Tutorial: Tools for mobile Linux (TmL)

Exercises

Setting Up the Environment for the Hands-on Sessions

You can get all the software you need for the TmL tutorial from http://wiki.eclipse.org/DSDP/TML/EclipseCon2009_Tutorial. Alternatively, you can copy it from the pen drives that are going to be passed around at the beginning of the tutorial at EclipseCon.

This is a check list of the components you need:

- ❑ Eclipse 3.5 Galileo Classic (with JDT and PDE) with the TmL plug-ins;
- ❑ The puppy Linux emulator with the echo server;
- ❑ A pre-configured workspace with the tutorial projects (optional).

Run Eclipse and select the pre-configured workspace.

Hands-on Session #1: Using the Device Framework to integrate an emulator into Eclipse

In this session, we are going to use the Device Framework component from TmL to integrate the puppy Linux emulator into the Eclipse platform. This will allow you to start and stop the emulator from Eclipse, as well as to visualize the state of the emulator, i.e. whether it has been started or stopped.

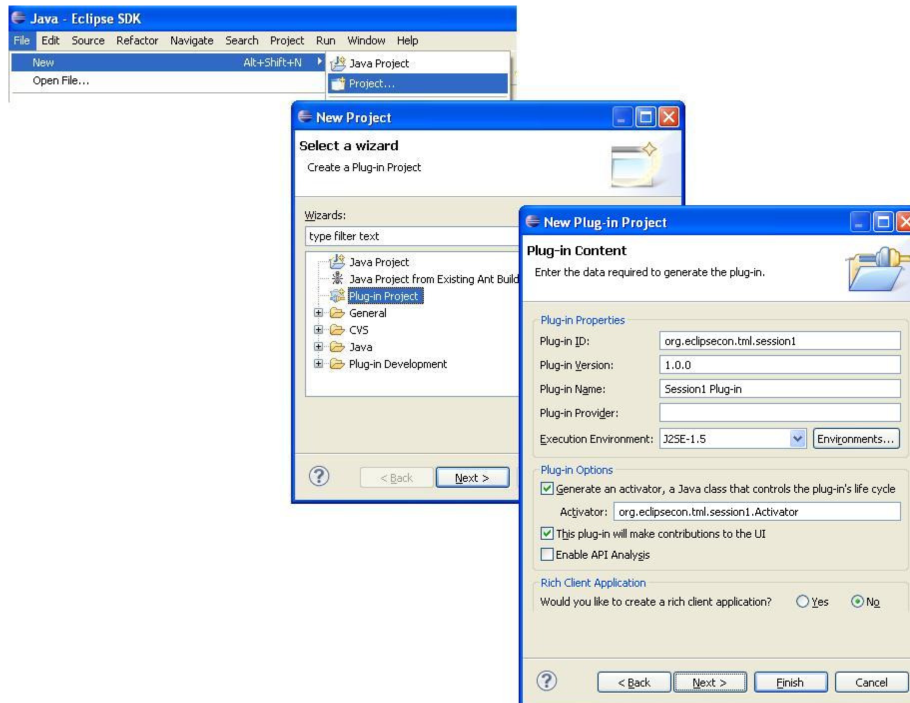
In order to do this, we are going to create extensions using the following extension points:

- **org.eclipse.tml.deviceTypes**, to define a type for the emulator;
- **org.eclipse.tml.serviceDefinition**, to define operations or services for the emulator;
- **org.eclipse.tml.device.ui.newDeviceWizardPages**, to define a wizard to create instances of the emulator.

You will also learn how to use the following extension points:

- **org.eclipse.tml.status**, to define states for a state machine;
- **org.eclipse.tml.service**, to define operations or services to transition from a state to another state.

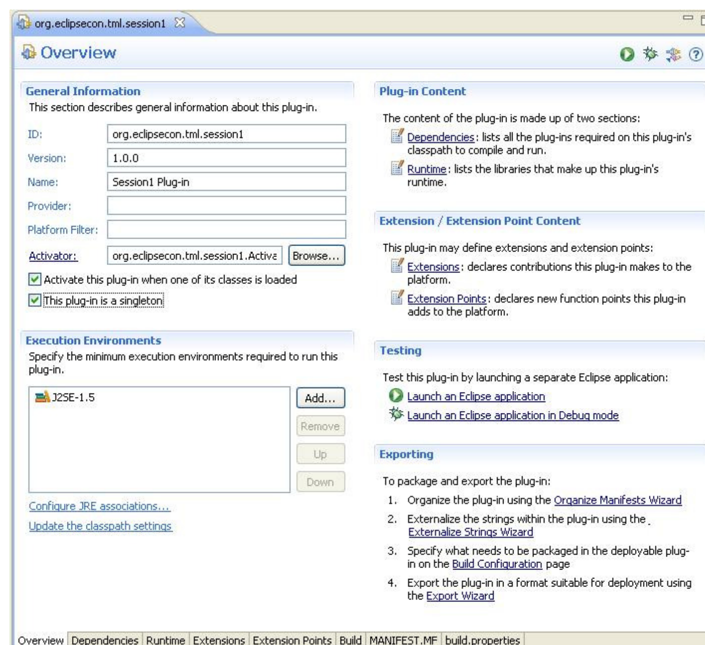
1. Open the project **org.eclipsecon.tml.session1**, or create a plug-in project (in this case you will need to copy the code yourself).



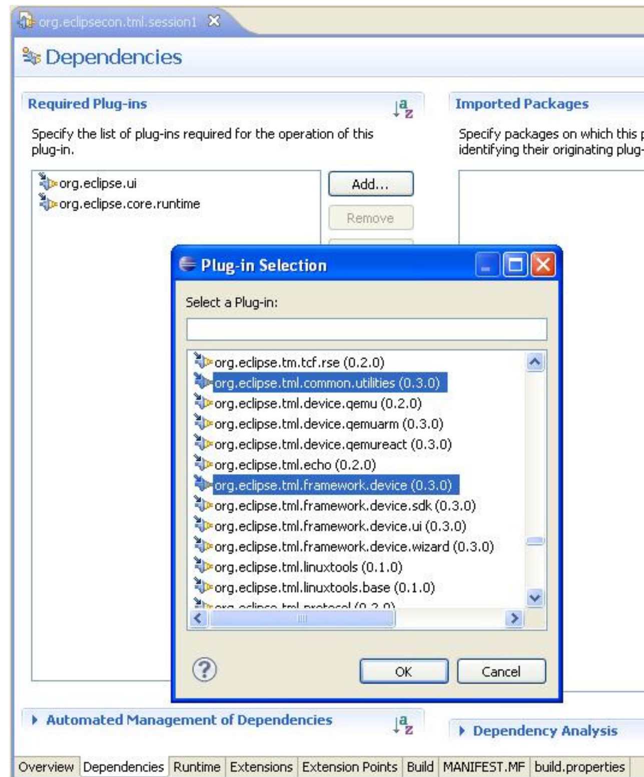
2. Switch to the **Plug-in Development** perspective.

3. Open the **META-INF/MANIFEST.MF** file.

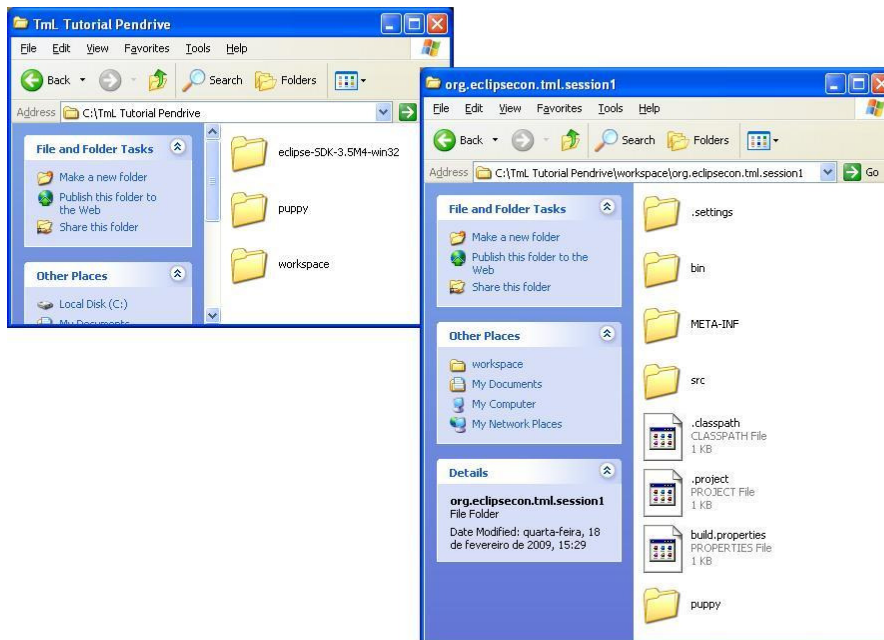
4. Select the **Overview** tab, check the option **This plug-in is a singleton** and save the file.



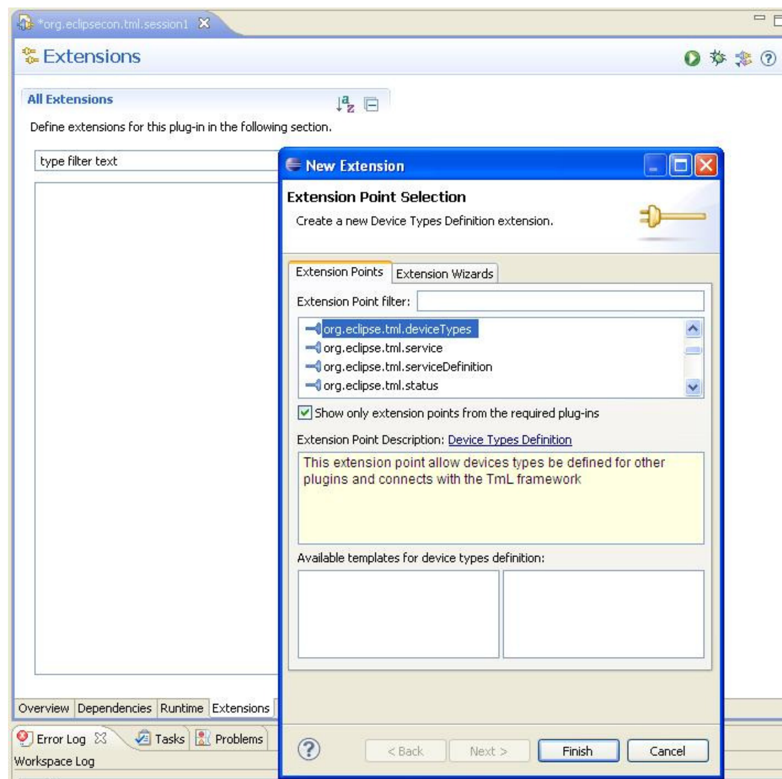
5. Select the **Dependencies** tab and add the plug-ins **org.eclipse.tml.common.utilities** and **org.eclipse.tml.framework.device** to the list of dependencies.



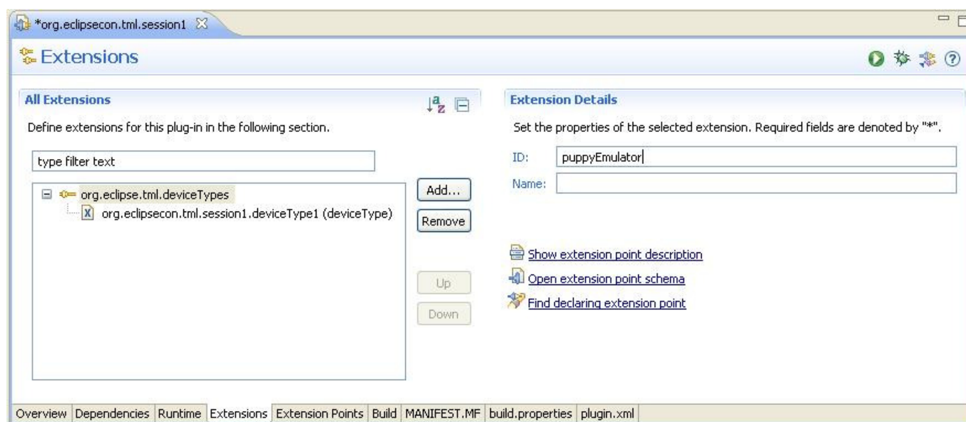
6. Copy the entire **puppy** directory from where you copied it into your plug-in project directory.



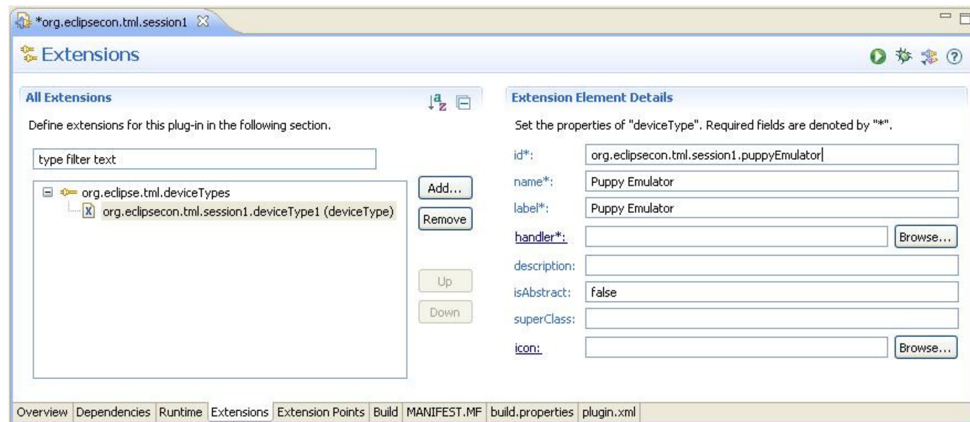
7. Select the **Extensions** tab from **MANIFEST.MF** in the editor and add an extension of type **org.eclipse.tml.deviceTypes**.



8. Select the extension and fill in the **ID** field with **puppyEmulator**.

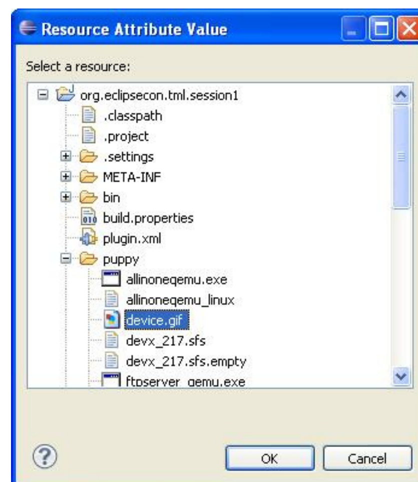


9. Select the **deviceType** element that was automatically created under the extension and fill in the detail fields as follows:

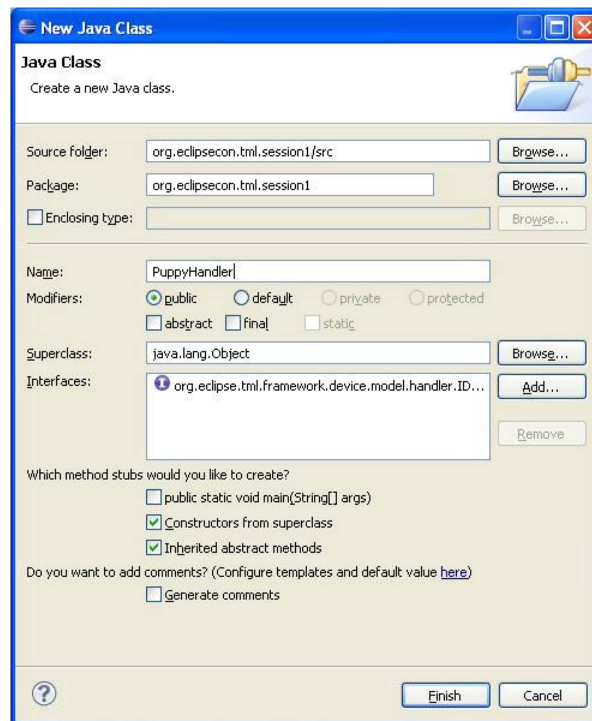


Note: the **id** field must contain the plug-in id followed by the **ID** from the previous step, e.g. **org.eclipsecon.tml.session1.puppyEmulator**.

10. Click the **Browse...** button next to the **icon** field and select **puppy/device.gif** from the plug-in project directory. This icon is going to represent the puppy Linux emulator in the GUI.



11. Click the **handler** label to open the **New Java Class** dialog. The dialog shows that the handler class must implement the interface **org.eclipse.tml.framework.device.model.handler.IDeviceHandler**. Fill in the **Package** field with **org.eclipsecon.tml.session1** and the **Name** field with **PuppyHandler**. Alternatively, you can click **Browse...** and select the pre-defined class provided with the project in the pre-configured workspace.



12. Click **Finish** to create the class and open it automatically in the editor. The new class contains three auto-generated stubs: the no-arg constructor, the **createDeviceInstance()** method and the **createDeviceLauncher()** method.

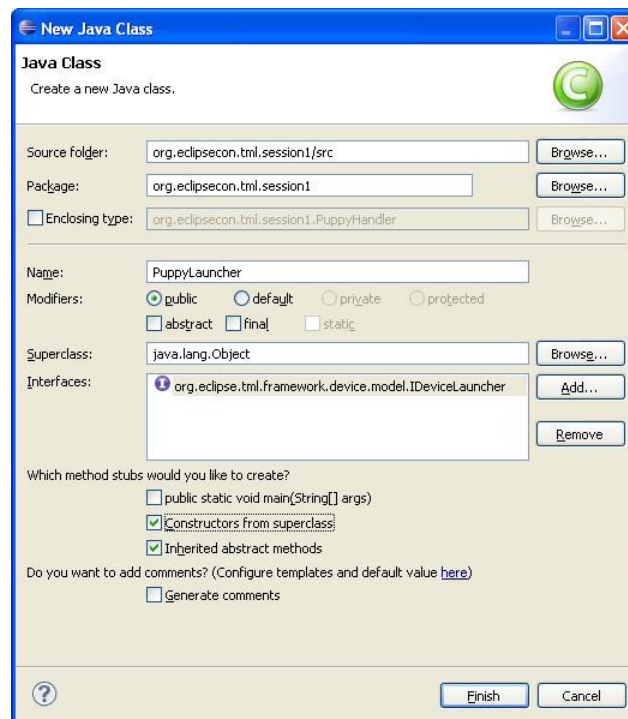
org.eclipsecon.tml.session1 | PuppyHandler.java

```
package org.eclipsecon.tml.session1;

import org.eclipse.tml.framework.device.model.IDeviceLauncher;

public class PuppyHandler implements IDeviceHandler {

    public PuppyHandler() {
        // TODO Auto-generated constructor stub
    }

    public IInstance createDeviceInstance(String arg0) {
        // TODO Auto-generated method stub
        return null;
    }

    public IDeviceLauncher createDeviceLauncher(IInstance arg0) {
        // TODO Auto-generated method stub
        return null;
    }
```

13. Replace the auto-generated method stub in the **createDeviceInstance()** method with the following line of code:

```java
package org.eclipsecon.tml.session1;

import org.eclipse.tml.framework.device.internal.model.MobileInstance;

public class PuppyHandler implements IDeviceHandler {

    public PuppyHandler() {
        // TODO Auto-generated constructor stub
    }

    public IInstance createDeviceInstance(String id) {
        return new MobileInstance(id);
    }

    public IDeviceLauncher createDeviceLauncher(IInstance arg0) {
        // TODO Auto-generated method stub
        return null;
    }
```

14. The **createDeviceLauncher()** method is going to create an instance of the launcher class, which is responsible for invoking the emulator executable in this case. To create the launcher class, create a new Java class called **PuppyLauncher** that implements **org.eclipse.tml.framework.device.IDeviceLauncher**. Alternatively, you can select the pre-defined class provided with the project in the pre-configured workspace.



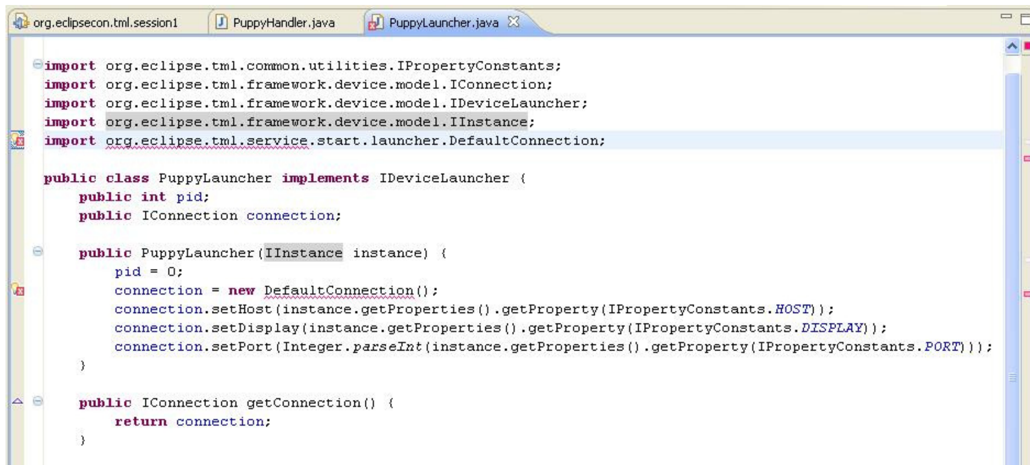
15. Click **Finish** to create the class and open it automatically in the editor. The class contains a number of auto-generated stubs.

```java
package org.eclipsecon.tml.session1;

import org.eclipse.tml.framework.device.model.IConnection;

public class PuppyLauncher implements IDeviceLauncher {

    public PuppyLauncher() {
        // TODO Auto-generated constructor stub
    }

    public IConnection getConnection() {
        // TODO Auto-generated method stub
        return null;
    }

    public String getFileId() {
        // TODO Auto-generated method stub
        return null;
    }

    public String getLocation() {
        // TODO Auto-generated method stub
        return null;
    }

    public int getPID() {
        // TODO Auto-generated method stub
        return 0;
    }

    public String getToolArguments() {
        // TODO Auto-generated method stub
        return null;
    }

    public String getWorkingDirectory() {
        // TODO Auto-generated method stub
        return null;
    }

    public void setPID(int arg0) {
        // TODO Auto-generated method stub

    }

}
```

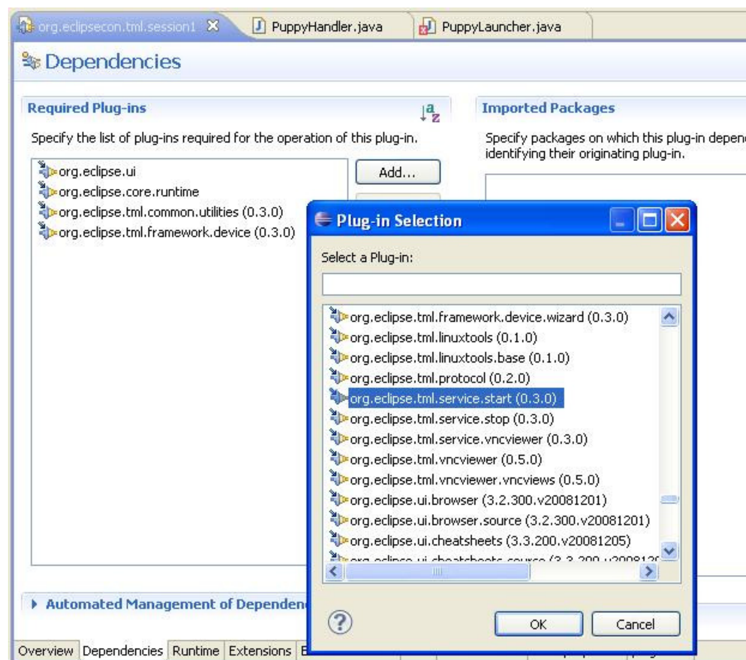
16. First, add the following code to handle the process id (pid) of the emulator instance:

```java
package org.eclipsecon.tml.session1;

import org.eclipse.tml.framework.device.model.IConnection;

public class PuppyLauncher implements IDeviceLauncher {
    public int pid;

    public PuppyLauncher() {
        pid = 0;
    }

    public IConnection getConnection() {

    public String getFileId() {

    public String getLocation() {

    public int getPID() {
        return pid;
    }

    public String getToolArguments() {

    public String getWorkingDirectory() {

    public void setPID(int pid) {
        this.pid = pid;
    }

}
```

17. Now, add the following code to handle the connection along with the corresponding **import** statements:



18. In order to fix the **org.eclipse.tml.service.start.launcher.DefaultConnection** import, select the **Dependencies** tab of **MANIFEST.MF** and add the plug-in **org.eclipse.tml.service.start** to the list of dependencies.



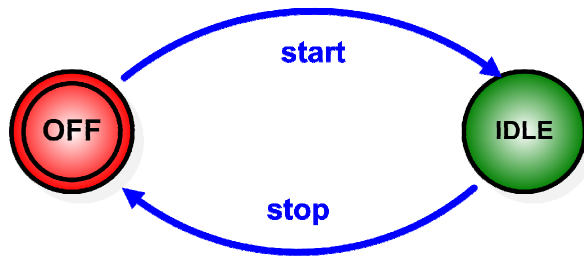
19. Finally, we must enable the launcher class to invoke the emulator executable by adding the code below, which sets the path to the emulator executable as well as the options with which to invoke it.

```
org.eclipsecon.tml.session1    PuppyHandler.java    PuppyLauncher.java

package org.eclipsecon.tml.session1;

import org.eclipse.core.runtime.IPath;

public class PuppyLauncher implements IDeviceLauncher {
    public int pid;
    public IConnection connection;
    public static final String DOUBLE_BACKSLASH = "\\";

    public PuppyLauncher(IInstance instance) {

    public IConnection getConnection() {

    public String getFileId() {
        IPath path = Activator.getDefault().getStateLocation();
        String filePath = path.addTrailingSeparator().toOSString()+ "puppy.id";
        return filePath;
    }

    public String getLocation() {
        return getWorkingDirectory().concat("puppy.exe");
    }

    public int getPID() {

    public String getToolArguments() {
        return buildEmulatorOptions();
    }

    public String getWorkingDirectory() {
        return getInstallationPath().concat("puppy").concat(DOUBLE_BACKSLASH);
    }

    public void setPID(int pid) {

    public String getInstallationPath() {
        return PluginUtils.getPluginInstallationPath(Activator.getDefault()).getAbsolutePath().concat(DOUBLE_BACKSLASH);
    }

    private String buildEmulatorOptions() {
        StringBuffer buffer = new StringBuffer();
        buffer.append(" -pidfile " + getFileId());
        buffer.append(" -redir udp:1534::1534 -redir tcp:1534::1534");
        return buffer.toString();
    }
}
```

20. Now that the launcher class is complete, add the following line of code to the **createDeviceLauncher()** method in class **PuppyHandler** along with the corresponding **import** statement:

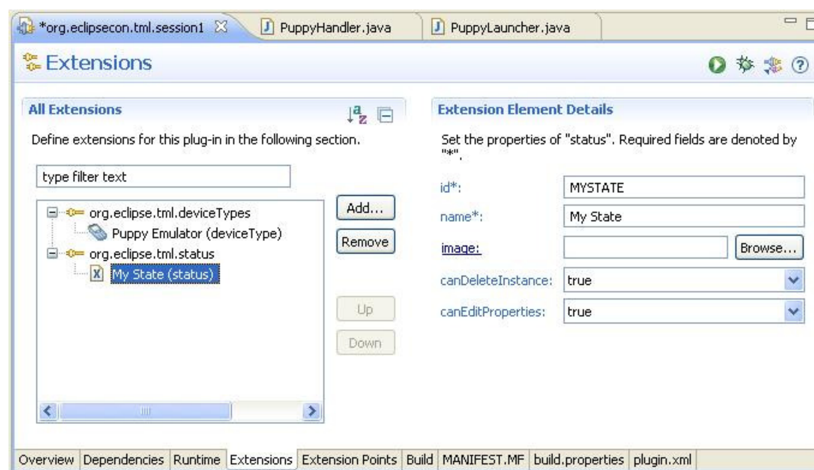
```
org.eclipsecon.tml.session1    PuppyHandler.java    PuppyLauncher.java

package org.eclipsecon.tml.session1;

import org.eclipse.tml.framework.device.internal.model.MobileInstance;
import org.eclipse.tml.framework.device.model.IDeviceLauncher;
import org.eclipse.tml.framework.device.model.IInstance;
import org.eclipse.tml.framework.device.model.handler.IDeviceHandler;
import org.eclipsecon.tml.session1.PuppyLauncher;

public class PuppyHandler implements IDeviceHandler {

    public PuppyHandler() {
        // TODO Auto-generated constructor stub
    }

    public IInstance createDeviceInstance(String id) {
        return new MobileInstance(id);
    }

    public IDeviceLauncher createDeviceLauncher(IInstance instance) {
        return new PuppyLauncher(instance);
    }
}
```

21. In the next few steps we are going to implement the state machine for this emulator, which is defined as follows:



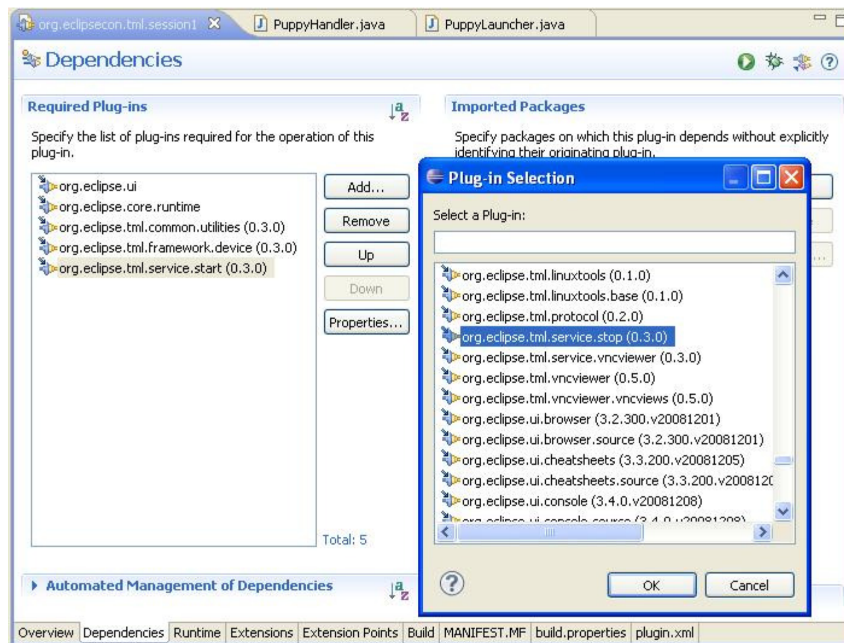
In this case we are going to use the **OFF** and **IDLE** states which have been pre-defined in the framework, together with the **start** and **stop** operations provided with the reference implementation in plug-ins **org.eclipse.tml.service.start** and **org.eclipse.tml.service.stop**.

What if we did not have pre-defined states, or if those states were not suitable for our implementation? In this case, we would use the extension point **org.eclipse.tml.status** to define each state identifier:

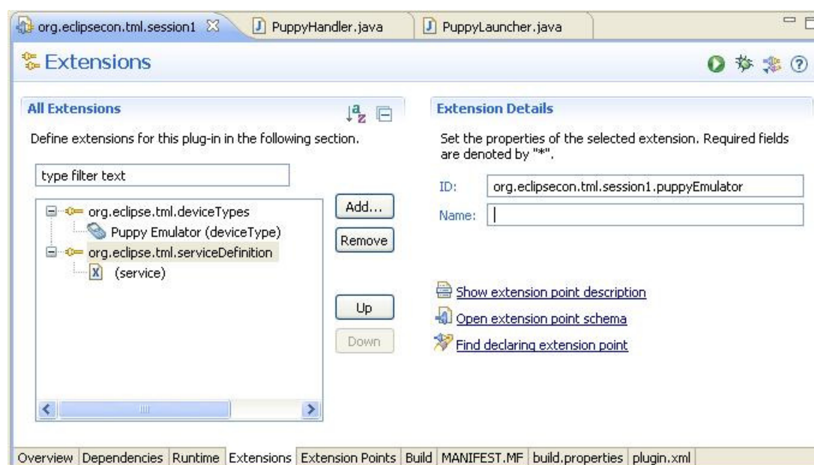


And what if we did not have suitable operations in the reference implementation? We would need to use the extension point **org.eclipse.tml.service** to define them.

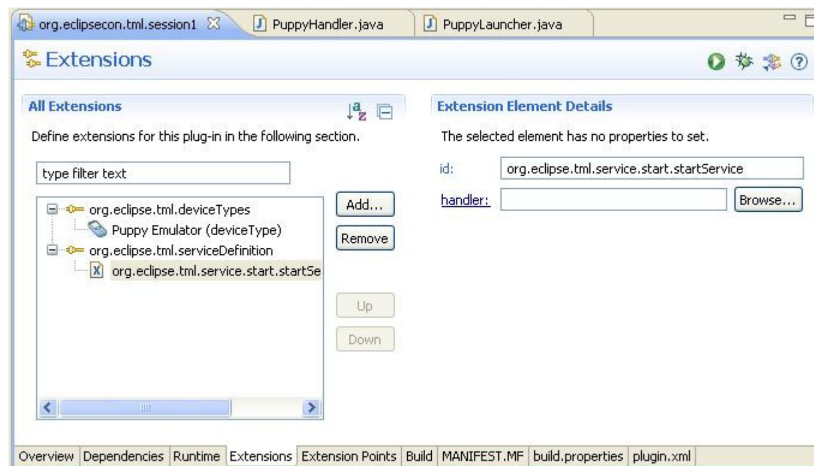
22. Select the **Dependencies** tab from **MANIFEST.MF** and add the plug-in **org.eclipse.tml.service.stop** to the list of dependencies (remember that we added **org.eclipse.tml.service.start** when defining the launcher class).



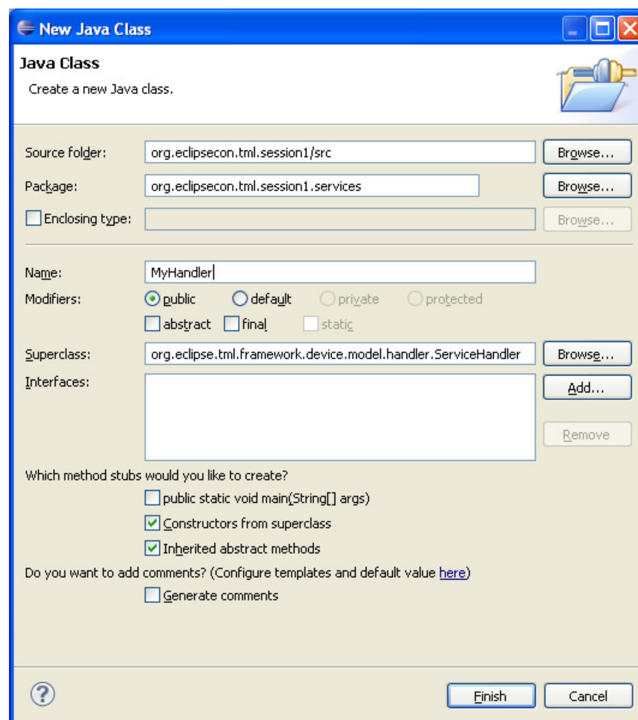
23. Select the **Extensions** tab from **MANIFEST.MF** and add an extension of type **org.eclipse.tml.serviceDefinition**. Select the extension (not the **service** element) and fill in the **ID** field with the device type ID concatenated to the plug-in id, e.g. **org.eclipsecon.tml.session1.puppyEmulator**. *Note:* the ID *must* correspond to the plug-in id + the device type ID.



24. Select the **service** element from the extension you have just created and fill in the **id** field with the id of the start service from the reference implementation, i.e. **org.eclipse.tml.service.start.startService**. We don't need to define a handler class here, since the service is already defined in the reference implementation.



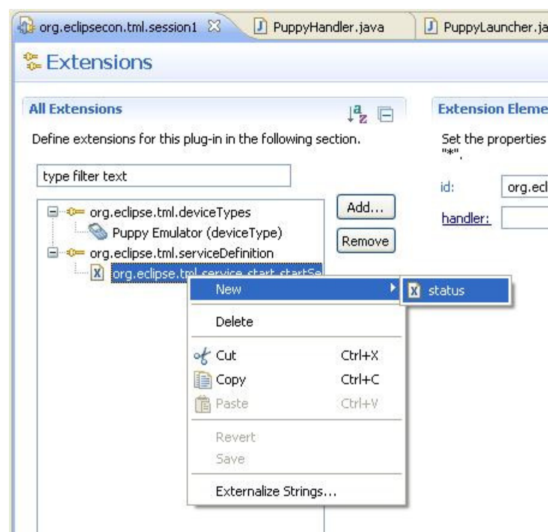
What if the start service were not defined in the reference implementation? In this case, we would need to create a handler class that extends **org.eclipse.tml.framework.device.model.handler.ServiceHandler**:



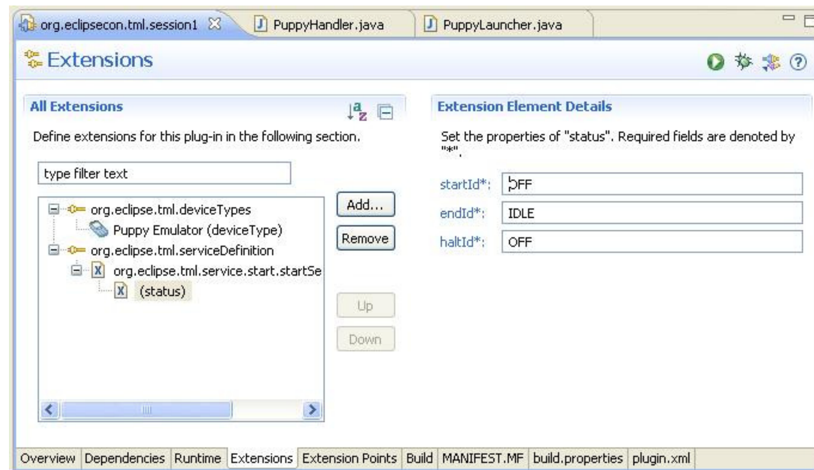
The service handler class can override the methods below, where **runService()** is the method that performs the actual operations.

```java
package org.eclipsecon.tml.session1.services;

import java.util.Map;

public class MyHandler extends ServiceHandler {

    public MyHandler() {
        // TODO Auto-generated constructor stub
    }

    @Override
    public IServiceHandler newInstance() {
        // TODO Auto-generated method stub
        return null;
    }

    @Override
    public IStatus runService(IInstance arg0, Map<Object, Object> arg1,
            IProgressMonitor arg2) {
        // TODO Auto-generated method stub
        return null;
    }

    @Override
    public IStatus updatingService(IInstance arg0, IProgressMonitor arg1) {
        // TODO Auto-generated method stub
        return null;
    }

}
```

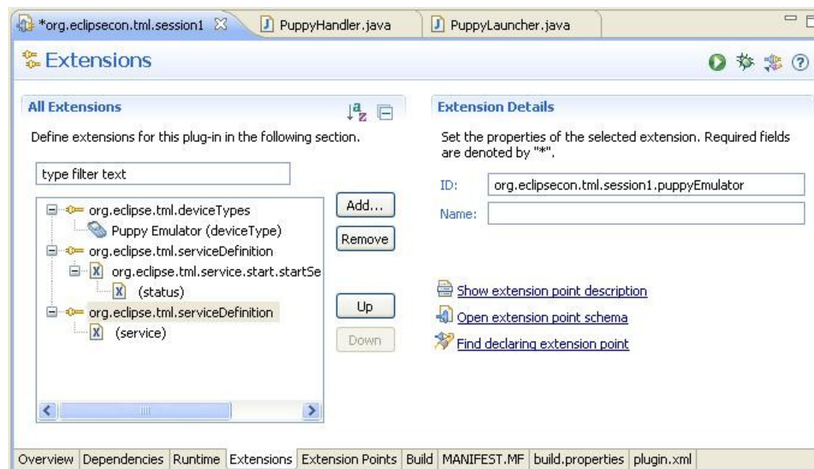
25. Select the **service** element from the **serviceDefinition** extension and add an element of type **status**:



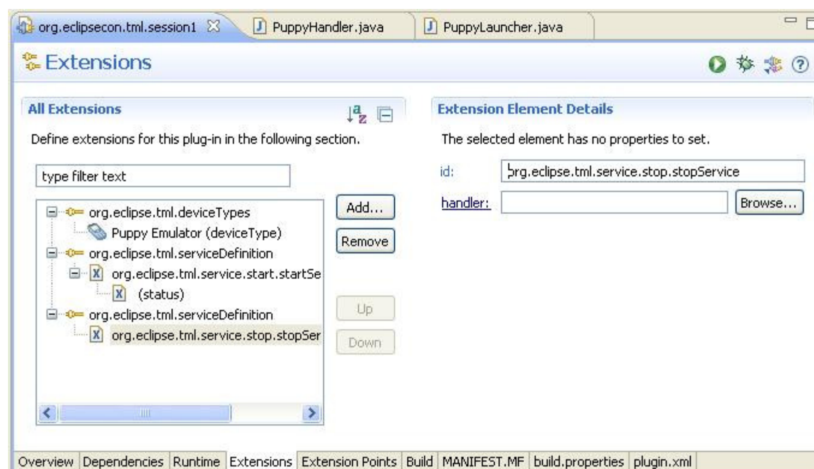
26. Fill in the **startId**, **endId** and **haltId** fields with the values **OFF**, **IDLE** and **OFF**, respectively. They correspond to the start state, end state and error state for the start operation, where the error state is the state of the emulator if the operation fails.



27. The previous steps complete the definition of the start service, which transitions from the OFF state to the IDLE state. To define the stop service, create another extension of type **org.eclipse.tml.serviceDefinition** with the same emulator ID:



28. Select the **service** element and fill in the **id** field with the id of the stop service, i.e. **org.eclipse.tml.service.stop.stopService**.



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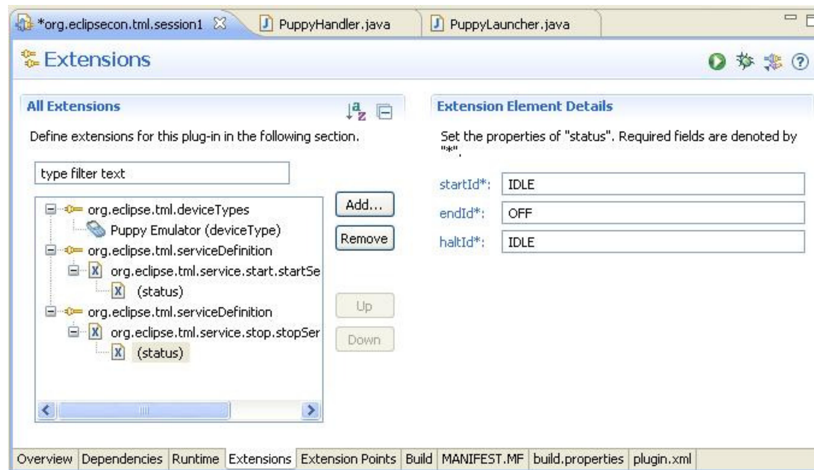
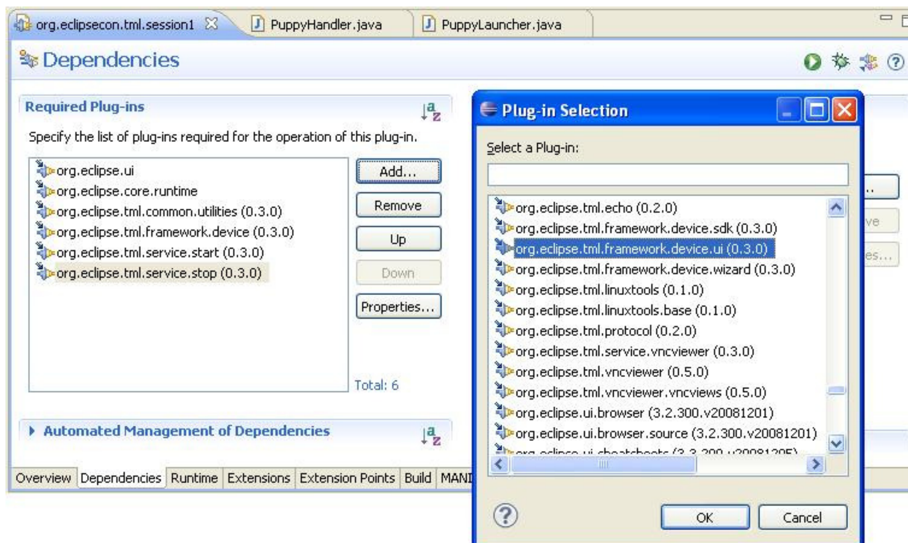
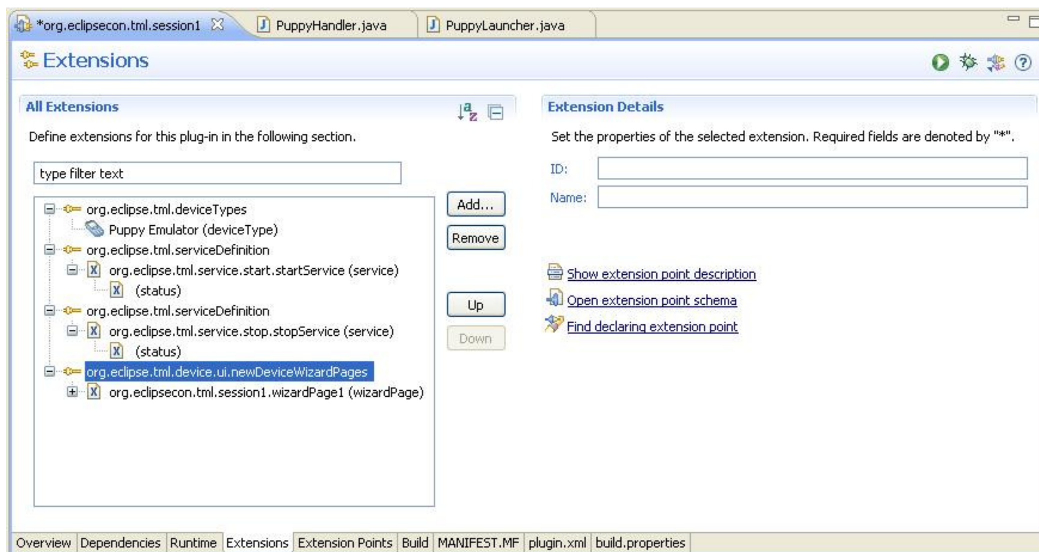
29. Add an element of type **status** to the **service** element and fill in the **startId, endId** and **haltId** fields with the values **IDLE, OFF** and **IDLE,** respectively.



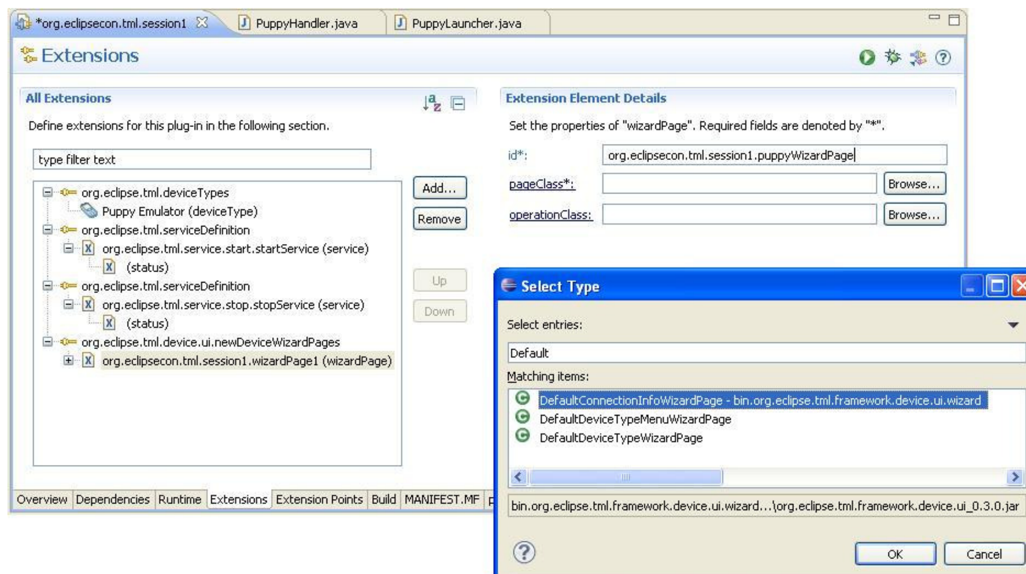
30. This completes the definition of the stop operation. The only thing we need to do now in order to be able to run an instance of the puppy Linux emulator is to define the wizard to create an instance of this device type. Select the **Dependencies** tab from **MANIFEST.MF** and add the plug-in **org.eclipse.tml.framework.device.ui** to the list of dependencies.



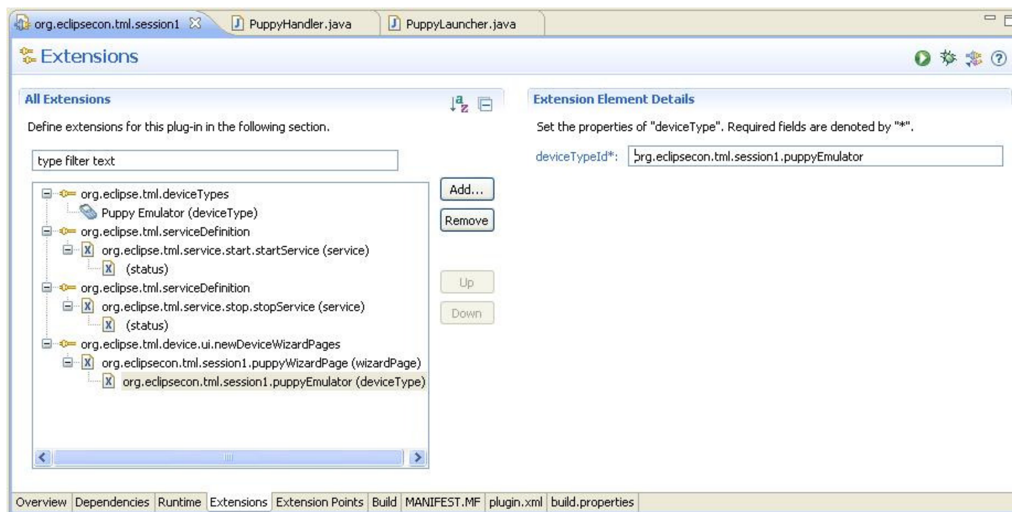
31. Select the **Extensions** tab from **MANIFEST.MF** and add an extension of type **org.eclipse.tml.device.ui.newDeviceWizardPages**.



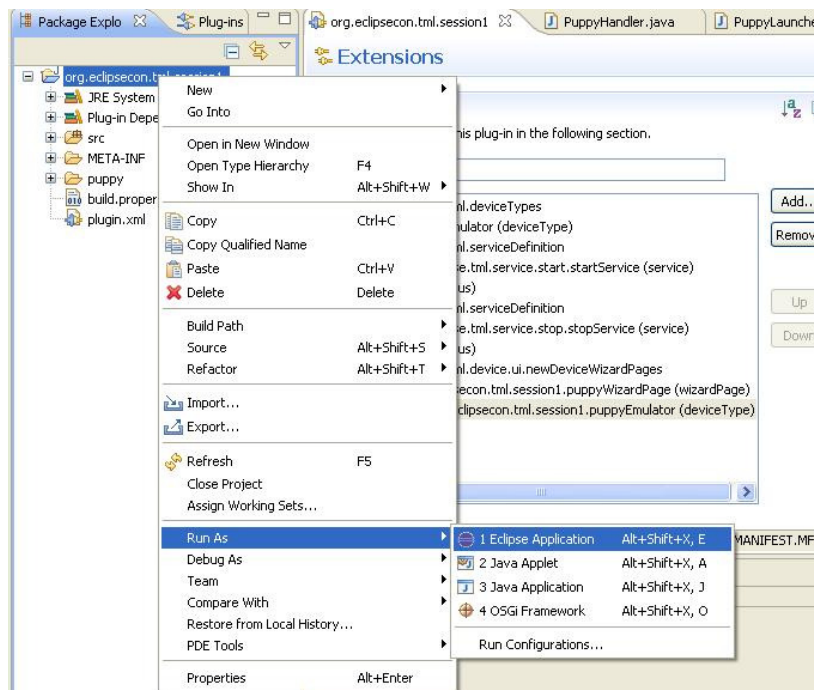
32. Select the **wizardPage** element from the extension you have just created. Again, we are going to use a default wizard page provided with the framework. The default wizard page contains three fields: host, port and display. To use the default page, click **Browse…** next to the **pageClass** field and select **org.eclipse.tml.framework.device.ui.DefaultConnectionInfoWizardPage** from the list.



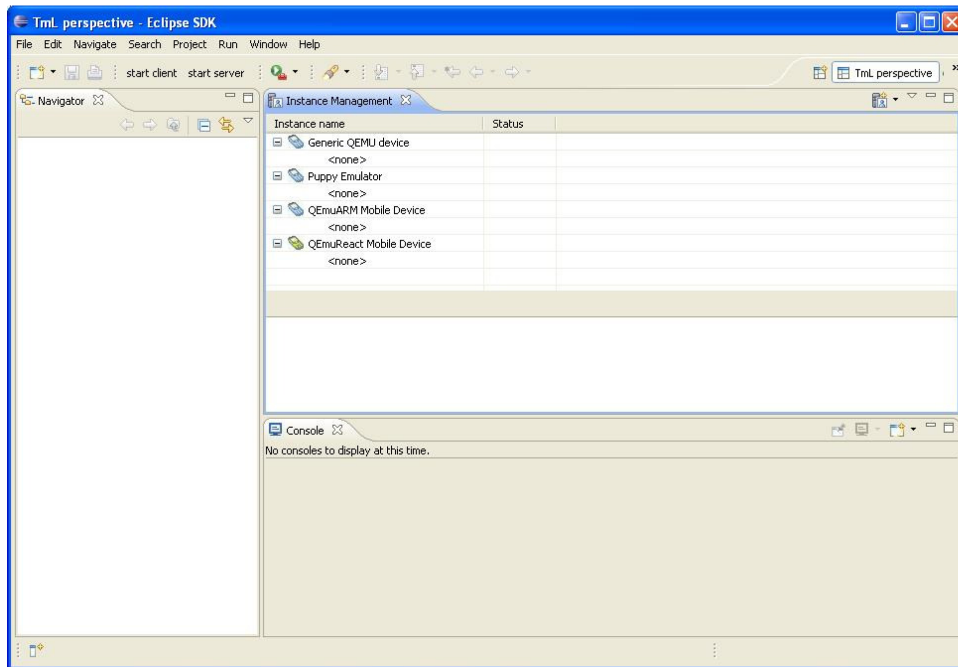
33. Select the **wizardPage** element and add an element of type **deviceType** to it. Fill in the **deviceTypeId** field with the same id you used in the service definition extensions, i.e. the plug-in id followed by the device type id, e.g. **org.eclipsecon.tml.session1.puppyEmulator**.



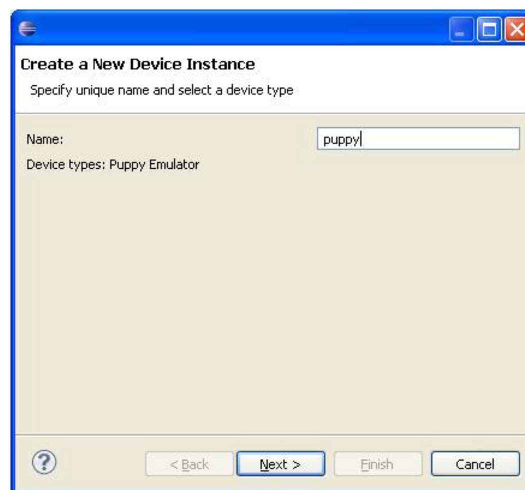
34. This completes the code required to integrate the puppy Linux emulator to Eclipse using the Device Framework. Make sure you saved everything and run the plug-in as an Eclipse application.



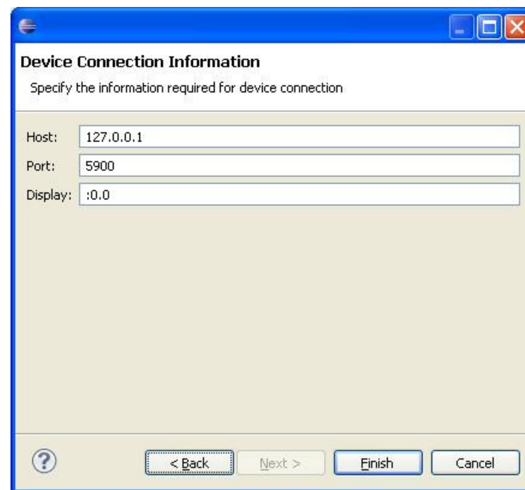
35. Select **Window > Open Perspective > Other...** and choose **TmL perspective** from the list. The TmL perspective is going to show you the **Instance Management** view, which lists the available device types along with their instances.



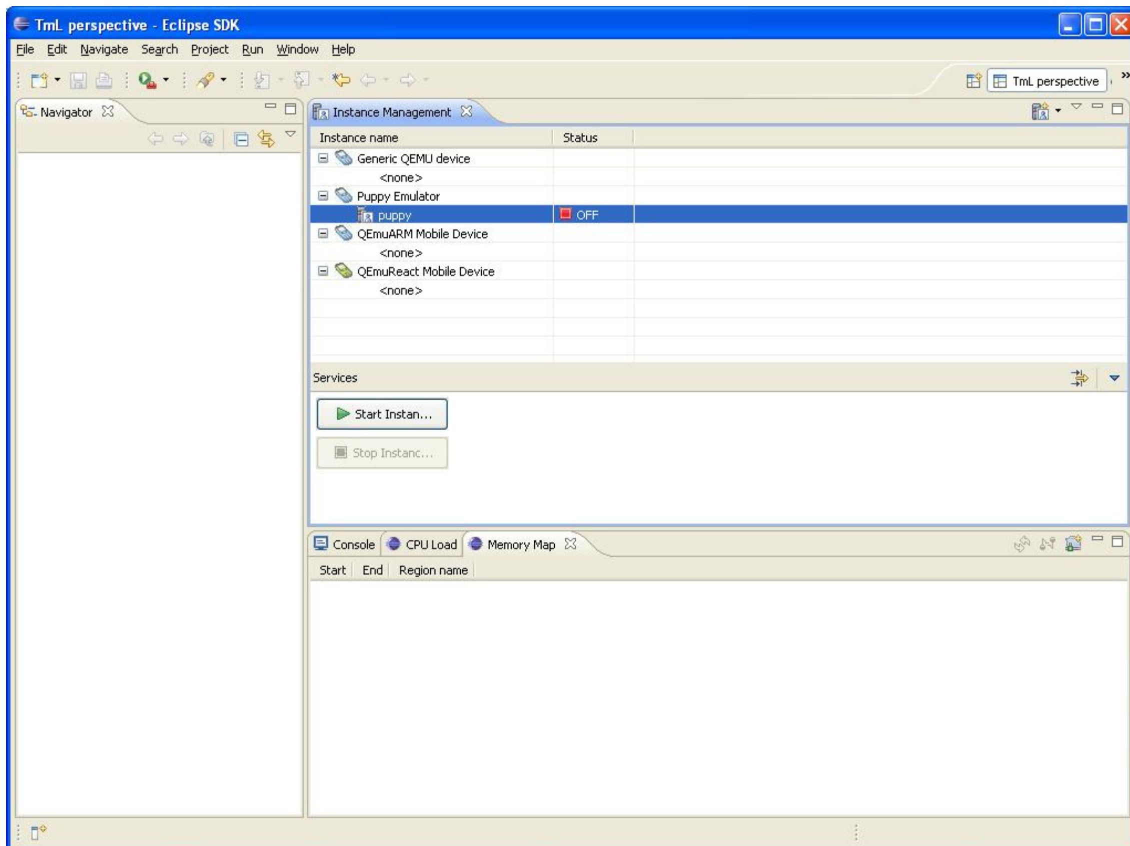
36. Right-click on the Puppy Emulator device type and select **New…** In the first wizard page, type a name for the emulator instance and click **Next**.



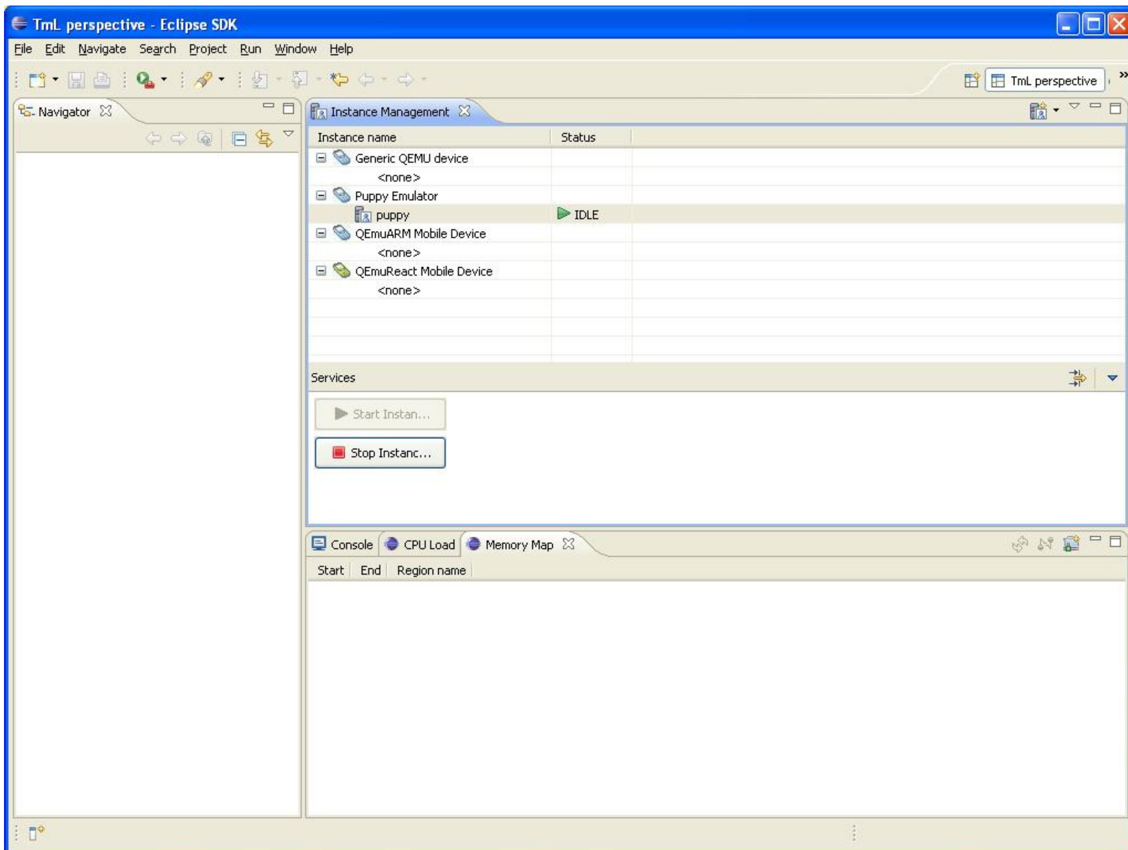
37. In the second wizard page, fill in the **Host**, **Port** and **Display** fields and click **Finish**.



38. The emulator instance has now been created and the corresponding services are shown, as well as the initial state. Click **Start Instance** to start the emulator instance.



39. The emulator instance is started and the state is updated in the GUI. You can click **Stop Instance** to stop the instance.



40. This concludes the first hands-on session, where you integrated a puppy Linux emulator to Eclipse by defining the device type and the state machine and using states and operations provided by the framework and reference implementation. In the next session, you are going to use the VNC Viewer to enable visualization of the emulator display in an Eclipse view.

Hands-on Session #2: Using the VNC Viewer to visualize the emulator display in Eclipse

In this session, we are going to take the puppy Linux emulator that we integrated into Eclipse in the previous session and use the VNC Viewer component from TmL to visualize the emulator display in an Eclipse view. A state will be added to the state machine to indicate that the emulator is connected to the VNC Viewer, and an operation will support the transition from the IDLE state to the new state.

In order to do this, we are going to create an extension using the extension point **org.eclipse.tml.serviceDefinition** to indicate the new operation along with the corresponding state transitions. Both the state and the connect operation are included in the **org.eclipse.tml.vncviewer** plug-in, so it is not necessary to define them.

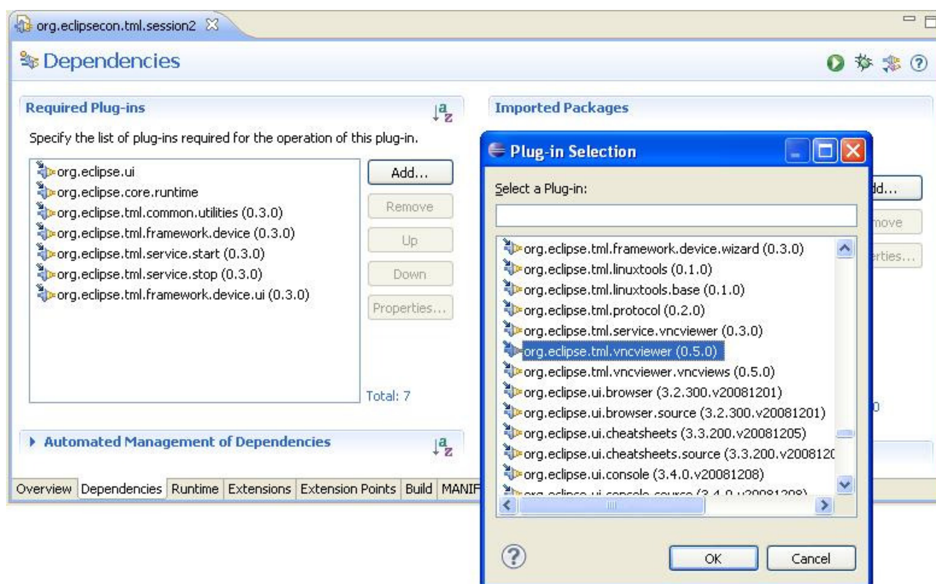
1. Open the project from the previous session, or use the pre-defined project **org.eclipsecon.tml.session2**. This exercise assumes that you have the completed

project from the previous session as a starting point, and the pre-defined project is provided in case you haven't completed it.

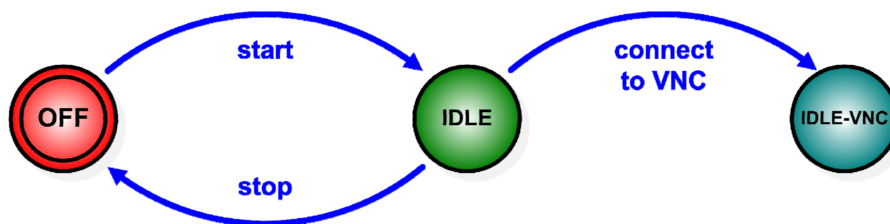
2. Switch to the **Plug-in Development** perspective.

3. Open the **META-INF/MANIFEST.MF** file.

4. Select the **Dependencies** tab from **MANIFEST.MF** and add the plug-in **org.eclipse.tml.service.vncviewer** to the list of dependencies.



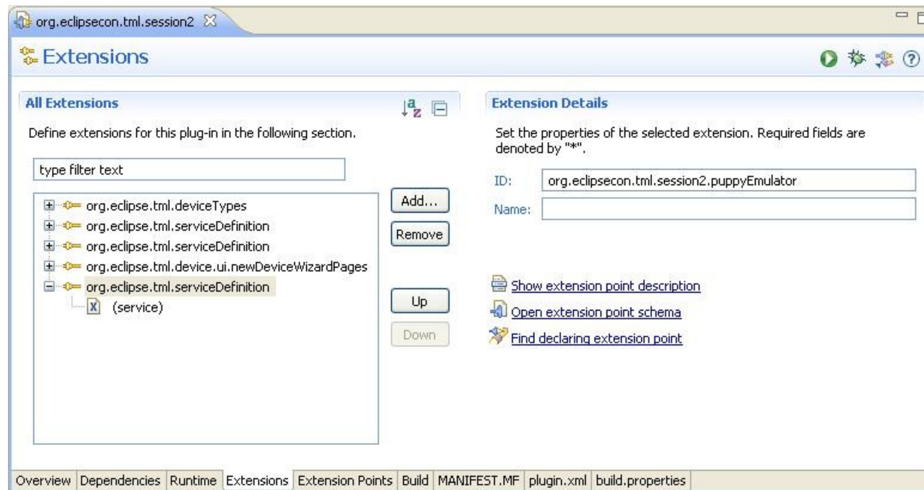
5. Now, we are going to modify the state machine by adding the **IDLE-VNC** state and operations that connect the VNC client in the VNC Viewer to the VNC server in the emulator and disconnect the VNC client from the VNC Viewer. These operations correspond to the transitions from the **IDLE** state to the **IDLE-VNC** state:



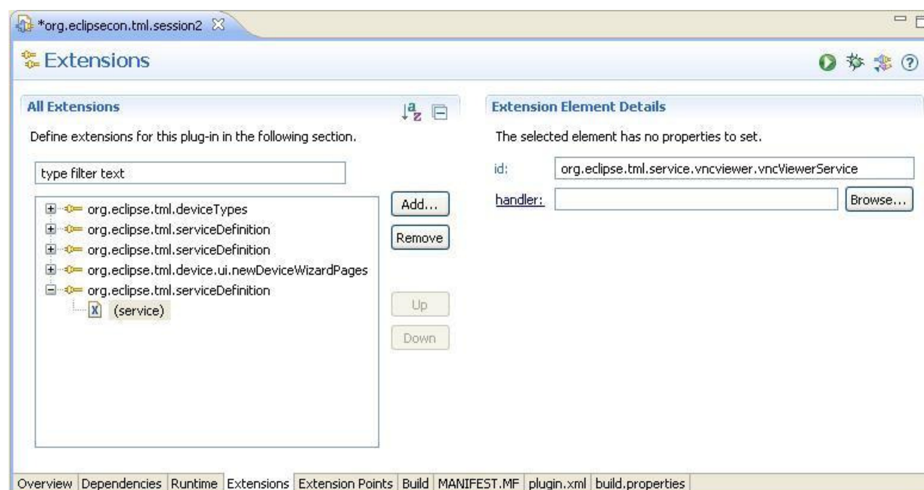
The **IDLE-VNC** state and the operations that we are going to use to connect and disconnect VNC client and server are included in the **org.eclipse.tml.vncviewer** plug-in, which was added as a dependency, so it is not necessary to define either.

To add the new state and the connect transition to the state machine, select the **Extensions** tab from **MANIFEST.MF** and add an extension of type **org.eclipse.tml.serviceDefinition**.

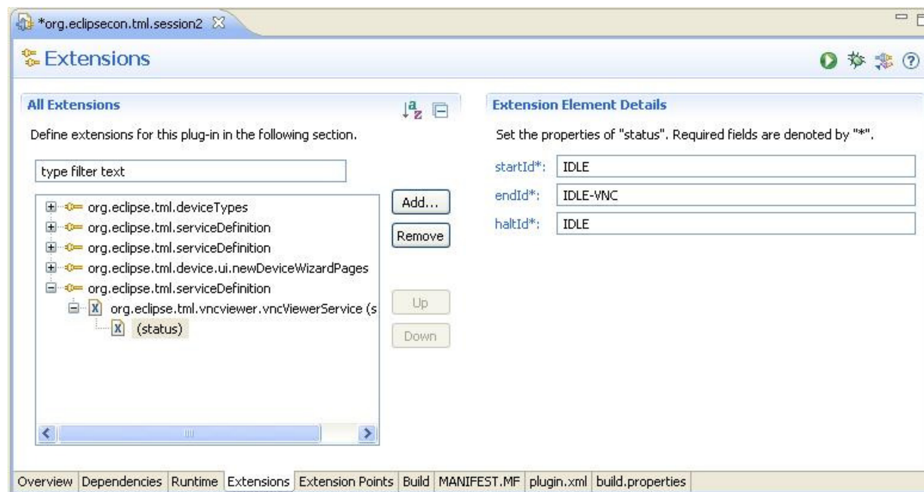
6. Fill in the **ID** field from the **serviceDefinition** extension with the plug-in id followed by the emulator id, e.g. **org.eclipsecon.tml.session2.puppyEmulator**.



7. Select the **service** element from the extension you have just created and fill in the id field with **org.eclipse.tml.service.vncviewer.vncViewerService**, which identifies the VNC connection operation from the VNC Viewer plug-in. Again, it is not necessary to create a handler class, since it is already defined in the VNC Viewer plug-in.



8. Right-click on the **service** element and add an element of type **status**. Fill in the **startId**, **endId** and **haltId** fields with **IDLE, IDLE-VNC** and **IDLE**, respectively.



9. Follow the same steps above to define an operation to disconnect the VNC client from the emulator, using the service **org.eclipse.tml.service.vncviewer.unplugVncViewerService** and the states **IDLE-VNC**, **IDLE** and **IDLE-VNC** as **startId, endId** and **haltId**, respectively.

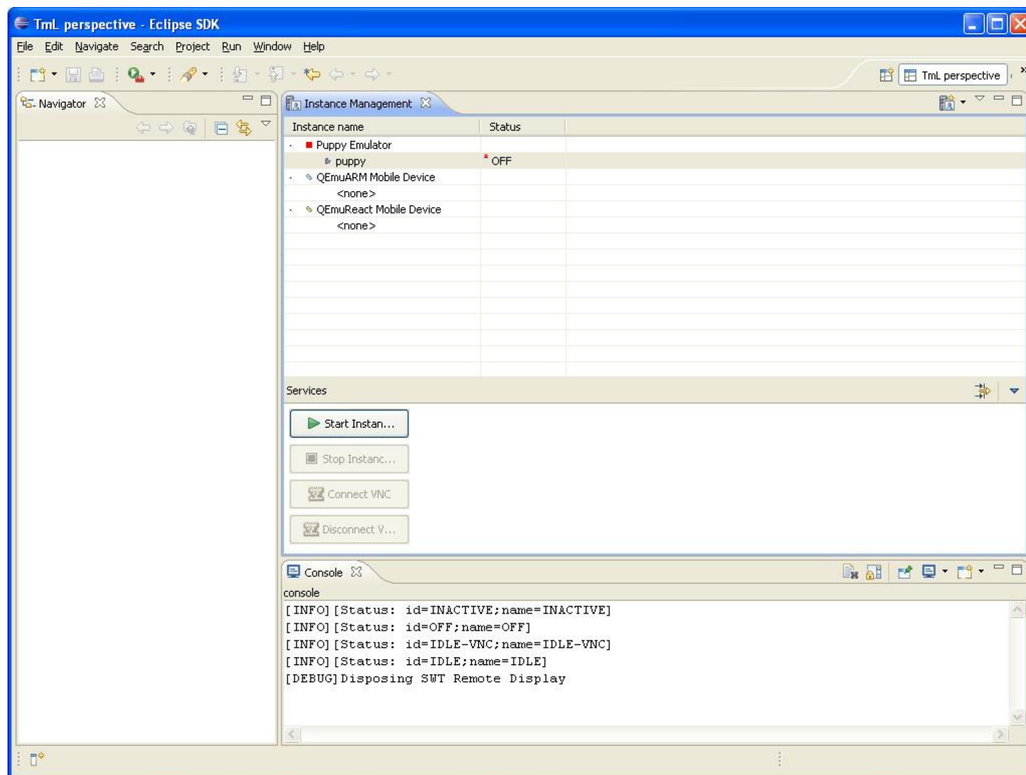
10. Open the launcher class and add an option for the VNC server in the emulator as follows.

```
package org.eclipsecon.tml.session1;

import org.eclipse.core.runtime.IPath;

public class PuppyLauncher implements IDeviceLauncher {
    public int pid;
    public IConnection connection;
    public static final String DOUBLE_BACKSLASH = "\\";

    public PuppyLauncher(IInstance instance) {

    public IConnection getConnection() {

    public String getFileId() {
        IPath path = Activator.getDefault().getStateLocation();
        String filePath = path.addTrailingSeparator().toOSString()+ "puppy.id";
        return filePath;
    }

    public String getLocation() {
        return getWorkingDirectory().concat("puppy.exe");
    }

    public int getPID() {

    public String getToolArguments() {
        return buildEmulatorOptions();
    }

    public String getWorkingDirectory() {
        return getInstallationPath().concat("puppy").concat(DOUBLE_BACKSLASH);
    }

    public void setPID(int pid) {

    public String getInstallationPath() {
        return PluginUtils.getPluginInstallationPath(Activator.getDefault()).getAbsolutePath().concat(DOUBLE_BACKSLASH);
    }

    private String buildEmulatorOptions() {
        StringBuffer buffer = new StringBuffer();
        buffer.append(" -pidfile " + getFileId());
        buffer.append(" -redir udp:1534::1534 -redir tcp:1534::1534 -vnc 127.0.0.1:0.0");
        return buffer.toString();
    }
}
```

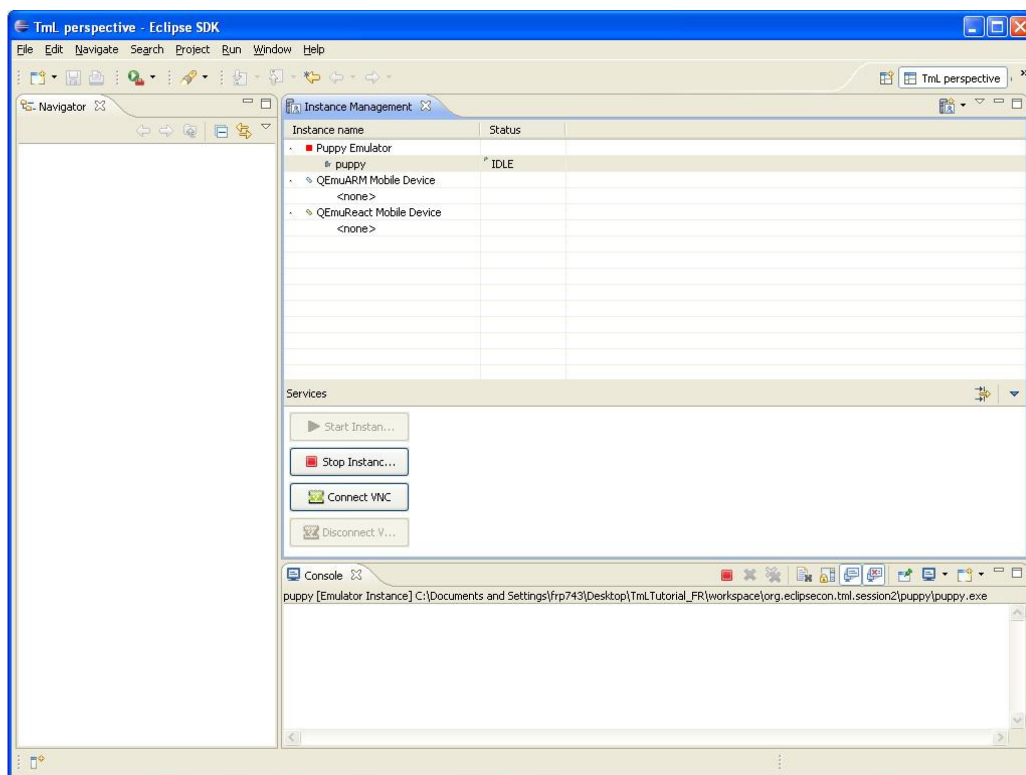
11. Make sure you saved everything and run the plug-in as an Eclipse application.

12. Create the emulator instance just as you did in the previous exercise.

13. Click **Start Instance** to start the emulator instance.

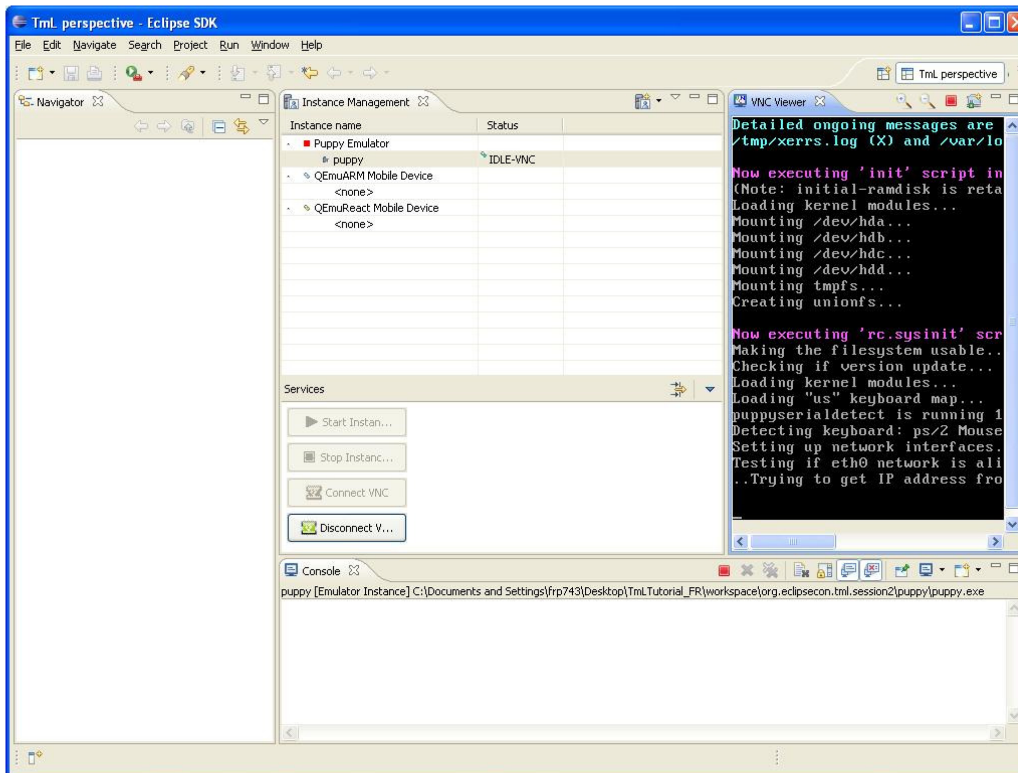


14. Click **Connect VNC** to connect the VNC Viewer to the emulator instance.

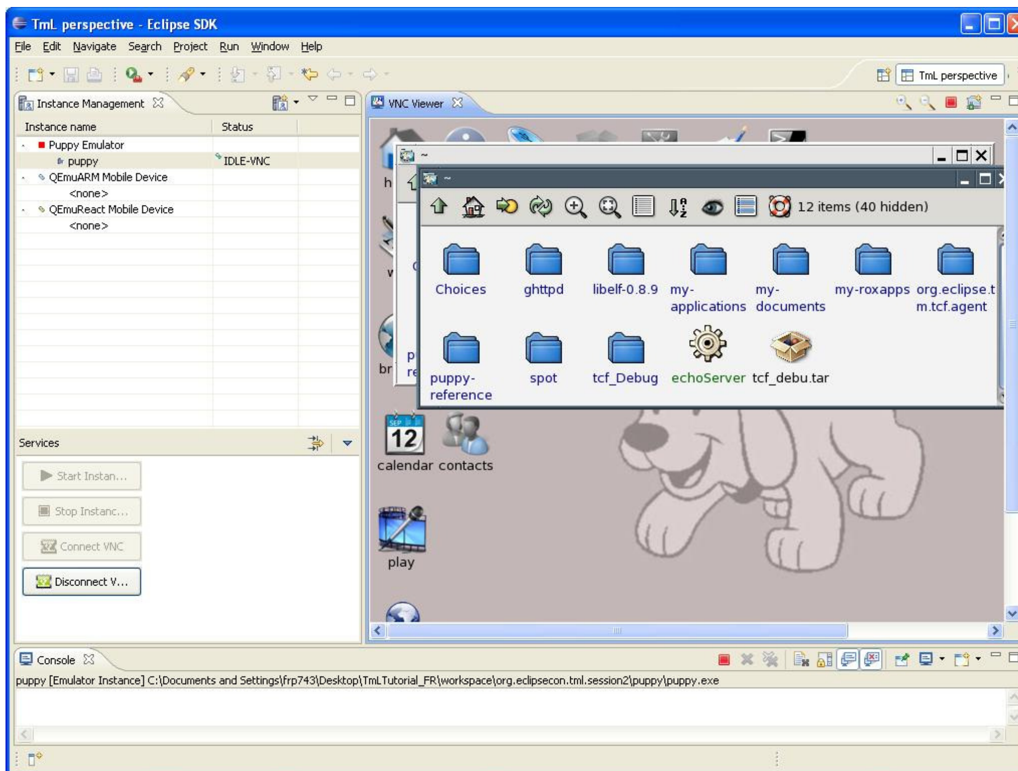


15. You should now see the VNC Viewer view with the emulator display:

eclipsecon 2009



16. To disconnect from the VNC Viewer, click **Disconnect VNC**, then click **Stop Instance** to stop the emulator.



17. You can also create an instance of the QEMU ARM Linux emulator and/or the QEMU ReactOS emulator provided, start them and connect each one to the VNC Viewer.

Hands-on Session #3: Using the Protocol Framework to implement an echo protocol

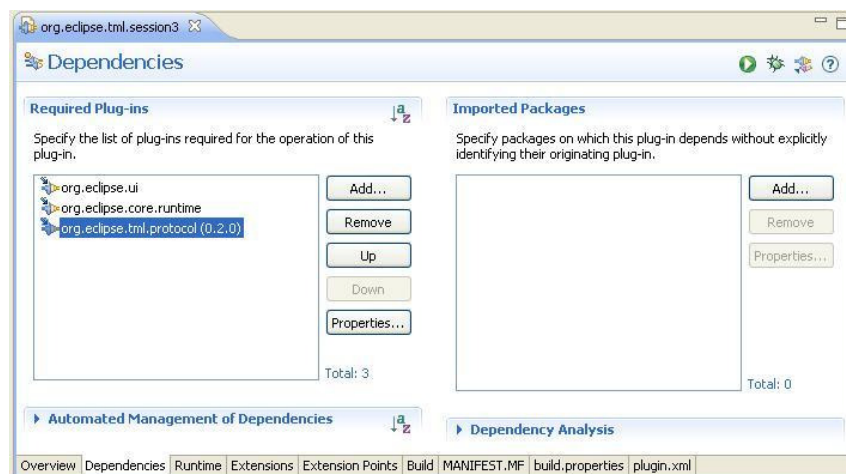
In this session, we are going to use the Protocol Framework to implement an echo client that communicates with the echo server included in the puppy Linux emulator that we integrated into Eclipse in the previous sessions.

1. Open the project **org.eclipsecon.tml.session3**, or create a plug-in project (in this case you will need to copy the code yourself).

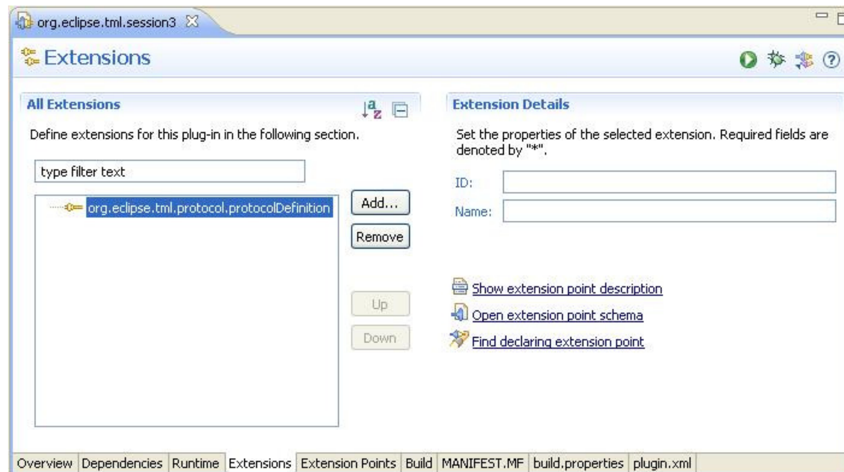
2. Switch to the **Plug-in Development** perspective.

3. Open the **META-INF/MANIFEST.MF** file. Select the **Overview** tab and check the option **This plug-in is a singleton**.

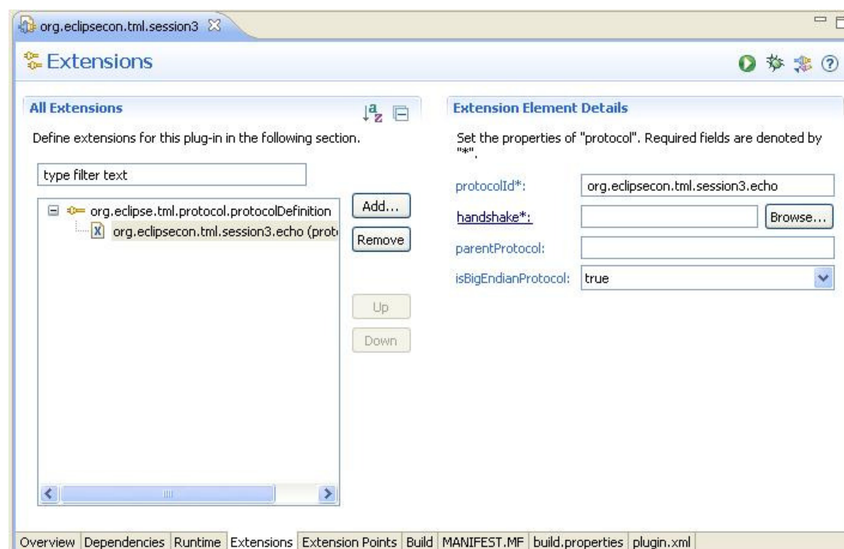
4. Select the **Dependencies** tab and add the plug-in **org.eclipse.tml.protocol** to the list of dependencies.



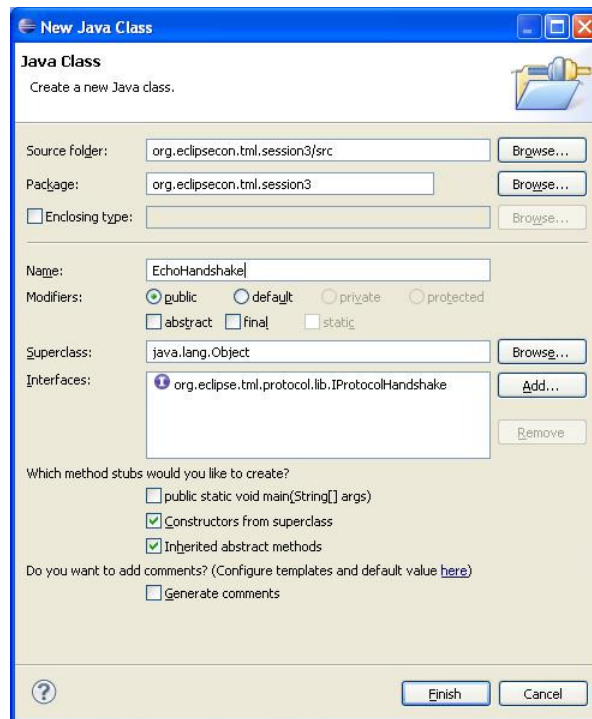
5. Select the **Extensions** tab and add an extension of type **org.eclipse.tml.protocol.protocolDefinition**.



6. Right-click on the extension you have just created and add an element of type **protocol**. Fill in the detail fields as follows:



7. Click on the **handshake** label to create the class with the handshaking code, or click **Browse...** to use the pre-defined class provided with the project. The class must implement the interface **org.eclipse.tml.protocol.lib.IProtocolHandshake**.



8. The new class contains two methods, **clientHandshake()** and **serverHandshake().** We are going to write code for the former but there is no need to write any code for the latter, since it is already implemented on the emulator.

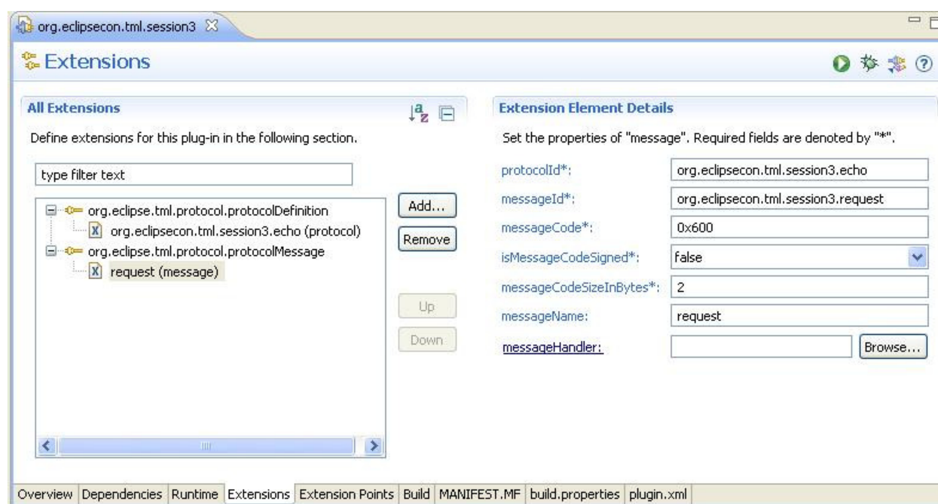
org.eclipsecon.tml.session3 | EchoHandshake.java

```
package org.eclipsecon.tml.session3;

import java.io.DataInput;

public class EchoHandshake implements IProtocolHandshake {

    public EchoHandshake() {
        // TODO Auto-generated constructor stub
    }

    public void clientHandshake(ProtocolHandle arg0, DataInput arg1,
            OutputStream arg2, Map<?, ?> arg3)
            throws ProtocolHandshakeException {
        // TODO Auto-generated method stub

    }

    public void serverHandshake(ProtocolHandle arg0, DataInput arg1,
            OutputStream arg2, Map<?, ?> arg3)
            throws ProtocolHandshakeException {
        // TODO Auto-generated method stub

    }
}
```

9. Modify the **clientHandshake()** method stub as follows:

```java
package org.eclipsecon.tml.session3;

import java.io.DataInput;

public class EchoHandshake implements IProtocolHandshake {

    public EchoHandshake() {

    public void clientHandshake(ProtocolHandle protocolHandle,
            DataInput in, OutputStream out, Map<?, ?> unused)
            throws ProtocolHandshakeException {

        try {
            out.write(new String("Hello server!").getBytes());
            String stringRead = in.readLine();

            if ((stringRead.length() != 13)
                    || (!stringRead.equals("Hello client."))) {
                System.out.println("ERROR");
                throw new ProtocolHandshakeException();
            }
        }
        catch (IOException e) {
            throw new ProtocolHandshakeException();
        }
    }

    public void serverHandshake(ProtocolHandle arg0, DataInput arg1,

}
```

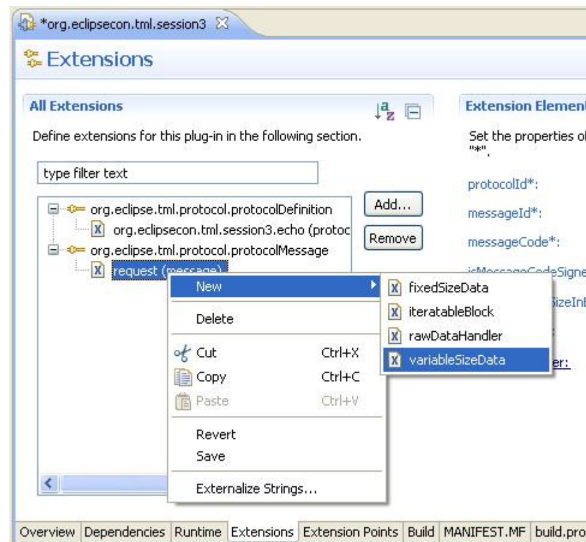
10. Select the **Extensions** tab and add an extension of type **org.eclipse.tml.protocol.protocolMessage** to define the request that the client is going to send to the server, then right-click on it and add an element of type **message**. Fill in the detail fields as follows:



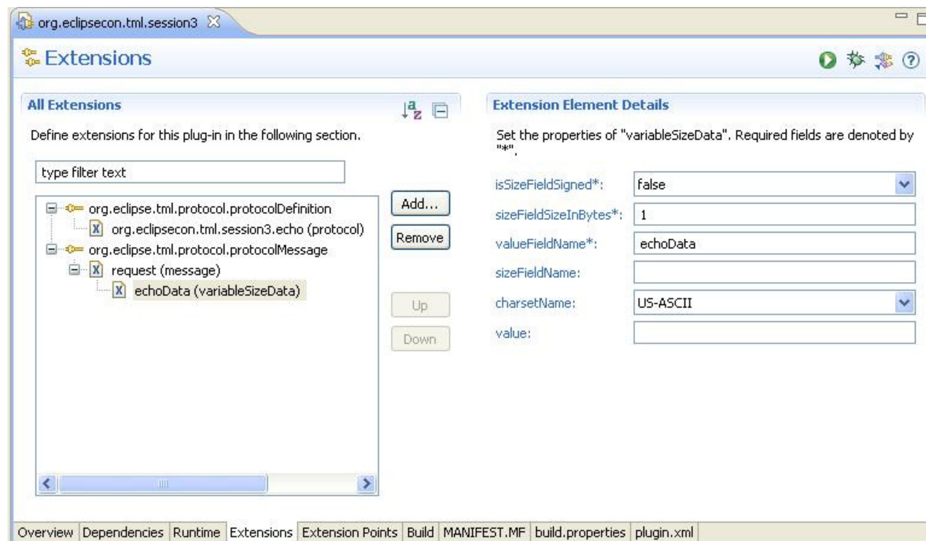
The **protocolId** here must correspond to the id that was given to the protocol in the protocol definition, since this indicates that the message belongs to that protocol.

We don’t need to create a handler for the request message because it is going to be handled by the server on the emulator, so just leave the **messageHandler** field empty.

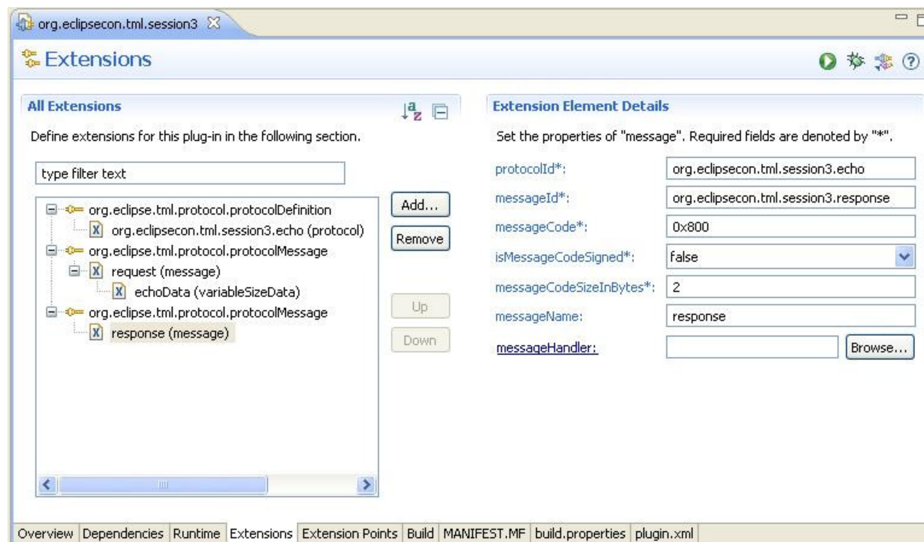
11. Right-click on the **message** element and add an element of type **variableSizeData** to specify the field that contains the string that the client is going to send to the server.



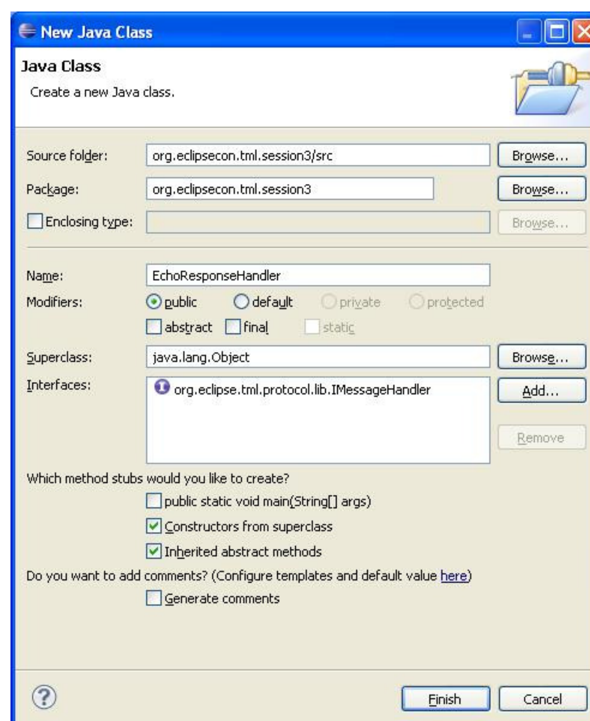
12. Fill in the detail fields as follows:



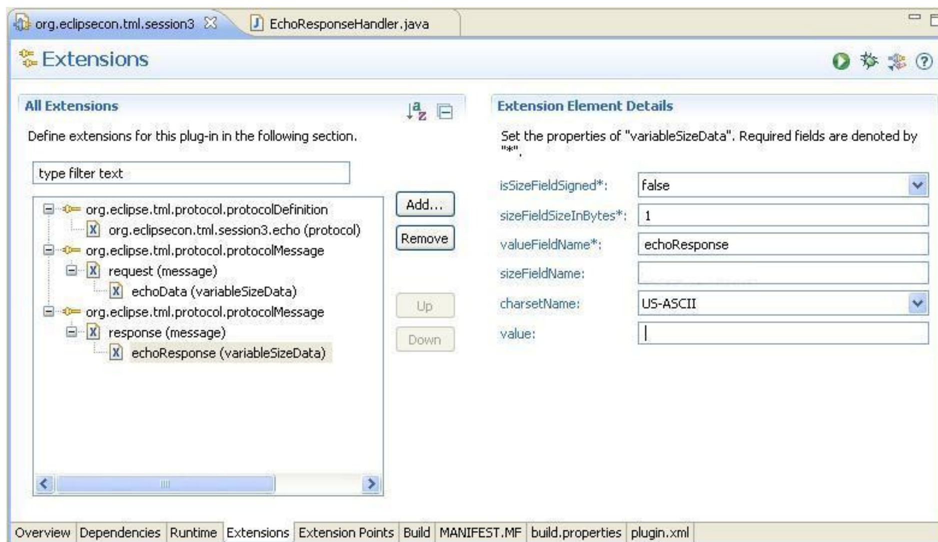
13. Select the **Extensions** tab and add an extension of type **org.eclipse.tml.protocol.protocolMessage** to define the response that the server is going to send back to the client. Right-click on it and add an element of type **message**, filling in the detail fields as follows:



14. Click on the **messageHandler** label to create the class containing the code that the client is going to use to handle the response message. You can also click **Browse…** to use the pre-defined class provided for this tutorial. Note that the class must implement **org.eclipse.tml.protocol.lib.IMessageHandler**:



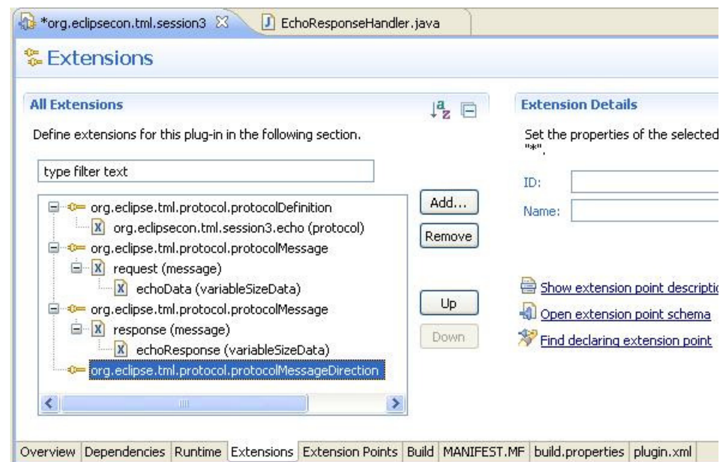
15. Right-click on the **message** element and add an element of type **variableSizeData** to specify the field that contains the string that the server is going to send back to the client, and fill in the detail fields as follows:



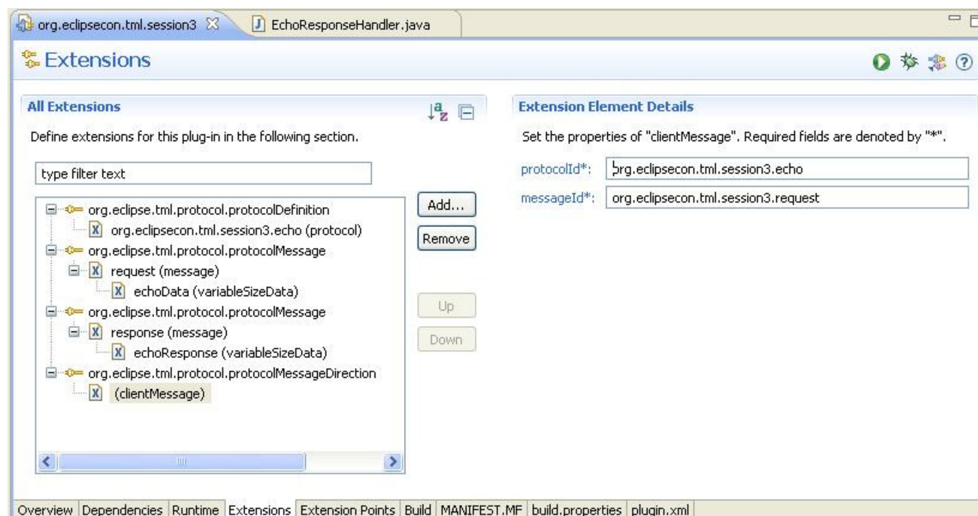
16. Modify the code in the **handleMessage()** method stub in the message handler class you created before as follows:

```java
package org.eclipsecon.tml.session3;

import org.eclipse.jface.dialogs.MessageDialog;

public class EchoResponseHandler implements IMessageHandler {

    public EchoResponseHandler() {

    public ProtocolMessage handleMessage(ProtocolHandle protocolHandle,
            ProtocolMessage response) throws MessageHandleException {

        final String echoedData = (String) response.getFieldValue("echoResponse");

        Display.getDefault().syncExec(new Runnable() {
            public void run() {
                String message = "The client has received this message from the echo server: " + echoedData;
                MessageDialog.openInformation(Display.getDefault().getActiveShell(), "Echo", message);
            }
        });

        PluginProtocolActionDelegate.requestStopProtocol(protocolHandle);
        return null;
    }
}
```

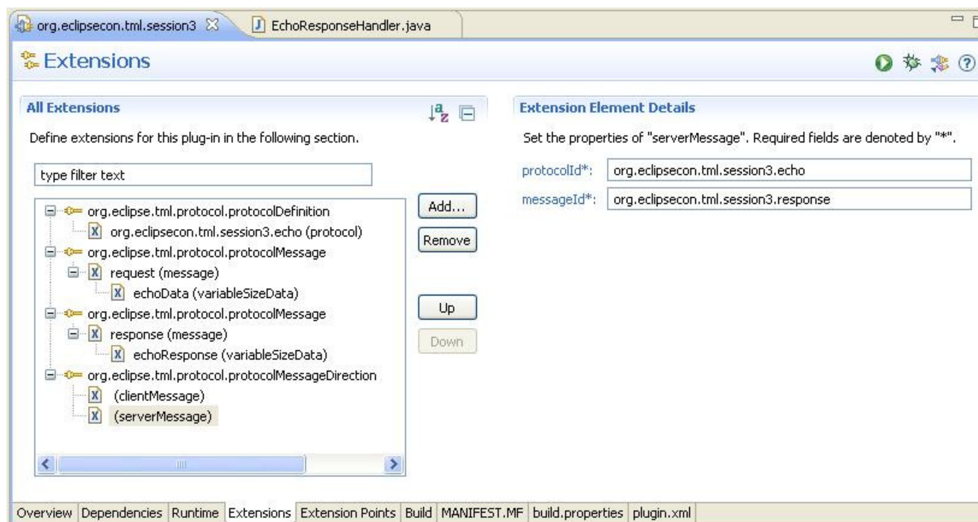
17. Now we need to define the message directions, specifying that the request message goes from the client to the server (i.e. it is a client message) and that the response message goes from the server to the client (thus being a server message). Select the **Extensions** tab from **MANIFEST.MF** and add an extension of type **org.eclipse.tml.protocol.protocolMessageDirection**.



18. Right-click on the extension you have just created and add an element of type **clientMessage**. Fill in the details with the protocol id and the id of the request message that you defined before.

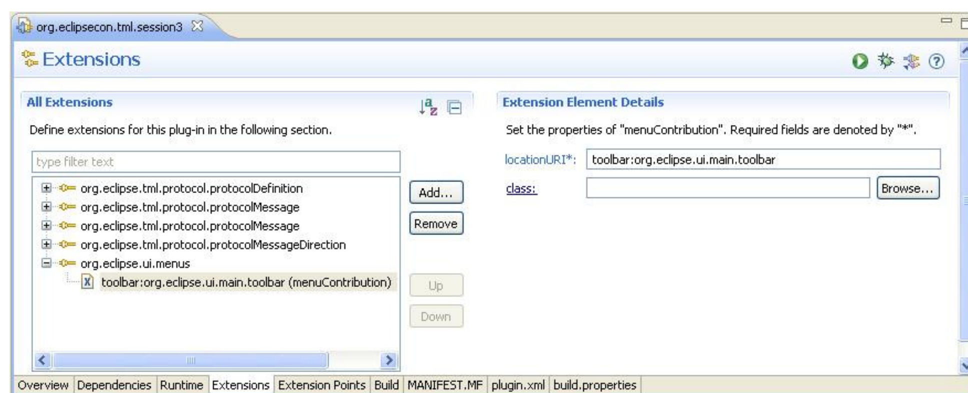


19. Right-click on the extension again and add an element of type **serverMessage**. Fill in the detail fields with the protocol id and the id of the response message that you defined before.

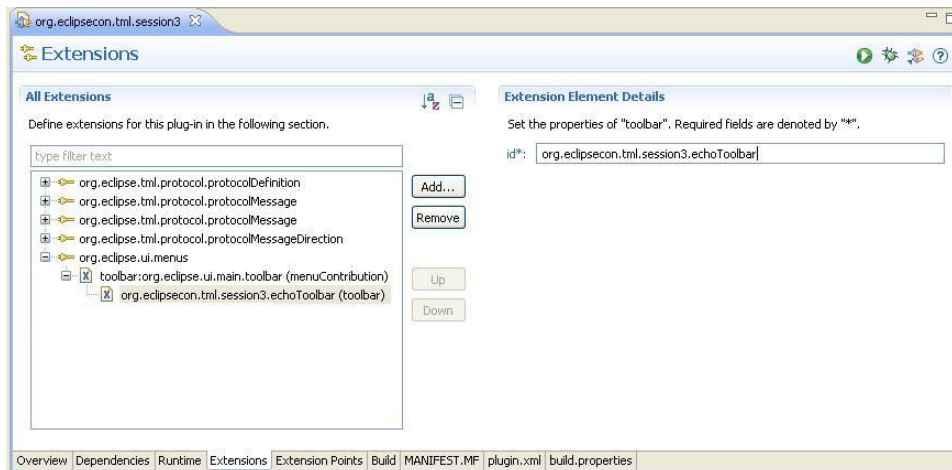


20. Open the launcher class **from the emulator project** and add the following option:

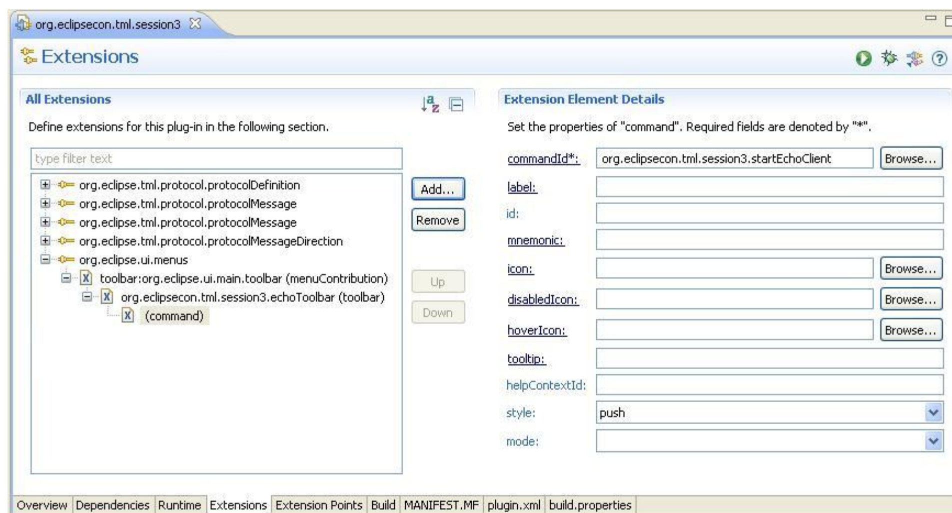
21. The protocol is now ready, but we need to create a way to start the client. We are going to add a button to the toolbar to do this. Select the **Extensions** tab from **MANIFEST.MF** and add an extension of type **org.eclipse.ui.menus**. Right-click on the extension and add an element of type **menuContribution**, filling in the **locationURI** field with **toolbar:org.eclipse.ui.main.toolbar** to add a command to the toolbar.



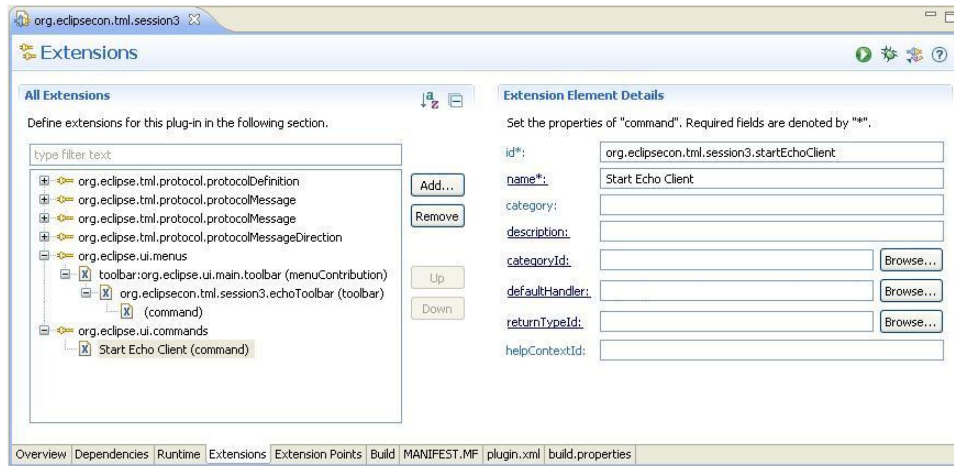
22. Right-click on the menuContribution element and add another element of type toolbar, filling in the id field with org.eclipsecon.tml.session3.echoToolbar.



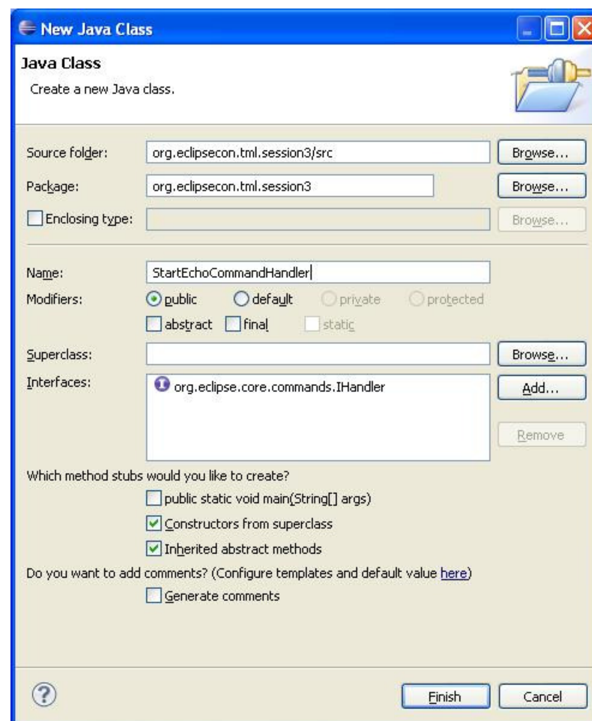
23. Right-click on the **toolbar** element and add another element of type **command,** filling in the **commandId** field with **org.eclipsecon.tml.session3.startEchoClient**. This should be the same id used in the next steps, where we are going to create the actual command.



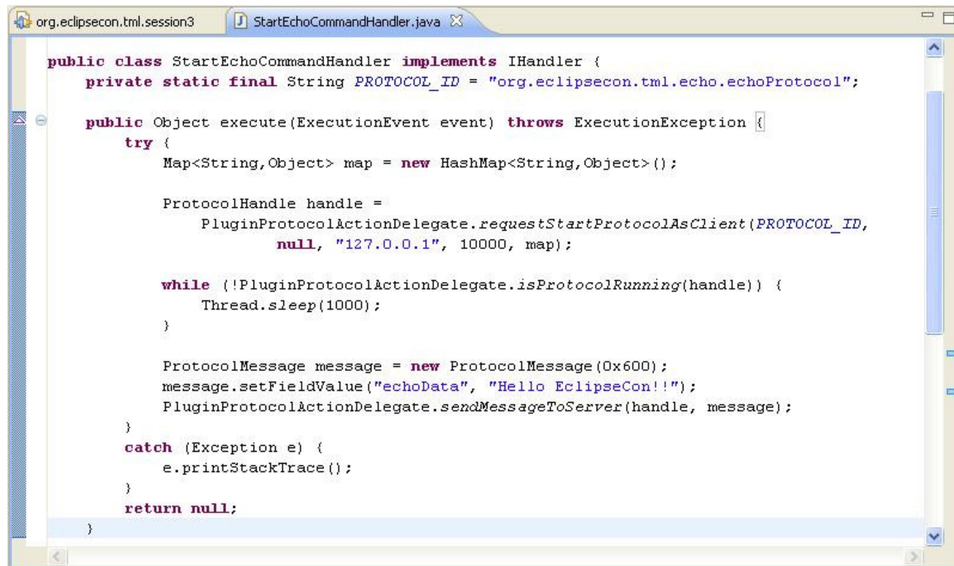
24. Add an extension of type **org.eclipse.ui.commands**. Right-click on the extension and add an element of type **command,** filling in the **id** field with the same command id you used in the previous step and filling in the name field with the text to be displayed in the UI.



25. Click the **defaultHandler** label to create the handler class for the command.



26. Insert the following code in the **execute()** method stub in the command handler class:



27. Make sure you saved everything and run the plug-in as an Eclipse application.

28. Start the emulator instance and connect it to the VNC Viewer.

29. Start the echo server on the emulator by typing in the command line:

```
cd /root
./echoServer 10000
```

30. Start the echo client in Eclipse by clicking on the toolbar button.

31. You can see the string that the client sends to the server and that the server sends back to the client.

Hands-on Session #4: Using the /proc tools to display system information in Eclipse views

In this session, we are going to take the puppy Linux emulator that we integrated into Eclipse in the first and second sessions, and use the /proc tools to get system information.

1. Open the project you created in the second hands-on session, or use the pre-defined project **org.eclipsecon.tml.session4**.

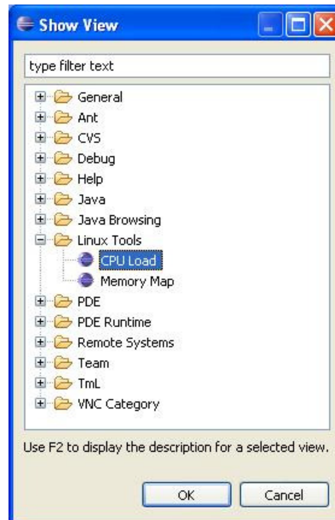
2. Run the plug-in as an Eclipse application and start the emulator.

3. Start the /proc tools server on the emulator by typing in the command line:

```
cd /root/tcf_Debug
```

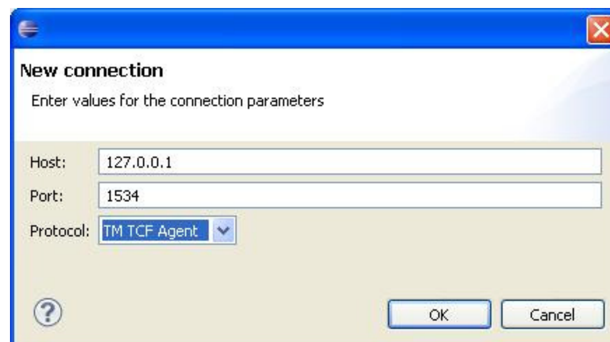
```
./agent
```

4. Select **Window > Show View > Other…** and choose the **CPU Load** view from the **Linux Tools** category.



5. Click the **Connect** button from the **CPU Load** view toolbar.

6. In the dialog box, fill in the **Host** and **Port** fields with 127.0.0.1 and 1534, respectively, and select **TM TCF Agent as** the **Protocol**. Click **OK** to connect.



7. The view shows processor load information from the emulator.

8. Select **Window > Show View > Other…** and choose the **Memory Map** view from the **Linux Tools** category.

9. Click the **Connect** button from the **Memory Map** view toolbar.

10. In the dialog box, fill in the **Host** and **Port** fields with 127.0.0.1 and 1534, respectively, and select **TM TCF Agent as** the **Protocol**. Click **OK** to connect.

11. The view shows memory map information from the emulator.