Pacific Northwest
NATIONAL LABORATORY

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VOLTTRON™: A Secure Tool for Achieving Energy Efficiency

Built-in features protect against cyber vulnerabilities

VOLTTRON™ is a distributed control and sensing software platform developed by the U.S. Department of Energy's Pacific Northwest National Laboratory. The technology enables connectivity, data acquisition, and distributed control for a large number of building systems and devices, either locally or in the cloud.

These capabilities require effective security approaches. VOLTTRON™ has been underpinned with a robust security foundation to combat today's cyber vulnerabilities and attacks.

SECURITY AT THE START

When PNNL sought a platform to develop and deploy agent-based solutions, it became clear that existing platforms could not meet resource management and security requirements. So PNNL developed its own platform—VOLTTRON™—and made security a priority. The platform's developers pursued a very structured approach from the outset, actively involving PNNL's cyber security experts and building security features into the technology. The commitment to security has continued, with developers regularly upgrading features in response to emerging requirements and VOLTTRON™ user feedback.

VOLTTRON™ applies a threat-model approach for determining software threats and vulnerabilities and how

Modern building efficiency strategies rely on secure management of a wide range of sensors and devices. The VOLTTRON™ platform's advanced security features are central to protecting this highly connected environment from cyber threats and vulnerabilities.

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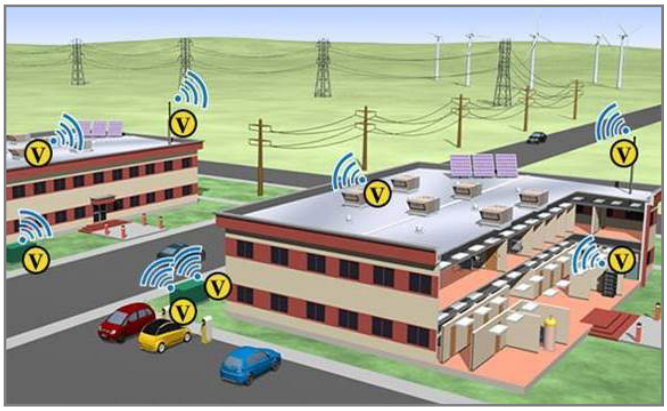
to reasonably reduce the attack surface and/or harm from a compromise. Through established mitigation strategies, VOLTTRON™ addresses a range of possible attack avenues and risks.

SECURITY FEATURES

VOLTTRON™'s security attributes address vulnerabilities and ensure the technology's effectiveness in delivering distributed sensing and control capabilities to buildings and building-grid integration activities.

- The technology is built on Linux to take advantage of the operating system's many security features, such as powerful file system permissions, user management, capabilities configuration, control groups, and a first-class firewall.
- Linux control groups CPU and memory subsystems are employed to limit excessive processor and memory use.
- When VOLTTRON™ accesses remote resources, it uses the highest version of TLS/SSL protocols, with the largest key size available to both endpoints, ensuring the greatest possible level of security. Within the technology, OpenSSL is used for TLS/SSL encrypted links. The system's OpenSSL libraries are kept as up-to-date as possible to prevent vulnerabilities such as HeartBleed.
- For multi-platform communication, VOLTTRON™ employs remote ZeroMQ (ØMQ) sockets using CurveZMQ elliptical curve encryption. Keys must be configured for links to be encrypted.



Secure communication is a focal point of VOLTTRON™ uses, represented here with the yellow "V" icons. The technology securely enables management of a wide range of devices, including solar panels, thermostats and vehicle chargers.

- Platform control (Unix domain) socket uses a mixture of file permissions and access control lists to limit access to authorized users.
- Code is peer reviewed for correctness and security.

MORE INFORMATION ABOUT VOLTTRON™ SECURITY FEATURES

Detailed descriptions of security components are provided in the document, "Security Features of VOLTTRON™ Distributed Sensing and Control Platform," available at *https://volttron.org/sites/default/files/publications/VOLTTRONSecurityFeatures-2017.pdf*.

ABOUT PNNL

Interdisciplinary teams at Pacific Northwest National Laboratory address many of America's most pressing issues in energy, the environment and national security through advances in basic and applied science. Founded in 1965, PNNL employs more than 4,000 staff and has an annual budget of approximately $1 billion. It is managed by Battelle for the U.S. Department of Energy's Office of Science.

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To download VOLTTRON™, visit
https://github.com/VOLTTRON/volttron

Web site: ***Volttron.org***

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