Procedure for MOSAIC

**Basic Install and Run**

1. Download the MOSAIC 22.1 and the following add-ons:
   1. MOASIC: <https://www.dcaiti.tu-berlin.de/research/simulation/download/get/eclipse-mosaic-22.1.zip>
   2. NS3: <https://www.dcaiti.tu-berlin.de/research/simulation/download/get/ns3-federate-22.1.zip>
   3. Omnetpp: <https://www.dcaiti.tu-berlin.de/research/simulation/download/get/omnetpp-federate-22.1.zip>
   4. Scenario-Convert: <https://www.dcaiti.tu-berlin.de/research/simulation/download/get/scenario-convert-22.1.zip>
2. Unzip all the zip files into one folder.
3. Download the OpenJDK by Eclipse:
   1. Go to <https://adoptium.net/de/download/>
   2. Click the purple “.msi” button for Windows x64
   3. Open the file and follow the steps to install OpenJDK
4. Go to <https://openstreetmap.org>
5. Search the map for the area you would like to use, for this example the map of UMass Dartmouth will be used.
6. Click “Export” in the top left corner
7. Click “Manually select a different area” under the “Export” tab on the left side of the page.
8. A box will appear over the map. Move the corners around the box to fit the area you would like to use.
9. Click the blue “Export” button. This will automatically download the map as a .osm file.
10. Copy the downloaded .osm file to the “eclipse-mosaic-22.1/scenarios” directory.
11. Rename the .osm file to be the name of the scenario, for this example it will be called UMassDartmouth
12. Add the path to “scenario-convert-22.1” to your PATH environment variable.
13. Open a command terminal
14. Change directories to “eclipse-mosaic-22.1/scenarios”
15. Run the following command: java -jar scenario-convert.jar --osm2mosaic -i UMassDartmouth.osm --generate-routes
    1. This will generate a scenario with cars and all possible routes
16. To run the scenario, change directories back to “eclipse-mosaic-22.1”
17. Run the following command: mosaic.bat -s UMassDartmouth -v -b 20

**Change Vehicles and RSUs**

1. Navigate to the scenario you would like to change, for this example the UMassDartmouth scenario will be changed.
2. In the file explorer, navigate to the “mapping” folder.
3. Open mapping\_config.json
   1. All possible setting changes are explained at the Eclipse MOSAIC website: <https://www.eclipse.org/mosaic/docs/mosaic_configuration/mapping_ambassador_config/>
4. To add RSUs to the scenario, in the “prototypes” property, add the following prototype:

{

      "name": "RSU",

      "applications": [

        "RSUComApp"

      ]

    }

1. After the “prototype” property, add a “rsu” property.
2. In this property you can define as many RSUs you would like. For this example, three RSUs will be added. The property will look like the following:

"rsus": [

    {

      "name": "RSU",

      "position": {

        "latitude": 41.63253168184327,

        "longitude": -71.00553295378838

      }

    },

    {

      "name": "RSU",

      "position": {

        "latitude": 41.624904823523146,

        "longitude": -71.00503028495768

      }

    },

    {

      "name": "RSU",

      "position": {

        "latitude": 41.63076589339778,

        "longitude": -71.01095504266775

      }

    }

  ]

1. The latitude and longitude were accurately chosen based on real-world latitude and longitude using the following website: <https://www.gps-coordinates.net/gps-coordinates-converter>
2. After the “rsus” property, the default “vehicles” property will be defined. This can be changed to allow a multitude of different configurations. For this example, this scenario will have 10 vehicles with 5 vehicles following one route and the other 5 vehicles following another route.
3. All settings are explained in depth on the Eclipse Mosaic website: <https://www.eclipse.org/mosaic/docs/mosaic_configuration/mapping_ambassador_config/#reference-prototype>
4. The vehicle property will look like the following:

{

      "startingTime": 5.0,

      "maxTime": 700.0,

      "targetFlow": 30.0,

      "spawningMode": "CONSTANT",

      "maxNumberVehicles": 5,

      "laneSelectionMode": "BEST",

      "departSpeed": "0.0 m/s",

      "departSpeedMode": "MAXIMUM",

      "types": [

        {

          "name": "Car",

          "weight": 1.0

        }

      ],

      "deterministic": true,

      "departConnectionIndex": 0,

      "pos": 0,

      "route": "1"

    },

    {

      "startingTime": 5.0,

      "maxTime": 700.0,

      "targetFlow": 30.0,

      "spawningMode": "CONSTANT",

      "maxNumberVehicles": 5,

      "laneSelectionMode": "BEST",

      "departSpeed": "0.0 m/s",

      "departSpeedMode": "MAXIMUM",

      "types": [

        {

          "name": "Car",

          "weight": 1.0

        }

      ],

      "deterministic": true,

      "departConnectionIndex": 0,

      "pos": 0,

      "route": "2"

    }

1. The “maxNumberVehicles” setting sets the number of vehicles and the “route” setting sets the route those vehicles will take.

**Creating Applications**

1. Download the Java Maven compiler: <https://dlcdn.apache.org/maven/maven-3/3.9.1/binaries/apache-maven-3.9.1-bin.zip>
2. Unzip the file in an accessible directory
3. Add the “**%Path of Download%**apache-maven-3.8.6-bin\apache-maven-3.8.6\bin” to the PATH environment variable.
4. Create a folder with the name of the application you would like to create, for this example the name of the application will be name VehicleComApp.
5. The folder should have the following structure:

└─ VehicleComApp

├─ src

| └─ main

| └─ java

| └─ VehicleComApp.java

└─ pom.xml

1. The pom.xml should have the following content:

**<?xml version="1.0" encoding="UTF-8"?>**

<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/maven-v4\_0\_0.xsd">

<modelVersion>4.0.0</modelVersion>

<groupId>org.eclipse.mosaic.app</groupId>

<artifactId> VehicleComApp </artifactId>

<version>0.0.1</version>

<packaging>jar</packaging>

<properties>

<maven.compiler.source>1.8</maven.compiler.source>

<maven.compiler.target>1.8</maven.compiler.target>

</properties>

<repositories>

<repository>

<id>repo.eclipse.org</id>

<name>MOSAIC Repository</name>

<url>https://repo.eclipse.org/content/repositories/mosaic</url>

</repository>

</repositories>

<dependencies>

<dependency>

<groupId>org.eclipse.mosaic</groupId>

<artifactId>mosaic-application</artifactId>

<version>23.0</version>

</dependency>

</dependencies>

</project>

1. This is a sample application that can be added to VehicleComApp.java

**import** org.eclipse.mosaic.fed.application.app.AbstractApplication;

**import** org.eclipse.mosaic.fed.application.app.api.VehicleApplication;

**import** org.eclipse.mosaic.fed.application.app.api.os.VehicleOperatingSystem;

**import** org.eclipse.mosaic.lib.objects.vehicle.VehicleData;

**import** org.eclipse.mosaic.lib.util.scheduling.Event;

**public** **class** **HelloWorldApp** **extends** **AbstractApplication**<**VehicleOperatingSystem**> **implements** **VehicleApplication** {

**@Override**

**public** **void** **onStartup**() {

getLog().info("Hello World!");

}

**@Override**

**public** **void** **onVehicleUpdated**(VehicleData previousVehicleData, VehicleData updatedVehicleData) {

getLog().info("Driving {} m/s.", updatedVehicleData.getSpeed());

}

**@Override**

**public** **void** **onShutdown**() {

getLog().info("Good bye!");

}

**@Override**

**public** **void** **processEvent**(Event event) {

*// ...*

}

}

1. Open a terminal command window.
2. Navigate to the top-level VehicleComApp folder.
3. Run the following command: mvn clean install
4. A “target” folder will be generated with a VehicleComApp-0.0.1.jar file.
5. Copy the jar file to the “applications” folder of the scenario.
6. Update the vehicle protoype in the “mapping\_config.json” to look like the following:

{

      "name": "Car",

      "length": "4.0 m",

      "minGap": "2.5 m",

      "maxSpeed": "70.0 m/s",

      "vehicleClass": "Car",

      "accel": 2.6,

      "decel": 4.5,

      "sigma": 0.1,

      "tau": 0.1,

      "speedFactor": 1.0,

      "deviations": {

        "length": 0.0,

        "width": 0.0,

        "height": 0.0,

        "minGap": 0.0,

        "maxSpeed": 0.0,

        "speedFactor": 0.0,

        "accel": 0.0,

        "decel": 0.0,

        "tau": 0.0

      },

      "applications": [

        "VehicleComApp"]

    }

1. Navigate to “eclipse-mosaic-22.1”
2. Run: mosaic.bat -s UMassDartmouth -v -b 20