Oracle® Java ME Embedded

Getting Started Guide for the Reference Platform (Qualcomm IoE)

Release 3.4

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This book describes how to install and run the Oracle Java ME Embedded software on the Qualcomm IoE reference platform.

ORACLE

Getting Started Guide for the Reference Platform (Qualcomm IoE), Release 3.4

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Preface

This book describes how to install and configure Oracle Java ME Embedded software onto a Qualcomm Internet-of-Everything (IoE) embedded device. In addition, it contains troubleshooting information and Device Access API peripheral specifications useful for Java embedded developers.

Audience

This document is intended for developers who want to run Oracle Java ME Embedded software on a Qualcomm IoE device.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at
http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc.

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit
http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info or visit
http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing impaired.

Related Documents

This document frequently references the *Qualcomm IoE Development Platform User's Guide*, which can be downloaded at:

https://developer.qualcomm.com/mobile-development/development-devices-boards/development-boards/internet-of-everything-development-platform/tools-and-resources

For a complete list of documents with the Oracle Java ME Embedded software, see the Release Notes.

Operating System Commands

This document does not contain information on basic commands and procedures such as opening a terminal window, changing directories, and setting environment

variables. See the software documentation that you received with your system for this information.

Shell Prompts

Shell	Prompt
Bourne shell and Korn shell	`$`
Windows	*directory*>

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

Installing Oracle Java ME Embedded on the Qualcomm IoE Board

This chapter demonstrates how to install the Oracle Java ME Embedded software on the Qualcomm Orion Internet-of-Everything (IoE) board. The following items are required for installing and developing on the Qualcomm IoE board:

- The Qualcomm IoE embedded board running the Brew MP operating system
- A desktop PC running Microsoft Windows 7
- A USB cable with a micro-B connector that can link the Qualcomm IoE board to your desktop PC
- The Qualcomm IoE USB Drivers
- The Qualcomm Netsetup Brew Application
- The Qualcomm Brew MP SDK tools
- A terminal emulation program, such as PuTTY.
- Oracle Java ME Embedded 3.4
- Oracle Java ME SDK 3.4
- The NetBeans 7.3.1+ or Eclipse Indigo or Juno IDE (optional)

Setting Up the Qualcomm IoE Board

First, download the *Qualcomm IoE Development Platform User's Guide* in PDF format, which can be downloaded at:

https://developer.qualcomm.com/mobile-development/development-devices-boards/development-boards/internet-of-everything-development-platform/tools-and-resources

This document contains important information about the Qualcomm IoE board and its hardware.

Next, perform the following steps, in order.

1. Assemble and connect the board's components as listed in Chapter 3, "Hardware", and Chapter 5, "Hardware Configuration", of the *Qualcomm IoE Development Platform User's Guide*.
2. Connect the power supply as shown in the *Qualcomm IoE Development Platform User's Guide* and power on the board.
   - To use an AC-power source, see Section 5.3.5.5, "AC-powered operation."

- To use a battery source, see Section 5.3.5.4, "Battery-powered operation."

Downloading and Installing the Brew MP SDK Tools

Download the Brew MP SDK tools from the following site:

https://developer.brewmp.com/tools/brew-mp-sdk

The version used in this documentation is 7.12.5. Double-click on the installer executable, and install the application on your Windows platform desktop as per the instructions shown. You will need the **Loader** and **Logger** applications that are installed with the Brew MP SDK Tools in later sections.

Installing the Qualcomm IoE USB Drivers

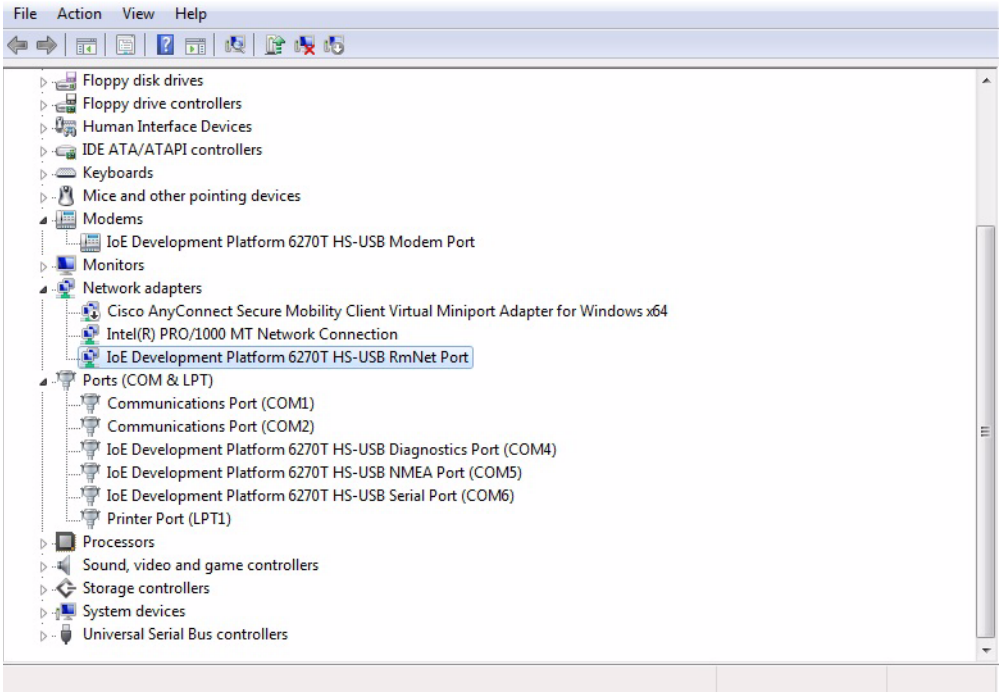
To develop on the Qualcomm IoE board, you must first install the Windows USB drivers for the board. If you have not already done this, use the following steps:

1. Download the Qualcomm IoE USB drivers from the following site:

   https://developer.qualcomm.com/mobile-development/development-devices-boards/development-boards/internet-of-everything-development-platform/tools-and-resources

2. Ensure that the Qualcomm IoE board is powered up by pressing the "PWR KEY" button on the board. Then, follow the instructions in Chapter 2, "Software Setup," of the *Qualcomm IoE Development Platform User's Guide* to properly install the USB drivers in Windows.
3. Open the Windows Device Manager (**Start** -> Search for '**Device Manager**').
4. Ensure that the drivers are successfully installed by verifying the following hardware ports, as shown in Figure 1–1.
   - HS-USB Modem (AT command port)
   - HS-USB Serial Port (Java tooling port)
   - HS-USB Diagnostics Port
   - HS-USB NMEA Port (GPS)

Figure 1–1 Device Manager with Qualcomm IoE USB Device Drivers Loaded



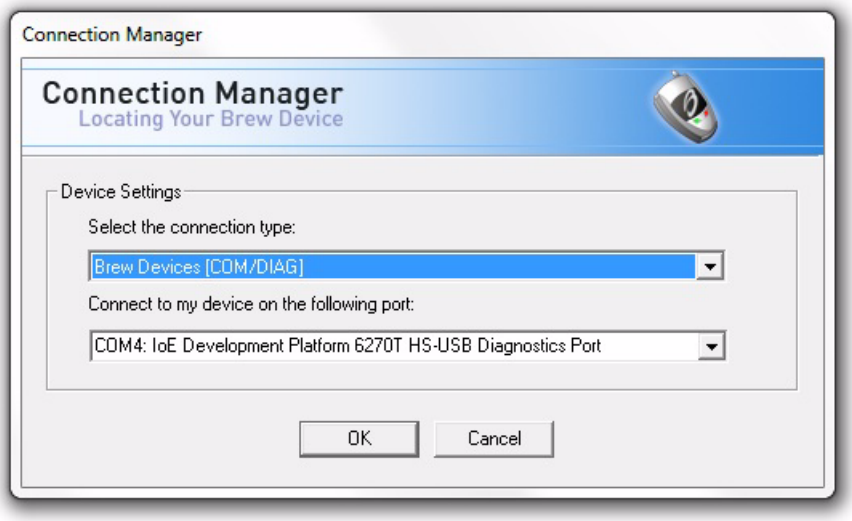
Copying Files to the Qualcomm IoE Board

Finally, you must install the Java ME Embedded Software on the Qualcomm IoE board using the **Loader** and **Logger** applications. Follow these steps to copy the appropriate files to the board:

1. Download and uncompress the Oracle Java ME Embedded Software 3.4 for the Qualcomm IoE board.
2. Obtain the latest `java.sig` and `netsetup.sig` signature files from the Qualcomm IoE website:

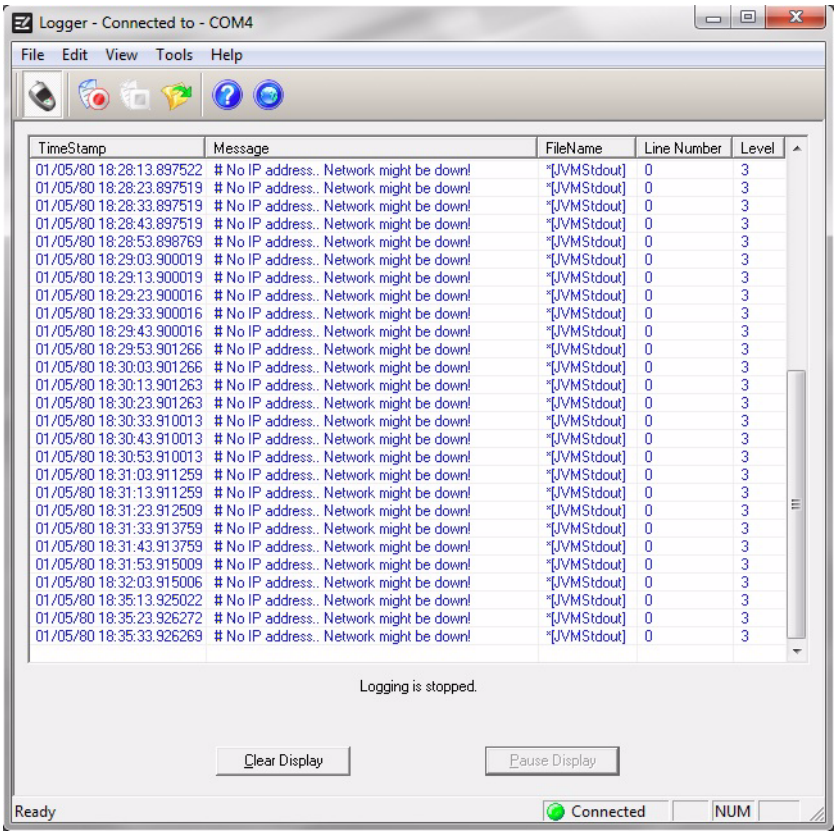
   `https://developer.qualcomm.com/mobile-development/development-devices-boards/development-boards/internet-of-everything-development-platform/tools-and-resources`
3. Start the **Loader** application that was installed with the Brew SDK. Click Start, and then type **Loader** in the Search box. Right-click **Loader** under Programs.
4. When the **Loader** application starts, connect to the board using the Connection type: Brew Devices (COM/DIAG), and whichever port matches the Qualcomm HS-USB Diagnostics Port, as shown in Figure 1–2.

Figure 1–2 Brew SDK Loader Connection Manager Dialog



5. If you are upgrading from the Oracle Java ME Embedded 3.2 release, you will need to delete all the files in the `/sys/mod/java` and `/sys/mod/netsetup` directories, including the `.sig` files. After deleting the files, reboot the board.
6. If it doesn't already exist, create the `/sys/mod/java` directory and drag and drop following files from the Oracle Java ME Embedded distribution's `java` folder into it.
   - `appdb` (folder)
   - `java.mif`
   - `java.mod`
   - `jwc_properties.ini`
   - `watchdog.ini`
7. Copy the `java.sig` signature file obtained from Qualcomm to the `/sys/mod/java` directory.
8. If it doesn't already exist, create the `/sys/mod/netsetup` directory and drag and drop following files from the Oracle Java ME Embedded distribution's `netsetup` folder into it.
   - `netsetup.mif`
   - `netsetup.mod`
9. Copy the `netsetup.sig` signature file obtained from Qualcomm to the `/sys/mod/netsetup` directory.
10. Reset the board by pressing the "RESET KEY" on the board, then wait approximately 40 seconds for the Java VM to startup.
11. Start the **Logger** application in the same way you started the **Loader** application. Connect to the board using the Connection type: Brew Devices (COM/DIAG), and whichever port matches the Qualcomm HS-USB Diagnostics Port. Connect to the board, press the Start Logging button, and verify that the Java VM is sending logging information to the Logger application by checking for messages that come from the `[JVMStdout]` file name. See Figure 1–3.

Figure 1–3 The Brew SDK Logger Application



12. Once Java is successfully running on the Qualcomm IoE board, continue on to the next chapter to learn how to use the tooling features of the Oracle Java ME Embedded software on the board. If Java is not running, please see Chapter 4, "Troubleshooting" to diagnose possible problems.

2

Tooling Over Serial and Networking

This chapter demonstrates how to configure the Qualcomm IoE embedded board using the serial and networking connections of the Oracle Java ME Embedded software so that external communication is possible: a process known as *tooling*. However, in order to successfully communicate with the Qualcomm Orion Internet-of-Everything (IoE) board through a serial connection, the Oracle Java ME SDK 3.4 distribution must be installed, and the Device Manager must be configured to recognize the board.

> **Note:** The term *IMlet*, in the context of the Oracle Java ME Embedded command-line interface and references in this chapter, is synonymous with *MIDlet*.

Tooling Overview

The Oracle Java ME Embedded platform offers the following tools that can be used to communicate and configure the Qualcomm IoE embedded board:

- A command-line interface (CLI) via a terminal emulator program for Application Management System (AMS) commands and for system configuration commands.
- A logging interface for obtaining JVM diagnostic information using a terminal emulator program.
- On-Device Tooling (ODT): the ability to install, run, and debug applications from an IDE on the desktop such as NetBeans or Eclipse.

It is important to note that tooling works over one physical channel. However, the CLI, logging, and ODT functions all use different ports. The ports for CLI and logging are available to the user, and will be discussed later in the chapter. However, the ports used for ODT are invisible to the user, and used by external development tools.

There are two tooling modes available: *serial* and *network*. The default tooling mode for the Oracle Java ME Embedded 3.4 release is *serial*. It's important to note that setting a particular tooling mode alters all the tooling's components. All the tooling components always work in the same mode. In other words, if the tooling mode is set to serial, all connections to the board will be made through that serial connection.

Using Serial Mode

In order to use the serial mode for tooling with the Qualcomm IoE embedded board, perform the following steps:

1. Connect the Qualcomm IoE board to the PC using a USB cable.

2. Ensure that the `com.oracle.tooling.mode` property in the `jwc_properties.ini` file on the board is set to `serial`, and that the `odt_run_on_start` property is set to `true`. See Appendix B, "Configuring the Java Runtime Properties" for more information.
3. Start the Oracle Java ME SDK 3.4 Device Manager on the desktop, if it is not already started, and ensure that the device is connected, as shown in the following section.

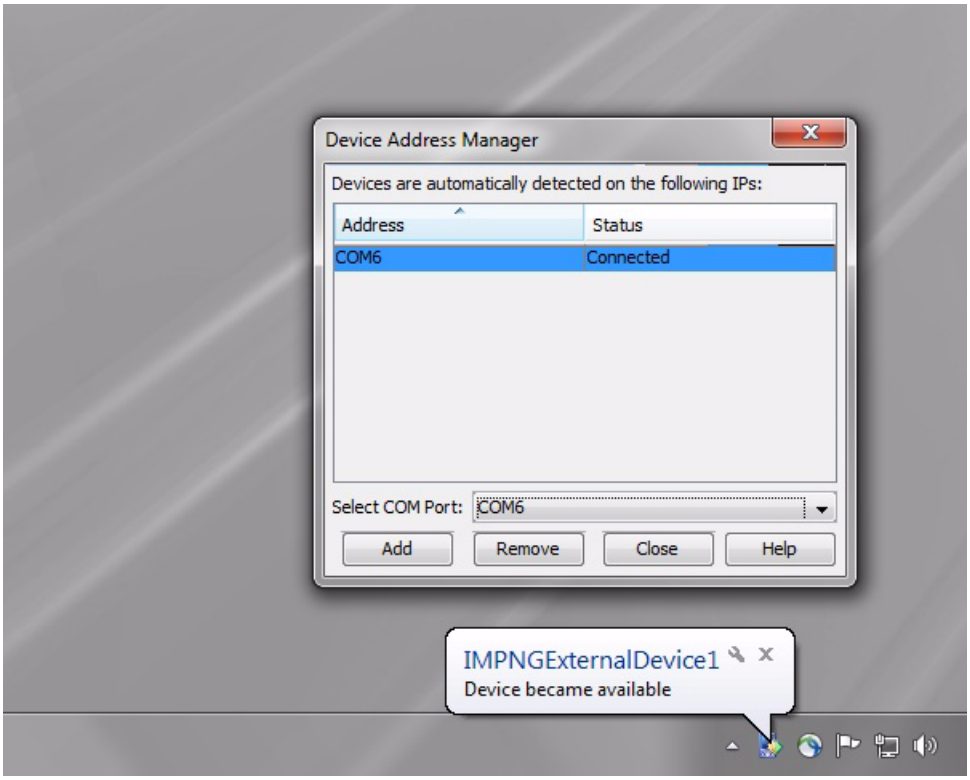
Installing and Configuring the Java ME SDK 3.4

Download and install the Java ME SDK 3.4 distribution onto your Windows desktop platform from the Oracle Technology Network website.

`http://www.oracle.com/technetwork/java/javame/javamobile/download/sdk/index.html`

Once this is installed, start the **Oracle Java ME SDK Device Manager** (located at *<SDK Installation Folder>*`/bin/device-manager.exe`) and right click on its icon in the taskbar, then select **Manage Device Addresses**. Selecting this option will bring up a small dialog box that looks similar to Figure 2–1.

Figure 2–1 Oracle Java ME SDK Device Manager



Choose the COM port that corresponds to the **Qualcomm IoE HT-USB Serial Port**, as reported earlier by the Windows **Device Manager**. At this point, the Oracle Java ME SDK Device Manager should locate the device and report that an external IMP-NG device has now become available.

Note that you can freely reboot the board or restart Java on the board without rebooting the Oracle Java ME SDK Device Manager. However, if you reboot the Device

Manager, you must reboot Java or the board as well. If you have issues with the Device Manager connecting to the board, please see Chapter 4, "Troubleshooting".

Downloading and Installing the PuTTY Terminal Emulator Program

Next, download the PuTTY Terminal Emulator Program (`putty.exe`) from the following site:

`http://www.putty.org/`

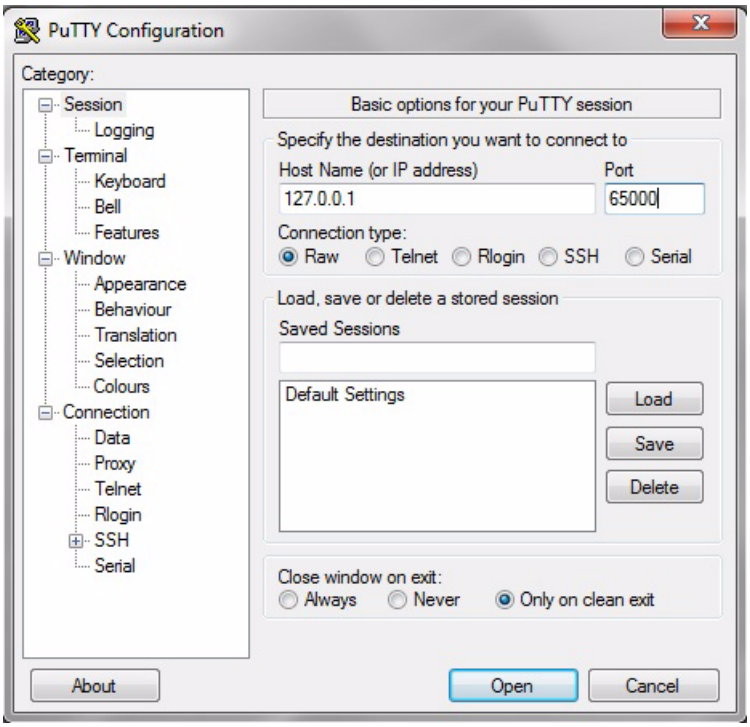
The terminal emulator executable is directly downloadable as `putty.exe`. The terminal emulator is used to connect to both the Java logger and the command-line interface (CLI) that issues commands to the board.

WARNING: Using the PuTTY Terminal Emulator Program is highly recommended. You're free to use any terminal program to connect to the Java Logger or CLI. However, Oracle cannot guarantee that other terminal programs will work with the Java Logger and CLI in the same manner as PuTTY.

Using the Java Logging Interface

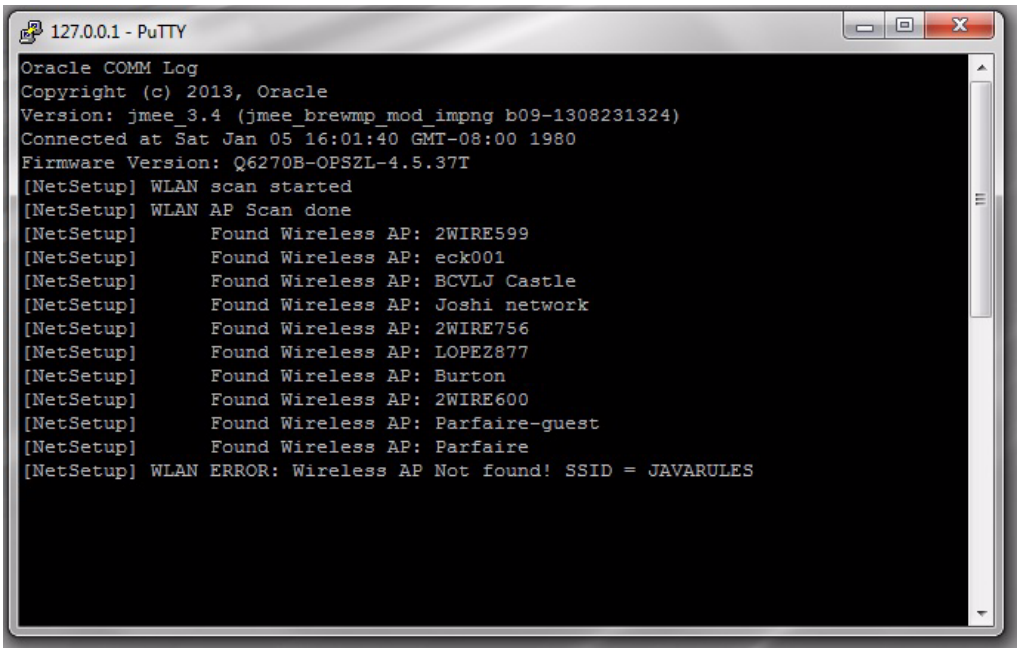
To connect to the Java logger, start a PuTTY executable on your desktop computer. Use this to create a Raw network connection to the board's IP address (127.0.0.1 in the case of serial mode) with the port 65000, as shown in Figure 2–2.

Figure 2–2 PuTTY Configuration for Java Logger Connection



Once connected, you should start seeing output from the Java Logger, as shown in Figure 2–3.

Figure 2–3 Oracle Java ME Embedded Logger



Connecting to port 65000 will display the logging information from only the Oracle Java ME Embedded platform. However, you can use the Brew MP SDK **Logger** application, as shown in Chapter 1, to capture logging output from both the Oracle Java ME Embedded system as well as the Qualcomm IoE board itself.

Finally, if you're using an IDE such as NetBeans or Eclipse, application output sent to `System.out` or `System.err` will appear in the Java output window of the IDE, as shown in Chapter 3, "Installing and Running Applications on the Qualcomm IoE Board".

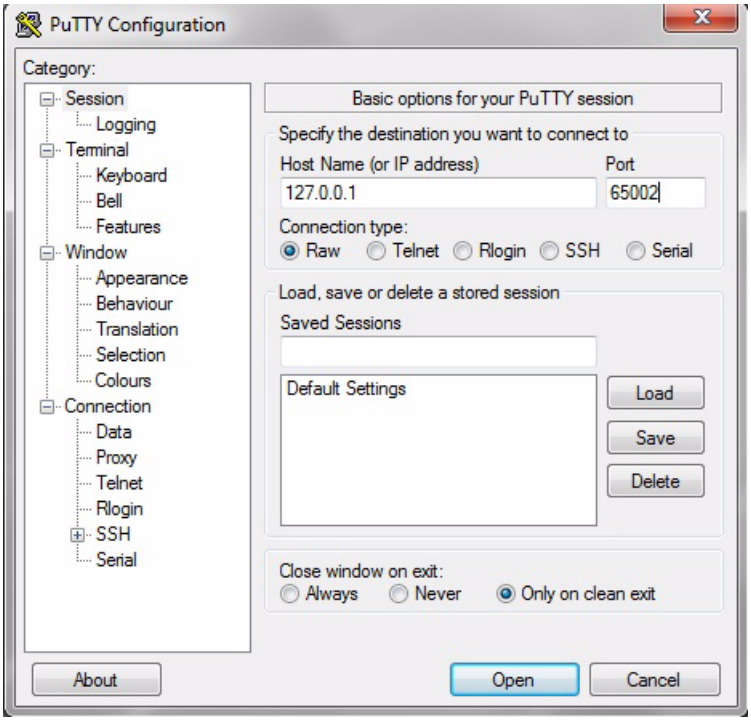
Note: The NetBeans and Eclipse IDEs also connect to port 65000 of the device to capture Java logs and display them in the appropriate logging windows. If you cannot connect to port 65000 with PuTTY, check that NetBeans or Eclipse is not already using this port. The same is true if you don't see any logs in NetBeans or Eclipse IDEs: ensure that there are no active connections to port 65000 from PuTTY.

Using the Command-Line Interface

The command-line interface is used to issue commands directly to Java runtime.

To use the command-line interface, start a PuTTY executable on your desktop computer. Use this to create a Raw network connection to the board's IP address (127.0.0.1 in the case of serial mode) with the port 65002, as shown in Figure 2–4.

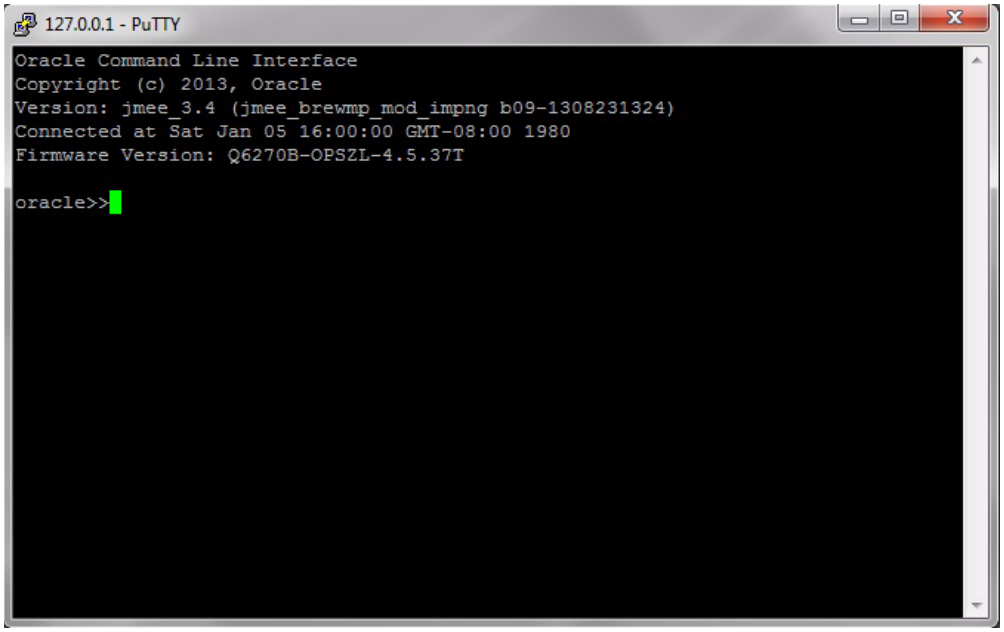
Figure 2–4 PuTTY Configuration for CLI Connection



If you are using the serial mode to connect to the board, ensure that the Java ME SDK 3.4 Device Manager has already successfully detected the device, as shown earlier in Figure 2–1.

The window from the connection provides a command-line interface (CLI), and is shown in Figure 2–5:

Figure 2–5 Oracle Java ME Embedded Command Line Interface



WARNING: The command-line interface (CLI) feature in this Oracle Java ME Embedded software release is provided only as a concept for your reference. It uses insecure connections with no encryption, authentication, or authorization.

AMS and System Commands

You can use the command-line interface to run numerous AMS and system commands, as shown in Table 2–1 and Table 2–2.

Table 2–1 AMS CLI Commands

Syntax	Description
`ams-list [INDEX or NAME|VENDOR]`	List all installed IMlet suites and their statuses or show the detail of a single suite
`ams-install <URL> [username:password]`	Install an IMlet using the specified JAR or JAD file, specified as a URL. An optional username and password can be supplied for login information as well.
`ams-update <INDEX or NAME|VENDOR>`	Update the installed IMlet
`ams-remove <INDEX or NAME|VENDOR>`	Remove an installed IMlet
`ams-run <INDEX or NAME|VENDOR> [IMLET_ID] [-debug]`	Execute the specified IMlet or the default if none is specified. An optional debug parameter can be specified to run the IMlet in debug mode.
`ams-stop <INDEX or NAME|VENDOR> [IMLET_ID]`	Stop the specified IMlet or the default if none is specified
`ams-suspend <INDEX or NAME|VENDOR> [IMLET_ID]`	Suspend (pause) the specified IMlet or the default if none is specified
`ams-resume <INDEX or NAME|VENDOR> [IMLET_ID]`	Resume the specified IMlet or the default if none is specified
`ams-setup <INDEX or NAME|VENDOR>`	Display the setup menu of the IMlet
`ams-info <INDEX or NAME|VENDOR>`	Show information about the installed IMlet
`ams-logger-list [INDEX or NAME|VENDOR]`	Retrieve the logger list for the IMlet or all the tasks if one is not specified
`ams-logger-info <INDEX or NAME|VENDOR> [LOGGER_NAME]`	Retrieve logger info for the specified IMlet and logger or all the loggers if is one is not specified
`ams-logger-level-set <INDEX or NAME|VENDOR> [LOGGER_NAME] <LOGGER_LEVEL>`	Set the logger level for specified IMlet or all loggers if one is not specified

Table 2–2 Additional System Commands

Syntax	Description
`help [command name]`	List the available commands or detailed usages for a single command
`sysmenu <on|off>`	Enable hidden system menu commands.

Table 2–2 (Cont.) Additional System Commands

Syntax	Description
`exit`	Terminates the current session.

When the `sysmenu` command is entered with the `on` option, additional system menu commands are available with the CLI, as shown in Table 2–3.

Table 2–3 Additional System Commands Available when System Menu is Activated

Syntax	Description
`setprop <KEY> <VALUE>`	Sets a property identified by `<KEY>` with the value `<VALUE>`
`getprop <KEY>`	Returns a property identified by `<KEY>`
`saveprops`	Saves properties to an internal storage
`net info`	Shows the network information of the system
`net set ssid <SSID>`	Sets the SSID value for WIFI access
`net set passwd <PASSWD>`	Sets the password for WIFI access
`net set pref <0|1|2|3|4|5>`	Sets the network mode preferences. Possible values are: 0: AUTO, 1: NO OP, 2: WLAN Only, 3: GSM/WCDMA only, 4: WCDMA only, 5: GSM/WCDMA/WLAN
`net set apn <APN>`	Sets APN
`net set pdp_authtype <0|1|2>`	Sets the APN's auth type: 0: NONE, 1: PAP, 2: CHAP
`net set pdp_username <USERNAME>`	Resets the PDP username
`net set pdp_password <PASSWORD>`	Resets the PDP password
`net reconnect`	Reconnects the network and reboots Java
`odd [on|off]`	Explicitly sets the on-device debugging (ODD) property to on or off. If no parameters are passed, returns the current ODD value.
`shutdown [-r]`	Perform either a shutdown of the board, or a reboot if the `-r` parameter has been passed.

Here is a typical example of using the Application Management System (AMS) to install, list, run, and remove a Java ME Embedded application on the board. Note that `/Shared` is a root directory name that can be accessed from Java. Files can be placed in this directory with the help of Qualcomm's **Loader** tool. However, in the **Loader** tool, this directory is named '`shared`'.

```
oracle>> ams-install file:///Shared/hello.jar
<<ams-install,start install,file:///Shared/hello.jar
<<ams-install,install status: stage 0, 5%
<<ams-install,install status: stage 3, 100%
<<ams-install,install status: stage 4, 100%
<<ams-install,OK,Install success

oracle>> ams-install http://www.example.com/netdemo.jar
<<ams-install,start install,http://www.example.com/netdemo.jar
<<ams-install,install status: stage 0, 5%
<<ams-install,install status: stage 3, 100%
<<ams-install,install status: stage 4, 100%
```

```
<<ams-install,OK,Install success

oracle>> ams-install http://www.example.com/notthere.jar
<<ams-install,start install,http://www.example.com/notthere.jar
<<ams-install,FAIL,errorCode=103 (OTHER_ERROR)
```

Note that the final installation example failed with an error code and matching description. If the install process shows any error code, see Table C–1 in Appendix C, "AMS Installer Error Codes" for more information on how to resolve the error.

Once an IMlet is installed, verify it using the `ams-list` command. Here, we have added an additional IMlet: `rs232dem`. Each IMlet has been assigned a number by the AMS for convenience.

```
oracle>> ams-list
<<ams-list,0.hello|Oracle,STOPPED
<<ams-list,1.netdemo|Oracle,STOPPED
<<ams-list,2.rs232dem|Oracle,RUNNING
<<ams-list,OK,3 suites are installed
```

The `ams-remove` command can be used to remove any installed IMlet.

```
oracle>> ams-remove 0
<<ams-remove,OK,hello removed
```

The results can again be verified with the `ams-list` command.

```
oracle>> ams-list
<<ams-list,1.netdemo|Oracle,STOPPED
<<ams-list,2.rs232dem|Oracle,RUNNING
<<ams-list,OK,2 suites are installed
```

Finally, start up the IMlet using the `ams-run` command. The application can be terminated with the `ams-stop` command.

```
oracle>> ams-run 1
<<ams-run,OK,started

oracle>> ams-list
<<ams-list,1.netdemo|Oracle,RUNNING
<<ams-list,2.rs232dem|Oracle,RUNNING
<<ams-list,OK,2 suites are installed
```

In order to check the current WiFi settings of the board, activate the system menu commands and use the `net info` command.

```
oracle>> sysmenu on
oracle>> net info
<<net,info,Address=192.168.1.103
<<net,info,SSID=network001
<<net,info,Preference=0
<<net,info,PDP APN=wap.cingular
<<net,info,PDP Auth Type=0
<<net,info,PDP Auth Username=user
<<net,info,PDP Auth Password=password
<<net,info,OK,success getting info
```

Networking Mode

The Qualcomm Orion Internet-of-Everything (IoE) can be configured for tooling over networking as well as serial. This allows the user to bypass the USB serial connections

when connecting to the board. However, in order to do this, the board must first be configured for networking first.

Configuring Wi-Fi networking

WiFi access must first be configured using the CLI. Connect the to CLI using the instructions above and perform the following steps:

1. Activate the system commands by entering the following CLI command: `sysmenu on`
2. Set the SSID of the WiFi network using the command: `net set ssid` *{SSID Name}*
3. Set the security password of the SSID network using the command `net set passwd` *{WiFi Password}*. This is only necessary if the security of WiFi network is enabled.
4. Enter the `net reconnect` command to apply the settings. Note that the Oracle Java ME SDK 3.4 Device Manager will temporarily lose its connection to the Qualcomm IoE device while it resets.

Once completed, you can verify the settings on the board by connecting to the CLI and performing the following steps.

1. Activate the system commands using the command: `sysmenu on`
2. Verify the network settings and state using the command: `net info`

If IP address is `0.0.0.0`, then the connection to the WiFi network was not established successfully; check the network settings and try again. If the SSID and password of network are correct, then try to reset the board to re-initialize the WiFi. You can use "IP Address Periodic Logging" feature described below to see the IP address that has been assigned.

> **Note:** Each time you make a connection to the Java Logger with PuTTY, you will see logs labeled with `[NetSetup]` channel. The logs contain information about a connection result to a WiFi access point specified earlier. If you can't connect to the Java Logger, try connecting to the board with Brew MP Loader and finding the same logs in the `/shared/netlog.txt` file

If you see a valid IP address, then the network is configured successfully. At this point, you can reset the following option in the `jwc_properties.ini` file.

```
com.oracle.tooling.mode = network
```

Finally, restart Java again using the `net reconnect` command and connect to port 65000 and 65002 using the IP address that has been assigned to the board.

IP Address Periodic Logging

The Oracle Java ME Embedded implementation has the ability to log the IP address that has been issued to the board. The log can be seen through Java Logger and Brew MP SDK **Logger** application.

The behavior of this feature is controlled by `com.oracle.periodic.logging.interval` property that accepts the values counter in milliseconds. By default, the logging period is set to 10 seconds (10000 milliseconds). To disable the periodic logging, set the value of the property to 0.

TCP-to-Serial Fallback

If you are using the tooling *network* mode and the Wi-Fi connection does not work, you can also try the TCP-to-Serial Fallback functionality provided by the Oracle Java ME Embedded software. The feature switches the CLI to *serial* mode for this session in order to allow the user to identify the problem and fix it.

To leverage the feature, make sure that:

- The Device Manager is executing and trying to connect to address "127.0.0.1" (see the "Tooling Over Serial" section earlier). Note that the state of Device Manager's connection to "127.0.0.1" will not be changed to "connected" because the ODT port will be still in the *network* mode.
- Ensure that the `com.oracle.midp.ams.headless.cli.tcp2comm.fallback` property from is set to `true`. This value is the default.
- Ensure that the `com.oracle.midp.ams.headless.cli.reconnect.timeout` is set to 0. This is also the default.
- Attempt to open the CLI as normal. Note that sometimes it can take up to a couple of minutes until the runtime switches the CLI to serial mode for the session.

If the Device Manager wasn't connecting to a COM port when the problem of connecting over TCP/IP occurred, then try resetting both Device Manager and the board.

Automatic Recovering for Java Logger and CLI Connections

If you are using the tooling network mode, or you are going to deploy an application that is based on Oracle Java ME Embedded 3.4 somewhere remotely, then it is worthwhile to turn on a feature that will automatically reopen both the Java Logger and CLI socket connections on the board side in the event that a network related error occurs.

- To turn on the CLI's auto-recovering feature, make sure that the `com.oracle.midp.ams.headless.cli.reconnect.timeout` property is set to a value, which is measured in milliseconds.
- To turn on Java Logger's auto-recovering feature, make sure that `log.tcp.reconnect.timeout` is set to a value, which is measured in milliseconds.
- If both of these properties are set to 0, then the feature is turned off.

Note that there can be situations when the underlying platform will not be able to recover a network subsystem after some network-related issue occurs. In such cases your application should be designed in a way that allows it to:

- Catch network-related issues and reopen application- level network connections
- Reboot the board using Device Access API's watchdog if an app assumes that the network subsystem is unrecoverable.

3

Installing and Running Applications on the Qualcomm IoE Board

Developers can run and debug IMlets on the Qualcomm IoE board in serial mode using the Oracle Java ME SDK, or in networking mode without Java ME SDK usage, either using the CLI or directly from IDEs such as NetBeans or Eclipse. This chapter describes how to install and run an IMlet on the board, as well as debugging an IMLet in both the NetBeans and Eclipse IDE.

Using NetBeans with the Qualcomm IoE Board

Installing and running IMlet projects on the Qualcomm IoE board using the NetBeans IDE requires the following software:

- NetBeans IDE 7.3.1 and later with Java ME, which can be downloaded from `http://www.netbeans.org/`.
- Oracle Java ME SDK 3.4
- Oracle Java ME SDK 3.4 NetBeans Plugin

Installing the Oracle Java ME SDK 3.4 Plugin for NetBeans

After installing NetBeans, use these steps to install the remaining software.

1. Ensure that Java ME is enabled in NetBeans. This can be done by selection **Tools** -> **Plugins** and selecting the **Installed** pane. Activate the Java ME plugin if it is not already activated.
2. Install the Java ME SDK 3.4 distribution, if you have not done so already. See the Java ME SDK 3.4 documentation for details.
3. Install the Oracle Java ME SDK 3.4 NetBeans plugin. This is a downloadable ZIP file that consists of a number of NetBeans modules (`.nbm` files) that can be added using the **Tools** -> **Plugins** dialog and selecting the **Downloaded** pane. Unzip the plugin file, and add all of the `.nbm` files to NetBeans. The Oracle Java ME SDK 3.4 NetBeans plugins are required to interface with the Device Selector and connect to the board.
4. Ensure that the Oracle Java ME Embedded 3.4 appears in the list of Java ME platforms. In the NetBeans IDE, go to **Tools** -> **Java Platforms**. If the Oracle Java Platform Micro Edition SDK 3.4 does not appear in the list of J2ME platforms, follow these steps:
   - Click on **Add Platform**.
   - Select **Java ME CLDC Platform Emulator** and click Next.

- Select the folder where the Oracle Java ME SDK 3.4 distribution resides and follow the instructions to install it. Then, click **Finish** to close the dialog.

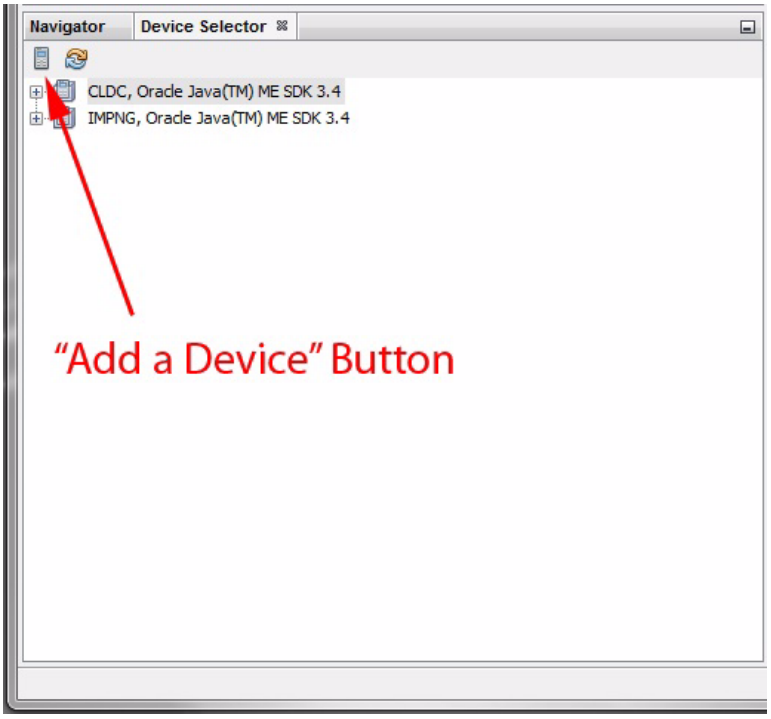
5. Ensure that the Qualcomm IoE board has the Oracle Java ME Embedded distribution. See Chapter 1, "Installing Oracle Java ME Embedded on the Qualcomm IoE Board" for more information on how to install the runtime distribution on the Qualcomm IoE board.

Adding the Qualcomm IoE Board to the Device Selector

Follow these steps to add the board to the Device Selector in NetBeans:

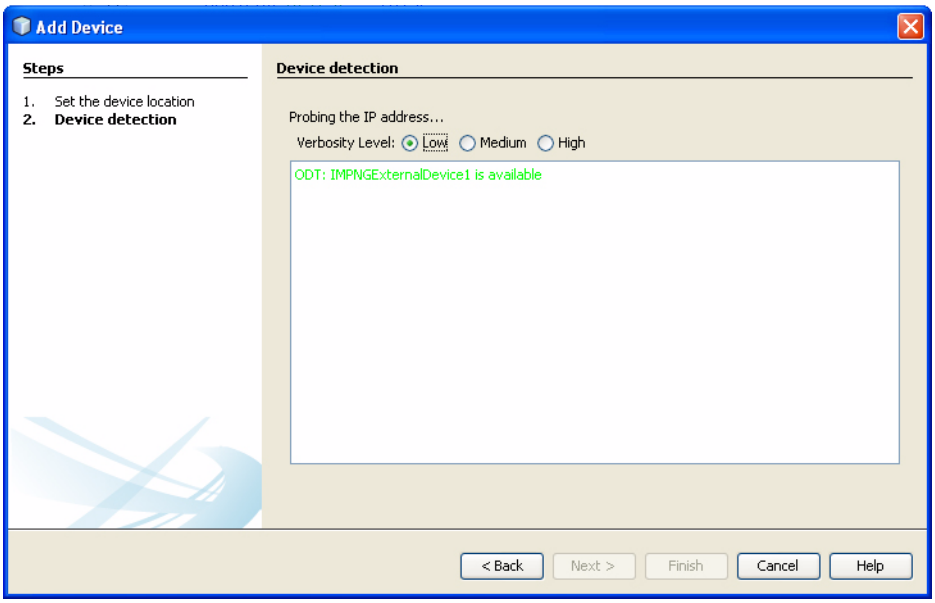
1. Ensure that the property `odt_run_on_start` has been set to `true` on the Qualcomm IoE.
2. Start the NetBeans IDE. In the NetBeans IDE, go to **Tools** -> **Java ME** -> **Device Selector**
3. If the device is not already listeed in the Device Selector, click on the **Add a Device** button at the top of the Device Selector window, as shown in Figure 3–1.

Figure 3–1 NetBeans Device Selector "Add a Device" Button



4. If you are using tooling over the serial mode then the connection between the IoE board and NetBeans should appear automatically in the list in Figure 3–1. The IP address of the connection will be '127.0.0.1' If it is not already shown, enter the IP address of the Qualcomm IoE board in the **IP Address** field, as shown in Figure 3–2, and click **Next**.

Figure 3–2 NetBeans Embedded Device Detection



5. Once the device is detected, click **Finish** on the Device Detection screen.

The list of devices in the Device Selector should now include **IMPNGExternalDevice1**.

Alternatively, you can use the Oracle Java ME SDK 3.4 to detect the device, as shown in Chapter 2, "Tooling Over Serial and Networking". If the device has already been detected using the Oracle Java ME SDK 3.4, it should already appear in the Device Selector.

Assigning the Qualcomm IoE Board to Your Project

If you already have an existing NetBeans project with an IMlet that you want to run or debug on the board, follow these steps:

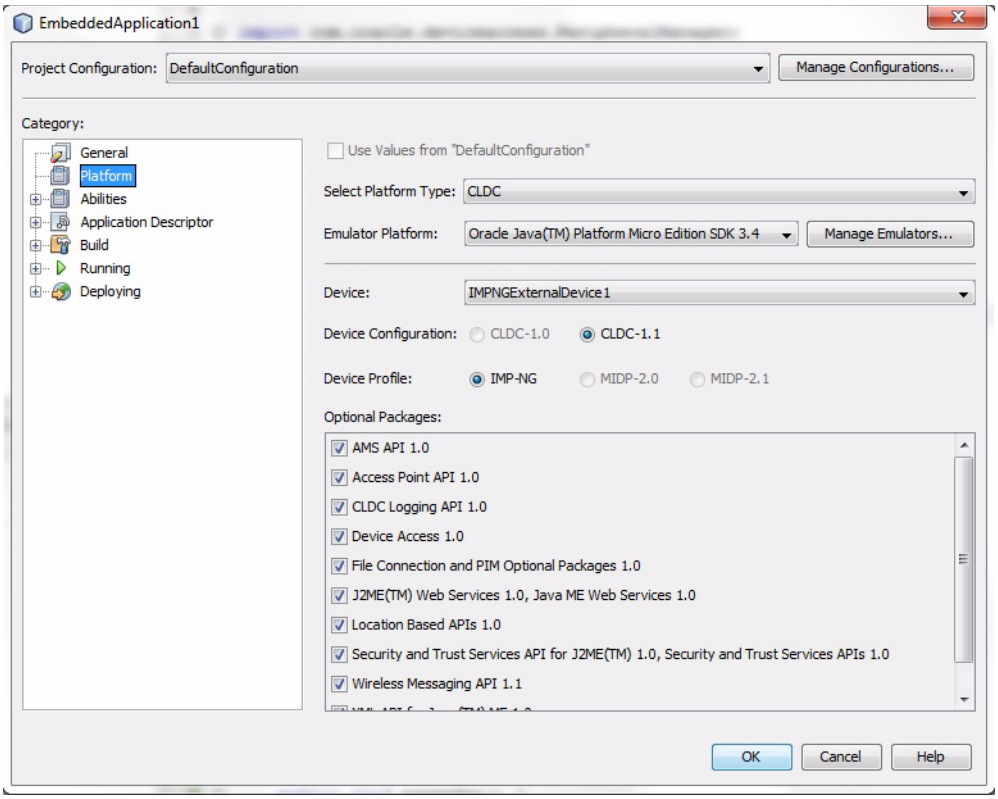
1. Right-click on your project and choose **Properties**.
2. Select the **Platform** category on the properties window.
3. Select the entry that represents the board (**IMPNGExternalDevice1**) from the device list.

If you are creating a new NetBeans project from scratch, follow these steps:

1. Select **File** -> **New Project**.
2. Select the **Java ME** category and **Embedded Application** in Projects. Click **Next**.
3. Provide a project name and click **Next**. Be sure that the **Create Default Package and IMlet Class** option is checked.
4. Ensure the Emulator Platform is **Oracle Java ME Embedded 3.4**. Then, select the entry that represents the board (**IMPNGExternalDevice1**) from the device list and click **Finish**.

The configured Platform dialog is shown in Figure 3–3. After you assign the board to your project, the IMlets run on the board instead of on the emulator when you click on **Run Project** on the NetBeans IDE.

Figure 3–3 NetBeans Platform Properties Dialog



Sample Source Code

Once the project is created, use the source code in Example 3–1 for the default `IMlet.java` source file.

Example 3–1 Sample Code to Access a GPIO Pin

```
package embeddedapplication1;

import com.oracle.deviceaccess.PeripheralManager;
import com.oracle.deviceaccess.PeripheralNotAvailableException;
import com.oracle.deviceaccess.PeripheralNotFoundException;
import com.oracle.deviceaccess.gpio.GPIOPin;
import java.io.IOException;
import javax.microedition.midlet.*;


public class IMlet extends MIDlet {

    public void startApp() {

        try {

            GPIOPin pin = (GPIOPin)PeripheralManager.open(14);

            for (int i = 0; i < 10; i++) {
                pin.setValue(true);
                Thread.sleep(1000);
                pin.setValue(false);
                Thread.sleep(1000);
```

```
            }

            pin.close();

        } catch (IOException ex) {
            ex.printStackTrace();
        } catch (PeripheralNotFoundException ex) {
            ex.printStackTrace();
        } catch (PeripheralNotAvailableException ex) {
            ex.printStackTrace();
        } catch (InterruptedException ex) {
            ex.printStackTrace();
        }

    }

    public void pauseApp() {
    }

    public void destroyApp(boolean unconditional) {
    }
}
```

This sample application will obtain an object representing GPIO pin 14 from the `PeripheralManager`, and set it from low to high at intervals of one second. This has the effect of blinking one of the LEDs on the Qualcomm IoE board. For more information on using the Device Access APIs, see the Device Access API (Version B) Guide and the associated Javadocs at:

http://docs.oracle.com/javame/embedded/embedded.html

Debugging an IMlet on the Qualcomm IoE Board

Follow these steps to debug an IMlet using NetBeans:

1. Open your IMlet class on the NetBeans editor.
2. Click once directly on the line number where you want to set a breakpoint. The line number is replaced by a red square and the line is highlighted in red.
3. Select **Debug** -> **Debug Project** or use the Debug button on the toolbar.

The debugger connects to the debug agent on the board and the program execution stops at your breakpoint, as shown in Figure 3–4.

Figure 3–4 Debugging an IMlet on the Qualcomm IoE Board Using NetBeans

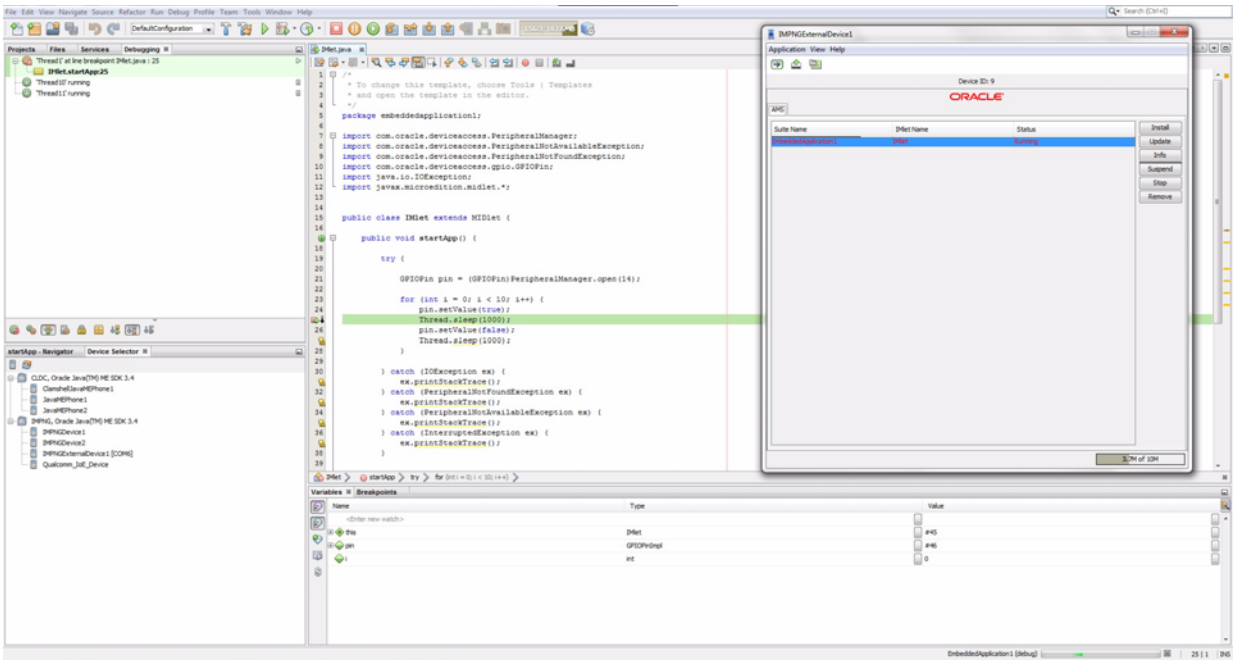


Figure 3–4 shown an entire NetBeans debugging environment that allows the programmer to execute a program step by step as well as add and remove variables from a watch list on the bottom of the screen.

For more information on using the Device Access APIs, see the Device Access API (Version B) Guide and the associated Javadocs at:

`http://docs.oracle.com/javame/embedded/embedded.html`

Using Eclipse with the Qualcomm IoE Board

Running and debugging IMlet projects on the Qualcomm IoE board using the Eclipse IDE requires the following software:

- Eclipse 3.7 Indigo or Eclipse 4.2 Juno, which can be downloaded from `http://www.eclipse.org/`.
- Oracle Java ME SDK 3.4
- Oracle Java ME SDK 3.4 Eclipse Plugin

Installing the Oracle Java ME SDK 3.4 Plugin for Eclipse

After installing Eclipse, use these steps to install the remaining software.

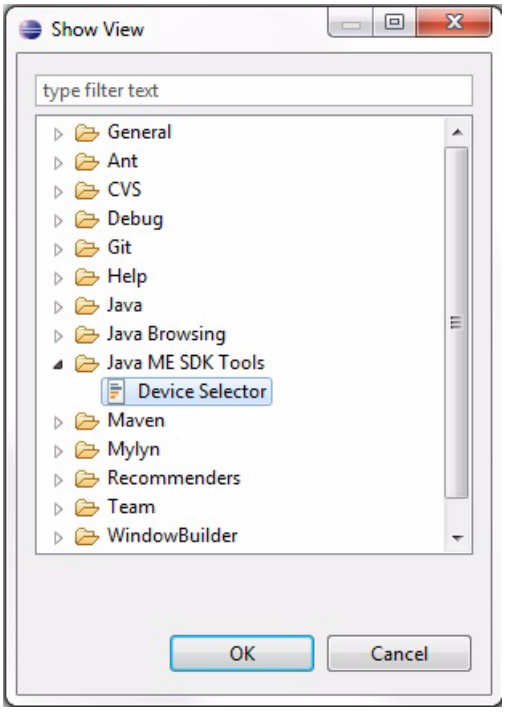
1. Install the Java ME SDK 3.4 distribution, if you have not done so already. See the Java ME SDK 3.4 documentation for details.
2. Install the Oracle Java ME SDK 3.4 Eclipse plugin. This is required to use the Device Selector to connect to the board.
3. Ensure that the Qualcomm IoE board has the Oracle Java ME Embedded 3.4 runtime. See Chapter 1, "Installing Oracle Java ME Embedded on the Qualcomm IoE Board" for more information on how to install the runtime distribution on the Qualcomm IoE board.

4. Ensure that the Oracle Java ME Embedded 3.4 appears in the list of Java ME platforms. If it doesn't appear, open "Window->Preferences" and follow these steps:
   - Under the **Java ME** category, select **Device Management**. In the Device Management window, press the **Manual Install...** button.
   - The Manual Device Installation window appears, without the Oracle Java ME Embedded devices. Press the **Browse** button. A browser window appears.
   - Browse to the base directory of the Java ME SDK environment and press the **OK** button. After the platform is scanned and the devices are installed, close each of the respective dialogs.

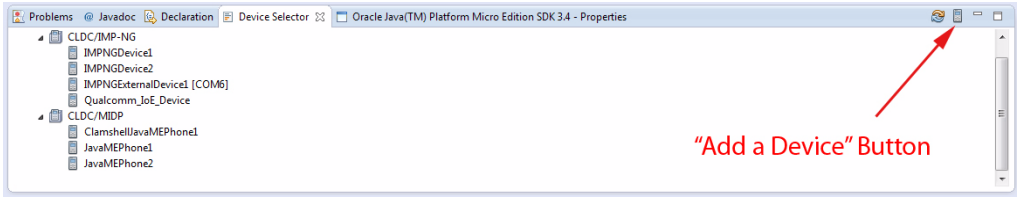
Adding the Qualcomm IoE Board to the Device Selector

Follow these steps to add the board to the Device Selector in the Oracle Java ME SDK:

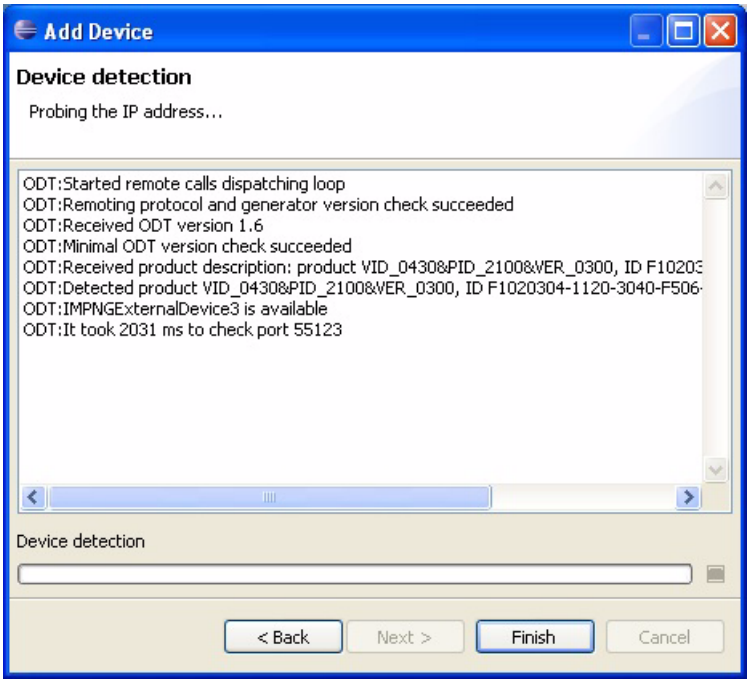
1. Ensure that the property `odt_run_on_start` is set to true in the file `jwc_properties.ini` on the Qualcomm IoE.
2. Start the Eclipse IDE. In the Eclipse IDE, go to **Window** -> **Show View** -> **Other**. In the popup window that appears, expand the **Java ME** node and select **Device Selector**.



3. On the Device Selector, click on the **Add a Device** button at the top of the Device Selector window.



4. If you are using tooling over the serial mode then the connection between the IoE board and NetBeans should appear automatically in the list in the figure above. If it is not listed already, enter the IP address of the Qualcomm IoE board in the **IP Address** field and click **Next**.



5. Once the device is detected, click **Finish** on the Add Device screen.

The list of devices in the Device Selector should now include **IMPNGExternalDevice1**.

Assigning the Qualcomm IoE Board to Your Project

If you already have an existing Eclipse project with an IMlet that you want to run or debug on the board, follow these steps:

1. Right-click on your project and choose **Properties**.
2. Select the **Java ME** category on the properties window.
3. Select the device entry for the Qualcomm IoE board (**IMPNGExternalDevice1**) from the device list. If the device is not shown, add it using the **Add...** button, selecting **Oracle Java ME Embedded 3.4** as the SDK and choosing the appropriate device that represents the Qualcomm IoE board.

If you are creating a new Eclipse project from scratch, follow these steps:

1. Select **New** -> **Other**. Then expand the **Java ME** tree node, and create a new **MIDlet Project**.
2. Expand the **Java ME** tree node, and create a new **MIDlet Project**.
3. In the Configuration pane of the creation dialog, select the appropriate entry (**IMPNGExternalDevice1**) from the device list.
4. Select the appropriate **Profile** and **Configuration** for your project.

After you assign the board to your project, the IMlets run on the board instead of on the emulator when you click on **Project** -> **Run** on the Eclipse IDE.

Sample Source Code

Once the project is created, use the source code given earlier in Example 3–1 for a default source file. This sample application will obtain an object representing GPIO pin 14 from the `PeripheralManager`, and set it from low to high at intervals of one second. This has the effect of blinking one of the LEDs on the Qualcomm IoE board.

Debugging an IMlet on the Qualcomm IoE Board

After you assign the board to your project, follow these steps to debug an IMlet:

1. Open your IMlet class on the Eclipse editor.
2. Click once directly on the line number where you want to set a breakpoint. The line number has a small circle next to it to indicate a breakpoint.
3. Select **Run** -> **Debug** or use the Debug button on the toolbar.

The debugger connects to the debug agent on the board and the program execution stops at your breakpoint, as shown in Figure 3–5.

Figure 3–5 Debugging an IMlet on the Board Using the Eclipse IDE

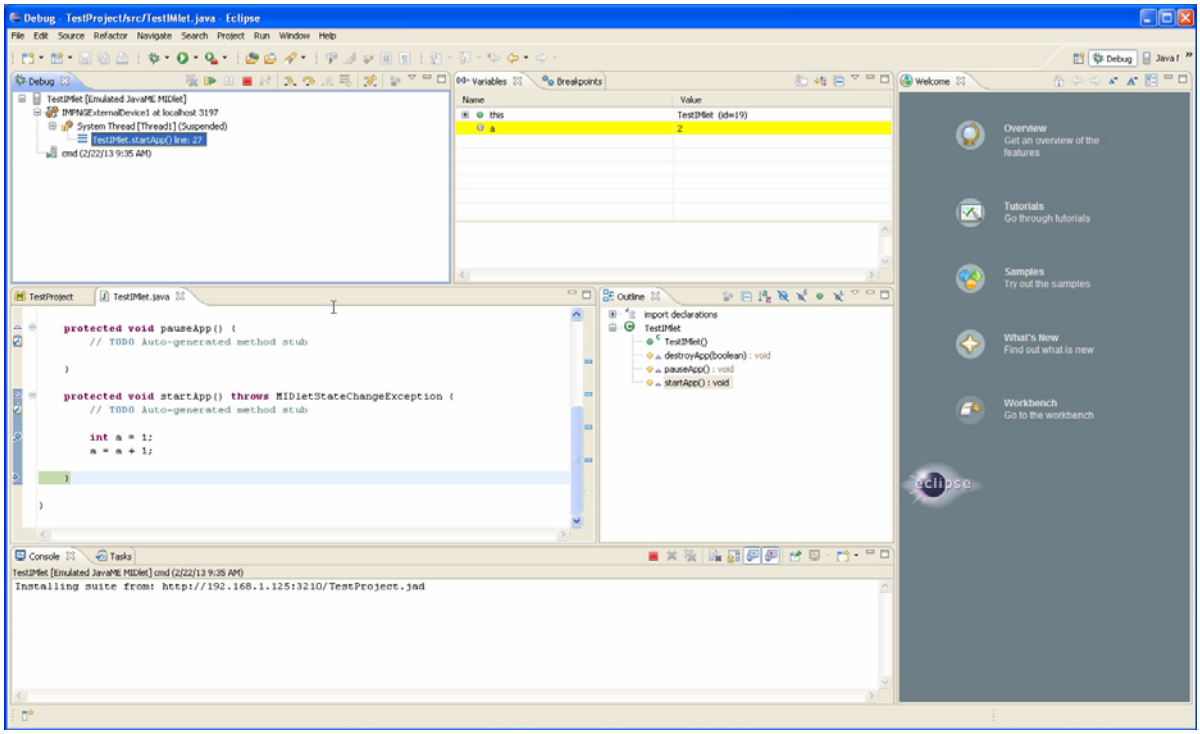


Figure 3–5 shown an entire Eclipse debugging environment that allows the programmer to execute a program step by step as well as add and remove variables from a watch list on the bottom of the screen.

For more information on using the Device Access APIs, please see the Device Access API (Version B) Guide and the associated Javadocs at the following site:

`http://docs.oracle.com/javame/embedded/embedded.html`

Installing and Running an IMlet Using the AMS CLI

If you are not using an IDE, you can still use the Oracle Java ME Embedded 3.4 CLI to install an application. Simply connect to the device at port 65002, and install and run the IMlet manually. For example:

```
oracle>> ams-install file:///Shared/hello.jar
<<ams-install,start install,file:///Shared/hello.jar
<<ams-install,install status: stage 0, 5%
<<ams-install,install status: stage 3, 100%
<<ams-install,install status: stage 4, 100%
<<ams-install,OK,Install success

oracle>> ams-list
<<ams-list,0.hello|Oracle,STOPPED
<<ams-list,OK,1 suites are installed

oracle>> ams-run 0
<<ams-run,OK,started

oracle>> ams-list
<<ams-list,1.netdemo|Oracle,RUNNING
<<ams-list,OK,1 suites are installed
```

See "Using the Command-Line Interface" in Chapter 2, "Tooling Over Serial and Networking" for more details.

Accessing Peripherals

Note that if an application is installed on the board using NetBeans or Eclipse during development, the application will automatically be installed in the `maximum` security domain as a convenience. IMlets that are not running through the NetBeans or Eclipse IDE, however, must have permission to access device peripherals using the Device Access APIs. For more information on using the device access APIs, please see the Device Access API (version B) Guide and the associated Javadocs at the following site:

`http://docs.oracle.com/javame/embedded/embedded.html`

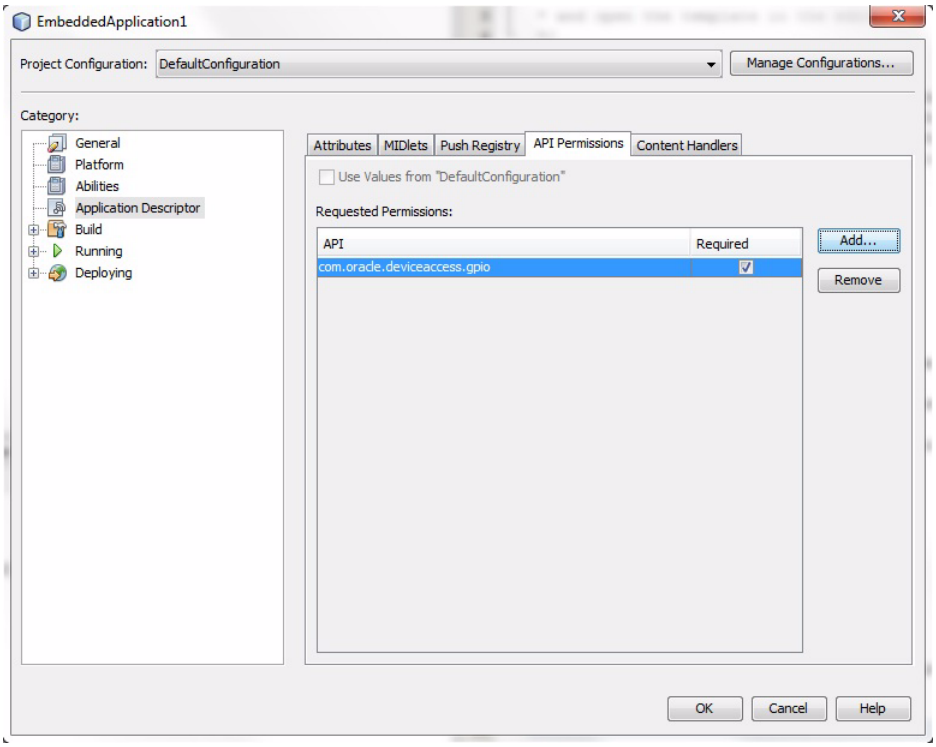
There are two ways to allow access to the device peripherals on the Qualcomm IoE. The first is to digitally sign the application with the appropriate API permissions requested in the JAD file; the second is to use unsigned applications and modify the security policy file.

Method #1: Signing the Application with API Permissions

The first method is more complex, but is the preferred route for applications that are widely distributed. First, the JAD file must have the proper API permissions. Here is how to sign the application in NetBeans, Eclipse, and without an IDE.

- In **NetBeans**, right-click the project name (**EmbeddedApplication1** in this example) and choose **Properties**. Select **Application Descriptor**, then in the resulting pane, select **API Permissions**. Click the **Add...** button, and add the `com.oracle.deviceaccess.gpio` API, as shown in Figure 3–6. Click **OK** to close the project properties dialog.

Figure 3–6 Adding API Permissions with NetBeans



- In **Eclipse**, open the Application Descriptor for your project in the Packages window, and select the **Application Descriptor** pane. You will need to manually add or change the following lines in the Application Descriptor.

  ```
  MIDlet-Permissions: com.oracle.deviceaccess.gpio
  Microedition-Profile: IMP-NG
  ```

- If you are not using an IDE, manually modify the application descriptor file to contain the permissions listed in the **Eclipse** section.

Here are the instructions on how to setup a keystore with a local certificate that can be used to sign the applications.

1. Generate a new self-signed certificate with the following command on the desktop, using the `keytool` that is shipped with the Java SE JDK.

   ```
   keytool -genkey -v -alias mycert -keystore mykeystore.ks -storepass
   spass -keypass kpass -validity 360 -keyalg rsa -keysize 2048 -dname
   "CN=thehost"
   ```

   This command will generate a 2048-bit RSA key pair and a self-signed certificate, placing them in a new keystore with a keystore password of `spass` and a key password of `kpass` that is valid for 360 days. Feel free to change both passwords as you see fit.

2. Copy the `appdb/_main.ks` keystore file from the Qualcomm IoE over to the desktop using the **Loader** tool and perform the following command using the `mekeytool.exe` command (or alternatively `java -jar MEKeyTool.jar...` if your distribution contains only that) that ships with the Oracle Java ME SDK 3.4 distribution.

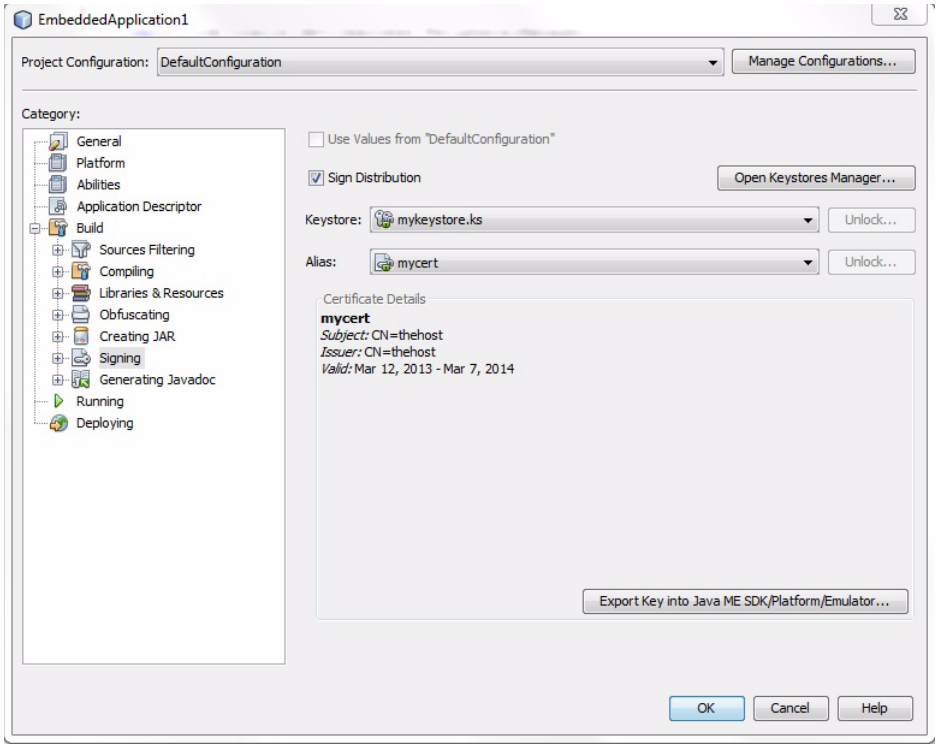
   ```
   {mekeytool} -import -MEkeystore _main.ks -keystore mykeystore.ks
   -storepass spass -alias mycert -domain trusted
   ```

This will import the information in `mykeystore.ks` you just created to the `_main.ks` keystore. Once this is completed, copy the `_main.ks` file back to its original location on the Qualcomm IoE using the **Loader** tool.

Use the following steps in to sign your application before deploying to the Qualcomm IoE board, depending on whether you are using NetBeans, Eclipse, or working without an IDE.

- In **NetBeans**, perform the following steps.
  1. Right click your project and select **Properties**.
  2. Choose the **Signing** option under the **Build** category.
  3. Open the **Keystores Manager** and import the `mykeystore.ks` file that you created.
  4. Check the **Sign Distribution** box. If you wish, unlock the keystore and the key with the passwords that you specified earlier. This is shown in Figure 3–7.
  5. When the project is built and run, it will be digitally signed and deployed to the Qualcomm IoE.

Figure 3–7 The Signing Pane in the NetBeans Project Properties



- In **Eclipse**, perform the following steps:
  1. Right click your project and select **Properties**.
  2. Choose the **Signing** option under the **Java ME** category.
  3. Check the **Enable Project Specific Settings** checkbox. Import the `mykeystore.ks` file that you created as an **External...** keystore file. Provide the keystore and key passwords that you created earlier. Ensure that the **mycert** key alias is present.

4. Ensure that the project is being signed in the project's Application Descriptor. When the project is built and run, it will be digitally signed when deployed to the Qualcomm IoE.

- If you are not using an IDE, enter the following command to sign a JAD:

  ```
  > jarsigner -keystore mykeystore.ks -storepass spass app.jad myalias
  ```

  If there is an issue with a non-valid certificate, be sure to check the date and time which has been setup on the board. Refer to Chapter 4, "Troubleshooting" for more details.

Method #2: Modifying the Security Policy File

With this method, the user will modify the Java security policy file. Typically, this is the `appdb/_policy.txt` file, but be sure to check the `security.policyfile` entry in the `jwc_properties.ini` file to verify the current file name.

Perform the following steps:

1. Use the **Loader** tool to download the `appdb/_policy.txt` file to the desktop.
2. Add the line "`allow: device_access`" to the "`untrusted`" domain (often paired with "`unsecured`")
3. Use the **Loader** application to copy the file back, overwriting the original file in the `appdb/` directory.

Remember that if an application is installed on the board using the NetBeans or Eclipse IDE during development, the application will automatically be installed in the `maximum` security domain as a convenience. Manual installation using the AMS, however, will place the unsigned application into the `untrusted` security domain.

After development is finished, you should *always* publish your applications with signed API permissions.

4

Troubleshooting

This chapter contains a list of common problems that you may encounter while installing and running the Oracle Java ME SDK and embedded software on the Qualcomm IoE board. This chapter provides information on the causes of these problems and possible solutions for them.

The common problems in this chapter are grouped in two categories:

- Starting Oracle Java ME Embedded on the Board
- Using the Board with the Oracle Java ME SDK and the NetBeans IDE

Starting Oracle Java ME Embedded on the Board

Table 4–1 contains information about problems and solutions when starting the runtime on the board.

Table 4–1 Problems and Solutions - Starting Oracle Java ME Embedded on the Board

Problem	Cause	Solution
Windows does not recognize the board when connected via USB.	Ensure the USB drivers are loaded.	See Chapter 1, "Installing Oracle Java ME Embedded on the Qualcomm IoE Board" for more information on installing the USB drivers for the Qualcomm IoE board.
Windows does not recognize the board when connected via USB	Ensure the board is powered on.	Press the PWR KEY button on the board.
Oracle Java ME Embedded fails to initialize the network on the board.	The network configuration is incorrect.	Check that the network connection on the board is correct. Ensure that the board is using DHCP to obtain an IP address.
(*continued*)	Network configuration on the WiFi access point is incorrect or unsupported.	Check that WiFi SSID broadcasting is enabled on the router.

Table 4–1 (Cont.) Problems and Solutions - Starting Oracle Java ME Embedded on the Board

Problem	Cause	Solution
(continued)	WPA2-PSK authentication algorithm is not working correctly on some routers.	Try manually setting the authentication algorithm to WPA-PSK or disabling the security checking.
There are no Java logs in Brew MP Logger application. However, the device has been recognized successfully by the Logger and Loader application.	The Oracle Java ME Embedded platform did not start. The `java.sig` or `netsetup.sig` files were not updated or are invalid for Oracle Java ME Embedded 3.4	Check the netsetup logs. Please refer to Configuring Wi-Fi networking in Chapter 2, "Tooling Over Serial and Networking" for additional information. If there is no `netlog.txt` file or it is incorrect, please ensure that Netsetup application has been updated and the `netsetup.sig` file is valid. The signature file from previous versions of the Oracle Java ME Embedded platform will not work correctly. If the `netlog.txt` file is present and is correct, ensure that Java ME Embedded application in the `/sys/mod/java` directory has been updated and the `java.sig` file is valid. The Java signature file from the previous version must also be updated for 3.4.
The board is not detected by the Device Manager when connecting to the board in serial mode.	Varies. See **Solution** column.	If you have some issues with connecting Device Manager and the board, please check the file *<USER_HOME_DIR>*`/javame-sdk/3.4/log/sos-proxy.log`. 1) if the last line in the output looks similar to "`Open COM`*{Number}*", then make sure that you've specified the correct COM port. If the port is incorrect, choose the proper one by specifying it in Device Manager and restarting the board. Note that is sometimes take a minute or more to boot Java after the board is powered on. This is because of WiFi related settings that are performed during the launch time. If you don't use WiFi (3G), then you can disable the network setup with net related commands. In addition, there is a "`system.netsetup.timeout`" property that configures the timeout to start Java after the network initialization has been started. if the COM port is correct and more then a minute has passed after the board is powered on, try to reboot both Device Manager and the board 2) If the last line in the output is *not* "`Open COM`*{Number}*", check that you specified the correct port numbers to connect to the CLI or the logger, then try to reboot both the Device Manager and the board

Using the Board with the Oracle Java ME SDK and the NetBeans IDE

Table 4–2 contains information about problems and solutions when using the board with the Oracle Java ME SDK and the NetBeans IDE:

Table 4–2 Problems and Solutions - Oracle Java ME SDK and the NetBeans IDE

Problem	Cause	Solution
The board is not detected when adding a new device to the Device Manager.	On-device debugging is not enabled.	Edit the file `jwc_properties.ini` and set the property `odt_run_on_start` to `true`.
The debugging session freezes, disconnects unexpectedly, or shows error messages.	The firewall on the computer is blocking some debugging traffic.	Open TCP port 2808 on your firewall configuration settings. The exact procedure to open a port differs depending on your version of Windows or your firewall software.
	Thunderbird is using a port that is needed for communication with the board.	Close `thunderbird.exe` during the debugging session.
The current time and date is invalid.	The time and date on the Qualcomm IoE board is configured automatically only if a valid SIM card is inserted.	Insert a valid SIM card. If the date and time is still wrong, try another SIM card.
A signed IMlet will not install. The AMS gives a return code that the certificate or the authentication are invalid.	Certificate is invalid or it is not added to keystore	Check the certificate. Refer to Method #1: Signing the Application with API Permissions in Chapter 3, "Installing and Running Applications on the Qualcomm IoE Board" for details.
(*continued*)	The date and time on the board were configured incorrectly.	Refer to note above about setting date and time on Qualcomm IoE board.

A

Qualcomm IoE Device Access API Peripheral List

This appendix provides information about the various peripheral ports and buses for the Qualcomm IoE embedded board, as well as device mappings and important notes, which are accessible using the Device Access APIs.

> **Note:** Power Management and MMIO are not supported on the Qualcomm IoE embedded board.

The tables use the following legend:

- **DA API Peripheral Id** - an integer identifier that can be used to open the peripheral with a `PeripheralManager`.
- **DA API Peripheral Name** - the string name of a peripheral that can be used to open it by name with `PeripheralManager`.
- **Mapped To** - all hardware related information regarding a peripheral, such as physical location, mapping, or port. This information allows the user to find out the peripheral's location on a target board. See the following site for more information:

  https://developer.qualcomm.com/mobile-development/development-devices-boards/development-boards/internet-of-everything-development-platform/tools-and-resources
- **Configuration** - properties that are passed to the specific `PeripheralConfig` constructor in order to open the peripheral by ID or name. The configuration can be used to open the peripheral using the `PeripheralManager` with the appropraite configuration.

AT Devices

The following AT devices are pre-configured.

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
800	DEFAULT	Brew's AT command interface	N/A

For a complete list of AT commands that can be used, please see the *Qualcomm IoE Development Platform User's Guide*.

Please note the following when using AT commands:

- Some AT commands required a SIM card to test. (for example, "`AT+CPBW`" or "`AT+CMUX`")
- With the `AT+CPBW` command, the valid form is "`AT+CPBW=?`" or "`AT+CPBW=<num>`". "`AT+CPBW?`" is an invalid form.
- `UnsolicitedResponseHandler` is not supported.

ADC

The following Analog-to-Digital (ADC) devices are pre-configured.

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
100	VTHERM_N	On-board Temperature Sensor	converterNumber = PeripheralConfig.DEFAULT channelNumber = 0 resolution = PeripheralConfig.DEFAULT samplingInterval = PeripheralConfig.DEFAULT samplingTime = PeripheralConfig.DEFAULT
101	HKAIN1	Any pin from J10 header. Pin number is chosen according to the configuration of ADC multiplexer	converterNumber = PeripheralConfig.DEFAULT channelNumber = 1 resolution = PeripheralConfig.DEFAULT samplingInterval = PeripheralConfig.DEFAULT samplingTime = PeripheralConfig.DEFAULT

Please note the following:

- The resolution and converter number are not supported. You can use `PeripheralConfig.DEFAULT` for those values.
- The channel number cannot be set as `PeripheralConfig.DEFAULT`. Use 0 or 1 instead.
- The default value for `samplingInterval` is 5000000 microseconds (5000 ms). The value can be changed immediately during acquisition. This is a platform-specific behavior.
- The `samplingTime` value of `PeripheralConfig.DEFAULT` is interpreted as 10 milliseconds.

DAC

The following Digital-to-Analog (DAC) devices are pre-configured.

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
700	PDM0	Header J5 pin 18	converter = PeripheralConfig.DEFAULT channel = 0 resolution = PeripheralConfig.DEFAULT samplingInterval = PeripheralConfig.DEFAULT
701	PDM1	Reserved for future use; not available on Qualcomm IoE	converter = PeripheralConfig.DEFAULT channel = 1 resolution = PeripheralConfig.DEFAULT samplingInterval = PeripheralConfig.DEFAULT

Please note the following:

- Both the `resolution` and `converter` values are ignored. You can use `PeripheralConfig.DEFAULT` for those values. In addition, `converterNumber` and `resolution` can only be `PeripheralConfig.DEFAULT`.
- The default `samplingInterval` value is 5000000 micro seconds (5000 ms). The value can be changed immediately during generation. This is a platform-specific behavior.
- The `channel` parameter cannot be set as `PeripheralConfig.DEFAULT` only be 0 or 1.
- The DAC signal is represented as a PDM (pulse density modulation) signal, so the DAC output value affects only the frequency of output signal, not the voltage level. As such, there is no resolution of DAC in the current implementation, only the `min` and `max` value can be used for calculation of output voltage on the DAC channel.

  For calculation of the output voltage, the following formula can be used: `vOutput = (value * vRef) / (maxValue - minValue + 1)`. Note that `(max - min) == (2^n - 1)` is not applicable.

GPIO Pins

The following GPIO pins are pre-configured.

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
0	GPIO0	Header J5 pin 3	portNumber = PeripheralConfig.DEFAULT pinNumber = 26 direction = GPIOPinConfig.DIR_INPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_RISING_EDGE initValue - ignored

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
1	GPIO1	Header J5 pin 5	portNumber = PeripheralConfig.DEFAULT
		JP7 ADC MUX 0	pinNumber = 25
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_RISING_EDGE
			initValue - ignored
2	GPIO2	Header J5 pin 7	portNumber = PeripheralConfig.DEFAULT
		JP8 ADC MUX 1	pinNumber = 31
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_FALLING_EDGE
			initValue - ignored
3	GPIO3	Header J5 pin 9	portNumber = PeripheralConfig.DEFAULT
		JP9 ADC MUX 2	pinNumber = 17
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_HIGH_LEVEL
			initValue - ignored
4	GPIO4	Header J5 pin 11	portNumber = PeripheralConfig.DEFAULT
			pinNumber = 32
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_HIGH_LEVEL
			initValue - ignored
5	GPIO5	Header J6 pin 3	portNumber = PeripheralConfig.DEFAULT
			pinNumber = 28
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_HIGH_LEVEL
			initValue - ignored

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
6	GPIO6	Header J6 pin 5	portNumber = PeripheralConfig.DEFAULT
		JP11 pin 2(to connect to G-sensor Interrupt)	pinNumber = 27
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_RISING_EDGE
			initValue - ignored
7	GPIO7	Header J6 pin 7	portNumber = PeripheralConfig.DEFAULT
		JP12 pin 2 (to connect to light sensor interrupt)	pinNumber = 30
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_FALLING_EDGE
			initValue - ignored
8	GPIO8	Header J6 pin 7	portNumber = PeripheralConfig.DEFAULT
			pinNumber = 38
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_LOW_LEVEL
			initValue - ignored
9	GPIO9	Header J6 pin 11	portNumber = PeripheralConfig.DEFAULT
		JP13 pin 1(to connect to temp sensor interrupt)	pinNumber = 33
			direction = GPIOPinConfig.DIR_INPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_FALLING_EDGE
			initValue - ignored
10	GPIO10	Header J7 pin 1	portNumber = PeripheralConfig.DEFAULT
		Relay 1	pinNumber = 18
			direction = GPIOPinConfig.DIR_OUTPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_NONE
			initValue = false

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
11	GPIO11	Header J7 pin 3 Relay 2	portNumber = PeripheralConfig.DEFAULT pinNumber = 24 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue = false
12	GPIO12	Header J7 pin 5	portNumber = PeripheralConfig.DEFAULT pinNumber = 29 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue = false
13	GPIO13	Header J7 pin 7	portNumber = PeripheralConfig.DEFAULT pinNumber = 35 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue = false
14	GPIO14	Header J7 pin 9 Jumper P2 pin 2 (Used by LED)	portNumber = PeripheralConfig.DEFAULT pinNumber = 13 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue = false

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
15	GPIO15	Header J7 pin 11 Jumper P3 pin 2 (Used by LED)	portNumber = PeripheralConfig.DEFAULT pinNumber = 34 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue = false
16	GPIO16	Header J7 pin 13 Jumper P4 pin 2 (Used by LED)	portNumber = Peripheral.Config.DEFAULT pinNumber = 12 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue - ignored
17	GPIO17 or LED2	Header J7 pin 15 Jumper P5 pin 2 (Used by LED)	portNumber = PeripheralConfig.DEFAULT pinNumber = 16 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue = false
18	GPIO18	Header J7 pin 17 Jumper P6 pin 2 (Used by LED)	portNumber = PeripheralConfig.DEFAULT pinNumber = 36 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue = false
19	GPIO19	Header J7 pin 19	portNumber = PeripheralConfig.DEFAULT pinNumber = 15 direction = GPIOPinConfig.DIR_OUTPUT_ONLY mode = PeripheralConfig.DEFAULT trigger = GPIOPinConfig.TRIGGER_NONE initValue = false

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
20	GPIO20	Header J7 pin 2	portNumber = PeripheralConfig.DEFAULT
		DB9 J12 lower pin 3	pinNumber = 10
			direction = GPIOPinConfig.DIR_INPUT_ ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_ LOW_LEVEL
			initValue - ignored
21	GPIO21	Header J7 pin 4	portNumber = PeripheralConfig.DEFAULT
		DB9 J12 lower pin 2	pinNumber = 14
			direction = GPIOPinConfig.DIR_INPUT_ ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_ LOW_LEVEL
			initValue - ignored
22	GPIO22	Header J7 pin 6	portNumber = PeripheralConfig.DEFAULT
			pinNumber = 11
			direction = GPIOPinConfig.DIR_ OUTPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_ NONE
			initValue = false
23	GPIO23	Header J7 pin 8	portNumber = PeripheralConfig.DEFAULT
			pinNumber = 9
			direction = GPIOPinConfig.DIR_ OUTPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_ NONE
			initValue = false
24	GPIO24	Header J7 pin 10	portNumber = PeripheralConfig.DEFAULT
		DB9 J10 lower pin 2	pinNumber = 37
			direction = GPIOPinConfig.DIR_ OUTPUT_ONLY
			mode = PeripheralConfig.DEFAULT
			trigger = GPIOPinConfig.TRIGGER_ NONE
			initValue = false

Please note the following:

- `portNumber` can only be set to `PeripheralConfig.DEFAULT`, so `pinNumber` is the unique identifier of the GPIO pin on the Brew MP platform. Note that `pinNumber` cannot be set to `PeripheralConfig.DEFAULT`.
- Configuration of GPIO mode is not supported by the BrewMP platform, so the `mode` parameter can only be set as `PeripheralConfig.DEFAULT`.
- `TRIGGER_BOTH_EDGES` and `TRIGGER_BOTH_LEVELS` are not supported by the BrewMP platform.
- The voltage of output GPIO 1.8V pins can be 1.79 volts. This value is recognized as `false` on input GPIO pins.
- Some GPIO pins are mapped to several physical pins; this allows the programmer to use a GPIO pin in different ways. For example:
  - GPIO1, GPIO2 and GPIO3 can be used to control ADC multiplexer. Please see the *Qualcomm IoE Development Platform User's Guide* at the following link for more information.

    https://developer.qualcomm.com/mobile-development/development-devices-boards/development-boards/internet-of-everything-development-platform/tools-and-resources
  - GPIO6, GPIO7, GPIO9 can be used as interrupt pins for the onboard sensors
  - GPIO10, GPIO11 can be used to control the state of on-board's relays
  - GPIO14, GPIO15, GPIO16, GPIO17, GPIO18 can be used to drive a signal to the on-board's leds. In this case leds related must be shorted. The same is true for "LEDS" port.
  - GPIO20, GPIO21, GPIO24 drives the signal to one of DB9 connectors' pin that is available on-board.

GPIO Ports

The following GPIO ports are pre-configured.

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
200	LEDS	Header J7 pin 9 and Jumper P2 LED Header J7 pin 11 and Jumper P3 LED Header J7 pin 13 and Jumper P4 LED	direction = GPIOPortConfig.DIR_OUTPUT_ONLY initValue = false pins = 13, 34, 12 mode of pins = PeripheralConfig.DEFAULT trigger of pins = GPIOPinConfig.TRIGGER_NONE

I2C

The following configurations can be used to communicate to I2C slaves.

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
300	G-SENSOR	On-board G-Sensor	busNumber = 1 address = 56 addressSize = PeripheralConfig.DEFAULT clockFrequency = 409600
301	LIGHT-SENSOR	On-board Light Sensor	busNumber = 1 address = 68 addressSize = PeripheralConfig.DEFAULT clockFrequency = 409600
302	TEMP-SENSOR	On-board Temperature sensor	busNumber = 1 address = 75 addressSize = PeripheralConfig.DEFAULT clockFrequency = 409600
303	BATTERY-GAUGE	On-board Battery Gauge	busNumber = 1 address = 85 addressSize = PeripheralConfig.DEFAULT clockFrequency = 409600

Please note the following:

- The protocol of the on-board battery gauge is unknown.
- The default clock frequency is 400000 Hz, and is represented by `PeripheralConfig.DEFAULT`. 100000 Hz is also supported as a `clockFrequency`.
- `addressSize` must be set either to `PeripheralConfig.DEFAULT` or to 7. 10-bit addressing mode is not supported.
- The I2C bus number can only be set to 1, which is also represented by `PeripheralConfig.DEFAULT`.

Pulse Counter

The pulse counter has the following configuration:

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
600	COUNTER	GPIO pin 35, Header J7 pin 7	counterNumber = PeripheralConfig.DEFAULT type = TYPE_RISING_EDGE_ONLY GPIO portNumber = PeripheralConfig.DEFAULT GPIO pinNumber = 35

Please note the following:

- Only the values `TYPE_RISING_EDGE_ONLY` and `TYPE_FALLING_EDGE_ONLY` are supported for the `type` parameter on BrewMP platform.

- The `counterNumber` parameter can be set only to `PeripheralConfig.DEFAULT`.

SPI

The SPI has a single static configuration with the following parameters:

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
400	G-SENSOR	On-board G-Sensor	wordLength = 8 clockFrequency = 26000000 clockMode = 3 address = 0 bitOrdering = PeripheralConfig.BIG_ENDIAN busNumber = 1

In order to connect an SPI device, remove JP17 jumper. Refer to section 5.2.3, "SPI" in the Qualcomm IoE Guide for more info. There are also some global SPI related options that are set for all SPI slaves:

- Chip select pin mode (`0`: chip select de-assert; `1`: chip select keep asserted). This value is to `1` by default.
- `PeripheralConfig.DEFAUT` is passed as busNumber is interpreted as 1 and because of only one SPI bus with number 1 is presented on the Qualcomm IoE, only 1 or `PeripheralConfig.DEFAULT` value of `busNumber` is supported.
- `clockFrequency` cannot be set to `PeripheralConfig.DEFAULT`.
- `wordLength` (always 8) and `bitOrdering` (always BIG_ENDIAN) are ignored on the Qualcomm IoE board.
- On the IoE board, address 0 is supported because there is only one CS pin available. The address number can be passed only via first byte of address parameter of `SPIDeviceConfig`.
- Chip select polarity can be controlled via 9 bit of address parameter: if this bit is 1 active high polarity will be set, otherwise active low polarity will be set. So in according of statement above (only address 0 is supported), there are two possible addresses for IoE board:

  0 - address 0, polarity active low

  256 address 0, polarity active high.
- The minimal frequency value in Hz is set to 0.
- The deassertion time value is st to 1000 by default.

If you must change any of these properties for some SPI device, you can add the following in the `jwc_properties.ini` file:

```
deviceaccess.spi.{bus_id}.{slave_address}.csMode = {value}
deviceaccess.spi.{bus_id}.{slave_address}.csPolarity = {value}
deviceaccess.spi.{bus_id}.{slave_address}.minFreq = {value}
deviceaccess.spi.{bus_id}.{slave_address}.deassertionTime = {value}
```

UART

The following UART devices are pre-configured:

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
40	COM1	DB9 J10 upper port	uartNumber - ignored baudRate = 19200 dataBits = DATABITS_8 parity = PARITY_NONE stopBits = STOPBITS_1 flowcontrol = FLOWCONTROL_NONE inputBufferSize - ignored outputBufferSize - ignored

Please note the following:

- There is only one UART port available from the DAAPIs with ID 40; it has the name `COM1`.
- `uartNumber` can only be set to 1, which is the value presented by `PeripheralConfig.DEFAULT`.
- There is only one event, `INPUT_DATA_AVAILABLE`, supported on Qualcomm IoE board.
- Only the `dataBits` values `DATABITS_7` and `DATABITS_8` are supported.

Watchdog

The following watchdog devices are pre-configured:

DAAPI Peripheral ID	DAAPI Peripheral Name	Mapped To	Configuration
500	WDG	Platform Watchdog	

B

Configuring the Java Runtime Properties

There are several ways to change the value of a property that affects Java's configuration or behavior at runtime.

Direct Modification of the jwc_properties.ini File

The `jwc_properties.ini` file contains all the properties that affect Java configuration and behavior at runtime. In order to edit this file, do the following:

1. Open the `jwc_properties.ini` that is a part of the Oracle Java ME Embedded bundle (or download it from the board using the Brew MP SDK **Loader** tool), find the property that should be changed, and modify its value.
2. Copy the modified version of the `jwc_properties.ini` file to the `/sys/mod/java` directory on the Qualcomm IoE board using the Brew MP SDK **Loader** tool.
3. If there is a `jwc_properties.inix` file located in this directory, delete it.
4. Restart Java on the Qualcomm IoE board.

Using the CLI Setprop Command

To modify a property using the `setprop` command in the command-line interface (CLI), do the following.

1. Connect to the board using command-line interface (CLI)
2. Execute the "`sysmenu on`" command
3. Execute the "`setprop` <*property_name*> <*desired_property_value*>
4. Execute the "`saveprops`" command
5. Restart Java on the board.

Note, that by executing the "`setprop`" and "`saveprops`" commands, the `jwc_properties.ini` file is always updated automatically.

Using CLI Commands to Alter Network-Related Settings

To alter the network-related settings, do the following:

1. Connect to the board using command-line interface (CLI)
2. Execute the "`sysmenu on`" command
3. Execute a command that starts with prefix "`net`" to apply a network-related change.

4. Apply the network-related change and restart Java

Restarting Java on the Qualcomm IoE Board

You can use any of the following methods to restart Java on the Qualcomm IoE board.

1. Use the CLI "`shutdown -r`" command. If the "`vmconfig.reboot_type`" property is set to "`soft`" (the default), then only Java will be rebooted. However, if the "`vmconfig.reboot_type`" property is set to "`hard`" then the board will be rebooted. Note that the "`vmconfig.reboot_type`" property also affects Device Access API watchdog's reboot type.
2. Using the CLI "`net reconnect`" command. This command reconfigures the network and performs a soft Java reboot.
3. Press the "RESET KEY" located on the board, or cycle the power to the board.

For example, here are two methods to change the tooling mode from *serial* to *network*. The first method contains the following steps.

1. Open the `jwc_properties.ini` file and set the "`com.oracle.tooling.mode`" property to "`network`".
2. Copy the modified version of the `jwc_properties.ini` file to the `/sys/mod/java` directory using the Brew MP SDK **Loader** application.
3. If there is a `jwc_properties.inix` file located in this directory, then remove it.
4. Reset the board using the "RESET KEY".

The second method contains the following steps.

1. Connect to the board using command-line interface (CLI).
2. Execute the "`sysmenu on`" command.
3. Execute a "`setprop com.oracle.tooling.mode network`" command.
4. Execute the "`saveprops`" command.
5. Execute a "`shutdown -r`" command.

C

AMS Installer Error Codes

Table C–1 lists the error codes that the AMS command-line interface shows when the installation of an IMlet fails. The description of each code contains more information about the problem that caused the error.

Table C–1 Installer Error Codes

Constant	Error Code	Description
ALAA_ALIAS_NOT_FOUND	78	Application Level Access Authorization: The alias definition is missing.
ALAA_ALIAS_WRONG	80	Application Level Access Authorization: The alias definition is wrong.
ALAA_MULTIPLE_ALIAS	79	Application Level Access Authorization: An alias has multiple entries that match.
ALAA_TYPE_WRONG	77	Application Level Access Authorization: The `MIDlet-Access-Auth-Type` has missing parameters.
ALREADY_INSTALLED	39	The JAD matches a version of a suite already installed.
APP_INTEGRITY_FAILURE_ DEPENDENCY_CONFLICT	69	Application Integrity Failure: two or more dependencies exist on the component with the same name and vendor, but have different versions or hashs.
APP_INTEGRITY_FAILURE_ DEPENDENCY_MISMATCH	70	Application Integrity Failure: there is a component name or vendor mismatch between the component JAD and IMlet or component JAD that depends on it.
APP_INTEGRITY_FAILURE_HASH_ MISMATCH	68	Application Integrity Failure: hash mismatch.
ATTRIBUTE_MISMATCH	50	A attribute in both the JAD and JAR manifest does not match.
AUTHORIZATION_FAILURE	49	Application authorization failure, possibly indicating that the application was not digitally signed.
CA_DISABLED	60	Indicates that the trusted certificate authority (CA) for this suite has been disabled for software authorization.
CANCELED	101	Canceled by user.
CANNOT_AUTH	35	The server does not support basic authentication.

Table C–1 (Cont.) Installer Error Codes

Constant	Error Code	Description
CIRCULAR_COMPONENT_DEPENDENCY	64	Circular dynamic component dependency.
COMPONENT_DEPS_LIMIT_EXCEEDED	65	Dynamic component dependencies limit exceeded.
COMPONENT_NAMESPACE_COLLISION	72	The namespace used by a component is the same as another.
CONTENT_HANDLER_CONFLICT	55	The installation of a content handler would conflict with an already installed handler.
CORRUPT_DEPENDENCY_HASH	71	A dependency has a corrupt hash code.
CORRUPT_JAR	36	An entry could not be read from the JAR.
CORRUPT_PROVIDER_CERT	5	The content provider certificate cannot be decoded.
CORRUPT_SIGNATURE	8	The JAR signature cannot be decoded.
DEVICE_INCOMPATIBLE	40	The device does not support either the configuration or profile in the JAD.
DUPLICATED_KEY	88	Duplicated JAD/manifest key attribute
EXPIRED_CA_KEY	12	The certificate authority's public key has expired.
EXPIRED_PROVIDER_CERT	11	The content provider certificate has expired.
INCORRECT_FONT_LOADING	82	A font that is contained with the JAR cannot be loaded.
INSUFFICIENT_STORAGE	30	Not enough storage for this suite to be installed.
INVALID_CONTENT_HANDLER	54	The MicroEdition-Handler-<*n*> JAD attribute has invalid values.
INVALID_JAD_TYPE	37	The server did not have a resource with the correct type or the JAD downloaded has the wrong media type.
INVALID_JAD_URL	43	The JAD URL is invalid.
INVALID_JAR_TYPE	38	The server did not have a resource with the correct type or the JAR downloaded has the wrong media type.
INVALID_JAR_URL	44	The JAR URL is invalid.
INVALID_KEY	28	A key for an attribute is not formatted correctly.
INVALID_NATIVE_LIBRARY	85	A native library contained within the JAR cannot be loaded.
INVALID_PACKAGING	87	A dependency cannot be satisfied.
INVALID_PAYMENT_INFO	58	Indicates that the payment information provided with the IMlet suite is incomplete or incorrect.
INVALID_PROVIDER_CERT	7	The signature of the content provider certificate is invalid.

Table C–1 (Cont.) Installer Error Codes

Constant	Error Code	Description
INVALID_RMS_DATA_TYPE	76	The server did not have a resource with the correct type or the JAD downloaded has the wrong media type.
INVALID_RMS_DATA_URL	73	The RMS data file URL is invalid.
INVALID_SERVICE_EXPORT	86	A LIBlet that exports a service with a LIBlet Services attribute does not contain the matching service provider configuration information.
INVALID_SIGNATURE	9	The signature of the JAR is invalid.
INVALID_VALUE	29	A value for an attribute is not formatted correctly.
INVALID_VERSION	16	The format of the version is invalid.
IO_ERROR	102	A low-level hardware error has occurred.
JAD_MOVED	34	The JAD URL for an installed suite is different than the original JAD URL.
JAD_NOT_FOUND	2	The JAD was not found.
JAD_SERVER_NOT_FOUND	1	The server for the JAD was not found.
JAR_CLASSES_VERIFICATION_FAILED	56	Not all classes within JAR package can be successfully verified with class verifier.
JAR_IS_LOCKED	100	Component or MIDlet or IMlet suite is locked by the system.
JAR_NOT_FOUND	20	The JAR was not found at the URL given in the JAD.
JAR_SERVER_NOT_FOUND	19	The server for the JAR was not found at the URL given in the JAD.
JAR_SIZE_MISMATCH	31	The JAR downloaded was not the same size as given in the JAD.
MISSING_CONFIGURATION	41	The configuration is missing from the manifest.
MISSING_DEPENDENCY_HASH	67	A dependency hash code is missing.
MISSING_DEPENDENCY_JAD_URL	66	A dependency JAD URL is missing.
MISSING_JAR_SIZE	21	The JAR size is missing.
MISSING_JAR_URL	18	The URL for the JAR is missing.
MISSING_PROFILE	42	The profile is missing from the manifest.
MISSING_PROVIDER_CERT	4	The content provider certificate is missing.
MISSING_SUITE_NAME	13	The name of MIDlet or IMlet suite is missing.
MISSING_VENDOR	14	The vendor is missing.
MISSING_VERSION	15	The version is missing.
NEW_VERSION	32	This suite is newer that the one currently installed.

Table C–1 (Cont.) Installer Error Codes

Constant	Error Code	Description
NO_ERROR	0	No error.
NOT_YET_VALID_PROVIDER_CERT	89	A certificate is not yet valid.
NOT_YET_VALID_CA_KEY	90	A CA's public key is not yet valid.
OLD_VERSION	17	This suite is older that the one currently installed.
OTHER_ERROR	103	Other errors.
PROXY_AUTH	51	Indicates that the user must first authenticate with the proxy.
PUSH_CLASS_FAILURE	48	The class in a push attribute is not in MIDlet-<*n*> attribute.
PUSH_DUP_FAILURE	45	The connection in a push entry is already taken.
PUSH_FORMAT_FAILURE	46	The format of a push attribute has an invalid format.
PUSH_PROTO_FAILURE	47	The connection in a push attribute is not supported.
REVOKED_CERT	62	The certificate has been revoked.
RMS_DATA_DECRYPT_PASSWORD	83	Indicates that a password is required to decrypt RMS data.
RMS_DATA_ENCRYPT_PASSWORD	84	Indicates that a password is required to encrypt RMS data.
RMS_DATA_NOT_FOUND	75	The RMS data file was not found at the specified URL.
RMS_DATA_SERVER_NOT_FOUND	74	The server for the RMS data file was not found at the specified URL.
RMS_INITIALIZATION_FAILURE	81	Failure to import RMS data.
SUITE_NAME_MISMATCH	25	The MIDlet or IMlet suite name does not match the one in the JAR manifest.
TOO_MANY_PROPS	53	Indicates that either the JAD or manifest has too many properties to fit into memory.
TRUSTED_OVERWRITE_FAILURE	52	Indicates that the user tried to overwrite a trusted suite with an untrusted suite during an update.
UNAUTHORIZED	33	Web server authentication failed or is required.
UNKNOWN_CA	6	The certificate authority (CA) that issued the content provider certificate is unknown.
UNKNOWN_CERT_STATUS	63	The certificate is unknown to OCSP server.
UNSUPPORTED_CERT	10	The content provider certificate has an unsupported version.
UNSUPPORTED_CHAR_ENCODING	61	Indicates that the character encoding specified in the MIME type is not supported.

Table C–1 (Cont.) Installer Error Codes

Constant	Error Code	Description
UNSUPPORTED_PAYMENT_INFO	57	Indicates that the payment information provided with the MIDlet or IMlet suite is incompatible with the current implementation.
UNTRUSTED_PAYMENT_SUITE	59	Indicates that the MIDlet or IMlet suite has payment provisioning information but it is not trusted.
VENDOR_MISMATCH	27	The vendor does not match the one in the JAR manifest.
VERSION_MISMATCH	26	The version does not match the one in the JAR manifest.

Glossary

Access Point

A network-connectivity configuration that is predefined on a device. An access point can represent different network profiles for the same bearer type, or for different bearer types that may be available on a device, such as WiFi or bluetooth.

ADC

Analog-to-Digital Converter. A hardware device that converts analog signals (time and amplitude) into a stream of binary numbers that can be processed by a digital device.

AMS

Application Management System. The system functionality that completes tasks such as installing applications, updating applications, and managing applications between foreground and background.

APDU

Application Protocol Data Unit. A communication mechanism used by SIM Cards and smart cards to communicate with card reader software or a card reader device.

API

Application Programming Interface. A set of classes used by programmers to write applications that provide standard methods and interfaces and eliminate the need for programmers to reinvent commonly used code.

ARM

Advanced RISC Machine. A family of computer processors using reduced instruction set (RISC) CPU technology, developed by ARM Holdings. ARM is a licensable instruction set architecture (ISA) and is used in the majority of embedded platforms.

AT commands

A set of commands developed to facilitate modem communications, such as dialing, hanging up, and changing the parameters of a connection. Also known as the Hayes command set, AT means *attention.*

AXF

ARM Executable Format. An ARM executable image generated by ARM tools.

BIP

Bearer Independent Protocol. Allows an application on a SIM Card to establish a data channel with a terminal, and through the terminal, to a remote server on the network.

CDMA

Code Division Multiple Access. A mobile telephone network standard used primarily in the United States and Canada as an alternative to GSM.

CLDC

Connected Limited Device Configuration. A Java ME platform configuration for devices with limited memory and network connectivity. It uses a low-footprint Java virtual machine such as the CLDC HotSpot Implementation, and several minimalist Java platform APIs for application services.

Configuration

Defines the minimum Java runtime environment (for example, the combination of a Java virtual machine and a core set of Java platform APIs) for a family of Java ME platform devices.

DAC

Digital-to-Analog Converter. A hardware device that converts a stream of binary numbers into an analog signal (time and amplitude), such as audio playback.

ETSI

European Telecommunications Standards Institute. An independent, non-profit group responsible for the standardization of information and communication technologies within Europe. Although based in Europe, it carries worldwide influence in the telecommunications industry.

GCF

Generic Connection Framework. A part of CLDC, it is a Java ME API consisting of a hierarchy of interfaces and classes to create connections (such as HTTP, datagram, or streams) and perform I/O.

GPIO

General Purpose Input/Output. Unassigned pins on an embedded platform that can be assigned or configured as needed by a developer.

GPIO Port

A group of GPIO pins (typically 8 pins) arranged in a group and treated as a single port.

GSM

Global System for Mobile Communications. A 3G mobile telephone network standard used widely in Europe, Asia, and other parts of the world.

HTTP

HyperText Transfer Protocol. The most commonly used Internet protocol, based on TCP/IP that is used to fetch documents and other hypertext objects from remote hosts.

HTTPS

Secure HyperText Transfer Protocol. A protocol for transferring encrypted hypertext data using Secure Socket Layer (SSL) technology.

ICCID

Integrated Circuit Card Identification. The unique serial number assigned to an individual SIM Card.

IMP-NG

Information Module Profile Next Generation. A profile for embedded "headless" devices, the IMP-NG specification (JSR 228) is a subset of MIDP 2.0 that leverages many of the APIs of MIDP 2.0, including the latest security and networking+, but does not include graphics and user interface APIs.

IMEI

International Mobile Equipment Identifier. A number unique to every mobile phone. It is used by a GSM or UMTS network to identify valid devices and can be used to stop a stolen or blocked phone from accessing the network. It is usually printed inside the battery compartment of the phone.

IMlet

An application written for IMP-NG. An IMlet does not differ from MIDP 2.0 MIDlet, except by the fact that an IMlet can not refer to MIDP classes that are not part of IMP-NG. An IMlet can only use the APIs defined by the IMP-NG and CLDC specifications.

IMlet Suite

A way of packaging one or more IMlets for easy distribution and use. Similar to a MIDlet suite, but for smaller applications running in an embedded environment.

IMSI

International Mobile Subscriber Identity. A unique number associated with all GSM and UMTS network mobile phone users. It is stored on the SIM Card inside a phone and is used to identify itself to the network.

I2C

Inter-Integrated Circuit. A multi-master, serial computer bus used to attach low-speed peripherals to an embedded platform

ISA

Instruction Set Architecture. The part of a computer's architecture related to programming, including data type, addressing modes, interrupt and exception handling, I/O, and memory architecture, and native commands. Reduced instruction set computing (RISC) is one kind of instruction set architecture.

JAD file

Java Application Descriptor file. A file provided in a MIDlet or IMlet suite that contains attributes used by application management software (AMS) to manage the MIDlet or IMlet life cycle, and other application-specific attributes used by the MIDlet or IMlet suite itself.

JAR file

Java Archive file. A platform-independent file format that aggregates many files into one. Multiple applications written in the Java programming language and their required components (class files, images, sounds, and other resource files) can be bundled in a JAR file and provided as part of a MIDlet or IMlet suite.

JCP

Java Community Process. The global standards body guiding the development of the Java programming language.

JDTS

Java Device Test Suite. A set of Java programming language tests developed specifically for the wireless marketplace, providing targeted, standardized testing for CLDC and MIDP on small and handheld devices.

Java ME platform

Java Platform, Micro Edition. A group of specifications and technologies that pertain to running the Java platform on small devices, such as cell phones, pagers, set-top boxes, and embedded devices. More specifically, the Java ME platform consists of a configuration (such as CLDC) and a profile (such as MIDP or IMP-NG) tailored to a specific class of device.

JSR

Java Specification Request. A proposal for developing new Java platform technology, which is reviewed, developed, and finalized into a formal specification by the JCP program.

Java Virtual Machine

A software "execution engine" that safely and compatibly executes the byte codes in Java class files on a microprocessor.

KVM

A Java virtual machine designed to run in a small, limited memory device. The CLDC configuration was initially designed to run in a KVM.

LCDUI

Liquid Crystal Display User Interface. A user interface toolkit for interacting with Liquid Crystal Display (LCD) screens in small devices. More generally, a shorthand way of referring to the MIDP user interface APIs.

MIDlet

An application written for MIDP.

MIDlet suite

A way of packaging one or more MIDlets for easy distribution and use. Each MIDlet suite contains a Java application descriptor file (`.jad`), which lists the class names and files names for each MIDlet, and a Java Archive file (`.jar`), which contains the class files and resource files for each MIDlet.

MIDP

Mobile Information Device Profile. A specification for a Java ME platform profile, running on top of a CLDC configuration that provides APIs for application life cycle, user interface, networking, and persistent storage in small devices.

MSISDN

Mobile Station Integrated Services Digital Network. A number uniquely identifying a subscription in a GSM or UMTS mobile network. It is the telephone number to the SIM Card in a mobile phone and used for voice, FAX, SMS, and data services.

MVM

Multiple Virtual Machines. A software mode that can run more than one MIDlet or IMlet at a time.

Obfuscation

A technique used to complicate code by making it harder to understand when it is decompiled. Obfuscation makes it harder to reverse-engineer applications and therefore, steal them.

Optional Package

A set of Java ME platform APIs that provides additional functionality by extending the runtime capabilities of an existing configuration and profile.

Preemption

Taking a resource, such as the foreground, from another application.

Preverification

Due to limited memory and processing power on small devices, the process of verifying Java technology classes is split into two parts. The first part is preverification which is done off-device using the preverify tool. The second part, which is verification, occurs on the device at runtime.

Profile

A set of APIs added to a configuration to support specific uses of an embedded or mobile device. Along with its underlying configuration, a profile defines a complete and self-contained application environment.

Provisioning

A mechanism for providing services, data, or both to an embedded or mobile device over a network.

Pulse Counter

A hardware or software component that counts electronic pulses, or events, on a digital input line, for example, a GPIO pin.

Push Registry

The list of inbound connections, across which entities can push data. Each item in the list contains the URL (protocol, host, and port) for the connection, the entity permitted to push data through the connection, and the application that receives the connection.

RISC

Reduced Instruction Set Computing. A CPU design based on simplified instruction sets that provide higher performance and faster execution of individual instructions. The ARM architecture is based on RISC design principles.

RL-ARM

Real-Time Library. A group of tightly coupled libraries designed to solve the real-time and communication challenges of embedded systems based on ARM processor-based microcontroller devices.

RMI

Remote Method Invocation. A feature of Java SE technology that enables Java technology objects running in one virtual machine to seamlessly invoke objects running in another virtual machine.

RMS

Record Management System. A simple record-oriented database that enables an IMlet or MIDlet to persistently store information and retrieve it later. MIDlets can also use the RMS to share data.

RTOS

Real-Time Operating System. An operating system designed to serve real-time application requests. It uses multi-tasking, an advanced scheduling algorithm, and minimal latency to prioritize and process data.

RTSP

Real Time Streaming Protocol. A network control protocol designed to control streaming media servers and media sessions.

SCWS

Smart Card Web Server. A web server embedded in a smart card (such as a SIM Card) that allows HTTP transactions with the card.

SD card

Secure Digital cards. A non-volatile memory card format for use in portable devices, such as mobile phones and digital cameras, and embedded systems. SD cards come in three different sizes, with several storage capacities and speeds.

SIM

Subscriber Identity Module. An integrated circuit embedded into a removable SIM card that securely stores the International Mobile Subscriber Identity (IMSI) and the related key used to identify and authenticate subscribers on mobile and embedded devices.

Slave Mode

Describes the relationship between a master and one or more devices in a Serial Peripheral Interface (SPI) bus arrangement. Data transmission in an SPI bus is initiated by the master device and received by one or more slave devices, which cannot initiate data transmissions on their own.

Smart Card

A card that stores and processes information through the electronic circuits embedded in silicon in the substrate of its body. Smart cards carry both processing power and information. A SIM Card is a special kind of smart card for use in a mobile device.

SMS

Short Message Service. A protocol allowing transmission of short text-based messages over a wireless network. SMS messaging is the most widely-used data application in the world.

SMSC

Short Message Service Center. The SMSC routes messages and regulates **SMS** traffic. When an SMS message is sent, it goes to an SMS center first, then gets forwarded to the destination. If the destination is unavailable (for example, the recipient embedded board is powered down), the message is stored in the SMSC until the recipient becomes available.

SOAP

Simple Object Access Protocol. An XML-based protocol that enables objects of any type to communicate in a distributed environment. It is most commonly used to develop web services.

SPI

Serial Peripheral Interface. A synchronous bus commonly used in embedded systems that allows full-duplex communication between a master device and one or more slave devices.

SSL

Secure Sockets Layer. A protocol for transmitting data over the Internet using encryption and authentication, including the use of digital certificates and both public and private keys.

SVM

Single Virtual Machine. A software mode that can run only one MIDlet or IMlet at a time.

Task

At the platform level, each separate application that runs within a single Java virtual machine is called a task. The API used to instantiate each task is a stripped-down version of the Isolate API defined in JSR 121.

TCP/IP

Transmission Control Protocol/Internet Protocol. A fundamental Internet protocol that provides for reliable delivery of streams of data from one host to another.

Terminal Profile

Device characteristics of a terminal (mobile or embedded device) passed to the SIM Card along with the IMEI at SIM Card initialization. The terminal profile tells the SIM Card what values are supported by the device.

UART

Universal Asynchronous Receiver/Transmitter. A piece of computer hardware that translates data between serial and parallel formats. It is used to facilitate communication between different kinds of peripheral devices, input/output streams, and embedded systems, to ensure universal communication between devices.

UICC

Universal Integrated Circuit Card. The smart card used in mobile terminals in GSM and UMTS networks. The UICC ensures the integrity and security of personal data on the card.

UMTS

Universal Mobile Telecommunications System. A third-generation (3G) mobile communications technology. It utilizes the radio spectrum in a fundamentally different way than GSM.

URI

Uniform Resource Identifier. A compact string of characters used to identify or name an abstract or physical resource. A URI can be further classified as a uniform resource locator (URL), a uniform resource name (URN), or both.

USAT

Universal SIM Application Toolkit. A software development kit intended for 3G networks. It enables USIM to initiate actions that can be used for various value-added services, such as those required for banking and other privacy related applications.

USB

Universal Serial Bus. An industry standard that defines the cables, connectors, and protocols used in a bus for connection, communication, and power supply between computers and electronic devices, such as embedded platforms and mobile phones.

USIM

Universal Subscriber Identity Module. An updated version of a SIM designed for use over 3G networks. USIM is able to process small applications securely using better cryptographic authentication and stronger keys. Larger memory on USIM enables the addition of thousands of contact details including subscriber information, contact details, and other custom settings.

WAE

Wireless Application Environment. An application framework for small devices, which leverages other technologies, such as Wireless Application Protocol (WAP).

WAP

Wireless Application Protocol. A protocol for transmitting data between a server and a client (such as a cell phone or embedded device) over a wireless network. WAP in the wireless world is analogous to HTTP in the World Wide Web.

Watchdog Timer

A dedicated piece of hardware or software that "watches" an embedded system for a fault condition by continually polling for a response. If the system goes offline and no response is received, the watchdog timer initiates a reboot procedure or takes other steps to return the system to a running state.

WCDMA

Wideband Code Division Multiple Access. A detailed protocol that defines how a mobile phone communicates with the tower, how its signals are modulated, how datagrams are structured, and how system interfaces are specified.

WMA

Wireless Messaging API. A set of classes for sending and receiving Short Message Service (SMS) messages.

XML Schema

A set of rules to which an XML document must conform to be considered valid.

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