Design Review

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Coast Guard Coverage

The US Coast Guard monitors over 296,000 nautical miles seas addition land coverage.

Introduction

- The US Coast Guard monitors over 296,000 nautical miles seas

- Our client is General Dynamics Mission Systems (GDMS)

- GDMS developed Rescue21 for the US Coast Guard

- Rescue21 averages 1,074 Search and Rescue (SAR) cases per month

- Rescue21 has over 250 Remote Fixed Facilities (RFFs) that find distressed callers
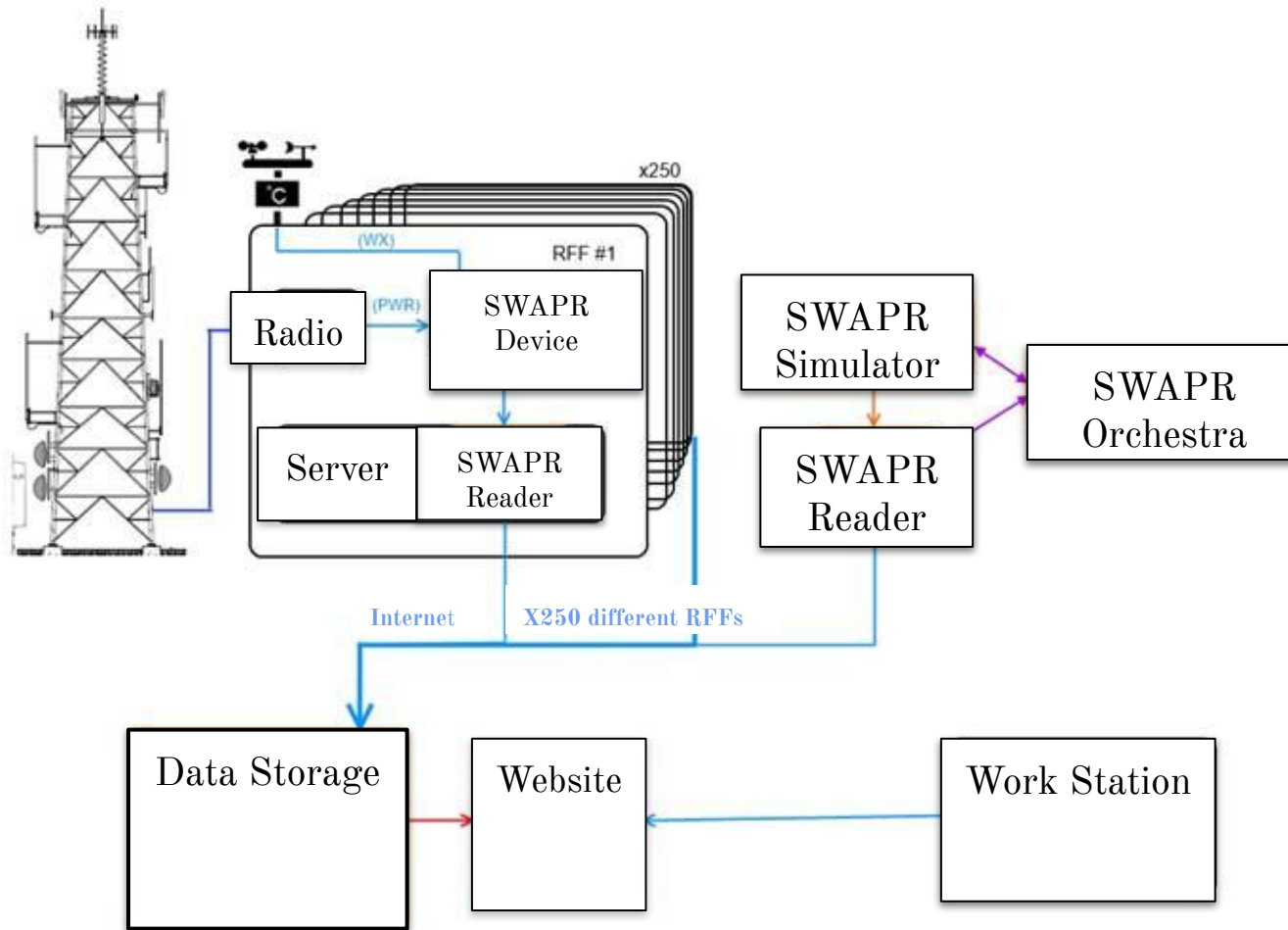

Rescue21 RFF Station

- SWAPR (AKA: Site Weather And Power Recorder)

- Built by last year's Electrical Engineering Capstone group

SWAPR Wind Sensor

SWAPR Humidity Sensor

Project Diagram

Outlines the connections between our subsystems and Remote Fixed Facility (RFF) site

Problem Statement

- Output is difficult to read

- User interface is unintuitive

- Scheduling RFF tower climbs for maintenance is difficult
  - Technician may run into storms

- Radio Frequency(RF) signal interference cause is unknown
  - Hardware Failure
  - Rainy/Stormy Weather

SWAPR Data Output

SWAPR / SIMULATOR

Data in JSON Format

{-124, -92, -87, -95, 64,78.0, 1012, 3.2,43 }

Solution Overview

- 5 Subsystems: Simulator, Reader, Database, Website, Orchestra

- Simulator sends output to Reader Software

- Reader gets Simulator data and sends to Database Subsystem

- Database Subsystem takes SWAPR data from Reader

Solution Overview continued

- Database Subsystem sends data to Website Subsystem
- Website Subsystem queries data from Database Server
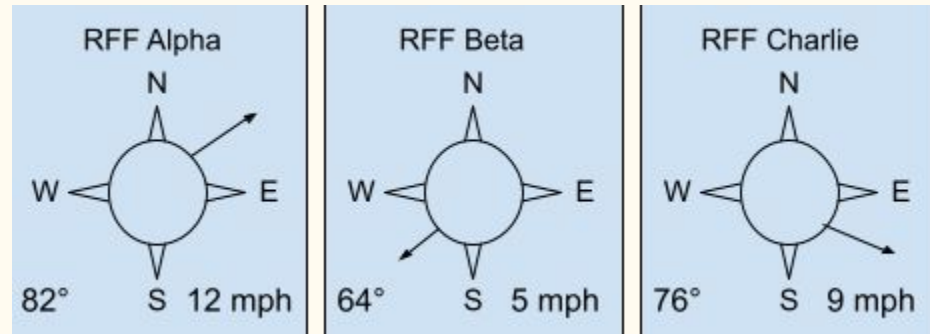 - Uses data to generate three different views
- Summary Views
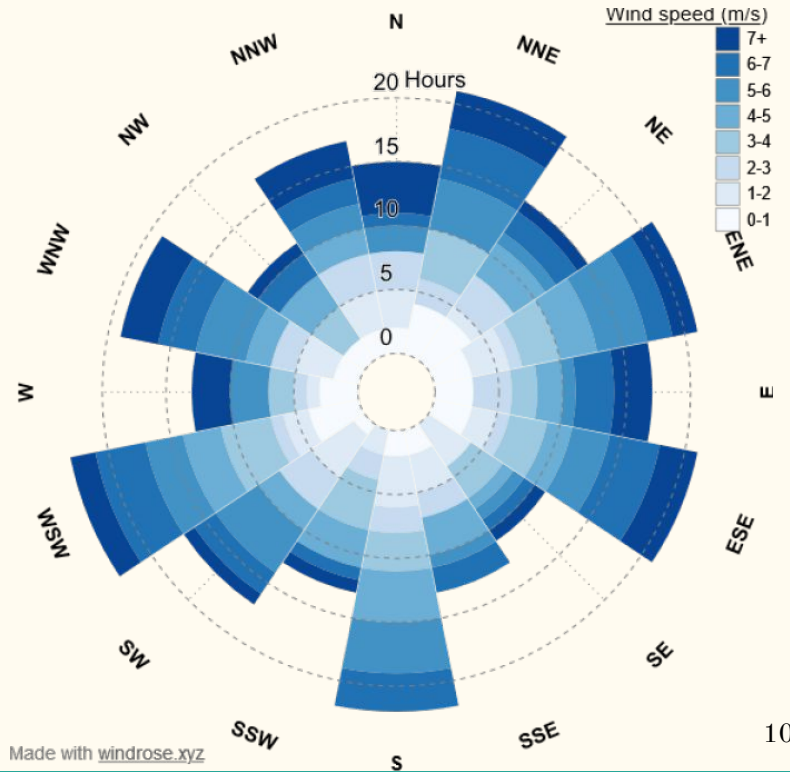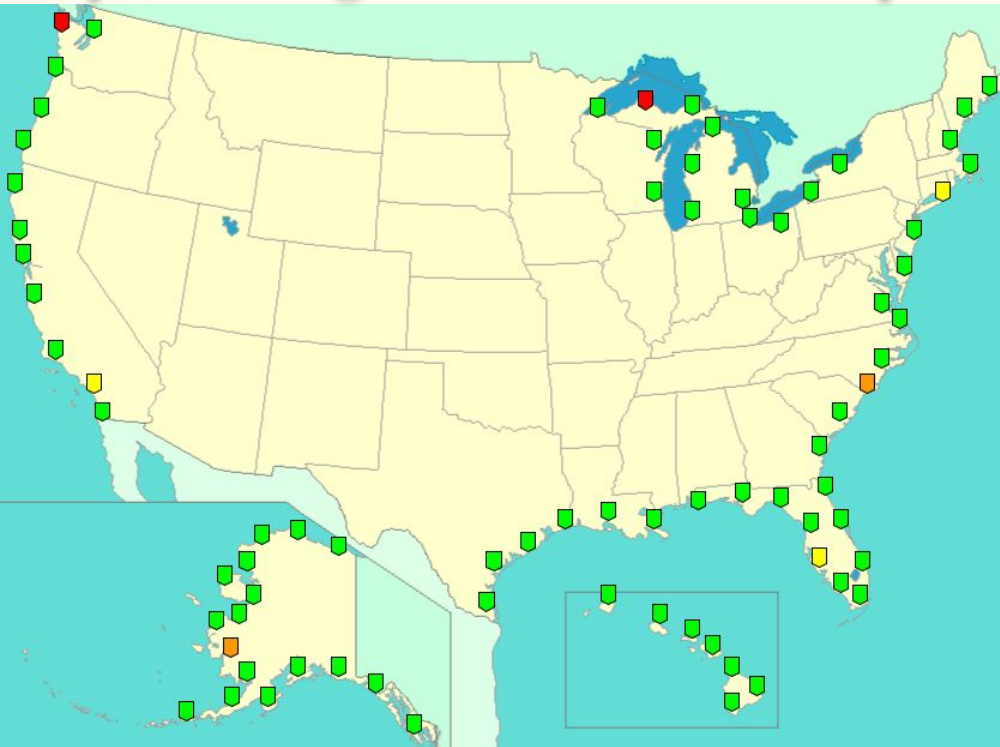 - List-View
  - Map-View
- Historical View
  - Charts e.g. Wind Rose compass

List-View

Solution Overview continued

## Map View Diagram & Wind Rose Compass

Key Requirements

1. Create a list view summary of the SWAPR devices in the network

2. Create a map view summary of the SWAPR devices in the network

3. Create graphs using historical SWAPR data

4. Create a way to notify operator when there is a problem with a RFF site

5. Export data from the database as a .csv file

Key Requirements Continued

6. Establish a secure website environment with authentication

7. Store and serve SWAPR data in a secure manner

8. Take data from a SWAPR device and send it securely off-site

9. Create data imitating the SWAPR device's output

10. Emulate the entire SWAPR device network for stress testing

Website Subsystem Diagram
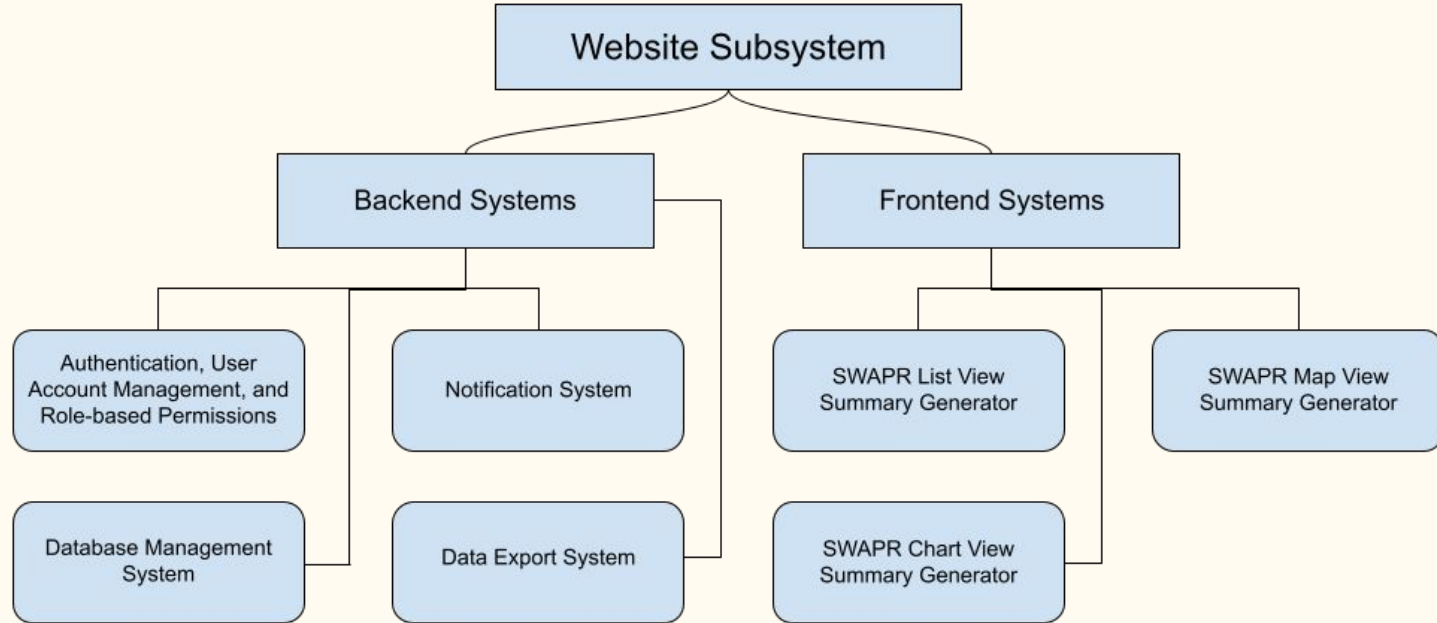
Overview diagram of the functions for the Website Subsystem

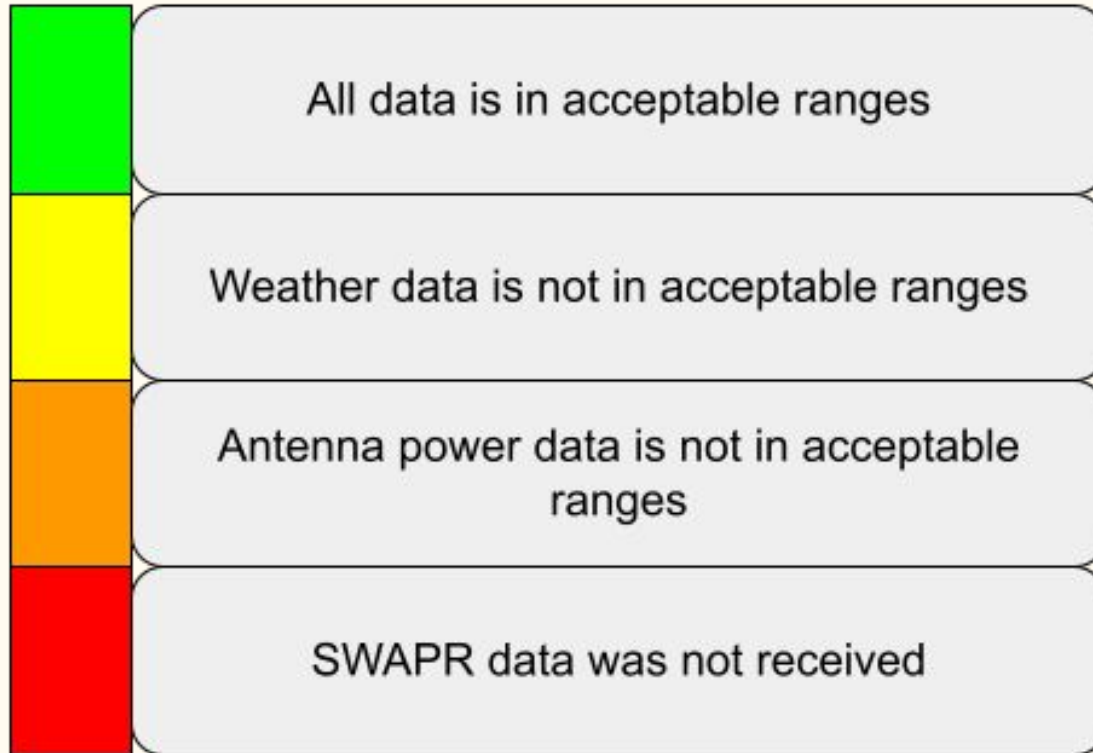# Website Subsystem Functional Requirements

Front-end

- Create list-view and map view summary of SWAPR weather data

- Create graphical view of historical data of a single SWAPR device

  - Extra: interactive functionality

Back-end

- Host Blazor Server on AWS (Amazon Web Services)

- Secure authentication between subsystems and role based permissions

- Securely query database server

- Export data from graphical view to .csv file

- Notifications for RFF malfunction

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Operational Status

🟢 (green)	All data is in acceptable ranges
🟡 (yellow)	Weather data is not in acceptable ranges
🟠 (orange)	Antenna power data is not in acceptable ranges
🔴 (red)	SWAPR data was not received

# Website Subsystem Performance Requirements

Front-end

- Live data dashboard refresh every minute

- Display list and graph view within 6 seconds

- Create 18 RFF maps within specified Area of Responsibility

- Display event to appropriate user under 2 seconds

Back-end

- Export SWAPR device data within 2 seconds

- Retrieve summary and historical data from database within 3 seconds

- Generate graphics of SWAPR device information within 6 seconds

- Determine critical event statuses of: Green, Yellow, Orange, and Red

Database Subsystem Diagram
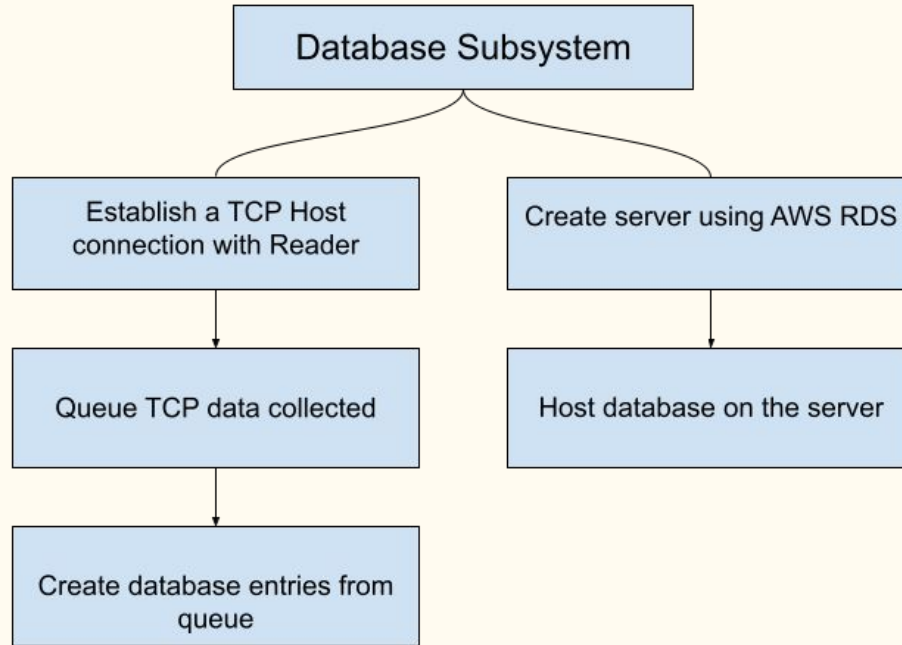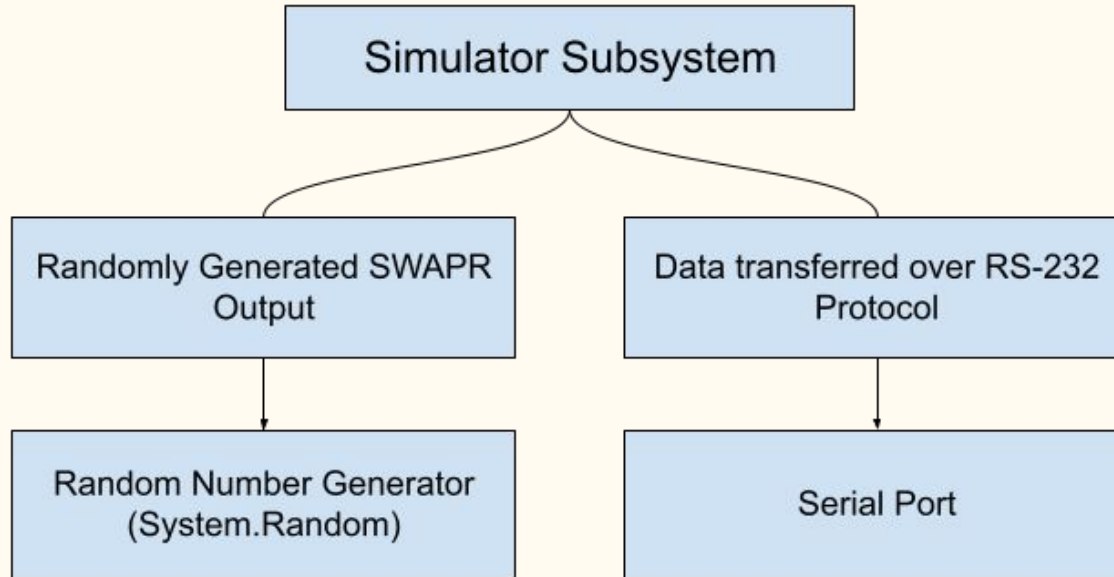

Overview diagram of the functions for the Database Subsystem

Reader Subsystem Diagram
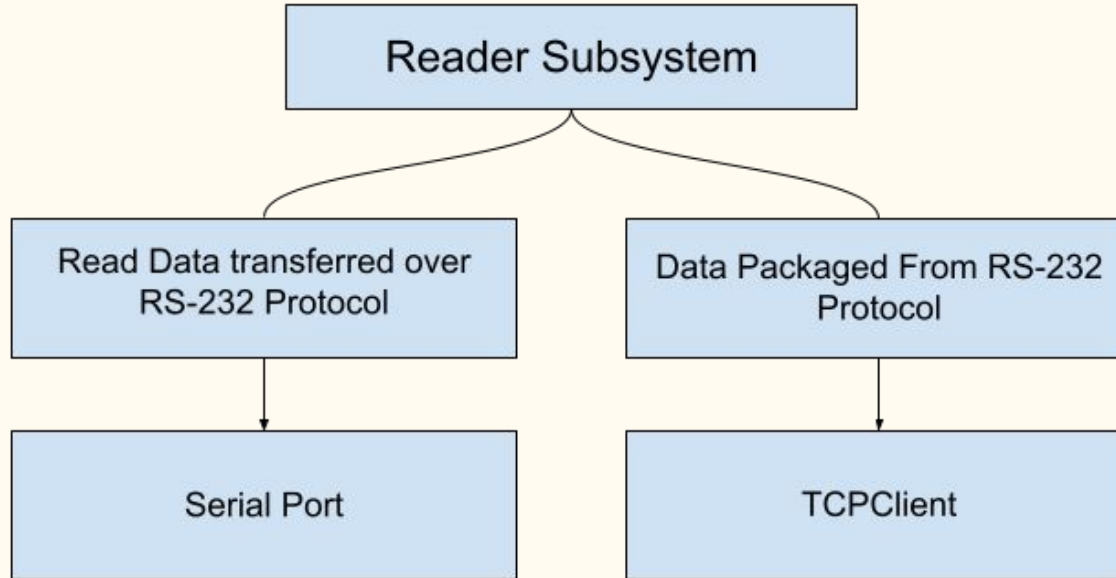
Overview diagram of the functions for the Reader Subsystem
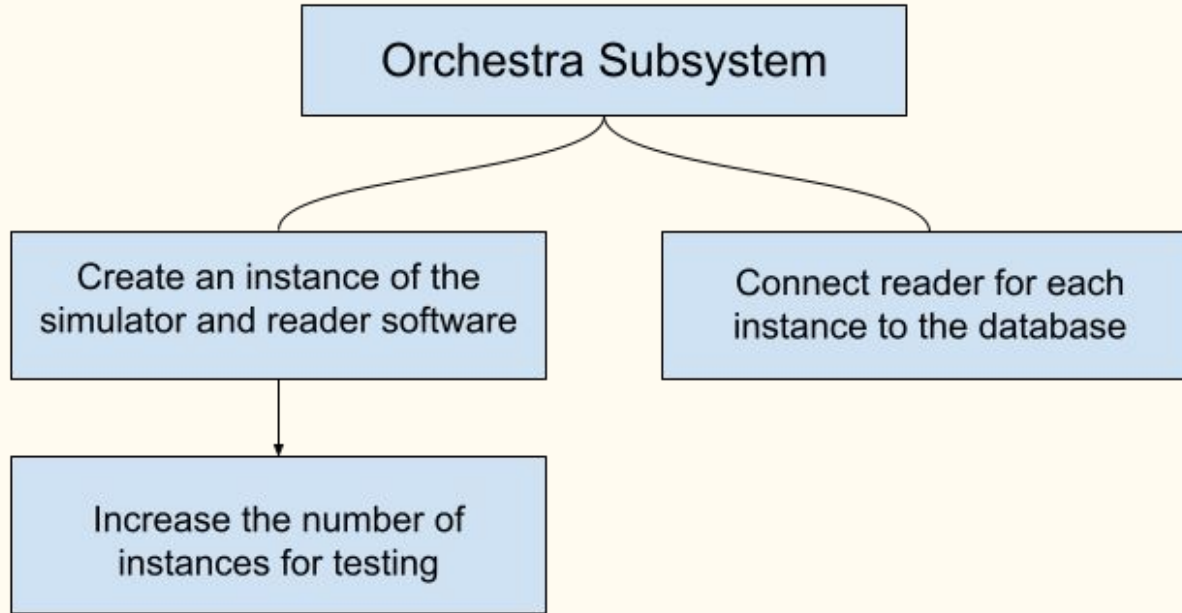
Simulator Subsystem Diagram

Overview diagram of the functions for the Simulator Subsystem

Orchestra Subsystem Diagram

Overview diagram of the functions for the Orchestra Subsystem

Environmental Constraints

- Built and used in a Windows Environment

- Developed in C#

- Developed using Microsoft Visual Studio

- Built into a Blazor Server

- Using built-in .NET 5 classes

Risks and Feasibility

1. Falsely Reported Antenna Power and Weather
   a. Technician sent in bad conditions
   b. Technician sent is unprepared
   c. More down-time due to weather damage

2. SWAPR Doesn't Send The Data to Database
   a. Hardware or internet issue
   b. No response
   c. Someone has to be sent out(once again)

Schedule

- Requirements Document Draft
- Design Review Presentation
- Design Review Dry Run with Mentor
- Project info Mini-Video
- Technical Prototypes Demo
- Tech Demo Flight Plan submitted to mentor
- Schedule Prototype Demo with Mentor
- Website Completed and Ready to Grade
- Requirements Doc Final
- Final Exam

- Start: 10/18/21, End: 11/16/21
- Start: 11/05/21, End: 11/19/21
- Start: 11/05/21, End: 11/16/21
- Start: 11/19/21, End: 12/03/21
- Start: 11/19/21, End: 12/03/21
- Start: 11/22/21, End: 11/24/21

- Start: 11/22/21, End: 11/24/21
- Start: 09/13/21, End: 12/03/21
- Start: 10/18/21, End: 12/03/21
- Start: 12/06/21, End: 12/08/21

Gantt Chart Semester 1

Gantt Chart Semester 2

CS486 - Semester 2 Assignments			
Community Strategy Memo	0%	1/18/22	1/22/22
Software Design Document Draft	0%	1/18/22	1/22/22
Software Design Document Draft Due to Mentor	0%	1/18/22	2/5/22
Final Software Design Document Due	0%	1/18/22	2/12/22
UGRADS registration	0%	2/15/22	2/26/22
Full Prototype Tech Demo Milestone Spec.	0%	3/1/22	3/5/22
Demo "Flight Plan" Template	0%	3/1/22	3/5/22
Full Prototype Tech Demo Milestone Spec.	0%	3/1/22	3/15/22
Software Testing Plan	0%	3/8/22	3/26/22
Design Review 3 Video (DR3)	0%	3/22/22	4/2/22
Completed Team Website	0%	4/5/22	4/16/22
Capstone Poster	0%	4/5/22	4/16/22
Capstone Presentation Dry Run	0%	4/5/22	4/16/22
Capstone Presentation	0%	4/5/22	4/16/22
Final Product Acceptance Test Demos	0%	4/12/22	4/22/22
Final(as-built) report	0%	4/18/22	4/22/22
Team Reflection Document	0%	4/18/22	4/29/22
User manual and completed checkof sheet signed	0%	4/18/22	4/29/22
Final Product Delivery	0%	4/18/22	4/29/22

Conclusion

- General Dynamics needs Weather and Antenna Power Data from RFFs

- Last Capstone Gathered the Data

  - Data is difficult to read and analyze

- Our Project Builds

  - Secure website with various graphical views

  - Architecture to collect and store data for website

- Moving forward, we will build our project demo

GENERAL DYNAMICS
Mission Systems

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