Software Requirements Specification: Firefighter Indoor Navigation

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Introduction

- Purpose
- Scope
- Overview

General Description

- Product Perspective
- Product Functions
- User Characteristics
- General Constraints
- Assumptions and Dependencies

Product Perspective

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Product Functions

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User Characteristics

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General Constraints

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Assumptions and Dependencies

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Specific Requirements

- External Interface Requirements
- Functional Requirements
- Non-Functional Requirements
- Design Constraints
- Logical Database Requirements

External Interface Requirements

- User Interfaces
- Hardware Interfaces
- Software Interfaces
- Communications Interfaces

Functional Requirements

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Non Functional Requirements

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Performance

- Human-computer interaction
  - Boot-time <10s
  - Camera change time <1s
- Stream/point cloud delay <5s

Reliability

- Failure is defined as the failure of any one of the following:
  - Failure to execute nodes on either unit
  - Failure to convert video data to a ROS image message
  - Of node to subscribe or publish to a topic
  - To read/write message to ROS bag file
  - To process ROD bag to perform SLAM
  - To output video or point cloud to GUI
- Measured in MTBF (Mean Time Between Failure)
- Requirement to have >30 min MTBF

Availability

- Availability of deliverables from this teams final version of FIN >98%
- 2% time measure of unavailability is estimate for minor future bug fixes

Security

- Per the project scope, security is non concern
- Future requirements of this legacy project are expected to implement security measures

Maintainability

- Corrective Maintainability
  - Bugs found during testing fixed
- Preventive Maintainability
  - If it is decided bug could reaccur in later development, it will be well documented for the next
- Adaptive maintainability
  - Does not have this attribute
  - Project build for specific build environment,
- Perfective Maintainability
  - Development will assure future requirements will be easily extended

Portability

- Not a requirement as it is designed and intended for specific build environment
  - Moving to another environment will call for major alteration of codebase

Scalability

- The more remote units in the system, the greater concern of a bottleneck with respect of processing power due to the SLAM on the base station
- FIN will scale to two remote units running simultaneously

Design Constraints

- Range of camera
  - Varies depending on lighting conditions and camera calibration
  - Range estimate 0.11m - 10m
- Strength of point to point wifi
  - Varies depending on building (walls, floors, furniture, etc.)
- Processing power of UP board

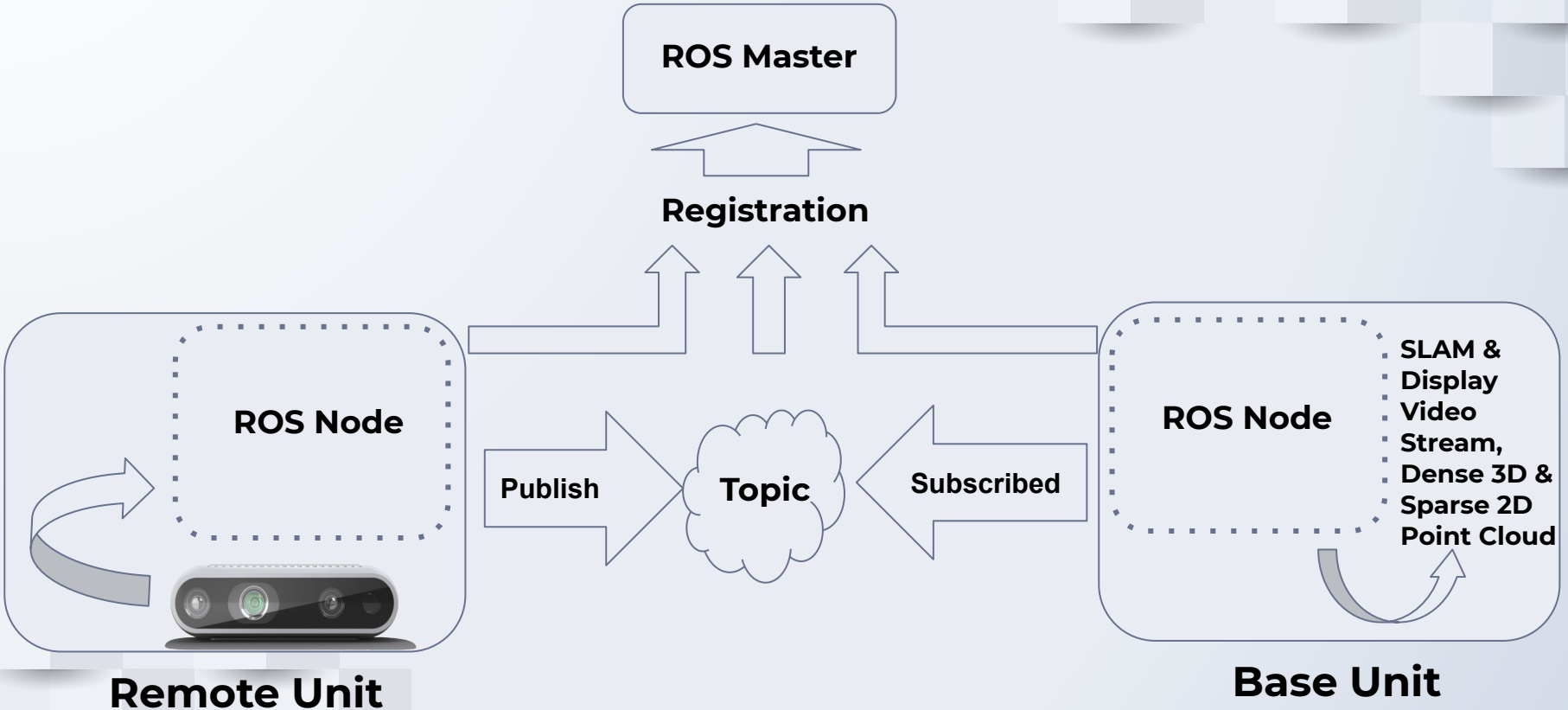
Logical Database Requirements

- For the scope of this project there is no need for traditional database
- Video feed and point cloud will be able to be saved locally on main unit

Data Flow Diagrams

- Three diagrams
  - Distributed FIN system as a whole
  - Remote unit data flow
  - Base unit data flow
- Start point on first two diagrams will be symbolized as the picture of the Intel camera

Overall System Data Flow



Capture Video Object

Raw Video Data

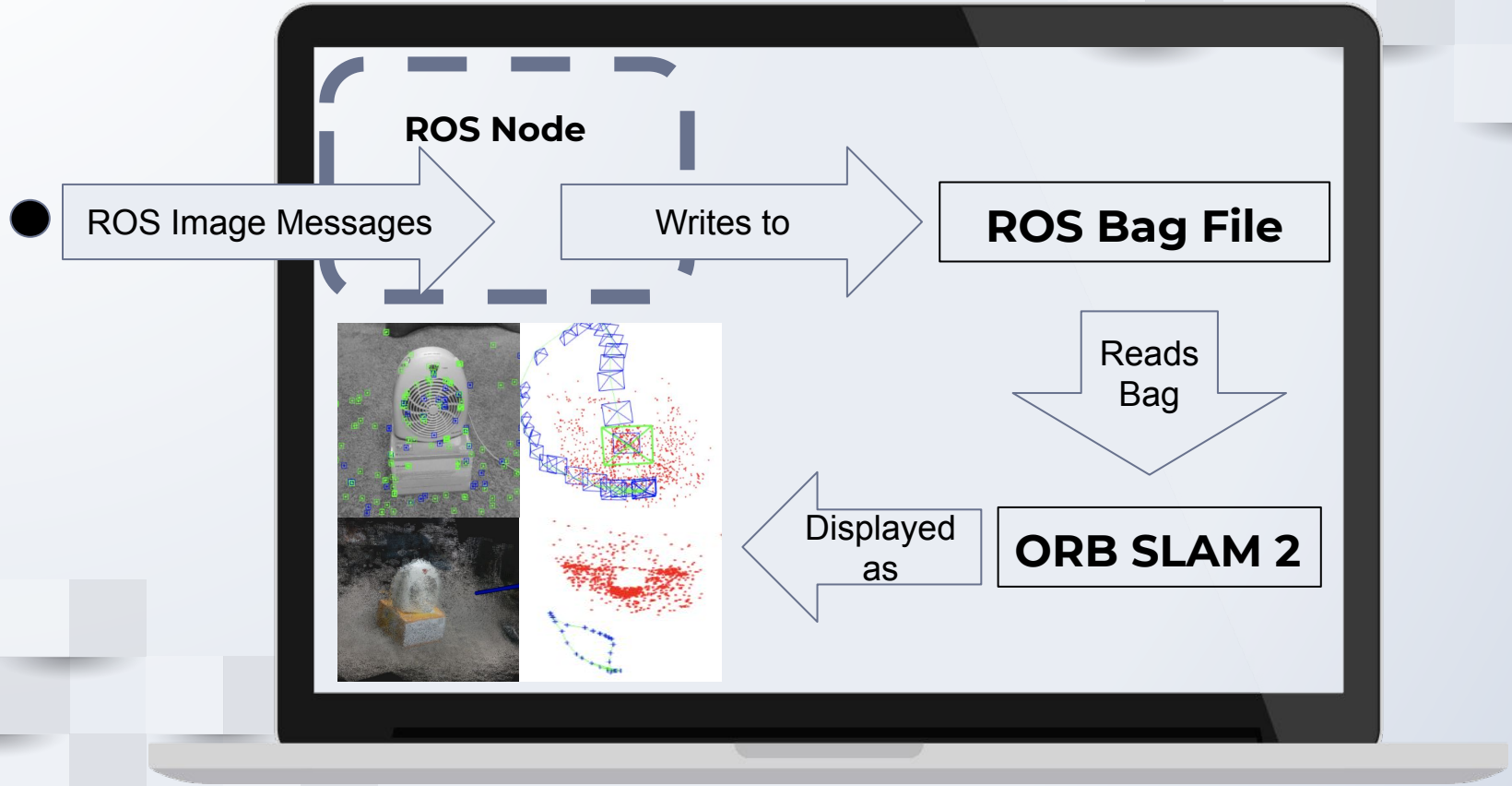
OpenCV Images

cv_bridge Interface

ROS Image Messages

ROS Node

Published to Topic


ROS Node
ROS Image Messages
Writes to
ROS Bag File
Reads Bag
ORB SLAM 2
Displayed as

Questions?