

## Situational Awareness Dashboard for UI Cyberphysical Systems Security Testbed

Industrial Control Systems (ICS) are commonly available all over the world for controlling industrial processes and critical infrastructure such as power systems. The level of computer control from remote control centers has increased, and these ICS systems have evolved into cyberphysical systems (CPS).

The UI College of Engineering is developing CPS Cybersecurity testbed. The testbed is designed for real time experimental research aimed at investigating and observing the impact of possible cyber attacks and evaluate the performance of new cybersecurity solutions on the smart grid using real automation controllers, Intelligent Electronic Devices (IEDs), SCADA software, and cyber-physical networks. The testbed consists of power utility and cyber system resources that enable researchers to perform simulations of smart grids and other CPS. The power system is simulated using a real time digital simulator (RTDS) with commercial control hardware and software connected to it in a hardware-in-the-loop environment. Figure 1 shows the RTDS and some of the control and protection hardware that can be connected to it.



Fig. 1: UI RTDS with protection and control hardware

The power lab testbed represents the power system and the RTDS has its own graphical user interface for controlling simulations and viewing results. In addition, commercial SCADA software provides a human machine interface for monitoring and controlling the system. In

addition, the Securing Cyberphysical systems ANalytics, Visualization, IoT, and machine Learning Laboratory of Enquiry (SCANVILLE) lab under construction and the Reconfigurable Attack-Defend Instructional Computing Laboratory (RADICL) are interfaced to the power lab for exploring CPS cybersecurity.

The objectives of this senior design project are:

- (1) To design, implement, and test a dashboard for monitoring and controlling the testbed to provide situational awareness for the operators of the testbed (equivalent power grid operators and power communication network managers).
  - a. This includes providing information on power system status
  - b. And communication network performance indicators
  - c. Possible include locational information on the power system and the communication system using GIS information or other mapping software.
- (2) Provide ability to interface the protection and control equipment, the RTDS, and the SCADA control software
- (3) Develop and test example scenarios
- (4) Documentation sufficient to allow future students to use, troubleshoot and expand the dashboard.

Team needs: 2 ECE students, 2 CS students