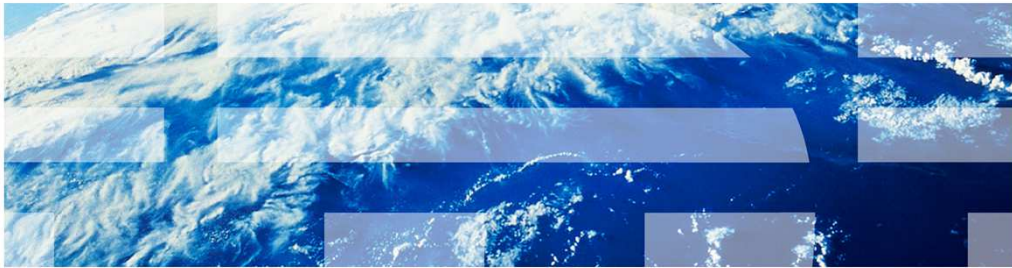

IBM WebSphere eXtreme Scale V8.6

Monitoring enhancements



This presentation describes monitoring enhancements included in IBM WebSphere® eXtreme Scale version 8.6.

Monitoring enhancements

- Message center
- Query Data Grid Contents panel - new features
- Port configuration
- Replication state monitoring
- Catalog placement monitoring

The first enhancement is that the message center is available through the monitoring console and the xscmd utility. Second, new features were added to the Query Data Grid Contents panel. Third, you can configure ports for the monitoring console. And finally, you will learn about new ways to monitor the state of replication and catalog placement.

Section

Message center

This section discusses the message center.

Message center overview

- As an operator of a WebSphere eXtreme Scale deployment, you might have dozens of Java virtual machines (JVMs) for a grid domain, any of which can exhibit error conditions affecting the health of the grid as a whole. The message center is intended to help recognize and diagnose problems with the grid.
- Information displayed in the message center
 - Java Management Extension (JMX) notifications for log and First Failure Data Capture (FFDC) messages
 - Implemented using interceptors that catch log messages and First Failure Data Capture (FFDC) events after they have been recorded on disk
 - Java Management Extension (JMX) notifications or log messages for health conditions
 - Server start/stop events
 - Quorum lost or regained events
 - Core group membership change
 - Replication problems
- Available through the monitoring console and xscmd utility

Since WebSphere eXtreme Scale deployments are built across a distributed set of Java virtual machines, it can be difficult to determine when specific JVMs are exhibiting error conditions that impact your grid or grids. New in version 8.6, the message center provides a single location in which to view critical events from across your distributed WebSphere eXtreme Scale environment.

The message center can be accessed from the monitoring console or from the xscmd utility. Through the use of Java Management Extension notifications, the message center makes individual log records and First Failure Data Capture events available in a single location. This includes the server start and stop events, quorum lost or regained events, core group membership change, and replication problems.

Message center implementation (1 of 2)

- Hub for JMX messages to run in each catalog server
 - Each hub maintains a notification history for all events throughout every catalog server/container server.
 - Each hub maintains a separate history of events. Therefore, if a catalog server goes down and another one is used to display the message history, it is possible that the list is different (in the ordering/numbering and number of total events). This might be confusing to a user, but it is designed to work this way.
 - Can be displayed in the monitoring console or through xscmd
- Each container and catalog server has two interceptors for events
 - First Failure Data Capture (FFDC) events
 - Log events
- Log events are filtered
 - Severities of level WARNING and higher generate notifications
 - You can configure a regular expression for a subset of INFO messages
 - INFO and WARNING messages are sent no more often than every five seconds
 - Notifications are sent asynchronously using a thread pool

The message center is powered by message hubs. A hub for JMX messages runs in each catalog server. Each hub maintains a separate notification history for all events. Therefore, if your primary catalog server goes down and you connect to another catalog server to display the message history, you might see a slightly different set of messages. This includes both the ordering of the messages and total number of messages.

Each container and catalog server has two interceptors for events, one for First Failure Data Capture events and one for log events. Log events are filtered. Any log event with a severity level of warning or higher will generate a notification. If you want to see more messages, you can configure a regular expression to include a subset of the informational messages. Informational and warning messages are sent no more often than once every five seconds. To protect against performance impacts on the WebSphere eXtreme Scale environment, the log events are sent asynchronously using a thread pool.

Message center implementation (2 of 2)

- Hub instance runs on each catalog server
 - Can be turned off with a catalog server property
 - In `server.properties` set `enableManagementConcentrator=false` (the default value is `true`)
 - Can be fine tuned to display more detail about specific events by using `xscmd`
 - `xscmd -c setNotificationFilter -fs <regular expression> [-server <servername>]`
- Hub implementation emphasized
 - Each hub has its own subscriptions and separate event history
 - Event histories on separate catalog servers are not kept synchronized
 - Catalog servers will subscribe to log and FFDC events from each other
- Event history is not stored in the grid
 - Allows it to be accessible and writable even if grid is sick
 - Do not need to keep the multiple versions of event history synchronized
 - Avoids complexities with containers writing to the grid
 - Event history is small (1000 1k entries), and can be configured to be smaller

There are configuration settings available for each message hub. Since a catalog server can only run a single message hub instance, the message hub settings are part of the catalog server configuration.

To turn off the message hub on a particular catalog server, set the property named `enableManagementConcentrator` to `false`. This property is configured in the `server.properties` file for the catalog server. You have to restart the catalog server for the change to go into effect.

To fine tune a message hub so that specific events are included in the message center, use the new `xscmd setNotificationFilter`.

It is important to know that the event history is not persisted anywhere. Restarting a catalog server will clear its event history. And a message hub holds a history of at most 1000 messages.

The message center displays messages as they come into the catalog server message hub. The message hub stores the last 1000 messages that have occurred throughout the system.

ID	Type	Date	Source	Message
No filter applied				
1	Information	Nov 28, 2012 10:40:53 AM	cs0	CWOBJ8250: Server started: server0
0	Information	Nov 28, 2012 10:40:52 AM	cs0	CWOBJ8250: Core group membership changed: DefaultZoneCG0

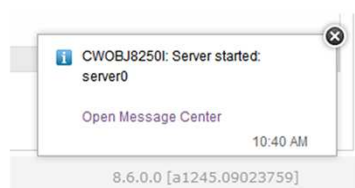
ID	Type	Date
No filter applied		
1	Information	Nov 28, 2012 10:40:53 AM
0	Information	Nov 28, 2012 10:40:52 AM

7 Monitoring enhancements © 2013 IBM Corporation

In the monitoring console, you find the message center under the Monitor menu item. The message history is displayed in table format. Note that the message center supports filtering, which enables you to find specific messages.

Monitoring console - Message center alerts

- Pop-up windows appear in the monitoring console for Severe messages and server start/stop events (No pop-up windows for warning and informational messages)
- If many messages occur at the same time, pop-up windows aren't displayed for all of them; the monitoring console will display the most recent message every 30 seconds



If the message hub is enabled and you are logged into the monitoring console, then you are notified when a new message arrives into the message center. Every 30 seconds the monitoring console checks for new messages. If there is a new message, it is displayed in a pop-up window. You do not have to be viewing the message center to see one of these alerts; you can be viewing any monitoring console panel. The screen capture shown here provides an example of an alert. In this example, the alert notifies you that a server named server0 has started. Every alert contains a link to the message center, where you can view the message in more detail.

To avoid overloading you with alerts, only severe messages, server start events and server stop events will trigger an alert. If a large number of these types of events occur at the same time, then only one alert is displayed – the alert for the most recent event.

Message center and xscmd - Overview

- Display the event notification history using the xscmd utility. The output displays in a tabular format.

```
- xscmd -c showNotificationHistory [-cep hostname:port(,hostname:port)]
```

```
C:\IBM\WebSphere\XtremeScale\standalone\windows\XS86_13112012\ObjectGrid\bin>xscmd.bat -c showNotificationHistory
Starting at: 2012-11-29 14:37:16.142

CWXSI0068I: Executing command: showNotificationHistory

Message ID Severity Server source Message
-----
0          INFO    cs0          CW0BJ8252I: Core group membership changed:
                DefaultZoneCG0
1          INFO    cs0          CW0BJ8250I: Server started: c0

CWXSI0040I: The showNotificationHistory command completed successfully.
```

- Listen for new notifications. The output is in raw format and runs until you stop the command. You can write additional scripts to parse the output.

```
- xscmd -c listenForNotifications [-cep hostname:port(,hostname:port)]
```

```
C:\IBM\WebSphere\XtremeScale\standalone\windows\XS86_13112012\ObjectGrid\bin>xscmd.bat -c listenForNotifications
Starting at: 2012-11-29 14:28:40.802

CWXSI0068I: Executing command: listenForNotifications

javax.management.Notification[source=com.ibm.websphere.objectgrid:type=CatalogService,host=9.27.57.97,ogServerName=cs0][type=com.ibm.websphere.objectgrid.management.message][message=CW0BJ8252I: Core group membership changed: DefaultZoneCG0]

javax.management.Notification[source=com.ibm.websphere.objectgrid:type=CatalogService,host=9.27.57.97,ogServerName=cs0][type=com.ibm.websphere.objectgrid.management.message][message=CW0BJ8250I: Server started: c0]
```

9

Monitoring enhancements

© 2013 IBM Corporation

You can use the xscmd utility to view the message history of a message hub or to subscribe to be notified when the message hub receives new messages. To view the message history, use the showNotificationHistory command. To be notified of new messages, use the listenForNotifications command. This slide shows usage and output examples for the two commands.

You can build additional tools that perform automated actions based on the JMX message notifications. If you do not have access to a JMX monitoring tool and you do not plan on building an application to subscribe to these notifications, then you can build scripts that perform automated actions based on the output of the listenForNotifications command.

Message center and xscmd - Filtering

- By default, the message center and commands only show WARNING errors, SEVERE errors, and events.
- You can change the filter, for example to include INFO, WARNING, and SEVERE log entries. You can set the filter for all servers in the environment or a single server.
 - `xscmd -c setNotificationFilter -fs <regular expression> [-server <servername>]`
- You can display the current filters for all the servers in your environment or a single server.
 - `xscmd -c getNotificationFilter [-s <servername>]`

```
C:\IBM\WebSphere\eXtremeScale\standalone\windows\XS86_13112012\ObjectGrid\bin>xscmd.bat -c getNotificationFilter
Starting at: 2012-11-29 14:56:18.017

CWXSI0068I: Executing command: getNotificationFilter

Server Host      Filter
-----
c0      9.27.57.97 Server

CWXSI0040I: The getNotificationFilter command completed successfully.
```

By default, the message center only shows log events of levels warning and severe and other critical events, like server starts and stops. To expand or shrink the list of log events displayed in the message center, use the `xscmd setNotificationFilter` command. You can provide a regular expression to specify the log events you want to see. You can set a notification filter per server or for your entire WebSphere eXtreme Scale environment at once. To view the filters that have been set, use the `xscmd getNotificationFilter`. This slide shows sample usage and output from the `getNotificationFilter` command.

Message center troubleshooting (1 of 4)

- If the console, catalog servers, and container servers are not upgraded to version 8.6 simultaneously:
 - Unable to get log and FFDC notifications from back-level servers
 - Unable to use back-level catalog servers as hubs
- Monitoring console to catalog server connection issue
 - If you see these messages in `ObjectGrid\console\logs\tr.log`, then the monitoring console was unable to connect to the catalog service domain. Ensure that the catalog server is running. And check for configuration errors defining the connections in the catalog server properties file and the catalog service domain configuration panels.
 - MessageCenter E com.ibm.ws.xsa.messagecenter.MessageCenter
getGridData The Message Center could not retrieve messages
from the catalog service domain.
 - SubscribeToMe W
com.ibm.ws.xsa.common.message.SubscribeToMessageHubThread run
The message center is unable to receive notifications from the
catalog server domain.

Since the message center is new in WebSphere eXtreme Scale version 8.6, it will not work in a WebSphere eXtreme Scale environment where servers are running older versions WebSphere eXtreme Scale. All console, catalog, and container servers need to be at version 8.6 for the message center to work.

If you are having trouble connecting your monitoring console to your catalog server to retrieve messages, inspect the monitoring console logs for the warning and error messages listed in this slide. If you see these messages, then ensure that the catalog server is running and check for mistakes on the catalog servers and catalog service domain configuration panels.

Message center troubleshooting (2 of 4)

- The message center collects a **subset** of the most critical server messages that are typically found in the catalogs and container logs. It is a subset because the message hub drops (throttles) log records that are deemed redundant (similar log record messages) or collections of records that tend to "flood" the history with rate too high to be read, comprehended, or act upon.
- Message seen in logs indicates message center is disabled and will need to be enabled in order to receive messages:
 - CWOBJ8264I: The management concentrator MBean is disabled for the [...] catalog server.
 - indicates the server properties has enabledManagementConcentrator=false (default is true, or commented out)

The message center only contains a subset of the severe events in your environment's log. This is because the message center drops some messages in order to throttle the number of incoming messages. It drops redundant messages from multiple containers. And it drops messages when it detects that messages are arriving at an abnormally high rate. This throttling keeps the message center from impacting the performance of the WebSphere eXtreme Scale environment and makes the message history more consumable.

If you are not receiving messages, and are wondering whether the message center is enabled, you can look in your logs for the CWOBJ8264I message. The presence of this message indicates that the message center is disabled and you will have to enable it to receive messages.

Message center troubleshooting (3 of 4)

- By default, the message hub server resides on each catalog server and registers itself for notifications from three types of catalog or container server MBeans: CatalogService, QuorumManager, and ObjectGridServer, therefore a large deployment log can show something like this after the catalogs are started:

```
[11/28/12 12:02:53:033 EST] 00000037 ManagementCon 3 HUB[WF3\node1\catalog10] currently listening to:
9.42.84.125 - WF3\node1\catalog10 - CatalogService
9.42.84.125 - WF3\node1\catalog10 - QuorumManager
9.42.84.125 - WF3\node1\catalog10 - ObjectGridServer
9.42.84.126 - WF3\node2\catalog20 - ObjectGridServer
9.42.84.128 - WF3\node4\catalog40 - ObjectGridServer
9.42.84.127 - WF3\node3\catalog30 - ObjectGridServer
```

– And this after the containers are started:

```
[11/28/12 13:38:37:067 EST] 00000037 ManagementCon 3 HUB[WF3\node1\catalog10] currently listening to:
9.42.84.125 - WF3\node1\catalog10 - CatalogService
9.42.84.125 - WF3\node1\catalog10 - QuorumManager
9.42.84.125 - WF3\node1\catalog10 - ObjectGridServer
9.42.84.126 - WF3\node2\catalog20 - ObjectGridServer
9.42.84.128 - WF3\node4\catalog40 - ObjectGridServer
9.42.84.127 - WF3\node3\catalog30 - ObjectGridServer
9.42.84.127 - WF3\node3\wxs306 - ObjectGridServer
9.42.84.128 - WF3\node4\wxs416 - ObjectGridServer
9.42.84.127 - WF3\node3\wxs302 - ObjectGridServer
9.42.84.128 - WF3\node4\wxs412 - ObjectGridServer
9.42.84.128 - WF3\node4\wxs408 - ObjectGridServer
9.42.84.125 - WF3\node1\wxs106 - ObjectGridServer
```

If the message center appears to be missing events from a specific WebSphere eXtreme Scale server, you can look in each catalog server log to find the list of servers from which the message center is registered to receive events. The first screen capture shows the list of servers that the message hub can be registered with after the catalog server is started. The second screen capture shows the list of servers that the message hub can be registered with after the containers are started.

Message center troubleshooting (4 of 4)

- Some of the I (information) and W (warning) log events are not submitted or saved by the message hub into its history due to throttling by the message center. They can be identified in the catalog server logs by these messages:

- event that was submitted and saved:

```
[11/28/12 12:02:37:963 EST] 00000008 ManagementCon 3 HUB[WF3\node1\catalog10] evaluating throttling conditions for [02:37.959]
CWOBj8253i: The WF3\node1\catalog10 server joined the d3_WF3DefaultCoreGroup core group.
[11/28/12 12:02:37:963 EST] 00000008 XSNotification 3 XSNotificationBroadcasterSupport sent:
[og.server.container.coregroup.membership.change];[CWOBj8253i: The WF3\node1\catalog10 server joined the
d3_WF3DefaultCoreGroup core
group.];[com.ibm.websphere.objectgrid.cell=WF3,ogServerName=WF3\node1\catalog10,type=ManagementConcentrator,host=9.42.84.125,
node=node1,process=catalog10]
[11/28/12 12:02:37:964 EST] 00000008 ManagementCon 3 HUB[WF3\node1\catalog10] relayed notification:
[og.server.container.coregroup.membership.change];[CWOBj8253i: The WF3\node1\catalog10 server joined the
d3_WF3DefaultCoreGroup core group.];
[com.ibm.websphere.objectgrid.cell=WF3,ogServerName=WF3\node1\catalog10,type=ManagementConcentrator,host=9.42.84.125,node=n
ode1,process=catalog10]
```

- event that was dropped:

```
[11/28/12 12:06:38:447 EST] 000000df JMXNotificati 3 HUB[WF3\node1\catalog10] throttling conditions evaluated up to [06:33.442]
[11/28/12 12:06:38:447 EST] 000000df JMXNotificati 3 HUB[WF3\node1\catalog10] recent history added: [6] [05:55.114]
CWOBj8265W: A notification was generated on the WF3\node1\catalog10 server for a new exception: java.io.IOException: Connection
close: Read failed. Possible end of stream encountered.
[11/28/12 12:06:38:447 EST] 000000df ManagementCon 3 HUB[WF3\node1\catalog10] comparing with latest notification: [WARNING]
CWOBj8265W: A notification was generated on the WF3\node1\catalog10 server for a new exception: java.io.IOException: Connection
close: Read failed. Possible end of stream encountered.
[11/28/12 12:06:38:447 EST] 000000df ManagementCon 3 HUB[WF3\node1\catalog10] redundancy/flooding throttling ignored notification
type [WARNING] [06:38.442] CWOBj8265W: A notification was generated on the WF3\node1\catalog10 server for a new
exception: com.ibm.websphere.objectgrid.LockTimeoutException: Local-4000013B-47FB-D050-E000-3E945EF40502 timed out after
waiting 15000 ms for lock mode U to be granted for map name: Configuration, key: deploymentPolicy
```

If you want to see the log events that the message center dropped due to throttling, search the catalog server logs for messages like the ones listed on this slide. There are log messages for each event that indicate whether or not it was dropped.

Section

Query Data Grid Contents panel - New features

The next slide describes the new features of the Query Data Grid Contents panel.

Query Data Grid Contents panel – New features

- Clear Map – clear data in the grid
- Show values - check the check box to retrieve values
- For a key/value that is too long for the table, click the key/value to display the full text
 - If the key is removed from the grid before the link is clicked, then clicking the link will display a null value. Refresh the table to remove results that are no longer in the grid.

Query Data Grid Contents

Map: IBM_DC_PARTITIONED_cache1

Enter a regular expression to find keys in the map. After searching for keys, use the invalidate button to permanently remove a key from the cache. Choose to invalidate All keys matching query to invalidate an entire query regardless of the number of matching keys.

Regular expression help

Invalidate Clear Map Show values

	Key	Value	Partition
<input type="checkbox"/>	1128	[CacheEntryData] value: [B@cod9a9 userData: null priority: -1 timeLimit: -1 inactivity: -1 validatorExpirationTime:...	0
<input type="checkbox"/>	1175	[CacheEntryData] value: [B@cod9be userData: null priority: -1 timeLimit: -1 inactivity: -1 validatorExpirationTime:...	0
<input type="checkbox"/>	1222	[CacheEntryData] value: [B@cb99d3 userData: null priority: -1 timeLimit: -1 inactivity: -1 validatorExpirationTime:...	0

16 Monitoring enhancements © 2013 IBM Corporation

The new Clear Map button allows you to clear the data in a grid for a specific map. The new Show values check box allows you to configure the monitoring console to retrieve the values for each entry. In the screen capture, the new Clear Map button and Show values check box are indicated by red boxes.

If a grid entry has a key or value that is too long for the table, it is truncated. You can click the truncated cell to display the full text.

Section

Port configuration

The next slide describes port configuration for the monitoring console.

Port configuration

- Settings > Configuration > System
- Restart required for changes to go into effect

The screenshot shows the IBM WebSphere eXtreme Scale Settings page. At the top, there is a navigation bar with 'Home', 'Monitor', 'Management', and 'Settings'. Below the navigation bar, the 'Logging' section is visible, showing the 'Trace string for eXtreme Scale web console' set to 'com.ibm.ws.xsa.common.message.SubscribeToMessageHubThread=all=enabled'. The 'System' section is also visible, showing the 'Web console HTTP port' set to 7081 with a red asterisk and the text '* Restart required' next to it, and the 'Secure web console HTTPS port' set to 7443.

Section	Property	Value
Logging	Trace string for eXtreme Scale web console	com.ibm.ws.xsa.common.message.SubscribeToMessageHubThread=all=enabled
	<hr/>	
System	Web console HTTP port	7081 * Restart required
	Secure web console HTTPS port	7443

In earlier versions of WebSphere eXtreme Scale, the monitoring console uses default HTTP and HTTPS ports that are not easily configured. In version 8.6, you can specify the ports that the monitoring console binds to during startup. Under the main Settings menu item, go to the Configuration panel. The port fields are under the System heading, as shown in the screen capture. You must restart the monitoring console for your changes to the port configuration to go into effect.

Replication state monitoring

The next section covers replication state monitoring.

Container replication state monitoring - Introduction

- As an operator of a WebSphere eXtreme Scale deployment, you might have a large number of primary shards and replicas located on a large number of container servers
- You want to be able to verify that none of the container servers falls behind with respect to primary-to-replica replication.
- You want to see the lengths of the outstanding revision queues to be replicated for all of the container servers

A common task for WebSphere eXtreme Scale operators is to check how far behind the replica shards are from their primary shard counterparts. This distance between a primary and its replica represents the number of entries that might be lost during a failover. It is called the outstanding revision queue. This queue represents replication that is planned but has not yet happened.

Container replication state monitoring through xscmd

```
xscmd -c showReplicationState
Starting at: 2012-11-28 15:26:57.262
CWXSI0068I: Executing command: showReplicationState
Command showReplicationState is a technology preview. The command usage and
output is subject to change.
Container      Outstanding Inbound Revisions Outstanding Outbound Revisions
-----
con1           21                               13
con0           0                                0
CWXSI0040I: The showReplicationState command completed successfully.
Ending at: 2012-11-28 15:26:59.559
```

In version 8.6, the xscmd utility offers a new command, showReplicationState. This command allows you to view the outstanding revision queues, per container, in order to determine the overall replication health.

This slide shows a sample of the usage and output from the showReplicationState command. The output includes two values for each container in the domain. First, the outstanding *inbound* revisions is the number of entry updates waiting to be replicated from primary shards on *other* containers to replica shards on *this* container. Second, the outstanding *outbound* revisions is the number of entry updates stored in primary shards on *this* container that are waiting to be replicated to replica shards on *other* containers.

CatalogServiceManagementMBean ContainerReplicationState

The screenshot shows the JConsole interface with the following components:

- Tree View (Left):** A hierarchical tree showing the MBean structure. The path is: `com.ibm.websphere.objectgrid` > `CatalogService` > `kobylin1.torolab.ibm.com` > `cs0` > `Attributes` > `ContainerReplicationState`.
- Main Display Area:**
 - Attribute value:** A table with columns 'Name' and 'Value'. It contains three rows: `Container` with value `con1`, `OutstandingInboundRevisions` with value `0`, and `OutstandingOutboundRevisions` with value `0`.
 - Navigation:** Includes 'Tabular Navigation 1/2' and 'Composite Navigation' buttons.
 - Refresh:** A button to refresh the data.
- MBeanAttributeInfo (Bottom):** A table providing metadata for the attribute.

Name	Value
Attribute:	
Name	ContainerReplicationState
Description	Retrieves the inbound/outbound queues for primary-replica replications.
Readable	true
Writable	false
Is	false
Type	javax.management.openmbean.TabularData

The data provided by the `showReplicationState` command can also be retrieved programmatically using the new `ContainerReplicationState` attribute of the `CatalogServiceManagementMBean`. In the screen capture, `jconsole`, which comes with the Java Development Kit, is used to show you the `ContainerReplicationState` attribute.

Container replication state output meaning

- For a problematic container server, the inbound and outbound queues have values greater than 0 that grow over time.
- If one of the queues grows during a period of 15 minutes, one of these warnings is logged:
 - CWOBJ1564W: The inbound queue of primary-replica replication has increased for container con1.
 - CWOBJ1566W: The outbound queue of primary-replica replication has increased for container con1.
 - where "con1" is the name of the container in this example
- Note: For synchronous replicas the replication queues are expected to be 0

You can identify a problematic container by watching the outstanding revision queue values over time. Values that are greater than 0 might be normal for your environment and work load. They only become a concern if they continue to grow over time. Outstanding revision queue growth over time indicates that the replica shard is not keeping up with the primary shard.

If any queue grows continuously over a period of 15 minutes, a warning message is sent to the message center.

Multi-master replication state monitoring - Introduction

- As an operator of a WebSphere eXtreme Scale deployment, you might have multiple domains linked in multi-master replication topology
- You need to verify that none of the container servers falls behind on inter-domain replication
- You need to know the lengths of the revision queues to be replicated for all the container servers

When dealing with multi-master replication environments, WebSphere eXtreme Scale operators need to check how far behind replication is for container servers between linked domains.

Multi-master replication state monitoring through xscmd

```
xscmd -c showDomainReplicationState
Starting at: 2012-08-13 16:46:05.619
CWXSI0068I: Executing command: showdomainreplicationstate
Domain d1
Container Outstanding Inbound Revisions Outstanding Outbound Revisions
-----
cont1      4                               21
cont2      2                               1
Domain d2
Container Outstanding Inbound Revisions Outstanding Outbound Revisions
-----
cont1      21                              4
cont2      1                               2
CWXSI0040I: The showDomainReplicationState command completed successfully.
```

25

Monitoring enhancements

© 2013 IBM Corporation

For this purpose, the xscmd utility provides a new command called `showDomainReplicationState`. The slide shows an example of the usage and output from this command. It looks very similar to the output from `showReplicationState`, except that it categorizes the containers by domain. And the outstanding inbound revisions for a container is the number of entry updates that are waiting to be replicated from primary shards *on the linked container of the remote domain* to replica shards on this container. Similarly, the outstanding outbound revisions for a container is the number of entry updates stored in primary shards on this container that are waiting to be replicated to replica shards on the linked container of the remote domain.

CatalogServiceManagementMBean DomainReplicationState

The screenshot shows the IBM WebSphere Monitoring Center interface. On the left, a tree view displays the MBean hierarchy: JImplementation > com.ibm.websphere.objectgrid > CatalogService > kobyin1.torolab.ibm.com > cs0 > Attributes > DomainReplicationState. The main window is titled 'Attribute value' and shows a table with 'Name' and 'Value' columns. Below this, there are navigation buttons: '< Tabular Navigation >', '<< Composite Navigation >>', and a 'Refresh' button. At the bottom, the 'MBeanAttributeInfo' section provides details for the attribute:

Name	Value
Attribute:	
Name	DomainReplicationState
Description	Retrieves the inbound/outbound queues for primary-remote primary replications.
Readable	true
Writable	false
Is	false
Type	javax.management.openmbean.TabularData

At the bottom of the screenshot, the page number '26' is on the left, 'Monitoring enhancements' is in the center, and '© 2013 IBM Corporation' is on the right.

The data provided by the `showDomainReplicationState` command can also be retrieved programmatically using the new `DomainReplicationState` attribute of the `CatalogServiceManagementMBean`. In the screen capture, `jconsole`, which comes with the Java Development Kit, is used to show you the `DomainReplicationState` attribute.

Multi-master replication state output meaning

- For a problematic container server, the inbound and outbound queues have values greater than 0 that grow over time
- If a queue grows during a period of 15 minutes, one of these warnings is logged:
 - CWOBJ1565W: The inbound queue of remote replication has increased for container con1 in domain d1.
 - CWOBJ1567W: The outbound queue of remote replication has increased for container con1 in domain d1.
 - where "d1" is the name of the domain in this example

You can identify a problematic linked container by watching the results of the `showDomainReplicationState` command over time. Queues that are greater than 0 can be normal for your environment and work load. It only becomes a concern if the queue numbers continue to grow over time. Outstanding revision queue growth over time is evidence that the primary shards in one container are not keeping up with the primary shards of the linked container in the remote domain.

If any queue grows continuously over a period of 15 minutes a warning is logged in the message center.

Replication state monitoring - troubleshooting

- Initially, after starting WebSphere eXtreme Scale, the output of the `showReplicationState` or `showDomainReplicationState` command is an empty table with no containers and no queues
- These commands required 10-15 minutes to “warm up” after the first container server is started

You will notice that the output of the two `xscmd` utility replication state commands is empty when you first start your WebSphere eXtreme Scale environment. The replication state is calculated over time, so that it does not impact the performance of the WebSphere eXtreme Scale environment. The first set of data is not available until approximately 15 minutes after the entire WebSphere eXtreme Scale environment has been started.

Catalog placement monitoring

The next section discusses the catalog placement monitoring.

Catalog placement monitoring - Overview

- You may encounter shard placement operations to particular containers that are failing, necessitating that these containers be disabled.
- You want to see which containers have been disabled and determine why they were disabled
- You want to be able to manage your containers and re-enable placement on containers

If shard placement operations to a particular container are failing, that container can be disabled and pulled out of the pool of containers available for shard placement. Then you need to view the list of containers that are disabled and, for each disabled container, determine the issue, fix it, and re-enable that container and put it back into the pool for shard placement.

Typically, shard placement issues can be traced to configuration or domain name server issues. While a container is in the disabled state, these issues can be corrected without further impacting the overall WebSphere eXtreme Scale environment.

Catalog placement monitoring through xscmd and PlacementServiceMBean

- New xscmd commands
 - xscmd -c **listDisabledContainers** - Displays a table of disabled containers
 - xscmd -c **enableContainer** -s <serverName> - Enables a previously-disabled container, which means shards can once again be placed on the container
- New PlacementServiceMBean operations
 - public List<String> **getDisabledContainers**();
 - Object **enableContainer**(String serverName);

The xscmd utility provides new commands for viewing the list of disabled containers and for re-enabling containers. The xscmd listDisabledContainers command displays a list of the containers that have been disabled. The xscmd enableContainer command allows you to transition a disabled container to an enabled state. Then shards will once again be placed on that container.

These operations can also be done programmatically using the PlacementServiceMBean. The operations are listed on this slide.

Feedback

Your feedback is valuable

You can help improve the quality of IBM Education Assistant content to better meet your needs by providing feedback.

- Did you find this module useful?
- Did it help you solve a problem or answer a question?
- Do you have suggestions for improvements?

Click to send email feedback:

mailto:iea@us.ibm.com?subject=Feedback_about_XS86_monitoring.ppt

This module is also available in PDF format at: [../XS86_monitoring.pdf](#)

You can help improve the quality of IBM Education Assistant content by providing feedback.



Trademarks, disclaimer, and copyright information

IBM, the IBM logo, ibm.com, and WebSphere are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of other IBM trademarks is available on the web at "[Copyright and trademark information](http://www.ibm.com/legal/copytrade.shtml)" at <http://www.ibm.com/legal/copytrade.shtml>

Other company, product, or service names may be trademarks or service marks of others.

THE INFORMATION CONTAINED IN THIS PRESENTATION IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY. WHILE EFFORTS WERE MADE TO VERIFY THE COMPLETENESS AND ACCURACY OF THE INFORMATION CONTAINED IN THIS PRESENTATION, IT IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. IN ADDITION, THIS INFORMATION IS BASED ON IBM'S CURRENT PRODUCT PLANS AND STRATEGY, WHICH ARE SUBJECT TO CHANGE BY IBM WITHOUT NOTICE. IBM SHALL NOT BE RESPONSIBLE FOR ANY DAMAGES ARISING OUT OF THE USE OF, OR OTHERWISE RELATED TO, THIS PRESENTATION OR ANY OTHER DOCUMENTATION. NOTHING CONTAINED IN THIS PRESENTATION IS INTENDED TO, NOR SHALL HAVE THE EFFECT OF, CREATING ANY WARRANTIES OR REPRESENTATIONS FROM IBM (OR ITS SUPPLIERS OR LICENSORS), OR ALTERING THE TERMS AND CONDITIONS OF ANY AGREEMENT OR LICENSE GOVERNING THE USE OF IBM PRODUCTS OR SOFTWARE.

© Copyright International Business Machines Corporation 2013. All rights reserved.