USER MANUAL MDFUWSN TRANSFORMATION ENGINE

1. Download Instructions

1.1. MDASMCPCS

Download Model-Driven Framework for Underwater Wireless Sensor Networks (MDFUWSN) from github as: "**MDFUWSN.zip**"
Extract **MDFUWSN.zip** file. You will find "MDFUWSN" Folder. In the "MDFUWSN" folder, you will find the following files shown in **Figure *1*** below.

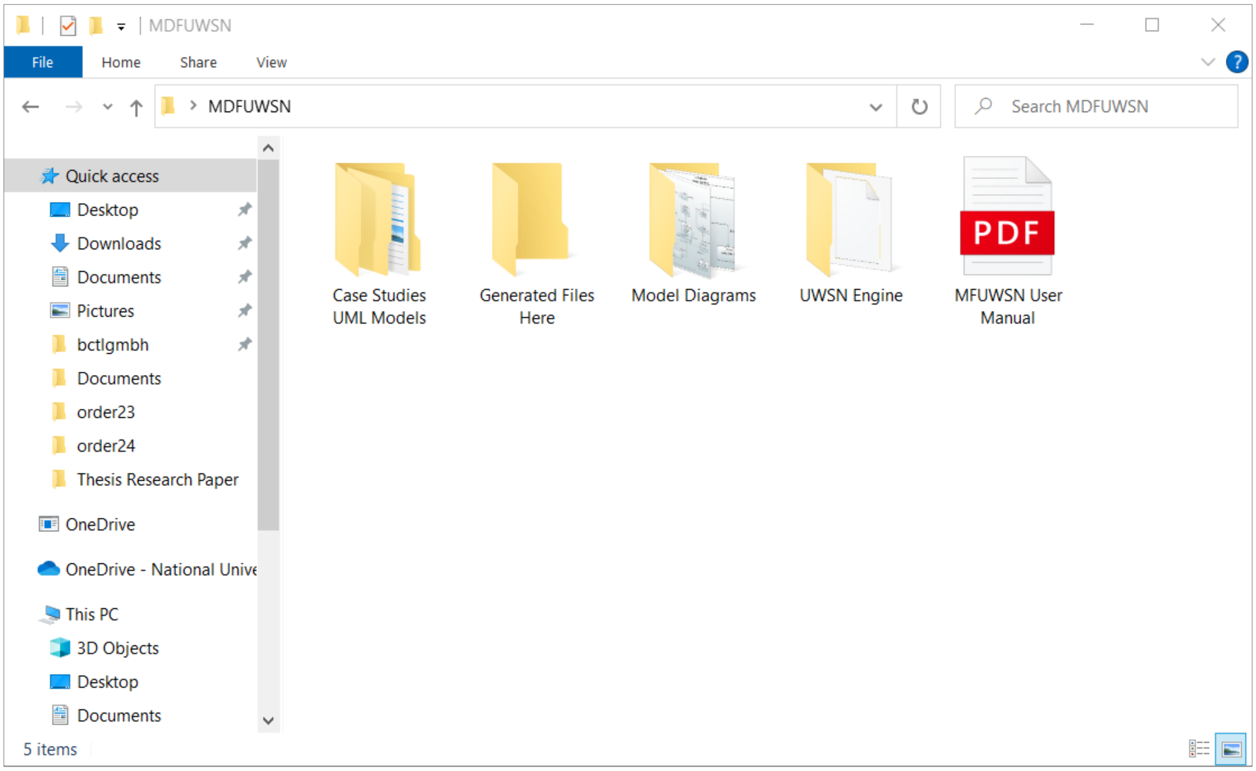


Figure 1. Files in "MDFUWSN" folder

1.2.Sample Case Studies

There are two case studies available that we deployed to validate MDFUWSN. You can find these case studies in "Case Studies UML Models" folder as shown in **Figure *2***. They both contains UML models for the respective case study developed in Eclipse using Papyrus plugin.

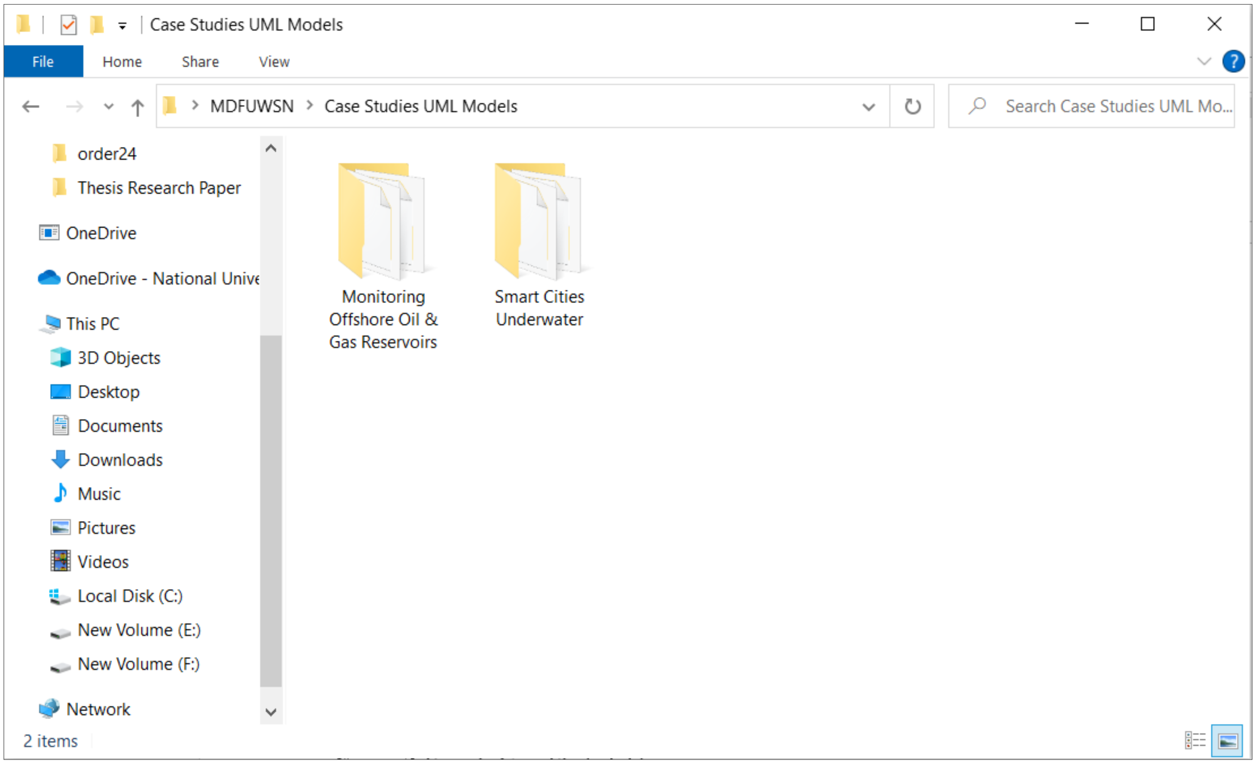


Figure 2. Sample Case Study folder

You can use the existing UML models to generate complete Code or you can update the UML model to include modeling of System.

2. Prerequisites for MDFUWSN

It is mandatory to have following software installed in your machine to use MDFUWSN:

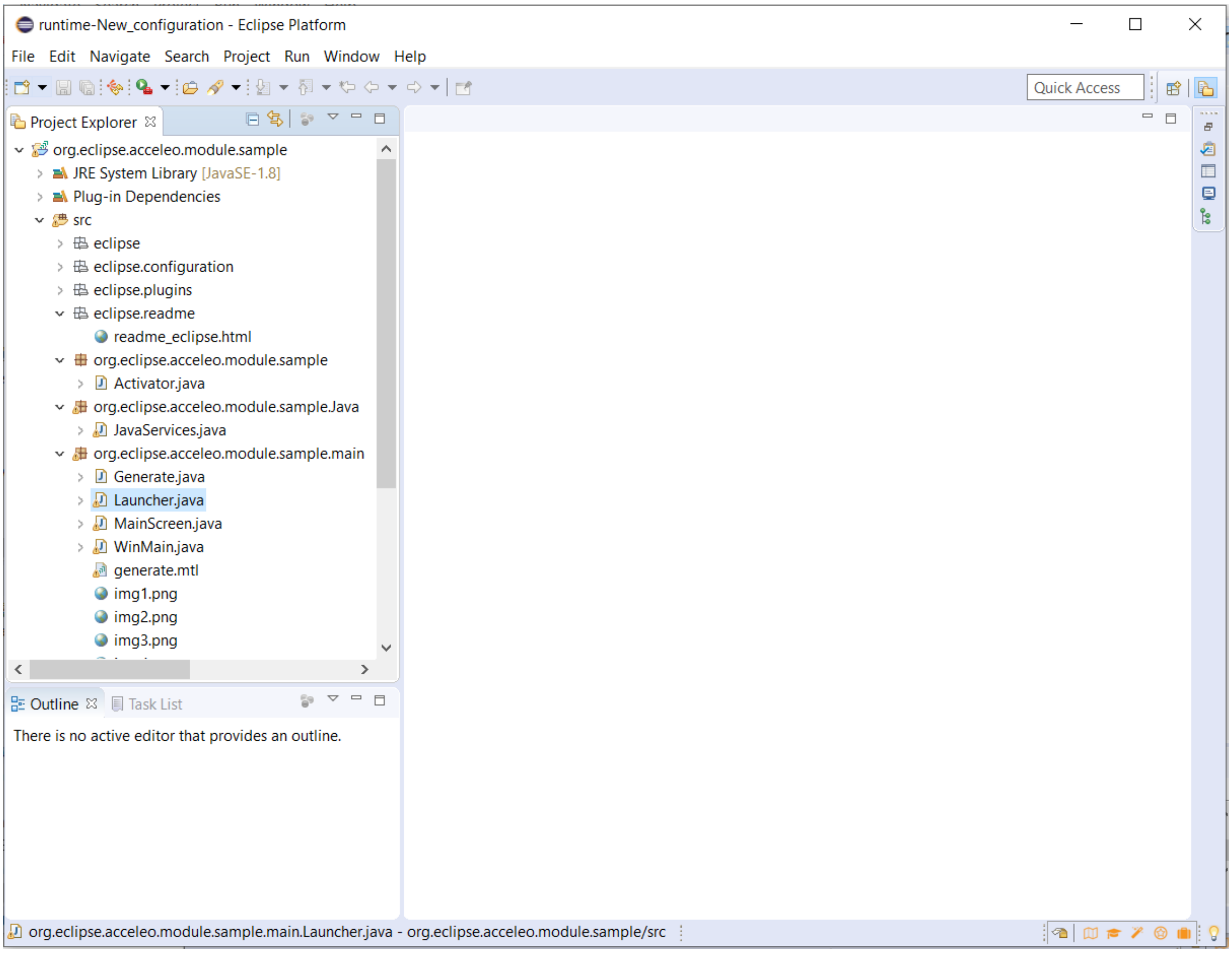
- Java Runtime Environment (JRE) version 8 or above
- Eclipse Version 4.13.0 or above
- Papyrus - Eclipse Plugin

We have tested MDFUWSN on HP ProBook, Windows 10 Pro. However, we are confident that MDFUWSN can also be executed on previous versions of Windows.

3. Execution of MDFUWSN Generator

To execute the MDFUWSN, follow the steps:

1. Open the “UWSN Engine” in Eclipse and it shall be like shown in **Figure 3**.


runtime-New_configuration - Eclipse Platform
File Edit Navigate Search Project Run Window Help
Quick Access
Project Explorer
org.eclipse.acceleo.module.sample
JRE System Library [JavaSE-1.8]
Plug-in Dependencies
src
eclipse
eclipse.configuration
eclipse.plugins
eclipse.readme
readme_eclipse.html
org.eclipse.acceleo.module.sample
Activator.java
org.eclipse.acceleo.module.sample.Java
JavaServices.java
org.eclipse.acceleo.module.sample.main
Generate.java
Launcher.java
MainScreen.java
WinMain.java
generate.mtl
img1.png
img2.png
img3.png
Outline
Task List

There is no active editor that provides an outline.

org.eclipse.acceleo.module.sample.main.Launcher.java - org.eclipse.acceleo.module.sample/src

Figure 3. Opening Transformation Engine in Eclipse

2. Right click on “Launcher.java” file and Run it as “Java Application” as shown in **Figure *4***.

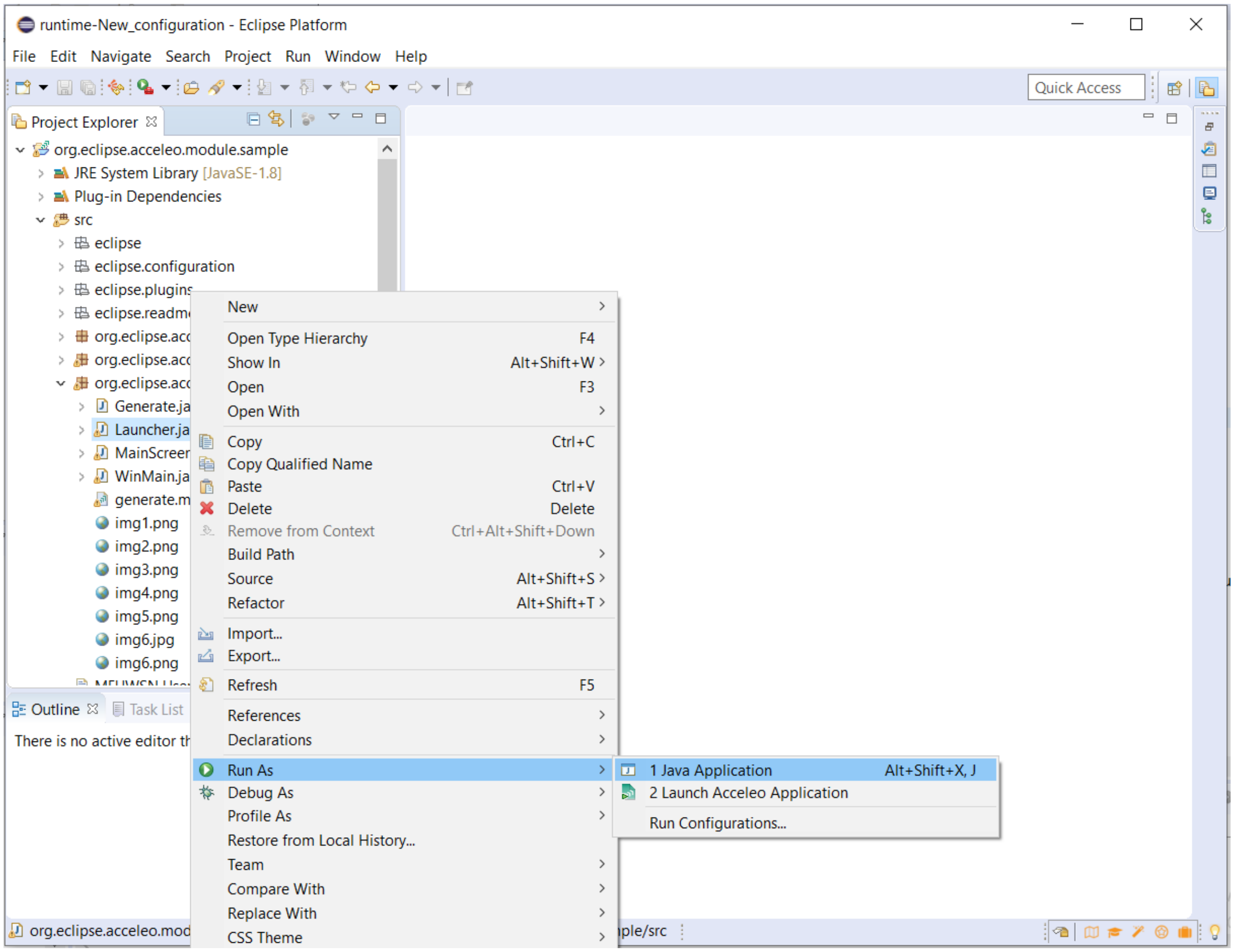


Figure 4. Run as Java Application

It shall compile the project and show the Main interface of the MDFUWSN as shown in **Figure 5**.

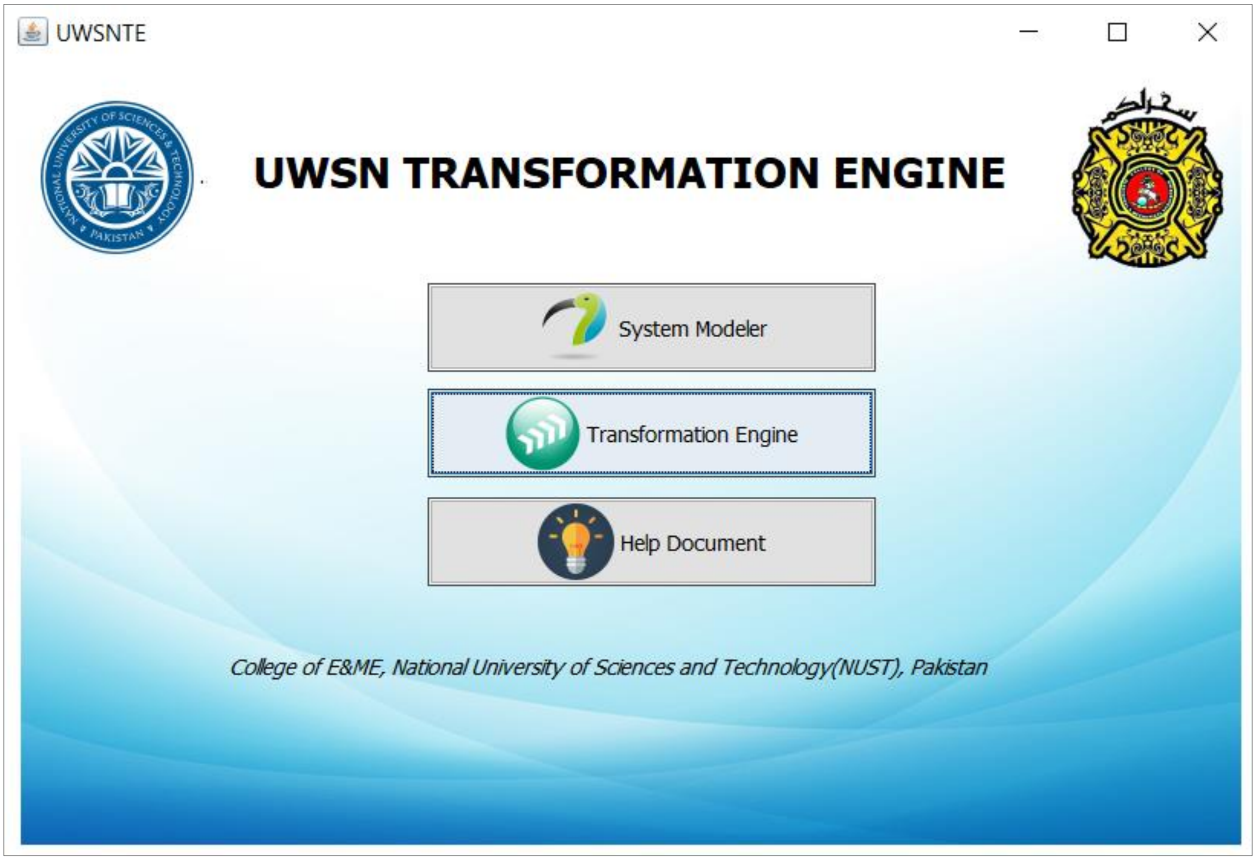

UWSNTE
UWSN TRANSFORMATION ENGINE
System Modeler
Transformation Engine
Help Document
College of E&ME, National University of Sciences and Technology(NUST), Pakistan

Figure 5. Main interface of MDFUWSN

The MDFUWSN contains three main functionalities.

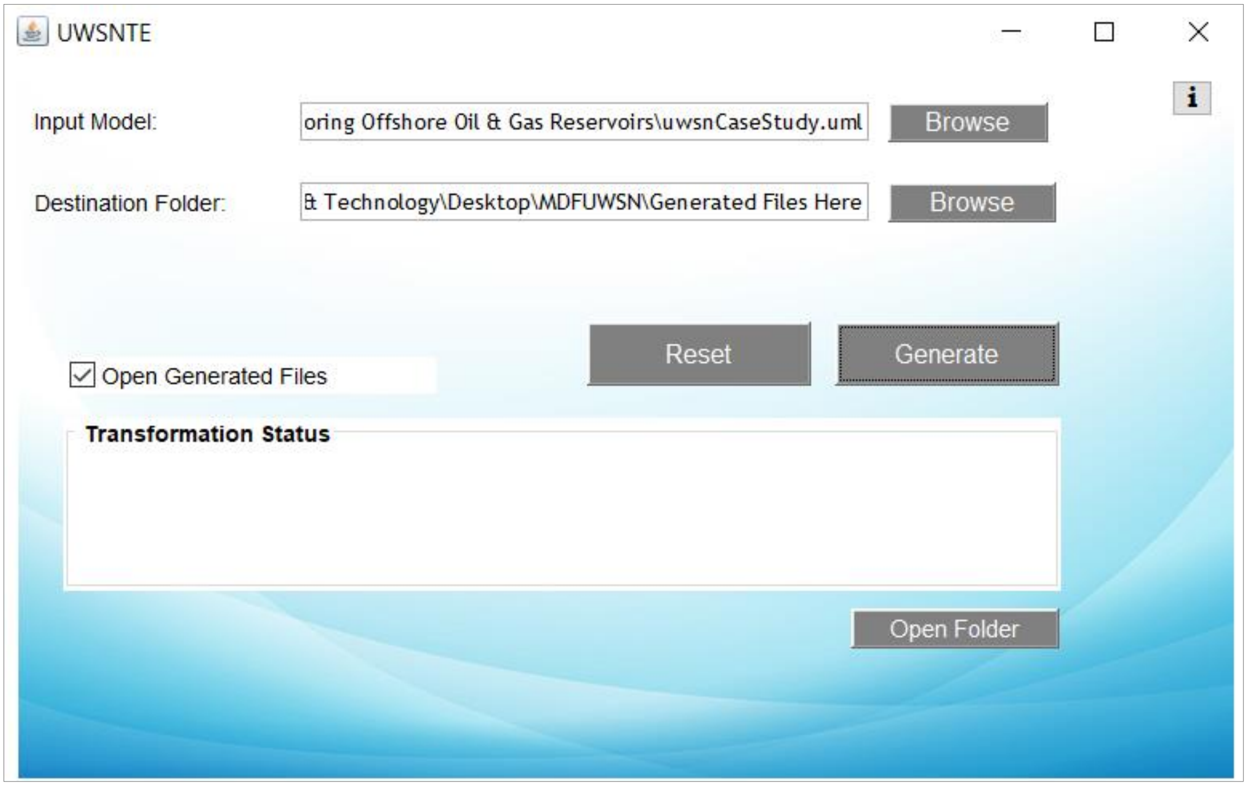
- **System Modeler:** It allows you to model your own system or modify existing system using Papyrus in Unified Modeling Language (UML).
- **Transformation Engine:** It enables the user to select the UML mode of a system to generate its source code as per transformation rules deployed.
- **Help Document:** It redirects the user to opens a "Help Document"

3.1. Papyrus

By clicking on "**System Modeler**" Eclipse environment is opened and in order to allow IFML modeling "Eclipse IFML plugin" must be installed.

3.2.Transformation

By clicking on "**Transformation Engine**" in the main interface, interface for "**Acceleo Code Transformation Engine**" is opened as shown in **Figure *6***



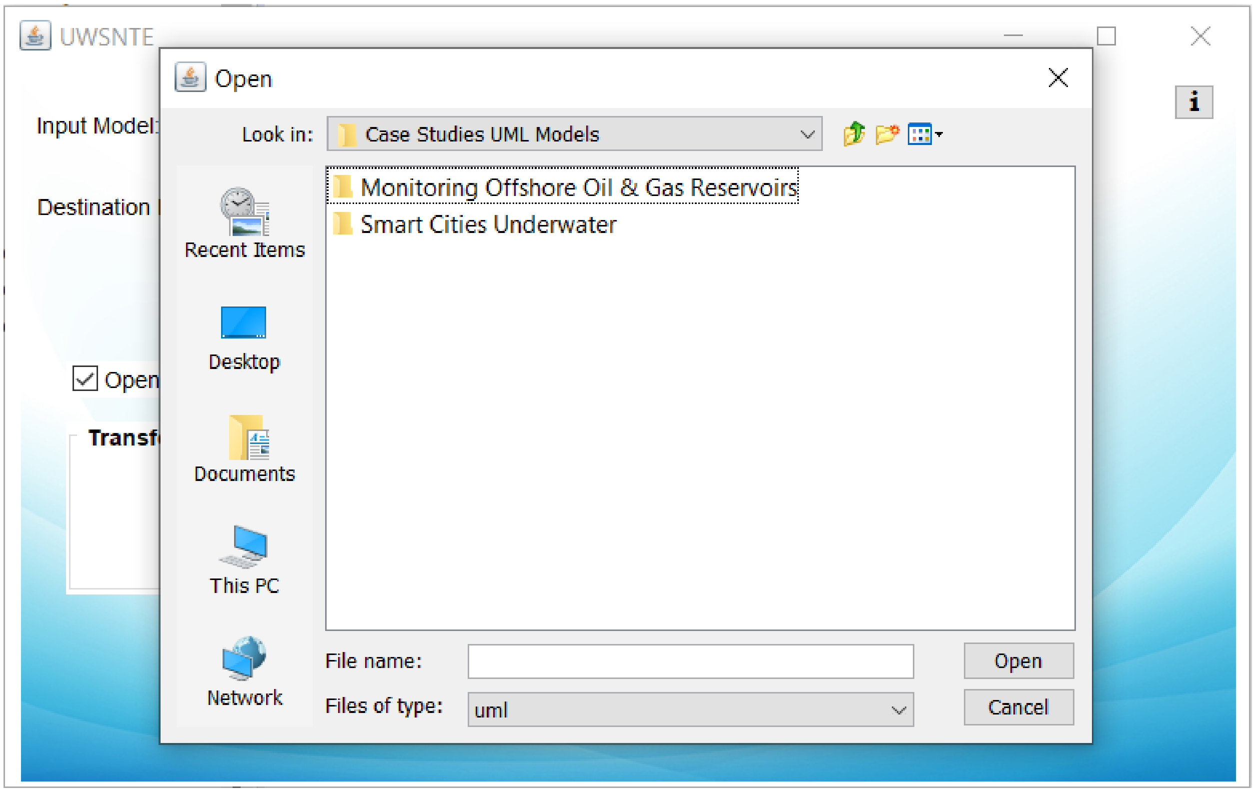
Input Model: oring Offshore Oil & Gas Reservoirs\uwsnCaseStudy.uml

Destination Folder: & Technology\Desktop\MDFUWSN\Generated Files Here

☑ Open Generated Files

Figure 6. Interface for Model to Code Transformation Engine

Input Model: Browse button is used to select the UML model for the case study.
Destination Folder: Browse button is used to specify the destination folder for the generated files.
Reset: This button clears all the current selections to defile new configurations.
Generate: This button transforms the selected UML models into the required testing artifacts. It is mandatory to fill all the above field in order to click generate button.
Transformation Status: This displays the status of current transformations i.e. List of generated files or Files Generated with Errors (in case of any problem in transformation).
Open Folder: This button is used to open the folder where output folder containing the generated files are placed.



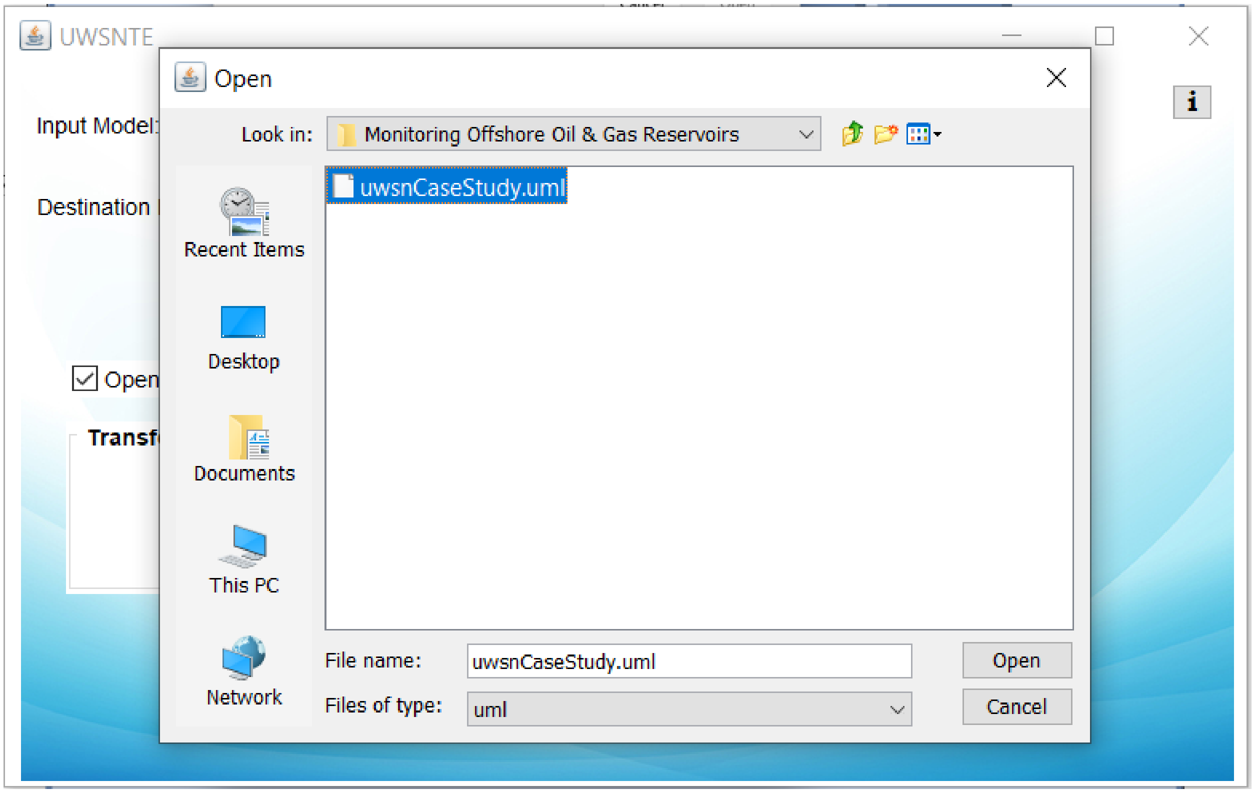
Look in: Case Studies UML Models

Monitoring Offshore Oil & Gas Reservoirs
Smart Cities Underwater

File name:

Files of type: uml

Figure 7. Selection of Case Study using browse button



Look in: Monitoring Offshore Oil & Gas Reservoirs

uwsnCaseStudy.uml

File name: uwsnCaseStudy.uml

Files of type: uml

Figure 8. Selection of UML model of Monitoring Offshore Oil & Gas Reservoirs Case study

The UML models shall be transformed into desired textual Artifacts i.e. AsciiOutput, NodeContainer. Simulator, Plotting, SetSinkNode, uanHelper, simulator etc. of the modeled UWSN in “Generated Files Here” folder as shown in **Figure *9***

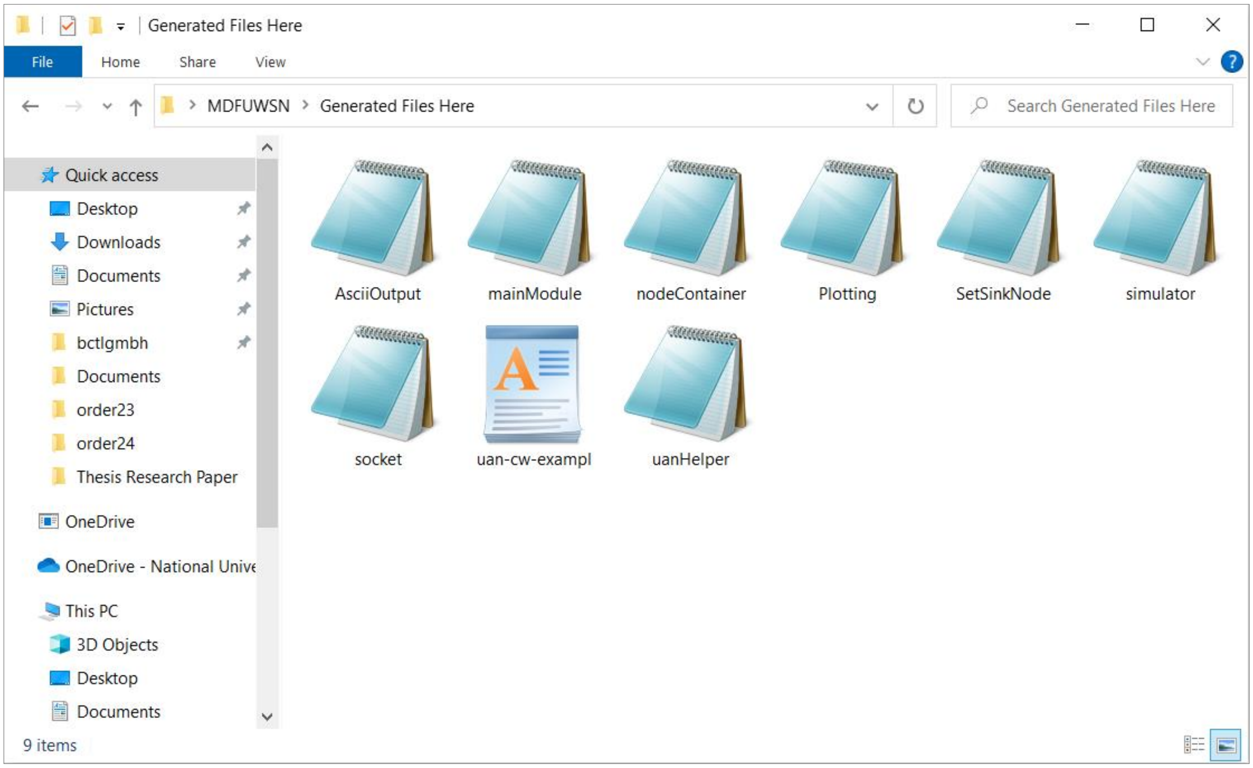
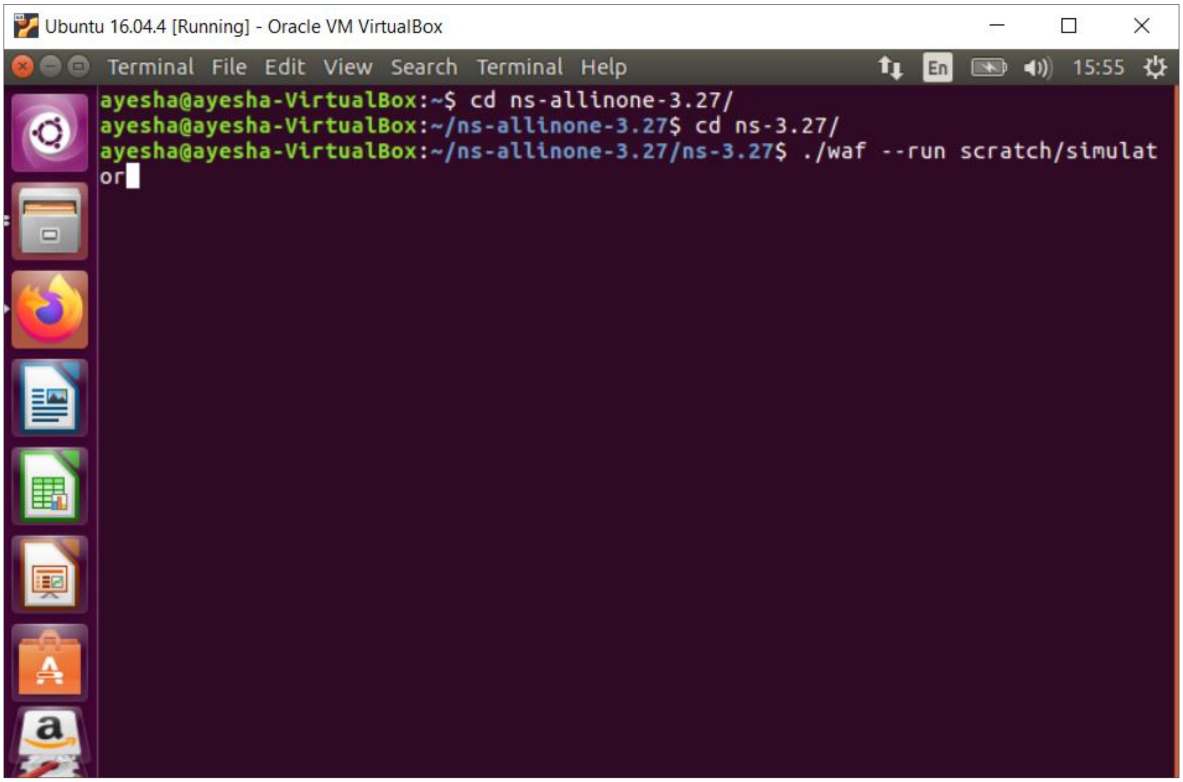


Figure 9. Generated Files of desired Textual Artifacts

3.3.Verification

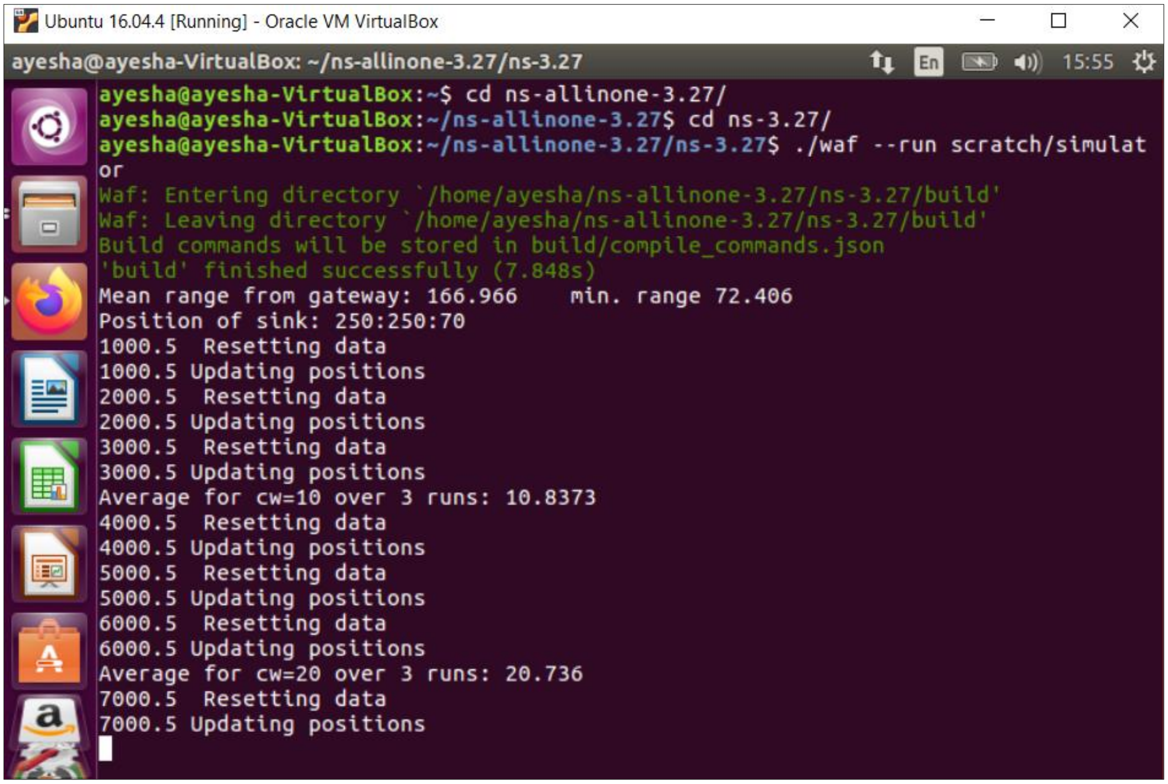
The generated code from MDFUWSN needs to be verified. Therefore, we have used AquaSim NS3 tool to perform simulation. For that we have installed Oracle VM Virtual Box, Version 6.0.14 with Ubuntu Linux, version 16.04.4.

User shall have to run the UWSN files on Terminal in Ubuntu Linux by using the --run option in Waf as shown in **Figure 10** and **Figure 101**.


Ubuntu 16.04.4 [Running] - Oracle VM VirtualBox
Terminal File Edit View Search Terminal Help
En
15:55

```
ayesha@ayesha-VirtualBox:~$ cd ns-allinone-3.27/
ayesha@ayesha-VirtualBox:~/ns-allinone-3.27$ cd ns-3.27/
ayesha@ayesha-VirtualBox:~/ns-allinone-3.27/ns-3.27$ ./waf --run scratch/simulat
or
```

Figure 10. Deployed CC code in Terminal for Offshore Oil & Gas Reservoirs Case study


Ubuntu 16.04.4 [Running] - Oracle VM VirtualBox
ayesha@ayesha-VirtualBox: ~/ns-allinone-3.27/ns-3.27
En
15:55

```
ayesha@ayesha-VirtualBox:~$ cd ns-allinone-3.27/
ayesha@ayesha-VirtualBox:~/ns-allinone-3.27$ cd ns-3.27/
ayesha@ayesha-VirtualBox:~/ns-allinone-3.27/ns-3.27$ ./waf --run scratch/simulat
or
Waf: Entering directory `/home/ayesha/ns-allinone-3.27/ns-3.27/build'
Waf: Leaving directory `/home/ayesha/ns-allinone-3.27/ns-3.27/build'
Build commands will be stored in build/compile_commands.json
'build' finished successfully (7.848s)
Mean range from gateway: 166.966    min. range 72.406
Position of sink: 250:250:70
1000.5  Resetting data
1000.5 Updating positions
2000.5  Resetting data
2000.5 Updating positions
3000.5  Resetting data
3000.5 Updating positions
Average for cw=10 over 3 runs: 10.8373
4000.5  Resetting data
4000.5 Updating positions
5000.5  Resetting data
5000.5 Updating positions
6000.5  Resetting data
6000.5 Updating positions
Average for cw=20 over 3 runs: 20.736
7000.5  Resetting data
7000.5 Updating positions
```

Figure 11. Build successfully with results for Offshore Oil & Gas Reservoirs Case study