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Project Group 22

Self-Assembling Off-World Colony

Requirements Definition

Functional Requirements

- The system shall authenticate the supervisor's credentials before access.
- The system shall display a list of commands.
- The system shall display reports.
- The system shall display what it has carried out with the rovers and the assembly colony.
- The system shall report and display the rovers' location, data, and action information.
- The system shall report and display the assembly colony's location and data on environmental and colony needs.
- The system shall display its connection strength with the communication satellite.
- The system shall alert supervisor when there is a weak connection with the communication satellite.
- The system shall display the option for the supervisor to override the system itself in cases of emergency.
- The system shall display the the list of components that have been assembled on the colony.
- The system shall record and keep track of assembled components.
- The system shall display diagnostics ran on the assembly colony.

Non-functional Requirements

- The system shall authenticate the supervisor within 10 seconds.
- The system shall update and display the rovers' location, data and action information in real time.
- The system shall update and display the assembly colony's location and data on environmental and colony needs in real time.
- The system shall update and report on its connection strength with the communication satellite in real time.
- The system shall display the the list of components that have been assembled on the colony from within the last minute.
- The system shall display diagnostics ran on the assembly colony from within the last minute.
- The system shall create and display reports when requested by the supervisor within 5 seconds.

Use Cases

Use Case 1: Off-World Colony Aquatic Planet Operation

Actors:

- The self assembling colony
- Home base - Human Supervisor
- Waterbound Rovers
- Satellite

Pre-Conditions:

- The self assembling capsule will have landed on another planet on the waters surface.
- The capsule will have all necessary components to start the assembly process.
- Communications with the base on Earth will be established to notify the home base that it has landed safely and begun building the colony.

Post-Conditions:

- Capsule will be fully established and operational on the water's surface
- The colony will be sectioned into 'tiles' where each tile will contribute something to the colony, there will be tiles for:
    - Growing hydroponic crops
    - Generating clean water
    - Generating renewable energy
    - Communication with the home base
    - Living quarters for humans
- Each section of the colony will be afloat and be able to sustain human life (have breathable air and be stabilized).

Flow of Events:

- Upon landing on the water's surface the self-assembling capsule will begin to unpack itself and begin the process of assembly.
- Drones will be dispersed in the surrounding water to gather information about the environment.
- The colony will begin sectioning itself off into buoyant tiles that each serve a different purpose for sustaining life.

- While assembly is undergoing, it will be communicating directly with the home base with updates on the process.
- When assembly is complete it will notify the home base and do routine maintenance checks on each tile of the base.

Use Case 2: Long Day/Night cycle planet

Actors:

- Supervisor
- Rovers
- Self-Assembler
- Satellites

Preconditions:

- User is on a hospitable habitat
- User has obtained a location that can be built on
- User's colony would be built on a celestial body that has extremely long days and nights. (like on Venus one day is 243 Earth days)
- User has contact with assembler via satellites
- User can perform the construction using the software
- User qualified and trained to perform the construction

Post conditions:

- The Self Assembler has built the colony
- The colony has been equipped with power, water and breathable air
- The colony has been modified to handle the long nights
- The colony is ready for colonists

Flow of events:

- Research is done to find habitable celestial body
- Self-assembler is sent to the planet to colonize
- Surface location is scouted by rovers to find the most optimal building location
- Self-assembler lands on that location
- Supervisor has established contact with the self-assembler
- Supervisor oversees the construction process
- Assembler builds the outer shell and the inside is now safe from outside weather

- Assembler now sets up the renewable power supply since nights are long it will rely on geothermal power, wind power and hydroelectric power
- Assembler sets breathable air system
- Assembler sets up clean water
- Supervisor performs safety check via the rovers and checks the safety gages to make sure everything is within the proper safety guidelines
- Colonists land on the colonized planet and settle into their new home

Use Case 3: Regulating oxygen levels and temperature due to solar flare

Actors

- Human supervisor
- Rovers
- Self-Assembler System
- Satellite

Preconditions

- Supervisor is observing that colony's oxygen levels and temperatures are threatened by solar flare.
- Solar flare has damaged the satellite
- Supervisor sees that the rovers nor the system have detected this solar flare.
- Supervisor is authorized, qualified, and trained to issue commands to the system directly.
- System is ready to receive commands from the Supervisor.

Post conditions

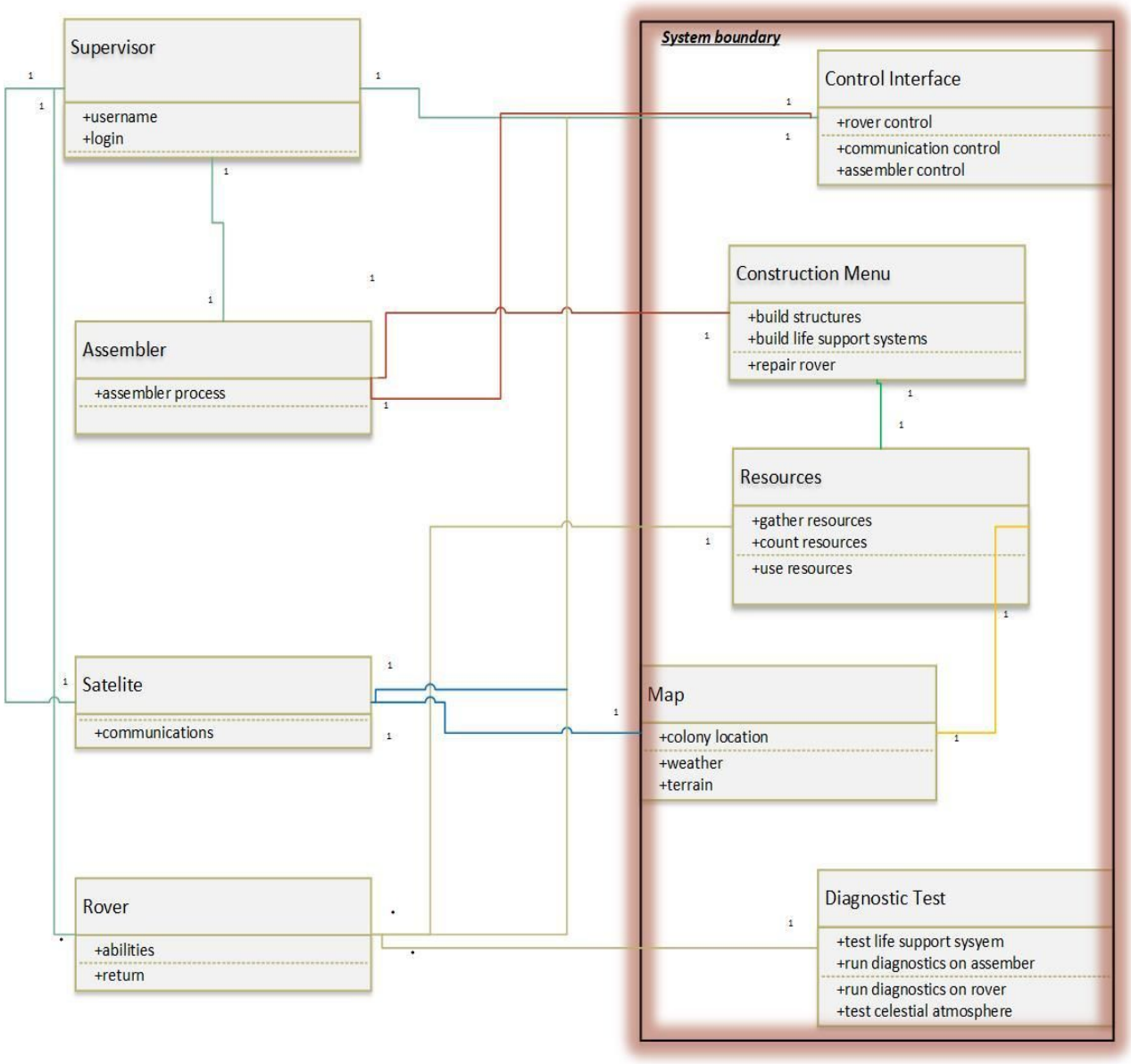
- Supervisor has issued commands to the system.
- System followed supervisor's commands to aid in the regulation of the colony's oxygen levels and temperatures.
- Rovers have followed the system to help regulate oxygen levels and temperatures.
- Colony's oxygen levels and temperatures are regulated and is now hospitable again.
- Supervisor has sent a replacement satellite and communication between rovers and system has been restored.

Flow of events

- Supervisor will take control over system and follow procedure on what the system should be instructed to do in the case of a solar flare
- Supervisor remains observant of the system and the drones to ensure plan is executed.

- System will then communicate with drones on what needs to be done to regulate oxygen levels and temperatures.
- The drones will go to the colony to realize oxygen and temperature regulation.
- Oxygen and temperature has been regulated and Supervisor sends a new satellite.
- With replacement satellite, communication between rovers and system has been restored.

UML Class Diagram



Requirements Specification

Functional Requirements

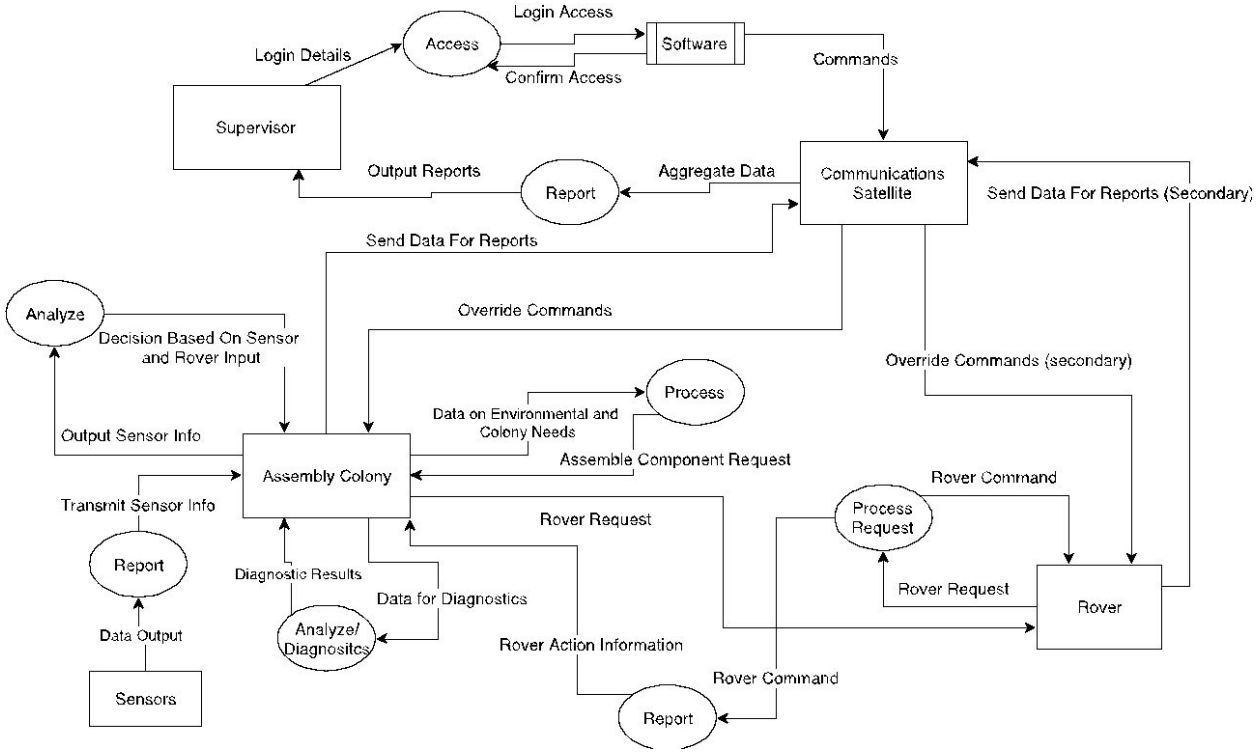
- The supervisor login details will be checked against the information of allowed users on the software's database.
- After the supervisor's login input succeeds, the system will display the list of commands.
- The system will autonomously direct the rovers and assembly colony.
- The system will communicate with the rovers and assembly colony via the communication satellite.
- The system's software will detect the rovers' and assembly colony's location, plot the locations, and graphically present it for the supervisor's readability on the interface.
- The system's software will detect and log the rovers' data and action information, parse the log, and translate the log into a presentable display for the supervisor.
- The system's software will detect and log the assembly colony's data on environmental and colony needs, parse the log, and translate the log into a presentable display for the supervisor.
- The system will run diagnostics on the assembly colony.
- The system will detect its connection with the communication satellite.
- When the supervisor selects command to override, the system will give up control and allow the supervisor to make decisions for the rovers and assembly colony.

Non-functional Requirements

- The system will query the database and return a user authentication response in less than 10 seconds.
- The system will update the rovers' and assembly colony's data every second.
- The system's software will detect and log the assembly colony's data on environmental and colony needs, parse the log, and translate the log into a presentable display for the supervisor.
- The system will run diagnostics on the assembly colony every minute.
- The system will create reports in at most 5 seconds.

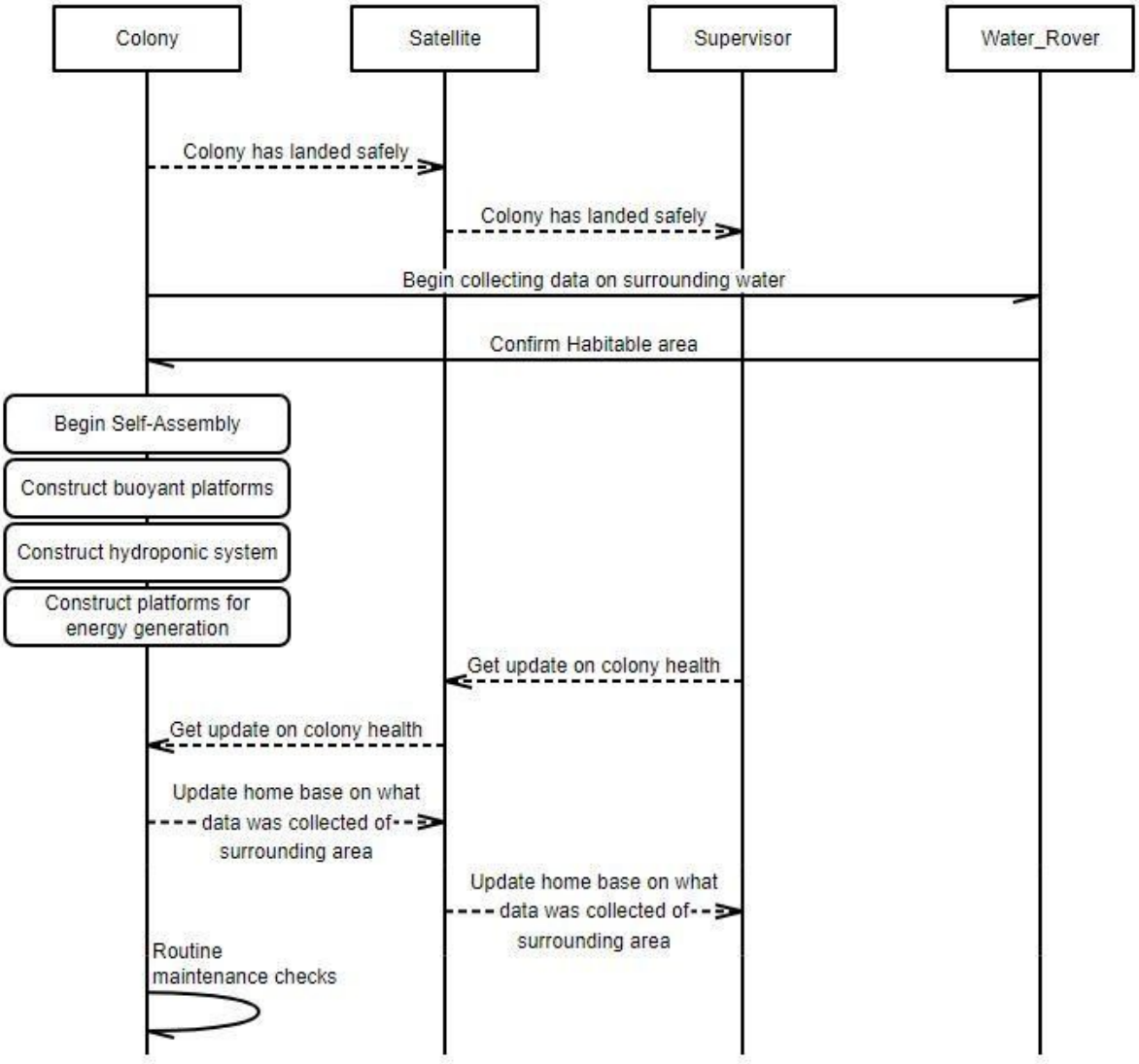
The system will detect its connection with the communication satellite every second.

Data Flow Diagram

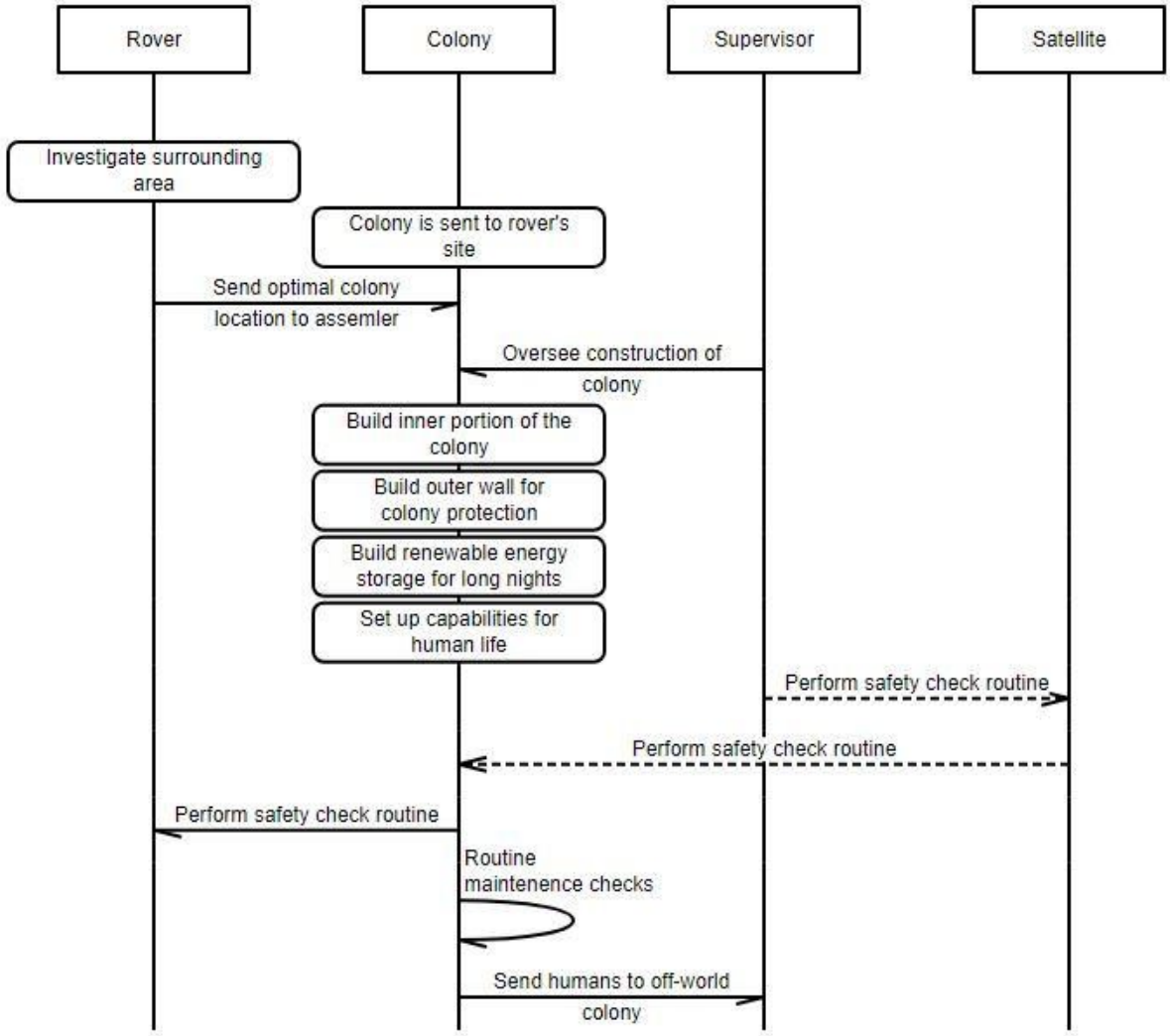


State Charts for the 3 most important use cases

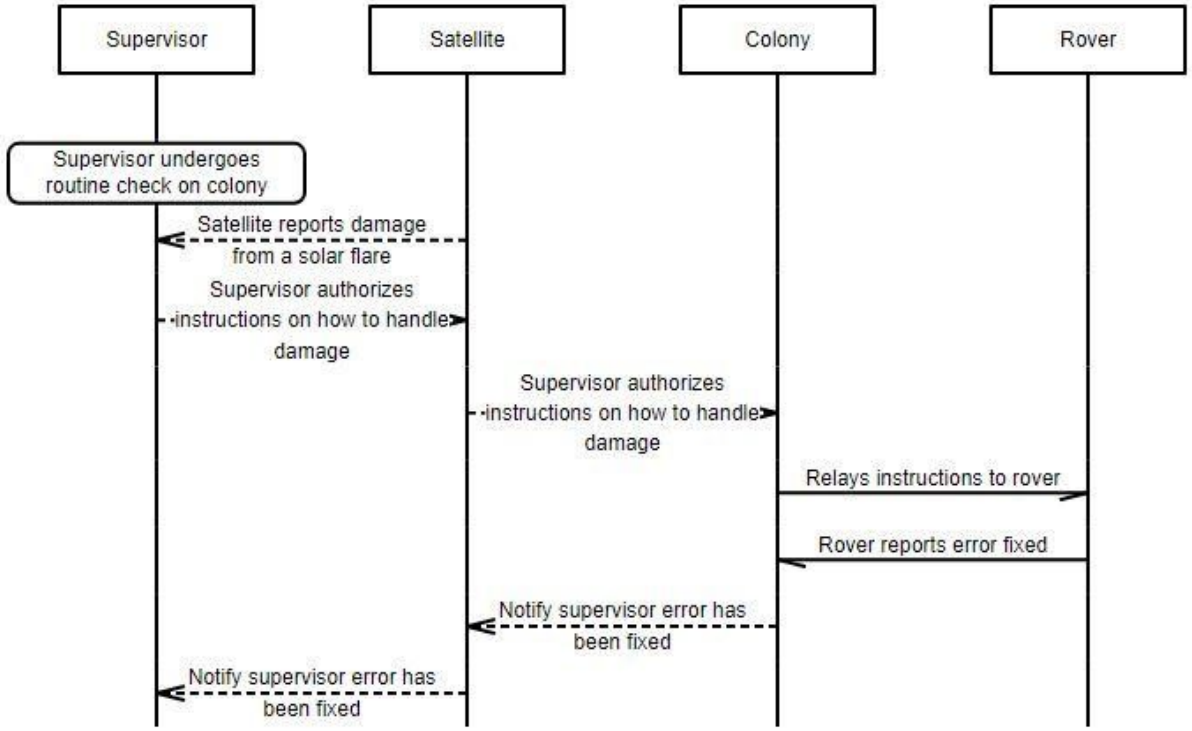
Case 1: Water bound colony



Case 2: Long Day/Night Cycle Planet



Case 3: Regulating Oxygen and Temperature Levels After a Solar Flare



Contributions from each member:

Austin Crow: Created data flow diagram, formatted report to fit one style. Made sure all language and style fit together into a cohesive document.
Justin Phillips: Wrote Use Case 2, created UML diagram
Ben Golden: Use case 1 and message sequence diagrams for the three use cases listed.
Daniela Muniz: Wrote use case 3, requirements definitions, and requirements specifications.