

# SeaLion Mission Architecture

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## Stakeholder Needs

The SeaLion Mission Architecture is guided by a series of stakeholder needs, listed below.

### 1.1: Primary Mission Objective A1

The SeaLion mission shall establish UHF communication link with Virginia ground station

### 1.2: Primary Mission Objective A2

The SeaLion mission shall establish S-Band communication link with MC3 ground station

### 1.3: Primary Mission Objective A3

The SeaLion mission shall successfully transmit “mission data” defined above to ground stations on the Earth.

### 1.4: Primary Mission Objective A4

The SeaLion mission shall adhere to CubeSat standards as per CDS Rev. 13

#### Reference:

- [CubeSat Design Specification Rev. 13](#)

### 1.5: Primary Mission Objective A5

The SeaLion mission shall validate the operation of the Impedance Probe (IP) as a primary payload in-orbit.

### 2.1: Secondary Mission Objective B1

The SeaLion mission shall provide a means to validate a Multi-spectral Sensor (Ms-S) in-orbit

## 2.2: Secondary Mission Objective B2

The SeaLion mission shall provide a means to validate a deployable composite structure (DeCS) in-orbit

## 3.1: Tertiary Mission Objective C1

The SeaLion mission shall qualify on-orbit the deployment and functioning of the newly developed UHF antenna system and its deployment.

## 3.2: Tertiary Mission Objective C2

The SeaLion mission shall qualify a CubeSat bus architecture for very-low Earth orbit (VLEO)

## 3.3: Tertiary Mission Objective C3

The SeaLion shall verify DeCS in-orbit behavior performance via accelerometer & temperature sensor data

## User Stories

The SeaLion Mission Architecture's stakeholder needs are then used to identify a series of user stories which then lead to design decisions captured in data structure and activity definitions.

### 1: Ping Satellite

As a **Ground Station Operator** I want to **Ping satellite** so that I can **Establish communication link with satellite**.

#### Example:

Ping the satellite in order to establish UHF communication link with Virginia ground station

#### Derived From:

- [Primary Mission Objective A1](#)

## 2: View Satellite Health Data Packet

As a **Ground Station Operator** I want to **View satellite health data packet** so that I can **Validate that satellite is operating nominally**.

### Example:

View satellite health data packet in order to validate the mission data of the IP and DeCS payloads

### Derived From:

- [Primary Mission Objective A2](#)
- [Primary Mission Objective A3](#)
- [Tertiary Mission Objective C3](#)

## 2.1: Listen for Satellite Beacon

As a **Ground Station Operator** I want to **Open ground station beacon monitor** so that I can **View satellite health data packet**.

### Example:

Open ground station beacon monitor to listen for satellite health data packet downlink

### Derived From:

- [View Satellite Health Data Packet](#)

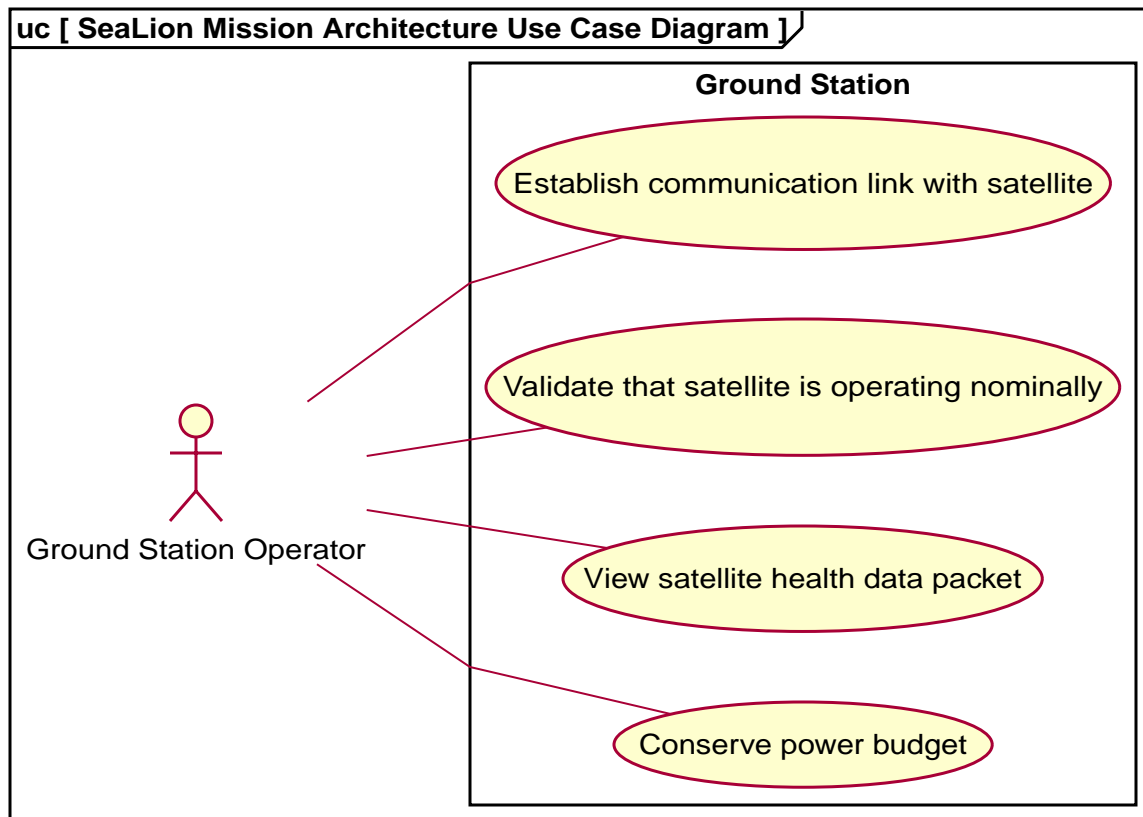
## 3: Update Beacon Rate

As a **Ground Station Operator** I want to **Update Beacon Rate** so that I can **Conserve power budget**.

### Example:

Update beacon rate to transmit every 30 minutes to conserve power

## User stories as Use Case Diagram



## Data Structures

This section covers each data structure type in the **SeaLion Mission Architecture**.

### Satellite Health Data Packet

**Purpose:** Data structure for satellite health data packet from ground station operator's viewpoint.

*Satellite Health Data Packet Template*

```

imu_gyro_x: {{imu_gyro_x}}
imu_gyro_y: {{imu_gyro_y}}
imu_gyro_z: {{imu_gyro_z}}
imu_magnetometer_x: {{imu_magnetometer_x}}
imu_magnetometer_y: {{imu_magnetometer_y}}
imu_magnetometer_z: {{imu_magnetometer_z}}
temperature_imu: {{temperature_imu}}
temperature_battery: {{temperature_battery}}
temperature_on_board_computer: {{temperature_on_board_computer}}
temperature_processor: {{temperature_processor}}
battery_voltage: {{battery_voltage}}
battery_current: {{battery_current}}
time_stamp: {{time_stamp}}
boot_count: {{boot_count}}
boot_time: {{boot_time}}
operational_status_of_equipment: {{operational_status_of_equipment}}
redundancy_status: {{redundancy_status}}
altitude_data: {{altitude_data}}
latitude: {{latitude}}
longitude: {{longitude}}

```

Field	Type	Item Type	Description	Source
imu_gyro_x	float		The angular rate of the body with to respective to the x-axis in the IMU's reference frame.	
imu_gyro_y	float		The angular rate of the body with to respective to the y-axis in the IMU's reference frame.	
imu_gyro_z	float		The angular rate of the body with to respective to the z-axis in the IMU's reference frame.	
imu_mag netomete r_x	float		The magnetic field strength with respective to the x-axis in the IMU's reference frame.	
imu_mag netomete r_y	float		The magnetic field strength with respective to the y-axis in the IMU's reference frame.	
imu_mag netomete r_z	float		The magnetic field strength with respective to the z-axis in the IMU's reference frame.	

Field	Type	Item Type	Description	Source
battery_voltage	float		Voltage of the battery. Units in volts.	
battery_current	float		Current draw of the battery. Units in milliamps.	
temperature_imu	float		The temperature of the IMU. Units in Kelvin.	
temperature_battery	float		The temperature of the battery. Units in Kelvin.	
temperature_onboard_computer	float		The temperature of the on board computer. Units in Kelvin.	
temperature_processor	float		The temperature of the processor. Units in Kelvin.	
time_stamp	string		Time stamp of the last transmission.	
boot_count	integer		Number of times the computer has rebooted.	
boot_time	string		The time stamp when the computer last booted.	
operational_status_of_equipment	string		The operation status of the equipment.	
redundancy_status	string		The redundancy status of the satellite.	
altitude_data	float		The altitude data of the satellite.	
latitude	float		Latitude coordinate of the satellite.	
longitude	float		Longitude coordinate of the satellite.	

Table 1. Satellite Health Data Packet Specification

**Derived From:**

- [View Satellite Health Data Packet](#)

## Finite State Machine

