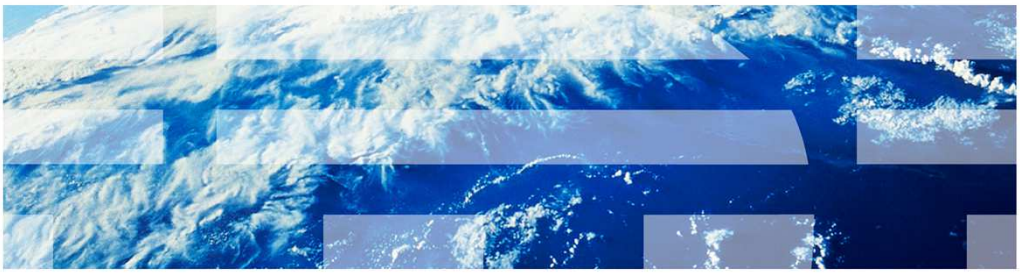
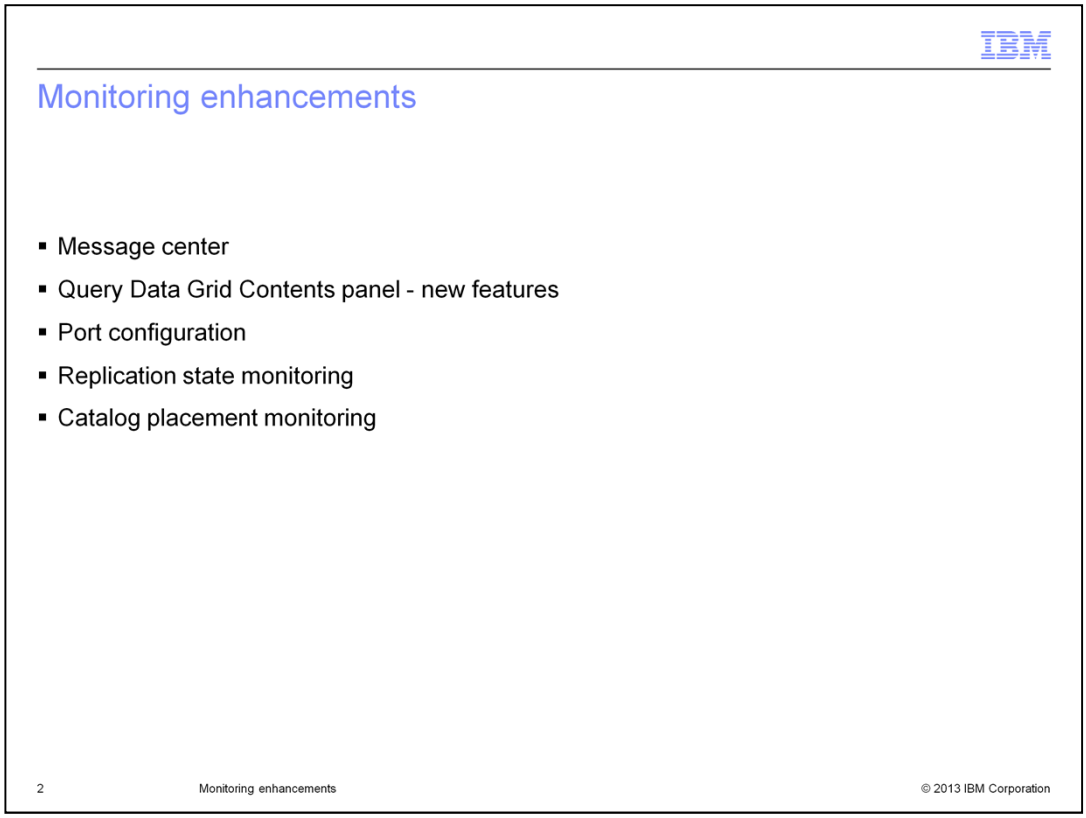
IBM WebSphere eXtreme Scale V8.6

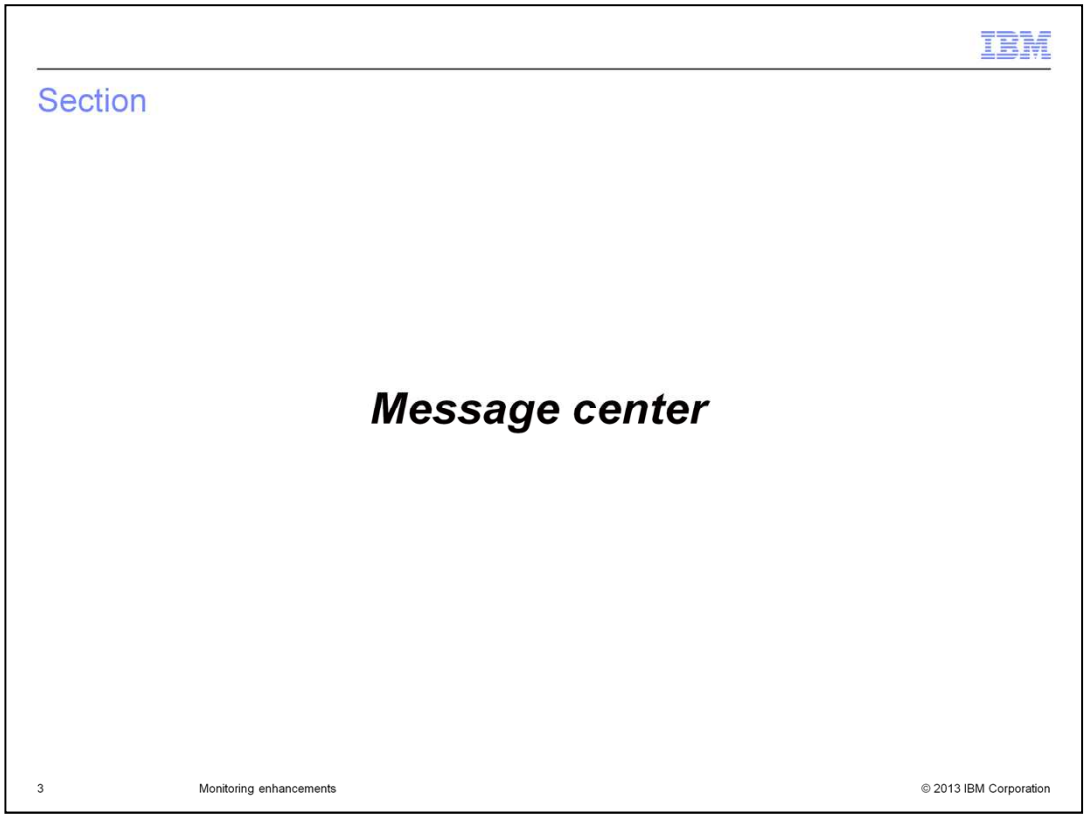
Monitoring enhancements



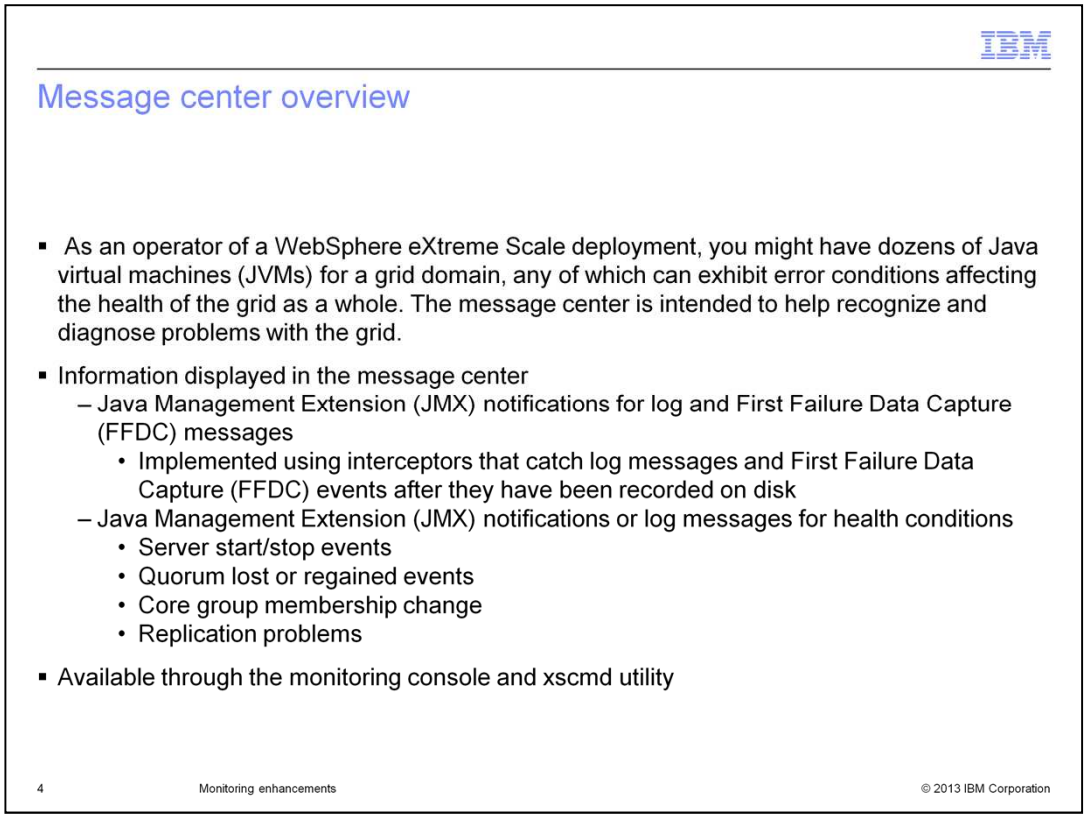
This presentation describes monitoring enhancements included in IBM WebSphere® eXtreme Scale version 8.6.



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.

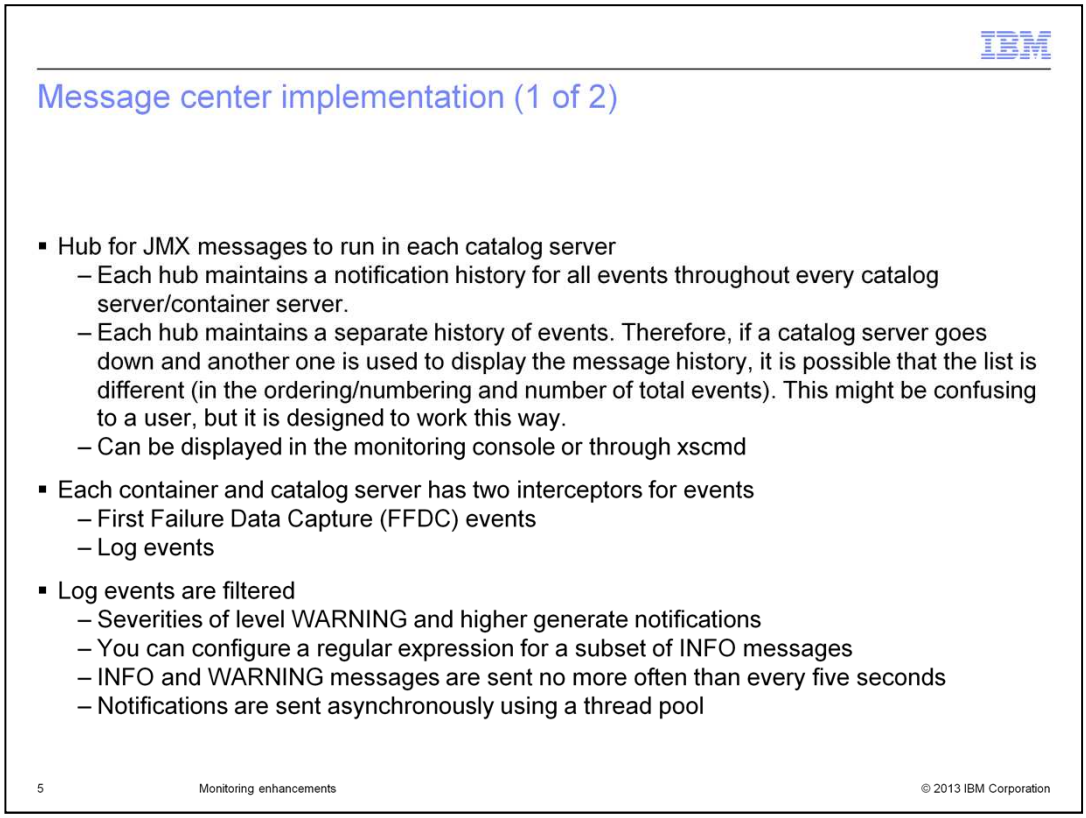


This section discusses the message center.



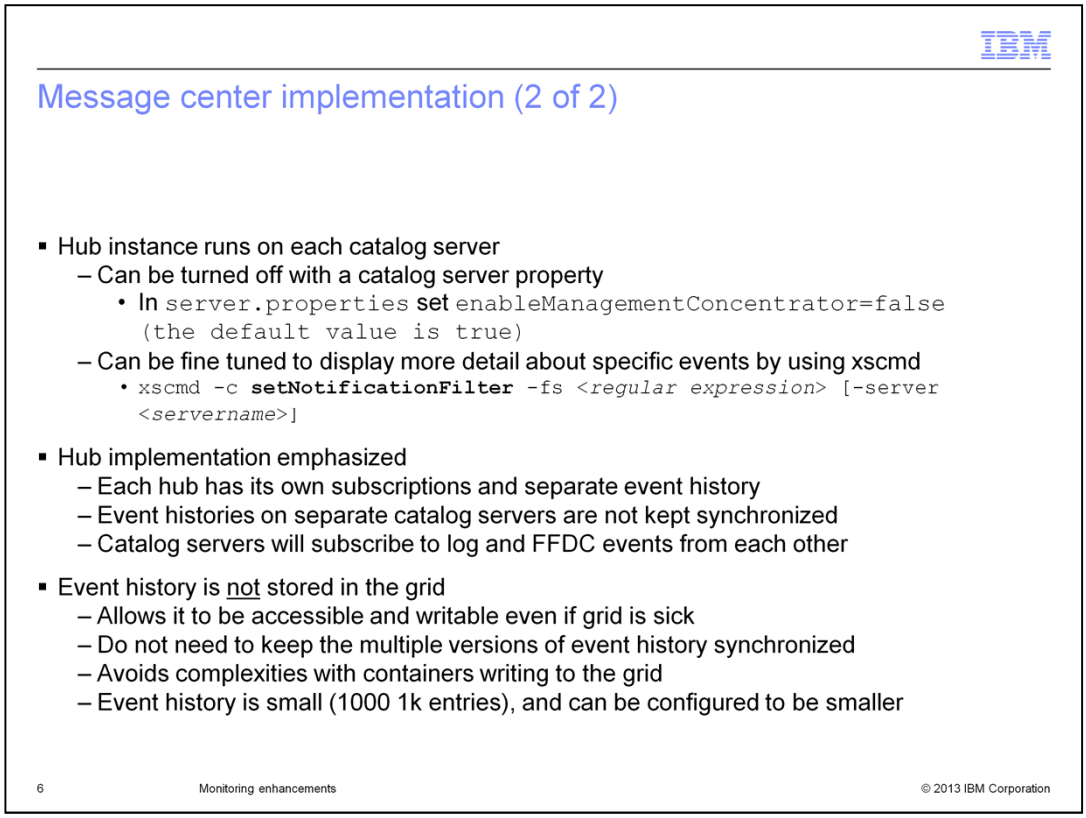
Since WebSphere eXtreme Scale deployments are built across a distributed set of Java virtual machines, it can be difficult to determine when specific JVMs are exhibiting error conditions that impact your grid or grids. New in version 8.6, the message center provides a single location in which to view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



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.

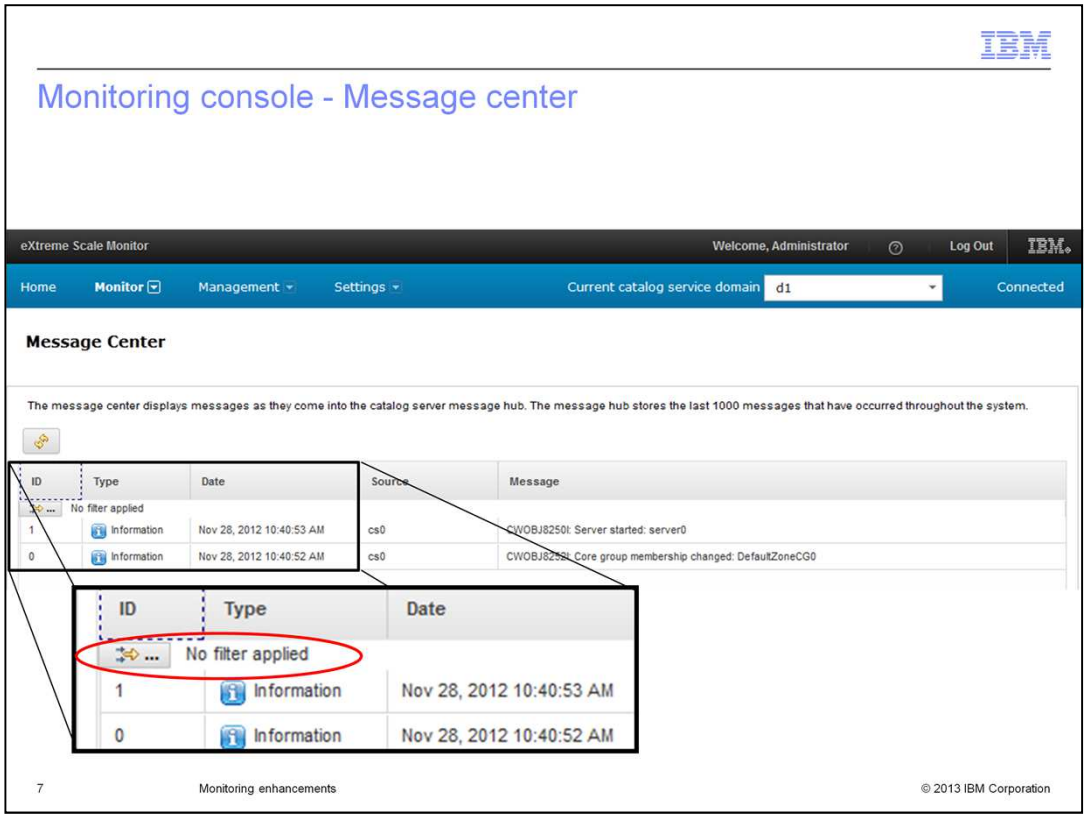


There are configuration settings available for each message hub. Since a catalog server can only run a single message hub instance, the message hub settings are part of the catalog server configuration.

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."

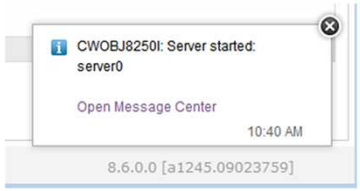
It is important to know that the event history is not persisted anywhere. Restarting a catalog server will clear its event history. And a message hub holds a history of at most 1000 messages.



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



8 Monitoring enhancements

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)]`

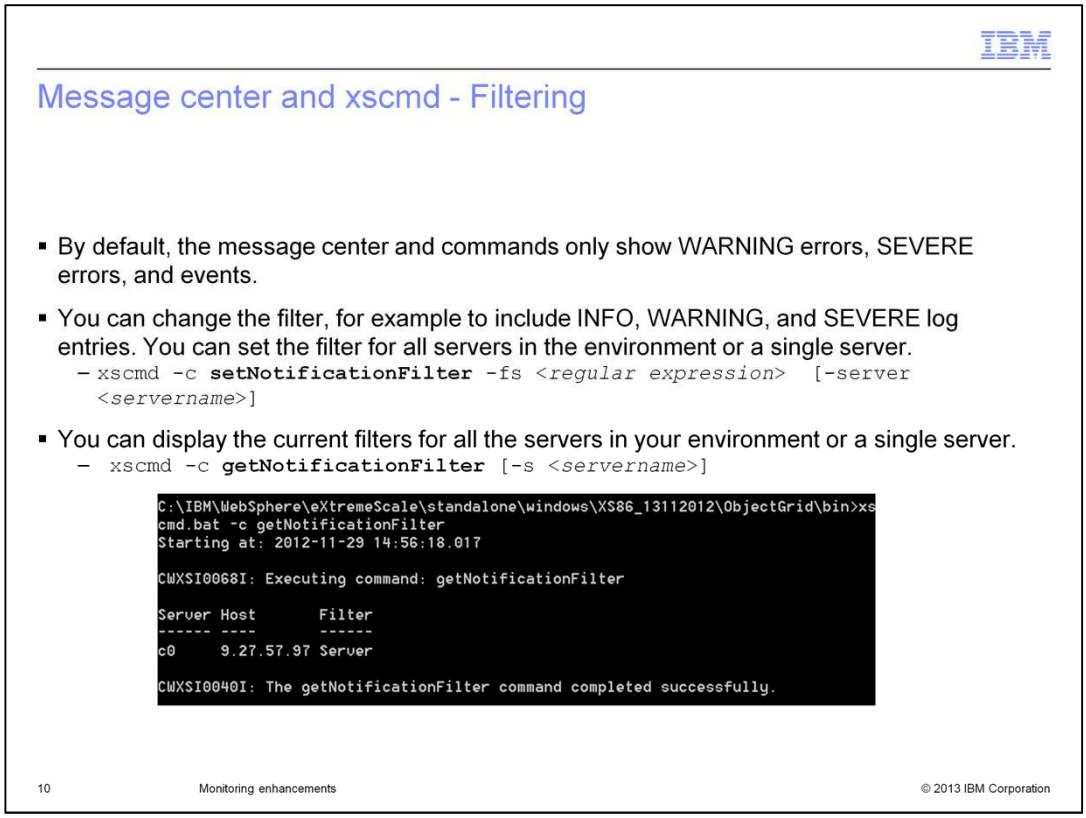
```
C:\IBM\WebSphere\eXtremeScale\standalone\windows\XS86_13112012\ObjectGrid\bin>xs
cmd.bat -c showNotificationHistory
Starting at: 2012-11-29 14:37:16.142

CWXSI0068I: Executing command: showNotificationHistory

Message ID Severity Server source Message
---------- -------- ------------- -------
0          INFO     cs0           CWOBJ8252I: Core group membership changed:
                                  DefaultZoneCG0
1          INFO     cs0           CWOBJ8250I: 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)]`

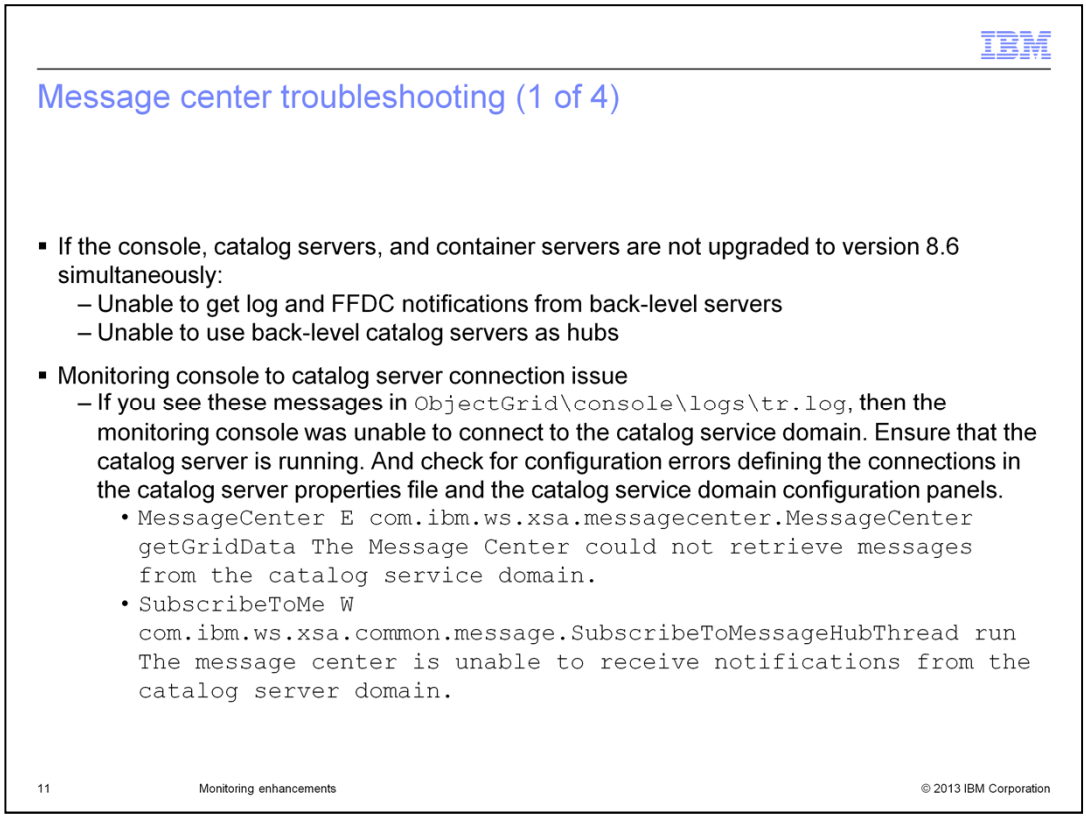
```
C:\IBM\WebSphere\eXtremeScale\standalone\windows\XS86_13112012\ObjectGrid\bin>xs
cmd.bat -c listenForNotifications
Starting at: 2012-11-29 14:28:40.802

CWXSI0068I: Executing command: listenForNotifications

javax.management.Notification[source=com.ibm.websphere.objectgrid:type=CatalogSe
rvice,host=9.27.57.97,ogServerName=cs0][type=com.ibm.websphere.objectgrid.manage
ment.message][message=CWOBJ8252I: Core group membership changed: DefaultZoneCG0]

javax.management.Notification[source=com.ibm.websphere.objectgrid:type=CatalogSe
rvice,host=9.27.57.97,ogServerName=cs0][type=com.ibm.websphere.objectgrid.manage
ment.message][message=CWOBJ8250I: Server started: c0]
```


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.

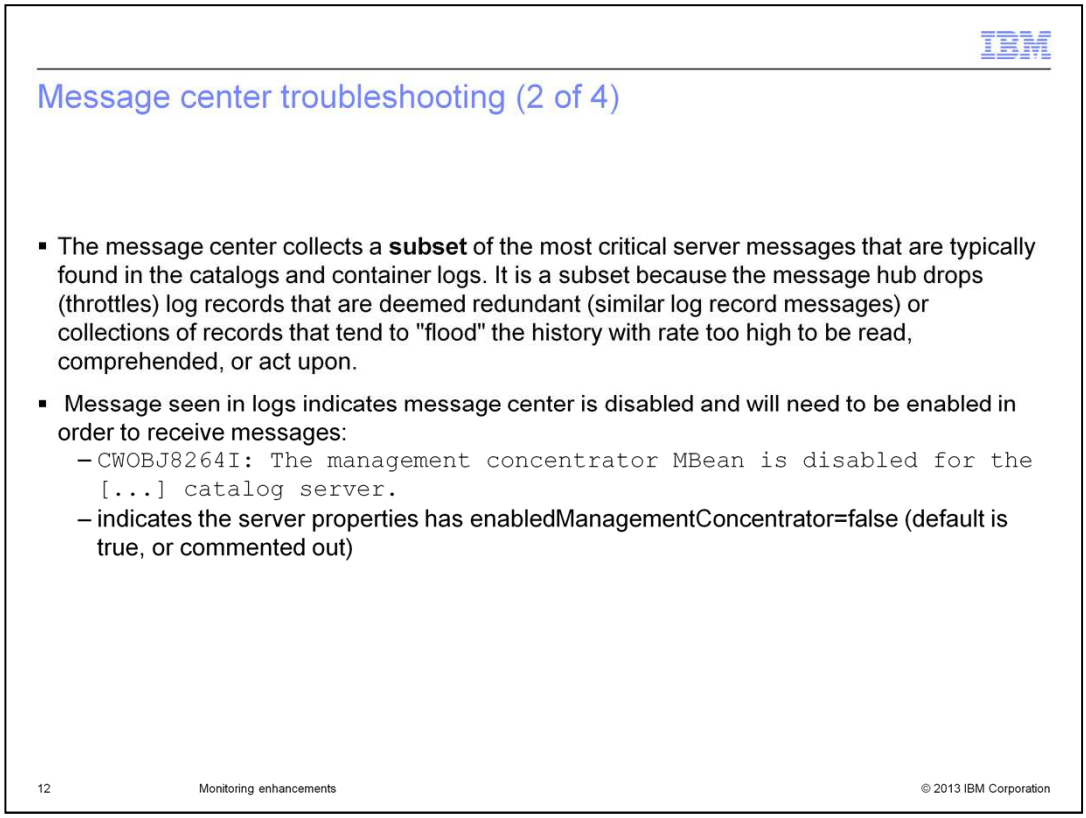


By default, the message center only shows log events of levels warning and severe and other critical events, like server starts and stops. To expand or shrink the list of log events displayed in the message center, use the xscmd setNotificationFilter command. You can provide a regular expression to specify 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.



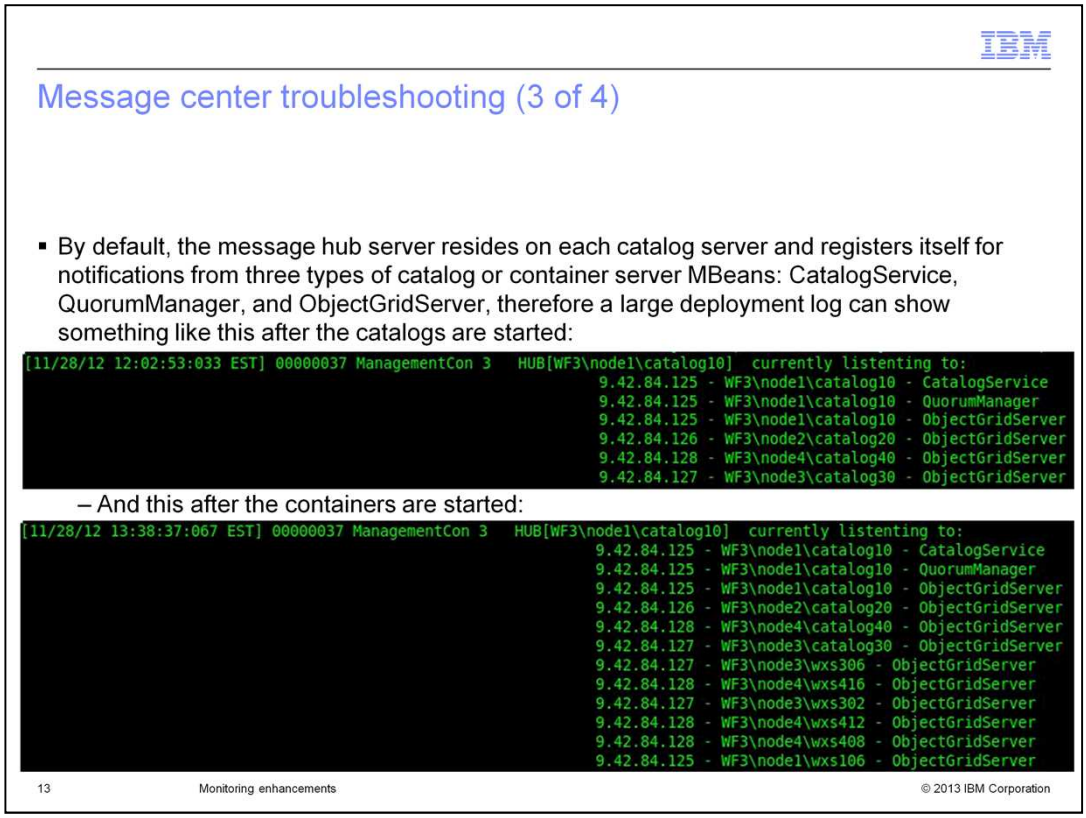
Since the message center is new in WebSphere eXtreme Scale version 8.6, it will not work in a WebSphere eXtreme Scale environment where servers are running older versions WebSphere eXtreme Scale. All console, catalog, and container servers need to be at version 8.6 for the message center to work.

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.

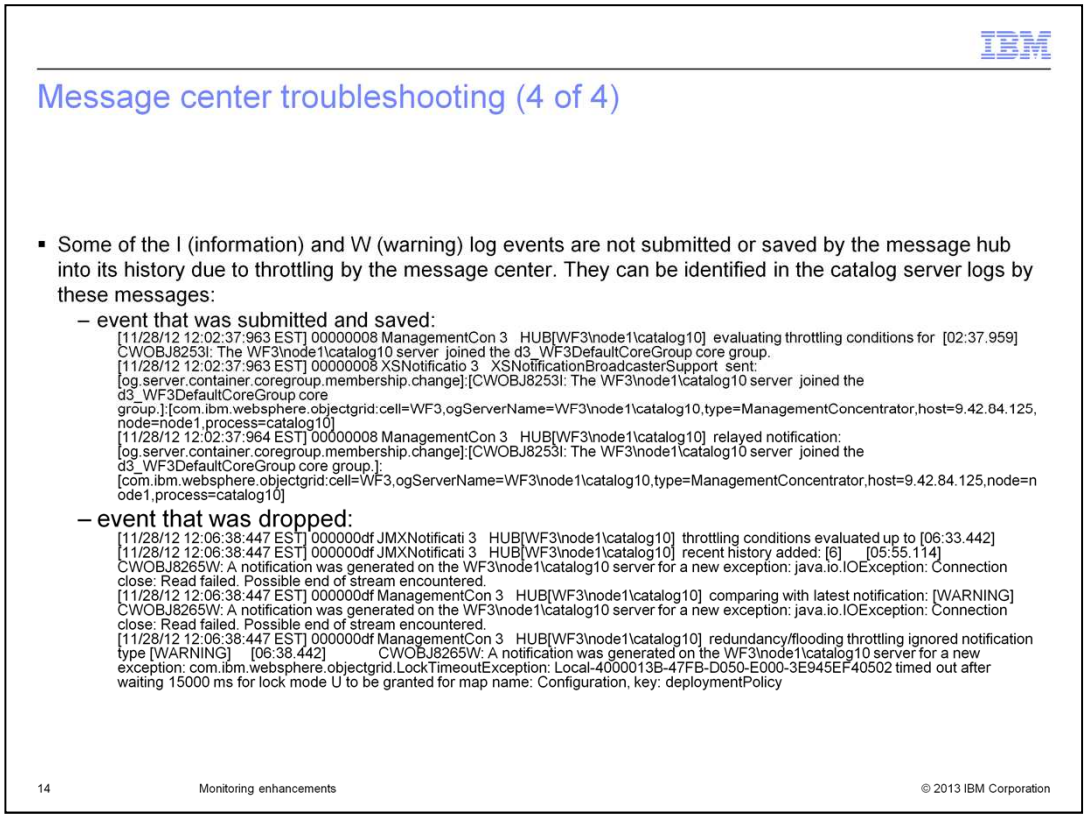


The message center only contains a subset of the severe events in your environment's log. This is because the message center drops some messages in order to throttle the number of incoming messages. It drops redundant messages from multiple containers. And it drops messages when it detects that messages 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.

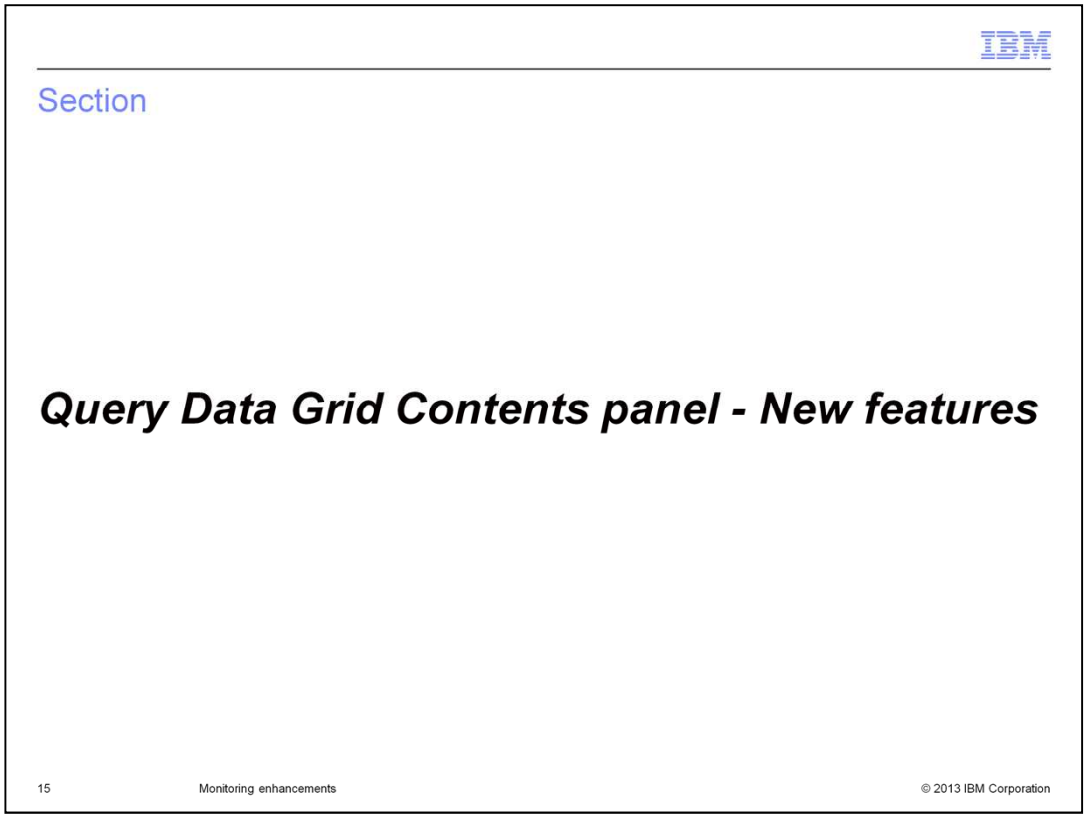
If you are not receiving messages, and are wondering whether the message center is enabled, you can look in your logs for the CWOBJ8264I message. The presence of this message indicates that the message center is disabled and you will have to enable it to receive messages.



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.



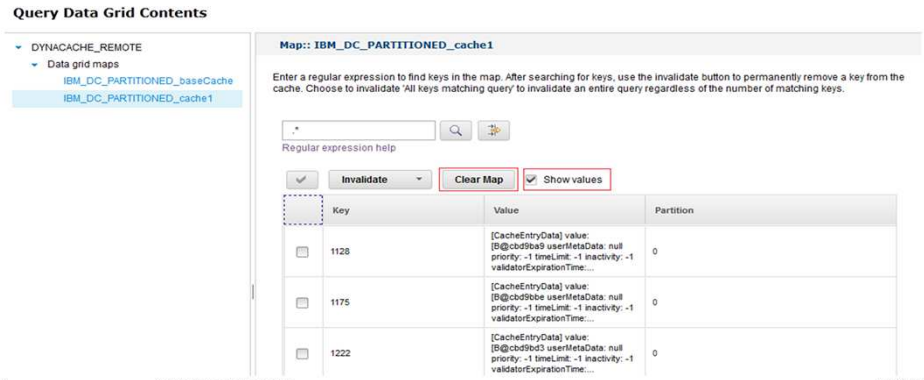
If you want to see the log events that the message center dropped due to throttling, search the catalog server logs for messages like the ones listed on this slide. There are log messages for each event that indicate whether or not it was dropped.



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

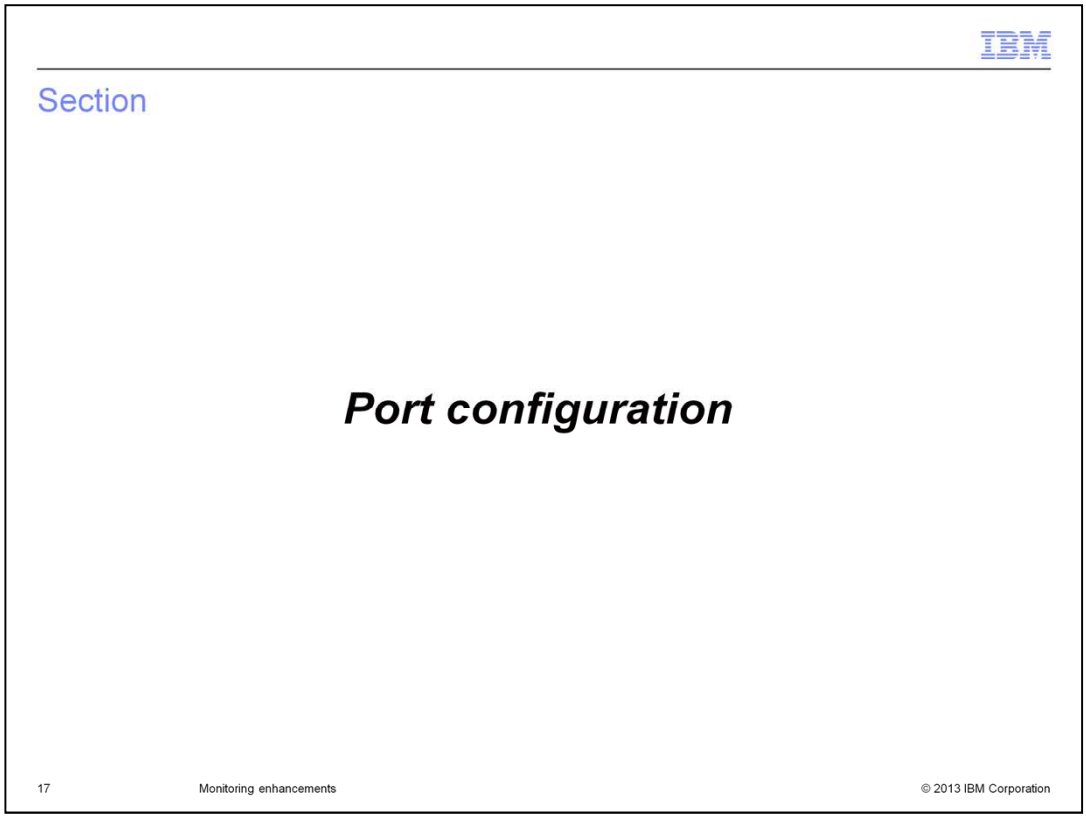
Query Data Grid Contents panel – New features

- 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.

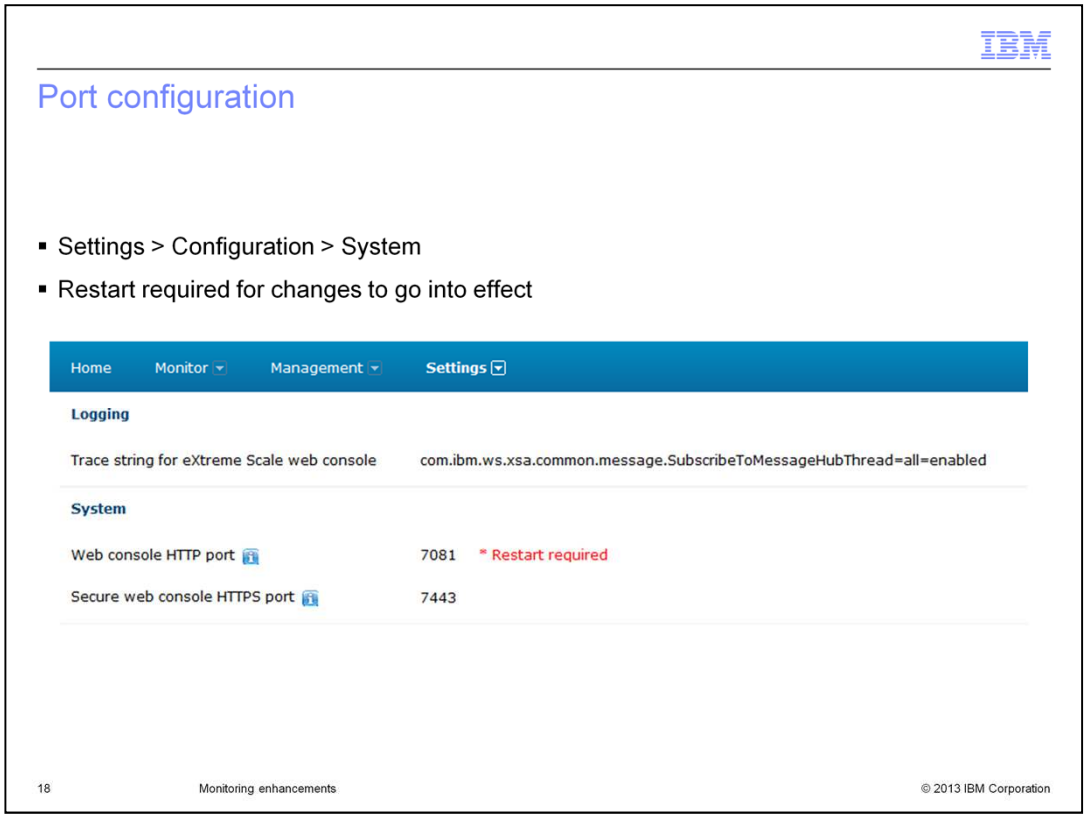


The new Clear Map button allows you to clear the data in a grid for a specific map. The new Show values check box allows you to configure the monitoring console to retrieve the values for each entry. In the screen capture, the new Clear Map button and Show values check box are indicated by red boxes.

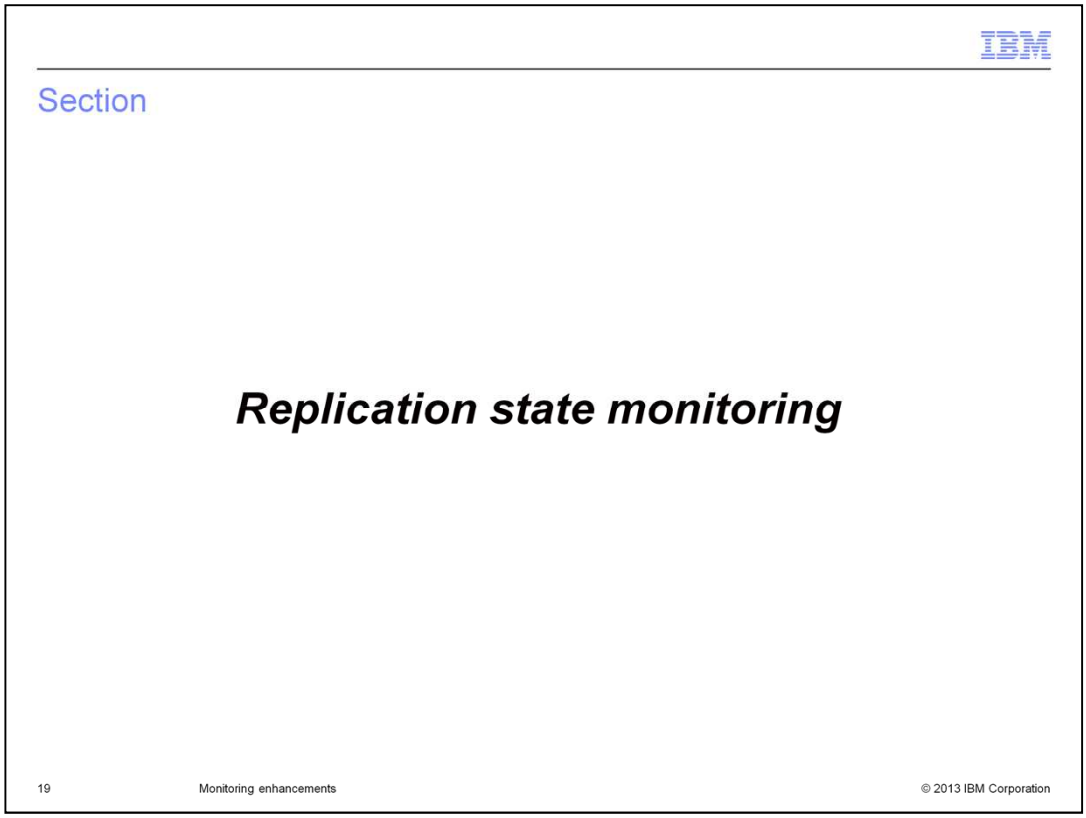
If a grid entry has a key or value that is too long for the table, it is truncated. You can click the truncated cell to display the full text.



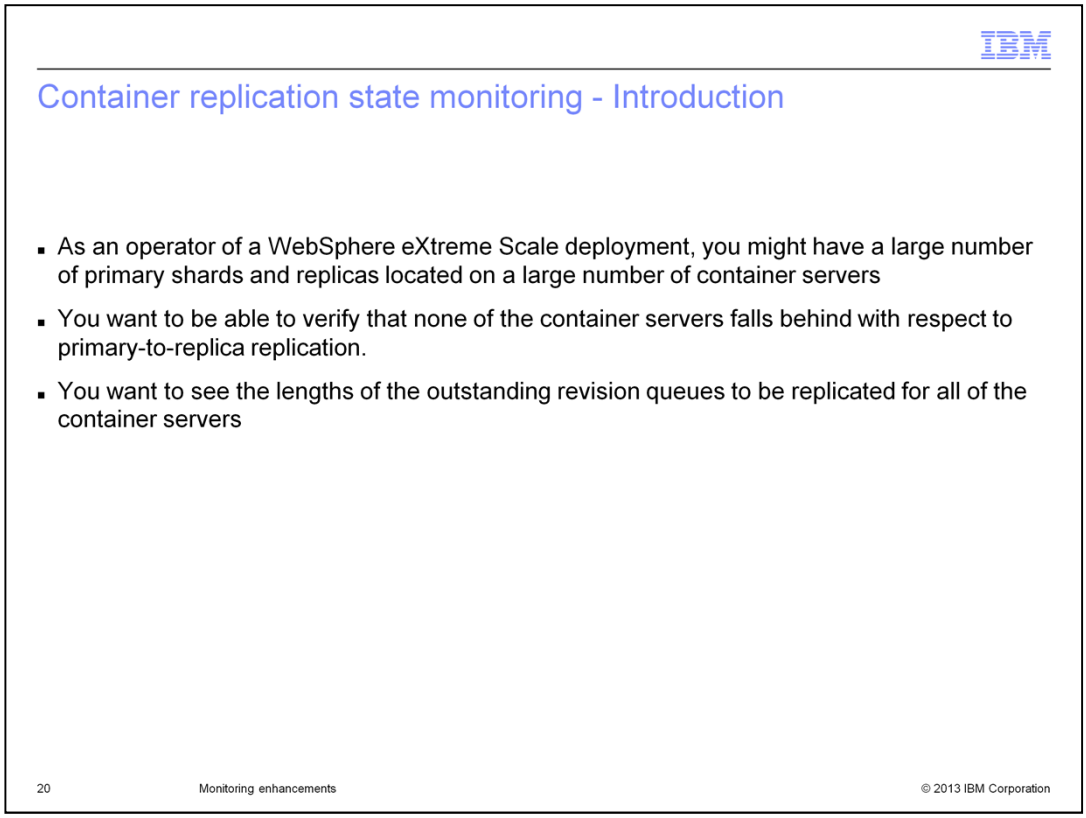
The next slide describes port configuration for the monitoring console.



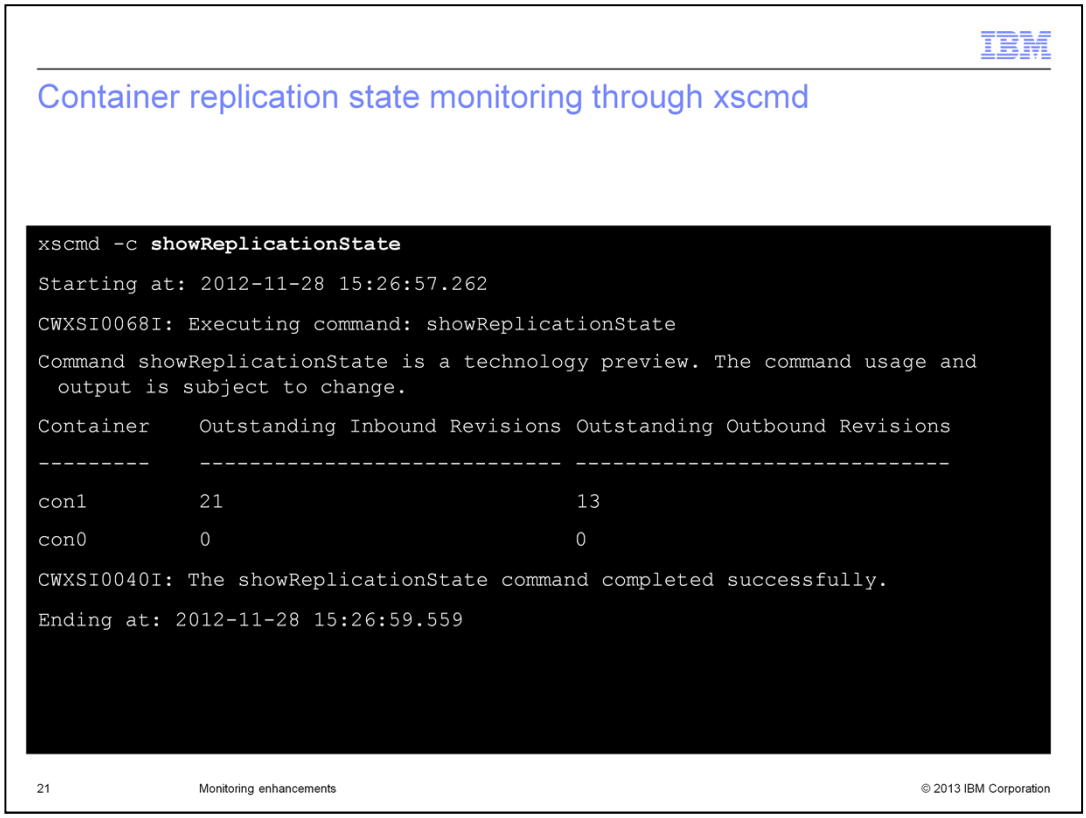
In earlier versions of WebSphere eXtreme Scale, the monitoring console uses default HTTP and HTTPS ports that are not easily configured. In version 8.6, you can specify the ports that the monitoring console binds to during startup. Under the main Settings menu item, go to the Configuration panel. The 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.



The next section covers replication state monitoring.

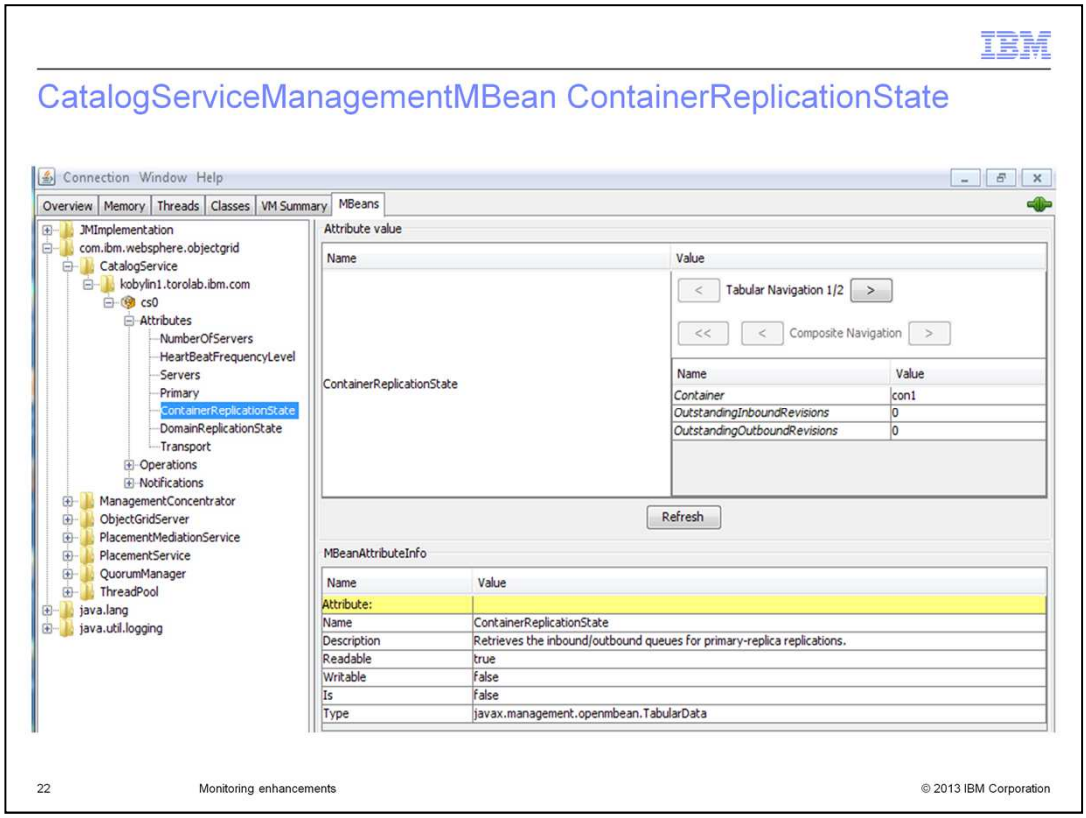


A common task for WebSphere eXtreme Scale operators is to check how far behind the replica shards are from their primary shard counterparts. This distance between a primary and its replica represents the number of entries that might be lost during a failover. It is called the outstanding revision queue.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

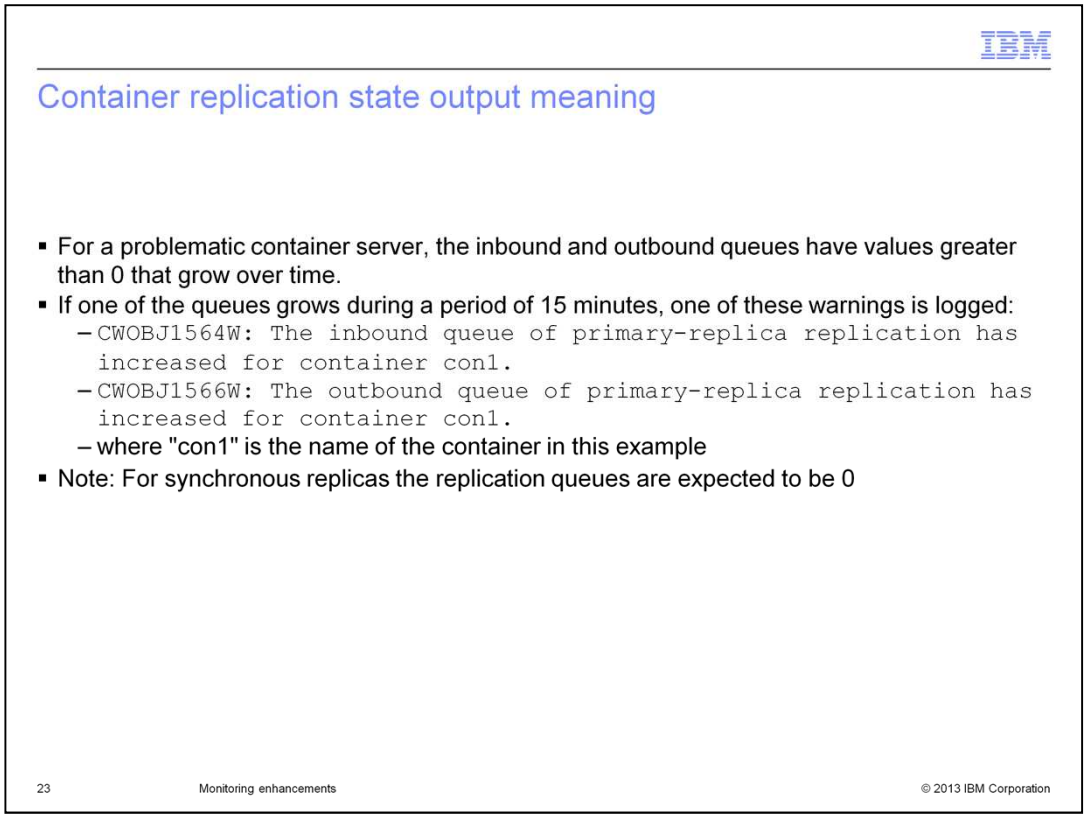


In version 8.6, the xscmd utility offers a new command, showReplicationState. This command allows you to view the outstanding revision queues, per container, in order to determine the overall replication health.

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.

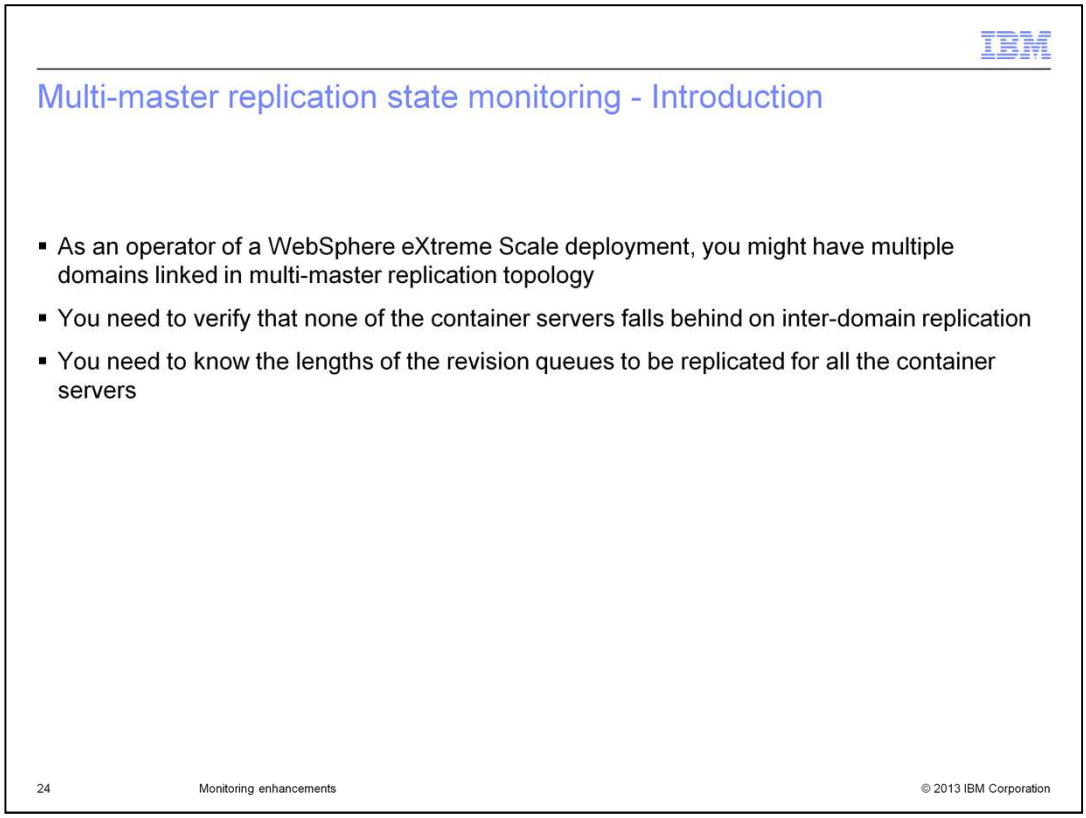


The data provided by the showReplicationState command can also be retrieved programmatically using the new ContainerReplicationState attribute of the CatalogServiceManagementMBean. In the screen capture, jconsole, which comes with the Java Development Kit, is used to show you the ContainerReplicationState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

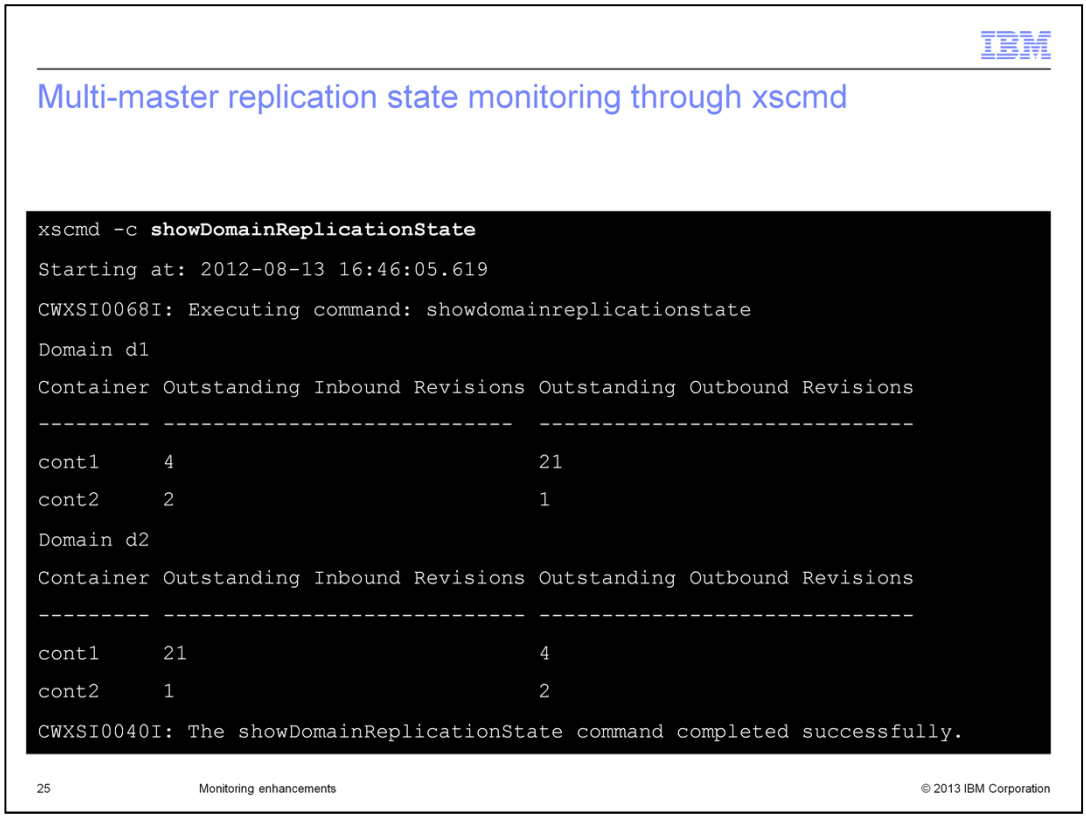


You can identify a problematic container by watching the outstanding revision queue values over time. Values that are greater than 0 might be normal for your environment and work load. They only become a concern if they continue to grow over time. Outstanding revision queue growth over time indicates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

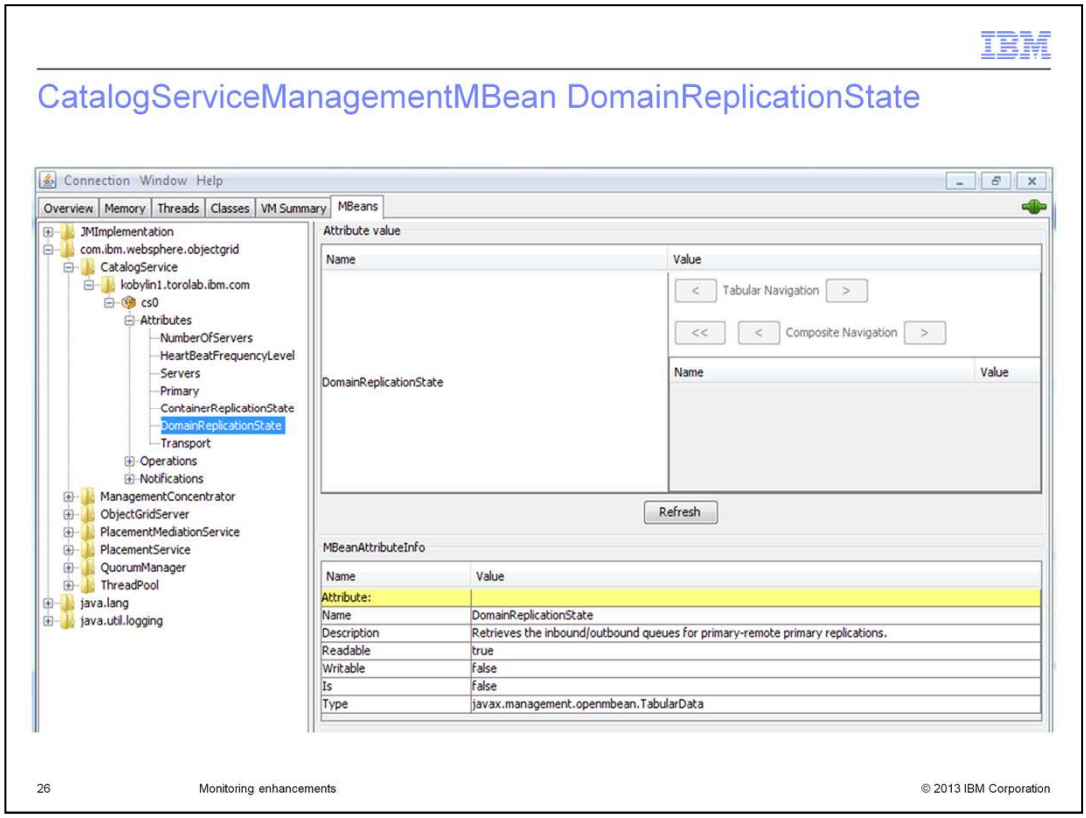
If any queue grows continuously over a period of 15 minutes, a warning message is sent to the message center.



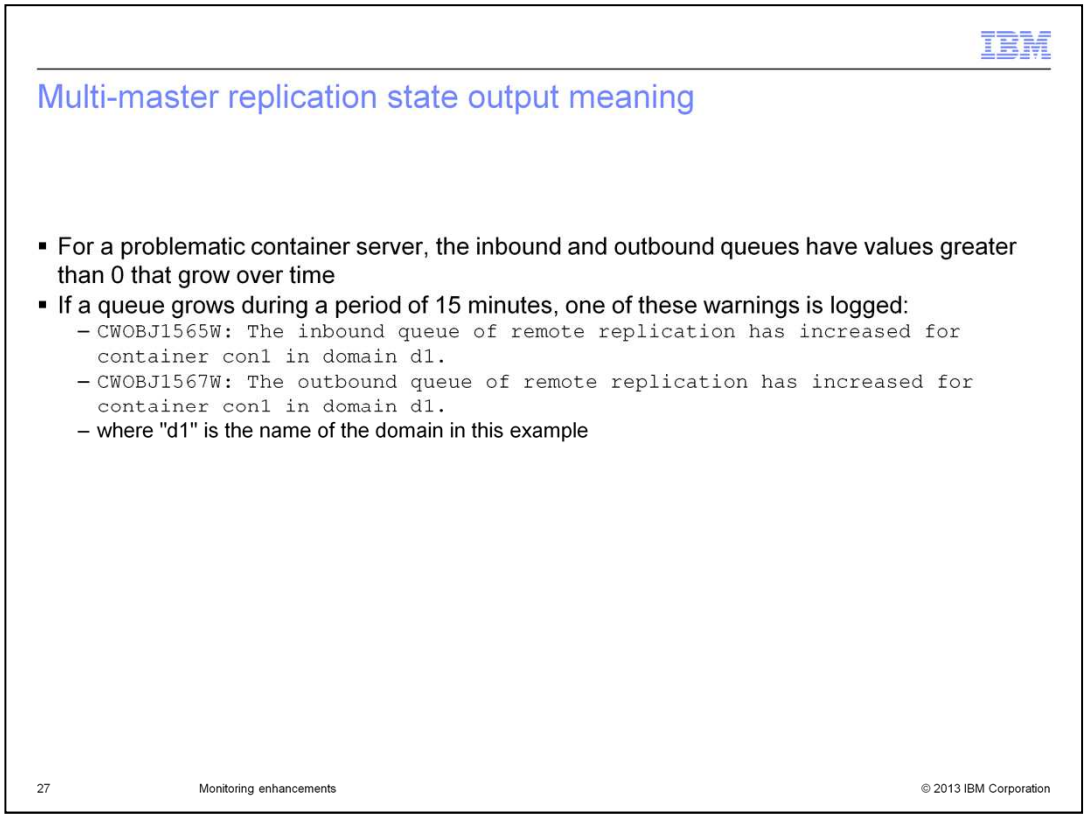
When dealing with multi-master replication environments, WebSphere eXtreme Scale operators need to check how far behind replication is for container servers between linked domains.



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.

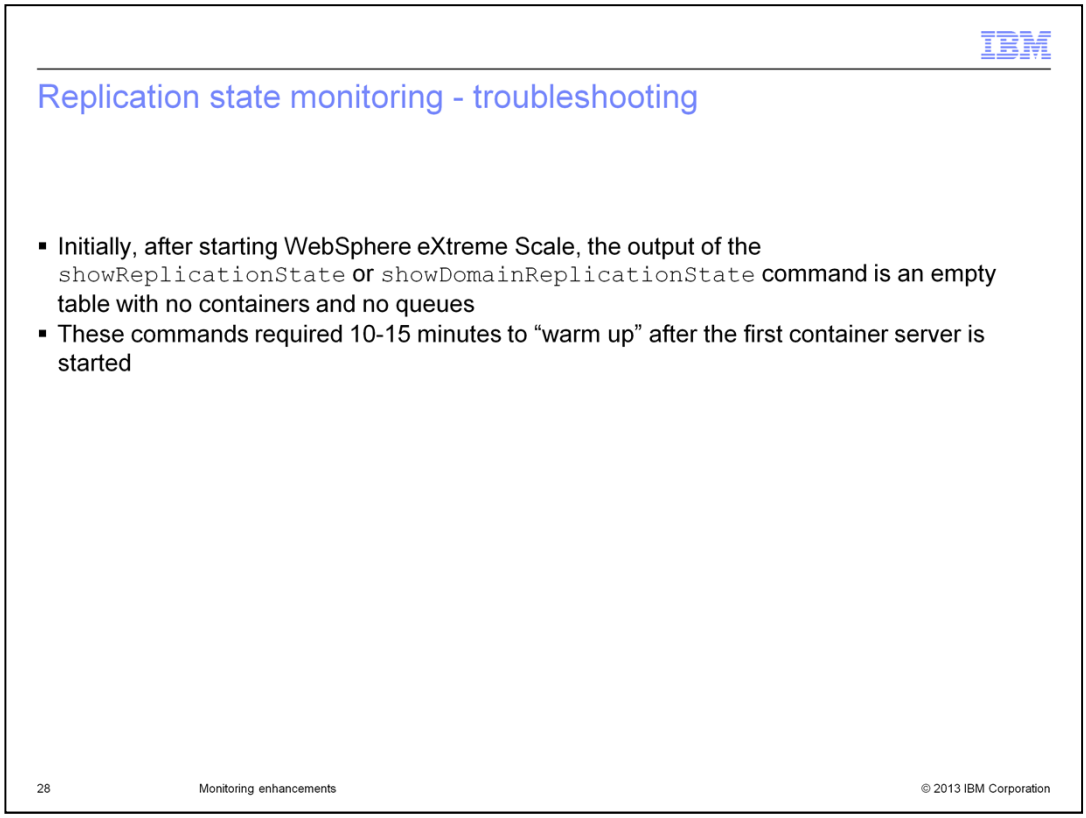


The data provided by the showDomainReplicationState command can also be retrieved programmatically using the new DomainReplicationState attribute of the CatalogServiceManagementMBean. In the screen capture, jconsole, which comes with the Java Development Kit, is used to show you the DomainReplicationState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

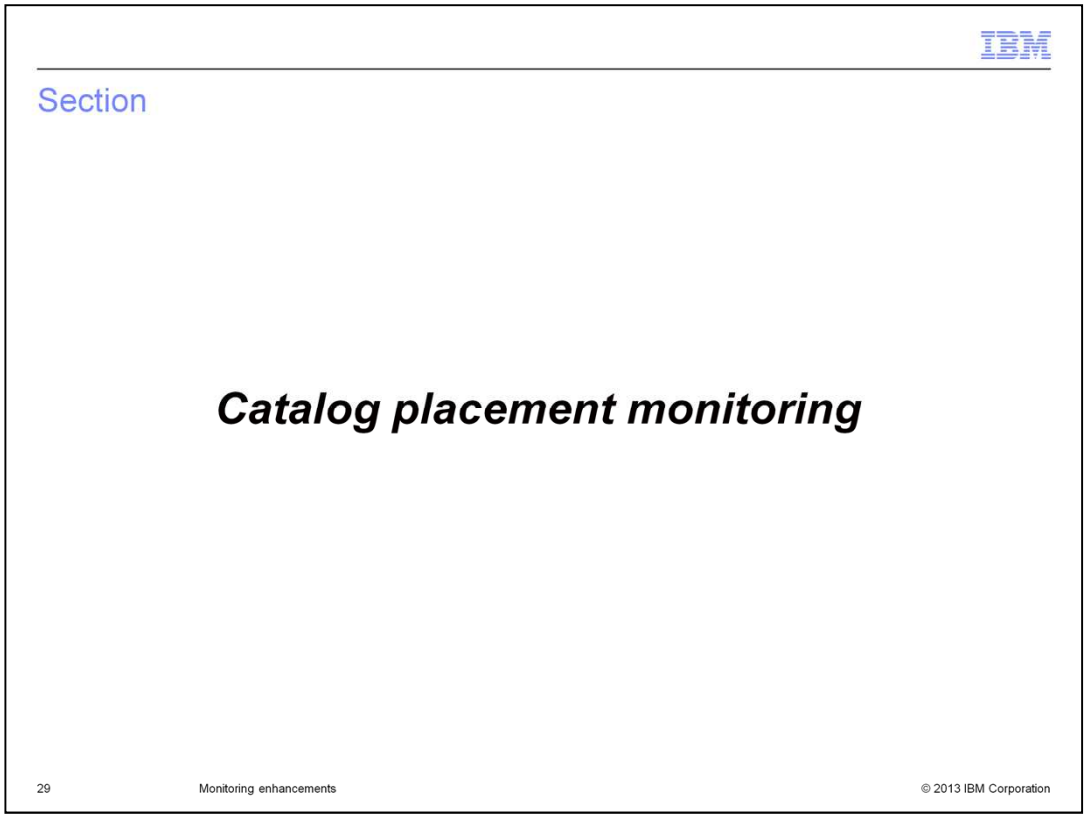


You can identify a problematic linked container by watching the results of the showDomainReplicationState command over time. Queues that are greater than 0 can be normal for your environment and work load. It only becomes a concern if the queue numbers continue to grow over time. Outstanding revision 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.

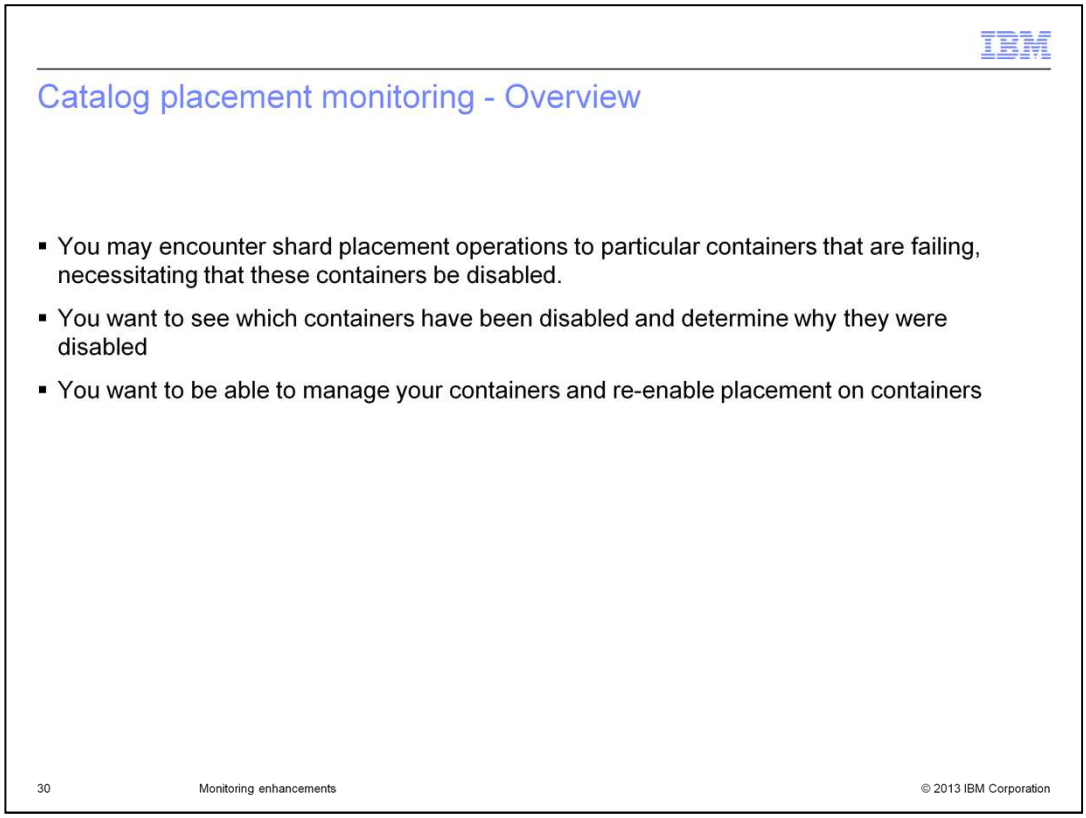
If any queue grows continuously over a period of 15 minutes a warning is logged in the message center.



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.

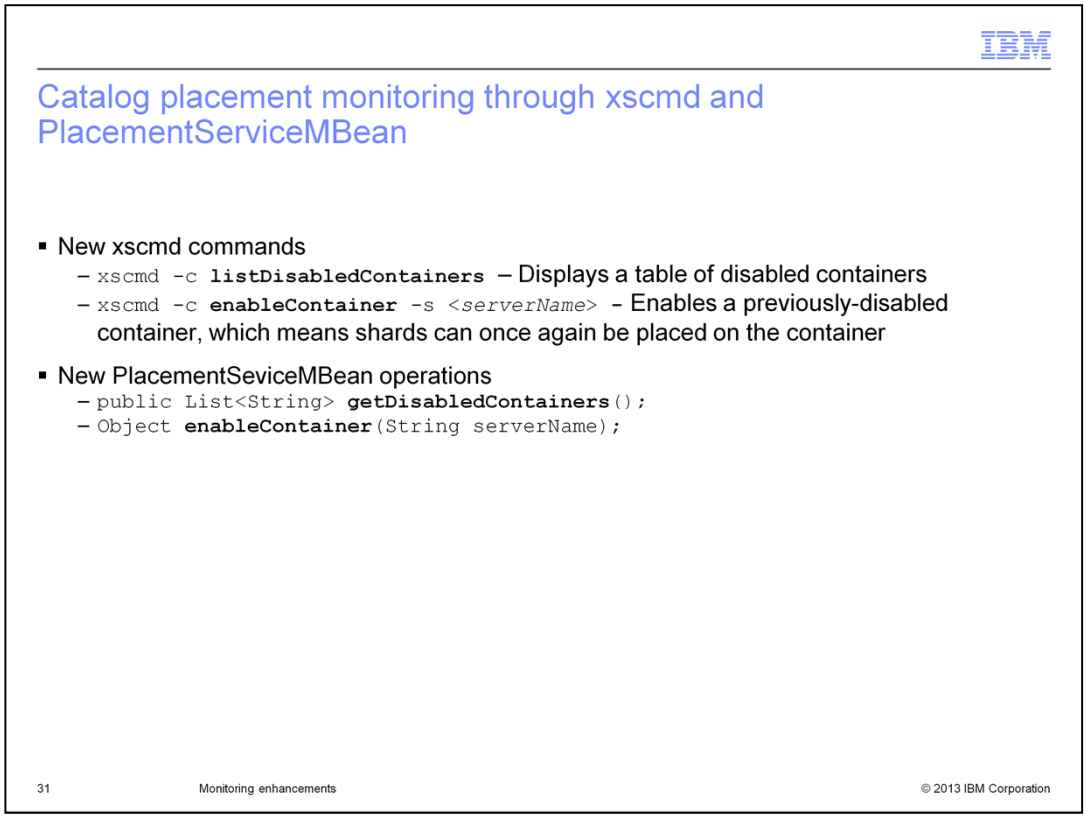


The next section discusses the catalog placement monitoring.



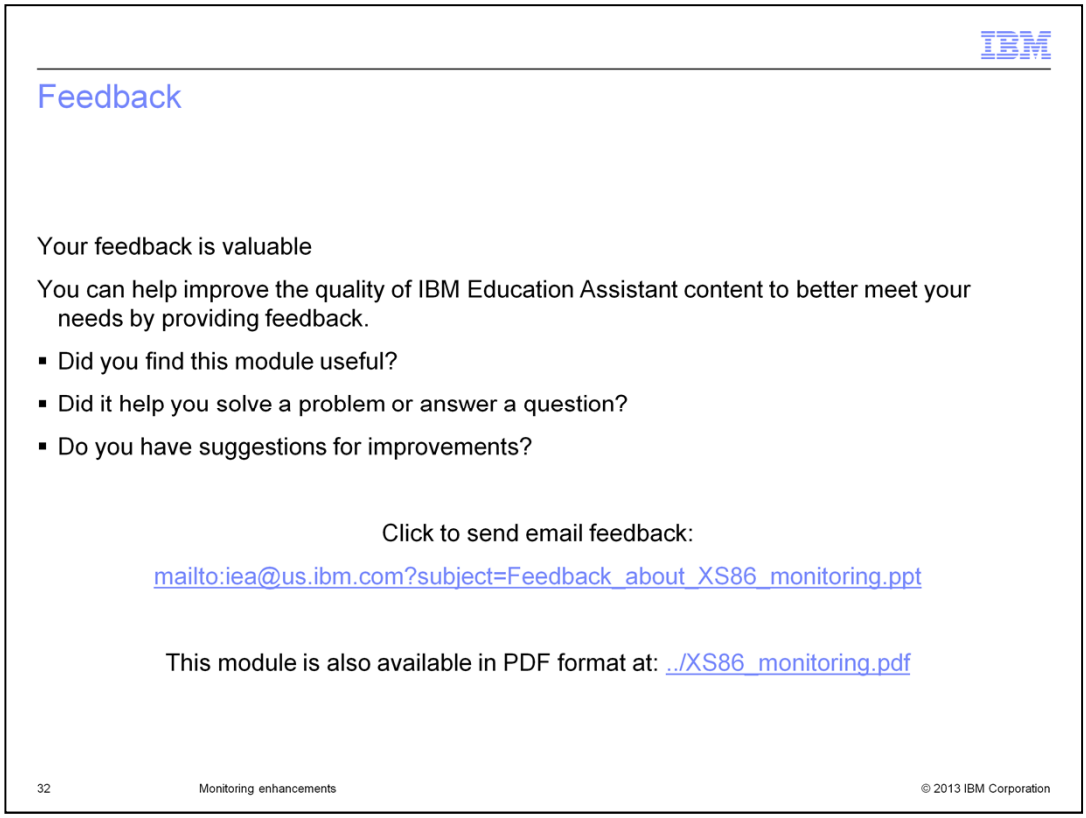
If shard placement operations to a particular container are failing, that container can be disabled and pulled out of the pool of containers available for shard placement. Then you need to view the list of containers that are disabled and, for each disabled container, determine the issue, fix it, and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



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.



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