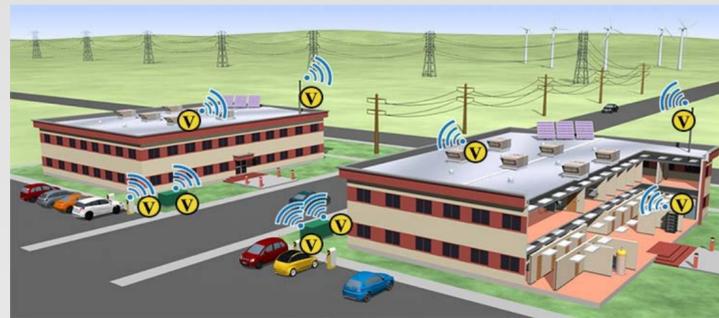


Project 3.7 Hardware Integration Platform for the CCSI Test Bed

Jereme Haack, Poorva Sharma, Shwetha Niddodi, Kyle Monson, Craig Allwardt and Michael Roup

Objective

- Combine simulated and actual hardware devices in a buildings-grid control test bed
- Enhance VOLTRON™, a PNNL-developed open source platform for sensing and control in buildings, devices, and grid, for use by CCSI:
 - Enable rapid prototyping of control algorithms
 - Allow algorithms to seamlessly operate against simulated or actual hardware
 - Mitigate concerns of facilities managers to simplify expanding test bed



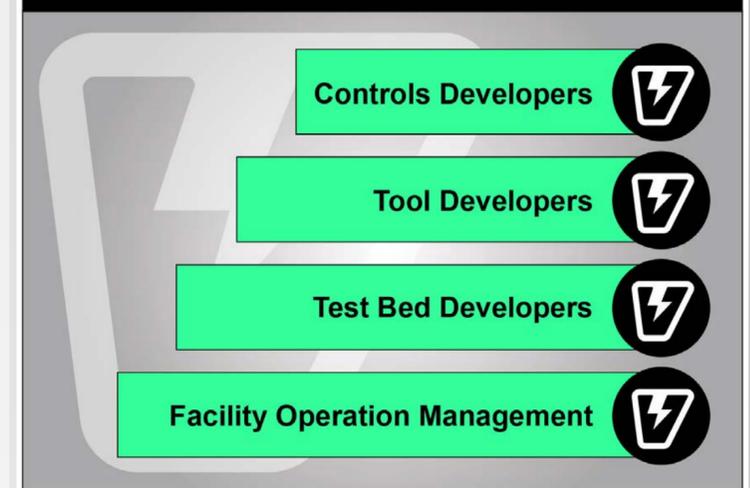
Methodology

Integrate existing capabilities:

- Framework for Network Co-Simulation (FNCS) for simulation
- XMS for experiment setup, control, and data storage
- Hardware test bed for realistic test deployments
- VOLTRON™ platform to interface with devices and provide an integrated messaging environment for control applications and the resources they require

This project serves many parties with differing requirements and priorities

VOLTRON™



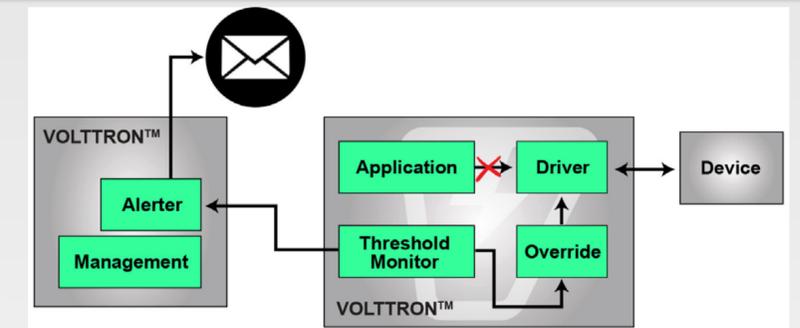
Results

Demonstrated XMS (3.4)/VOLTRON™ Experiment Deployment, Monitoring, and Override

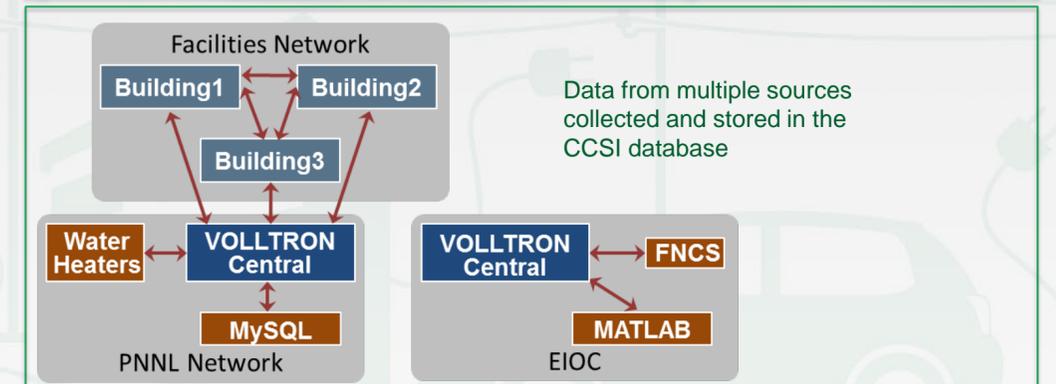
- XMS sends an “Experiment” definition to VOLTRON™
 - Application code
 - Devices to be controlled
 - Sensor reading thresholds for affected devices
- VOLTRON™ uses definition to deploy application and configure Threshold Monitor agent
- Threshold Monitor agent issues an alert if sensor readings exceed limits
- Override agent locks out application control and resets devices to known state
- Alerter agent sends out email to experimenters and test bed administrators

Enhanced and applied VOLTRON™ to fill needs of the CCSI team by providing these key capabilities:

- Support connections to resources across multiple network and firewall boundaries, a capability important for test bed federation
- Enhanced options for facilities management to override experiments and return devices to standard settings
- An existing VOLTRON™ community that provides potential users/collaborators for CCSI-based research



Define applications to deploy, devices affected, and threshold values for device sensors. If Threshold Monitor detects out of bounds values, override is issued locking out application actions and sets device back to good state. Administrators notified of violation.



Data from multiple sources collected and stored in the CCSI database