Energy utilities, including power, water and gas, have been one of the key sectors demonstrating fast and steady adoption of industrial IoT (IIoT) technologies. This is evident by forecasts placing the global market for IoT in utilities at nearly $54 billion by 2024, representing a growth of 13.5% from 2019\(^1\).

The reasoning for this trend is clear – by making sensor-based meters and other end points “smart”, utilities expect to benefit from higher efficiency, easy scalability and improved operations, as well as to minimize risk and downtime. To help achieve these benefits, there’s a growing use of cloud-based Big Data, analytics and dashboards, which provide critical real-time insights for decision makers.

These insights are required to ensure that the utility company is able to meet fluctuating customer demand at all times, with no hiccups.

However, going smart isn’t enough. In a typical utility company, thousands or more of these end points need to be connected, sometimes from remote locations with no network reach. For example, data from program logic controller (PLCs) needs to be aggregated and hauled securely over various wireline and wireless networks to the control center.

In many cases, there’s also the issue of connecting existing devices from older generations and making sure they can “speak” with the control room/management system that are using new SCADA protocols such as MQTT.

And last but certainly not least, given the rise in cybersecurity vulnerabilities that goes hand in hand with hyper-connectedness, such deployments require in addition to secure tunnels, a remote Operational Technology (OT) security probe. The latter connects to a central OT security system, for example for anomaly detection.

Until now, all of the above would have meant that five (5!) different appliances would be required at each remote site (a PLC gateway, a LoRaWAN gateway, a ruggedized router/firewall, a protocol converter, and a cellular modem). When multiplied by the number of connected sites, this results in a massive footprint that would prove to be very difficult to manage and maintain.

RAD offers ruggedized, multiservice and compact Industrial IoT (IIoT) gateways with Edge Computing and an advanced security information and event management (SIEM) that eliminate the multi-appliance clutter described above. They also save CapEx and OpEx, and allow the flexible addition of functions, as needed. These IIoT gateways combine multiple wired and wireless interfaces to connect large volumes of sensors, meters and other smart devices over various WAN links in a secure manner. RAD’s IIoT solution hosts both networking and non-networking functions on the same appliance, to reduce the number of devices in the network and increase security and reliability.

Solution Highlights

- A comprehensive IIoT communications solution for re-closers, load breakers, meters, SCADA PLCs/RTUs, sensors for flow control, leak detection, valve/ pump control, and others in power and water utility networks
- All-in-One Industrial IoT Gateways simplify deployment and scale up to reduce CapEx and OpEx
- Virtual environment for user-tailored applications allows customers to add new applications
- Redundant backhaul links over fiber optics, licensed and unlicensed radio bands, 2G/3G/LTE cellular links, and leased lines
- Integrated IPsec encryption, Stateful Firewall, automated PKI X.509, VPN
- Support IEC61850 substation communications for mission-critical automation traffic with the SCADA and HMI
• Support IEC61850 substation communications for mission-critical automation traffic with the SCADA and HMI
• Zero-touch provisioning with enhanced cyber security (stateful firewall, SIEM)
• Integrated LoRaWAN gateway or PLC software to simplify architecture and data acquisition
• Secure remote access for end-user device management
• Transparent delivery of legacy traffic from serial-based devices
• Ruggedized devices suitable for harsh environments
• Upgradeable to SD-CloudAaccess support for application-aware traffic distribution across multiple links

**Edge Computing**

**Edge Computing** allows hosting of various software-based functionalities on an edge device, so that less appliances are required there, introducing cost and space savings and flexibility to add future functions. Such software-based functions allow local processing of the data produced by sensor-rich assets, rather than sending it all the way to a centralized control center. As a result, the following benefits can be achieved:

- **Ultra-low latency**: As the data doesn’t need to be sent across long routes to data centers or cloud services, better deterministic response time due to low latency can be achieved.
- **Trigger local, real-time actions** when anomalies are detected.
- **Save on cellular data plan costs** since not all traffic needs to be backhauled across metered networks
- **Enable smart data collection** for advanced support programs or predictive maintenance.
- **Tighter cyber security** as less assets require protection.
- **Flexibility in choosing best-of-breed** software edge applications.

With Edge Computing capabilities, RAD’s SecFlow supports more than secure networking functionality, providing the option for onboarding third-party software using containers to further reduce the number of appliances required in the field. In the context of large-scale smart utility deployments, this integrated gateway approach simplifies operations and reduces the cost of connecting thousands of remote IoT assets, while strengthening security.

**Harnessing LPWAN Connectivity**

Low-power WAN (LPWAN) technologies including LoRaWAN, LTE-M and narrowband IoT (NB-IoT) support large scale connectivity for collecting sensor data. Such applications tend to require sporadic connectivity for low bandwidth data transfer. LoRaWAN in particular has increasingly been deployed in smart utility applications due to its use of unlicensed spectrum and the availability of standardized, low-cost modules with long battery life. RAD’s IIoT gateways use LoRaWAN to connect smart utility devices to the cloud for data processing and management gateways use LoRaWAN to connect smart utility devices to the cloud for data processing and management.
Energy Substation Deployment Example

RAD’s SecFlow IIoT Gateway solution is being used by a large power generation, transmission and distribution utility in APAC as part of a project to modernize its distribution network, which serves 9 million enterprise customers via 10,000 substations and three regional SCADA centers. The utility was looking to deploy an end-to-end managed IIoT service for its substations in a project that required:

- Collection of field data from legacy serial RTUs
- Real-time conversion from IEC101, IEC104 and DNP3 to IEC104/TCP
- Backhaul to the regional SCADA centers over fiber, with private 3G/LTE cellular links as backup
- End-to-end data protection and encryption

RAD’s SecFlow is the only solution that meets all these requirements with a single platform, in which protocol converter functionality is hosted as a software container. In addition, RAD’s Security Gateway at the SCADA centers decrypts the IPsec tunnels, while the RADView management system manages the entire network, enabling intuitive and automated provisioning and monitoring of the thousands of RTUs and gateways in the network.
## Secflow Product Family Features

<table>
<thead>
<tr>
<th>SecFlow-1p</th>
<th>SecFlow-1v-PLC</th>
<th>SecFlow-1v-LoRa</th>
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<tbody>
<tr>
<td>H: 138 mm (5.43 in) W: 53.3 mm (2.1 in) D:123.3 mm (4.85 in)</td>
<td>H: 146 mm (5.74 in) W: 91.2 mm (3.59 in) D:132.6 mm (5.22 in)</td>
<td>H: 157.2 mm (6.19 in) W: 82.8 mm (3.25 in) D:150 mm (5.9 in)</td>
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<tr>
<td>Edge Computing</td>
<td>Edge Computing with PLC software</td>
<td>Edge Computing with LoRaWAN server</td>
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<td>Copper/SFP Ethernet ports</td>
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<td>POE</td>
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To learn more about RAD’s solutions for smart utilities, contact us at [market@rad.com](mailto:market@rad.com)