COMP 3005 – Assignment 1

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Part 1

a. No, software by itself is not inherently safe or unsafe; its safety depends on the context in which it is used.
b. Safety should come into play from the beginning of software development by emphasizing the identification of safety-critical requirements from the start.
c. Reusing software does not necessarily guarantee safety, as safety depends on the specific context in which the software is used because safety is a quality of the system the software is used in, not the software itself.
d. Object-oriented technology is suitable for data-oriented systems but may not be appropriate for control-oriented systems. The choice of technology alone does not determine the safety of software.
e. It is better to first implement error-handling behavior and then normal behavior to prioritize safety-critical aspects and ensure that the system can handle errors effectively.

Part 2

Use Case 1: Install the elevator
Primary Actor: Elevator Island (company installing the elevator)
Scope: Elevator to be installed
Level: Summary
Stakeholders and Interests:
Elevator installation company- Install the elevator such that elevator will remain functioning and safe for an extended period.
Municipality- Needs to verify that all elevators installed within the local region comply to law and regulations to always ensure safe operation of passenger-carrying elevators.
Local fire department- Elevators have to adhere to safety standards to ensure standard procedure is kept in the case of an emergency, so that the fire department has easy access to the elevator cars when an emergency rescue is required.
Precondition: Elevator shaft already framed according to architectural drawings
Main success scenario:

1. Perform ***"Use Case 2: Install the elevator bracket"***.
2. Perform ***"Use Case 3: Install elevator entrances".***
3. Perform ***"Use Case 4: Install elevator cab and conduct final tests"***.

Use Case 2: **Install the elevator bracket**
Primary Actor: Elevator bracket installers
Scope: Elevator brackets, elevator shaft
Level: User goal
Stakeholders and Interests:
Elevator shaft installers- Install the elevator brackets with perfect precision.
Elevator installation company- Have the brackets be installed as part of the larger goal to install a fully functioning and safe elevator.
Precondition: Elevator shaft already framed according to architectural drawings
Main success scenario:

1. Install the spot brackets at the topmost part of the elevator shaft.
2. Drop a plumb line to the elevator pit to accurately line up the lower brackets with the spot brackets from up top.
3. Repeat the rail bracket installation from floor-to-floor and side-to-side until all brackets are in place.
4. Attach guide rails.
5. Install computerized motion control system.
6. Install elevator car sling (foundation for the elevator cab)

Extensions:
2a. Plumb line is dropped with a 12lbs weight to mitigate sway over long distances.
2b. Rail brackets must be perfectly aligned to the tolerance of 1/64 inch. If not, realign the rail brackets before moving on to the next steps.
4a. Guide rails are aligned with a 1-ton chain hoist.
5a. Also install a temporary run box to move and test the platform while under construction.

6a. Car sling must be put in square, level, and plumb to marry it up to the previously installed pistons and rails. If not, readjust car sling before proceeding.

Use Case 3: **Install elevator entrances**
Primary Actor: Elevator entrance installers
Scope: Elevator entrances on each floor
Level: User goal
Stakeholders and Interests:
Elevator shaft installers- Install the elevator entrance with perfect precision.
Elevator installation company- Have the entrances be installed as part of the larger goal to install a fully functioning and safe elevator.
Precondition: Elevator brackets and guide rails must be installed up to specifications.
Main success scenario:

1. Make precise measurements and install struts that guide the entrances at each landing.
2. Hoist-way sills are placed on each level with perfect alignment.
3. Headers are placed along the top of entrances of each level.
4. Door boxes are installed on each level, secured from the top and bottom to strict and exact specifications.
5. Install landing doors on landing headers of each level, resting on smooth rolling casters.

Extensions:
1a. Precision must be within the tolerance of ¼ inch to the elevator rails. Otherwise, collision will occur when elevator is operational. Readjust brackets and struts to ensure ¼ inch tolerance before proceeding with installation.
2a. Must be in perfect alignment with the cab capsule.
5a. Landing doors are kept in a track with the hoist-way sill using gibbs (guides)

Use Case 4: **Install elevator cab and conduct final tests**
Primary Actor: Elevator cab installers
Scope: Elevator cab capsule
Level: User goal
Stakeholders and Interests:
Elevator cab installers- Install the elevator cab with perfect precision.
Elevator installation company- Have the elevator cab capsule be installed as part of the larger goal to install a fully functioning and safe elevator.
Precondition: Elevator brackets and guide rails must be installed up to specifications. As well, elevator entrances must be ready on each floor.
Main success scenario:

1. Join the sides and interior wall.
2. Unpack dome and ceiling to finish the top of elevator.
3. Strike columns and return columns are assembled on the front of the car.
4. Dome is attached to the top of the car.
5. Door control and motor drive unit is joined to the front walls and dome.
6. Cab assembly is completed.
7. Cab door is moved into position, attached to the door operator.

8. Door clutch assembly attached to cab door and adjusted.
9. Door lock/unlock mechanism is installed and adjusted.
10. Door obstacle sensors installed.
11. High and low voltage electrical control system installed.
12. Complete inspection of all elements inside the shaft.
13. Command protocols are programmed into the computer.
14. Elevator is turned over to fully automatic control.
15. Tidying and painting is done.

Extensions:

3a. Control panel is also installed in the columns of the car (computer interface, aux control key switches, fire services, call registration button).

6a. Tighten all parts.

6b. Double-check for square and anchor the platform to final positions.

7a. Adjustments are made until door is running smoothly. Fasten gibbes (guide aligners) to align cab door with the capsule.

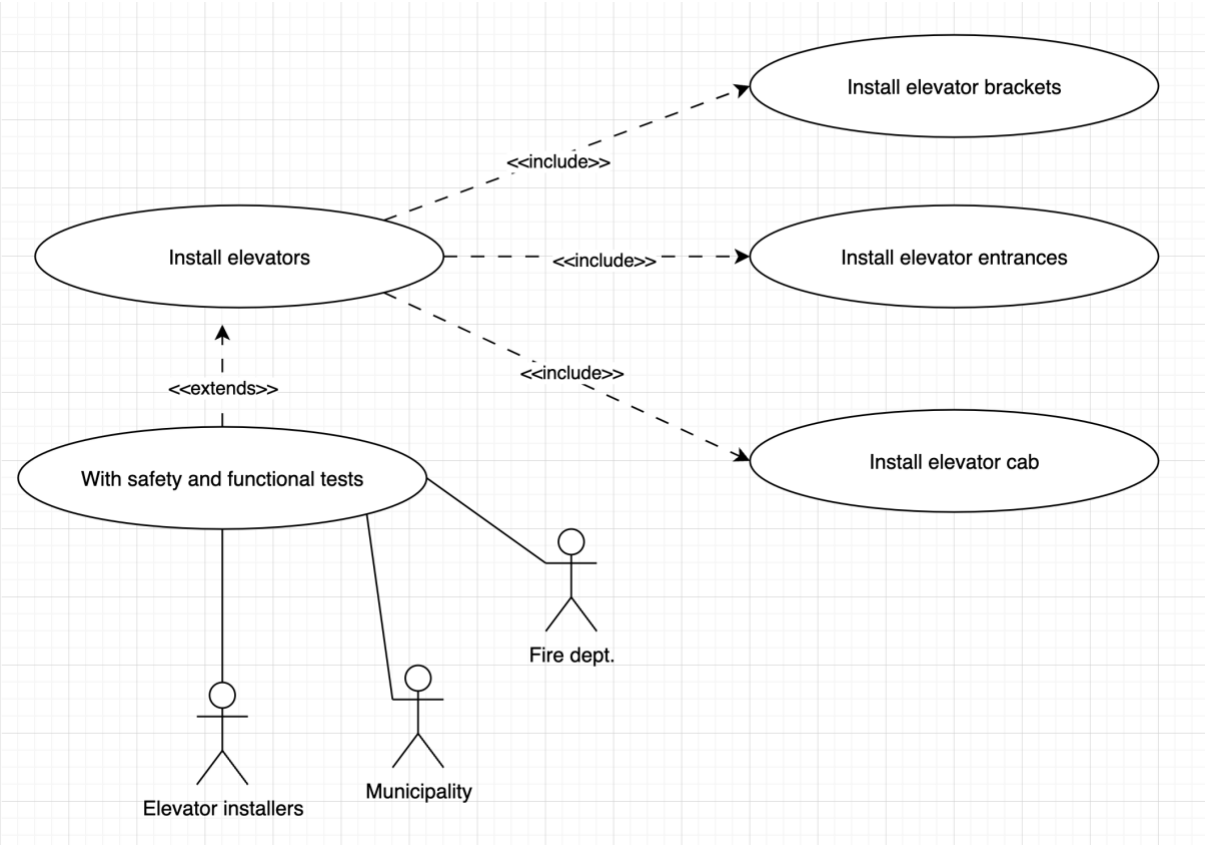
11a. Control computer is installed and wired into the cab. Remove jumper cables allowing manual control, remove temporary run box.

12a. Minor adjustments with door latch and sensors are corrected/repaired before moving on.

12b. Valve is adjusted to control speed of elevator such that exact specifications are met.

14a. Door switches, buttons, and controls are fully tested to ensure smooth operations.

14b. Fire safety systems are checked to make sure elevator performs safe shutdown protocol.



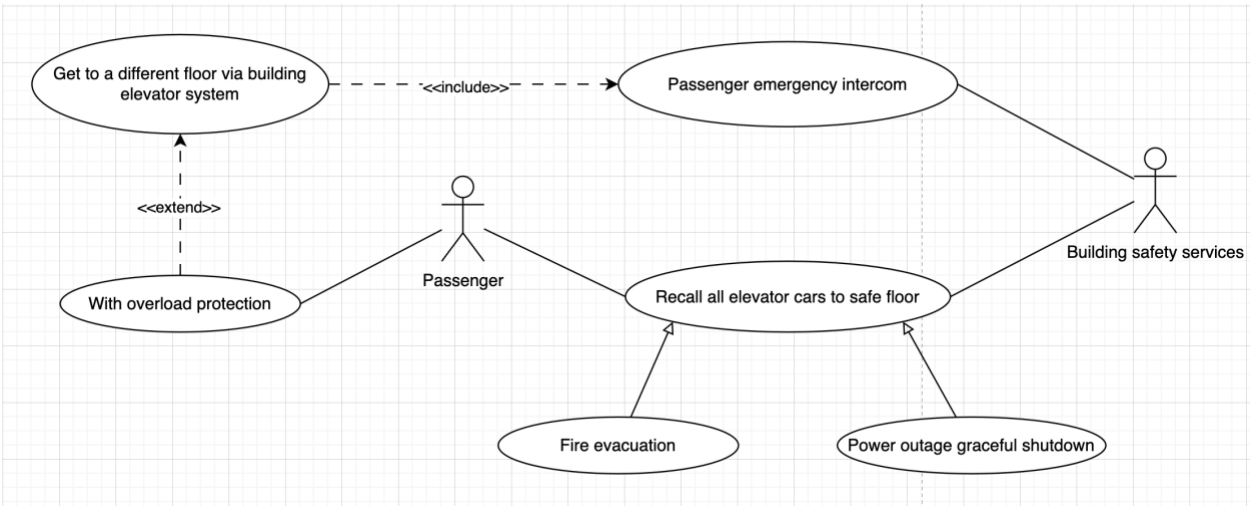
Part 3

Use Case 1: Board the elevator to get to a different floor

Primary Actor: Customer of the building (passenger)
Scope: Elevator cars of the building
Level: User goal
Stakeholders and Interests:
Customers- Get from one floor to another in the shortest amount of time as possible
Building safety services- Ensure the safety of building customers by receiving help calls or having access to elevator status at all times
Precondition: Elevators are in service
Minimal guarantee: Customers/passengers are safe from physical harm
Main success scenario:

1. User presses either the "UP" or "DOWN" arrow button on their current floor.
2. Elevator control system uses optimized algorithm to calculate which of the M elevator cars to dispatch to the user's floor.
3. Elevator arrives, rings the bell, and user (or users) gets into the elevator.
4. Elevator doors close after a set delay (e.g. 5 seconds).
5. On-board passengers select one (or more) destination floors on the floor buttons panel in the elevator car.
6. Elevator starts travelling to the closest next floor.
7. Elevator arrives at destination floor, reads the floor number, and opens the door.

Extensions:
3a. If elevator mass sensor detects too much load, an "Overload" indicator light and buzzer will go off, informing passengers to reduce load until an acceptable level before attempting to move again.
4a. If the "open" button in the elevator car is held, the doors will be overridden to stay open for longer
4b. If the "close" button in the elevator car is pressed, the doors will attempt to close prematurely (if there are no obstacles blocking the doors)
4c. If the door sensors detect an obstacle preventing the doors from closing,
6a. If the help button is pressed, notify the building safety services control room. The passenger is connected through a voice channel to building safety services. If no acknowledgement is received from either sides, then an automatic call to 911 is placed.
6b. Elevator displays the current floor level and beeps each time it enters a different floor.
1-7. If the elevator system receives a "Fire" signal, it recalls all elevators to a safe floor. Fire alarm goes off in all elevator cars, and doors open. Text display notifies all passengers to disembark.
1-7. In the event of a power outage, power is switched to auxiliary backup power. Elevators are recalled to a safe floor, doors open, and passengers are notified to disembark.


Get to a different floor via building elevator system
<<include>>
Passenger emergency intercom
<<extend>>
Passenger
Building safety services
With overload protection
Recall all elevator cars to safe floor
Fire evacuation
Power outage graceful shutdown