

Designing, Implementing, and Managing IBM MQ V9 Clusters

WM253 (Classroom)

Course description

This course prepares you to plan, design, configure, and administer IBM MQ clusters.

After a review of IBM MQ, the course explains the similarities and differences between administration of a cluster and administration of a distributed message IBM MQ environment. You learn cluster specific commands and procedures, and explore the role of a cluster in a highly available IBM MQ infrastructure. You learn how to do a detailed verification of a new cluster configuration, review and identify all resulting components, and troubleshoot problems.

You also learn about cluster administration, workload balancing, security, and use of publish/subscribe clusters. You learn how to recognize when a problem is due to connection authentication, channel authentication, or object authorizations. You also learn about design options such as overlapping clusters and use of clusters with z/OS queue sharing groups. Many of the considerations in this course are based on actual engagement experiences.

For information about other related courses, see the IBM Training website:

**ibm.com**/training

General information

Delivery method

Classroom

Course level

ERC 1.0

Product and version

IBM MQ version 9

Audience

This course is designed for IBM MQ administrators, architects, application developers, and other professionals who need to understand the design considerations, architectural role, and implementation of IBM MQ clusters.

Learning objectives

After completing this course, you should be able to:

* Describe the basic IBM MQ components
* Identify which IBM MQ objects are used to impact routing in a cluster environment
* Identify who in your organization can impact the health of a cluster and the need for adequate communication
* Describe the correct role of a cluster in a highly available IBM MQ infrastructure
* Describe the differences and similarities between administering clustered and non-clustered IBM MQ environments
* Describe how to configure, verify, and troubleshoot an IBM MQ cluster
* Identify the various channels that are present in a cluster environment and how each is created
* Describe how to use separate transmission queues in a clustered queue manager
* Explain how to remove a queue manager from a cluster on a permanent or temporary basis
* Explain IBM MQ connection authentication
* Explain IBM MQ channel authentication
* Describe IBM MQ object authorizations
* Explain how to troubleshoot security challenges in a cluster
* List ways to influence workload balancing in a cluster
* Describe the history and basic components of IBM MQ publish/subscribe
* Explain the considerations and details of implementing publish/subscribe in an IBM MQ clustered environment
* Describe cluster design architectural considerations
* Summarize the benefits of design and configuration simplicity in a cluster implementation
* Explain how to configure overlapping clusters

Prerequisites

Before taking this course, you should have experience with IBM MQ or complete one of the following courses:

* *IBM MQ V9 System Administration (using Windows for labs)* (WM153G)
* *IBM MQ V9 System Administration (using Linux for labs)* (WM154G)
* *IBM MQ V8 System Administration for z/OS* (WM302G)

You should also have working knowledge of the Windows operating system to run the lab exercises.

Duration

2.5 days

Skill level

Intermediate

Notes

The following unit and exercise durations are estimates, and might not reflect every class experience. If the course is customized or abbreviated, the duration of unchanged units will probably increase.

This course is an update of the following previous course:

* WM252: *Designing, Implementing, and Managing IBM MQ V8 Clusters*

Course agenda

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| Course introduction  Duration: 15 minutes |

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| Unit 1. IBM MQ baseline  Duration: 1 hour and 30 minutes | |
| Overview | This unit provides a review of IBM MQ topics. Where appropriate, it describes how administration of a cluster resembles regular unclustered IBM MQ administration. The unit also establishes a base for later topics, and identifies areas that might require extra considerations for clusters. |
| Learning objectives | After completing this unit, you should be able to:   * Summarize the IBM MQ components * Describe the role of a queue manager * Describe an IBM MQ message * Describe queues and identify what types of queues hold messages * Describe the IBM MQ procedural application programming interface * Describe precedence between queue and API attributes * Distinguish among the various types of IBM MQ channels * Explain how a channel is started by using triggering * Describe the trajectory of a message that uses distributed message channels * Identify IBM MQ troubleshooting resources * Describe queue name resolution in a distributed message channel environment * Distinguish between the point-to-point and publish-subscribe messaging styles * Explain the impact of IBM MQ design and development considerations * Introduce an IBM MQ cluster * Explain IBM MQ Shared Queues |

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| Exercise 1. Configuring and reviewing base IBM MQ resources  Duration: 1 hour | |
| Overview | In this exercise, you define and start the queue managers that are used in the cluster implementation lab. You also establish distributed two-way connectivity between two of the queue managers in the cluster in preparation for setting up a cluster gateway. |
| Learning objectives | After completing this exercise, you should be able to:   * Define and start IBM MQ queue managers * Establish two-way distributed message channels between two queue managers * Examine the channel status * Locate the IBM MQ queue manager logs and the dead letter queue * Describe the queue manage cluster repository process |

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| Unit 2. Before you start  Duration: 30 minutes | |
| Overview | This unit provides guidelines that are derived from actual engagement experiences to help with planning, design, implementation, and administration of a successful IBM MQ cluster environment. The unit emphasizes the role of cross organizational communication in the success of the cluster. |
| Learning objectives | After completing this unit, you should be able to:   * Identify who in an organization impacts a cluster * Describe the details that must be considered before designing and implementing a cluster * Contrast the effort that is required to implement a cluster with distributed administration * Identify the role of a cluster in a highly available IBM MQ infrastructure * Describe workload management considerations * Explain key considerations to observe as an IBM MQ administrator when introducing clusters to the environment |

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| Unit 3. Understanding and implementing an IBM MQ cluster  Duration: 1 hour and 30 minutes | |
| Overview | In this unit, you review the components of a cluster. You then learn how to implement a basic cluster, verify its configuration, and resolve any problems. You also learn how to configure a cluster gateway. |
| Learning objectives | After completing this unit, you should be able to:   * Review a basic IBM MQ cluster * Describe the components that support an IBM MQ cluster * Distinguish between the definitions that are required to set up a cluster and distributed message channel definitions * Describe how to implement a basic IBM MQ cluster * Explain how to verify a new cluster configuration * Describe how to add queues to a cluster * Describe the trajectory of a message that uses a basic cluster * Explain how to set up a cluster gateway by configuring a queue manager external to the cluster to route messages to cluster queues * Summarize the administrative options that can be used to manage a cluster |

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| Exercise 2. Implementing and verifying a cluster, cluster queues, and a cluster gateway  Duration: 1 hour and 30 minutes | |
| Overview | In this exercise, you implement a basic cluster. As you incorporate extra queue managers, you verify that each addition is successful by using the DIS CLUSQMGR incrementally. As you review the displayed information, you learn the differences in the dynamically generated CLUSSDRA or CLUSSDRB channels. You also learn how to implement a cluster gateway, and how to do a simple workload distribution baseline. |
| Learning objectives | After completing this exercise, you should be able to:   * Describe the MQSC commands that are used to create an IBM MQ cluster * Implement an IBM MQ cluster by using MQSC commands * Use the DIS CLUSQMGR command to verify a new cluster by identifying the channel types, status, and repository type * Create cluster queues * Identify problems that are found in the cluster * Observe the cluster "need-to-know basis" behavior by using the DIS QCLUSTER command from a partial configuration queue manager before any messages are exchanged * Configure and test a cluster gateway * Send messages from a queue manager external to the cluster, to a cluster gateway queue manager * Baseline default message workload distribution |

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| Unit 4. Cluster administration tasks and commands  Duration: 1 hour | |
| Overview | This unit highlights similarities and differences in administering IBM MQ with and without clusters. You learn about the documented processes to accomplish various cluster specific tasks, and the MQSC commands that are used in the cluster administration processes. |
| Learning objectives | After completing this unit, you should be able to:   * Summarize the similarities and differences in administering IBM MQ with and without clusters * Describe the cluster specific MQSC administration commands * List the predefined procedures that are available to complete cluster tasks * Describe how to create a cluster queue manager that uses separate transmission queues * Describe the process that is used to remove a cluster queue from a queue manager * Describe the process that is used to remove a cluster member queue manager from the cluster * Describe the process that is used to move a full repository to a different cluster queue manager * Explain how to add a queue-sharing group to an existing cluster * Explain how to use the IBM MQ Explorer equivalent cluster capabilities to complete selected cluster administrative tasks * Describe how to use selected IBM MQ utilities to work with cluster tasks |

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| Exercise 3. Working with cluster administration tasks  Duration: 1 hour and 30 minutes | |
| Overview | In this exercise, you follow processes to accomplish selected cluster administration tasks. As part of the tasks, you use various cluster specific administration commands. |
| Learning objectives | After completing this exercise, you should be able to:   * Add a queue manager that uses a separate transmission queue to the cluster * Inhibit use of a queue manager by using the SUSPEND command * Contrast the results and possible actions that are required by the various SUSPEND modes * Describe how some actions that you take to administer cluster message channels resemble actions that you take to administer distributed message channels * Restore use of a suspended queue manager by using the RESUME command * Remove a queue manager from the cluster by using the RESET command * Use the REFRESH CLUSTER command and review the entries that are generated in the queue manager log for this command * Describe IBM MQ Explorer cluster administration capabilities |

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| Unit 5. IBM MQ security and clusters  Duration: 1 hour | |
| Overview | This unit teaches connection authentication, channel authentication, and object authentication, and the similarities of managing these security mechanisms for a cluster. The unit includes special considerations for the security mechanisms and considerations to observe when introducing SSL/TLS to a cluster environment. You also learn how to troubleshoot connection authentication, channel authentication, and object authorization problems. |
| Learning objectives | After completing this unit, you should be able to:   * Summarize security areas and terminology * Describe IBM MQ connection authentication * Identify the IBM MQ connection authentication initial settings in a new queue manager * Explain how to modify connection authentication and respond to the new settings * Describe channel authentication and the types of channel authentication records * Describe the channel authentication initial default settings and rules in a new queue manager * Explain channel authentication rule precedence * Describe the channel authentication back-stop rule * Explain how to set, change, and remove channel authentication records * List considerations to observe for a successful channel authentication implementation * Describe IBM MQ object authorizations * Explain how to use the dspmqaut and setmqaut control commands to display and grant object authorizations * Explain how to use the IBM MQ script commands DISPLAY AUTHREC and SET AUTHREC to display and grant object authorizations * Differentiate when to use the object authorization control commands, and when to use the object authorization IBM MQ script commands. |

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| Exercise 4. Working with IBM MQ security  Duration: 2 hours | |
| Overview | In this exercise, you harden connection and channel authentication. You learn how to review the queue manager log to determine the correct security challenge to resolve. You then learn how to mitigate channel authentication challenges by setting channel authentication rules. You also learn how to adequately invoke commands in a queue manager with required connection authentication. |
| Learning objectives | After completing this exercise, you should be able to:   * Review the commands that are used to harden connection authentication and channel authentication * Harden connection authentication and channel authentication in a queue manager * Create a type ADDRESSMAP channel authentication record to allow a specific queue manager to connect to a queue manager with strict channel authentication * Differentiate between connection authentication and channel authentication entries in the queue manager log * Create a type QMGRMAP channel authentication record to allow the cluster member queue managers to interact with a cluster queue manager with strict channel authentication * Invoke the runmqsc utility with credentials to access a queue manager with required connection authentication * Use the dspmqaut and setmqaut control commands to display and set object authorities * Use the MQSC DISPLAY AUTHREC and SET AUTHREC commands to display and set object authorities * Use control commands in a queue manager with required connection authentication |

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| Unit 6. Influencing workload balancing behavior  Duration: 1 hour | |
| Overview | This unit describes capabilities that can change the base workload balancing in a clustered environment. |
| Learning objectives | After completing this unit, you should be able to:   * Describe the factors to consider before altering base workload management * Explain when cluster workload management takes place * Summarize the cluster workload management algorithm * Explain how to identify and remove message affinities that negatively impact load balancing * Describe how to use various queue attributes to influence load balancing * Describe how to use various channel attributes to influence load balancing * Describe how to use the queue manager properties to influence load balancing * Describe when and how to use a customized workload balancing exit |

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| Exercise 5. Working with workload balancing options  Duration: 1 hour and 30 minutes | |
| Overview | This exercise starts by setting up and testing a round robin message distribution of messages in a cluster. You then use queue, channel, and queue manager options to influence the distribution of messages. |
| Learning objectives | After completing this exercise, you should be able to:   * Send messages to cluster queues by using round robin distribution * Use channel priority to influence the cluster workload * Use channel weights to influence the cluster workload * Use the queue manager to influence the cluster workload |

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| Unit 7. Publish/subscribe and clusters  Duration: 1 hour | |
| Overview | This unit teaches you how to work with the publish/subscribe messaging style. After an introduction to the history of publish/subscribe, you learn key terminology that refers to the co-existing publish/subscribe capabilities. The unit continues with a description of the publish/subscribe components, and concludes with an explanation of the options that can be implemented for a clustered publish/subscribe environment. |
| Learning objectives | After completing this unit, you should be able to:   * Differentiate between publish/subscribe and point-to-point messaging * Summarize how the history of publish/subscribe influences its functions and terminology * Identify the basic components of publish/subscribe * Describe key properties of topics, subscriptions, and publications * Describe the publish/subscribe cluster topologies * Explain how to configure a direct routing publish/subscribe cluster * Explain how to configure a topic host routing publish/subscribe cluster |

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| Exercise 6. Configuring a publish/subscribe cluster  Duration: 1 hour | |
| Overview | In this exercise, you work with publish/subscribe clusters and learn how to verify the path of the messages. |
| Learning objectives | After completing this exercise, you should be able to:   * Create a cluster topic and review its status * Create subscriptions and publications to a topic * Use the dspmqrte tool to identify the path of a message in the publish/subscribe cluster * Configure and verify topic host routing |

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| Unit 8. Cluster design considerations  Duration: 30 minutes | |
| Overview | This unit covers complex cluster design and implementation options such as overlapping clusters and overlapping cluster gateways. |
| Learning objectives | After completing this unit, you should be able to:   * Summarize environmental factors that might hinder the effectiveness of a complex cluster implementation * Describe techniques to consider when dividing a large organization of systems * Explain how to distinguish among classes of service when designing a clustering solution * Explain how to define and manage an overlapping cluster * Describe how to define a cluster gateway in an overlapping cluster environment |

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| Exercise 7. Configuring an overlapping cluster  Duration: 1 hour | |
| Overview | In this exercise, you work with the implementation and verification of overlapping clusters. |
| Learning objectives | After completing this exercise, you should be able to:   * Implement overlapping clusters * Verify and test the overlapping clusters |

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| Unit 9. Course summary  Duration: 15 minutes | |
| Overview | This unit summarizes the course and provides information for future study. |
| Learning objectives | After completing this unit, you should be able to:   * Explain how the course met its learning objectives * Access the IBM Training website * Identify other IBM Training courses that are related to this topic * Locate appropriate resources for further study |

For more information

To learn more about this course and other related offerings, and to schedule training, see **ibm.com**/training

To learn more about validating your technical skills with IBM certification, see **ibm.com**/certify