Mobile Virtualized Radio Control System

Eric Chen, eac130530@utdallas.edu; Thomas Dang, txd140830@utdallas.edu; Sindayihebul Gistave, sxg155531@utdallas.edu; Paul Mba, pum130030@utdallas.edu; Joshua Newhouse, jbn160130@utdallas.edu

CS 4485 / Spring 2018
Department of Computer Science
Erik Jonsson School of Engineering & Computer Science
The University of Texas at Dallas
Richardson, TX 75080, USA

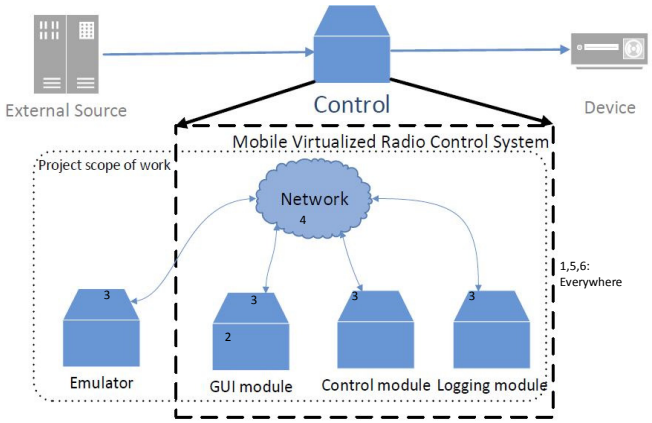
Overview

Radio equipment remote controls have a long history in communications. The concept of an operator removed from the large, noisy, and heat-generating transmitter is easily understood. Today, console space and multiple levels of user interface to the radio equipment take a large percentage of the available real estate. To control multiple radio systems, each radio transmitter and receiver requires a unique control device on the console. Today's platforms are relying on more networked communication functions, the controls for networking and interfaces to the devices are increasing in complexity, increasing operator workload and human error factor. Rockwell Collins proposes for Phase 2, the use of an extensible, programmable, reconfigurable control technology to incorporate innovative technology, enable workload reduction and provide deterministic control, while reducing size, weight and power for radio control.

Legacy Discrete Control Approach

Mobile Virtualized Radio Control System (MVRCS)

Architecture



Utilized Technologies

- Java
- JavaFX/FXML
- Java Messaging Service
- ActiveMQ
- CentOS
- Virtual Box

Requirements

- Provide a flat panel display and remote control application providing direct equipment interface for local control of radio devices.
- Remote monitoring of control system commands
- Provide status information and rapid recovery of operational control of radio systems
- Maintenance terminal for support of equipment

Impact

Our application system

1) Reduces the space, weight, and power required by traditional legacy radio control equipment
2) Virtualization reduces capital and operating costs
3) Reduces operator workload by providing a consistent and intuitive GUI for all devices under control
4) Provides simpler maintenance and testing via an external source, interface emulators, and consistent GUI
5) Provides high availability via virtual machine architecture
6) Reduces MTBF via control monitoring and event logging

Summary

Our team developed a Mobile Virtualized Radio Control System(MVRCS) to replace legacy radio control heads. The MVRCS is an operating system independent, software based controller capable of remote control, management, and monitoring of radios and special mission equipment. The controller is portable and intended for deployment on mobile platforms including those that are hardware resource limited. The goals of this effort are to provide a system that will reduce space, weight, and power requirements on the host platform, reduce operator workload controlling and maintaining the radio equipment, and provide a portable, extensible, fault tolerant, scalable architecture.

Phase 2 - 4 of 5 project goals met:

- 58% of System requirements met (HW in phase 3)
- Radio Emulator, Test and Evaluation control interface
- External Source Emulator for testing completed
- Extensible Framework and interfaces demonstrated
- Maintenance interface and maintenance controller