IIoT with LoRaWAN
Use Cases

Craig Watson
Head of IIoT Solutions and Development
About RAD

Telecommunications access solutions provider and Industrial IoT technology leader

Founded in 1981, privately owned

Global presence, part of the $1.46 billion RAD Group
Craig Watson
Head of IIoT Solutions and CI Sales Engineering

Speaker Bio:
Craig Watson has over 20 years of IT networking and security experience working with utilities, cities, and government entities on improving the reliability and availability of all phases of critical infrastructure data, video, and voice networks. He has a strong understanding and working knowledge of the importance of security as it relates to the regulations and standards that utilities must adhere to, as well as providing network design architecture expertise and on-site field project support and engineering guidance for the operations and optimization of IT communication infrastructures.

Craig has coordinated, led, and managed teams for IT project consultations and assessments on large-scale network architectures, communication network design and gap analysis reporting efforts on several utility networks across North America. He currently serves as the Head of IIoT Solutions and CI Sales Engineering for RAD Data Communications and is responsible for the design, implementation, and roll out of large utility, smart city, and transportation communication programs.
IIoT – Areas of Focus
10 IoT technology trends to watch in 2022

1. IoT is developing into a crucial technology for sustainability
2. The platform hype is moving from cloud to the edge
3. IIoT initiatives are transforming manufacturing
4. Cloud-Native applications are on the rise
5. Hyperautomation is transforming operations
6. AI is increasingly found at the (Thin) Edge
7. "Invisible AI" adoption is happening right under our noses
8. Immersive realities (VR/AR) are entering the enterprise environment
9. 5G is becoming "IoT ready"
10. Secure remote access of assets is growing in importance

Source: IoT Analytics Research 2022. We welcome republication but require source citation with link to the original post and company website.
IIC Market Verticals

Power Utilities
- Smart Grid
- Re-closers
- Load breakers
- RTUs/SCADA
- Secondary substations
- Smart Meters

Oil and Gas Utilities
- Flow meters
- Volume/pressure/level sensors
- Safety sensors
- Vibration, temperature, and moisture sensors

Water Utilities
- Temperature, pressure, quality, and consumption
- Pump/valve control
- Smart Water sensors
- Water leak detectors
- Smart Meters

Connected Industry
- Non-factory
- Asset monitoring
- Remote control (cranes, forklifts,..)
- Mines, oilfields
- Factory
- Production floor monitoring
- Wearables on the shop-floor
- Remote PLC control
- Automated quality control systems

Safe City/Smart City
- Smart Parking; electric car charging
- Traffic management and control
- Fleet Management
- Smart bus lanes
- Info boards/Digital Signage
- Air quality monitoring
- Video Surveillance
- Smart Lighting
- Waste management

Smart Agriculture
- Soil Irrigation and Moisture Monitoring
- Autonomous Irrigation
- Smart Soil Sensors
- Connected Farms

Mobile Service Providers
- Cell Tower asset monitoring

Connected Building/Remote Monitoring
- Building Automation/Generators
- Building security/Surveillance
- HVAC/Heating/Cooling
- Sensors and Informational Status
- Alarms and Alerts
### IloT Solutions Development and Innovation

<table>
<thead>
<tr>
<th>Smart Street light</th>
<th>Security &amp; Surveillance</th>
<th>Smart Energy</th>
<th>Asset Tracking Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage city lights, saving costs, increase efficiency</td>
<td>Enabling Smart Security monitoring in any office, facility, or site</td>
<td>Smart grid / DC management</td>
<td>Real-time tracking, status monitoring of heavy and light assets, vehicles and equipment, outdoors or in indoor industrial facilities</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Smart parking</th>
<th>Smart Environment</th>
<th>Connected building</th>
<th>Waste management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking space at your fingertips – anytime anywhere</td>
<td>Monitoring for a healthy and risk-free environment</td>
<td>Make living in the building an enjoyable experience efficient management of resources (power, water, etc.)</td>
<td>Ultrasonic measurement of waste levels, autonomous, providing continuous monitoring of any type of container</td>
</tr>
</tbody>
</table>

- **Solutions available today**
- **Solutions in progress**
Main trends

- More cloud adoption for higher efficiency and scalability
- Big Data and analytics for preventive maintenance, performance improvement and anomaly detection
- As the network expands into more and more locations – rising need for cyber secure solutions

SecFlow is a flexible “Swiss Army knife”

- PoE, LTE, LPWAN (LoRa), serial, fiber, PLC, Stateful firewall and edge computing

Building the Next Generation of Smart Grid Edge connectivity!
# IIOT Gateway Options

<table>
<thead>
<tr>
<th>SecFlow-1v</th>
<th>SecFlow-1v LoRa</th>
<th>SecFlow-1v IP66</th>
<th>SecFlow-1v PLC</th>
<th>SecFlow-1p</th>
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<tbody>
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<td>E1 chassis</td>
<td>E2 LoRa</td>
<td>E2 IP66</td>
<td>E5 PLC</td>
<td>E3 chassis</td>
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<tr>
<td>4 Ethernet LAN</td>
<td>4 PoE Ethernet LAN</td>
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<tr>
<td>1 Fiber WAN</td>
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<tr>
<td>2 In/Out Dry Contacts</td>
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**Option:** 3 AI ports can work as 4-20mA

Common ordering options for all chassis

Proprietary and Confidential
RAD’s Comprehensive, End-to-end Solution

- **IPsec VPN tunnel for SCADA and management traffic**
- **IPsec VPN for Remote Management**
- **Device Connection Control 802.1X MAC**
The Case for LoRaWAN
Definition LPWAN — What is it?

- Low-power wide-area networks (LPWANs or LPWA networks) are a relatively new category of wireless communication technologies designed for power-efficient, long-range, and low-cost communication from simple IoT devices. LPWAN technologies address low-end IoT applications that are often cost-sensitive and characterized by 1) infrequent transmissions of small bursts of data, 2) a large number of devices, often spread over wide areas, and 3) the need for devices to operate autonomously for many years.
LP-WAN Technologies

An introduction to LoRa

- Low data rate
- Very low power
- Very short distance

- Medium data rate
- Low power
- Short distance
- Paired

- High data rate
- Medium power
- Medium distance

- Low data rate
- Low power
- Mesh structure

- Medium data rate
- Medium power
- Long distance

- Low data rate
- Low power
- Long distance
- Licensed spectrum

- Medium data rate
- Medium power
- Long distance
- Licensed spectrum

- Low data rate
- Very low power
- Very long distance
- Low cost
- Unlicensed spectrum

RFID - Bluetooth - Zigbee - WiFi - LTE-M - NB-IoT - LoRaWAN
LoRaWAN ITU Announcement

The LoRaWAN® standard has been officially approved as a standard for low power wide area networking (LPWAN) by the International Telecommunication Union (ITU), the United Nations specialized agency for information and communication technologies.

Recommendation ITU-T Y.4480 “Low power protocol for wide area wireless networks”
LoRaWAN Network Architecture – Smart Sensor Networks

Gives users real-time data on a variety of conditions such as temperature, moisture, level conditions, and metering through a network of low-cost wireless sensors, all concentrated and visualized in a headend dashboard.
IIoT Use Cases
Motivation:

- Save money by getting timely alerts before problems become critical, thus avoiding catastrophic damage, unanticipated shutdowns, security violations,..

Main elements to an IIoT based remote monitoring solution.

1. Surveillance cameras to detect activity and sensors to monitor environment and assets HVAC (Heating, Ventilation and AC), generators, doors/windows, etc.
2. RAD SecFlow Gateway that connects to the equipment, acquires and processes the data and communicates it to a remote server.
3. Remote server that collects and stores the data
4. Central HMI dashboard, VMS, control and analytics Software

SecFlow provides 24/7 visibility and control
**Condition Reporting with RAD LoRa Container**

**Motivation and Value**
- SecFlow container technology facilitates both GW function and Lora Network Server (LNS)
- Easy integration to 3rd party Applications / Dashboards

**Solution Blueprint Components**
- LoRa sensors located in the RAD vLAB is connected to SecFlow-1v
- SecFlow-1v with RAD LoRa Gateway / Server container transform LoRa messages to MQTT
- SF-1v will receive messages from LoRa sensors, transmit MQTT messages over secure tunnel to Dashboard application
- Dashboard from Thingspark located in the Cloud receives MQTT messages from RAD LoRa GW server (LSN)
# Asset Tracking (LoRa + 5G)

<table>
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<tr>
<th><strong>1. Sensors/Devices:</strong></th>
<th><strong>2. Multi-function Gateways:</strong></th>
<th><strong>3. Connectivity:</strong></th>
<th><strong>4. Backend:</strong></th>
<th><strong>5. Dashboards:</strong></th>
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<td>Abeeway Trackers</td>
<td>SF-1v</td>
<td>LTE/5G/CBRS 450Mhz</td>
<td>Abeeway Device Manager</td>
<td>Location APIs</td>
</tr>
<tr>
<td>SF-1v with containers:</td>
<td>Hosting Actility LoRaWAN</td>
<td>Fiber Broadband</td>
<td>ThingParkX</td>
<td>Location APIs</td>
</tr>
<tr>
<td></td>
<td>Gateway and Network Server</td>
<td>MPLS/Ethernet</td>
<td>IoT Core Location Data Storage &amp; Cloud Connectors</td>
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- Fiber Broadband
- Broadband
- MPLS/Ethernet
- LTE/5G/CBRS
- Connectivity: Fiber, LTE or 5G with 1 / 2 SIMs or 1 / 2 modems
- Backend Servers: Abeeway Device manager, Location engine and data storage
- Dashboards: Visual display of data, Business Applications

- Airports, Ports, Harbors
- Construction sites
- Transportation & Logistics
- Mines, Oil and Gas
- Warehouses and facilities
- Livestock and Farming
Out-of-Band Management with Redundant Cellular Connectivity

**Remote Site**
- Out-of-band Ethernet
- Router
- RTU
- Serial (2 x RS-232)
- Dry Contacts
- 2+2 Discrete IO

**Wireless Network**
- LTE/5G #1
- LTE/5G #2
- 1st SIM Primary Link
- 2nd SIM Backup Link

**Operation Center**
- Control Center LAN
- Firewall

**Requirement**
- Secure out-of-band management of equipment over cellular
- Reduce OpEx by minimizing truck rolls for operations and maintenance

**Solution Benefits**
- Secure mgt. (IPsec and stateful Firewall)
- Terminal server access to console ports
- Seamless access to out of band Ethernet interfaces
- Redundant connectivity (supports 2 SIMs or 2 modems for resilience)
Remote Site and Asset Monitoring Functionality

Remote Monitor & Control

- LoRa
- CCTV
- Air-condition
- Doors/windows
- Fuel tanks
- Temperature
- Humidity
- Generators
- Motion detection

Backhaul Technologies

- 3G/4G
- 5G*
- 450 MHz

Applications/Dashboard

- Cellular
- Backhaul
- Fiber

Note: Max 2 simultaneous wireless services are supported
LoRaWAN Sensor Vendor Partners

- Tekelep
  - Smart Tank Monitoring
  - General, Water, and LPG/propane monitoring solutions

- Laird
  - Humidity and Temp
  - Temperature Probe sensor for monitoring environmental data

- Radio Bridge
  - LoRaWAN Customized Sensors
  - Support Temperature, Proximity, Liquid, Movement, and Air

- Dragino
  - Open Source IoT solution
  - Outdoor/Indoor Humidity, Temperature, Soil sensor

- PNI
  - PlacePod
  - IoT-enabled smart parking sensor for both in-ground and surface

- Brown
  - End Node Manufacturer
  - CO2, Window/Door, Temp, Motion, Leak Detection sensors

- The Things Network
  - Industrial IoT Market
  - Industrial products and IIoT software solutions

- Digital Matter
  - Battery-powered GPS trackers
  - Track anything, anywhere

- Netvox
  - Smart Building sensors
  - Temp, Light, Occupancy, and Door/Window sensors

- Seeed
  - Smart Agriculture sensors
  - Smart and Precision Agriculture, Environmental Monitoring

- Yokogawa
  - “Sushi Sensor”
  - Pressure, Vibration, and Temperature sensors

- ICOT Wireless
  - C1D1 Tank Level Monitor
  - Level, temperature, measurement quality, battery status, etc

- Abeeway
  - IoT tracking solutions
  - Reliable, cost-and energy-efficient tracking solutions.

- Vutility
  - Submetering Energy Management
  - Gain a better sense of your Building electricity usage

Plus, any certified LoRaWAN sensor from the following marketplaces:

- [https://www.thethingsnetwork.org/marketplace/products/devices](https://www.thethingsnetwork.org/marketplace/products/devices)
- [https://www.semtech.com/lora/ecosystem/sensor-features](https://www.semtech.com/lora/ecosystem/sensor-features)
- [https://lora-alliance.org/showcase/search?is_certified=1](https://lora-alliance.org/showcase/search?is_certified=1)
Time for a Poll

Poll Question of the Day
Live Demo
Takeaways

- RAD has extensive IIoT hardware and software product capabilities across many different verticals
- LoRaWAN serves as a cornerstone wireless technology to be able to connect thousands of sensors together
- SecFlow accommodates flexibility with virtual containers that provides the perfect fit for Asset Monitoring and Automation
Thank you
For your attention

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