



**NORTHROP
GRUMMAN**

Weapon System Support Software

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Our Clients & Business

Aerospace & Defense Contractor

- Armament Systems
- \$30 billion in revenue / year

Harlan Mitchell

- Sr. Systems Engineering Manager

Laurel Enstrom

- Principal Systems Engineer



B-2 Spirit Stealth Bomber
Source: Northrop Grumman



RQ-4 Global Hawk
Source: Northrop Grumman



The Problem

Advanced Weapon Systems



Faults with these weapon systems produce a lot of data



NG must dispatch engineers with a tool to collect data



NG will work to resolve the problem, traveling to and from as much as needed



No end-user diagnostic tool



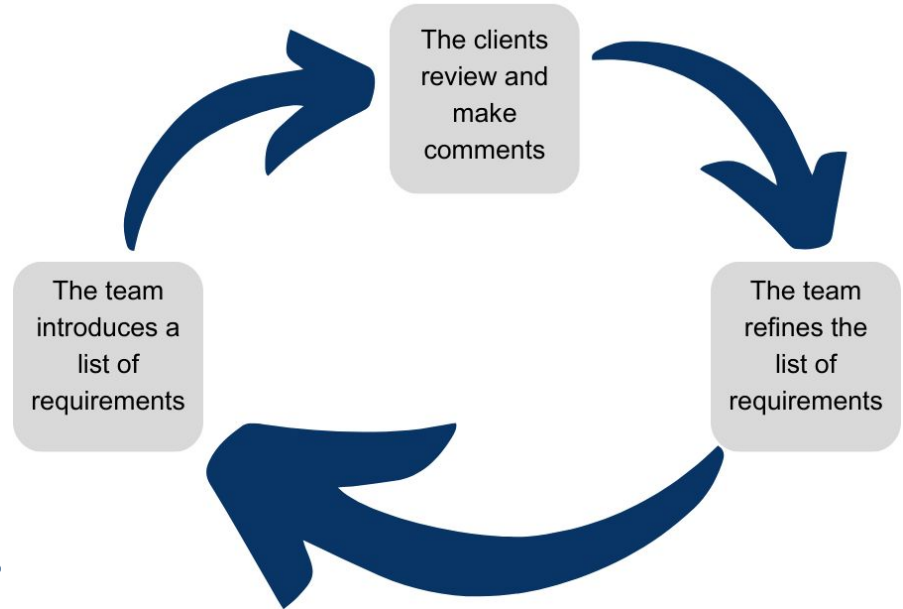
Complex, or insignificant data in existing tool



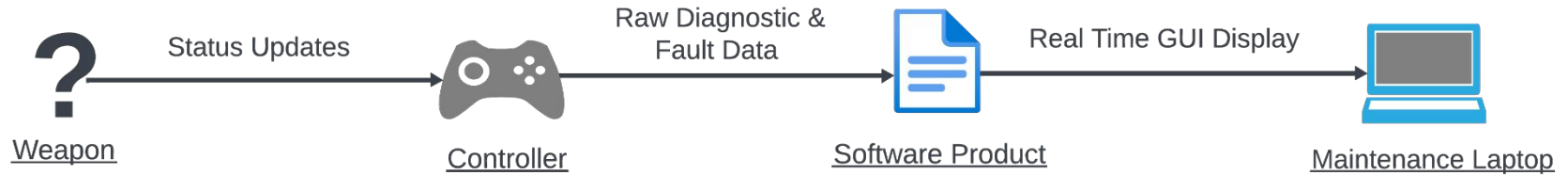
Expensive to dispatch engineers

Key Requirements

- **Key Requirements**
 - Must be a desktop application
 - Read data via RS 422 serial communication
 - Must be able to output to logfile
 - Must be able to filter weapon events and errors



Solution Overview



- Controller will send data to the software application via RS 422 serial communication
- The application will display the data into GUI and log file if selected by user
- The application will be installed by an installer that does not require administrator rights

Implementation Overview

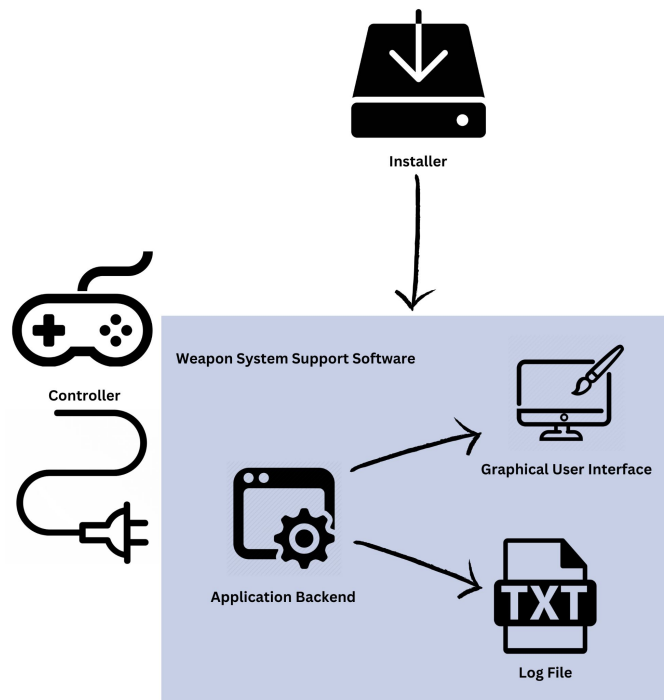
QT Framework

- QT Serial Bus
- QT Serial Port
- QT Graphical User Interface support

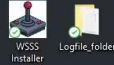


C++ Backend

- OOP based classes
- Dynamic memory management



Prototype Review - Installer



```
const clock = {  
  hour: 8,  
  minute: 13,  
  second: 8,  
  period: "AM",  
  day: 9,  
  weekday: "Tuesday"  
};
```



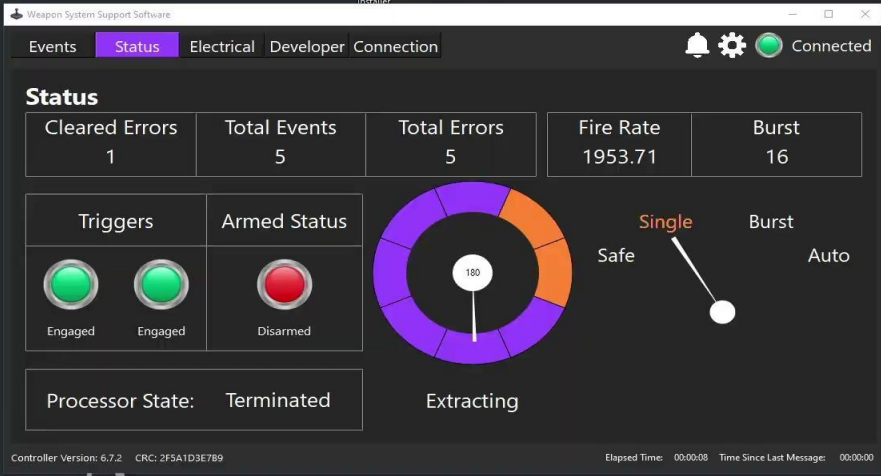
Prototype Review - Events Page

The screenshot displays the 'WSSS System Support Software' interface. The top navigation bar includes tabs for 'Events', 'Status', 'Electrical', 'Developer', and 'Connection'. A search bar contains the text 'Auto save log set'. The main content area is titled 'Events' and shows a list of six event entries. The first entry is a sample event message, while the others are errors that have not been cleared. Below the list, a summary table provides counts for total events, total errors, cleared errors, and active errors. At the bottom, there are buttons for 'Open Logfile Folder', 'Set Logfile Folder', 'Load events from log file', and 'Download'. The footer of the application window shows the controller version (6.7.2), CRC (2F5A1D3E7B9), elapsed time (00:00:03), and time since the last message (00:00:00).

Total Events	Total Errors	Cleared Errors	Active Errors
3	3	0	3

Controller Version: 6.7.2 CRC: 2F5A1D3E7B9 Elapsed Time: 00:00:03 Time Since Last Message: 00:00:00

Prototype Review - Status Page



WSSS Installer | Logfile_folder | WSSS



Weapon System Support Software

Events | **Status** | Electrical | Developer | Connection

Connected

Status

Cleared Errors 1	Total Events 5	Total Errors 5	Fire Rate 1953.71	Burst 16
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Triggers	Armed Status
 Engaged	 Disarmed

Processor State: Terminated

Extracting

180

Single | Burst

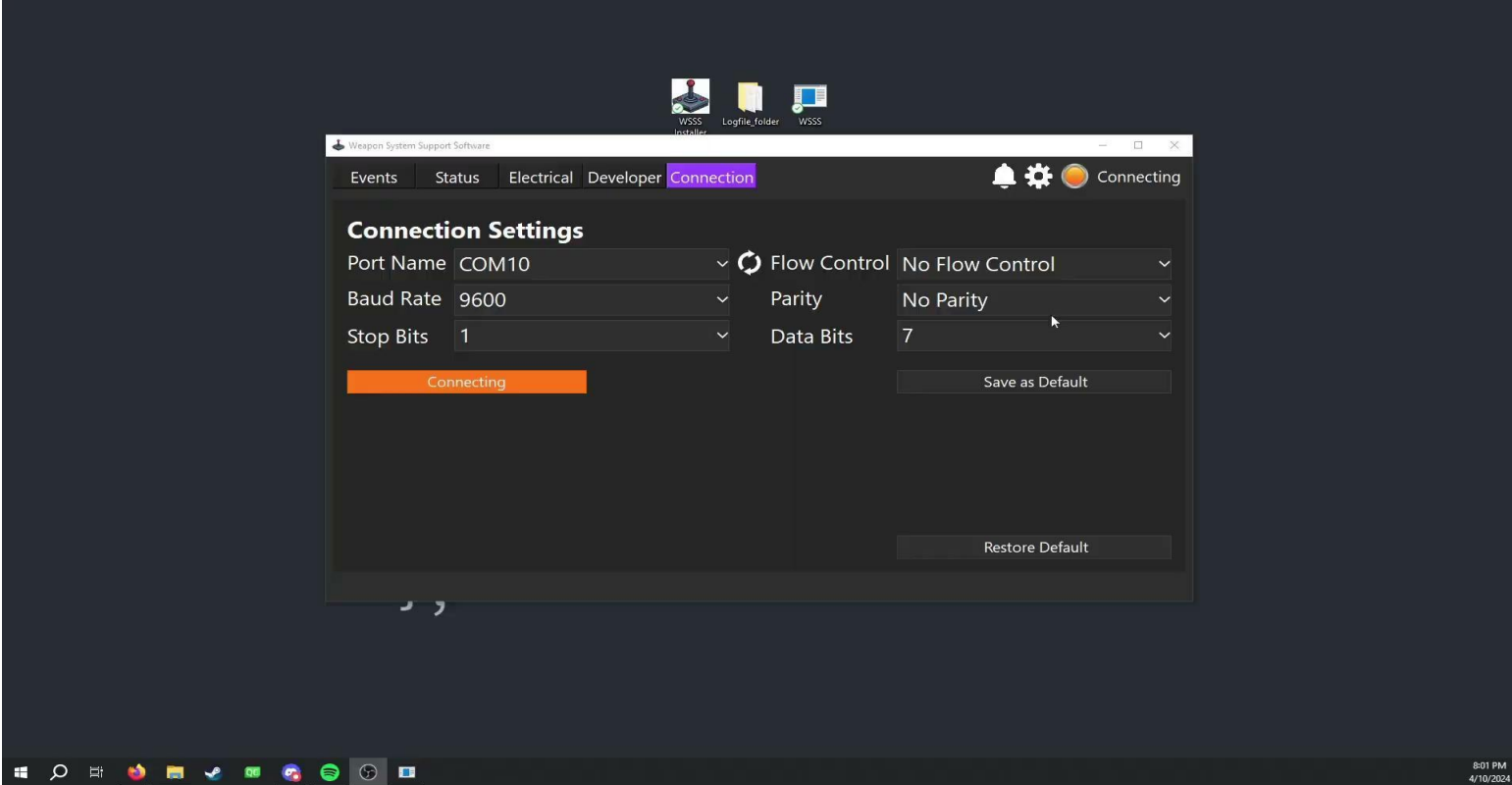
Safe | Auto

Controller Version: 6.7.2 | CRC: 2F5A1D3E7B9

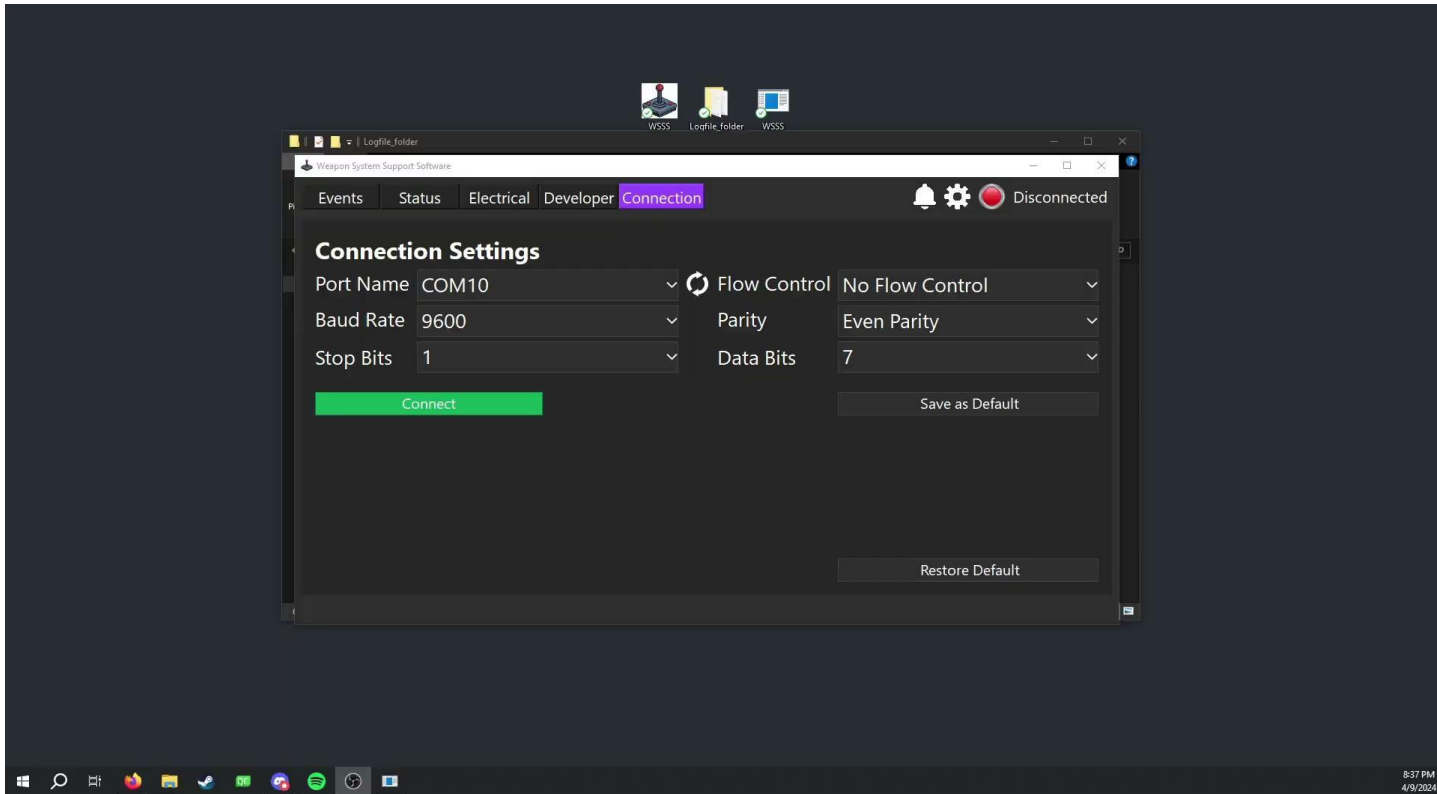
Elapsed Time: 00:00:08 | Time Since Last Message: 00:00:00

7:58 PM 4/10/2024

Prototype Review - Electrical Page



Prototype Review - Settings



Challenges and Resolutions

Risks

Misinformation

- Software Miscalculations
- Serial Protocol
Encoding/Decoding Errors

Challenges

Completed

- Front end sub classes
- Simulated serial communication
- Installer
- Device to Device serial communication

In Progress

- Testing
 - Unit tests complete

Schedule

TEAM CONTROLLER SEMESTER 2 PLAN



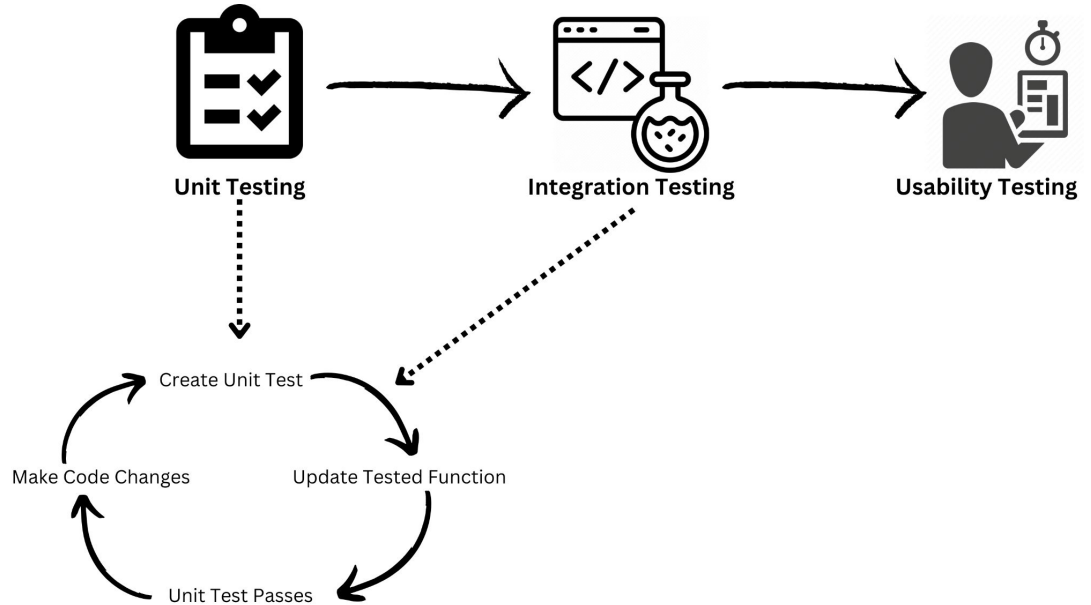
Sprint 5 is done

Current software progress:

- Back-end is finished
- Front-end refinement
- Finishing up testing

Testing Plan

- Linear testing path
 - Unit testing
 - Integration test
 - Usability testing
- Using QTest library
 - QCOMPARE()
 - QVERIFY()



Conclusion

Our clients are Northrop Grumman and the main issues are:

- Long travel times
- Complex data
- (Lack of) End user tool

Our goal is to provide our clients with an easy to use desktop application so a non-engineer can diagnose weapon data

We currently meet weekly to showcase what has been accomplished with our clients during our two week sprints