

Firefighter Indoor Navigation: Design Document

Thomas Anter
Nawar Mikha
Jordan Shimel

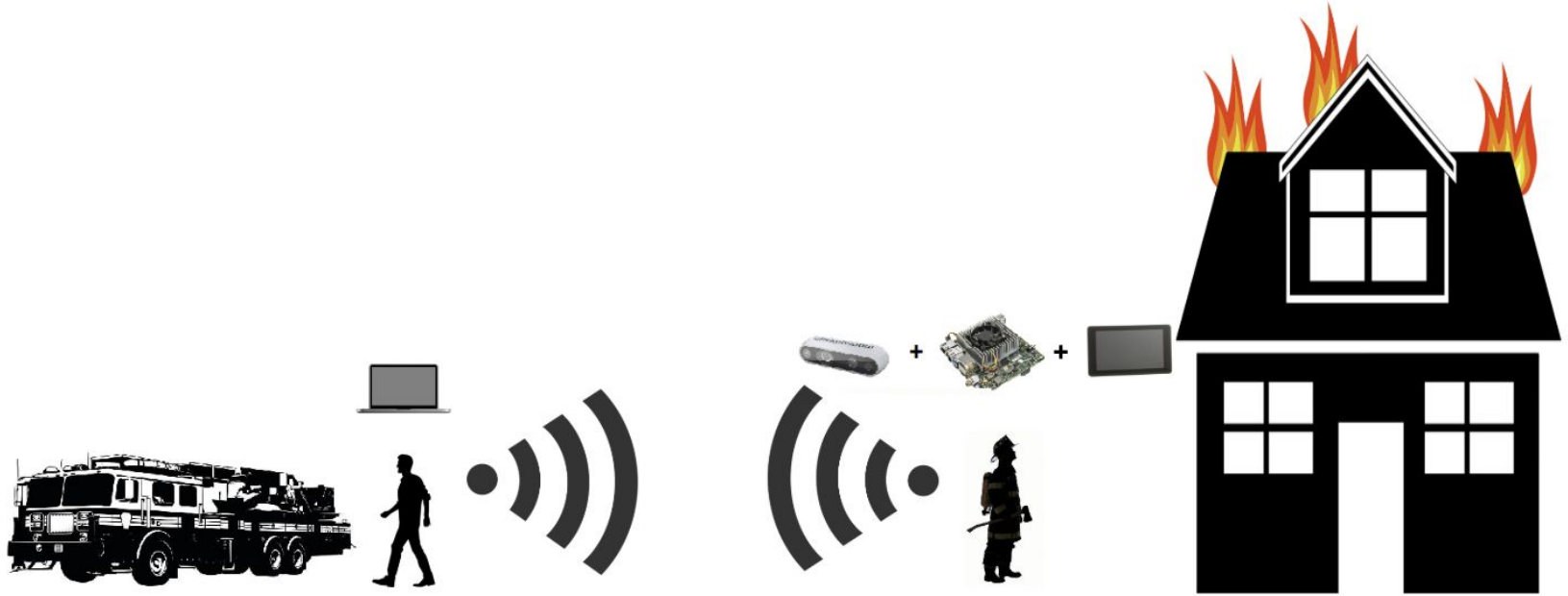
- ▷ Intro / System Context
- ▷ Data Flow Diagrams
- ▷ Assumptions / Constraints
- ▷ Architecture Design
- ▷ Use Cases
 - ▶ Sequence / Dependency Diagrams
- ▷ Class Diagram
- ▷ UI Design

Introduction

Context with Updated Scope

Introduction

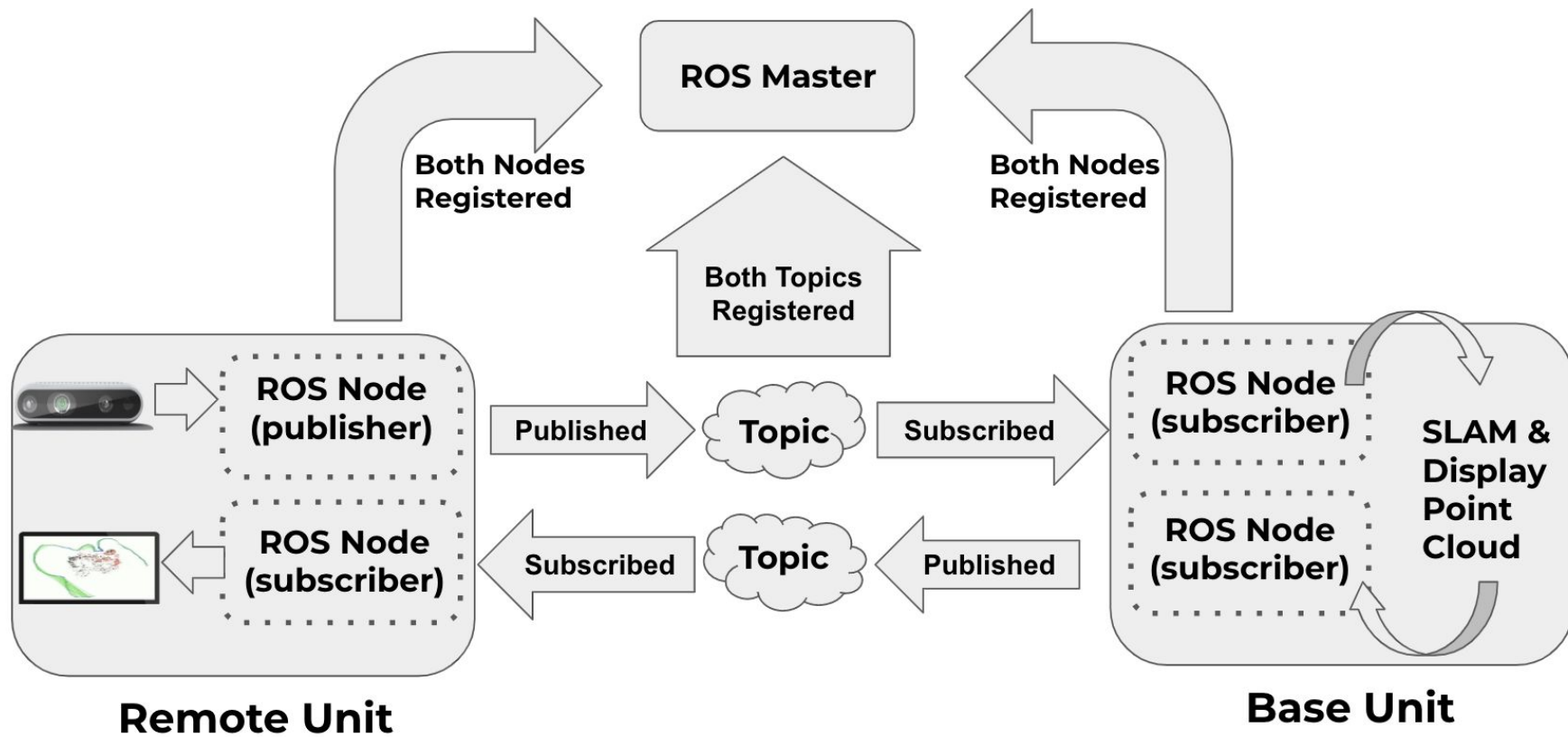
- ▷ Purpose
- ▷ Updated Scope
 - ▶ Allow firefighter to view point cloud of their path and that of other remote unit



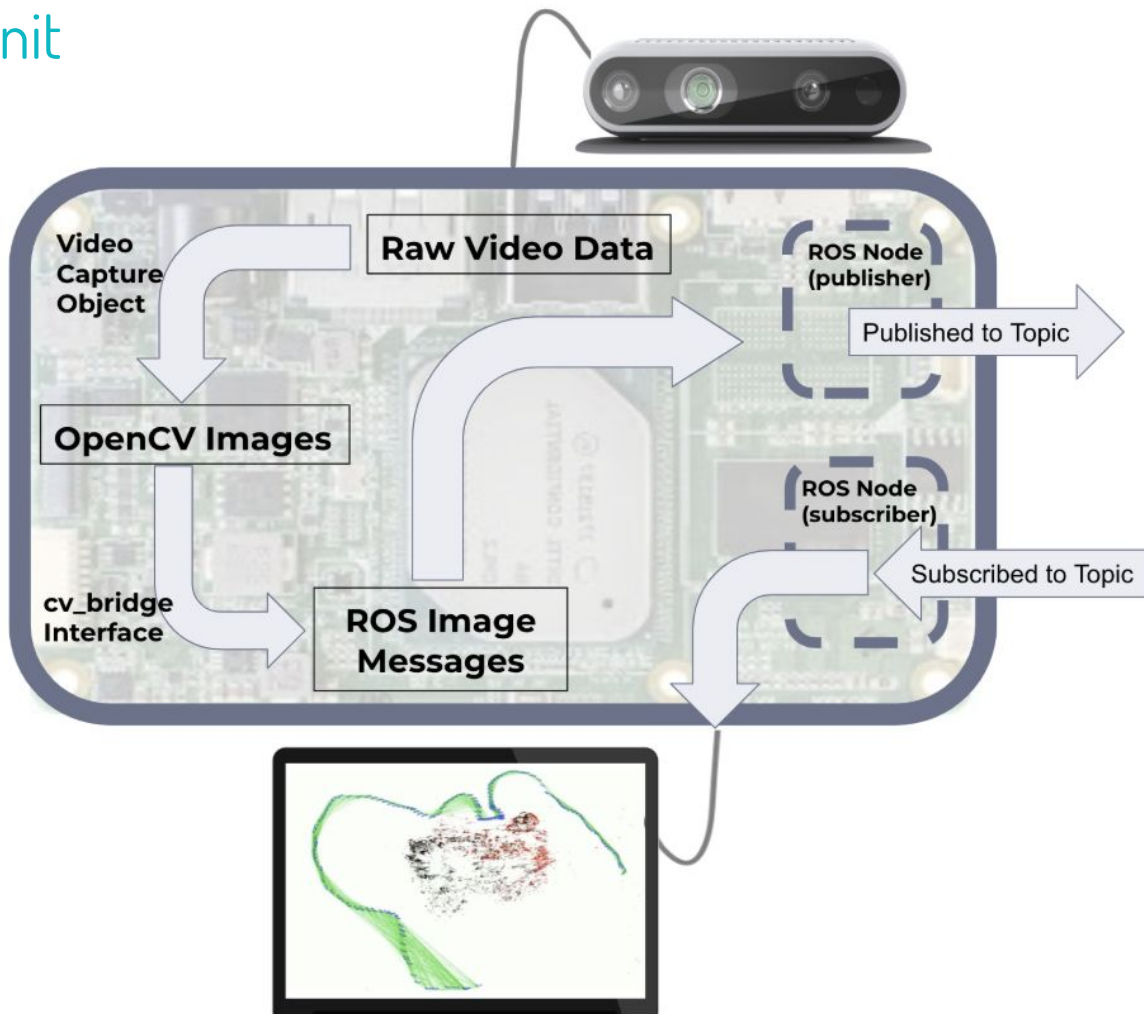
Data Flow Diagrams

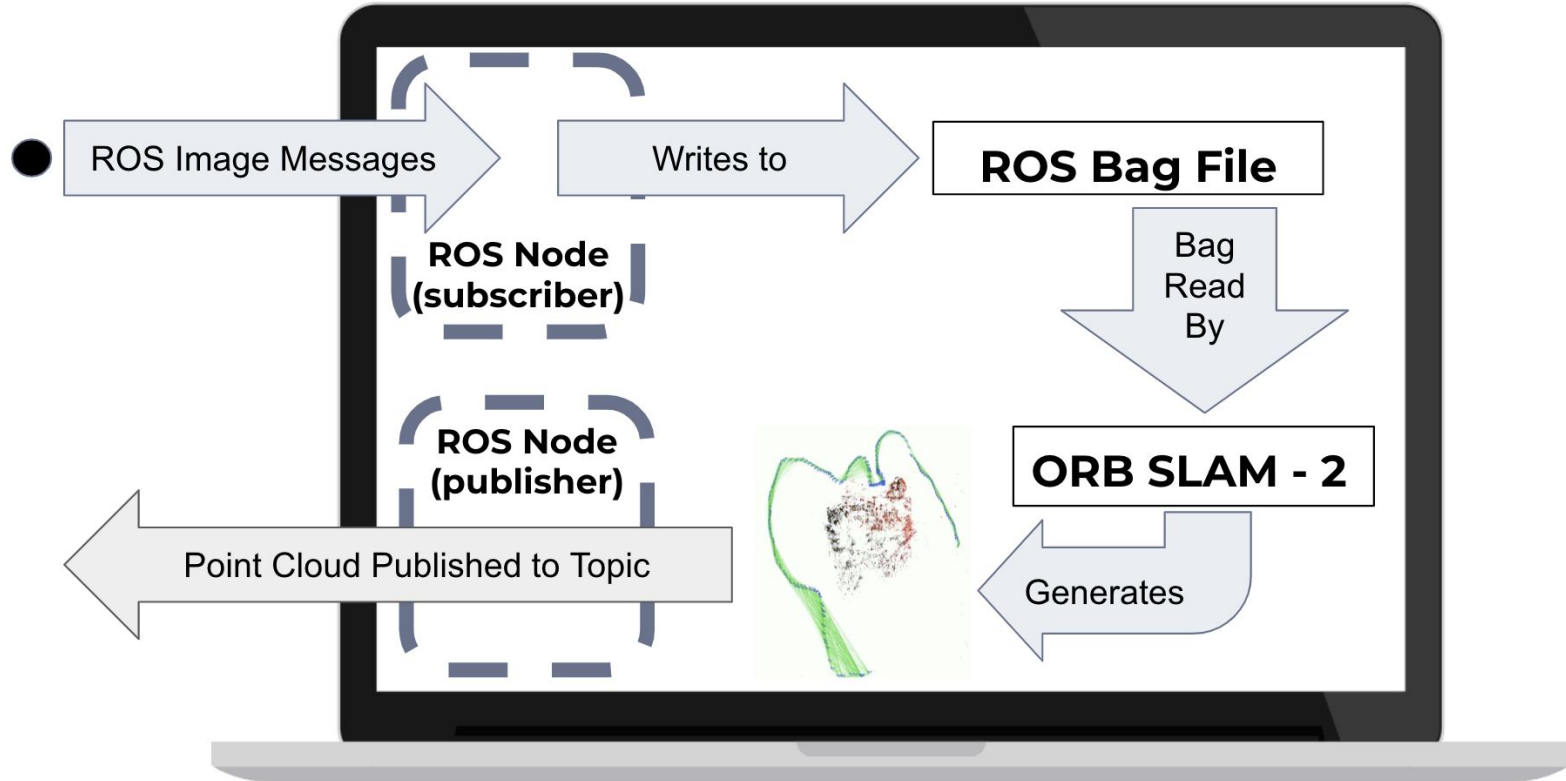
From Three Angles

System Overview



Remote Unit





Assumptions / Constraints

Constraints

- Bandwidth and reliability of the Wi-Fi connection
 - May adjust frame rate and resolution of camera
- Processing limitations of the base station
 - May reduce resolution of point cloud
- Limitation on the number of cameras that can be connected to the base unit simultaneously

Remote unit assumptions:

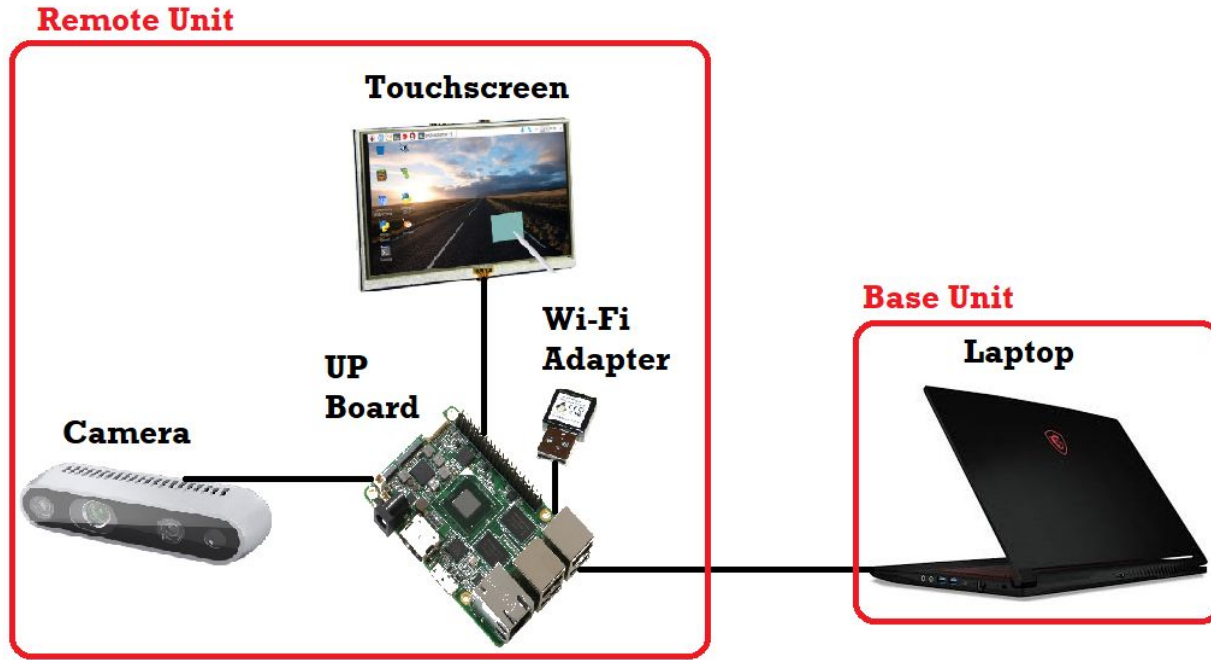
- The UP board is able to work with the selected hardware and software to capture depth and motion data
- The transmission hardware provides adequate bandwidth and latency to transmit our data

Base unit assumptions:

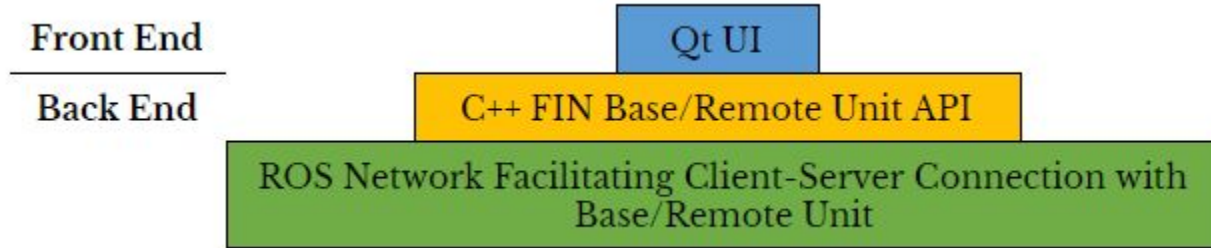
- The transmission hardware provides adequate bandwidth and latency to receive data from two remote units
- Capable of real time processing of depth and motion data into a 3D point cloud

Architecture Design

Hardware Architecture



Software Architecture

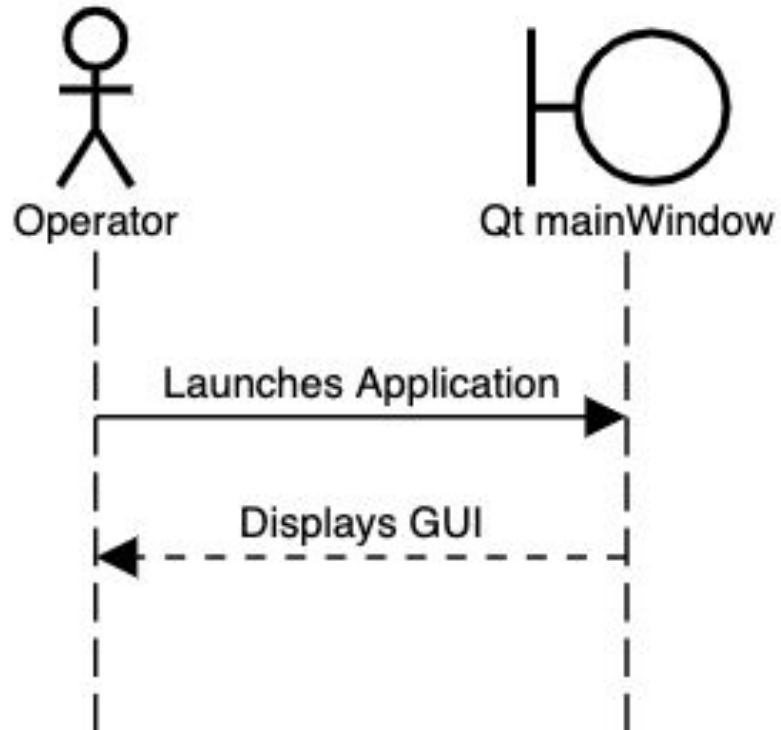


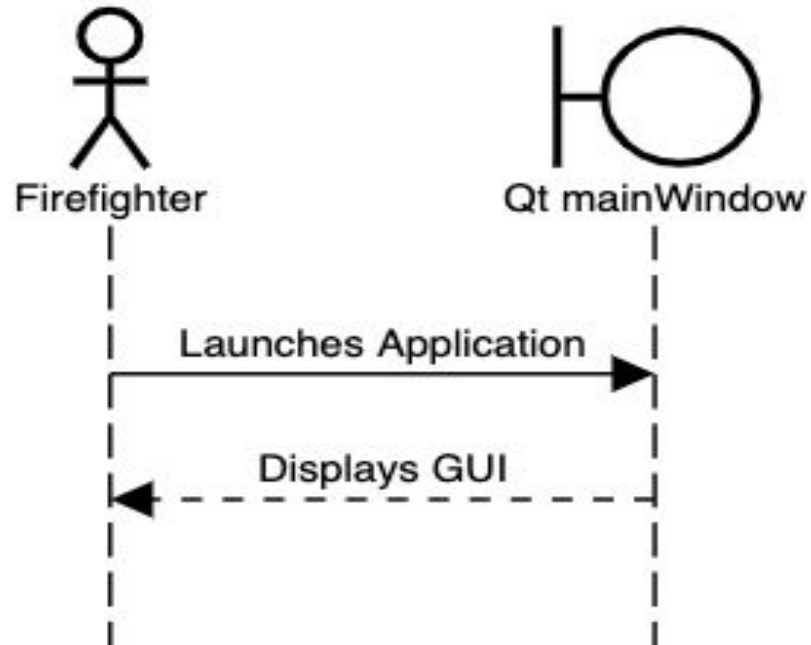
Network Architecture

- Distributed system
- 1 base unit, multiple remote units
- Base unit is hosting the Wi-Fi signal
- 150 Mbps max per remote unit
- Direct point-to-point network

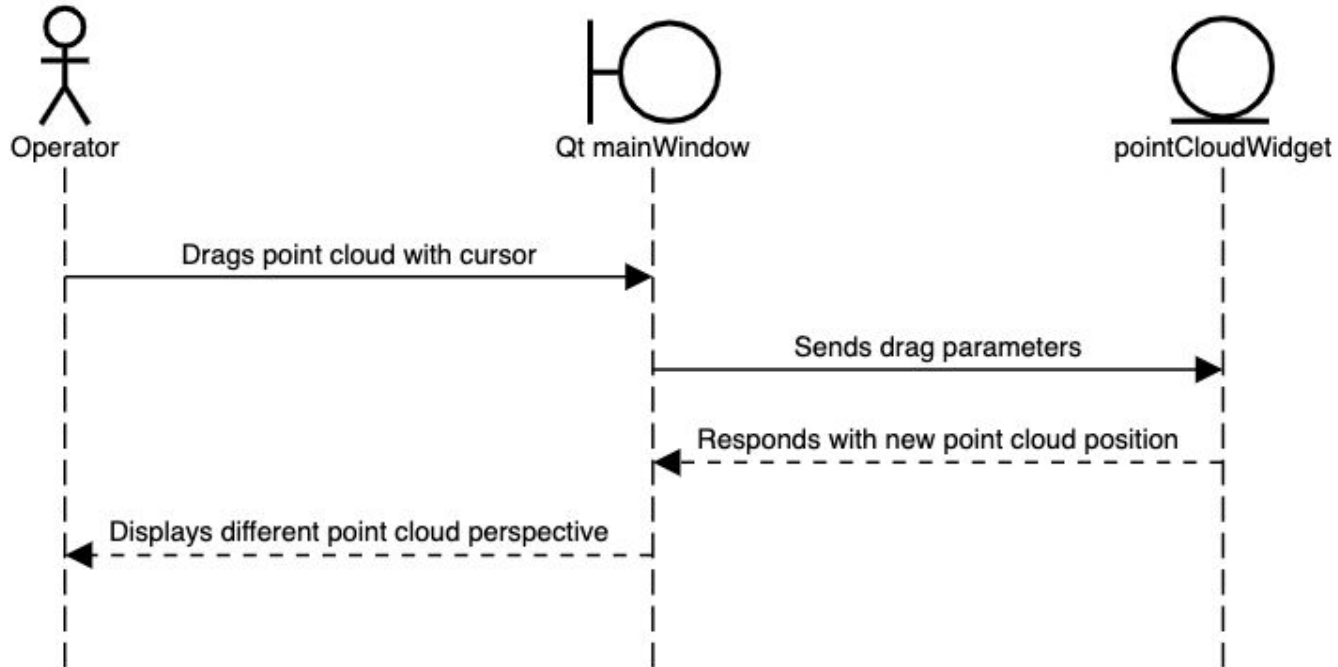
Use Cases

Alongside their sequence

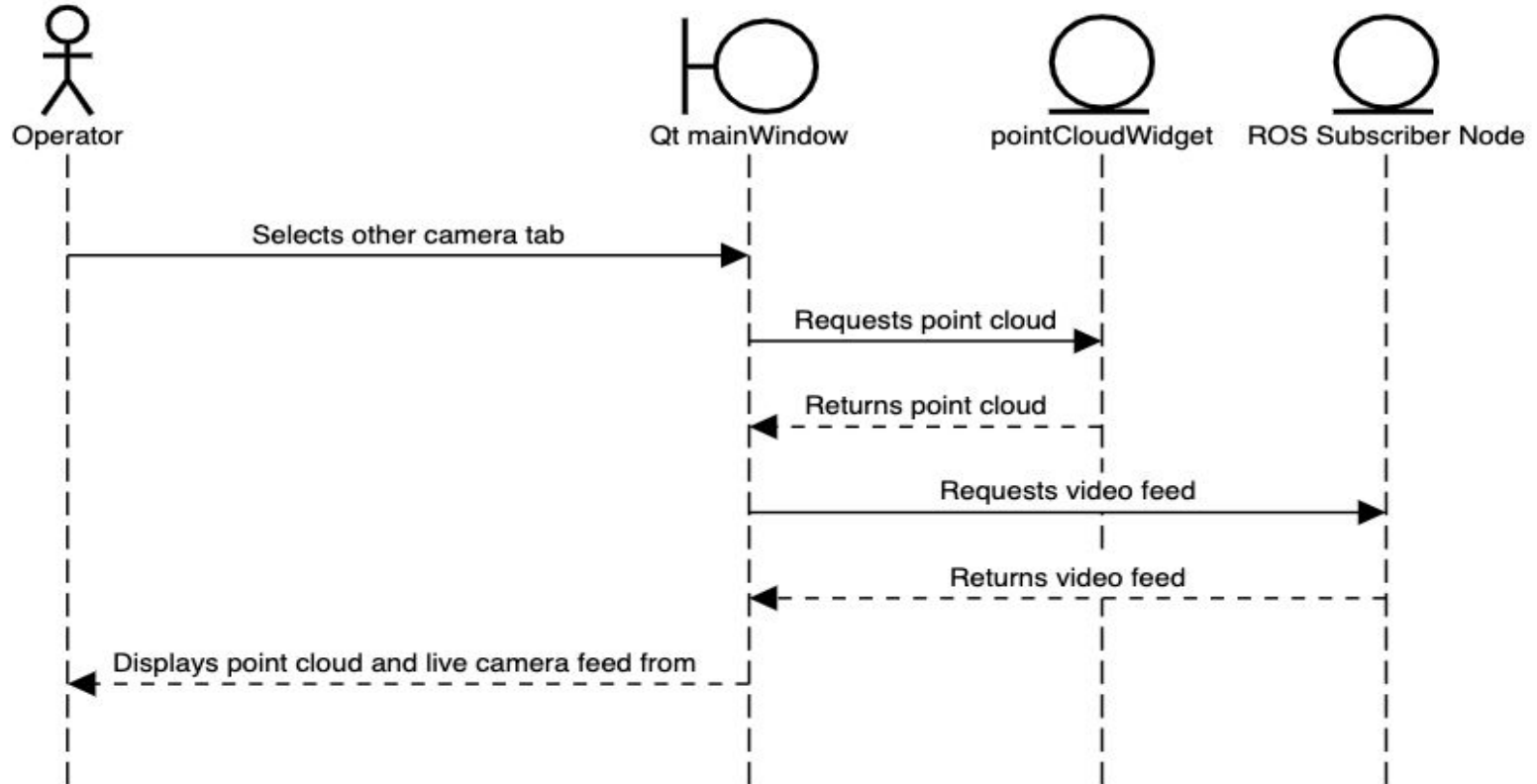




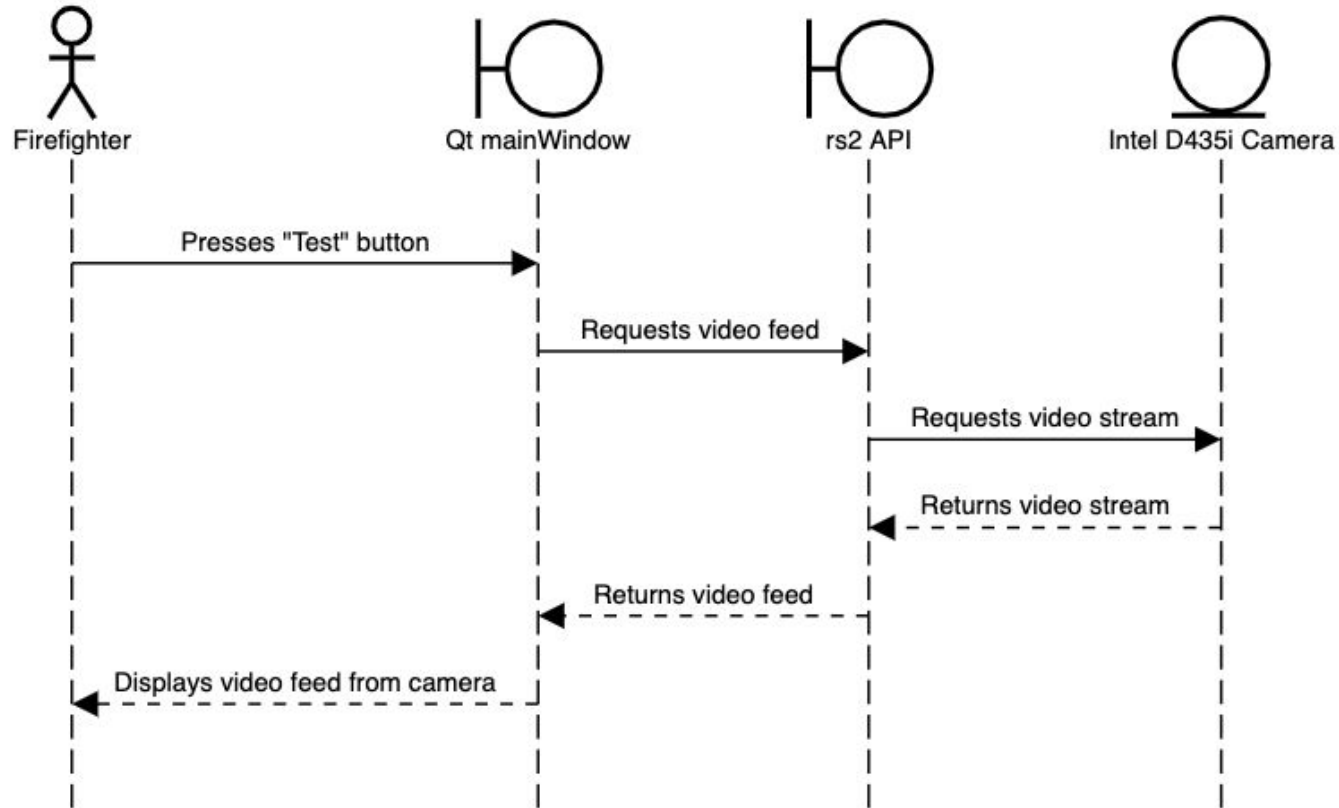
UC-3 Point Cloud Manipulation on Base Unit



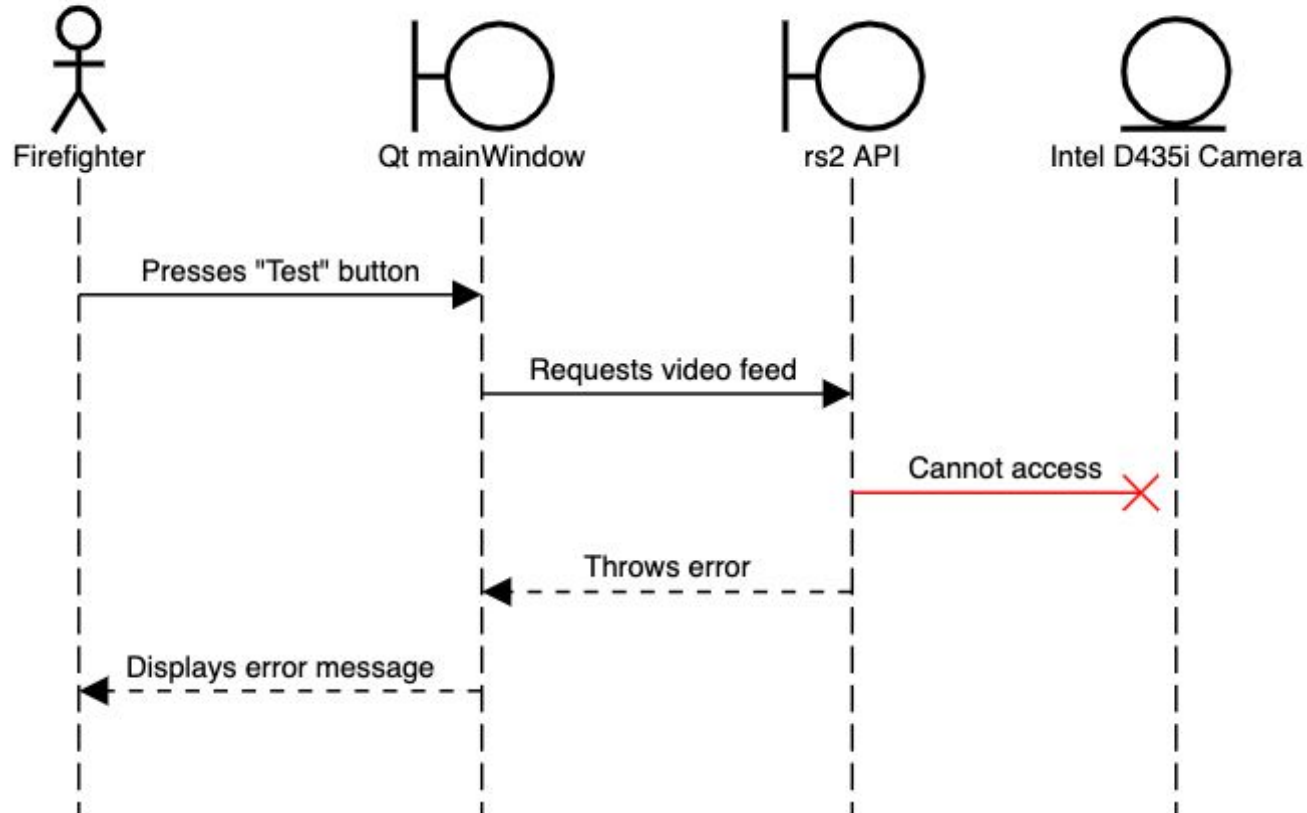
UC-4 Switching Camera Views on the Base Unit



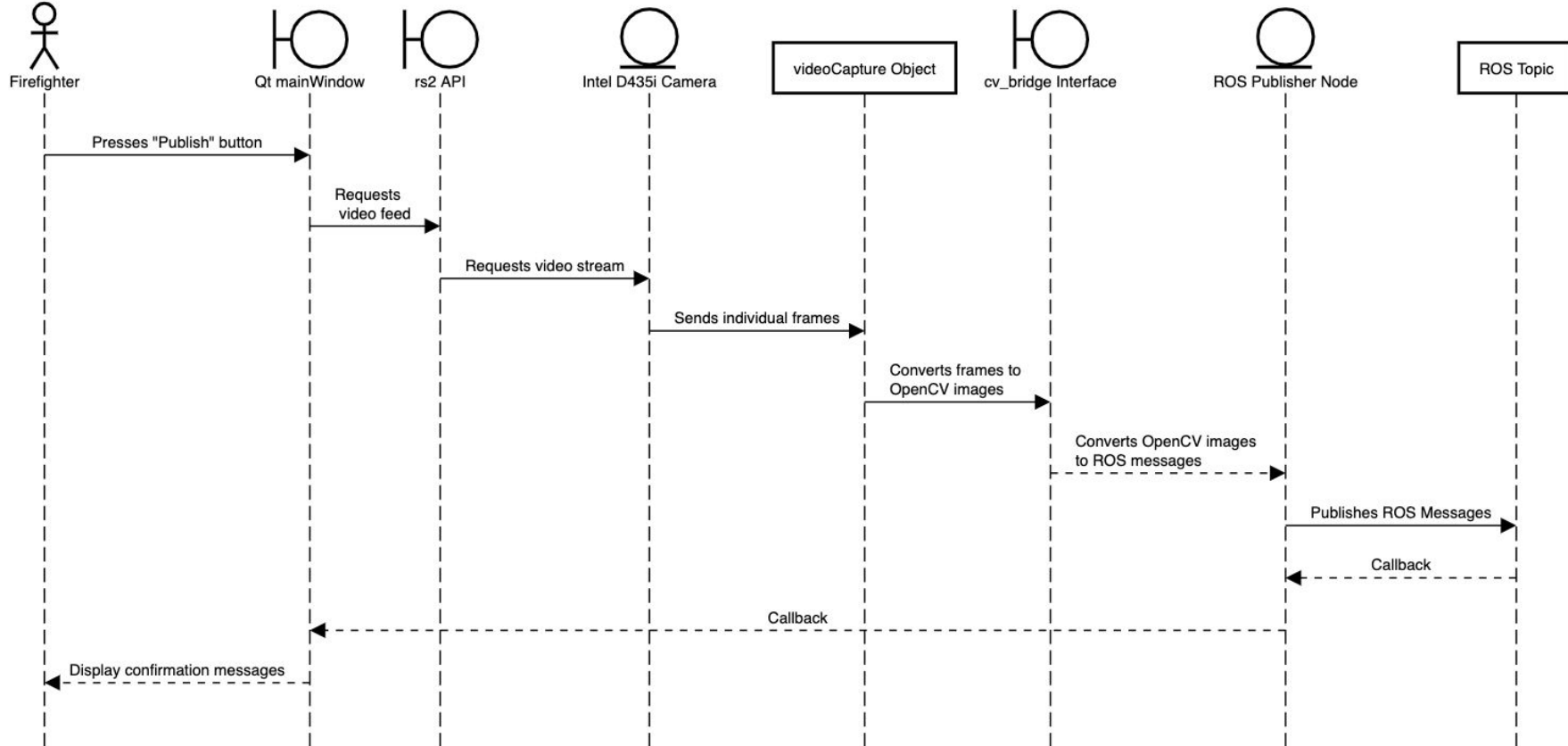
UC-5 Video Feed Test on Remote Unit



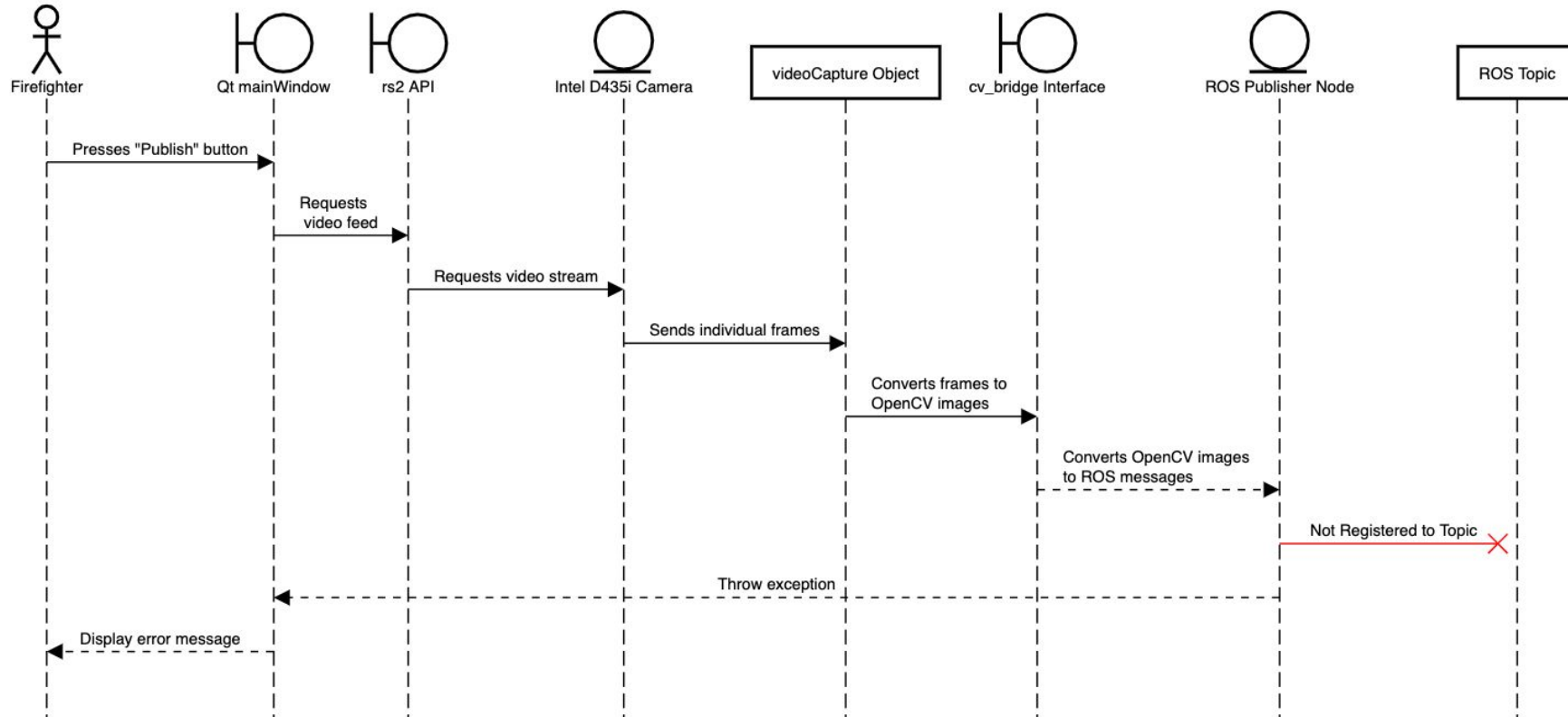
UC-5 Video Feed Test on Remote Unit (Alternative Flow)



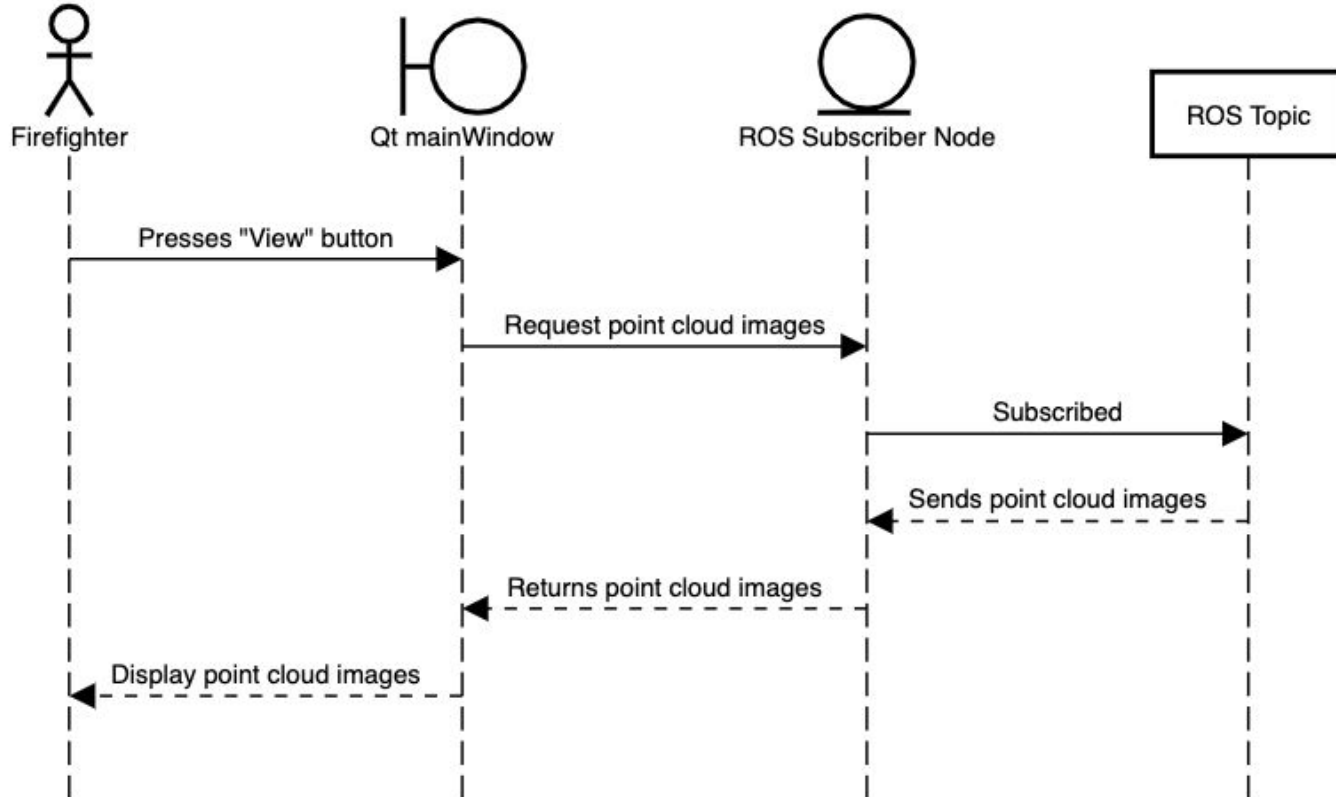
UC-6 Publish Video Data to Topic



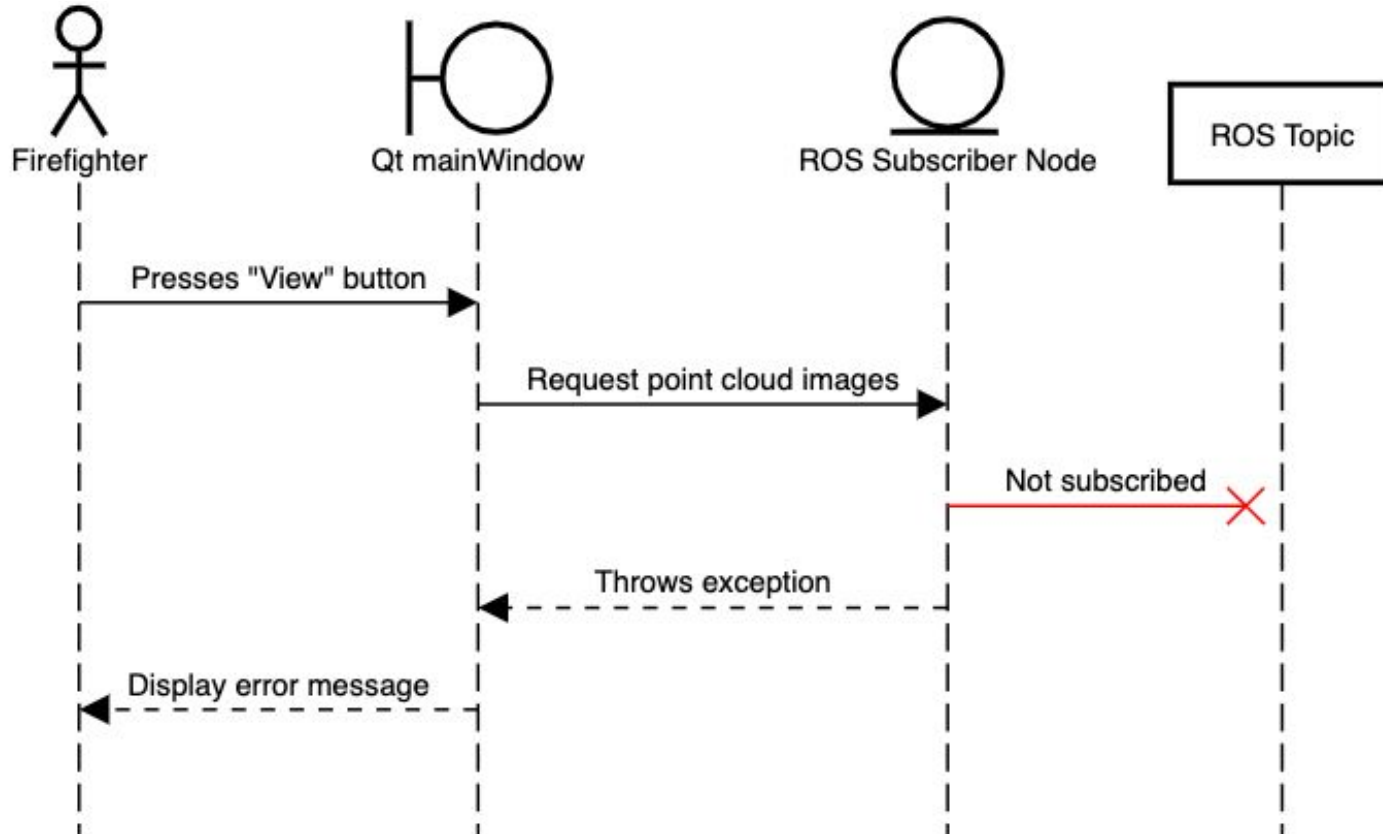
UC-6: Publish Video Data to Topic (Alternative Flow)



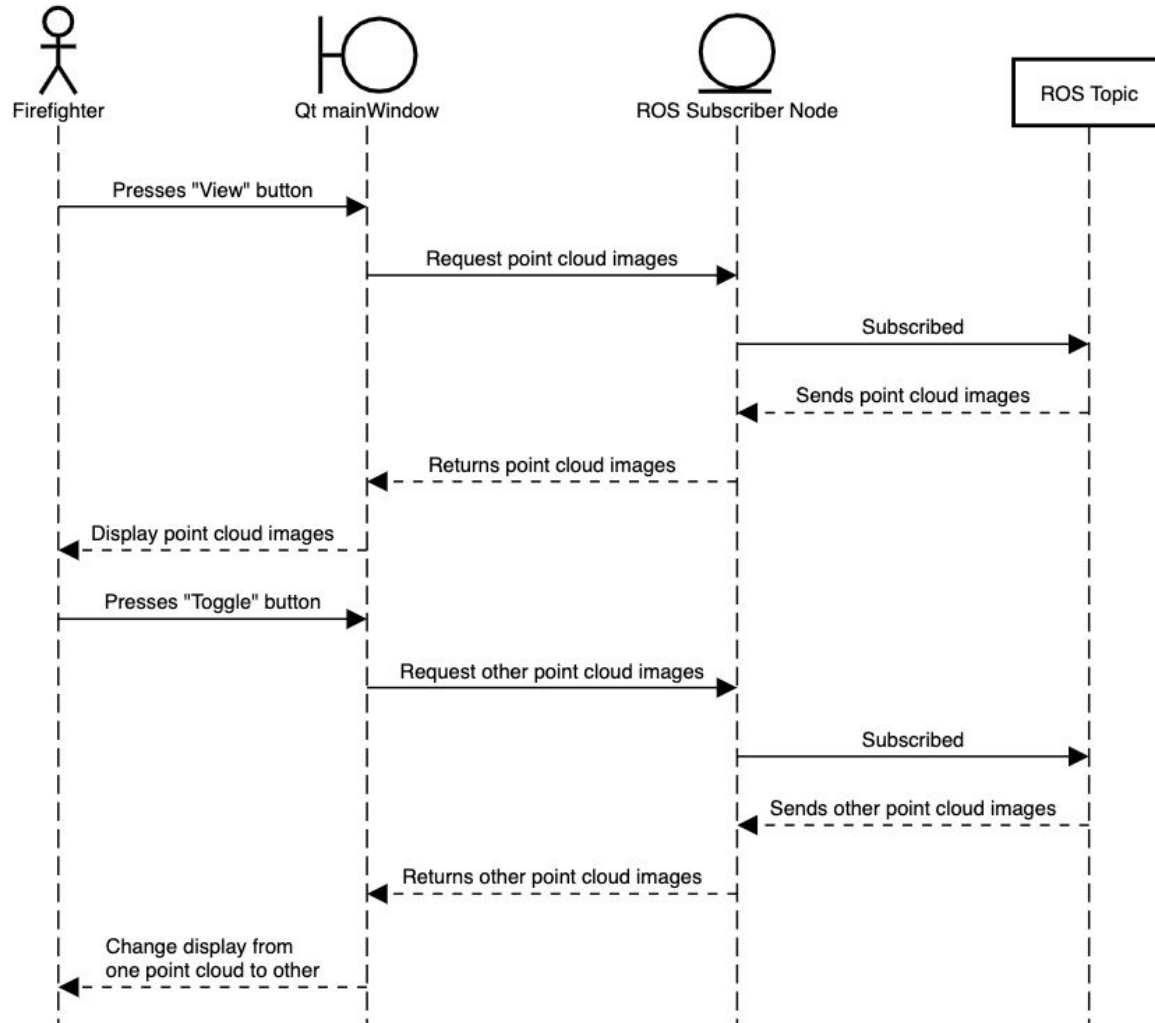
UC-7 Change Camera View on Remote Unit



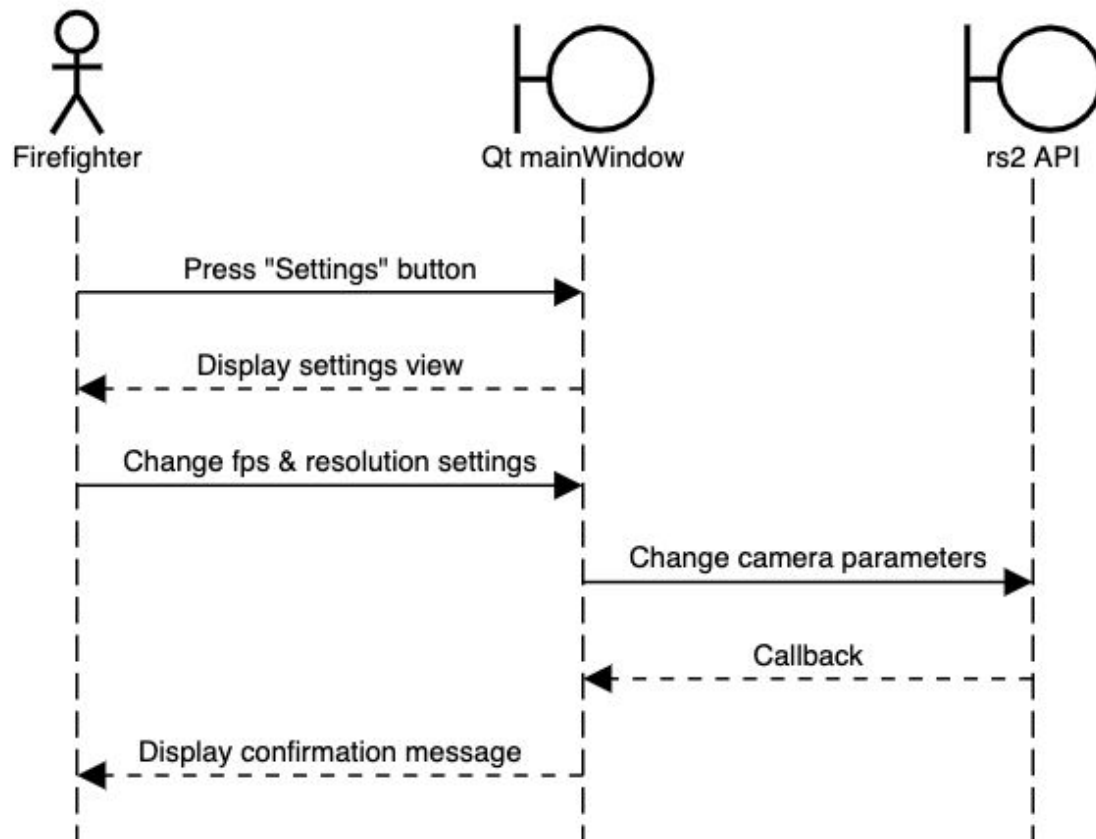
UC-7 Change Camera View on Remote Unit (Alternative Flow 1)



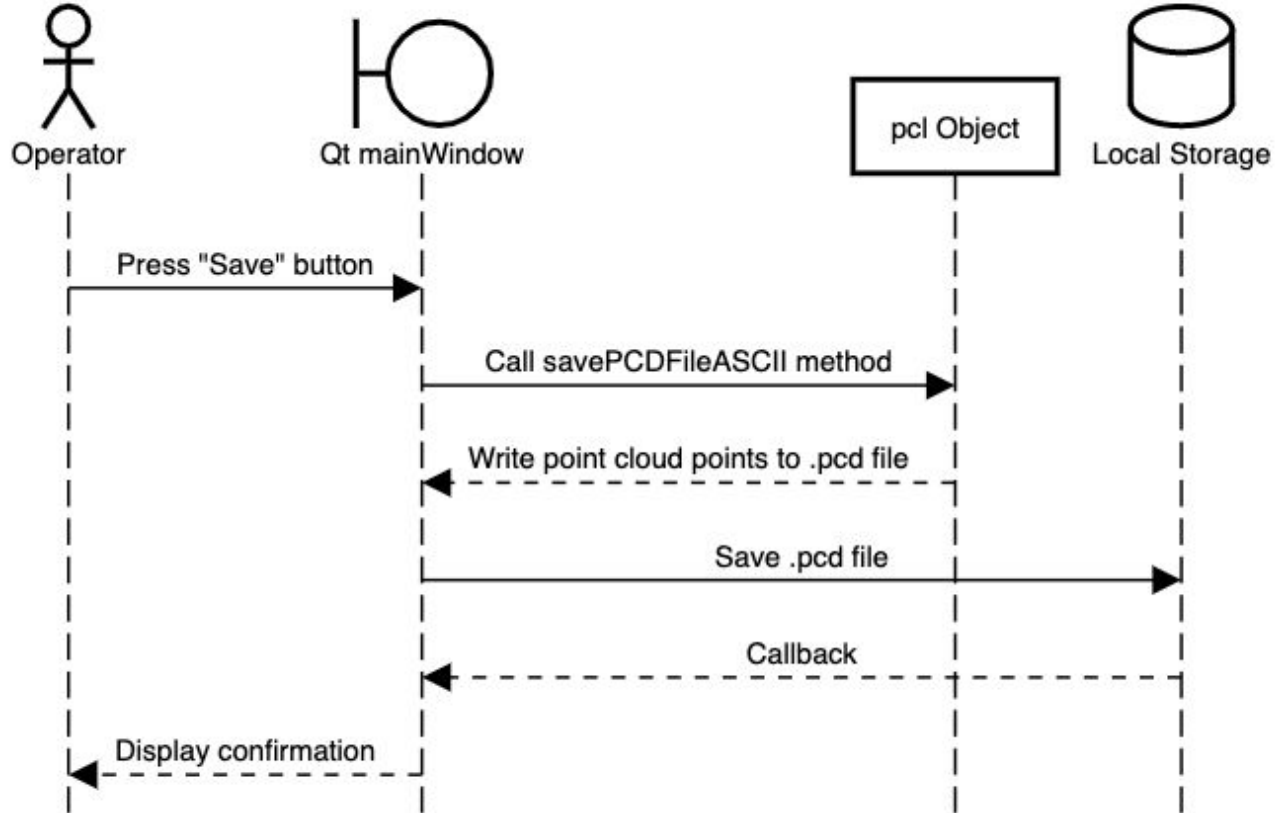
UC-7 Change Camera View on Remote Unit (Alternative Flow 2)



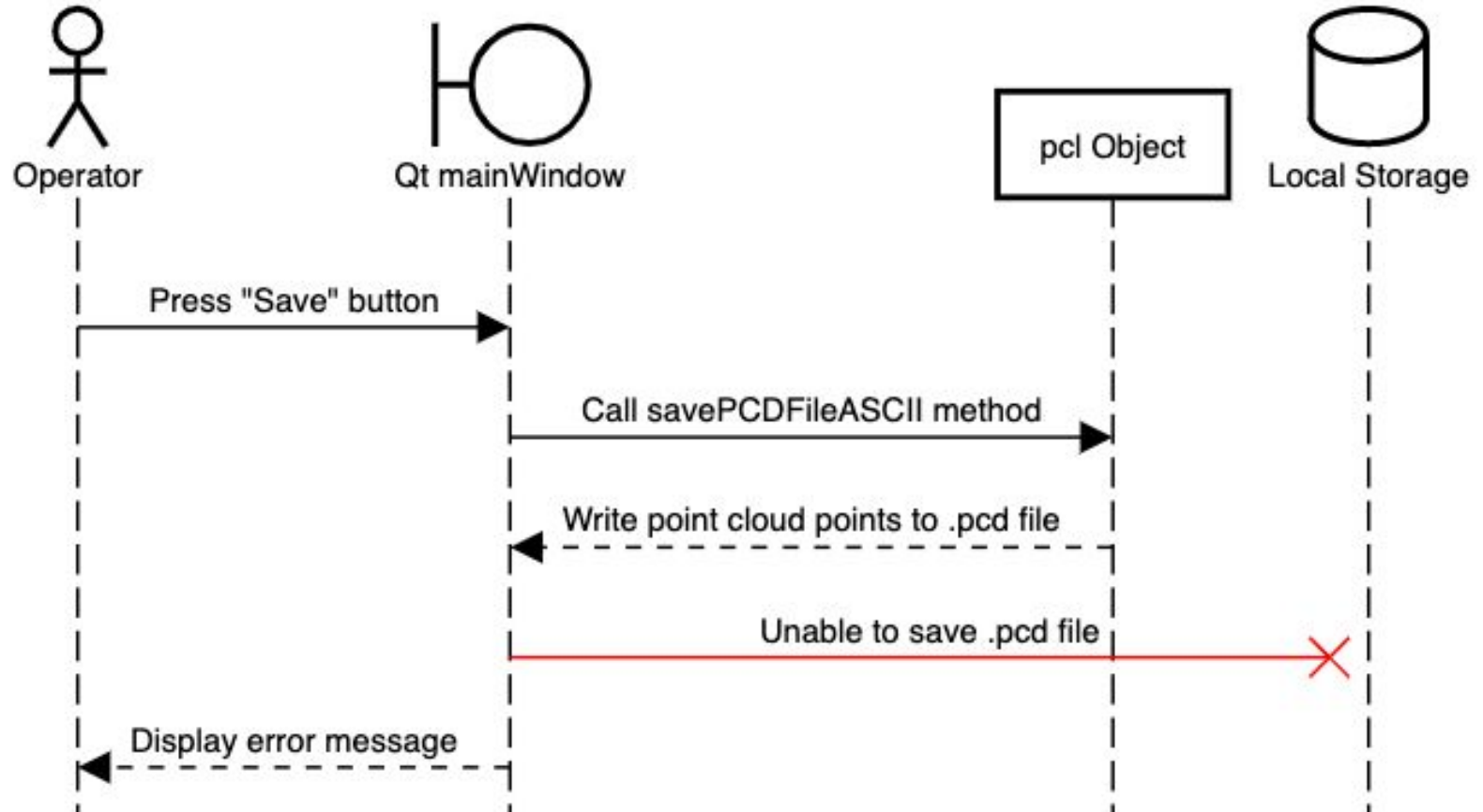
UC-8 Remote Unit Settings



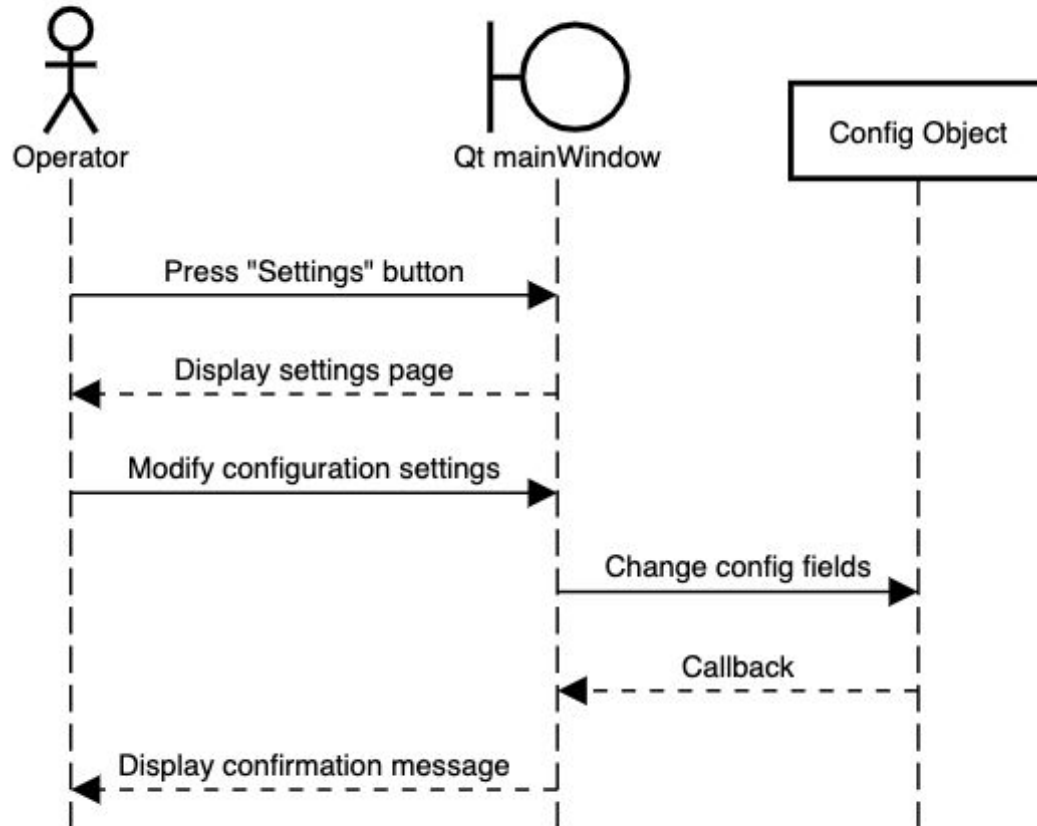
UC-9 Saving Point Cloud on Base Unit



UC-9 Saving Point Cloud on Base Unit (Alternative Flow)

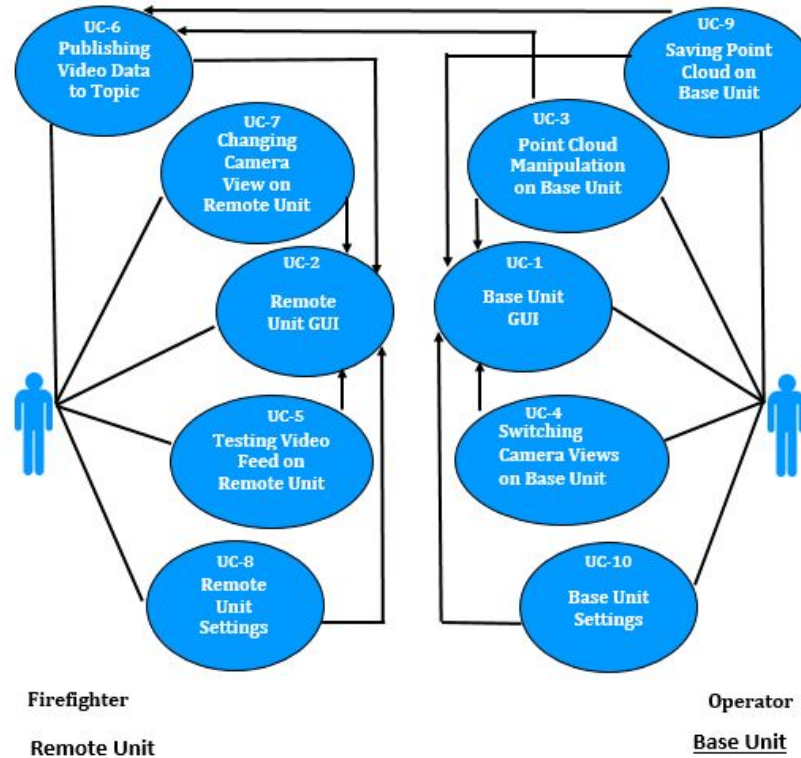


UC-10 Base Unit Settings



Use Case Dependency Diagram

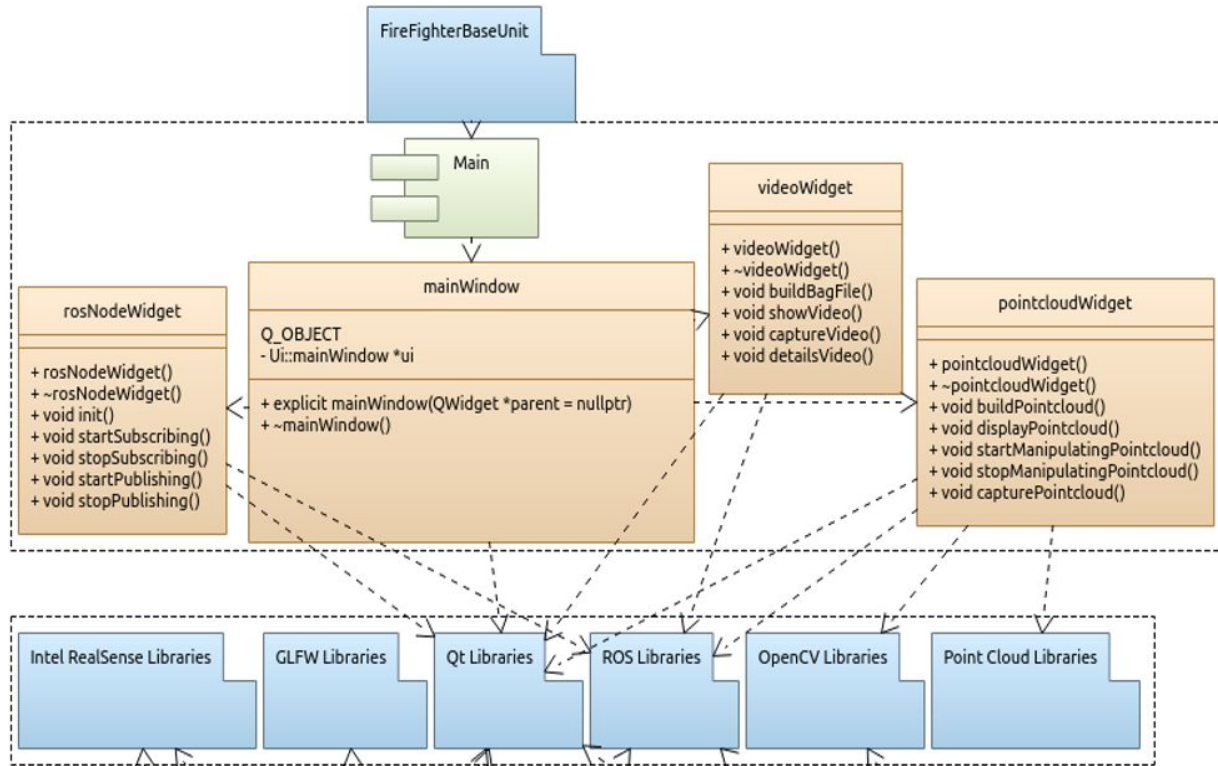
Dependency Diagram



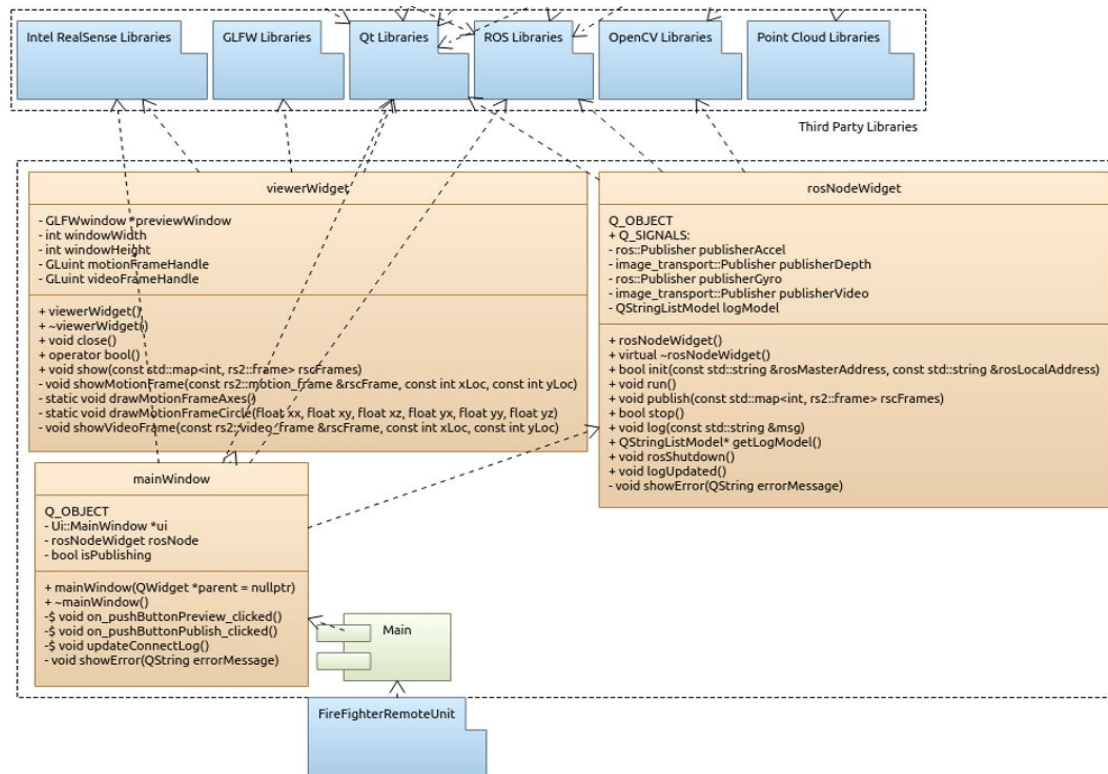
Class Diagrams

Base & Remote Units

Class Diagram Base Unit

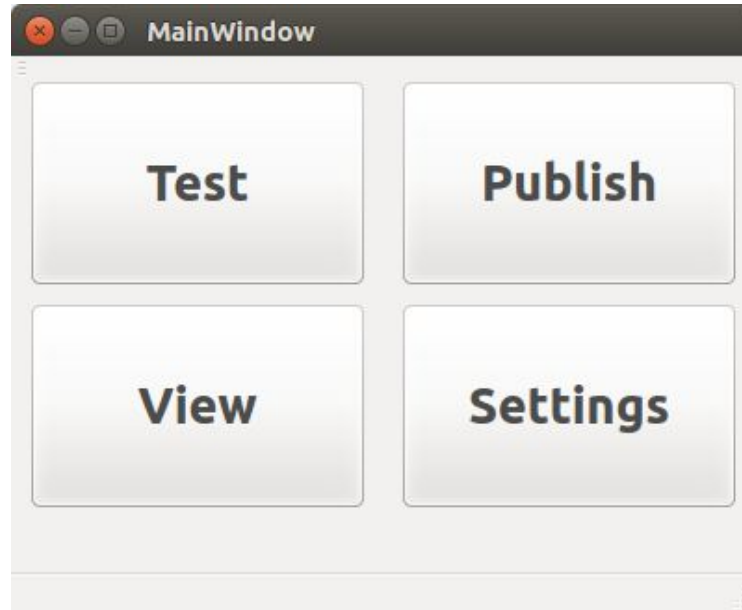


Class Diagram Remote Units



User Interface Design

Base & Remote Units



Base Unit GUI



Questions