

SYSTEM MODELING

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1 Context, stakeholder, current needs and benefits of UWC 2.0

1.1 Domain context

- Urban waste management is one of several significant issues which is faced by many countries in the world and thus considered one of the important points to be improved in Sustainable Development Goal (SDG) 11: sustainable cities and communities and SDG 6: clean water and sanitation. And attention is paid to developing countries, which prioritize the development and economic growth.
- In urban context, solid waste management is costly and ineffective.
- We are Organization X, who is contradicted to develop an information management system called UWC 2.0 in order to improve efficiency of garbage collection of Service provider Y.

1.2 Relevant stakeholders

- Back officers, who is responsible for operating a central system to create calendar, coordinate front collectors and janitors.
- Collectors, who drive different types of vehicles.
- Janitors, who manually collect garbage from Major Collecting Points (MCPs).

1.3 Their current needs

1. Back officers

- Have an overview of janitors and collectors, their work calendar.
- Have an overview of vehicles and their technical details (weight, capacity, fuel consumptions,...).
- Have an overview of all MCPs and information about their capacity. Information should be updated from MCPs every 15 minutes with the availability of at least 95% of their operating time.
- Assign vehicles to janitors and collectors.
- Assign janitors and collectors to MCPs (task).
- Create a route for each collector. Assigned route is optimized in term of fuel consumption and travel distance.
- Have the ability to send messages to collectors and janitors.

2. Collectors and janitors

- Have an overview of their work calendar.
- Have a detail view of their task on a daily and weekly basic. All important information should be displayed in one view (without scrolling down).
- Be able to communicate with collectors, other janitors and back officers. The messages should be communicated in a real-time manner with delay less than 1 second.
- Check in / check out task every day.

- Be notified about the MCPs if they are fully loaded.

3. Customer - Service provider Y

- UWC 2.0 is expected get and use the existing data of UWC 1.0. The Task Management is hoped to be interacted with the UWC 1.0 as much as possible.
- The system should be able to dealt with real-time data from at least 1000 MCPs now and 10000 MCPs in five years later.
- The interfaces of UWC 2.0 system should be in Vietnamese and hopefully can be switch to English in the future.

1.4 The advantages of UWC 2.0 for each stakeholder

1. Back officers

- The UWC 2.0 will have a real-time map about collectors and janitors as well as information of MCPs's capacity, which make the management more convinient.
- Having the software to support the daily work assignment (assigning vehicles, routes and MCPS) to collectors and janitors, optimizing the cost as well as increasing the efficiency.
- To be able to send messages to collectors and janitors with delay less than 1 second will make communication easier, allowing fast changing to vehicles and routes if any issues take place.

2. Collectors and janitors

- A detailed view of tasks for daily and weekly basic is optimized so that all important information will be showed in one view, which avoids missing necessary information.
- Knowing the vehicles and the routes that are assigned by the back officers, which avoid so many vehicles collecting garbage from same MCPS at the same time, so the work can be optimized.
- Having ability to send and receive messages between the officers and workers with minimum delay of making the information exchange to vehicles, routes, MCPs and employees status easier and faster.

2 Functional and non-functional requirementsm use-case diagram for the whole system

2.1 Functional requirements

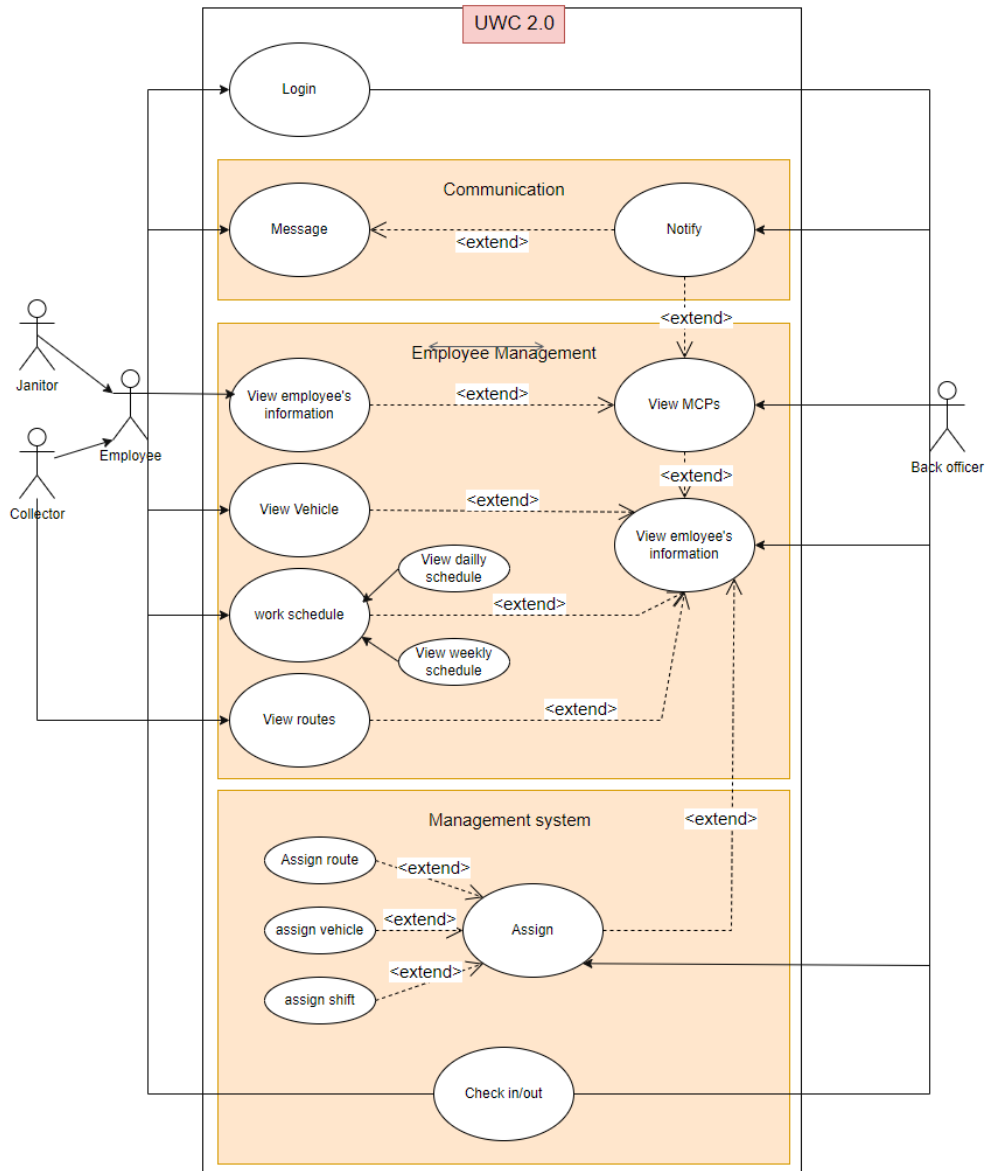
1. Back Officers can manage their employees (collectors and janitors) including see, update their information as well as their weekly schedule.
2. Back officers are able to manage the vehicles such as get, create and update the their weight, capacity, fuel consumption, ..etc.
3. Back officers are able to get the information from all MCPs (capacity).
4. Back officers can assign vehicles to janitors and collectors.

5. Back officers can create route base with given MCPs and assigned it to each collector.
6. Back officers can assign janitors to specific MCP.
7. Back officers can send messages to their employees,
8. Employees are able to see their work schedule.
9. employees are able to get their detail task daily (check in, check out).
10. Employees can communicate each others.
11. Employees are notified if the MCP is full.

2.2 Non-Functional requirements

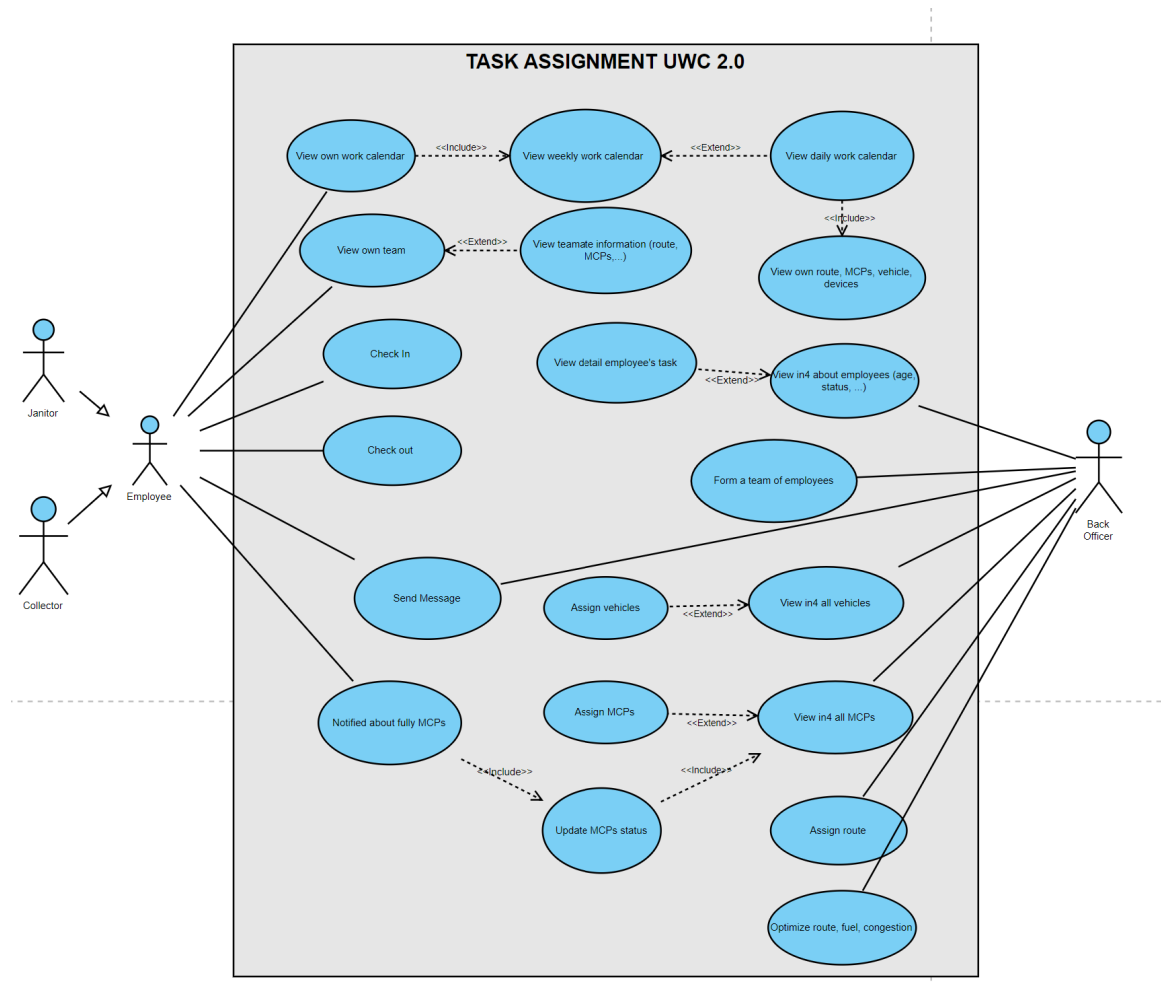
1. MCP's information must be updated after every 15 minutes and available for at least 95% of the organization operating time.
2. take advantages of map API from Google Map or leaflet,.. etc. Allow Back Officers to choose among MCPs, auto generate the shortest route, optimized for fuel consumption, time and travel distance.
3. Communication should be in real-time, with less than 1 second delay.
4. The system is able to operate all weekdays and at least 12 hours per day (from 7:00 PM to 8:00 Am).
5. System is expected to import and use the existing data from the previous system.
6. Task managements is inter-operable with the UWC 1.0 for at least 70%.
7. System is able to handle real-time data from at least 1000 MCPs now and scale up to 10000 MCPs in the next five years.
8. System interface are in Vietnamese and can also be switch to English.

2.3 General use-case diagram for the whole system



Hình 1: Use-case diagram for the whole system

2.4 Use-case diagram for Task assignment module



Hình 2: Use-case diagram for Task assignment module