



Team Controller

**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



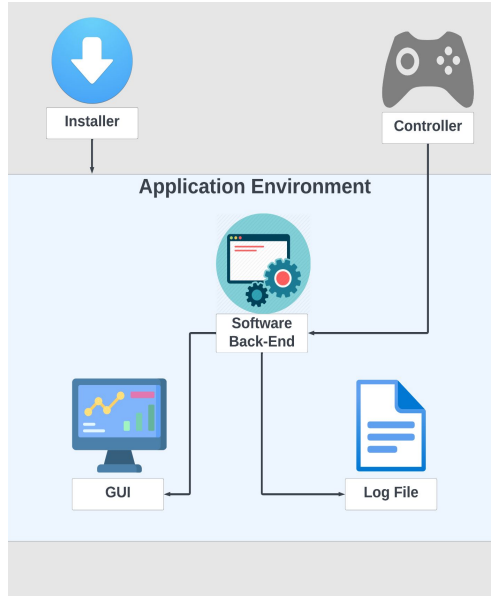
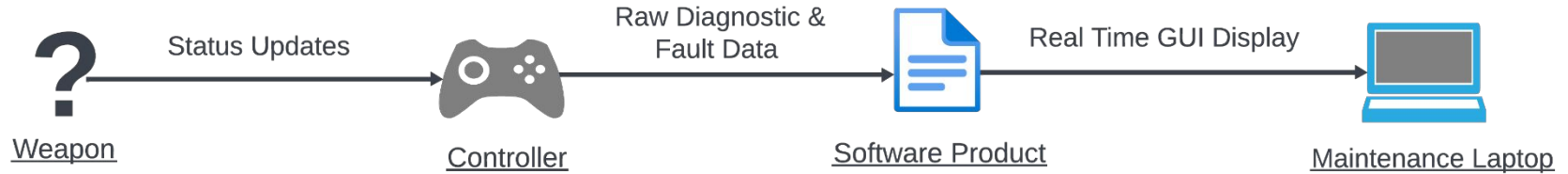
NG will work to resolve the problem, traveling to and from as much as needed

 No end-user diagnostic tool

 Complex, or insignificant data in existing tool

 Expensive to dispatch engineers

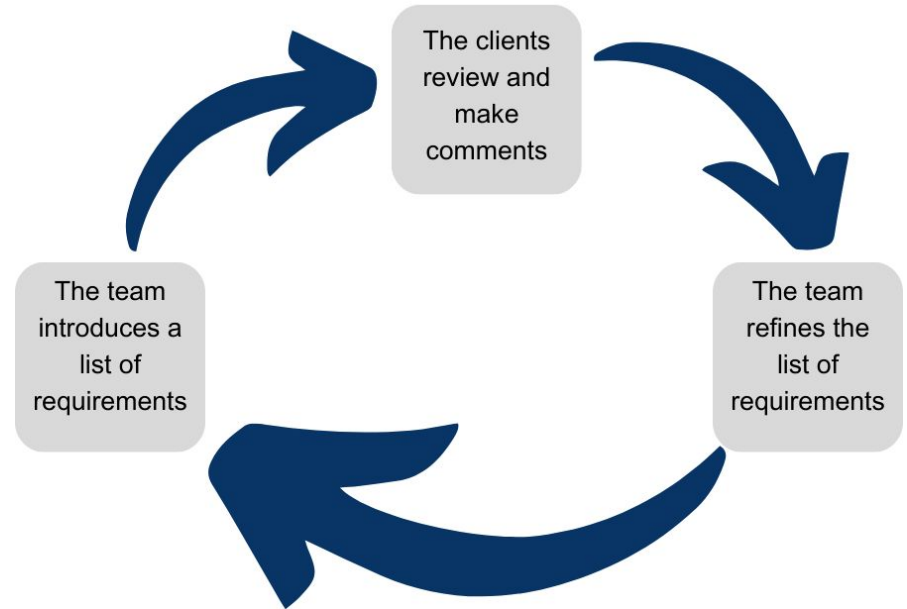
Solution Overview



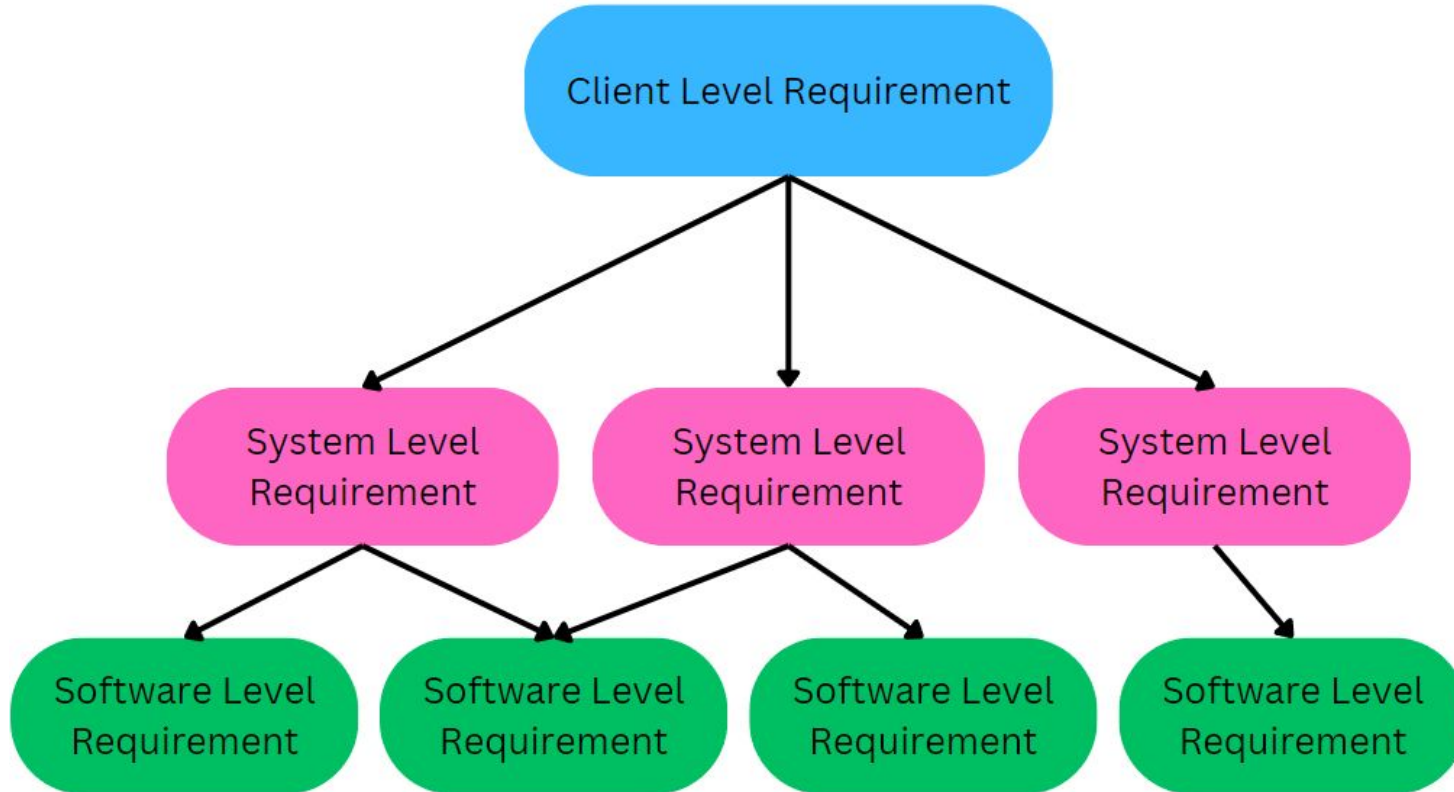
- Controller will give data into the software application
- The application will display the data into GUI and log file if selected by user
- The application will be installed by an installer that does not require administrator rights

Requirements Acquisition

- The team meets weekly with the clients
- Emails are exchanged as needed to provide in-depth feedback on requirements
- Files and important documents are shared on Github



Requirements Breakdown



Client Level Requirements

1

The EVENTS panel displays a list of recent events with their timestamps and details. A summary table at the bottom shows the following data:

Total Events	Total Errors	Cleared Errors	Active Errors
23	12	10	2

Additional information includes 'Elapsed Time: 00:15:22' and a 'Download' button.

2

The STATUS panel shows the system's operational state. It includes a 'Triggers' indicator (ENGAGED/NIA), 'Total Errors' (12), and 'Total Events' (23). A large purple circle indicates the 'feed position'. The mode is set to 'SAFE SINGLE BURST AUTOMATIC'. Additional information includes 'Elapsed Time: 00:16:28' and 'Controller Version 1.0 | CRC 7F285291'.

- Connects to weapon controller via RS422 serial communication

- Simple design

- Avoid the need for admin

rights during installation or operation

3

The ELECTRICAL panel displays a table of sensor and actuator data:

#1: Cooling motor	#2: Internal temp sensor
Voltage: 220v Current: 15a	Voltage: 12v Current: 20mA
#3: External temp sensor	#4: Hydraulic actuator
Voltage: 12v Current: 15mA	Voltage: 240v Current: 25a
#5: Servo motor	#6: Pressure sensor

Additional information includes 'Elapsed Time: 01:13:11' and a settings gear icon.

4

The CONNECTION SETTINGS panel shows the current connection status (CONNECTED) and configuration parameters:

Port Name	Flow Control
COM1	None
Baud Rate	Parity
9600	None
Stop Bits	Data Bits
1	8

Buttons for 'DISCONNECT' and 'Save' are present. Additional information includes 'Elapsed Time: 00:00:48' and a 'Restore Defaults' button.

- Works on Windows 10 and 11

Traceability Matrix

Client Level

System Level

Software Level

CR02 The data display module shall read input data via RS422 serial protocol from the controller simulator.	R03 The data display module shall be capable of serializing / deserializing messages received via an RS422 serial port.	SR01 - SR05 SR08
	R04 The controller simulator shall be capable of serializing / deserializing messages received via an RS422 serial port.	SR01 - SR05 SR08

SR Examples:

- **SR01** - The software shall be capable of generating *serialized* versions of given *status data* and *event data*.
- **SR05** - The software shall be capable of sending *serialized data* through a *serial port*.

Risks and Feasibility

Risks

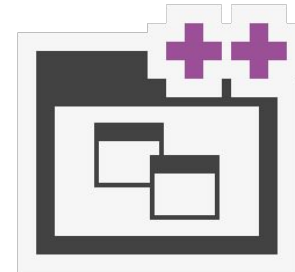
Misinformation

- Incorrect controller information
- Software Miscalculations
- Serial Protocol
Encoding/Decoding Errors

Improper port hardware

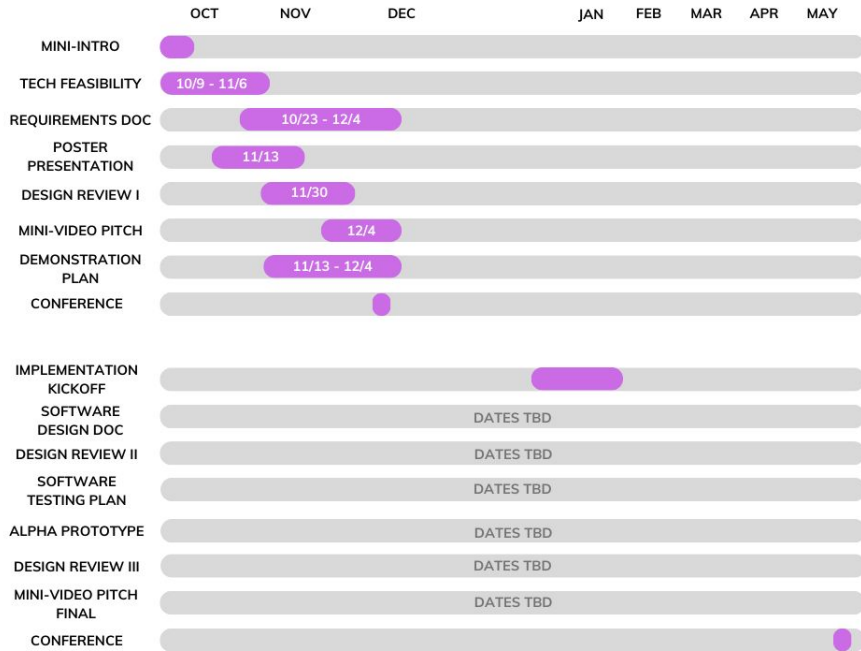
- RS422 only

Feasibility

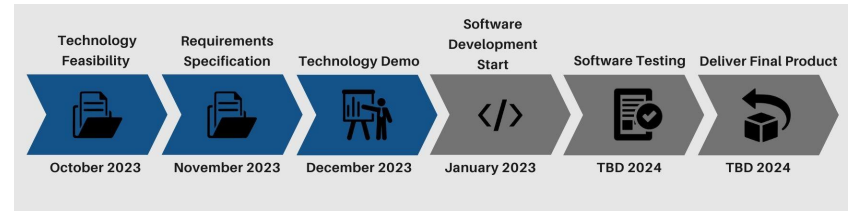


Schedule

TEAM SCHEDULE



- Development Phase
 - Agile sprints
- Testing Phase(s)
- Final Product



Conclusion

Our clients are Northrop Grumman and the main issues are:

- Long travel times
- Complex data

Our goal is to provide our clients with an easy to use desktop application that anyone can use.

Our plan is to meet with our clients weekly throughout development and follow all the requirements and avoid the risk.