

IBM Product Connectivity Scenarios and Patterns
Version 1 Release 0

*Connecting WebSphere Application
Server to WebSphere MQ*

IBM

Note

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Chapter 1. Scenario: Deploying an MQTT mobile application with WebSphere MQ and WebSphere Application Server

Mobile devices can connect to Java™ EE applications on WebSphere Application Server by using the MQTT protocol. Starting with an existing WebSphere MQ and WebSphere Application Server installation, this scenario leads you through the key tasks that are required to connect a mobile device to WebSphere Application Server.

This scenario was developed using sample installations, and uses sample applications to demonstrate the use of WebSphere Application Server connected to WebSphere MQ. If you want to try the scenario, you can set up a copy of the sample installation as described in the scenario. You can use the sample applications that are provided with the scenario to verify your progress through each stage.

Chapter 2. Planning the solution

You can connect WebSphere Application Server to a mobile client through WebSphere MQ. Review the topics in this section to understand what is covered in this scenario, the reasons why a business might want to follow the scenario, and the user roles that are involved.

Assumptions

This scenario makes the following assumptions about your setup.

- You are using the Windows operating system.
- You are continuing from the Getting started on Windows scenario.
- You do not have security configured for WebSphere MQ. This scenario does not describe security configuration. However, if you do have security configured for WebSphere MQ you can still complete the scenario.
- You are using graphical user interfaces of WebSphere MQ rather than command-line equivalents.

Business overview

A company wants to extend their existing Java EE application on WebSphere Application Server to work with messages from mobile devices.

This business overview follows on from the one in “Getting started on Windows”. For more information, see Business overview.

This business overview follows on from the one in Getting started on Windows.

The company now wants to offer a mobile solution to its clients, which must take the following things into account:

- Volume and cost of data that is transmitted, especially in machine to machine (M2M) messaging with limited data plans
- Power consumption of battery-powered devices
- Responsiveness (near-real time delivery of information)
- Reliable delivery over fragile connections
- Security and privacy
- Scalability

The MQ Telemetry Transport (MQTT) protocol is designed to meet these challenges.

The company wants its clients to always use the most up-to-date version of the application. Additionally, the application should be cross-platform to minimize development costs. A JavaScript application is ideal because the most recent version is loaded from the server each time it is opened. As demand rises the company wants to serve the application from WebSphere Application Server, where the existing Java EE application is already running.

Related information:

User roles and interactions

Roles used throughout these scenarios, with interactions between roles for scenario tasks.

Although roles to develop the solution are listed, this scenario focuses on deploying a solution that connects a mobile device to WebSphere MQ and WebSphere Application Server. These roles are the same as the ones found in “Getting started on Windows”. For more information, see User roles and interactions.

Develop the solution

Develop the software aspects of the solution.

Software Architect

The Software Architect is responsible for dividing the required function between the components that make up a software solution. This person works with the specifications and standards used by existing IT systems, and determines where enhancements or new components must be written by the Developer.

Developer

The Developer is responsible for creating and testing the software components and linking them together. In some cases the Developer might need information from the Administrator, for example if the Developer must use an existing queue name in their software code. After the Developer finishes creating the software components, the Developer gives those components to the Administrator for deployment.

Deploy the solution

Deploy the solution for production use, by installing, configuring, and testing the components that provide the solution.

Administrator

The Administrator installs and configures the components that support the solution, in this case WebSphere MQ and WebSphere Application Server. The business might have a different Administrator for each product, or one Administrator might perform installation and configuration for all components. If the Administrators are different they might need to exchange information. For example, in this scenario the WebSphere MQ administrator must give the name of the queue to the WebSphere Application Server administrator. The Administrator also deploys the software components given to them by the Developer.

Test Implementer

The Test Implementer runs the tests to validate the solution and that the solution is ready for production use. For example, can the solution be started, stopped, backed up, and recovered after a system failure as well as be maintained?

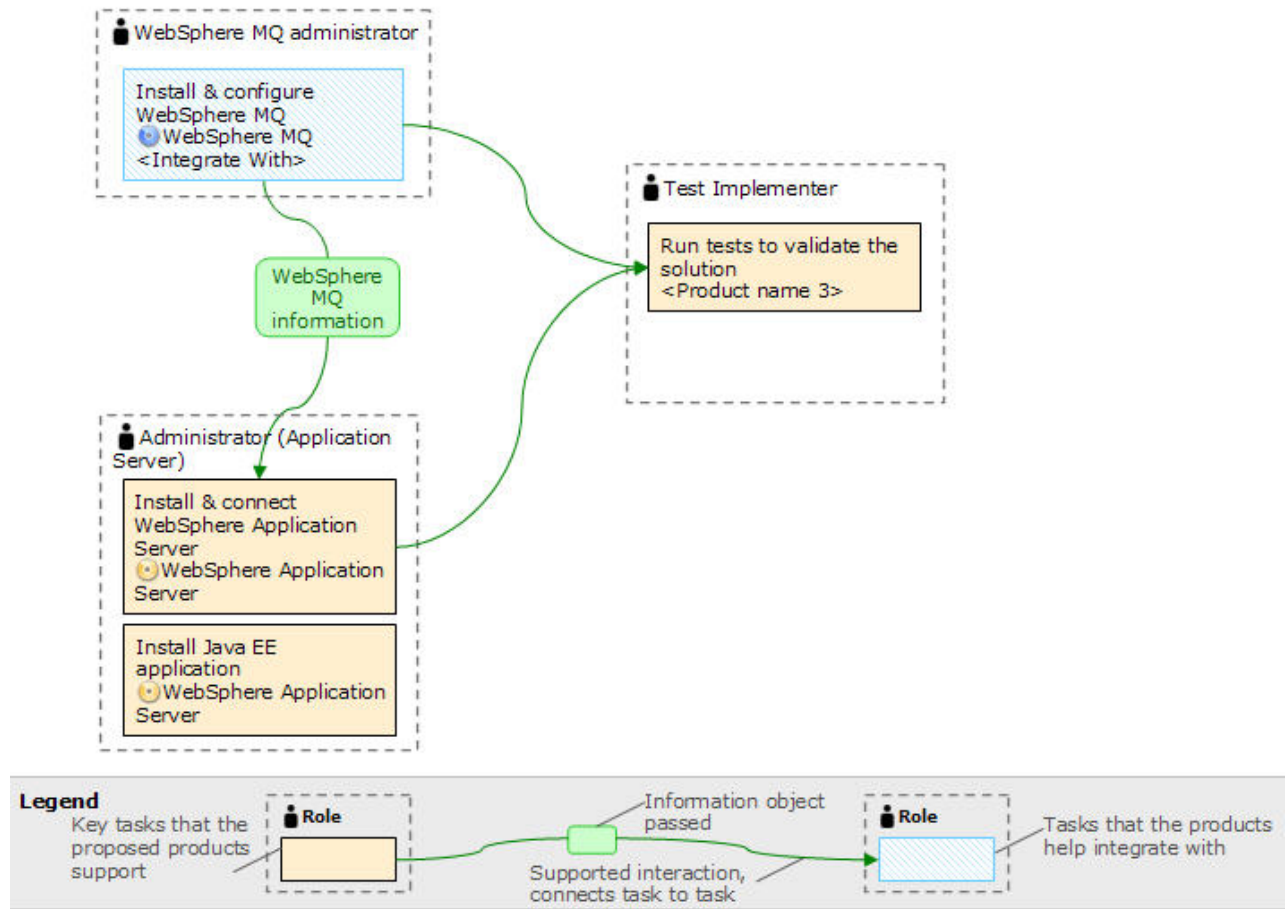


Figure 1. User role interactions to deploy the solution

Chapter 3. Implementing the solution

Implementing the solution in this scenario involves configuring WebSphere® MQ to use the MQTT protocol, deploying sample applications to WebSphere Application Server and mobile devices, and finally, configuring a web server.

Before you begin

The starting point for this scenario is an existing WebSphere MQ installation as the initial messaging infrastructure and an existing WebSphere Application Server installation like in the Getting started on Windows scenario.

About this task

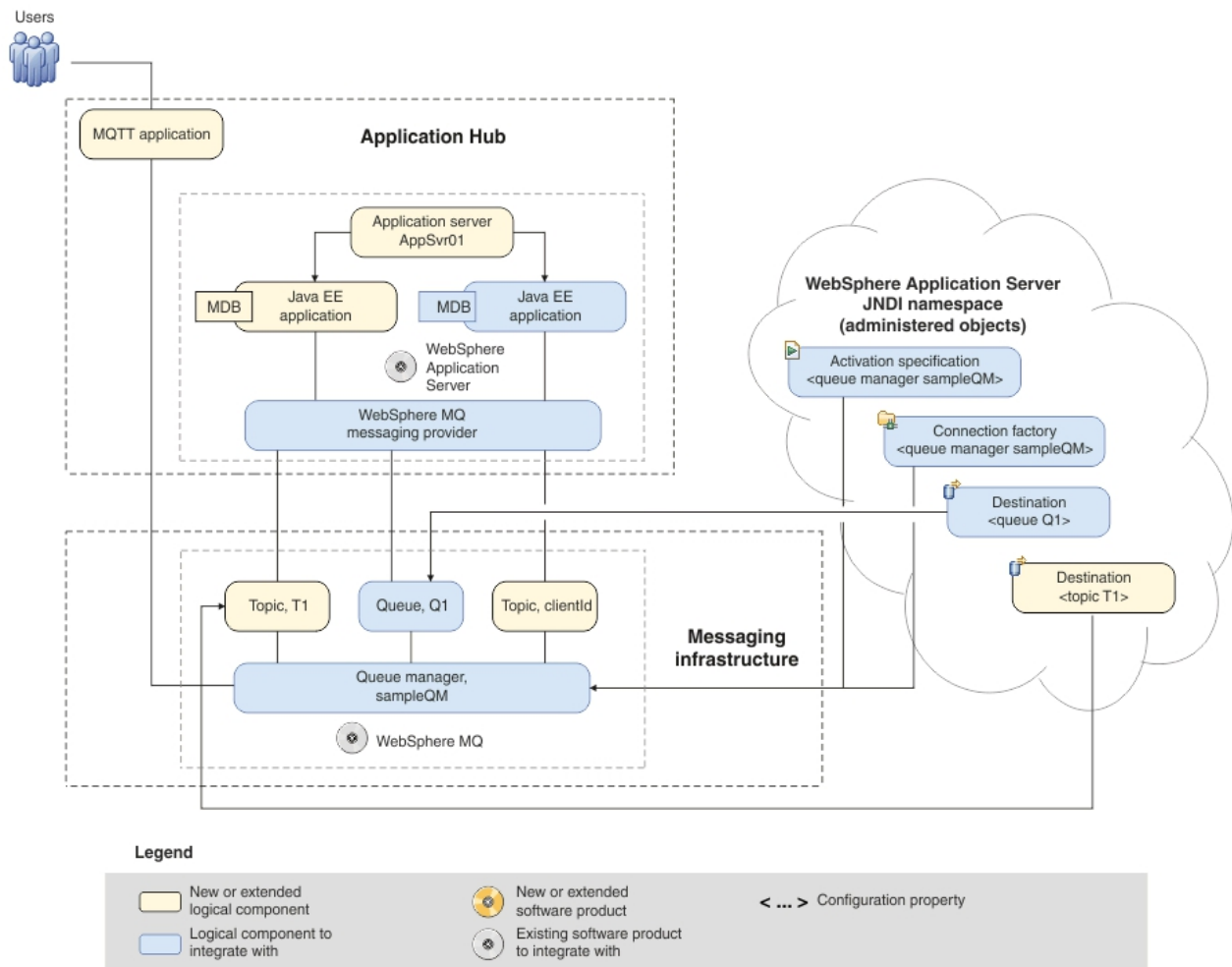


Figure 2. Delivered logical topology. The high-level logical topology diagram for new software functions delivered by integrating MQTT into the initial WebSphere MQ messaging infrastructure. This delivered logical topology shows the new functions as new or extended logical components, integrated with the software functions and products from the initial logical topology.

Configuring the MQTT service with WebSphere MQ

The MQTT service for WebSphere MQ can be installed and ready to use with the following steps.

Before you begin

- Set up and configure the sample IT configuration from Creating a sample initial IT configuration on your system.
- You must have local administrator authority when you are installing. Define this authority through the Windows facilities.

About this task

This task modifies an existing WebSphere MQ installation and creates an MQTT service to listen on port 1883. The configuration gives everyone permission to publish and subscribe to any topic.

Procedure

1. Modify the existing installation to include the MQTT service.
 - a. Run the same WebSphere MQ installer as in the initial sample IT configuration. This is the IBM® WebSphere MQ InstallShield Wizard. For more information, see steps 1-3 in Installing WebSphere MQ.
 - b. In the installer, select **Maintain or upgrade an existing instance**.
 - c. Select your existing installation and click **Next**.
 - d. Leave **Modify** selected and click **Next**.
 - e. Click the icons for **Telemetry Service** and **Telemetry Clients**, and select **Install this feature** to install each feature.
 - f. Click **Next** and then click **Modify**. The installer will stop any WebSphere MQ activity if it is running.
2. Open WebSphere MQ Explorer.
3. Run the Telemetry “Define sample configuration” wizard.
 - a. Optional: If the “MQ Explorer - Content” window is closed, click **Window > Reset Perspective**.
 - b. Expand sampleQM and select the **Telemetry** folder.
 - c. Click **Define sample configuration** to start the wizard.
 - d. Click **Finish** to create the telemetry service and run the MQTT Client Utility.
4. Test the connection in the MQTT Client Utility window.
 - a. In the Connection section, click **Connect**.
 - b. In the Subscription section, click **Subscribe**.
 - c. In the Publication section, click **Publish**. In the Client History section, you can see that a message has been published and received.

Results

You have installed the MQTT service.

Deploying the sample application to WebSphere Application Server

Deploy a Java EE application to WebSphere Application Server so that it can act as a formatter for the existing application.

Before you begin

- Set up and configure the sample IT configuration from Creating a sample initial IT configuration on your system.
- Download the sample applications: FormatterApp.ear and MQTTJavascript.war.

About this task

When you set up WebSphere Application Server in the previous scenario, you deployed the sampleMDB.ear sample application to respond to requests. The messages that are sent by the MQTT application do not contain the reply information that is required by this sample application. Therefore, you need a second application to format the incoming messages before sending them on to the sample application. Additionally, you need a web application that devices use to communicate with the messaging infrastructure.

Procedure

1. Start WebSphere Application Server and open the administrative console. For more information, see step 1 and 2 in Configuring WebSphere Application Server.
2. Add a Topic.
 - a. In the console, click **Resources > JMS > Topics**.
 - b. Ensure that the scope is set to **Cell=cell_name**, then click **New**.
 - c. Select **WebSphere MQ messaging provider** then click **OK**.
 - d. Under General Properties, enter the following values for the required fields.

Name A name of your choice.

This name is used to display the queue in the administrative console.

JNDI name

jms/myTopic

The JNDI name is used to reference this queue in the WebSphere Application Server JNDI namespace. The value matches the destination name that you specified when creating the activation specification.

Topic name

T1

This value is the administrative name of the topic that you want to communicate with. This is different from the JNDI name of the queue.

- e. Click **OK**.
3. Add an activation specification.
 - a. In the administrative console, click **Resources > JMS > Activation specifications**.
 - b. Ensure that the scope is set to **Cell=cell_name**, then click **New**.

Why am I doing this?

You use the **Scope** property to set the level at which the activation specification is visible. The cell scope is the highest level, giving the activation specification the greatest visibility.

What else might I do or be interested in?

You can also create activation specifications at other levels. For example, if you have multiple servers you might create an activation specification for each server, using the server scope, so that you can specify different settings to be used for each server.

- c. Select **WebSphere MQ messaging provider** then click **OK**. The “Create WebSphere MQ JMS resource” wizard starts.
- d. On the “Configure basic attributes” page, add a **Name** of your choice, then type `jms/FormatterApp` in the **JNDI name** field. Click **Next**.

Why am I doing this?

The name you choose is used to display the activation specification in the administrative console. The JNDI name is used to reference the object in the JNDI namespace.

- e. On the “Specify MDB destination data” page, type `jms/myTopic` in the **Destination JNDI name** field. The destination type is `Topic`. Click **Next**.
- f. On the “Configure Durable Subscription” page, leave the defaults and click **Next**.
- g. On the “Select connection method” page, leave the default option, **Enter all the required information into this wizard**, selected and click **Next**.
- h. On the “Supply queue connection details” page type the name of the WebSphere MQ queue manager, `sampleQM` in the **Queue manager or queue-sharing group name** field, then click **Next**.
- i. On the “Enter connection details” page, enter the following information then click **Next**.

Transport mode

Leave as the default setting, **Bindings, then client**.

Why am I doing this?

In this mode, WebSphere Application Server first attempts to connect in bindings mode, where the WebSphere MQ messaging provider within WebSphere Application Server connects directly to the WebSphere MQ queue manager. If this connection attempt fails, the WebSphere MQ messaging provider then attempts to connect by using client mode, which uses a TCP/IP-based network. Bindings mode usually has better performance, but can be used only when WebSphere Application Server and WebSphere MQ are installed on the same machine. The host name, port, and server connection channel information is required for client mode. Bindings mode requires the configuration of native library path information, which you will add in a later step in this task.

Host name

The name of your machine.

Port The port number of the WebSphere MQ queue manager `sampleQM`.

This port number is displayed in WebSphere MQ Explorer under **Queue managers** > *sampleQM* > **Advanced** > **Listeners**, in the Port column in the LISTENER.TCP row.

Server connection channel

The name of the WebSphere MQ channel to use for communication.

If you do not have a specific channel that you want to use, specify the default channel that is created when you created the queue manager, SYSTEM.DEF.SVRCONN.

Tip: To display the default channel in WebSphere MQ Explorer, click the Show System Objects icon at the upper right of the MQ Explorer - Content pane.

- j. On the “Test connection” page, click **Test connection**.

Why am I doing this?

The **Test connection** button verifies that the activation specification contains the necessary details to create a connection to WebSphere MQ. To use this connection, you must create further administrative objects, as described in the rest of the steps.

If successful, the wizard displays the message A connection was successfully made to WebSphere MQ. If not successful, check that the queue manager name, port, and server channel that you specified are correct, and match the corresponding values in WebSphere MQ.

- k. Click **Next**, then on the Summary page click **Finish**.
4. Install the application.
 - a. Click **Applications** > **Application Types** > **WebSphere enterprise applications**.
 - b. In the Enterprise Applications pane, click **Install**.
 - c. On the Preparing for the application installation page, select **Local file system**, then browse to where you downloaded the formatter MDB application, FormatterApp.ear and click **Next**.
 - d. For “How do you want to install the application?”, leave the default option, **Fast path** selected.

Why am I doing this?

By choosing the “fast path” option, you can skip many of the steps on the Install New Application page; you are prompted only when additional information is required. For more information, see the topic Preparing for application installation binding settings in the WebSphere Application Server information center.

Click **Next**.

- e. Click the **Step 3** link to go to the “Step 3: Bind listeners for message-driven beans” page. Select **Activation Specification** and enter `jms/FormatterApp` in the Target Resource JNDI Name field.
- f. On the “Step 4: Bind message destination references to administered objects” page, enter `jms/wasQueue` in the Target Resource JNDI Name field.

- g. On the “Step 5: Map resource references to resources” page, enter `jms/replyCF` in the Target Resource JNDI Name field. This is the JNDI name for the connection factory that you created in step 4 of Configuring WebSphere Application Server.
 - h. On the “Step 7: Summary” page, click **Finish**. The program displays messages to indicate that the application is being installed.
 - i. When the application is installed successfully, click the **Save** link that is displayed at the end of the messages, to save your changes to the master configuration.
 - j. On the Enterprise Applications page, if your new application is not running then select it and click **Start**.
5. Install the web application.
- a. Click **Applications > Application Types > WebSphere enterprise applications**.
 - b. In the Enterprise Applications pane, click **Install**.
 - c. On the Preparing for the application installation page, select **Local file system**, then browse to where you downloaded the `MQTTJavascript.war` file and click **Next**.
 - d. For “How do you want to install the application?”, leave the default option, **Fast path** selected and click **Next**.
 - e. On the Step 1, Step 2, and Step 3 pages, click **Next**.
 - f. On the “Step 4: Map context roots for Web modules” page, enter `/MQTTJavascript` in the Context Root field and click **Next**. Then, click **Next** again.
 - g. On the “Step 6: Summary” page, click **Finish**. The program displays messages to indicate that the application is being installed.
 - h. When the application is installed successfully, click the **Save** link that is displayed at the end of the messages, to save your changes to the master configuration.
 - i. On the Enterprise Applications page, if your new application is not running then select it and click **Start**.

Results

WebSphere Application Server is now ready to accept requests from mobile devices that use the MQTT protocol and serve the web application.

Deploying the sample application to mobile devices

You can deploy the sample application to mobile devices. After the deployment, mobile devices can use the sample application to connect to the Java EE application.

Deploying the sample application to an iOS device

The sample application can be deployed to an iOS device.

About this task

iOS supports WebSockets by default, so you can access the web application on WebSphere Application Server by using the browser. Alternatively, you can make an app with a WebView to load the application without the need for a browser.

This task assumes that you access the web application on WebSphere Application Server by using the browser.

Procedure

1. On the iOS device, open the Safari web browser.
2. Load the web application. The URL is `http://192.168.0.101:9080/MQTTJavascript`, where 192.168.0.101 is replaced with the IP address of WebSphere Application Server.
3. Enter the address of your WebSphere MQ installation, and then click **Connect**. On successful connection to WebSphere MQ, the **Connect** button turns green.
4. To send a message to WebSphere Application Server and display the response, click **Send**. If the client connects correctly in the previous step, but no response is displayed, check that WebSphere Application Server was configured properly in “Deploying the sample application to WebSphere Application Server” on page 8.

Deploying the sample application to an Android device

The sample application can be deployed to an Android device.

Before you begin

Download the sample project
SampleMQTTRequestorApp.zip

About this task

Until the default Android browser supports WebSockets, it is difficult to load the JavaScript as part of a native application like the iOS example. There are two options to consider.

1. Use an existing installation of Google Chrome or Mozilla Firefox for Android: open the browser and type in the URL of the JavaScript application.
2. Create an Android application that uses the MQTT Java libraries.

This task assumes that you use the second option.

Procedure


1. Prepare Eclipse and the Android SDK.
 - a. Install a Java development environment (JDK) and an Eclipse development environment. To run the virtual device for Android, you must use the JDK from Oracle. You can obtain the JDK and Eclipse from Java SE Downloads and Eclipse IDE for Java Developers.
 - b. Add the development tools (ADT) plug-in for Android to Eclipse. For more information, see Installing the Eclipse Plugin. Alternatively, the Android SDK can be downloaded which includes Eclipse and the required libraries and tools. For more information, see Get the Android SDK.
2. Import the sample project.
 - a. In Eclipse, click **File > Import > Android > Existing Android Code Into Workspace**.
 - b. Click **Browse** and select the SampleMQTTRequestorApp.zip file.
 - c. Select the project in the **Project to Import** pane, select **Copy projects into workspace**, and click **Finish**.

3. Optional: Change the WebSphere MQ address in the project if it is not running on the same machine.
 - a. In the Package Explorer, navigate to: `SampleMQTTRequestorApp/src/Requestor.java`.
 - b. Change the address on line 17 to the correct address. The default one is `10.0.2.2:1883`, which is localhost for the machine running the Android Virtual Device.
4. Configure an Android Virtual Device.
 - a. Using the Java perspective in Eclipse, click **Window > Android Virtual Device Manager**.
 - b. Click **New** and complete the fields to create a new virtual device. The project requires a target of Android 4.2.2 or above. For more information, see <http://developer.android.com/tools/devices/managing-avds.html>.
5. Run the sample application.
 - a. Right-click the project folder in the Package Explorer and click **Run As > Android Application**.
 - b. The Android emulator will take some time to start and install the application. You should be able to see an interface to request the price of beans that is similar to the JavaScript application. If the **Connected** check box is not selected, check that your WebSphere MQ server is running and configured properly in step 3.

Results

The Android device is now ready to message the Java EE application. Click the **Send** button to send a message and receive a reply from the application on the server.

Related information:

 https://www.ibm.com/developerworks/community/blogs/c565c720-fe84-4f63-873f-607d87787327/entry/mobile_messaging_on_android

Verifying the solution

Verify that your solution works and that WebSphere MQ and WebSphere Application Server are connected correctly.

About this task

You have now connected WebSphere Application Server to WebSphere MQ and installed a web application and Java EE application on WebSphere Application Server. To verify that this has been done correctly, use the web application to send a message and display a response. You can do this through your browser, or the mobile applications provided.

Procedure

1. Test the application by using your browser.
 - a. Open your browser. The application uses the WebSocket protocol, which is supported by Mozilla Firefox 6.0 and later, Google Chrome 14.0 and later, and Safari 6.0 and later.
 - b. Load the web application. If you are on the same machine where WebSphere Application Server is running, then this is `http://localhost:9080/MQTTJavascript` by default.

- c. If the address of your WebSphere MQ installation is not the one displayed, enter the details and click **Connect**. The **Connect** button turns green upon a successful connection to WebSphere MQ.
 - d. Click **Send** to send a message to WebSphere Application Server and display the response. If the client connects correctly in the previous step, but no response is displayed, check that WebSphere Application Server was configured properly in “Deploying the sample application to WebSphere Application Server” on page 8.
2. Optional: Test the application by using the mobile applications and instructions provided in “Deploying the sample application to an Android device” on page 13 and “Deploying the sample application to an iOS device” on page 12.

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