Red Hat

Red Hat AMQ 7.4

Getting Started with AMQ Broker

For Use with AMQ Broker 7.4

Last Updated: 2020-01-13

Red Hat AMQ 7.4 Getting Started with AMQ Broker

For Use with AMQ Broker 7.4

Legal Notice

Abstract

This guide describes how to get started using AMQ Broker.

Table of Contents

CHAPTER 1. OVERVIEW

AMQ Broker is a high-performance messaging implementation based on ActiveMQ Artemis. It uses an asynchronous journal for fast message persistence, and supports multiple languages, protocols, and platforms.

1.1. KEY FEATURES

AMQ Broker provides the following features:

- Clustering and high availability options
- Fast, native-IO persistence
- Supports local transactions
- Supports XA transactions when using AMQ Core Protocol JMS and AMQ OpenWire JMS clients
- Written in Java for broad platform support
- Multiple management interfaces: AMQ Console, Management APIs, and JMX

1.2. SUPPORTED STANDARDS AND PROTOCOLS

AMQ Broker supports the following standards and protocols:

- Wire protocols:
  - AMQP 1.0
  - Artemis Core Protocol
  - HornetQ Core Protocol
  - MQTT
  - OpenWire (Used by A-MQ 6 clients)
  - STOMP
- JMS 2.0

NOTE

The details of distributed transactions (XA) within AMQP are not provided in the 1.0 version of the specification. If your environment requires support for distributed transactions, it is recommended that you use the AMQ Core Protocol JMS.

1.3. SUPPORTED CONFIGURATIONS

Refer to the article "Red Hat AMQ Supported Configurations " on the Red Hat Customer Portal for current information regarding AMQ Broker supported configurations.

1.4. DOCUMENT CONVENTIONS

This document uses the following conventions for the **sudo** command and file paths.

The **sudo** command

In this document, **sudo** is used for any command that requires root privileges. You should always exercise caution when using **sudo**, as any changes can affect the entire system.

For more information about using **sudo**, see The **sudo** Command.

About the use of file paths in this document

In this document, all file paths are valid for Linux, UNIX, and similar operating systems (for example, **/home/...**). If you are using Microsoft Windows, you should use the equivalent Microsoft Windows paths (for example, **C:\Users\...**).

CHAPTER 2. UNDERSTANDING AMQ BROKER

AMQ Broker enables you to loosely couple heterogeneous systems together, while providing reliability, transactions, and many other features. Before using AMQ Broker, you should understand the capabilities it offers.

2.1. BROKER INSTANCES

In AMQ Broker, the installed AMQ Broker software serves as a "home" for one or more *broker instances*. This architecture provides several benefits, such as:

- You can create as many broker instances as you require from a single AMQ Broker installation. The AMQ Broker installation contains the necessary binaries and resources that each broker instance needs to run. These resources are then shared between the broker instances.
- When upgrading to a new version of AMQ Broker, you only need to update the software once, even if you are running multiple broker instances on that host.

You can think of a broker instance as a message broker. Each broker instance has its own directory containing its unique configuration and runtime data. This runtime data consists of logs and data files, and is associated with a unique broker process on the host.

2.2. CLUSTERING AND HIGH AVAILABILITY

Clustering and high availability (HA) enable you to group multiple brokers together to increase messaging throughput and reliability.

Clustering

By using clustering, you can:

- Connect brokers in a variety of topologies and architectures.
  A broker cluster can contain brokers on a shared host, different hosts, or both shared and different hosts.
- Load balance client connections across the brokers in the cluster.
- Redistribute messages across the brokers in the cluster at runtime to avoid imbalanced load scenarios.

High availability (HA)

You can minimize downtime in a broker cluster by implementing HA. With HA, the brokers in the cluster are grouped into master-slave groups: master brokers are active and serve client requests, while slave brokers back them up. If a master broker goes offline, its slave broker becomes active. Clients can then reconnect to the slave broker and resume sending and receiving messages.

AMQ Broker supports several HA policies:

Replication

The master and slave brokers synchronize their messaging data over the network. If a master broker fails, the slave broker becomes active using the synchronized data.

Shared-store

Master and slave brokers share the same location for their messaging data. If a master broker fails, the slave broker becomes active using the data in the shared location.

Live-only

If a broker is shut down, it copies its messages and transaction state to another broker in the cluster. Typically, you use this policy to scale down a broker cluster, not to handle unexpected broker failures.

2.3. SECURITY

AMQ Broker provides a number of methods you can use to authenticate clients and control what they can access on the broker.

Guest/anonymous access control

You can configure the broker to allow anonymous access. If a user does not have login credentials, or if their credentials fail validation, the user can be granted a guess account with limited access.

Basic user and password access control

With this method, you store client user names, passwords, and security roles in properties files. A client can connect to the broker by using its user name and password. After the connection is accepted, the role assigned to the client's user name controls the resources they can access on the broker.
For an added layer of security, you can encrypt the client's connection to the broker by configuring server-side SSL/TLS certificates. This is also called one-way SSL/TLS.

Certificate-based access control

This method provides greater security than user and password access control by using an SSL/TLS certificate to authenticate the client. Also called two-way SSL/TLS, both the broker and the client present certificates and validate each other's identity during the TLS handshake. Once verified, the client is assigned to a security role that defines the resources it can access on the broker.

LDAP integration

If LDAP is deployed in your environment, you can integrate AMQ Broker with it to authenticate clients and authorize what they can access.

Kerberos integration

If Kerberos is deployed in your environment, you can integrate AMQ Broker with it to authenticate clients and authorize what they can access.

NOTE

You can only use Kerberos to authenticate and authorize AMQP clients.

2.4. UNDERSTANDING THE AMQ ADDRESS MODEL

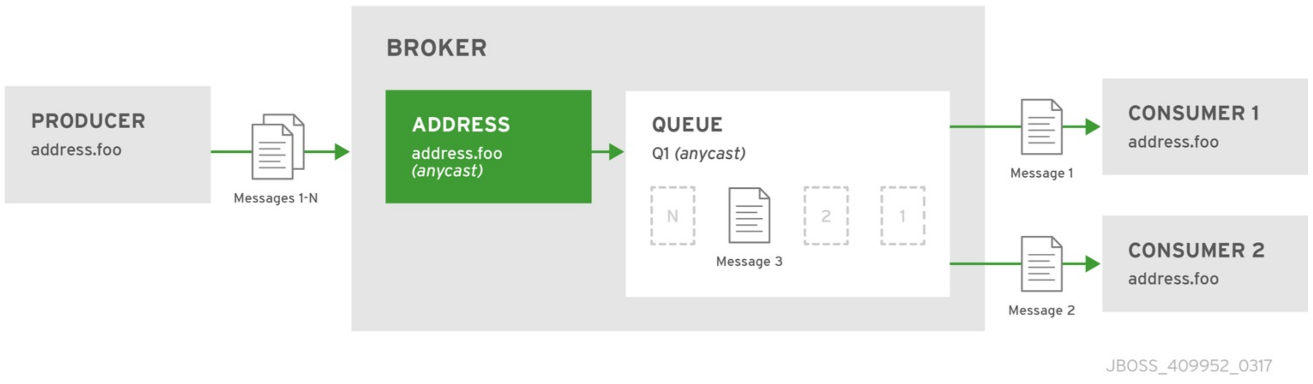
AMQ Broker provides a flexible address model that enables you to define point-to-point and publish-subscribe messaging patterns that work for any messaging protocol.

An *address* represents a messaging endpoint. Each address has a *routing type* (anycast or multicast), and a set of *queues* (that is, destinations). Essentially, the address model enables you to define what you want the broker to do when it receives a message with a particular address.

Point-to-point messaging

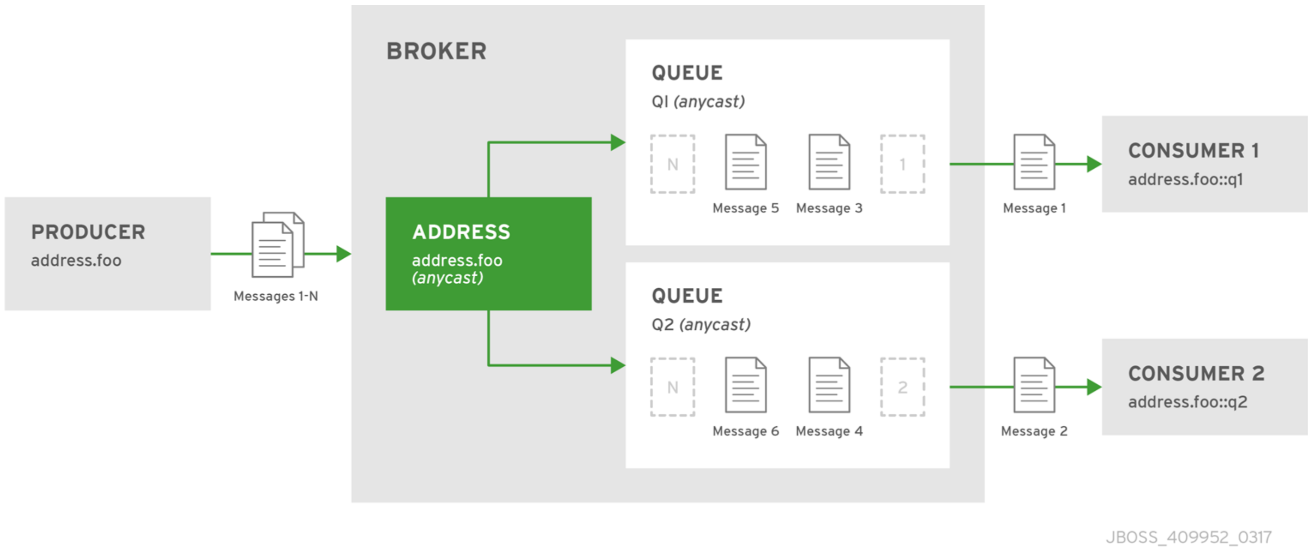
The AMQ address model supports point-to-point messaging (also called anycast) in which a producer sends a message to a single consumer. If multiple consumers are connected to the same queue, messages are distributed among each consumer equally, provided the consumers are able to handle them equally. Point-to-point messaging provides traditional queue-like behavior.

Figure 2.1. Point-to-point messaging with one queue



You can also use point-to-point messaging with multiple queues for a single address. In this case, messages sent to the address are distributed evenly across all associated queues. If more than one consumer connects to the same queue, AMQ distributes messages between them.

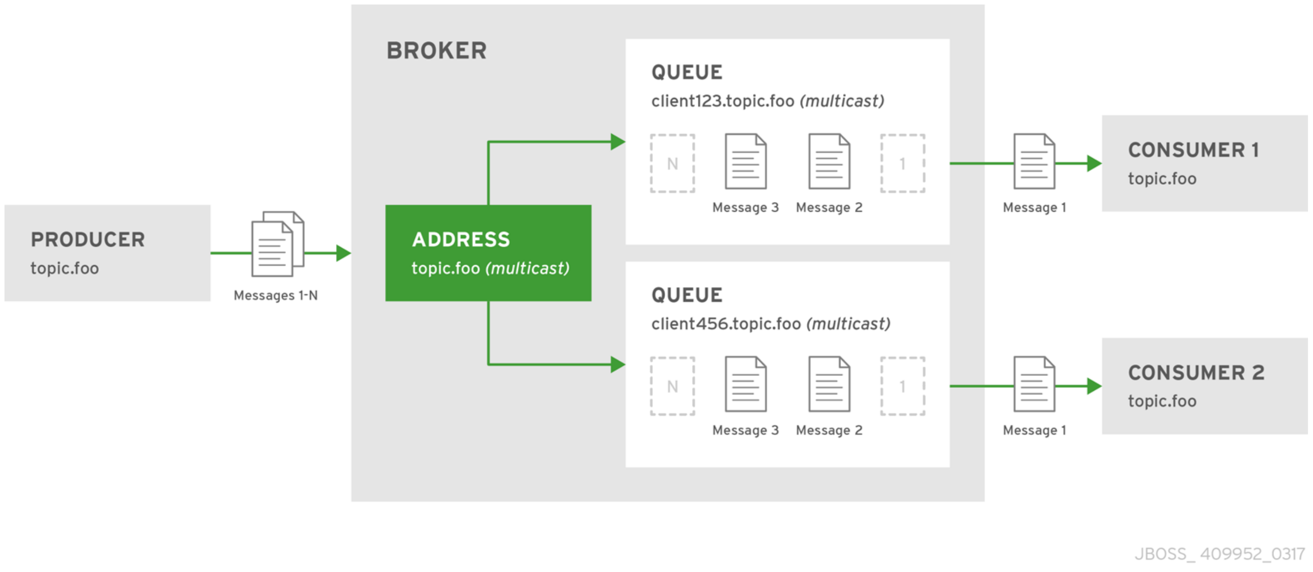
Figure 2.2. Point-to-point messaging with two queues



Publish-subscribe messaging

The AMQ address model also supports publish-subscribe messaging (also called multicast) in which a producer sends a message to every consumer subscribed to the address. Publish-subscribe messaging provides topic-like behavior.

Figure 2.3. Publish-subscribe

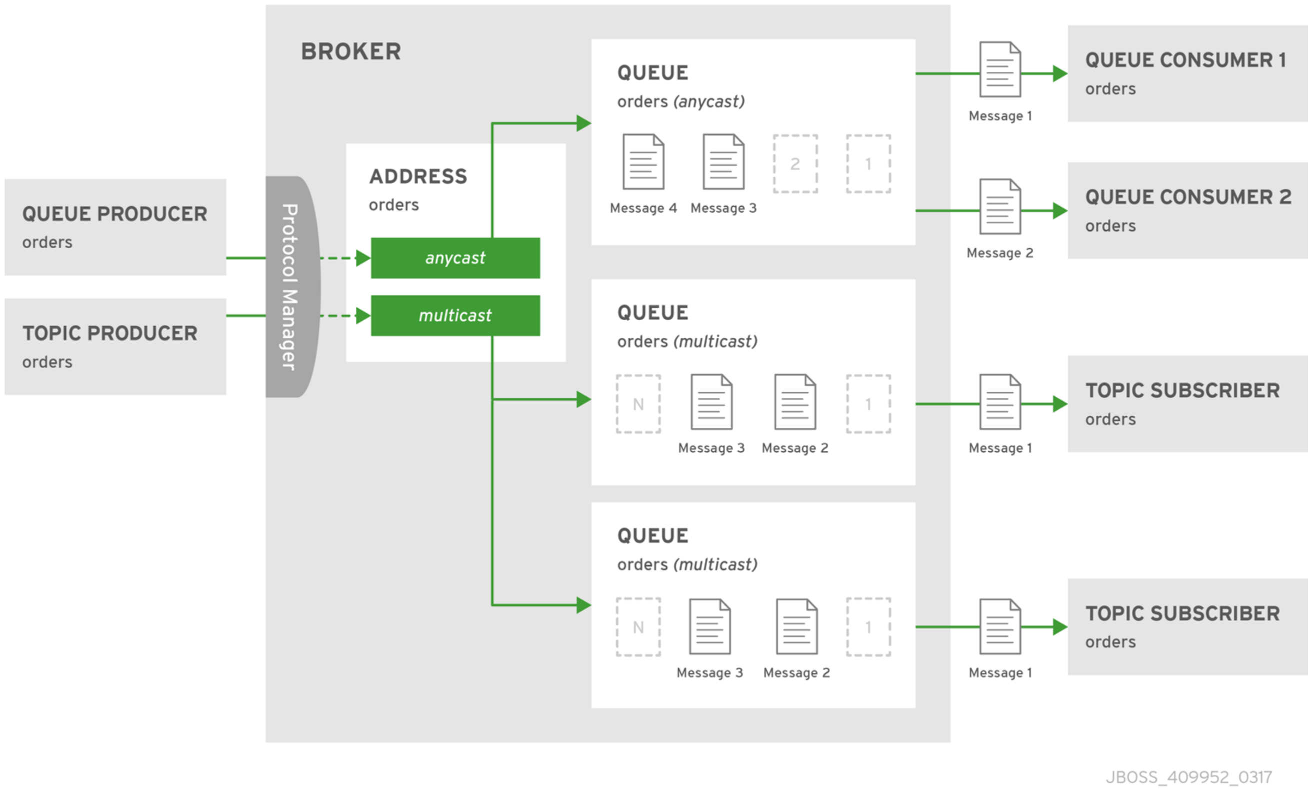


Publish-subscribe messaging also supports durable and non-durable subscription queues.

Combining point-to-point and publish-subscribe messaging

AMQ Broker also supports both point-to-point and publish-subscribe semantics for the same address. This configuration is not common, but it does provide the greater flexibility required for advanced messaging patterns.

Figure 2.4. Point-to-point and publish-subscribe



2.5. MESSAGE PERSISTENCE

AMQ Broker persists message data to ensure that messages are never lost, even if the broker fails or shuts down unexpectedly. AMQ Broker provides two options for message persistence: journal-based persistence and database persistence.

Journal-based persistence

The default method, this option writes message data to message journal files stored on the file system. Initially, each of these journal files is created automatically with a fixed size and filled with empty data. As clients perform various broker operations, records are appended to the journal. When one of the journal files is full, the broker moves to the next journal file.

Journal-based persistence supports transactional operations, including both local and XA transactions.

Journal-based persistence requires an IO interface to the file system. AMQ Broker supports the following:

Linux Asynchronous IO (AIO)

AIO typically provides the best performance, but it requires the following:

- Linux Kernel version 2.6 or later
- Supported file system
  To see the currently supported file systems, see Red Hat AMQ Supported Configurations .

Java NIO

Java NIO provides good performance, and it can run on any platform with a Java 6 or later runtime.

Database persistence

This option stores message and bindings data in a database by using Java Database Connectivity (JDBC). This option is a good choice if you already have a reliable and high performing database platform in your environment, or if using a database is mandated by company policy.

The broker JDBC persistence store uses a standard JDBC driver to create a JDBC connection that stores message and bindings data in database tables. The data in the database tables is encoded using the same encoding as journal-based persistence. This means that messages stored in the database are not human-readable if accessed directly using SQL.

To use database persistence, you must use a supported database platform. To see the currently supported database platforms, see Red Hat AMQ Supported Configurations .

2.6. RESOURCE CONSUMPTION

AMQ Broker provides a number of options to limit memory and resource consumption on the broker.

Resource limits

You can set connection and queue limits for each user. This prevents users from consuming too many of the broker’s resources and causing degraded performance for other users.

Message paging

Message paging enables AMQ Broker to support large queues containing millions of messages while also running with a limited amount of memory. When the broker receives a surge of messages that exceeds its memory capacity, it begins paging messages to disk. This paging process is transparent; the broker pages messages into and out of memory as needed.
Message paging is address-based. When the size of all messages in memory for an address exceeds the maximum size, each additional message for the address will be paged to the address’s page file.

Large messages

With AMQ Broker, you can send and receive huge messages, even when running with limited memory resources. To avoid the overhead of storing large messages in memory, you can configure AMQ Broker to store these large messages in the file system or in a database table.

2.7. MONITORING AND MANAGEMENT

AMQ Broker provides several tools you can use to monitor and manage your brokers.

AMQ Console

AMQ Console is a web interface accessible through a web browser. You can use to monitor network health, view broker topology, and create and delete broker resources.

CLI

AMQ Broker provides the **artemis** CLI, which you can use to administer your brokers. Using the CLI, you can create, start, and stop broker instances. The CLI also provides several commands for managing the message journal.

Management API

AMQ Broker provides an extensive management API. You can use it to modify a broker's configuration, create new resources, inspect these resources, and interact with them. Clients can also use the management API to manage the broker and subscribe to management notifications.

AMQ Broker provides the following methods for using the management API:

- Java Management Extensions (JMX) - JMX is a standard technology for managing Java applications. The broker's management operations are exposed through AMQ MBeans interfaces.
- JMS API - Management operations are sent using standard JMS messages to a special management JMS queue.

Logs

Each broker instance logs error messages, warnings, and other broker-related information and activities. You can configure the logging levels, the location of the log files, and log format. You can then use the resulting log files to monitor the broker and diagnose error conditions.

CHAPTER 3. INSTALLING AMQ BROKER

AMQ Broker is distributed as a platform-independent archive file. To install AMQ Broker on your system, you must download the archive and extract the contents. You should also understand the directories included in the archive.

Prerequisites

- The host on which you are installing AMQ Broker must meet the AMQ Broker supported configurations.
  For more information, see Red Hat AMQ Supported Configurations .

3.1. DOWNLOADING THE AMQ BROKER ARCHIVE

AMQ Broker is distributed as a platform-independent archive file. You can download it from the Red Hat Customer Portal.

Prerequisites

- You must have a Red Hat subscription.
  For more information, see Using your Subscription .

Procedure

1. In a web browser, navigate to https://access.redhat.com/downloads/ and log in.
   The **Product Downloads** page is displayed.
2. In the **JBoss Integration and Automation** section, click the **Red Hat AMQ Broker** link.
   The **Software Downloads** page is displayed.
3. Select the desired AMQ Broker version from the **Version** drop-down menu.
4. On the **Releases** tab, click the **Download** link for the specific AMQ Broker file you want to download.

3.2. EXTRACTING THE AMQ BROKER ARCHIVE ON LINUX

If you are installing AMQ Broker on Red Hat Enterprise Linux, create a new user account for AMQ Broker, and then extract the contents from the installation archive.

Procedure

1. Create a new user named **amq-broker** and provide it a password.

```
$ sudo useradd amq-broker
$ sudo passwd amq-broker
```

2. Create the directory **/opt/redhat/amq-broker** and make the new **amq-broker** user and group the owners of it.

```
$ sudo mkdir /opt/redhat
$ sudo mkdir /opt/redhat/amq-broker
$ sudo chown -R amq-broker:amq-broker /opt/redhat/amq-broker
```

3. Change the owner of the archive to the new user.

```
$ sudo chown amq-broker:amq-broker amq-broker-7.x.x-bin.zip
```

4. Move the installation archive to the directory you just created.

```
$ sudo mv amq-broker-7.x.x-bin.zip /opt/redhat/amq-broker
```

5. As the new **amq-broker** user, extract the contents by using the **unzip** command.

```
$ su - amq-broker
$ cd /opt/redhat/amq-broker
$ unzip <archive-name>.zip
$ exit
```

   A directory named something similar to **amq-broker-7.4** is created. In the documentation, this location is referred to as **<install-dir>**.

3.3. EXTRACTING THE AMQ BROKER ARCHIVE ON WINDOWS SYSTEMS

If you are installing AMQ Broker on a Windows system, create a new directory folder for AMQ Broker, and then extract the contents there.

Procedure

1. Use Windows Explorer to create the directory folder **\redhat\amq-broker** on the desired drive letter.
   For example: **C:\redhat\amq-broker**

2. Use Windows Explorer to move the installation archive to the directory you just created.

3. In the **\redhat\amq-broker** directory, right-click the installation archive zip file and select **Extract All**.
   A directory named something similar to **amq-broker-7.4** is created. In the documentation, this location is referred to as **<install-dir>**.

3.4. UNDERSTANDING THE AMQ BROKER INSTALLATION ARCHIVE CONTENTS

The directory created by extracting the archive is the top-level directory for the AMQ Broker installation. This directory is referred to as **<install-dir>**, and includes the following contents:

This directory...	Contains...
<install-dir>/web/api	API documentation.
<install-dir>/bin	Binaries and scripts needed to run AMQ Broker.
<install-dir>/etc	Configuration files.

This directory…	Contains…
<install-dir>/examples	JMS and Java EE examples.
<install-dir>/lib	JARs and libraries needed to run AMQ Broker.
<install-dir>/schema	XML schemas used to validate AMQ Broker configuration.
<install-dir>/web	The web context loaded when AMQ Broker runs.

CHAPTER 4. CREATING A STANDALONE BROKER

You can get started quickly with AMQ Broker by creating a standalone broker instance on your local machine, starting it, and producing and consuming some test messages.

Prerequisites

- AMQ Broker must be installed.
  For more information, see Chapter 3, *Installing AMQ Broker*.

4.1. CREATING A BROKER INSTANCE

A broker instance is a directory containing the configuration and runtime data for a broker. To create a new broker instance, you first create a directory for the broker instance, and then use the **artemis create** command to create the broker instance.

This procedure demonstrates how to create a simple, standalone broker on your local machine. The broker uses a basic, default configuration, and accepts connections from clients using any of the supported messaging protocols.

Procedure

1. Create a directory for the broker instance.

If you are using...	Do this...

Red Hat Enterprise Linux	1. Create a new directory to serve as the location for the broker instance.
	`$ sudo mkdir /var/opt/amq-broker`
	2. Assign the user that you created during installation.
	`$ sudo chown -R amq-broker:amq-broker /var/opt/amq-broker`

Windows	Use Windows Explorer to create a new folder to serve as the location for the broker instance.

2. Use the **artemis create** command to create the broker.

If you are using...	Do this...

If you are using...	Do this...
Red Hat Enterprise Linux	1. Switch to the user account you created during installation. `$ su - amq-broker` 2. Change to the directory you just created for the broker instance. `$ cd /var/opt/amq-broker` 3. From the broker instance's directory, create the broker instance. `$ <install-dir>/bin/artemis create mybroker`
Windows	1. Open a command prompt from the directory you just created for the broker instance. 2. From the broker instance's directory, create the broker instance. `> <install-dir>\bin\artemis.cmd create mybroker`

3. Follow the **artemis create** prompts to configure the broker instance.

Example 4.1. Configuring a broker instance usingartemis create

```
$ /opt/redhat/amq-broker/bin/artemis create mybroker

Creating ActiveMQ Artemis instance at: /var/opt/amq-broker/mybroker

--user: is mandatory with this configuration:
Please provide the default username:
admin

--password: is mandatory with this configuration:
Please provide the default password:

--role: is mandatory with this configuration:
Please provide the default role:
amq

--allow-anonymous | --require-login: is mandatory with this configuration:
Allow anonymous access? (Y/N):
Y

Auto tuning journal ...
done! Your system can make 19.23 writes per millisecond, your journal-buffer-timeout will
be 52000

You can now start the broker by executing:
```

```
"/var/opt/amq-broker/mybroker/bin/artemis" run

Or you can run the broker in the background using:

"/var/opt/amq-broker/mybroker/bin/artemis-service" start
```

4.2. STARTING THE BROKER INSTANCE

After the broker instance is created, you use the **artemis run** command to start it.

Procedure

1. Switch to the user account you created during installation.

   ```
   $ su - amq-broker
   ```

2. Use the **artemis run** command to start the broker instance.

   ```
   $ /var/opt/amq-broker/mybroker/bin/artemis run


        __  __  ____    ____            _
       /\  |  \/  |/ __ \  |  _ \          | |
      /  \ | \  / | |  | | | |_) |_ __ ___ | | _____ _ __
     / /\ \| |\/| | |  | | |  _ <| '__/ _ \| |/ / _ \ '__|
    / ____ \ |  | | |__| | | |_) | | | (_) |   <  __/ |
   /_/    \_\_|  |_|\___\_\ |____/|_|  \___/|_|\_\___|_|

   Red Hat JBoss AMQ 7.2.1.GA

   10:53:43,959 INFO  [org.apache.activemq.artemis.integration.bootstrap] AMQ101000:
   Starting ActiveMQ Artemis Server
   10:53:44,076 INFO  [org.apache.activemq.artemis.core.server] AMQ221000: live Message
   Broker is starting with configuration Broker Configuration
   (clustered=false,journalDirectory=./data/journal,bindingsDirectory=./data/bindings,largeMessage
   sDirectory=./data/large-messages,pagingDirectory=./data/paging)
   10:53:44,099 INFO  [org.apache.activemq.artemis.core.server] AMQ221012: Using AIO
   Journal
   ...
   ```

   The broker starts and displays log output with the following information:

   - The location of the transaction logs and cluster configuration.
   - The type of journal being used for message persistence (AIO in this case).
   - The URI(s) that can accept client connections.
     By default, port 61616 can accept connections from any of the supported protocols (CORE, MQTT, AMQP, STOMP, HORNETQ, and OPENWIRE). There are separate, individual ports for each protocol as well.
   - The web console is available at http://localhost:8161.
   - The Jolokia service (JMX over REST) is available at http://localhost:8161/jolokia.

4.3. PRODUCING AND CONSUMING TEST MESSAGES

After starting the broker, you should verify that it is running properly. This involves producing a few test messages, sending them to the broker, and then consuming them.

Procedure

1. Use the **artemis producer** command to produce a few test messages and send them to the broker.
   This command sends 100 messages to the **helloworld** address, which is created automatically on the broker. The producer connects to the broker by using the default port 61616, which accepts all supported messaging protocols.

   ```
   $ /opt/redhat/amq-broker/amq-broker-7.2.0/bin/artemis producer --destination helloworld --message-count 100 --url tcp://localhost:61616
   Producer ActiveMQQueue[helloworld], thread=0 Started to calculate elapsed time ...

   Producer ActiveMQQueue[helloworld], thread=0 Produced: 100 messages
   Producer ActiveMQQueue[helloworld], thread=0 Elapsed time in second : 1 s
   Producer ActiveMQQueue[helloworld], thread=0 Elapsed time in milli second : 1289 milli seconds
   ```

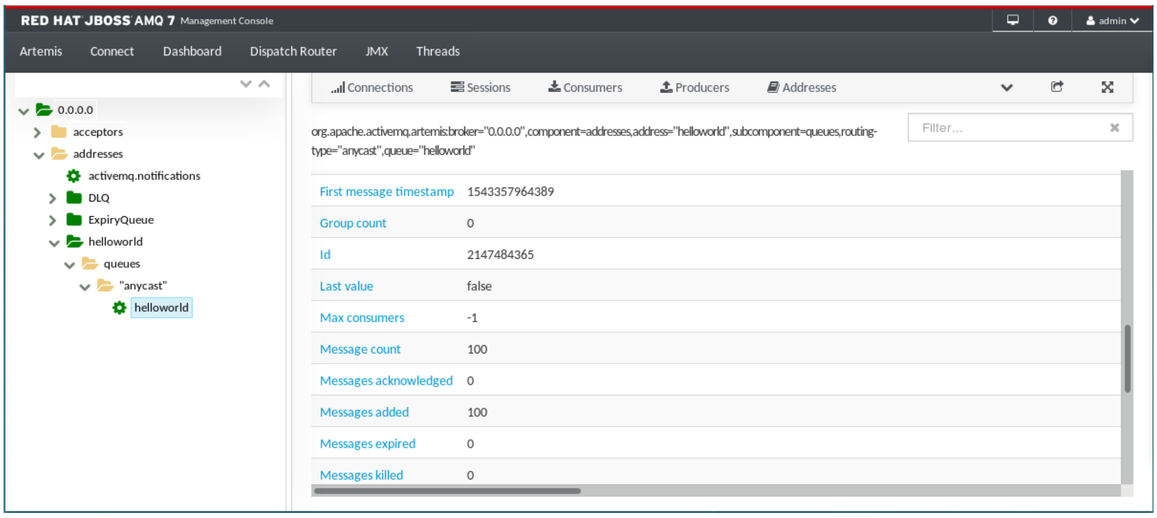
2. Use the web console to see the messages stored in the broker.

   a. In a web browser, navigate to http://localhost:8161.

   b. Log into the console using the default username and default password that you created when you created the broker instance.
   The **Attributes** tab is displayed.

   c. On the **Attributes** tab, navigate to menu:[addresses > helloworld > queues > "anycast" > helloworld].
   In the previous step, you sent messages to the **helloworld** address. This created a new anycast **helloworld** address with a queue (also named **helloworld**). The **Message count** attribute shows that all 100 messages that were sent to **helloworld** are currently stored in this queue.

   Figure 4.1. Message count



org.apache.activemq.artemis:broker="0.0.0.0",component=addresses,address="helloworld",subcomponent=queues,routing-type="anycast",queue="helloworld"

First message timestamp	1543357964389
Group count	0
Id	2147484365
Last value	false
Max consumers	-1
Message count	100
Messages acknowledged	0
Messages added	100
Messages expired	0
Messages killed	0

3. Use the **artemis consumer** command to consume 50 of the messages stored on the broker.
   This command consumes 50 of the messages that you sent to the broker previously.

```
$ /opt/redhat/amq-broker/amq-broker-7.2.0/bin/artemis consumer --destination helloworld --
message-count 50 --url tcp://localhost:61616

Consumer:: filter = null
Consumer ActiveMQQueue[helloworld], thread=0 wait until 50 messages are consumed
Consumer ActiveMQQueue[helloworld], thread=0 Consumed: 50 messages
Consumer ActiveMQQueue[helloworld], thread=0 Consumer thread finished
```

4. In the web console, verify that the **Message count** is now 50.
   50 of the messages were consumed, which leaves 50 messages stored in the **helloworld** queue.

5. Stop the broker and verify that the 50 remaining messages are still stored in the **helloworld** queue.

   a. In the terminal in which the broker is running, press **Ctrl**+**C** to stop the broker.

   b. Restart the broker.

   ```
   $ /var/opt/amq-broker/mybroker/bin/artemis run
   ```

   c. In the web console, navigate back to the **helloworld** queue and verify that there are still 50 messages stored in the queue.

6. Consume the remaining 50 messages.

```
$ /opt/redhat/amq-broker/amq-broker-7.2.0/bin/artemis consumer --destination helloworld --
message-count 50 --url tcp://localhost:61616

Consumer:: filter = null
Consumer ActiveMQQueue[helloworld], thread=0 wait until 50 messages are consumed
Consumer ActiveMQQueue[helloworld], thread=0 Consumed: 50 messages
Consumer ActiveMQQueue[helloworld], thread=0 Consumer thread finished
```

7. In the web console, verify that the **Message count** is 0.
   All of the messages stored in the **helloworld** queue were consumed, and the queue is now empty.

4.4. STOPPING THE BROKER INSTANCE

After creating the standalone broker and producing and consuming test messages, you can stop the broker instance.

This procedure manually stops the broker, which forcefully closes all client connections. In a production environment, you should configure the broker to stop gracefully so that client connections can be closed properly.

Procedure

- Use the **artemis stop** command to stop the broker instance:

```
$ /var/opt/amq-broker/mybroker/bin/artemis stop
2018-12-03 14:37:30,630 INFO  [org.apache.activemq.artemis.core.server] AMQ221002:
Apache ActiveMQ Artemis Message Broker version 2.6.1.amq-720004-redhat-1 [b6c244ef-
```

```
f1cb-11e8-a2d7-0800271b03bd] stopped, uptime 35 minutes
Server stopped!
```

CHAPTER 5. RUNNING THE AMQ BROKER EXAMPLES

AMQ Broker ships with many example programs that demonstrate basic and advanced features of the product. You can run these examples to become familiar with the capabilities of AMQ Broker.

To run the AMQ Broker examples, you must first set up your machine by installing and configuring Apache Maven and the AMQ Maven repository. Then, you use Maven to run the AMQ Broker example programs.

5.1. SETTING UP YOUR MACHINE TO RUN THE AMQ BROKER EXAMPLES

Before you can run the included AMQ Broker example programs, you must first download and install Maven and the AMQ Maven repository, and configure the Maven settings file.

5.1.1. Downloading and installing Maven

Maven is required to run the AMQ Broker examples.

Procedure

1. Go to the Apache Maven Download page and download the latest distribution for your operating system.
2. Install Maven for your operating system.
   For more information, see Installing Apache Maven.

Additional resources

- For more information about Maven, see Introduction to Apache Maven.

5.1.2. Downloading and installing the AMQ Maven repository

After Maven is installed on your machine, you download and install the AMQ Maven repository. This repository is available on the Red Hat Customer Portal.

1. In a web browser, navigate to https://access.redhat.com/downloads/ and log in.
   The **Product Downloads** page is displayed.
2. In the **JBoss Integration and Automation** section, click the **Red Hat AMQ Broker** link.
   The **Software Downloads** page is displayed.
3. Select the desired AMQ Broker version from the **Version** drop-down menu.
4. On the **Releases** tab, click the **Download** link for the AMQ Broker Maven Repository.
   The AMQ Maven repository file is downloaded as a zip file.
5. On your machine, unzip the AMQ repository file into a directory of your choosing.
   A new directory is created on your machine, which contains the Maven repository in a subdirectory named **maven-repository/**.

5.1.3. Configuring the Maven settings file

After downloading and installing the AMQ Maven repository, you must add the repository to the Maven settings file.

Procedure

1. Open the Maven **settings.xml** file.
   The **settings.xml** file is typically located in the **${user.home}/.m2/** directory.

   - For Linux, this is **~/.m2/**
   - For Windows, this is **\Documents and Settings\.m2** or **\Users\.m2**

   If you do not find a **settings.xml** file in **${user.home}/.m2/**, there is a default version located in the **conf/** directory of your Maven installation. Copy the default **settings.xml** file into the **${user.home}/.m2/** directory.

2. In the **<profiles>** element, add a profile for the AMQ Maven repository.

```
<!-- Configure the JBoss AMQ Maven repository -->
<profile>
  <id>jboss-amq-maven-repository</id>
  <repositories>
    <repository>
      <id>jboss-amq-maven-repository</id>
      <url>file://<JBoss-AMQ-repository-path></url> (1)
      <releases>
        <enabled>true</enabled>
      </releases>
      <snapshots>
        <enabled>false</enabled>
      </snapshots>
    </repository>
  </repositories>
  <pluginRepositories>
    <pluginRepository>
      <id>jboss-amq-maven-repository</id>
      <url>file://<JBoss-AMQ-repository-path></url> (2)
      <releases>
        <enabled>true</enabled>
      </releases>
      <snapshots>
        <enabled>false</enabled>
      </snapshots>
    </pluginRepository>
  </pluginRepositories>
</profile>
```

(1) (2) Replace **<JBoss-AMQ-repository-path>** with the location of the Maven repository that you installed. Typically, this location ends with **/maven-repository**. For example:

```
<url>file:///path/to/repo/amq-broker-7.2.0-maven-repository/maven-repository</url>
```

3. In the **<activeProfiles>** element, set the AMQ Maven repository to be active:

```
<activeProfiles>
  <activeProfile>jboss-amq-maven-repository</activeProfile>
...
</activeProfiles>
```

4. If you copied the default **settings.xml** from your Maven installation, uncomment the **<active-profiles>** section if it was commented out by default.

5. Save and close **settings.xml**.

6. Remove the cached **${user.home}/.m2/repository/** directory.
   If your Maven repository contains outdated artifacts, you may encounter one of the following Maven error messages when you build or deploy your project:

   - **Missing artifact <artifact-name>**
   - **[ERROR] Failed to execute goal on project <project-name>; Could not resolve dependencies for <project-name>**

5.2. AMQ BROKER EXAMPLE PROGRAMS

AMQ Broker ships with more than 90 example programs that demonstrate how to use AMQ Broker features and the supported messaging protocols.

The example programs are located in **<install-dir>/examples**, and include the following:

- Features
  Broker-specific features such as:
  - Clustered - examples showing load balancing and distribution capabilities
  - HA - examples showing failover and reconnection capabilities
  - Perf - examples allowing you to run a few performance tests on the server
  - Standard - examples demonstrating various broker features
  - Sub-modules - examples of integrated external modules
- Protocols
  Examples for each of the supported messaging protocols:
  - AMQP
  - MQTT
  - OpenWire
  - STOMP

Additional resources

- For a description of each example program, see Examples in the Apache Artemis documentation.

5.3. RUNNING AN AMQ BROKER EXAMPLE PROGRAM

AMQ Broker ships with many example programs that demonstrate basic and advanced features of the product. You use Maven to run these programs.

Prerequisites

- Your machine must be set up to run the AMQ Broker examples.
  For more information, see Section 5.1, "Setting up your machine to run the AMQ Broker examples".

Procedure

1. Navigate to the directory of the example you want to run.
   The example programs are located in **<install-dir>/examples**. For example:

   ```
   $ cd <install-dir>/examples/features/standard/queue
   ```

2. Use the **mvn clean verify** command to run the example program.
   Maven starts the broker and runs the example program. The first time you run the example program, Maven downloads any missing dependencies, which may take a while to run.

   In this case, the **queue** example program is run, which creates a producer, sends a test message, and then creates a consumer that receives the message:

   ```
   $ mvn clean verify
   [INFO] Scanning for projects...
   [INFO]
   [INFO] -------------< org.apache.activemq.examples.broker:queue >--------------
   [INFO] Building ActiveMQ Artemis JMS Queue Example 2.6.1.amq-720004-redhat-1
   [INFO] --------------------------------[ jar ]---------------------------------
   ...
   server-out:2018-12-05 16:37:57,023 INFO  [org.apache.activemq.artemis.core.server]
   AMQ221001: Apache ActiveMQ Artemis Message Broker version 2.6.1.amq-720004-redhat-
   1 [0.0.0.0, nodeID=06f529d3-f8d6-11e8-9bea-0800271b03bd]
   [INFO] Server started
   [INFO]
   [INFO] --- artemis-maven-plugin:2.6.1.amq-720004-redhat-1:runClient (runClient) @ queue --
   -
   Sent message: This is a text message
   Received message: This is a text message
   [INFO]
   [INFO] --- artemis-maven-plugin:2.6.1.amq-720004-redhat-1:cli (stop) @ queue ---
   server-out:2018-12-05 16:37:59,519 INFO  [org.apache.activemq.artemis.core.server]
   AMQ221002: Apache ActiveMQ Artemis Message Broker version 2.6.1.amq-720004-redhat-
   1 [06f529d3-f8d6-11e8-9bea-0800271b03bd] stopped, uptime 3.734 seconds
   server-out:Server stopped!
   [INFO] ------------------------------------------------------------------------
   [INFO] BUILD SUCCESS
   [INFO] ------------------------------------------------------------------------
   [INFO] Total time:  48.681 s
   [INFO] Finished at: 2018-12-05T16:37:59-05:00
   [INFO] ------------------------------------------------------------------------
   ```

NOTE

Some of the example programs use UDP clustering, and may not work in your environment by default. To run these examples successfully, redirect traffic directed to 224.0.0.0 to the loopback interface:

```
$ sudo route add -net 224.0.0.0 netmask 240.0.0.0 dev lo
```

CHAPTER 6. NEXT STEPS

After you have installed AMQ Broker and created a standalone broker with the default configuration settings, you can configure it to meet your messaging requirements, connect messaging client applications to it, and monitor and manage it. Additional resources are available to help you complete these goals.

Configuring the broker

Use Configuring AMQ Broker to configure the broker to meet your requirements. You can configure:

- The broker to accept client connections
- The address space (including point-to-point and publish-subscribe messaging)
- Message persistence
- Broker resource consumption (including resource limits, message paging, and large message support)
- Duplicate message detection
- Logging

Securing the broker

Use Configuring AMQ Broker to implement any of the following methods to secure the broker:

- Guest/anonymous access control
- Basic user and password access control
- Certificate-based access control
- LDAP integration
- Kerberos integration

Setting up clustering and high availability

Use Configuring AMQ Broker to add additional brokers to form a broker cluster and increase messaging throughput. You can also configure high availability to increase messaging reliability.

Creating messaging client applications

Use AMQ Clients Overview to learn about AMQ Clients and how it can help you to create messaging client applications that connect to the broker and produce and consume messages.

Monitoring and managing the broker

Use Managing AMQ Broker to monitor and manage your broker (or brokers) once they are running.

APPENDIX A. USING YOUR SUBSCRIPTION

AMQ is provided through a software subscription. To manage your subscriptions, access your account at the Red Hat Customer Portal.

Accessing your account

1. Go to access.redhat.com.
2. If you do not already have an account, create one.
3. Log in to your account.

Activating a subscription

1. Go to access.redhat.com.
2. Navigate to **My Subscriptions**.
3. Navigate to **Activate a subscription** and enter your 16-digit activation number.

Downloading ZIP and TAR files

To access ZIP or TAR files, use the customer portal to find the relevant files for download. If you are using RPM packages, this step is not required.

1. Open a browser and log in to the Red Hat Customer Portal **Product Downloads** page at access.redhat.com/downloads.
2. Locate the **Red Hat AMQ** entries in the **JBOSS INTEGRATION AND AUTOMATION** category.
3. Select the desired AMQ product. The **Software Downloads** page opens.
4. Click the **Download** link for your component.

Registering your system for packages

To install RPM packages on Red Hat Enterprise Linux, your system must be registered. If you are using ZIP or TAR files, this step is not required.

1. Go to access.redhat.com.
2. Navigate to **Registration Assistant**.
3. Select your OS version and continue to the next page.
4. Use the listed command in your system terminal to complete the registration.

To learn more see How to Register and Subscribe a System to the Red Hat Customer Portal .

APPENDIX B. INTRODUCTION TO APACHE MAVEN

Apache Maven is a distributed build automation tool used in Java application development to create, manage, and build software projects. You use it to run the AMQ Broker example programs that are included with the AMQ Broker installation.

Running the AMQ Broker example programs requires you to interact with several Maven components:

Project object model (POM) files
: Store information about how the project should be built.

Repositories
: Hold build artifacts and dependencies.

The Maven settings file
: Stores user-specific configuration information.

B.1. MAVEN POM FILES

Maven uses standard configuration files called Project Object Model (POM) files to define projects and manage the build process. They ensure that the project is built correctly and uniformly. POM files are XML files (**pom.xml**).

Maven favors "convention over configuration". Therefore, POM files require minimal configuration and default all other values. A POM file can define the following information for a Maven project:

- Location of the source, test, and target directories
- Project dependencies
- Plug-in repositories
- Goals that the project can execute
- Additional details about the project, such as the version, description, developers, mailing list, license, and so on.

Example B.1. Sample pom.xml file

This basic **pom.xml** file demonstrates the minimum requirements for a POM file:

```xml
<project>
  <modelVersion>4.0.0</modelVersion>
  <groupId>com.jboss.app</groupId>
  <artifactId>my-app</artifactId>
  <version>1</version>
</project>
```

Additional Resources

- The schema for the **pom.xml** file is available at http://maven.apache.org/maven-v4_0_0.xsd.
- For more information about POM files, see the Apache Maven Project POM Reference .

B.2. MAVEN REPOSITORIES

A Maven repository stores Java libraries, plugins, and other build artifacts. Repositories can be either local or remote.

The default public repository is the Maven 2 Central Repository, but repositories can be private and internal within a company so that common artifacts can be shared among development teams.

Repositories are also available from third-parties. AMQ includes a Maven repository that contains tested and supported versions of the AMQ 7.4 Java packages and dependencies.

Additional resources

- For more information about Maven repositories, see Introduction to Repositories.

B.3. THE MAVEN SETTINGS FILE

The Maven **settings.xml** file contains user-specific configuration information for Maven. It contains information that must not be distributed with the **pom.xml** file, such as developer identity, proxy information, local repository location, and other settings specific to a user.

The **settings.xml** file is found in two locations:

- In the Maven installation:
  The **settings.xml** file is located in the **<maven-install-dir>/conf/** directory. These settings are referred to as **global** settings. The default Maven settings file is a template that you can copy and use as a starting point for the user settings file.

- In the user's installation:
  The **settings.xml** file is located in the **${user.home}/.m2/** directory. If both the Maven and user **settings.xml** files exist, the contents are merged. Where there are overlaps, the user's **settings.xml** file takes precedence.

Example B.2. The Maven settings file

```xml
<?xml version="1.0" encoding="UTF-8"?>
<settings xmlns="http://maven.apache.org/SETTINGS/1.0.0"
          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
          xsi:schemaLocation="http://maven.apache.org/SETTINGS/1.0.0
http://maven.apache.org/xsd/settings-1.0.0.xsd">
  <profiles>
    <!-- Configure the JBoss AMQ Maven repository -->
    <profile>
      <id>jboss-amq-maven-repository</id>
      <repositories>
        <repository>
          <id>jboss-amq</id>
          <url>file:///path/to/repo/</url>
          <releases>
            <enabled>true</enabled>
          </releases>
          <snapshots>
            <enabled>false</enabled>
          </snapshots>
        </repository>
      </repositories>
      <pluginRepositories>
        <pluginRepository>
          <id>jboss-amq-maven-plugin-repository</id>
          <url>file://path/to/repo</url>
          <releases>
            <enabled>true</enabled>
          </releases>
          <snapshots>
            <enabled>false</enabled>
          </snapshots>
        </pluginRepository>
      </pluginRepositories>
    </profile>
  </profiles>
  <activeProfiles>
    <!-- Optionally, make the repository active by default -->
    <activeProfile>jboss-amq-maven-repository</activeProfile>
  </activeProfiles>
</settings>
```

Additional resources

- The schema for the **settings.xml** file is available at http://maven.apache.org/xsd/settings-1.0.0.xsd.
- For more information about the Maven settings file, see the Settings Reference.

Revised on 2020-01-13 22:09:12 UTC