

Exercise 16

Creating and executing a BPMN flow

Prior Knowledge

BPMN Lecture

Objectives

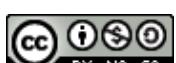
Understand the basics of the BPMN specification, and be able to create and execute a business process using the BPMN tooling using Camunda. Deploy the BPMN into the Camunda runtime and be able to track instances etc.

Software Requirements

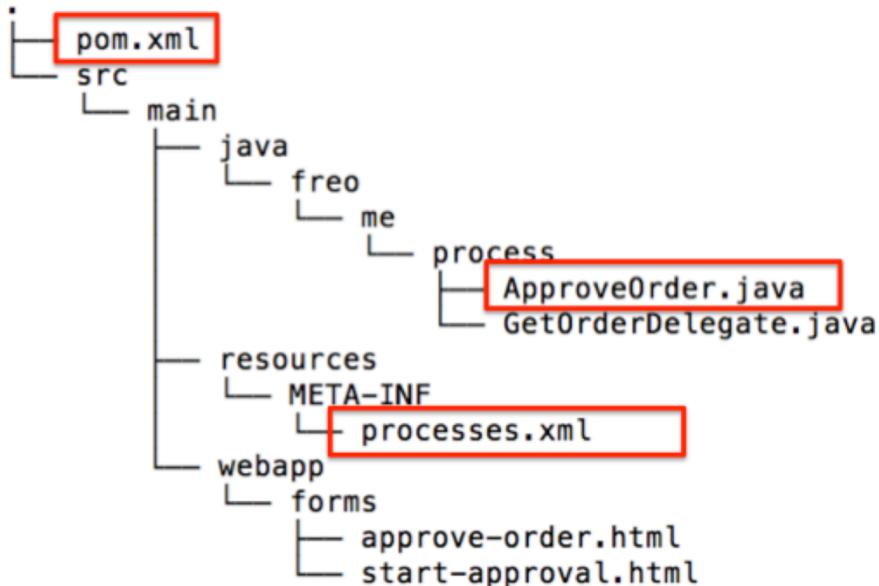
- Camunda BPMN Modeler 2.2.3
- Camunda BPMN runtime 7.10.0

Steps.

1. Let's get our project initiated. Firstly let's make a directory structure:
`mkdir ~/bpmn/`
2. Now lets grab a simple default project layout:
`cd ~/bpmn`
`wget http://freo.me/bpmn-kit -O process-archive.zip`
`unzip process-archive.zip`



3. The main files here are the build (pom.xml), a generic process descriptor XML (see <https://docs.camunda.org/manual/latest/user-guide/process-applications/the-processes-xml-deployment-descriptor/#empty-processes-xml>) and a basic Application class (ApproveOrder). We'll ignore the other files for the moment.



10 directories, 6 files

Take a look at those three.

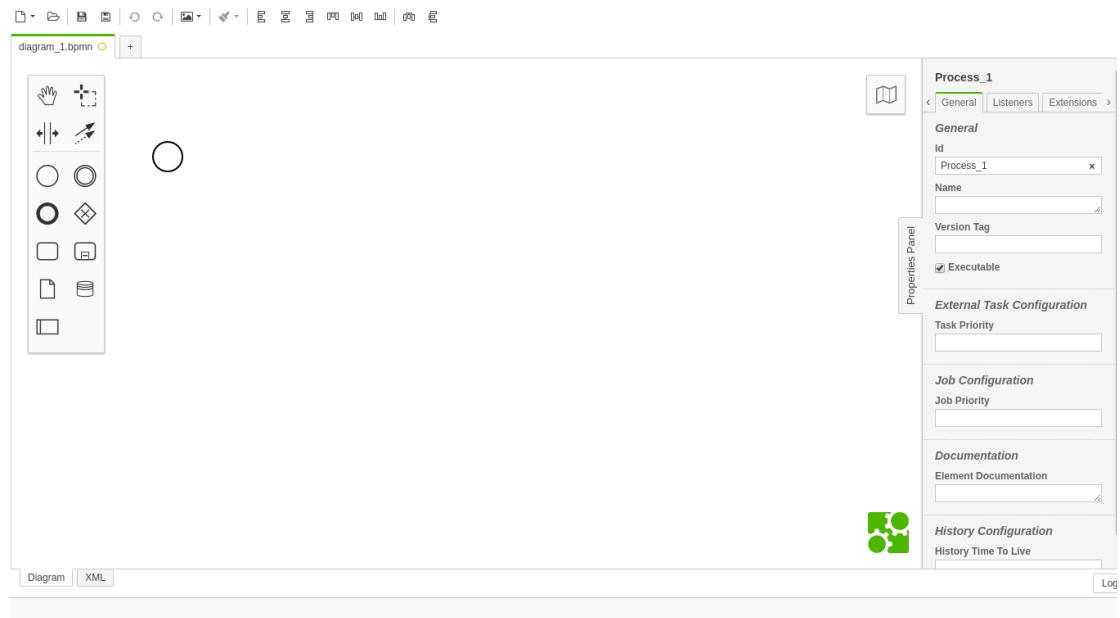
With the three mentioned files, this will create a WAR that will run *whatever* BPMN process we deploy into the **src/main/resources** folder.

4. Let's create our first BPMN.
5. Start the Camunda BPMN Modeler from the launcher.



6. Click on Create a BPMN diagram.

7. You should see:

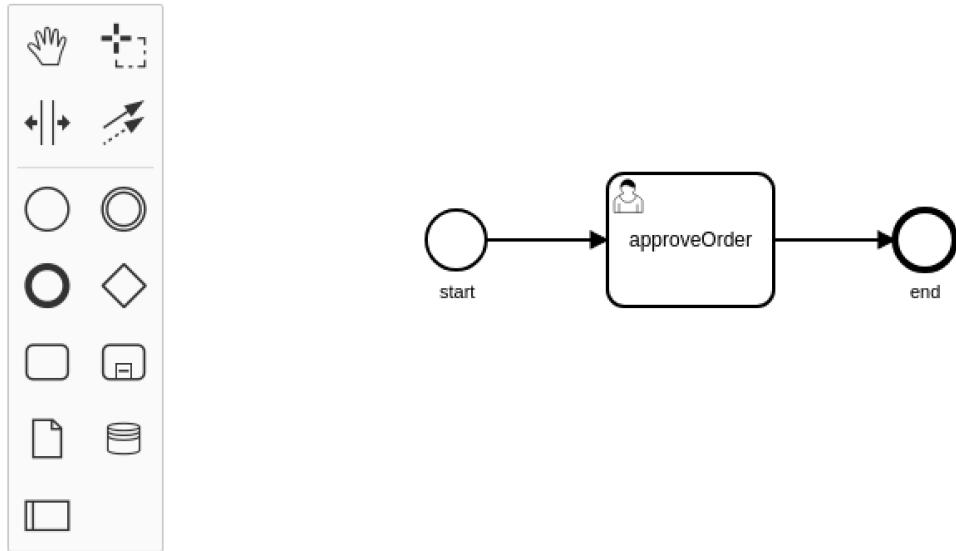


8. Make sure the properties panel is expanded.

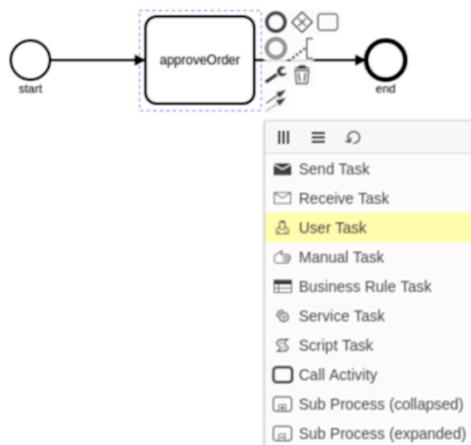
9. Make sure the **Executable** tag is ticked, and change the process id and name to be **ApproveOrder**. Change the version number to be 1.0.0:

The screenshot shows the 'ApproveOrder' process configuration dialog. It has tabs for General, Listeners, and Extensions. The General tab is selected, showing fields for Id (ApproveOrder), Name (ApproveOrder), Version Tag (1.0.0), and an checked Executable checkbox. Below the General tab is an External Task Configuration section with a Task Priority field. The Listener and Extensions tabs are also visible.

10. Use the tool to draw a simple process like this. Make the **id** of each object match the name (e.g start/start).



11. In order to make the task into a User Task (with the little “man” icon), click on the spanner/wrench and choose User Task.



12. Edit the properties for the Approve Order Task:

Id: **approveOrder**
Name: **approveOrder**
Assignee: **demo**



13. Save the file as ~/bpmn/src/main/resources/approveorder.bpmn

Hint: Sometimes there is a bug with the BPMN editor and the Save dialog box appears behind the main window. To solve it, click on the new icon that appears in the Launcher.

14. Now you can test your process.

15. In the BPMN directory, type:

```
mvn clean install
```

16. You should see some text in the console like:

```
INFO] Installing /home/oxsoa/bpmn/target/approve-order-0.1.0.war to /home/oxsoa/.m2/repository/freo/me/process/approve-order/0.1.0/approve-order-0.1.0.war
[INFO] Installing /home/oxsoa/bpmn/pom.xml to /home/oxsoa/.m2/repository/freo/me/process/approve-order/0.1.0/approve-order-0.1.0.pom
[INFO] 
[INFO] BUILD SUCCESS
[INFO] 
[INFO] Total time: 3.245 s
[INFO] Finished at: 2016-06-14T09:02:34+01:00
[INFO] Final Memory: 22M/290M
[INFO] 
oxsoa@oxsoa:~/bpmn$
```

17. The Camunda server will need to run on 8080, so make sure none of your other servers is still running on 8080.

18. Start the server:

```
cd ~/servers/camunda/server/apache-tomcat-9.0.12/
bin/catalina.sh run
```

19. We haven't yet copied our process across, but you should see the server deploy a default process:

```
oxsoa@oxsoa:~/servers/camunda/server/apache-tomcat-8.0.24
14-Jun-2016 09:08:07.393 INFO [localhost-startStop-1] org.apache.jasper.servlet.TldScanner.scanJars At least one JAR was scanned for
TLDs yet contained no TLDs. Enable debug logging for this logger for a complete list of JARs that were scanned but no TLDs were found
in them. Skipping unneeded JARs during scanning can improve startup time and JSP compilation time.
14-Jun-2016 09:08:07.394 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-07015 Detected @ProcessAp
plication class 'org.camunda.bpm.example.invoice.InvoiceProcessApplication'
14-Jun-2016 09:08:07.401 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-08024 Found processes.xml
file at file:/home/oxsoa/servers/camunda/server/apache-tomcat-8.0.24/webapps/camunda-invoice/WEB-INF/classes/META-INF/processes.xml
14-Jun-2016 09:08:07.457 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-08023 Deployment summary
for process archive 'camunda-invoice':
assign-approver-groups.dmn
invoice.v2.bpmn

14-Jun-2016 09:08:07.917 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-07021 ProcessApplication
'camunda-invoice' registered for DB deployments [13711c20-313b-11e6-b553-024208065a2e, 139d8356-313b-11e6-b553-024208065a2e]. Will ex
ecute process definitions

    invoice[version: 1, id: invoice:1:137fc223-313b-11e6-b553-024208065a2e]
    invoice[version: 2, id: invoice:2:13a328a9-313b-11e6-b553-024208065a2e]
Deployment does not provide any case definitions.

14-Jun-2016 09:08:07.923 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo SPIN-01010 Discovered Spin data
format provider: org.camunda.spin.impl.json.jackson.format.JacksonJsonDataFormatProvider[name = application/json]
14-Jun-2016 09:08:07.923 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo SPIN-01010 Discovered Spin data
format provider: org.camunda.spin.impl.xml.dom.format.DomXmlDataFormatProvider[name = application/xml]
14-Jun-2016 09:08:07.925 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo SPIN-01009 Discovered Spin data
format: org.camunda.spin.impl.xml.dom.format.DomXmlDataFormat[name = application/xml]
14-Jun-2016 09:08:07.925 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo SPIN-01009 Discovered Spin data
format: org.camunda.spin.impl.json.jackson.format.JacksonJsonDataFormat[name = application/json]
14-Jun-2016 09:08:08.095 WARNING [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logWarn ENGINE-09004 Warnings during
parsing:
* Exclusive Gateway 'reviewSuccessful_gw' has outgoing sequence flow 'reviewSuccessful' without condition which is not the default fl
ow. We assume it to be the default flow, but it is bad modeling practice, better set the default flow in your gateway. | invoice.vi
b
pnn | line 0 | column 0
14-Jun-2016 09:08:09.253 INFO [localhost-startStop-1] org.camunda.bpm.example.invoice.service.NotifyCreditorService.execute

... Now notifying creditor Bobby's Office Supplies

14-Jun-2016 09:08:09.648 INFO [localhost-startStop-1] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-08050 Process application
camunda-invoice successfully deployed
14-Jun-2016 09:08:09.649 INFO [localhost-startStop-1] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web applic
ation directory /home/oxsoa/servers/camunda/server/apache-tomcat-8.0.24/webapps/camunda-invoice has finished in 3,081 ms
14-Jun-2016 09:08:09.649 INFO [localhost-startStop-1] org.apache.catalina.startup.HostConfig.deployDirectory Deploying web applicatio
n directory /home/oxsoa/servers/camunda/server/apache-tomcat-8.0.24/webapps/engine-rest
14-Jun-2016 09:08:10.910 INFO [localhost-startStop-1] org.apache.jasper.servlet.TldScanner.scanJars At least one JAR was scanned for
TLDs yet contained no TLDs. Enable debug logging for this logger for a complete list of JARs that were scanned but no TLDs were found
in them. Skipping unneeded JARs during scanning can improve startup time and JSP compilation time.
14-Jun-2016 09:08:11.025 INFO [localhost-startStop-1] org.jboss.resteasy.logging.impl.Slf4jLogger.info Deploying javax.ws.rs.core.App
lication: class org.camunda.bpm.engine.rest.impl.application.DefaultApplication
14-Jun-2016 09:08:11.114 INFO [localhost-startStop-1] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web applic
ation directory /home/oxsoa/servers/camunda/server/apache-tomcat-8.0.24/webapps/engine-rest has finished in 1,465 ms
```

20. Now we can copy over our process WAR. In a new command window:

```
cp ~/bpmm/target/approve-order-0.1.0.war
~/servers/camunda/server/apache-tomcat-9.0.12/webapps
```

All on one line!

21. If everything is going well, you can go back to the other terminal window and see the log, and you will see the process be deployed:

```
14-Jun-2016 09:13:24.717 INFO [localhost-startStop-2] org.apache.jasper.servlet.TldScanner.scanJars At least one JAR was scanned for
TLDs yet contained no TLDs. Enable debug logging for this logger for a complete list of JARs that were scanned but no TLDs were found
in them. Skipping unneeded JARs during scanning can improve startup time and JSP compilation time.
14-Jun-2016 09:13:24.718 INFO [localhost-startStop-2] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-07015 Detected @ProcessAp
plication class 'freo.me.process.ApproveOrder'
14-Jun-2016 09:13:24.720 INFO [localhost-startStop-2] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-08024 Found processes.xml
file at file:/home/oxsoa/servers/camunda/server/apache-tomcat-8.0.24/webapps/approve-order-0.1.0/WEB-INF/classes/META-INF/processes.
xml
14-Jun-2016 09:13:24.724 INFO [localhost-startStop-2] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-08023 Deployment summary
for process archive 'Order Approval Process':
    approveorder.bpmn

14-Jun-2016 09:13:24.757 INFO [localhost-startStop-2] org.camunda.commons.logging.BaseLogger.logInfo ENGINE-07021 ProcessApplication
'Order Approval Process' registered for DB deployments [8ce46b42-313b-11e6-ae62-024208065a2e, ddb75bdb-3207-11e6-bbd0-024208065a2e]. Will
execute process definitions

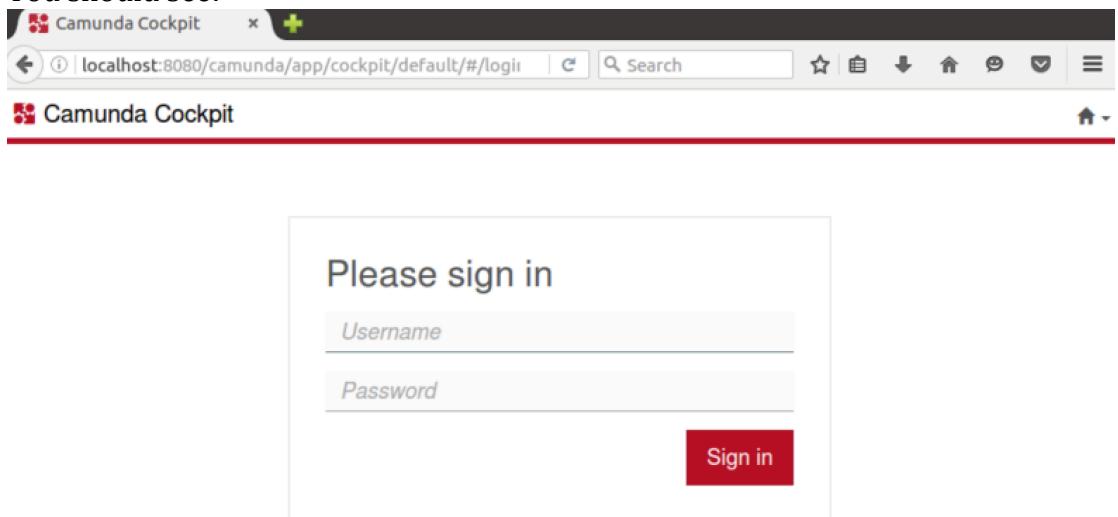
    ApproveOrder[version: 1, id: ApproveOrder:1:8cf708e4-313b-11e6-ae62-024208065a2e]
    ApproveOrder[version: 2, id: ApproveOrder:2:ddba902d-3207-11e6-bbd0-024208065a2e]
Deployment does not provide any case definitions.
```

22. Let's test the process now.



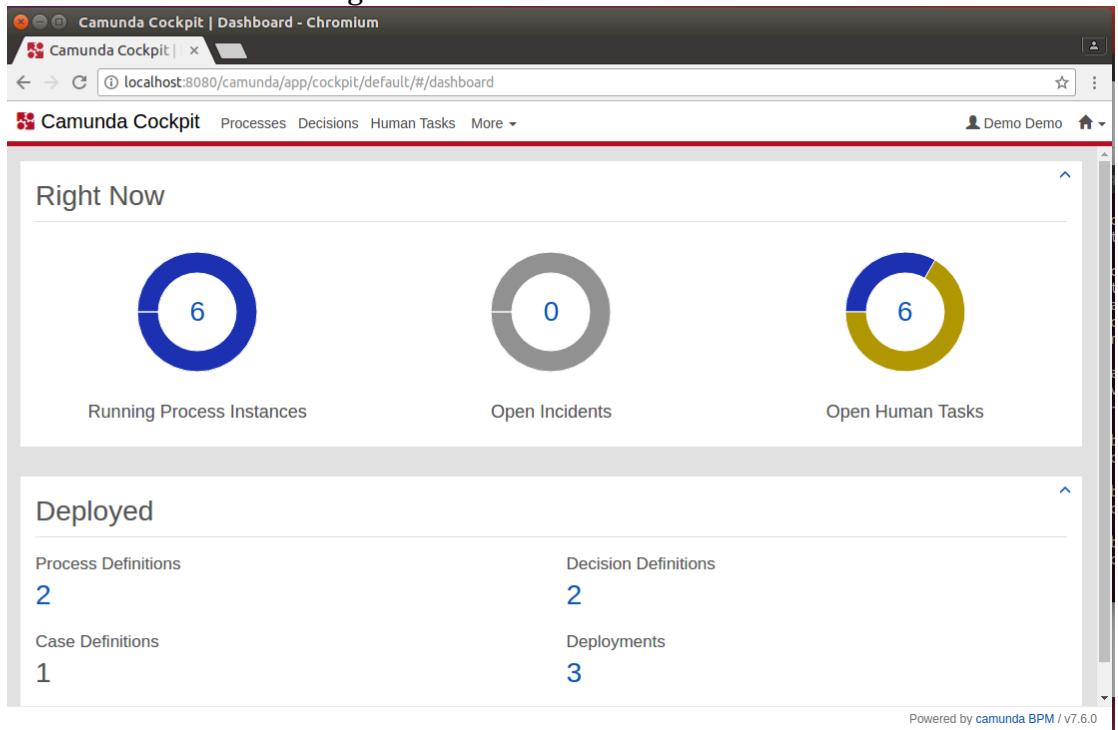
23. Start up a browser (please use Chromium as there seems to be a problem with Firefox) and browse to
<http://localhost:8080/camunda/app/cockpit/>

24. You should see:



25. Sign in with *demo/demo*

26. You should see something similar to this:



27. Select the little Home icon in the corner and choose **Tasklist**

28. Now you should see something like this:

The screenshot shows the Camunda Tasklist interface in a Chromium browser window. The URL is `localhost:8080/camunda/app/tasklist/default/#?searchQuery=%5B%5D&filter=77075899-3311-11e7-8a1c-0242ad9e77de&sorting=%5B%7B%22`. The interface has a header with 'Camunda Tasklist' and various navigation links. On the left, there's a sidebar with sections like 'My Tasks (2)', 'My Group Tasks', 'John's Tasks', 'Mary's Tasks', 'Peter's Tasks', and 'All Tasks'. The main area shows a table of tasks. One task is highlighted: 'Assign Reviewer' for 'Review Invoice' created 2 minutes ago, assigned to 'Demo Demo' with a value of 50. Other tasks listed include 'Invoice Am...' and 'Invoice Nu...'. A filter bar at the top says 'Filter Tasks' and 'Select a task in the list.' At the bottom right, it says 'Powered by camunda BPM / v7.6.0'.

Those tasks are from the default process that comes with Camunda.
Ignore those.

29. Click on **Start Process**

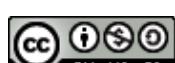
30. Choose **ApproveOrder**

The screenshot shows a 'Start process' dialog. It has a title bar 'Start process'. Below it, a note says 'You can set variables, using a generic form, by clicking the "Add a variable" link below.' There is a 'Business Key' input field with a '+' button to add more keys. At the bottom are 'Back', 'Close', and a large red 'Start' button.

31. Enter anything you like in Business Key and then click **Start**

32. Do you remember where you set the assignee for the User Task in the BPMN process to **demo**? Well this has just happened and you are logged in as demo and hence the portal has popped up a message saying you've been assigned a task to work on:

You are assigned to the following tasks in the same process : X
approveOrder



33. Click on **Approve Order**

34. You should see something like this:

approveOrder

ApproveOrder [🔗](#)

[Set follow-up date](#) [Set due date](#) [Add groups](#) [Demo Demo ×](#)

[Form](#) [History](#) [Diagram](#) [Description](#)

ⓘ You can set variables, using a generic form, by clicking the "Add a variable" link below.

Business Key test

[Add a variable +](#) [Load Variables ⓘ](#)

[Complete](#)

35. Click on the **Diagram** tab

You will see the process you designed, now with the current step highlighted:

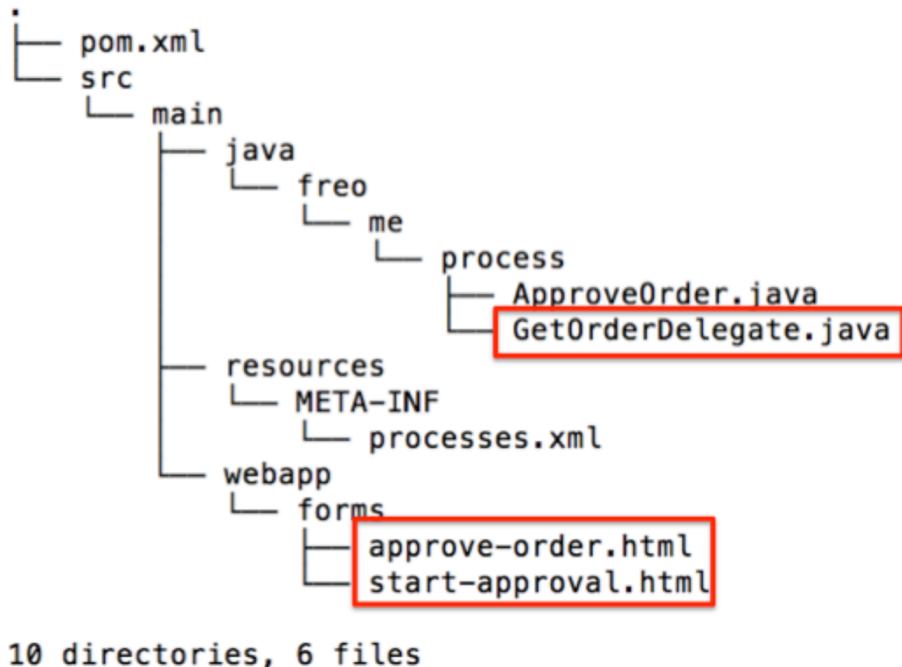


36. Go back to the **Form** tab and click Complete. This will “complete” this instance of the process.

37. This process works, but lets be honest, it is almost pointless.

38. To make the process more interesting we need to tie it in with our existing order processing system. A simple way to do that would be to take an order ID as input, and then gather information about that order to put in front of the approver.

39. If you look at the directory, you should see that there are three other files that came with process-archive.zip that will help:



40. There are two forms already deployed in the `src/main/webapp/forms` directory. Take a look at these.

41. These are standard HTML with some extensions for Camunda that enable the developer to specify fields that will be displayed or collected and to map those fields to process instance variables.

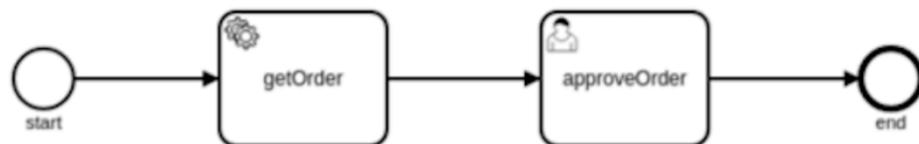
42. There is also a “Delegate” Java class. Here is the code listing:

```
public class GetOrderDelegate implements JavaDelegate {  
    private final static Logger LOGGER =  
        Logger.getLogger("APPROVAL-REQUESTS");  
  
    public void execute(DelegateExecution de) throws Exception {  
  
        String id = (String) de.getVariable("id");  
        LOGGER.info("Processing request by '" + de.getVariable("id"));  
  
        Client client = ClientBuilder.newClient();  
        WebTarget target = client.target("http://localhost:80")  
            .path("purchase").path(id);  
  
        Response response =  
            target.request(MediaType.APPLICATION_JSON).get();  
        if (response.getStatus() == 200) {  
  
            JSONObject json =  
                new JSONObject(response.readEntity(String.class));  
            de.setVariable("lineItem", json.get("lineItem"));  
            de.setVariable("date", json.get("date"));  
            de.setVariable("quantity", json.get("quantity"));  
            de.setVariable("customerNumber",  
                json.get("customerNumber"));  
            de.setVariable("poNumber", json.get("poNumber"));  
  
        } else {  
            throw new BpmnError("ID NOT FOUND");  
        }  
    }  
}
```

43. This is a class specific to Camunda that can be called from a “ServiceTask”. As you can see, it takes a process variable (id) and uses it to look up a PO from our purchase server, using JAX RS REST client code.

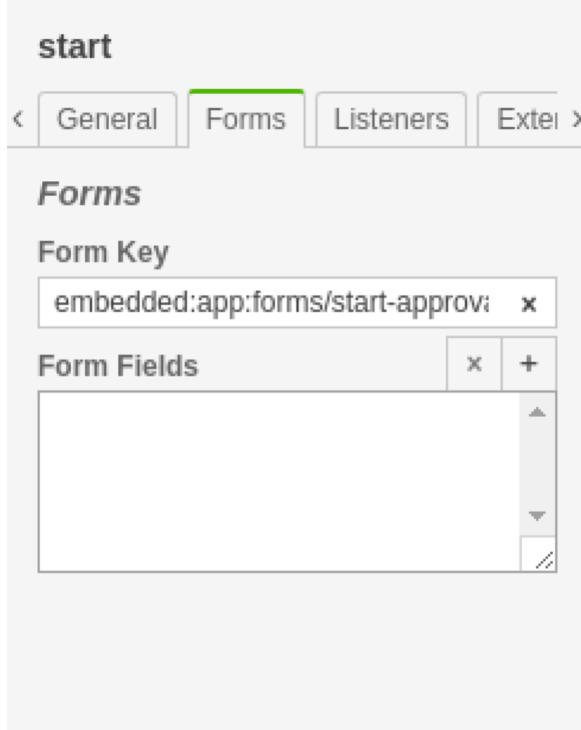
44. Let's use these extra files.

45. Firstly expand the BPMN flow to look like this:

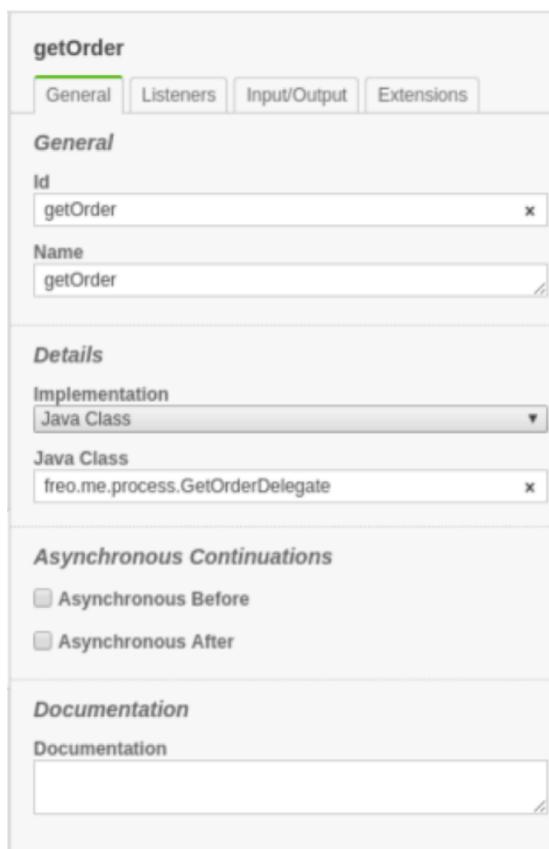


46. The getOrder task is a Service Task.

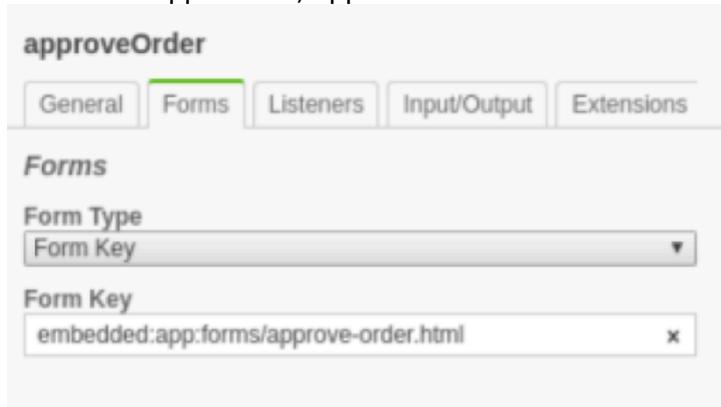
47. Go to the properties of the Start event and add a Form, with the Form Type is **Form Key** and the value is:
`embedded:app:forms/start-approval.html`



48. Edit the properties of the Service Task getOrder:
Implementation: Java Class
Java Class: `freo.me.process.GetOrderDelegate`



49. Add a form to the approveOrder User Task and reference the other form:
embedded:app:forms/approve-order.html



50. Now we should be ready to run this. **Save the BPMN**.

51. Rebuild the WAR file:

```
cd ~/bpmmn  
mvn clean install
```

52. Recopy the WAR to the Camunda directory:

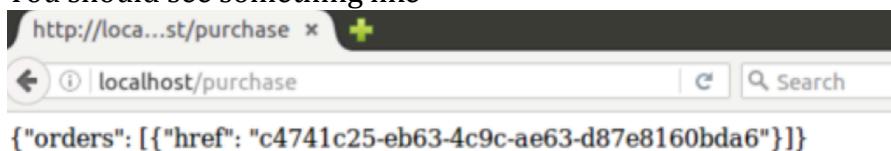
```
cp ~/bpmmn/target/approve-order-0.1.0.war  
~/servers/camunda/server/apache-tomcat-9.0.12/webapps
```

53. Make sure your backend purchase service is up and running. This is the docker-compose service from Exercise 8¹.

You can check that the service is up and running by browsing:

<http://localhost/purchase>

You should see something like



54. Keep this window open as you are going to need that order id.

55. If Camunda's Tomcat is already running it should have redeployed the process, otherwise start up the Tomcat again.

¹ If you didn't get this working, you can run the service using the following command lines:

```
cd ~  
git clone https://github.com/pzfereo/PSBComplete.git  
cd PSBComplete  
gradle clean build  
sudo docker-compose up
```

56. Go back to the Camunda tasklist

57. Now when you start the ApproveOrder process, you should see a new form asking for the id:

A screenshot of a web-based tasklist interface. At the top, there is a grey header bar with the text "Start process". Below this is a white input field labeled "Order ID" with a placeholder text area. At the bottom of the form are three buttons: "Back" (light blue), "Close" (light blue), and a prominent red "Start" button.

58. Copy and paste the id from the previous browser window and click **Start**

59. Once again you should be notified that you are the approver for this process instance. Now you can click to approve that.

60. You should see a form that has data collected from the REST service.
[approveOrder](#)

A screenshot of the Camunda process instance details page for the "ApproveOrder" task. The top navigation bar includes "ApproveOrder" with a refresh icon, "Set follow-up date", "Set due date", "Add groups", and a user profile for "Demo Demo". Below the navigation are tabs: "Form" (selected), "History", "Diagram", and "Description". The main area contains several input fields with data: "customerNumber" (1), "lineItem" (11111), "quantity" (1), "date" (24/7/2012), and "poNumber" (PO1). At the bottom left is an "Approve" checkbox with a checked status. At the bottom right are "Save" and "Complete" buttons.

61. You can click the **Approve** tickbox and then Complete.

62. Check out the Cockpit and the Admin windows (from the little House icon). There are a lot of features in the package that you would need for a real process management scenario (e.g. adding users, creating tenants, adding new approvers to existing processes, checking on the state of processes, etc).

63. That's all.