SOFTWARE ENGINEERING (CO3001)

Capstone Project

"Urban waste collection aid - UWC 2.0"

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1 Task 1: Requirement elicitation

1.1 Task 1.1: Describe the domain context of Urban waste management in Vietnam. Who are relevant stakeholders? What are their current needs? In your opinion, what benefits UWC 2.0 will be for each stakeholder?

1.1.1 The domain context of Urban waste management in Vietnam:

Urban waste management is one of several significant problems faced by many countries in the world, including Vietnam. An excellent waste management is one of the important points in Sustainable Development Goal (SDG) 11: sustainable cities and communities, and SDG 6: clean water and sanitation, which are the keys to sustainable development, according to the United Nations General Assembly. However, there are some problems with the current waste management in Vietnam, especially in Ho Chi Minh City. As the infrastructure in HCM City is constantly being synchronized and strongly developed every day, which follows Part 2 of Section III in the Politburo's Resolution No 31-NQ/TW on orientations and tasks for the development of Ho Chi Minh City by 2030, with a vision to 2045, the amount of garbage that households and companies release into the environment is increasing. This leads to the practical demand of increasing the size of janitors and the appearance of some new jobs, such as back officers and collectors at MCPs. In addition, the existing software product, which is UWC 1.0, has some drawbacks that limit janitors from working efficiently. For example, it does not follow the business rules of some companies, and the route created by the software is sometimes not the most convenient one at that time. Therefore, the UWC 2.0 software will overcome those limitations and create an excellent garbage management for the city.

1.1.2 The relevant stakeholders:

The relevant stakeholders of the UWC 2.0 project include back officers, janitors, collectors, the service provider Y, the organisation X, and the super back officers. The back officers need to control the janitors and collectors. Back officers also need to have enough information of vehicles and all MCPs regularly. The janitors and collectors need to keep in contact with other workers at all time and send messages to others when in need. They also need to be informed about their work calendar and their task on a regular basis. The service provider Y needs to manage garbage collection with high efficiency. The organiser X needs to have an efficient and convenient information management system. The super back officers need to have an overview of the Task Management module and all the MCPs.

1.1.3 The benefits of UWC 2.0 for each stakeholder:

By applying the UWC 2.0 project, the stakeholders will receive many benefits. The back officers can have a better overview of janitors and collectors, as well as their work calendar. Back officers can also update the information of all the MCPs more regularly and can send messages to janitors and collectors faster. The janitors and collectors can communicate with other workers quicker and can check-in and check-out, as well as have a detailed view of their task on their work calendar on a daily and weekly basis, without scrolling down on the device. The janitors will be assigned the most convenient route and be notified about which MCP to deliver garbage. The collectors will be announced about the vehicle they use and the MCPs they are assigned regularly. The service provider Y will improve efficiency of garbage collection. The organisation X will receive a much more efficient and convenient information management system, so they can save much

time and effort. The super back officers will have a better view of the Task Management module and all the MCPs.

1.2 Task 1.2: Describe all functional and non-functional requirements that can be inferred from the project description. Draw a general use-case diagram for the whole system

1.2.1 Functional requirements:

- As a back officer:

    - A back officer shall be able to create work calendar for collectors and janitors.
    - A back officer shall be able to send messages with information about collecting route and time to collectors and janitors.
    - A back officer shall be able to assign vehicles janitors and collectors.
    - A back officer shall be able to assign calendar and tasks for each team of janitors
    - A back officer shall be able to assign route for each vehicles to use.
    - A back officer shall be able to get information of vehicles technical details(weight, capacity, fuel consumption).
    - A back officer shall be able to know MCPs position, scope and information about their capacity.

- As a collector:

    - A collector shall be able to know his/her work calendar.
    - A collector shall be able to have a detail knowledge of his/her task on a daily and weekly basis.
    - A collector shall be able to send messages to or call other collectors, janitors and back officers.
    - A collector shall be able to check in, check out task every day.
    - A collectors shall be able to know which troller to use to collect garbage.
    - A collector shall be able to know which Major collecting points assigned to his/her.

- As a janitor:

    - A janitor shall be able to know his/her work calendar.
    - A janitor shall be able to have a detail knowledge of his/her task on a daily and weekly basis.
    - A janitor shall be able to send messages to or call other collectors, janitors and back officers.
    - A janitor shall be able to check in, check out task every day.
    - A janitor shall be able to know which vehicle to use.
    - A janitor shall be able to know which route assigned to him/her.
    - A janitor shall be able to know which MCP to pick garbage from.
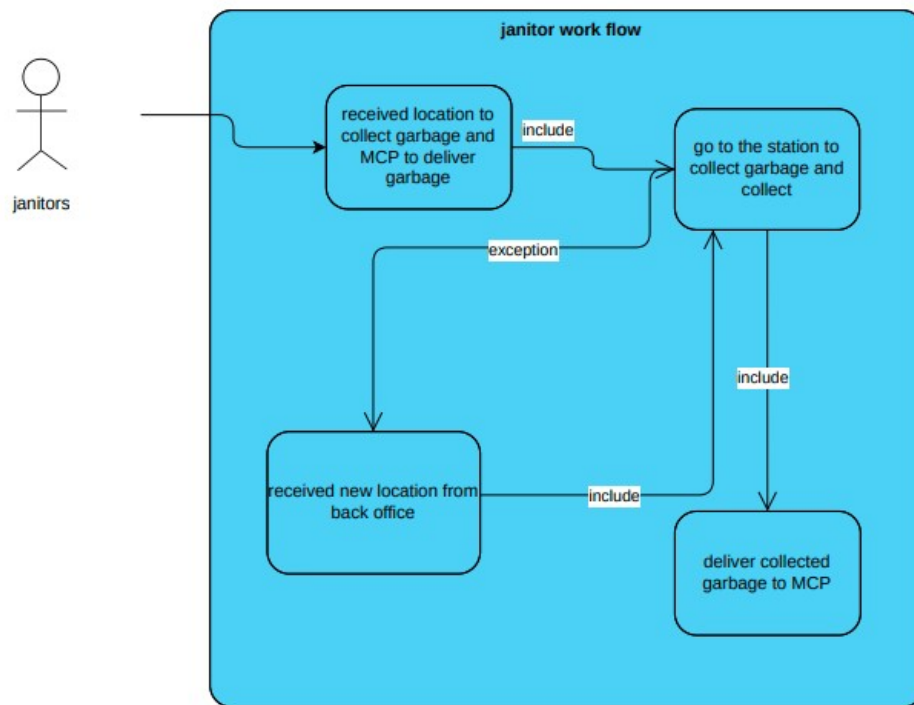
1.2.2   Non-functional requirements:

- Communication between janitors, collectors and back officers via message or call should be in real-time manner with delay less than 1 second.

- All important information about collector's and janitor's task should be displayed in one view (without scrolling down).

- UWC 2.0 is expected to import and to use the existing data from UWC 1.0.

- Task Management need to be inter-operable with the UWC 1.0 as much as possible.

- The system should be able to handle real-time data from at least 1000 MCPs at the moment and 10.000 MCPs in five years.

- UWC 2.0 system interfaces should be in Vietnamese.

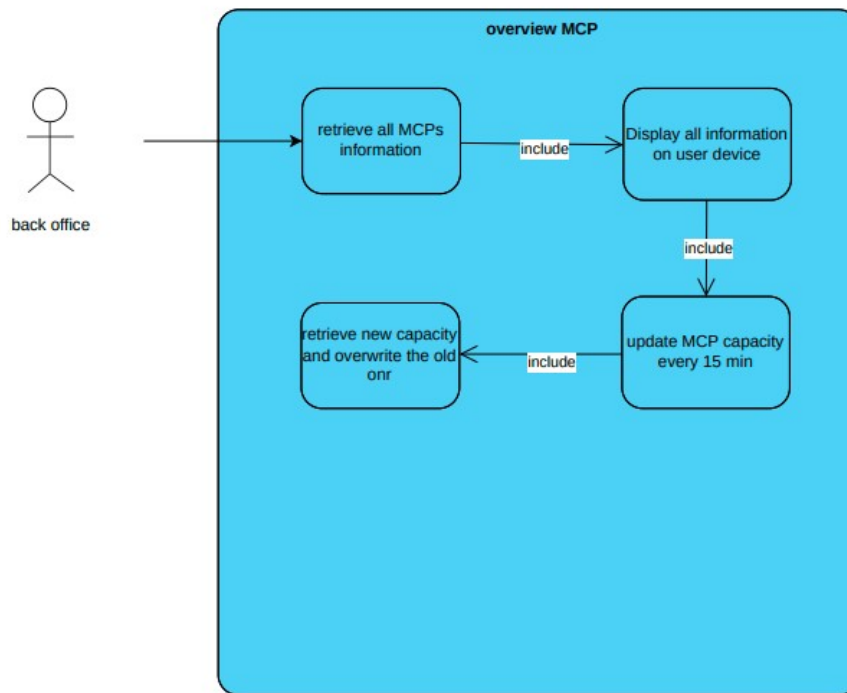### 1.2.3 General use-case diagram for the whole system:
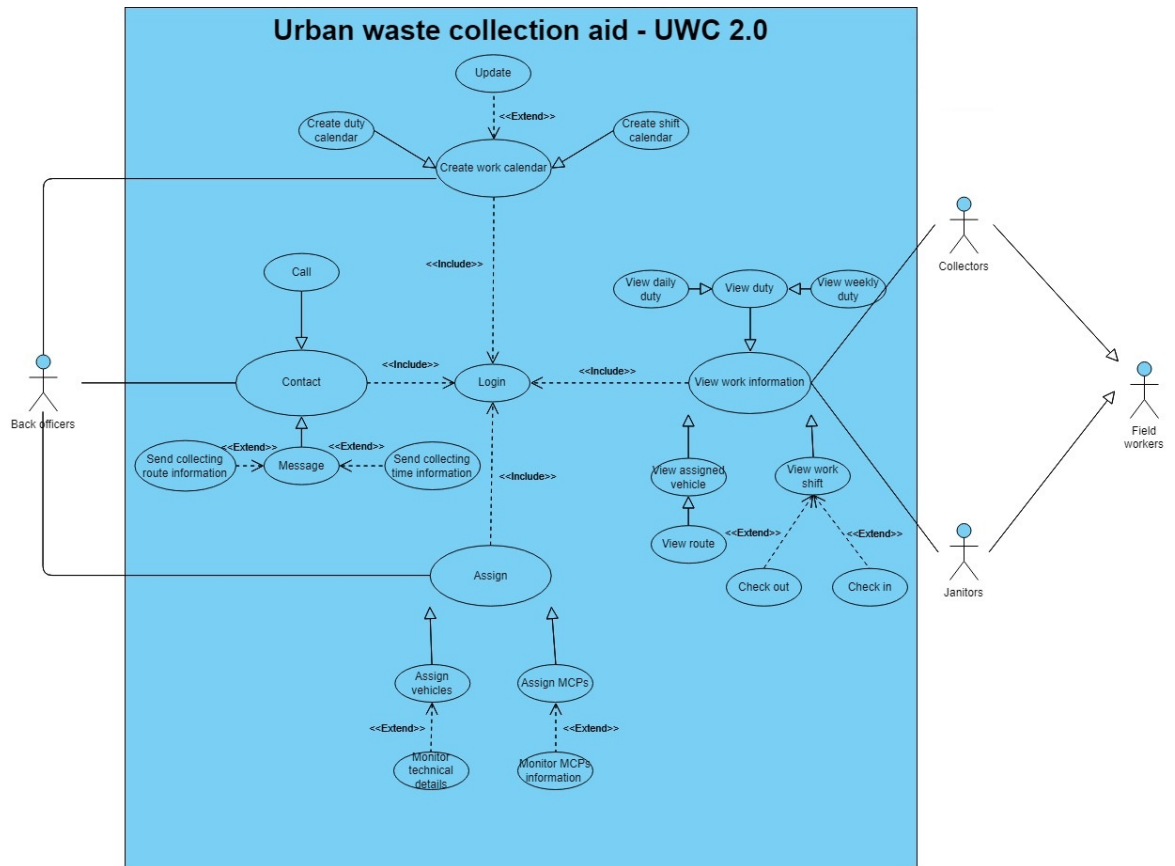
1.3   Task 1.3: For the Task assignment module, draw its use-case diagram and describe the use-case using a table format
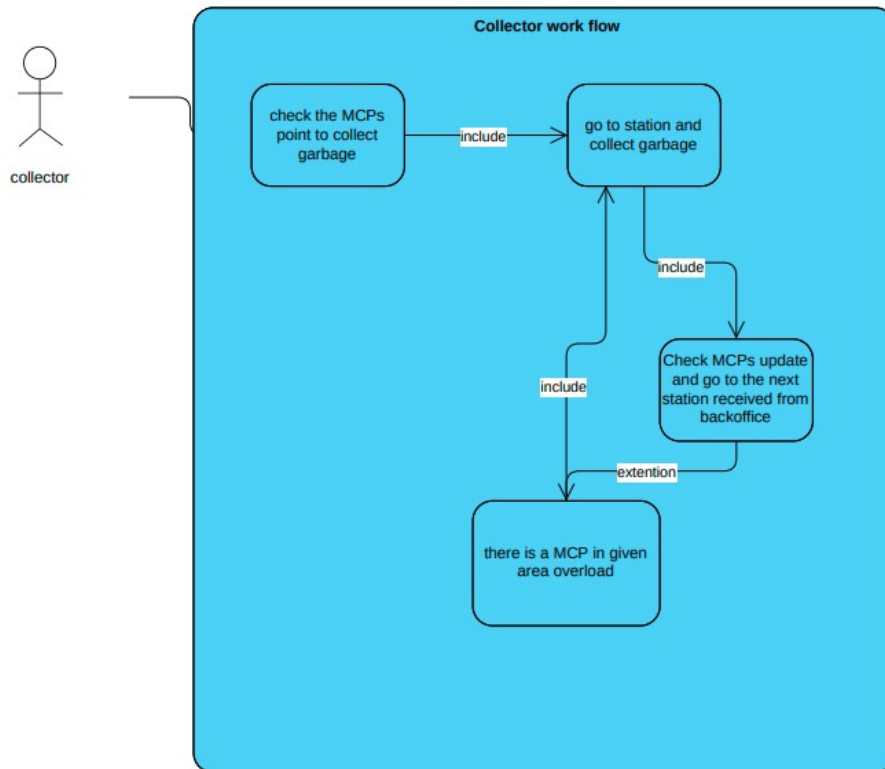
1.3.1   Janitor's workflow

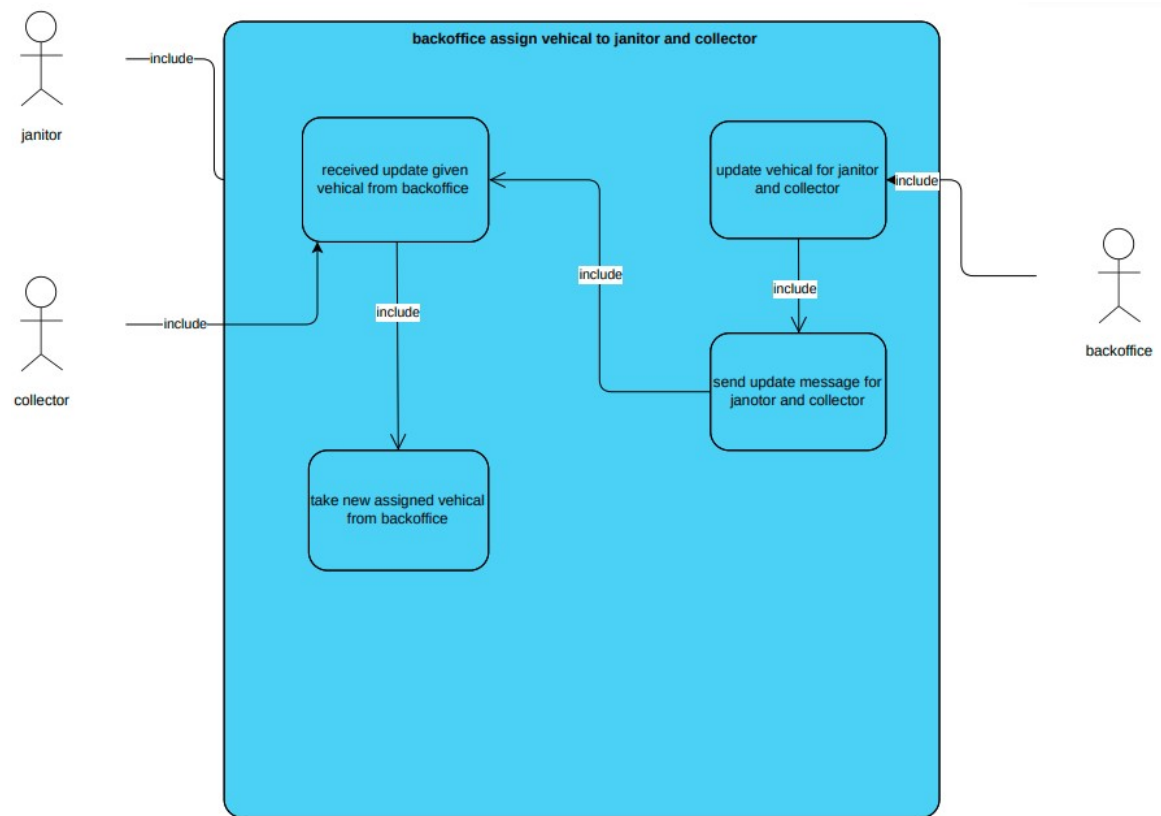| Use-case ID	U1
Use-case name	Janitor work.
Use-case overview	Janitor work flow in day.
Actors	Janitors
Preconditions	1. Must not in holiday. 2. The back officers sent work location.
Trigger	None
Steps	1. Received location to collect garbage and MCP to deliver garbage. 2. Go to the station to collect garbage and collect. 3. Deliver garbage collected to MCP.
Post conditions	The garbage collected must be clean.
Exception flow	E1: janitor don't have any troller to work.

1.3.2   Overview MCP

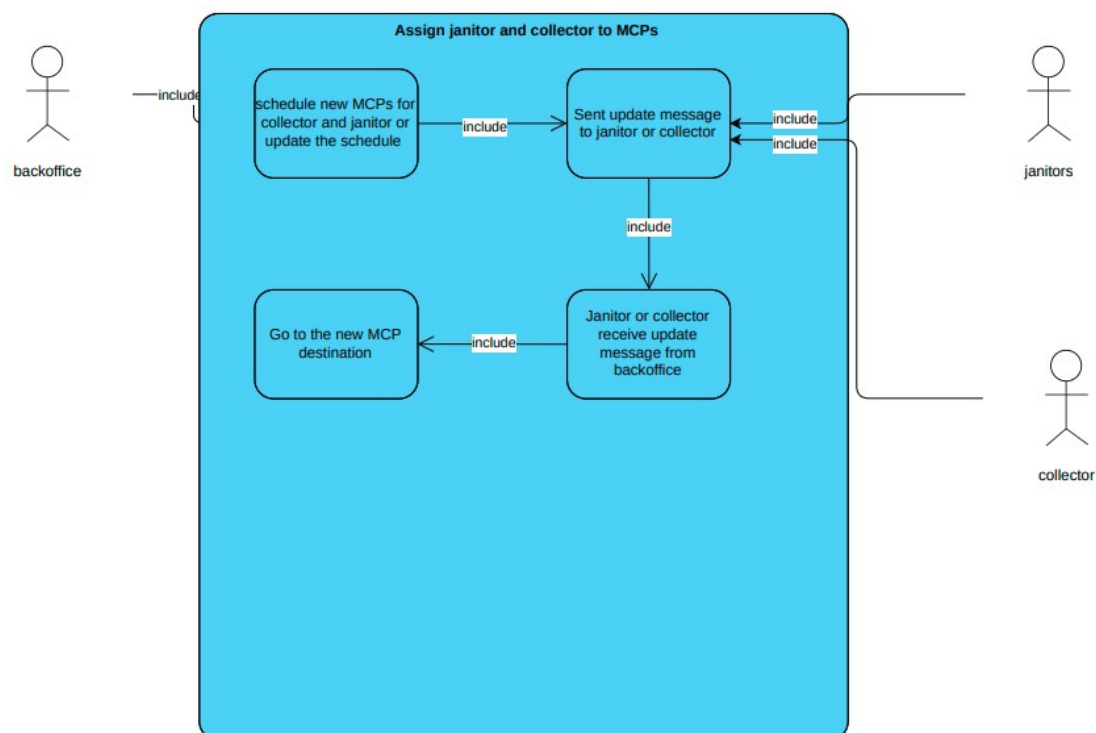| Use-case ID	U2
Use-case name	Overview MCP.
Use-case overview	To provide information about Major collecting points (MCPs) and their current capacity.
Actors	Back officers.
Preconditions	1. System is running. 2. Database is connect to MC. 3. Internet available.
Trigger	User click MCP overview button.
Steps	1. Retrieve all MCP information. 2. Display all information on user device. 3. Update MCP capacity every 15 min then retrieve capacity from database and overwrite it.
Post conditions	Information display on the screen of user's device and update every 15 minutes.
Exception flow	E1: Collector don't have any vehicle to work.

1.3.3   Collector workflow

Use-case ID	U3
Use-case name	Collector work.
Use-case overview	Provide and overview about collector work flow.
Actors	Collectors.
Preconditions	1. There must exist free vehicle. 2. Must not on holiday.
Trigger	None.
Steps	1. Check the MCP point to collect garbage. 2. Go to the MCP point the collect all garbage from janitors. 3. Check updated MCPs point, given MCPs point and go to the next place.
Post conditions	Not miss any given MCP.
Exception flow	None.

1.3.4 Back officers assign vehicle to janitors and collectors

Use-case ID	U4
Use-case name	Assign vehicle.
Use-case overview	Back officers assign new vehicles for janitors or collectors when their old vehicles got in trouble.
Actors	Back officers, collectors, janitors.
Preconditions	1. There must exist free vehicle.
	2. Internet must be available.
Trigger	Some janitors or collectors don't have any vehicle to work.
Steps	1. Janitors update assigned vehicle for everyone.
	2. Send update messages to janitors and collectors.
	3. Janitors and collectors received message from back officers.
	4. Collectors and janitors using new vehicle.
Post conditions	Every janitor and collector working must have a vehicle.
Exception flow	E1: Internet not available.
	E2: No free vehicle.

1.3.5 Assign janitors and collectors to MCPs

Use-case ID	U5
Use-case name	Assign MCPs.
Use-case overview	Assign new MCPs for collectors and janitors.
Actors	Back officers, collectors, janitors.
Preconditions	Internet must be available.
Trigger	Some areas are too dirty (have too many garbage) so the people there are not enough.
Steps	1. Schedule new MCPs for collectors and janitors or update the MCP.
	2. Send updated messages to janitors and collectors.
	3. Janitors and collectors received message from back officers.
	4. Collectors and janitors go to new MCPs.
Post conditions	None.
Exception flow	E1: Internet not available.