Internet of Things Common Operating Environment Testbed

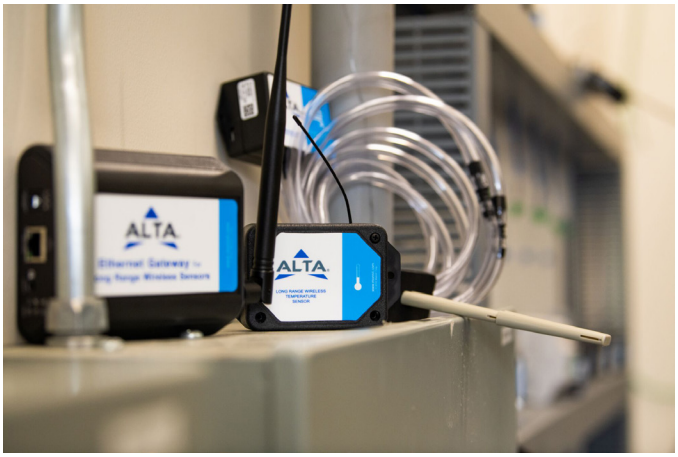
IMPROVING RESEARCH AND DEVELOPMENT FOR AN INTERCONNECTED WORLD

As the world of IoT/IIoT continues to grow, both in terms of numbers and complexity, security threats associated with these IoT/IIoT devices will continue to increase. To further complicate the challenge, no security standards and protocols currently exist for most of these evices.

By 2025, conservative estimates indicate that more than 80 billion devices, worldwide, will be interconnected and actively communicating with one another. Every network-connected device has security implications that must be mitigated for a device to be considered secure. These security implications are due not only to a device's network connections, but also Internet of Things (IoT) and Industrial Internet of Things (IIoT) protocols, locations, and external communications.

APPROACH

PNNL has established the IoT Common Operating Environment (IoTCOE) Testbed as an IoT/IIoT research and development laboratory focusing on solving current and future



challenges in new technologies, cybersecurity, and the development of connected devices space. The IoTCOE Testbed is made up of two physical spaces deploying over 60 different IoT and IIoT devices for experimentation individually and collectively—and the device list is steadily growing. One testbed space is in PNNL's Building Management Testbed—facilities and commercial buildings network. The other testbed space is in PNNL's Lab Homes (two homes, one control and one testbed)—each a full-scale replica of a residential home.

A distinct lack of realistic testing environments are available for IoT/IIoT research and development in cybersecurity, electricity distribution and transmission, and energy use. The IoTCOE Testbed provides an environment that includes devices for multiple sector collaborations. It is designed to provide a space for collaboration across areas of IoT/IIoT research and to support security-minded projects in energy use, cybersecurity protections and defense, supply chain, and IoT/IIoT development.

The innovations and data being developed using the IoTCOE Testbed will identify and provide the identification of novel solutions including cybersecurity control implementations; IoT/IIoT deployment best practices; new, innovative, and secure IT connections; and communications with IoT/IIoT. The IoTCOE Testbed will provide important data sets that industry can use to advance security best practices, energy sustainability, and more.

The IoTCOE Testbed can isolate devices from interference by competing signals such as Bluetooth, infrared, ZigBee, wireless, cellular, Ethernet, and radio frequency, thus providing an ideal collaborative space for unique and innovative research experiments. PNNL's IoTCOE team has also identified normal device behavior as a baseline for experiments, providing a sanitized test environment to conduct experiments and eliminate false positives.

BENEFIT

The IoTCOE Testbed affords researchers with a 360-degree view of interconnected devices. This approach to IoT/IIoT experimentation is unique and accommodates a myriad of research needs, including the exploration of cutting-edge chemical, physical, and cyber challenges using visual analytics, artificial intelligence, and machine learning.

Equipped with residential and commercial IoT devices, the IoTCOE Testbed delivers insight into untested hypotheses of IoT/IIoT experiments, including those in cybersecurity vulnerability detection, threat prevention and identification, energy usage functions, and more. PNNL's IoTCOE Testbed will strengthen our national cybersecurity posture in an interconnected world and inform our understanding of the IoT/IIoT connections of the future.

ABOUT PNNL

PNNL draws on signature capabilities in chemistry, Earth sciences, and data analytics to advance scientific discovery and create solutions to the nation's toughest challenges in energy resiliency and national security.

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