

IBM App Connect Enterprise V11 Application Development

WM668 (Classroom)

ZM668 (Self-paced)

Course description

IBM App Connect Enterprise provides connectivity and universal data transformation in heterogeneous IT environments. It enables businesses of any size to eliminate point-to-point connections and batch processing, regardless of operating system, protocol, and data format.

This course teaches you how to use IBM App Connect Enterprise to develop, deploy, and support message flow applications. These applications use various messaging topologies to transport messages between service requesters and service providers, and allow the messages to be routed, transformed, and enriched during processing.

In this course, you learn how to construct applications to transport and transform data. The course explores how to control the flow of data by using various processing nodes, and how to use databases and maps to transform and enrich data during processing. You also learn how to construct data models by using the Data Format Description Language (DFDL).

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

**ibm.com**/training

General information

Delivery method

Classroom or self-paced virtual classroom (SPVC)

Course level

ERC 1.0

Product and version

IBM App Connect Enterprise V11

Audience

This course is designed for experienced integration specialists and senior-level developers with experience in application development, messaging middleware applications, and transport protocols such as HTTP and FTP.

Learning objectives

After completing this course, you should be able to:

* Describe the features and uses of IBM App Connect Enterprise
* Develop, deploy, and test message flow applications
* Generate message flow applications from predefined patterns
* Use the IBM App Connect Enterprise Toolkit problem determination aids to diagnose and solve development and runtime errors
* Describe the function and appropriate use of IBM App Connect Enterprise processing nodes
* Write basic Extended Structured Query Language and Java programs to transform data
* Use the IBM Graphical Data Mapping editor to transform data
* Define, use, and test simple XML and Data Format Description Language (DFDL) data models
* Describe supported transport protocols and how to call them in message flows

Prerequisites

Before taking this course, you should have:

* A basic understanding of current IT technologies such as Structured Query Language (SQL), Extensible Markup Language (XML), Java, and XML Path language (XPath)
* A familiarity with the Eclipse development environment
* A basic understanding of transport protocols such as HTTP and FTP, and message-oriented middleware such as Java Message Service (JMS) and IBM MQ

Duration

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 courses:

* WM666 and ZM666, *IBM App Connect Enterprise V10 Application Development I*

Course agenda

|  |
| --- |
| Course introduction  Duration: 15 minutes |

|  |  |
| --- | --- |
| Unit 1. Introduction to IBM App Connect Enterprise  Duration: 1 hour | |
| Overview | This unit introduces IBM App Connect Enterprise, including its components, functions, and business value. The unit also summarizes the options for extending IBM App Connect and the migration path for WebSphere Enterprise Service Bus applications. |
| Learning objectives | After completing this unit, you should be able to:   * Describe the features and functions of IBM App Connect Enterprise * Describe the business value of IBM App Connect Enterprise * Describe the IBM App Connect architecture and components * Identify the IBM App Connect editions |

|  |  |
| --- | --- |
| Unit 2. Application development fundamentals  Duration: 1 hour and 30 minutes | |
| Overview | This unit describes the IBM App Connect components and how they work together. You also learn how to import and export resources into the IBM App Connect development environment, view the message processing node properties, and test the message flow by using the IBM App Connect Flow exerciser. |
| Learning objectives | After completing this unit, you should be able to:   * Describe how IBM App Connect does basic message processing * Describe the components of a message flow application and message processing nodes * Describe the basic structure of a logical message tree * Use patterns as a starting point for developing message flow applications * Import resources to and export resources from the IBM App Connect Toolkit * Use the IBM App Connect Toolkit Flow exerciser to test a message flow application * Use the IBM App Connect Toolkit to check the status of the integration node, integration server, and message flow application |

|  |  |
| --- | --- |
| Exercise 1. Importing and testing a message flow  Duration: 30 minutes | |
| Overview | This exercise introduces you to the IBM App Connect development environment. To become familiar with the IBM App Connect Enterprise Toolkit views and navigator, you import a simple message flow project and examine the message flow components and properties. You also use the IBM App Connect Enterprise Toolkit Flow exerciser to test the message flow. Before importing the message flow, you create and start an integration server. |
| Learning objectives | After completing this exercise, you should be able to:   * Create and start an integration server * Import an IBM App Connect project interchange file * Use the Message Flow editor to examine the message flow components and properties * Test the message flow by using the IBM App Connect Toolkit Flow exerciser |

|  |  |
| --- | --- |
| Unit 3. Creating message flow applications  Duration: 1 hour and 30 minutes | |
| Overview | In this unit, you learn how to manually define an IBM App Connect application. You learn how to add and connect message flow nodes, define message flow node properties, and test the message flow application. You also learn how to use the IBM App Connect Enterprise web user interface to monitor the integration node, integration server, and message flow application at run time. |
| Learning objectives | After completing this unit, you should be able to:   * Create a message flow application * Add nodes to a message flow * Package and deploy message flow applications and resources * Use the IBM App Connect Enterprise web user interface to monitor the integration node, integration server, and message flow |

|  |  |
| --- | --- |
| Exercise 2. Creating a message flow application  Duration: 1 hour | |
| Overview | In this exercise, you create a simple message flow application, and use the IBM Integration Flow exerciser to test it. You also use the IBM App Connect Enterprise web user interface to check the status of the integration node, integration server, and message flow application at run time. |
| Learning objectives | After completing this exercise, you should be able to:   * Create a message flow application * Use the IBM Integration Flow exerciser to test the message flow application * Use the IBM App Connect Enterprise web user interface to check the status of the integration node, integration server, and message flow application at run time |

|  |  |
| --- | --- |
| Unit 4. Connecting to IBM MQ  Duration: 1 hour and 30 minutes | |
| Overview | In this unit, you learn how to process IBM MQ messages in a message flow. You also learn about the connection and topology options for IBM MQ. |
| Learning objectives | After completing this unit, you should be able to:   * Describe the IBM MQ connection options * Examine the properties of the IBM MQ nodes * Predict the location of the message if a runtime error is encountered during message flow processing * Use an MQEndpoint policy to control the values of IBM MQ node connection properties at run time * Use tools to test a message flow that connects to IBM MQ |

|  |  |
| --- | --- |
| Exercise 3. Connecting to IBM MQ  Duration: 1 hour and 30 minutes | |
| Overview | In this exercise, you create an IBM MQ queue manager and IBM App Connect Enterprise integration nodes that use the same queue manager as the default queue manager. Next, you create and test a simple flow that gets a message from an input queue and puts a message to an output queue. Finally, you test that the workload is evenly distributed between the integration nodes by sharing a queue manager and putting multiple messages to the input queue. |
| Learning objectives | After completing this exercise, you should be able to:   * Create an integration node that uses a default IBM MQ queue manager * Share a default IBM MQ queue manager with multiple integration nodes * Create a message flow that gets a message with an MQInput node and puts a message with an MQOutput node * Edit a BAR file * Manually deploy a BAR file * Verify that the integration nodes that share a queue manager also share the workload |

|  |  |
| --- | --- |
| Unit 5. Controlling the flow of messages  Duration: 1 hour | |
| Overview | In this unit, you learn about message processing nodes that are used to control the flow of a message. |
| Learning objectives | After completing this unit, you should be able to:   * Describe logical messages and the message assembly, and explain how they are used in IBM App Connect application programming * Use the Filter and Route message processing nodes to examine the contents of a message and alter its flow * Use the RouteToLabel and Label nodes to dynamically change the routing of messages * Use the FlowOrder node to control the flow path order in which a message is processed through a message flow * Create reusable subflows |

|  |  |
| --- | --- |
| Exercise 4. Adding flow control to a message flow application  Duration: 1 hour | |
| Overview | In this exercise, you add a Route node to a message flow to route the message based on the message content. You also wire the Failure terminal to handle exceptions. |
| Learning objectives | After completing this exercise, you should be able to:   * Use the Route node to control message processing * Use the XPath Expression Builder to define a filter pattern * Create custom output terminals on the Route node * Connect a Failure terminal to an output node to capture exceptions * Test the message flow by importing messages into the IBM App Connect Toolkit Flow exerciser |

|  |  |
| --- | --- |
| Unit 6. Modeling the data  Duration: 1 hour and 30 minutes | |
| Overview | In this unit, you learn about the message modeling options that IBM App Connect provides. The unit concentrates on using DFDL to model the data. |
| Learning objectives | After completing this unit, you should be able to:   * Explain the concepts of message models and how they are used to help message transformation * List the parsers that are available for use within IBM App Connect Enterprise * Create and modify a DFDL model * Use importers to create data models * Choose the appropriate message validation options * Organize and administer message models * Reference message models in message flows |

|  |  |
| --- | --- |
| Exercise 5. Creating a DFDL model  Duration: 1 hour | |
| Overview | In this exercise, you create a DFDL message model schema file in a shared library. The DFDL schema that you create defines a delimited text file. You test the model by using the Test Parse Model and Test Serialize Model options that are provided in the DFDL schema editor. |
| Learning objectives | After completing this exercise, you should be able to:   * Create a DFDL message model schema file in a shared library * Define the logical structure and physical properties of the message model elements * Test a DFDL schema by parsing test input data * Test a DFDL schema by serializing test data to create an output file |

|  |  |
| --- | --- |
| Unit 7. Processing file data  Duration: 1 hour | |
| Overview | In this unit, you learn how to use IBM App Connect to process file data. |
| Learning objectives | After completing this unit, you should be able to:   * Describe the file processing nodes * Describe the record detection options for splitting files into multiple records * Use a file as a message flow source and target * Include file input and output nodes that use File Transfer Protocol (FTP) and secure FTP (SFTP) to transfer data |

|  |  |
| --- | --- |
| Exercise 6. Processing file data  Duration: 1 hour | |
| Overview | In this exercise, you create a message flow that reads an input file that contains many records, and creates a separate IBM MQ message for each record. You also import a library that contains the DFDL message model that defines the input file, and update the application to reference the library. |
| Learning objectives | After completing this exercise, you should be able to:   * Use a FileInput node in a message flow * Configure the FileInput node so that each record in the file is processed as a separate transaction * Reference a library in a message flow application * Use the IBM App Connect Toolkit Flow exerciser to view multiple output messages |

|  |  |
| --- | --- |
| Unit 8. Using problem determination tools and help resources  Duration: 1 hour and 30 minutes | |
| Overview | In this unit, you learn about runtime errors in message flow applications. You learn how IBM App Connect responds to a runtime exception and what happens to the data that is being processed. You also learn how transactions can be coordinated. The unit also introduces some of the tools and techniques that IBM App Connect offers for problem determination and debugging, and how to support explicit error handling within a message flow application. |
| Learning objectives | After completing this unit, you should be able to:   * Use the TryCatch and Throw nodes to implement explicit error handling within a message flow * Describe the structure of the ExceptionList component of the message assembly, and the role it plays in runtime error handling * Use problem determination tools to debug message flows * Understand how to catch exceptions and perform failure checking on nodes in a message flow. * Use help resources to learn more about the product and find information about resolving problems |

|  |  |
| --- | --- |
| Exercise 7. Using problem determination tools  Duration: 1 hour and 30 minutes | |
| Overview | In this exercise, you use various tools and procedures to diagnose runtime errors in message flow applications. You also learn how to add a Trace node to a message flow and customize the Trace node output. |
| Learning objectives | After completing this exercise, you should be able to:   * Enable a user trace and retrieve the collected trace data * Add a Trace node to a message flow application * Use RFHUtil to send test data to a message flow and view messages on an IBM MQ queue * Use the IBM App Connect Toolkit Test Client and message flow debugger view to step through a message flow application * Examine the IBM App Connect logs and system logs to diagnose problems |

|  |  |
| --- | --- |
| Exercise 8. Implementing explicit error handling  Duration: 1 hour and 30 minutes | |
| Overview | In this exercise, you implement message processing nodes that control the paths that messages take in a message flow. You also write a general-purpose subflow to handle errors that occur during message processing. |
| Learning objectives | After completing this exercise, you should be able to:   * Implement a generic error handling routine in the form of a subflow * Use a ResetContentDescriptor node to force the message to be reparsed according to the parser domain that is specified in the node properties * Use the TryCatch node to provide a special handler for exception processing |

|  |  |
| --- | --- |
| Unit 9. Mapping messages with the Graphical Data Mapping editor  Duration: 1 hour | |
| Overview | In this unit, you learn how to use the Graphical Data Mapping editor to create and edit graphical data maps. |
| Learning objectives | After completing this unit, you should be able to:   * Use the Graphical Data Mapping editor to map logical messages * Run message maps within message flows |

|  |  |
| --- | --- |
| Unit 10. Referencing a database in a message flow application  Duration: 1 hour | |
| Overview | In this unit, you learn about the database functions and nodes in IBM App Connect Enterprise. You also learn about defining a database service for database assets. |
| Learning objectives | After completing this unit, you should be able to:   * Use database message processing nodes to modify messages and control message processing * Configure database nodes to access user databases * Describe the differences between ESQL and SQL SELECT * Create a database definition file |

|  |  |
| --- | --- |
| Exercise 9. Referencing a database in a map  Duration: 1 hour and 30 minutes | |
| Overview | In this exercise, you use a Database node in a message flow to store a message in a database. You also import a COBOL Copybook and XML schema to create a data model and use the Graphical Data Mapping editor to transform the message. |
| Learning objectives | After completing this exercise, you should be able to:   * Create a shared library that contains data models that describe the input and output data * Import a COBOL Copybook to create a DFDL schema file * Reference a shared library in a message flow application * Discover database definitions * Define database connectivity * Add a Database node to a message flow * Create the logic to store a message in a database * Use the Graphical Data Mapping editor to map message elements * Reference an external database when mapping message elements |

|  |  |
| --- | --- |
| Unit 11. Using Compute nodes to transform messages  Duration: 2 hours | |
| Overview | This unit introduces programming options that are available in IBM App Connect for transforming and enriching data. It concentrates on the use of ESQL (Extended Structured Query Language) and Java. |
| Learning objectives | After completing this unit, you should be able to:   * Use the Compute node and ESQL to transform messages * Use the JavaCompute node and Java to transform messages |

|  |  |
| --- | --- |
| Exercise 10. Transforming data by using the Compute and JavaCompute nodes  Duration: 1 hour and 30 minutes | |
| Overview | In this exercise, you create a message flow application that uses ESQL and a Compute node or Java and a JavaCompute node to transform message content. As part of the exercise, you choose to create one or the other. If time permits, you can choose to implement both. |
| Learning objectives | After completing this exercise, you should be able to:   * Use a Compute node or JavaCompute node in a message flow application to transform a message |

|  |  |
| --- | --- |
| Unit 12. Processing JMS, HTTP, and web service messages  Duration: 1 hour | |
| Overview | This unit introduces IBM App Connect support for HTTP, JMS, and web services. |
| Learning objectives | After completing this unit, you should be able to:   * Describe how to use message flow applications with JMS * Describe how message flow applications can support Hypertext Transfer Protocol (HTTP) and SOAP messages * Explain how the Web Services Definition Language (WSDL) file is used to develop web services message flows |

|  |  |
| --- | --- |
| Unit 13. Preparing for production  Duration: 1 hour and 30 minutes | |
| Overview | In this unit, you learn how to expand the capabilities of message flow applications by making them aware of the runtime environments in which they operate. You also learn techniques for implementing dynamic message routing at run time, adding monitoring and auditing, and controlling processing of message flows with applications and shared libraries. |
| Learning objectives | After completing this unit, you should be able to:   * Deploy applications and shared libraries at run time to affect the visibility of resources * Use promoted properties, user-defined properties, and operational policies to develop environment-aware message flows * Dynamically route messages in a message flow by using external registries and registry lookup nodes to allow policy-driven message flows to meet governance requirements * Add monitoring and auditing to a message flow * Perform basic performance analysis on message flows |

|  |  |
| --- | --- |
| Exercise 11. Creating a runtime-aware message flow  Duration: 1 hour | |
| Overview | Message flows can be made even more powerful and flexible if they can interact with the environment in which they are operating. In this exercise, you modify an existing message flow for its runtime environment. |
| Learning objectives | After completing this exercise, you should be able to:   * Add a user-defined property to a message flow * Promote subflow properties to the main flow * Define custom keywords * Set configurable properties in the BAR file * View BAR file properties at run time |

|  |  |
| --- | --- |
| Unit 14. Course summary  Duration: 30 minutes | |
| Overview | This unit summarizes the course and provides information for future study. |
| Learning objectives | After completing this unit, you should be able to:   * Describe the course objectives and what you learned * Earn a badge for this course * Identify and describe product certifications that are related to this course * Identify resources that can help you learn more |

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