VEHICLE INTERCHANGEABLE ELECTRONIC CONTROLLER (VIEC) NETWORK SYSTEM

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Problem Description

When conducting missions in space it is difficult to obtain replacement components and parts that might have failed

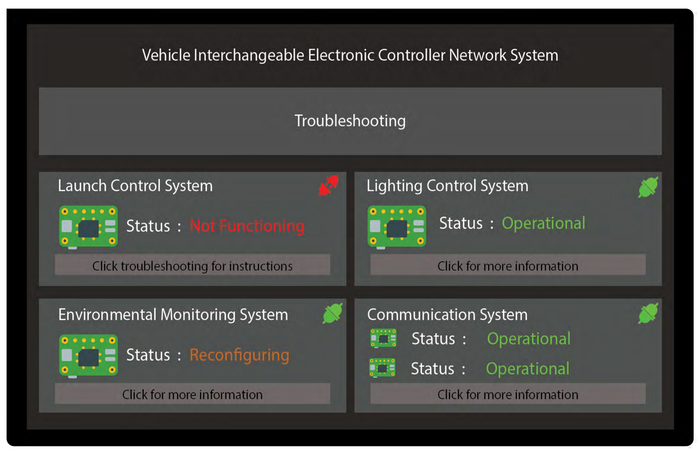
- Sending replacements can be too costly, or might not be a viable option
- Loading replacements onto the spacecraft before launch would lead to an increase in mass, which in turn leads to an increase in fuel consumption

Proposed Solution

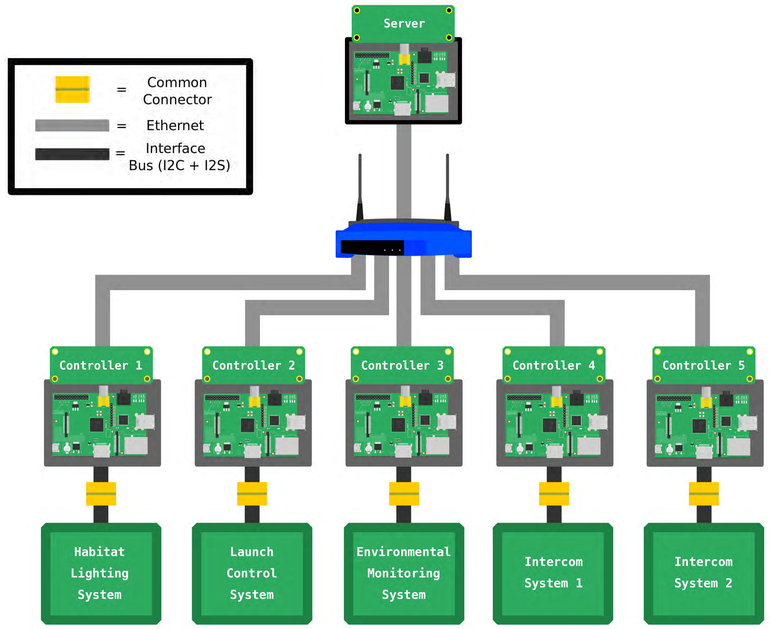
The VIEC Network System aims to mitigate these concerns by promoting interchangeability between the components and parts used in the spacecraft, leading to an overall reduction in the amount of replacement parts needed. This is achieved by:

- Interchangeability between controllers performing different task in the spacecraft
- Using common busses to interface with the controllers
- Using a system-wide common connector to enhance the interchangeability of the controllers
- Easily replace certain components used by the test applications within the VIEC Network System

Graphical User Interface



System Architecture



Test Applications

Each test application is design to simulate a different aspect of what would be used in a spacecraft. These test applications are store on both the server and on each IC. The test applications used are as follows:

- Habitat Lighting System - Turns on an LED light if motion is detected. The intensity of the LED light will vary based on the values received from the LUX sensor
- Launch Control System - If the Correct Numerical code is entered, a sequence of lights, sounds, and text will be outputted
- Environmental Monitoring System - Monitors the levels of gas, oxygen, and temperature/humidity it receives from its sensors. An alert will be issued if any value exceeds the safety level for a human being
- Intercom System - Enables two-way communication between two ICs. Audio input is received from the source IC and is outputted to the destination IC

PRELIMINARY RESULTS

Requirement	How it was tested	What is verifies	Number of test	Results
Deploy Applications	Check if the file was sent correctly	Appropriate programs can be sent to the ICs	50	100% Success Rate
Application Identification	Check if the values are the same as on the switch	It is possible to find the Id of a subsystem in the network	50	100% Success Rate
Swap to or more controllers	Swapping the ICs and verifying if they execute the application correctly	Verifies that multiple subsystems can be handle by the server	25	100% Success Rate
Common Connector	Connect an IC to different subsystems	Proves any IC can interface with any subsystem	25	100% Success Rate
Reconfigure an IC within 20 seconds	Connect an IC to a subsystem and time how long it takes for the new application to be functional	Any IC can be reconfigured within 20 seconds	50	Average Time Taken: 17.32 seconds

Conclusion

The VIEC Network System aims to reduce the amount of replacement controllers needed on a spacecraft by making each controller interchangeable with one another. Our team was able to successfully create a system that achieves all the goals set out to accomplish.

As for future development, the system could be expanded upon by adding more subsystem into the network and seeing if the server can handle all of them. The complexity of each subsystem can also be expanded upon, which would affect the way each subsystem runs.

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