**Lab Guide**

IBM Business Automation Manager Open Edition

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Hands-on Lab

Watsonx Orchestrate Integrating with Open-Source Solutions

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# Introduction

In this Lab you connect watsonX Orchestrate to two open-source solutions:

* BAMOE - open-source equivalent drools <https://www.drools.org/>
* Cloudant – Open-source equivalent is CouchDB <https://couchdb.apache.org/>

The Lab is structured into four sections.

* Build a speeding ticket decision service.
* Generate an OpenAPI for this service.
* Invoke the service as a watsonx Orchestrate skill.
* Save the results to a Cloudant database.

## Pre-requisites

To perform this Lab, you need:

* An IBM watsonx Orchestrate Standard account with Builder role.
* Techzone BAMOE VM : <https://techzone.ibm.com/my/reservations/create/64a7121eb9776b0016a10cb0>

Alternatively, you can build your own environment, in which case you need:

* VSC and the IBM BAMOE plugin
* Git Bash
* Latest Java JDK

# Build a decision service to calculate speeding fines

In this task, you ...

* Import a speeding ticket decision service.
* Run the service locally.
* Expose the decision service to the outside world

## Before you start

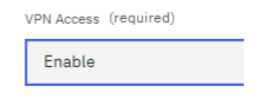
In this exercise, you will build and test the decision service using Visual Studio Code (VSC).

Reserve the following BAMOE Techzone image (or later version if available):

A screenshot of a computer

Description automatically generated

When reserving, ensure IP address is enabled:



Once the VM is reserved, login using RDP:

**User:** .\techzone

**Password:** IBMDem0s!

For further details on setting up the VM, see the getting started guide here: <https://ibm.ent.box.com/folder/170819029423>

1. Open Git Bash by clicking the Git Bash  icon on the Windows **Taskbar** at the bottom of the screen.
2. Within the Git Bash shell, clone the rule project using the command:

git clone <https://github.com/ncrowther/bamoe2wxo>

1. Hit return. You should see the git repository cloned into the local drive:

Text

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Now open the decision project with VSC:

cd bamoe2wxo/

code SpeedingDecisionService/

1. VSC will open:

A screenshot of a computer

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1. On the left-hand side of the Visual Studio Code in the file explorer locate *src\main\resources\TrafficViolation.dmn*A screenshot of a computer

   Description automatically generated
2. Double-click the DMN file to view it in the BAMOE DMN Editor:

A screenshot of a diagram

Description automatically generated

1. On the far right, select the edit icon . Change the DMN Model Name to [YOUR\_INITIALS]TrafficViolation, where [YOUR\_INITIALS] are your initials. For example, if your initials are XXX, the DMN Model name would be XXXTrafficViolation:

A screenshot of a computer

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1. Select the *Fine* decision and edit by selecting . You should see the decision table below. It determines the speeding points and fine depending on the severity of the violation:

A screenshot of a computer

Description automatically generated

## Run the Decision Service

In this step we are going to build and run our decision service in development mode using Quarkus. Quarkus is a container-native Java stack. For more details see <https://quarkus.io/>

**Important**: if you are not using VSC 1.85 or later, you must update. Select *Help->Restart* to update.

1. Within the VSC editor, click on the **Terminal** menu at the top of the screen:



1. In the drop down click on **New Terminal**.

A screenshot of a computer

Description automatically generated with medium confidence

1. In this terminal window, verify you are in the *SpeedingService* folder and then run the Mavern build:

mvn quarkus:dev

1. Once built, our decision model is deployed to Quarkus and ready to run in development mode:

A computer screen with text

Description automatically generated

## Expose the decision service to the outside world

1. Within the VSC editor, click the PORTS tab:

A screen shot of a computer

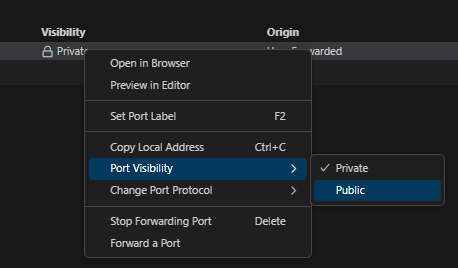
Description automatically generated

1. Select *Forward a Port*
2. Enter the kogito service port (usually 8080) as the Port and hit return. You can find your port in the Quarkus terminal output. After a few seconds, you should see this:

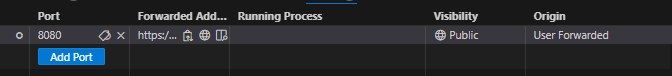
A black background with white text

Description automatically generated

1. Right-click the value in the *Visibility* column and change from *Private* to *Public*:



1. Press *Continue* to accept the warning message. Select the *copy local address* button  to store the exposed URL into your clipboard.



## Test the Decision Service

Let’s look at the API generated by Quarkus.

1. Open your favorite browser.
2. Paste the following URL into the browser address and press **Enter**.

[[REMOTE\_URL]/q/swagger-ui](localhost:8123/q/swagger-ui)

Where [REMOTE\_URL] is the url you copied in the last step of the previous section. If you see a warning message, accept it by pressing *Continue*. You should see this:  
A screenshot of a computer

Description automatically generated

We can see three endpoints; The only endpoint we are interested in is the first **POST /TrafficViolation** endpoint. The second one includes additional trace information which we won’t be using for this lab.

1. Click on the **POST /TrafficViolation** endpoint to expand it, then click the **Try it out** button on the right-side.  
   A white rectangular object with a black border

   Description automatically generated
2. Enter the following data into the request body:

{

"Violation": {

"Date": "2023-12-21",

"SpeedLimit": 20,

"ActualSpeed": 40

},

"DriverId": "D45454"

}

1. Press *Execute*. You should see the following response:

**Response Body**

**{**

**"Violation": {**

**"SpeedLimit": 20,**

**"ActualSpeed": 40,**

**"Date": "2023-12-21"**

**},**

**"DriverId": "D45454",**

**"Fine": {**

**"Points": 3,**

**"Amount": 500**

**}**

1. Verify the points are 3 and the fine is 300.
2. Congratulations, you have built and deployed the Speeding Ticket decision service on your local machine and exposed it to the outside world. The next step is to generate an OpenAPI specification so that the decision service can be executed in watsonx Orchestrate.

# Generate an OpenAPI specification

In this section you will generate an open API compatible with watsonx Orchestrate. In order to generate the OPenAPI, the decision service ran in the previous section must still be running. Also note that the OpenApi has already been pre generated in the Git repo, so you are not interested in generating it again, you can move to section 3.

* 1. Open the *OpenApiGenerator* folder in VSC:

code OpenApiGenerator/

* 1. The VSC editor appears with the OpenApiGenerator folder.

A screenshot of a computer program

Description automatically generated

1. Expand the *data* folder and edit *config.json*
2. The *decisionId* is the name of the decision service you created in 7. Replace [YOUR\_INITIALS] with your initials. For example, if your initials are XXX, the DMN Model name would be XXXTrafficViolation.
3. The internal URL should be set to the local URL of your running Kogito service. The external URL is defined on page 10

A computer screen shot of a code

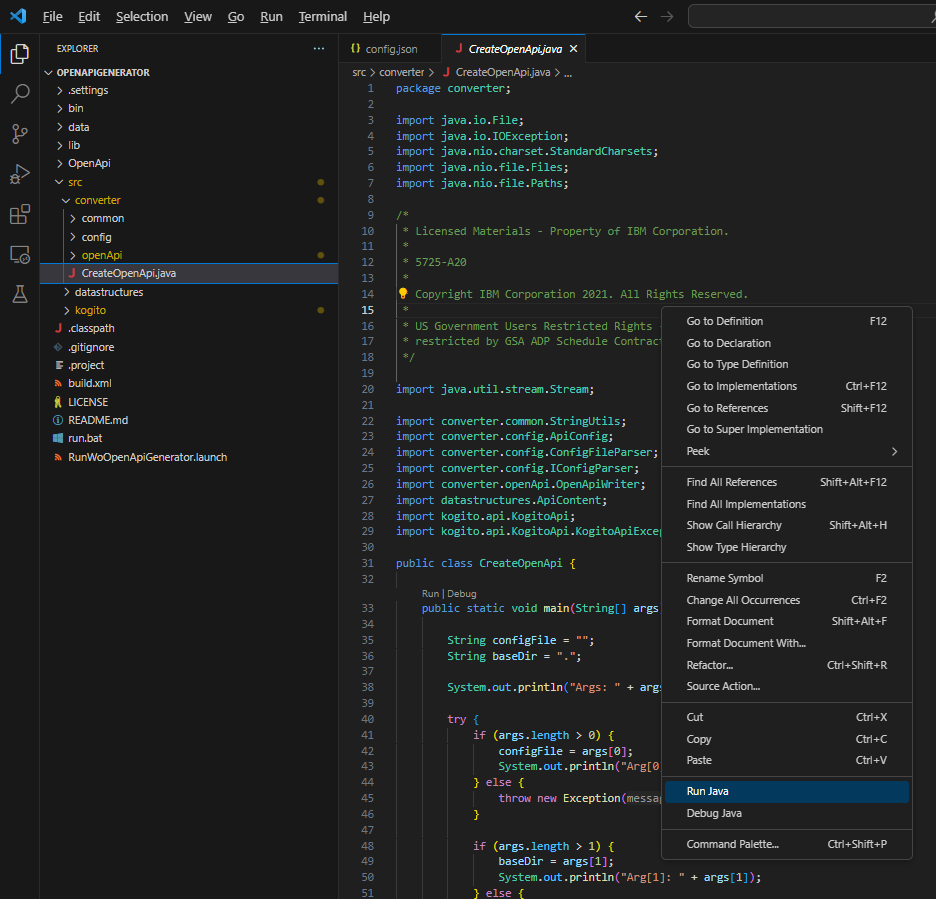
Description automatically generated

1. Save *config.json*
2. Open *CreateOpenApi.java* in the *src/converter* folder:

A screenshot of a computer

Description automatically generated

1. Right-click anywhere in the code and select *Run Java*:



1. The generator creates an open API file in *.\generated\TrafficViolation.json :*

A screen shot of a computer

Description automatically generated

1. Open *generated\Trafficviolation.json* and paste it into <https://editor.swagger.io>
2. You should see the same decision service we inspected in section 1.4

A screenshot of a computer

Description automatically generated

1. There are differences compared with the original OpenApi generated by Quarkus:

* *x-ibm* annotations have been added.
* The data model has been appended so that it is all in one file.
* Only a single TrafficVioloation endpoint is generated.

This OpenAPI is ready to be imported into watsonx Orchestrate.

# Import the OpenAPI into watsonx Orchestrate

1. Login to **IBM watsonx Orchestrate**
2. Under skills, select *add skills* from *Files* then drag the following file into the drop area:

[GIT]\bamoe2wxo\OpenApiGenerator\generated\*TrafficViolation.json*

A screenshot of a computer

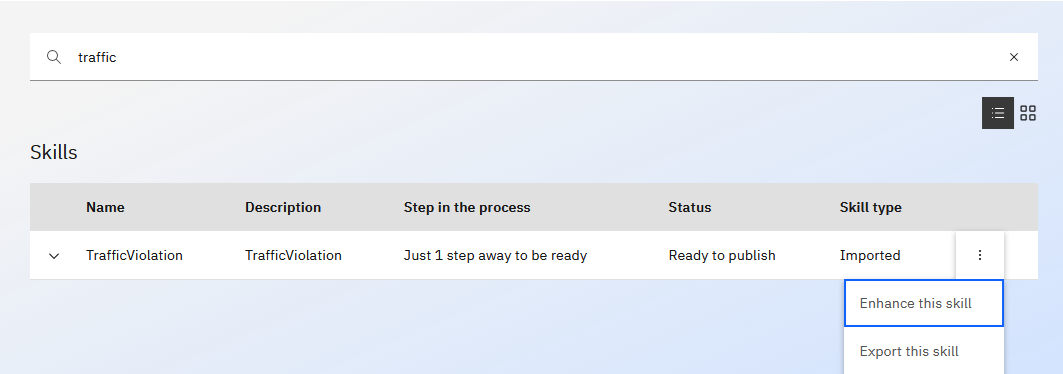
Description automatically generated

1. Click Next. Select the *TrafficViolation* skill and press Add.

A screenshot of a computer

Description automatically generated

1. Find the *TrafficViolation* skill.
2. Right click the button with three vertical dots, and select *Enhance this skill*:



1. Publish the skill:

A close up of a logo

Description automatically generated

1. Click on *Skill Catalog*
2. Find the *TrafficViolation* skill (type in the full name to find it). Select it and press *Add skill*

A white background with black text

Description automatically generated

1. Click on Connect app  and enter any username and password (these credentials are placebos).
2. Go to *Chat* and run the skill by typing *trafficviolation*
3. Enter the following:

A screenshot of a computer

Description automatically generated

Hit *Apply*. This will invoke the decision service via your local PC using the exposed port.

The response should be:

**A screenshot of a computer

Description automatically generated**

Congratulations, you have run your Decision Service from watsonx Orchestrate!

# Persist Decisions

In this section we call a database skill to store the speeding tickets. We use a public instance already created. If you are interested in creating your own instance, see section 5.

* 1. Open the *cloudantFacade* in VSC

code cloudantFacade/

* 1. The VSC editor should appear with the *cloudantFacade* folder.

A screenshot of a computer

Description automatically generated

* 1. Expand the *openapi* folder and edit *dataApi.yaml*
  2. Replace text [YOUR\_INITIALS] with your initials. If your initials are XXX then lines 13 and 14 would be:

  x-ibm-application-name: XXXcloudantWxoFacade

  x-ibm-application-id: XXXcloudantWxoFacade

* 1. Open *dataApi.yaml* and paste it into <https://editor.swagger.io>
  2. You should see the following Apis:

A screenshot of a computer

Description automatically generatedA screenshot of a computer

Description automatically generated

1. Now we will import this API into watsonx Orchestrate
2. Login to **IBM watsonx Orchestrate**
3. Under *Build* *skills*, select *add skills* from *Files* then drag and drop the *dataApi.yaml* API spec:

A screenshot of a computer

Description automatically generated

1. Click Next. Select the top twoskills and press *Add*.

A screenshot of a computer

Description automatically generated

1. Publish each skill above as described in section 3
2. You should now have both skills published under the *cloudantWxoFacade* and added to your catalog. Run the skill *write a doc to cloudant.* Enter a *driverId* containing your initials and six random numbers to make it unique:

A screenshot of a phone

Description automatically generated

1. Now run the *get docs from cloudant* skill. You should see data retrieved from the database.

Find the entry just created by using the search  button:

A screenshot of a computer

Description automatically generated

1. Now under *Skills*, add a skill flow called *[YOUR\_INITIALS]\_SpeedingDatabase.* The composite skill flow should look like this.

A white rectangular object with text

Description automatically generated

1. Publish the skill and add it to your catalog.
2. Run the skill. Enter a violation like the one below:

A screenshot of a computer

Description automatically generated

1. After a while you should see your decision along with others:

A screenshot of a computer

Description automatically generated

# Advanced – Create Cloudant Façade for Watsonx Orchestrate

In this section we implement the Cloudant skill used in the previous section.

## Local host Prerequisites

1. Create a Cloudant instance in your IBM Cloud account.
2. See: <https://cloud.ibm.com/docs/Cloudant?topic=Cloudant-getting-started-with-cloudant>
3. Create a Cloudant database with name *wxodb.*
4. Create credentials.

## Run on local host

1. Edit *setenv.bat* to Cloudant credentials (see above).
2. Open DOS prompt (NOT powershell).  Enter:

   setenv.bat

 Start a local nodejs server:

   npm start

## Code Engine Hosting Prerequisites

1. Follow Local Host Prerequisites above.
2. Create a *Code Engine* instance in IBM Cloud account. If using TechZone, reserve the following:

A screenshot of a computer

Description automatically generated

1. Login to the provisioned environment.
2. Create a code engine project called cloudant-facade, with the image referencing your docker image.

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Description automatically generated

1. Within your CodeEngine project, select Secrets and configmaps. Press Create.
2. Create a configmap with name *dataserviceconfig* and press *Create.*
3. Create a code engine *configmap configuration* with your Cloudant credentials:

A screenshot of a computer

Description automatically generated

## Deployment to code engine on IBM Cloud

1. Open Git Bash shell from VSC
2. Login to IBM Cloud.

ibmcloud login --sso

1. In the IBM Cloud console, go to **Manage > Account > Account resources > Resource groups.** Select the resource group for Code Engine. E.g. *default*

ibmcloud target -g default

1. Select the code engine project:

ibmcloud ce project select -n [PROJECT\_NAME]

1. Start Docker Desktop
2. In Bash Shell, go to the cloned git repo folder and go to the dataservice folder e.g: /bamoe2wxo/cloudantFacade/dataservice
3. Within this folder, edit *build.sh* and *run.sh* and change the REGISTRY to your Docker registry.
4. Using the same bash shell, deploy the sample application to your docker repo:

./build

1. Deploy the application to Code Engine on IBM Cloud. From the app's folder do:

./run

1. Open your IBM Cloud app route in the browser and copy the URL
2. Using curl, execute the following command:

# Conclusion

In this lab were created a decision service and called as a skill from wastonx Orchestrate. We then created a composite flow to store the results of the decision into a database.

Thank you for taking this lab and I hope you create new applications using this technology.