



Figure 1: UML Class Diagram: Urban Mobility Simulator

Assignment 1 Use Cases (unaltered)

Use Case UC1: Envision real-time traffic data (fully dressed)

Scope: Urban Mobility Simulator

Primary actor: Urban Planning Department

Stakeholders and Interests:

- Urban Planning Department: Wants fast, accurate visualizations of real time data regarding the traffic situations in Wonderland.
- Mayor: Wants overall satisfaction among citizens regarding traffic.
- Citizens: Want reduced traffic congestions within the city center and city ring.

Preconditions: Urban Planning Department is authenticated into the system and all sensors necessary for gathering real-time data are available.

Success guarantee (or postconditions): The whole city is visualized in a dashboard, with real-time data about traffic and possible congestions and busy areas are clearly highlighted.

Main success scenario (or Basic flow):

1. A member of the Urban Planning Department starts their computer and logs in in the Urban Mobility Simulator.
2. The member clicks on the visualization dashboard.
3. The Urban Mobility Simulator gathers the required data and visualizes a city map.
4. The city map is updated with real-time traffic data gathered by sensors around the city.
5. Member of the department checks the visualization on traffic congestions and busy areas to see if there are any problems regarding the traffic at this moment.
6. Member of the department logs out of the system.

Extensions (or Alternative flows):

- a. At any time, one or more sensors are not working:
To support demand for information, the last possible data is visualized, clearly indicating that this is not the real-time data.
 1. Urban Planning Department calls maintenance team to go check the sensors as soon as possible.
 2. Maintenance team checks the sensors, fixes them and resets them.
 3. Urban Planning Department restarts the system.
- 1a. Department gets several calls about traffic congestions.
 1. Urban Planning Department gathers and discusses possible solutions.
 2. On short notice, they consult the police on which streets are available to redirect part of the traffic.
 3. On long term planning:
 - a. If crossroad or street has been center of attention before: they plan a project for coming up with a long term solution using stakeholder workshops.

- b. If this is the first time crossroad or street encounters problem, the particular crossroad or street will be noted as “monitor closely”.

Special requirements:

- Availability of the system 24 hours a day 7 days a week with real-time data.
- System has to be available within 2 minutes from starting up.

Use Case UC2: Envision real time environmental data (fully dressed)

Scope: Urban Mobility Simulator

Primary actor: Urban Planning Department

Stakeholders and Interests:

- Urban Planning Department: Wants insight into **environment pollution**, especially focus on CO2 levels, noise levels and pollution around Wonderland.
- Mayor: Wants overall satisfaction among citizens regarding environmental conditions in Wonderland.
- Citizens: Want to live in a healthy city and wants municipality to optimize these environmental conditions.
- Activists: Want a solution for the adverse effects of traffic congestions on the environment.

Preconditions: Urban Planning Department is authenticated into the system and **stations** in the city with real-time environmental measures are available. Also, an external company calculating environmental data for the rest of the city is available.

Success guarantee (or postconditions): The whole city is visualized in a dashboard, with real-time data about environment measures. **CO2 levels**, **noise levels** and **pollution** are clearly indicated in the city map.

Main success scenario (or Basic flow):

1. A member of the Urban Planning Department starts their computer and logs in in the Urban Mobility Simulator.
2. The member clicks on the visualization dashboard with environment details.
3. The Urban Mobility Simulator gathers the required environment measures and visualizes a city map.
4. The city map is updated with real-time **environment measures** gathered by both stations and **calculated measures** from **external organizations**.
5. Member of the department compared the real-time measures and the calculated measures.
6. The measures between real-time data and external calculations don't differ more than 3% and are therefore considered reliable.
7. Member of the department can now see environmental measures throughout the city.
8. Member of the department logs out of the Urban Mobility Planner.

Extensions (or Alternative flows)

- a. At any time, one or more stations are not working:
To support demand for information, the last possible data is visualized, clearly indicating that this is not the real-time data.

1. Department calls maintenance team to go check the stations as soon as possible.
 2. Maintenance team checks the stations, fixes them and resets them.
 3. Department restarts the system.
- b. At any time, member of the department concludes that the differences between real-time data gathered in the station is not corresponding to the calculations by the external company.
1. Member of the department calls the external company, reports the differences and asks for explanation.
 2. Member of the department calls maintenance team to check if the problem originates from the measurement stations.
 3. Calculation data cannot be trusted and assumptions based on the calculations will not be made until the mistake has been corrected by the external company or the maintenance team.
- 1 a. Activists are demonstrating in the streets of wonderland about the fact that the municipality still did not change anything about the traffic with regard to the environment.
1. The Mayor calls the Urban Planning Department, panicking about the demonstration that gets out of hand for the police. Asking the department if they can help him.
 2. The head of the department starts the Urban Mobility Simulator.
 3. Due to the environmental map, he knows that CO2-level measures has decreased over the last month. He tells the Mayor about this news.
 4. The Mayor gives a speech in front of the city hall to update the city and her activists about this wonderful decrease.

Special requirements:

- Availability of the system 24 hours a day 7 days a week with real-time data.
- System has to be available within 2 minutes from starting up.
- Difference between real-time station data and calculated measures can not be more than 3% before considered unreliable.

Use Case UC3: Compare between real-time data and historical data (casual)

Main Success Scenario: The Urban Planning Department gets numerous calls about a traffic congestion. Some citizens complain that there is always a problem with this traffic light. The Urban Planning Department start up their Urban Mobility Simulator and compare the real-time data gathered with historical data from previous days and weeks and sees there is an ongoing problem at the particular traffic light. They plan a project to come up with a solution for the traffic light problem.

Alternate scenarios:

- The citizens calling are overreacting out of frustration and the department sees that indeed there is a congestion at this moment around the traffic light. But this problem has not been encountered before. They will note this problem to monitor but will leave it as is for now.
- Historical data has not been saved correctly so that comparison cannot be made. Systems has to be checked on saving historical data in their database so that the analysis can be conducted in the future.

Use Case UC4: Analyze specific traffic situations (casual)

Main Success Scenario: There is a soccer-match scheduled on Saturday in the city of Wonderland. The Urban Planning Department knows that this will cause congestions around the stations and on the ring around the city. To redirect traffic as smooth as possible, they start up the Urban Mobility Simulator and conduct several analyses on **historical** matchdays, to see what the best solution is. The department comes up with the best approach to avoid congestions and the match and additional traffic goes smoothly.

Alternate scenarios:

- Analyses have been conducted but the other team has not been taken into account. Therefore, the department expected a congestion on street "R" based on historical data, while traffic was coming from street "A". This caused major congestions and unsatisfied crowds. Therefore, they have to take into account the right opponent next time.
- Because of the rain, there were not many citizens that were interesting in seeing the match in real-life. Therefore, there were no traffic congestions but also no point in planning the match from traffic-perspective.

Use Case UC5: Ability to add data sources (brief)

The Urban Mobility Simulator has been using environmental calculations from organization "X". Since a few weeks, there is a new organization on the market, called "Y". Their calculations have been rated 99.9% accuracy. The Urban Planning Department wants to switch contracts from company "X" to company "Y". They add the software of organization "Y" to the data sources in the Urban Mobility Simulator and can now also calculate environment measures with a 99.9% accuracy.

Use Case UC6: Available 24/7 (brief)

The head of the Urban Planning Department gets a call in the middle of the night, from the Mayor of Wonderland. The Mayor is frustrated, because he already had several phone calls from the police department saying that there has been an accident on the main highway coming from Superland to Wonderland. The Mayor wants the head of the department to check the congestion caused by the accident. The head of the department starts the system and the data is real-time, even though it is gathered in the middle of the night.

Use Case UC7: Starting up system within 2 minutes (brief)

The head of the Urban Planning Department is in a hurry because his meeting is starting in 5 minutes. The meeting he has to attend is a workshop with stakeholders in the city to solve some ongoing traffic issues. The head of the department forgot to print the data about the particular issues and still wants to do it before the meeting start. He starts up the Urban Mobility Simulator which activates and shows the real time data within 1 minute, 1 minute less than the maximum time. The head of the department is therefore 4 minutes early for his meeting.