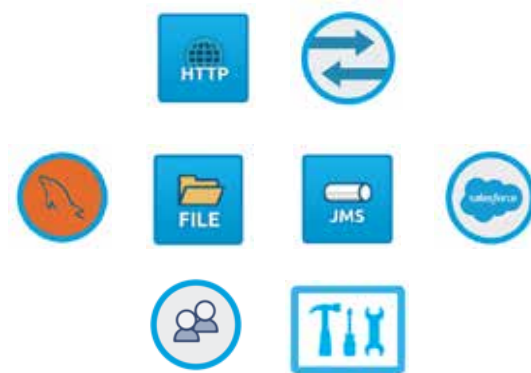




Module 4: Connecting to Additional Resources

Goal



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Objectives

- In this module, you will learn:
 - To connect to databases
 - To connect to files
 - To connect to JMS queues
 - To connect to SaaS applications
 - To discover and install connectors not bundled with Anypoint Studio
 - About developing your own custom connectors with Anypoint Connector DevKit

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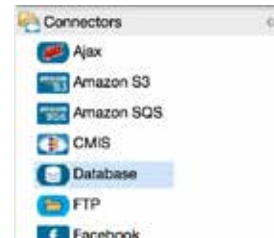


Connecting to databases

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The Database connector

- Can connect to almost any JDBC relational database
 - Any database engine for which you have a driver
- Supports operations including
 - SELECT, INSERT, UPDATE, DELETE
 - Stored Procedures
 - Bulk Execute
 - Data Definition Language (DDL) requests like CREATE and ALTER

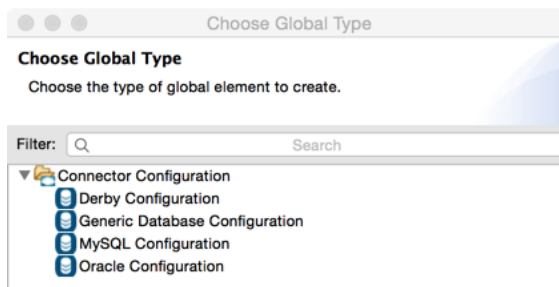


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Supported database engines

- Out-of-the-box support for
 - MySQL, Oracle, Derby
- Others are supported by a generic database configuration
 - Specify the driver class as one of the connection parameters

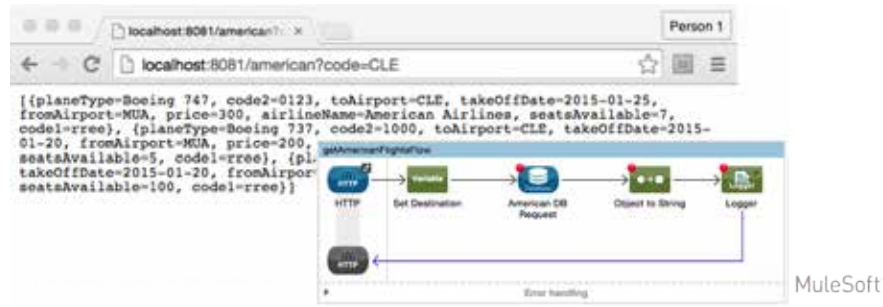


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Walkthrough 4-1: Connect to a database (MySQL)

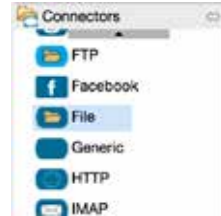
- Create a new flow for requests at <http://localhost:8081/american>
- Add a Database connector that connects to a MySQL database
- Write a query to return all flights for the static destination SFO
- Modify the query to use a dynamic destination from a query param
- Use the Object to String transformer to return the results as a string



Connecting to files

The File connector

- Gives Mule applications the ability to both read and write files in the local file system
 - Read files every certain period of time and delete, move, or leave the file as it is once processed
 - Copy files from one directory to another
 - Read input files while saving a backup of the input file
 - Create new files with a specific names
 - Append output to existing files



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Using the File connector as an inbound endpoint

- If placed at the beginning of a flow
 - It will act as an inbound endpoint, a message source
 - It checks for files in a location at some set frequency
 - It triggers the flow whenever it receives an incoming file
 - It reads the file into the payload and dispatches the message to the next processor
 - By default, it consumes the file, but it can also move and/or rename the file
 - It can filter the files it reads by different name patterns



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Using the File connector as an inbound endpoint

- By default, it uses streaming
 - Payload is a `FileInputStream`
 - Streams are closed by transformers reading the input stream
 - Can turn off streaming if you want a byte array instead
- Does not require a connector configuration
- Create and use a connector configuration for
 - Reusability
 - Setting properties, like `autoDelete=false` or `streaming=false`

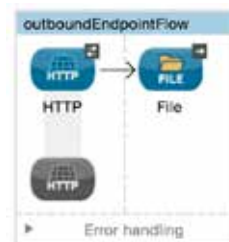


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Using the File connector as an outbound endpoint

- If placed in the middle or end of a flow
 - It will serve as an outbound endpoint, passing files to the connected file system
 - It can generate new files or append content to an existing file
 - The file name can be set at runtime



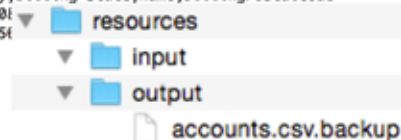
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Walkthrough 4-2: Connect to a file (CSV)

- Add and configure a File connector endpoint to watch an input directory, read the contents of any added files, and then rename the files and move them to an output folder
- Add a CSV file to the input directory and watch it moved
- Restrict the type of file read
- Use the File to String transformer to return results as a string

```
INFO 2015-08-19 13:44:16,688 [[apessentials].getCSVAccountsFlow.stage1.02] org.mule.api.processor.Logger
MessageProcessor: Billing Street,Billing City,Billing Country,Billing State,Name,BillingPostalCode
111 Boulevard Hausmann,Paris,France,,Dog Park Industries,75001
400 South St,San Francisco,USA,CA,Iguana Park Industries,91156
777 North St,San Francisco,USA,CA,Cat Park Industries,91156
```



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Tips for using the File connector

- The account running Mule must have read and/or write permissions on the specified directories
 - In standalone mode, the user that runs the Mule ESB server
 - Otherwise, the user that runs the application server
- Be careful not to permanently delete or overwrite files
 - Use `autoDelete` and `moveToDirectory` attributes wisely
- See both the File connector documentation and the File Transport documentation

<http://www.mulesoft.org/documentation/display/current/File+Transport+Reference>

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Connecting to JMS queues

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Java Messaging Service (JMS)

- Is a widely-used API for enabling applications to communicate through the exchange of messages
- It simplifies application development by providing a standard interface for creating, sending, and receiving messages
- It supports two messaging models
 - Queues: PTP (point-to-point)
 - Topics: Pub-Sub (publish/subscribe)

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JMS messaging models: Point to Point

- Queues: PTP (point-to-point)
 - One-to-one
 - A sender delivers messages to a queue and a single receiver pulls the message off of the queue
 - The receiver does not need to be listening to the queue at the time the message is sent

JMS messaging models: Pub-Sub

- Topics: Pub-Sub (publish / subscribe)
 - One-to-many
 - A publisher sends a message to a topic and all active subscribers of the topic receive the message
 - Subscribers that are not actively listening to the topic will miss the published message
 - Unless messages are made durable

Connecting to JMS queues

- The Mule JMS transport provides support for sending messages via JMS queues
- The JMS connector is a generic connector for sending and receiving messages over JMS queues
 - Can connect to any JMS messaging service that implements the JMS spec
 - Lets you send and receive messages to queues and topics

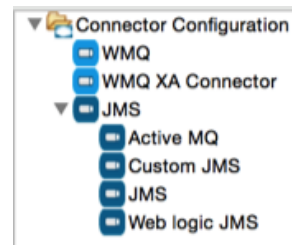


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Supported JMS providers

- Out-of-the-box support for
 - ActiveMQ and WebLogic JMS
 - Others are supported by a generic JMS or custom JMS configuration
- HornetMQ, Open MQ, Solace JMS, Tibco EMS
 - Examples in the documentation
- WebSphereMQ
 - Mule Enterprise has an enhanced transport to use



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Walkthrough 4-3: Connect to a JMS queue (ActiveMQ)

- Create a flow accessible at <http://localhost:8081/jms>
- Add and configure an ActiveMQ connector
- Use a JMS endpoint to retrieve messages from a JMS topic
- Add messages to the topic using a web form
- Use a JMS endpoint to send messages to a JMS topic

Send a Message to a JMS Topic

Name: Molly

Message: Can I get a ride to class

Send

INFO 2015-08-20 08:55:31,666 [[apessentials].getTopicMessageProcessor: Max: Is it break time yet?

INFO 2015-08-20 08:55:46,959 [[apessentials].getTopicMessageProcessor: Molly: Can I get a ride to class tomorrow?

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Connecting to SaaS applications

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Out-of-the-box SaaS connectors

- SaaS connectors are operation-based endpoints for connecting to third-party APIs
- Many bundled with Anypoint Studio



- Additional SaaS connectors can be found on the Anypoint Exchange

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The Salesforce connector

- Is as a secure way to access and act upon Salesforce.com (SFDC) data from a Mule application
 - Eliminates need to custom-code and secure a connection
- Handles all of five of the integration patterns for connecting with Salesforce
 - As identified by Salesforce
- Can perform operations that Salesforce exposes via four of their APIs
 - It does not expose all possible operations

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Salesforce connector operations

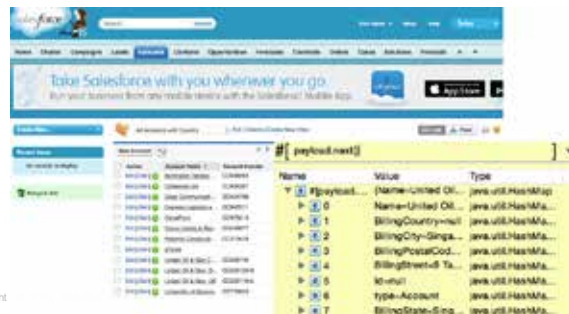
- Correlate to those Salesforce exposes via their APIs
 - SOAP API
 - For accessing Salesforce data
 - Most of the Salesforce connector operations map to the operations this API exposes
 - REST API
 - Bulk API
 - For loading batches of data in Salesforce
 - Streaming API
 - For receiving notifications for data changes

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Walkthrough 4-4: Connect to a SaaS application (Salesforce)

- Browse Salesforce data on <http://salesforce.com>
- Create a flow accessible at <http://localhost:8081/sfdc>
- Use the Salesforce connector to retrieve accounts for a postal code
- Use the Query Builder to write a query
- Use the Object to JSON transformer to return the results as a string



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Discovering and using additional connectors

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Not-in-the-box connectors

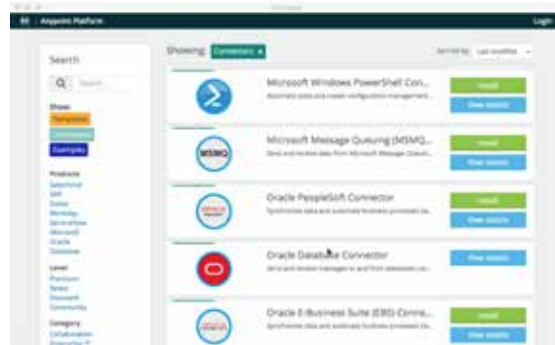
- Anypoint Studio comes with 30 out-of-the-box connectors
 - Endpoint-based connectors
 - Some operation-based connectors
- There are many other connectors you can use to connect to third-party APIs
 - Operation-based endpoints for connecting to third-party APIs
 - Find them on the Anypoint Exchange
 - Install as new software to Anypoint Studio from the Anypoint Connectors Update Site

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The Anypoint Exchange: <http://mulesoft.com/exchange>

- Anypoint Exchange is a library of assets for the Anypoint Platform including
 - Anypoint Connectors
 - Integration templates
 - Examples



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Connector levels

	Premium	Select (new)	Standard	Community
Additional cost	x			
Updated APIs	x	x		
Fully tested	x	x		
Support	Tier 1-3	Tier 1-3	Tier 1	Tier 1
Connector example	HL7, SAP, Siebel, etc.	Salesforce, Workday, etc.	Zendesk, Zuora, etc.	LinkedIn, Twilio, etc.

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Connector support levels

- Tier 1
 - MuleSoft will isolate the problem and diagnose it
- Tier 2
 - MuleSoft will find a workaround
- Tier 3
 - MuleSoft will fix the code

	Premium	Select	Standard	Community
Not included in platform license	x			
MuleSoft Certified	x	x		
Tier 2-3 Support	x	x		
Tier 1 Support	x	x	x	x

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Walkthrough 4-5: Find and install not-in-the-box connectors

- Browse the Anypoint Exchange
- Add a new connector to Anypoint Studio



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Introducing Anypoint Connector DevKit for creating custom connectors

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Custom connectors

- A connector is software that provides a connection between a Mule flow and an external resource
 - The resource can be any source of content, such as a database, protocol, or API
- Despite the 120+ connectors created by MuleSoft and the community, you may want a custom connector
 - To facilitate integration with additional SaaS and on-premise web services, applications, or data sources
- You create custom connectors with Anypoint Studio and the Anypoint Connector DevKit

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Creating custom connectors with DevKit



- Anypoint Connector DevKit provides the tools and interfaces for building custom connectors
- Custom connectors
 - Facilitate integration with SaaS and on-premise Web services, applications, and data sources
 - Function as extensions of the core product
 - Are reusable components that hide API complexity from the integration developer
 - Are written in Java version 7
 - Access web resources using REST, SOAP, or the Java SDK
 - Use Maven for development and building

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Training for creating Anypoint Connectors

- Connector Development Essentials (1 day)
 - An instructor-led training class
 - Teaches you to build, implement, and install an Anypoint Connector
 - Creating a connector with the DevKit plugin
 - Implementing connection management
 - Implementing connector message processors
 - Invoking web services with REST annotations
 - Testing and documenting connectors
 - Packaging and installing connectors
 - <http://training.mulesoft.com>

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Summary

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Summary

- In this module, you learned to connect to additional resources
- Use the Database connector to connect to any JDBC database with a driver
 - There are specific configs for Derby, MySQL, and Oracle
 - Use the Generic Database Configuration for all others
- Use the File connector to read or write local files
 - As an inbound endpoint, it checks for files in a location at some set frequency
 - As an outbound endpoint, it creates new files or appends existing files

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Summary

- Use the JMS connector to connect to any JMS messaging service that implements the JMS spec
 - Lets you send and receive messages to queues and topics
 - There are specific configs for Active MQ and WebLogic JMS
 - Use the Generic JMS config for all others
- SaaS connectors are operation-based endpoints for connecting to third-party APIs
 - Many bundled with Anypoint Studio
 - Additional connectors can be found on the Anypoint Exchange

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Summary

- There are 120+ connectors created by MuleSoft and the community
 - Anypoint Studio comes with 30 out-of-the-box connectors
 - Find additional connectors on the Anypoint Exchange
 - Connector levels include Premium, Select, Standard, and Community
- Create custom connectors with Anypoint Studio and the Anypoint Connector DevKit
 - Uses Java 7 and Maven

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