Deploying ISA100 Wireless Distributed Networks

YC Cheng
NEXCOM
2016/09/27
Go Industrial Wireless for IIOT

- Industrial IoT
- Industrial Wireless Sensor Network
- Industrial Wi-Fi Backbone
- Industrial Network and Asset Manager
Current Status Quo

- **Recent trend - deployments require**
  - Increased scalability
  - Support for higher network throughput

- **Due to the emergence of novel ISA100 Wireless compliant instruments such as**
  - Stream trap monitoring
  - Safety – gas detection
  - Corrosion monitoring
  - Condition monitoring
## Technical Primer – Logical Roles

### Field Network

<table>
<thead>
<tr>
<th>Device</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Device</td>
<td>Sources or consumes data. Does not route.</td>
</tr>
<tr>
<td>Router</td>
<td>Routes messages for other devices operating in the wireless subnet.</td>
</tr>
</tbody>
</table>

### Infrastructure

<table>
<thead>
<tr>
<th>Device</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backbone Router</td>
<td>Routes data over the backbone infrastructure.</td>
</tr>
<tr>
<td>System Manager</td>
<td>Provides policy controlled management for all network devices.</td>
</tr>
<tr>
<td>Security Manager</td>
<td>Enables, controls and supervises the secure operation of all devices.</td>
</tr>
<tr>
<td>Gateway</td>
<td>Provides an application interface between the wireless and the plant network.</td>
</tr>
</tbody>
</table>

### Operational

<table>
<thead>
<tr>
<th>Device</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioning</td>
<td>Provisions devices with configurations required for network operation.</td>
</tr>
<tr>
<td>System Time Source</td>
<td>Responsible for maintaining the master time source of the network.</td>
</tr>
</tbody>
</table>

*Note: Devices typically incorporate multiple logical roles.*
ISA100 standard inherently supports various different network topologies.

Infrastructure devices can support a combination of logical roles.

Single Subnet – “All-In-One”

Multiple Subnets – “Distributed”

Multiple Gateways
ISA100 Wireless networks – versatile topologies and scaling due to IPv6 based backbone infrastructure
“All-in-One” Topology

- Simple network deployment
- Low cost installation and maintenance

- Limited scalability
- Deeper mesh networks result in
  - Increased power consumption results in shorter field instrument battery life
  - Increased communication latency
  - Decreased network throughput
- Limited geographic coverage
Distributed Topology

- Increased scalability
- Shallow mesh networks result in:
  - Optimized power consumption results in increased field instrument battery life
  - Lower communication latency
  - Increased network throughput
  - Extended geographic coverage

- Network deployment more complex
- Increased cost of installation and maintenance
Hybrid network of Wi-Fi & ISA100

- Multi-link, more reliable
  - Multi-redundancy for better reliable transmission
  - Flexible to expand field device coverage
  - Less maintenance expense in cabling
  - High throughput backbone enable flexible application
Deployment Considerations

- **“All-in-One” deployments**
  - Gateway is installed outdoors
  - Typically close to the control room
  - Determining optimal location is vital
  - Manageable mechanism is essential

- **Distributed deployments**
  - Gateway is installed in the control room or outdoor next to control room
  - BBRs deployed throughout the facility
  - Wi-Fi Mesh backbone simplifies & enhance deployment flexibility
  - Manageable mechanism is essential
Benefits

- Supports distributed network topologies
- Supports multiple subnets managed by the same Gateway
- Mesh Wi-Fi enabled backbone
- Mesh Wi-Fi enabled backbone

Cost-effective, extended geographic coverage
Increased scalability lowers CAPEX and ensures swift ROI
Reliable, robust wireless backbone infrastructure reduces installation and maintenance costs
Reduced TCO when compared to wired backbone solutions
Hybrid network of Wi-Fi & ISA100

- Multi-link, more reliable
  - Multi-redundancy for better reliable transmission
  - Flexible to expand field device coverage
  - Less maintenance expense in cabling
  - High throughput backbone enable flexible application
Dual Wi-Fi Mesh to Expand Coverage & Application

- Networking status
- Device Platform Status
- Reporting
- Provision & Maintain
- Debug assist

**Industrial Sensor Network**

- SCADA HMI
- ERP
- Manag't Layer
- Wi-Fi Devices
NEXCOM Architecture with nCare

DCS Architecture

NIO200IDG
ISA100 Distributed Gateway

NIO200IDR
ISA100 Backbone Router

NIO200IDR
ISA100 Backbone Router

NIO200IAG
ISA100 All-in-One Gateway

Modbus TCP

GSAP

nCare

Management APP (PAD/Phone)
The NIO200 Product Family

NIO200IAG – All-in1-Gateway
• ISA100 compliant System/Security Manager, Gateway and Backbone Router
• Manages an ISA100 subnet composed of field instruments arranged in a multi-hop wireless mesh configuration
• EZ Mesh Wi-Fi Backbone infrastructure connectivity to the control room + perfect triple play infrastructure video surveillance

NIO210IDG – Distributed Gateway
• ISA100 compliant System/Security Manager, Gateway and Backbone Router
• Manages multiple ISA100 subnets federated by NIO200IWR Backbone Routers
• Allows for distributed network topologies that maximize geographic
• EZ Mesh Wi-Fi Backbone infrastructure connectivity + perfect triple play infrastructure video surveillance

NIO200IDR – Backbone Router
• ISA100 compliant, cost-effective Backbone Router
• Provides wireless and wired backbone connectivity to ISA100 compliant wireless field instruments
• EZ Mesh Wi-Fi Backbone infrastructure connectivity + perfect triple play infrastructure video surveillance
Rugged Design

<table>
<thead>
<tr>
<th></th>
<th>ESD</th>
<th>Surge</th>
<th>EFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level-1</td>
<td>Contact: +/- 2KV</td>
<td>+/- 0.5KV</td>
<td>+/- 0.5KV</td>
</tr>
<tr>
<td></td>
<td>Air: +/- 2KV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level-2</td>
<td>Contact: +/- 4KV</td>
<td>+/- 1KV</td>
<td>+/- 1KV</td>
</tr>
<tr>
<td></td>
<td>Air: +/- 4KV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level-3</td>
<td>Contact: +/- 6KV</td>
<td>+/- 2KV</td>
<td>+/- 2KV</td>
</tr>
<tr>
<td></td>
<td>Air: +/- 8KV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level-4</td>
<td>Contact: +/- 8KV</td>
<td>+/- 4KV</td>
<td>+/- 4KV</td>
</tr>
<tr>
<td></td>
<td>Air: +/- 15KV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reliable wireless communication
- Multi-link Mesh topology
- High sensitivity RF radio (-95dBm)
- Redundant power source (DC & PoE)
- Robust system with EMC Level-4/ATEX Anti-explosion/IP67/Wide temp
- Central management by nCare
For additional information please visit

www.nexcom.com

Or

www.centero.com

or contact me at

yc_cheng@nexcom.com.tw
Thank You!