again when you log in again.
- Access codes are valid for a few days, expiring within a week, so you need to request the access code again, if required.
- You must have databases backed up before doing any update task on the JCR.
- Avoid doing any update task (edit, delete, etc.) unless IBM Support suggests you do so.
- The WCM Support portlet should be kept on an Administrator page, with restricted access.

## 7 Resources

developerWorks Web Content Manager page:

<http://www.ibm.com/developerworks/lotus/products/webcontentmanager/>

developerWorks article, "Introducing the Java Content Repository API:"

<http://www.ibm.com/developerworks/java/library/j-jcr/>

IBM Web Content Manager forum:

<http://www-10.lotus.com/ldd/wcmforum.nsf>

## 8 Author biography

**Noushad Nazmi** is a Staff Software Engineer on the WebSphere Portal and Web Content Manager Support team at IBM's Technical Support Center in Dublin, Ireland. He is a WCM certified developer and administrator, and worked extensively with other portal servers (Oracle's WebLogic) and Web content management software (Interwoven TeamSite) before joining IBM in 2006. He holds a degree in Mathematics and a Master of Computer Applications with honors.

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