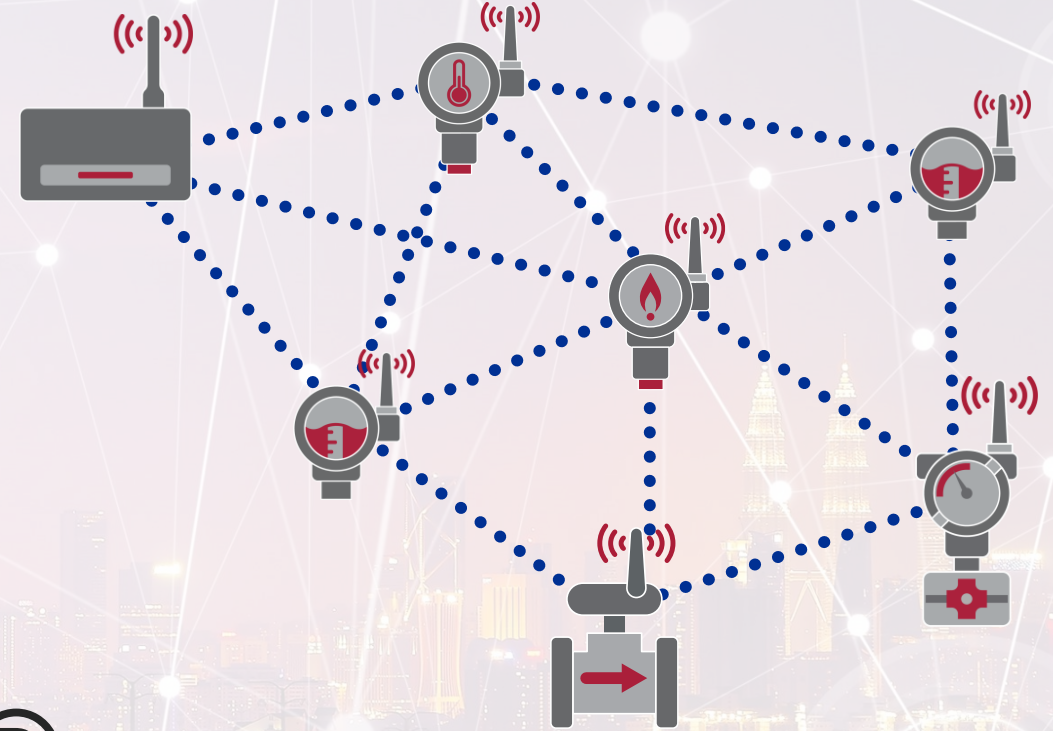




FIELDCOMM GROUP™
*Connecting the World of
Process Automation*

centro

EMERSON™



WirelessHART®

Deployment Methodology and Guidelines

Agenda

WirelessHART®

- About the Speakers
- Why Choose WirelessHART?
- Requirements Collection Phase
- Network Design Phase
- Network Deployment and Commissioning Phase
- Network Operation and Maintenance Phase
- Practical Deployment Considerations
- Q&A

Webinar Speaker



Robert Assimiti is the Co-Founder and CEO of Centero, LLC. He has over 18 years of technical leadership in the wireless IoT/IIoT arena. He has architected and developed several highly scalable, widely deployed mesh based wireless product lines for both commercial and industrial wireless markets and applications. Robert manages a team of technologists focused on the creation of new technologies, standardization and generation of novel intellectual property. He has also authored and co-authored several patents. Centero is a provider of wireless products, technologies and services for IIoT connectivity.



Robert Assimiti

Co-Founder and CEO
Centero

Webinar Speaker



Shane has over 25 years' experience in the instrumentation and control field in many industry segments including Oil & Gas, petrochemicals, and metals & mining. Shane joined Emerson 20 years ago as a field technician in Sydney, Australia, and has held various roles including project design & commissioning engineer for international projects, business development manager, director of product management, and now global director for business development for Emerson's pervasive sensing business. He is now living with his young family in Minneapolis, MN.



Shane Hale

Global Director of Business Development
Emerson - Pervasive Sensing

WirelessHART Facts



Architected to meet rigorous requirements for industrial process automation



International standard IEC62591 – approved January 2009



Built on the ***solid foundation of the HART open protocol*** - deployed since 1986



Deployed ecosystem of 50K+ networks.



Same application layer is used in HART and WirelessHART



FieldComm Group is chartered and tasked with

- Defining and maintaining clear specifications
- Ensuring Interoperability through registration program
- Providing training workshops and in-depth support

Why Choose WirelessHART?

Communication Reliability

99.99% uptime in well-formed networks



- ✓ Path diversity – mesh routing
- ✓ Time diversity – TDMA slotted access
- ✓ Frequency diversity – channel hopping

Interoperability

15 device manufacturers have products registered via FieldComm Group's registration program (see product links on last page)



- ✓ Fully defined application layer
- ✓ Utilizes well understood HART structures
- ✓ Interoperable with existing control systems

Cybersecurity

Secured to a two-layer strategy



- ✓ Mandatory security protocols
- ✓ Data link layer hop-by-hop authentication
- ✓ Transport layer authentication + encryption

Why Choose WirelessHART? (continued)

Scalability

Hundreds or devices per network



- ✓ Self-organizing mesh networks
- ✓ No need for Gateway line-of-sight
- ✓ Deterministic technology

Full Data Context

Application layer data structures



- ✓ Application layer data points have full context
- ✓ Maximized value of data for analytics

Publish-by-Exception

Periodically published data flows



- ✓ Data published based on process/device conditions
- ✓ Ensures availability of data for monitoring/control
- ✓ Reduces energy needed compared to polling

Collect Requirements

- RFP/RFQ that details field deployment requirements
- OR send out requirement survey
- Map(s) or drawings of facility or area where coverage is desired
- GPS coordinates used for preliminary RF link modeling
 - Distances between network components (field instruments, control rooms, etc)
 - Elevation differences

Industrial IoT Field Deployment - Requirement Survey

1	Customer name	
2	Application/Market	
3	Type of environment (please describe in detail, also include any HAZLOC area designation)	
4	Target line-of-sight range between field instruments	
5	Desired scalability per Gateway	
6	What is the typical real estate area covered by one deployment?	
7	Is standards compliance desired or mandatory? Is instrument certification desired or mandatory?	
8	How often is periodical data transmitted? (in msgs/sec)	
9	What is the typical data payload sent?	
10	What is the max data payload sent?	
11	Are instruments engaged in monitoring, control, or both?	
12	Any latency requirements?	
13	What is the size of the periodical data payload (bytes)?	
14	Are there any latency requirements associated with periodic data (max)?	
15	Are non-periodic commands being sent to the field instrument?	

Collect Requirements

Deployment vertical
Deployment segment

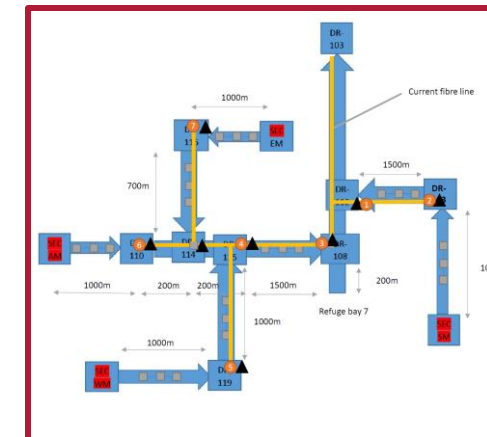
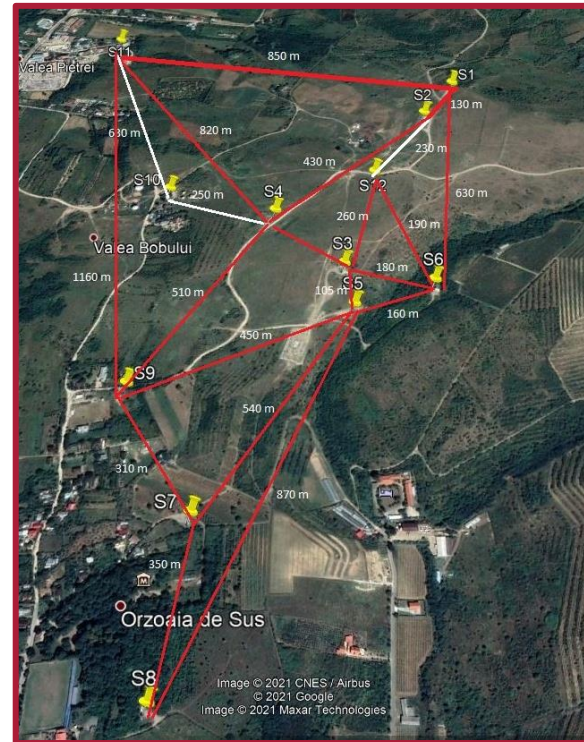
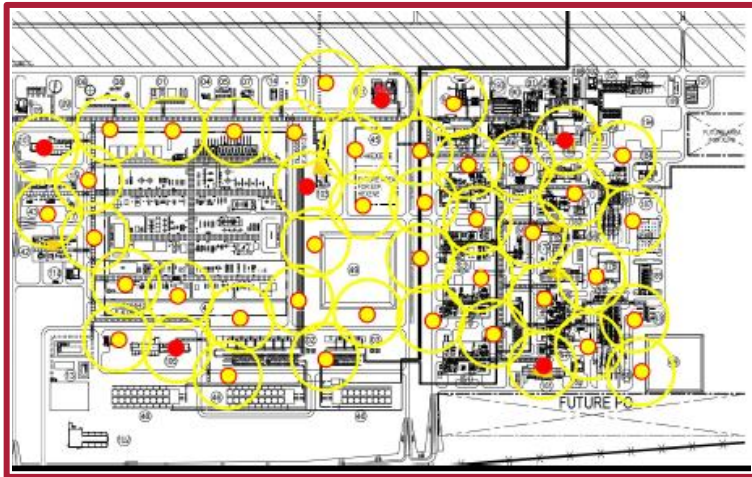
Oil and Gas, Chemical, Pharma, Mining,
Paper and Pulp, Power etc
Downstream, midstream or downstream



Downstream

Upstream

Mining



Collect Requirements

Area designation (HAZLOC, non-HAZLOC, zones etc)



Select equipment with appropriate classifications and certifications

Scalability and geographic area to be covered



Determine deployment topology

Type of instruments and data transfer requirements



Network throughput decisions – number of hops + repeaters

Monitoring and/or control



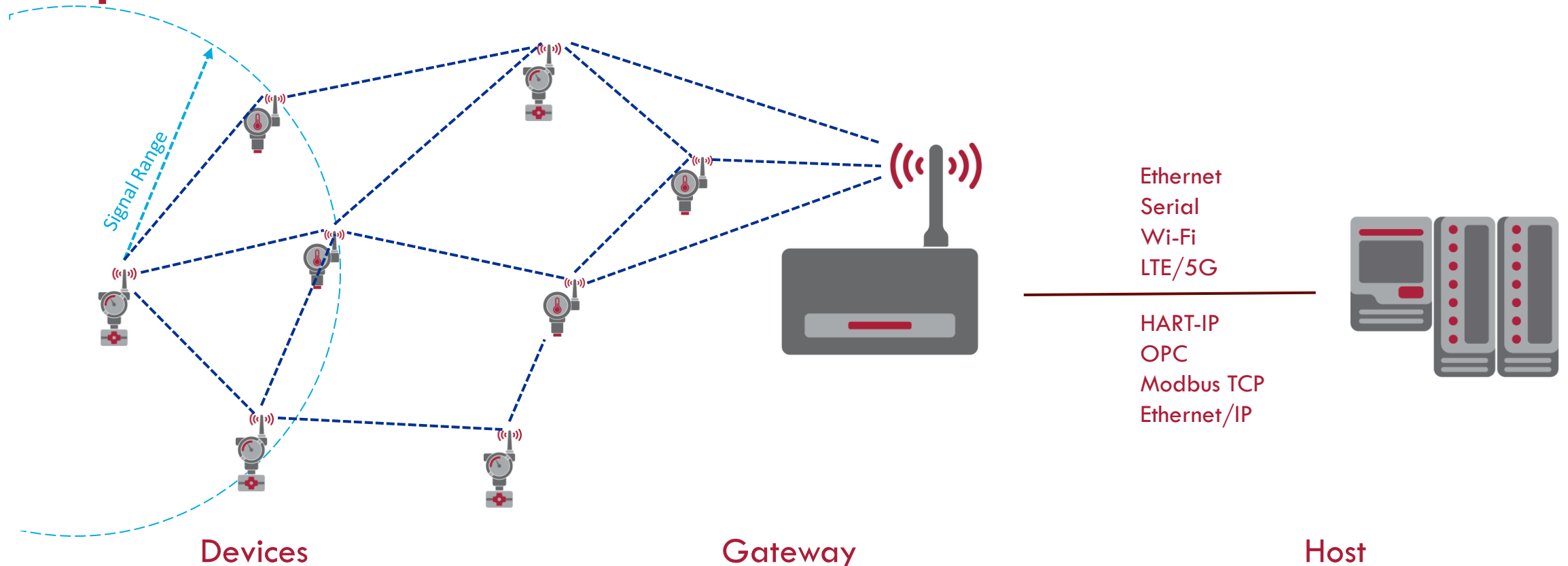
Latency considerations

Connectivity to the plant network



MODBUS, HART IP, OPC UA,

Components of a WirelessHART Network

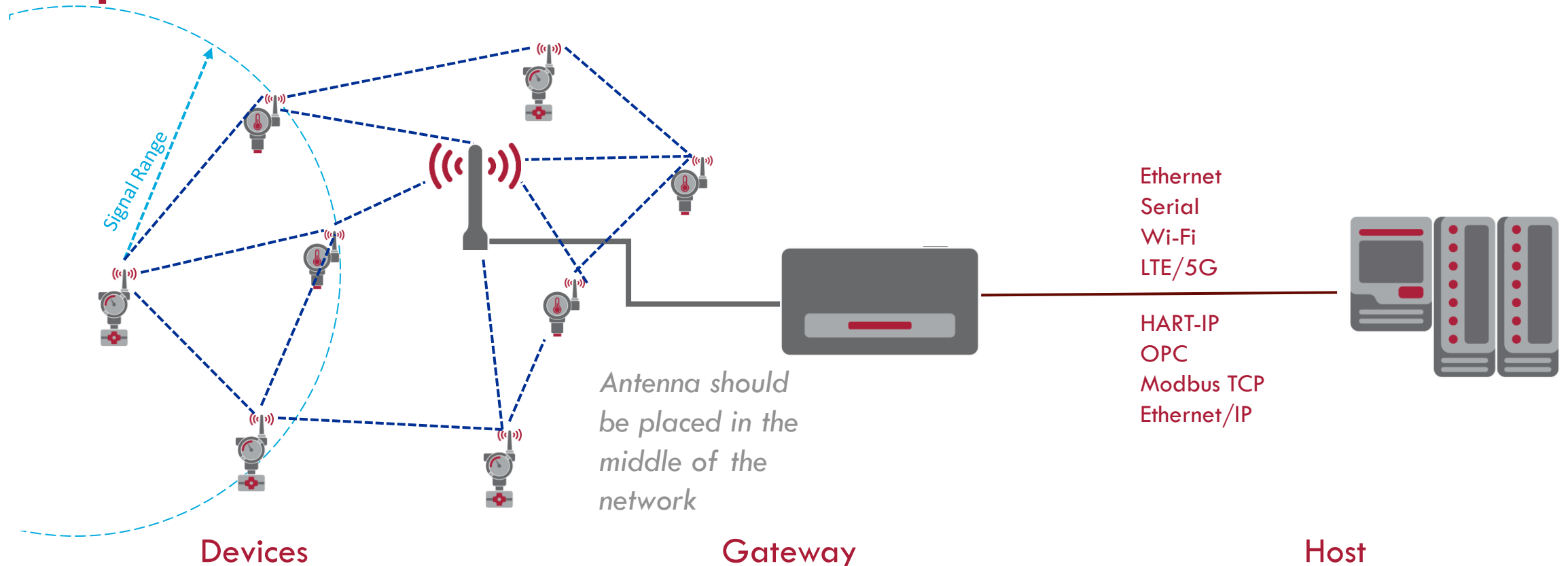


Devices
WirelessHART sensors from multiple vendors used for process and asset monitoring

Gateway
Connects to sensors and manages the mesh network to optimize reliability

Host
Data communication with wide range of secure, industry standard protocols

Components of a WirelessHART Network



Devices

WirelessHART sensors from multiple vendors used for process and asset monitoring

Gateway

Connects to sensors and manages the mesh network to optimize reliability

Host

Data communication with wide range of secure, industry standard protocols

Network Design

Site Walkdown

- WirelessHART should co-exist with other wireless protocols with good planning
 - Antennas for any wireless signals should be kept at least 1 meter/3 feet apart
- Site walkdown should identify
 - Location of WirelessHART sensor applications
 - Location of existing Wi-Fi or other wireless antennas
 - Location of backhaul signal access, such as Plant LAN connections, Serial communication connections, or Wi-Fi access points
 - Location of power supply for WirelessHART Gateways (DC/AC/Power-Over-Ethernet)

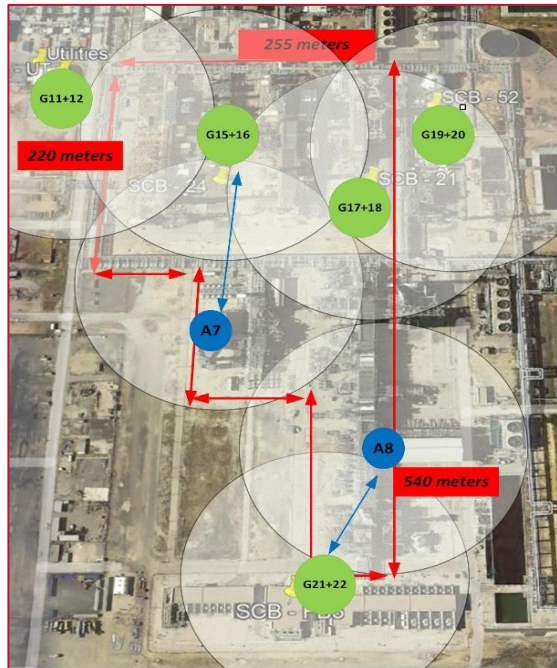
Combined Wi-Fi and WirelessHART Access Points

- Ideal for connectivity infrastructure rollout
- High-bandwidth (power hungry) Wi-Fi access for Mobile Worker applications and data backhaul
- Very efficient and secure WirelessHART sensor communications
- Line power for Wi-Fi Access-point that provides Power Over Ethernet (POE) to WirelessHART Gateway

Network Design - Deliverables

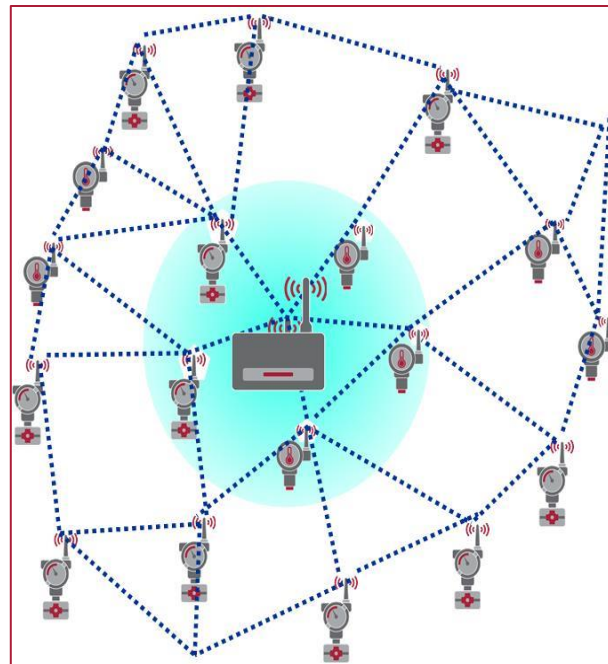
Network Proposed Physical Layout

- Shows proposed location of the equipment to be installed
- Includes distances and wireless coverage



Network Proposed Logical Layout

- Shows proposed network topology
- Highlights mesh redundancy for wireless communications reliability








List of Equipment

- Includes infrastructure devices
- List of accessories: antennas, mounting brackets, cables, surge arrestors, RF connectors etc)
- Should include spares for all equipment

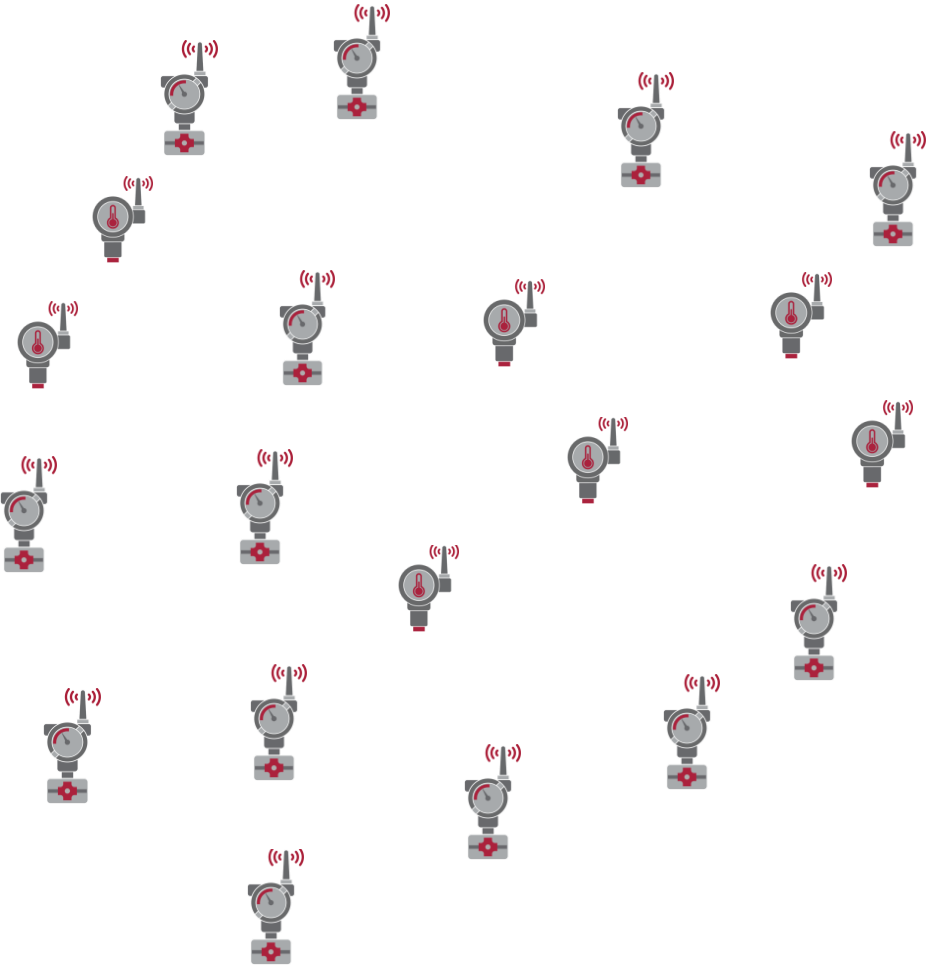
Icon	Product Description	Quantity
	WirelessHART Gateway	9
	WiFi Mesh Router	7
	Industrial Wi-Fi MODBUS TCP/RS485/Ethernet Adapter/Router/Gateway	4
	Asset Manager	2

Icon	Product Description	Quantity
	High-gain, rugged omni-directional antennas 2.4 GHz	70
	High-gain, rugged omni-directional antennas 5 GHz for WiFi MESH+	232
	High-gain, rugged directional antennas 5 GHz for WiFi MESH+	24
	Surge Arrester FT-RF, DC-6 GHz N-MALE TO N-FEMALE	Optional - recommended
	Low RF loss cable high-gain antenna, L=3M, L=6M, L=9M	48
	Wall mount kit	70
	Pole mount kit	30

Signal Range Is Dependent on the Density of Obstructions

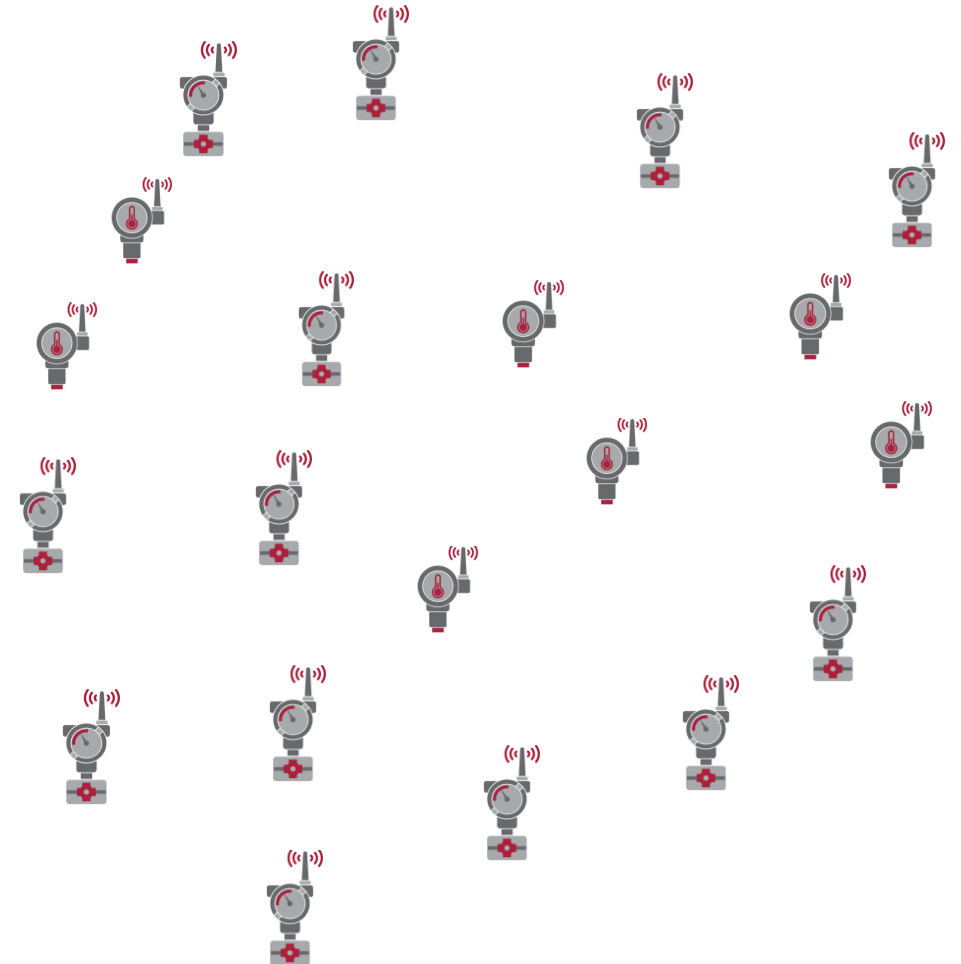
	>½ mile, 2600ft 800m	Line of Sight, Extended Range – Extended range antennas above obstructions, up to 2 miles.
	~750ft 230m	Clear Line of Sight – The antenna for the device is mounted above obstructions and the angle of the terrain change is less than five degrees.
	~500ft 150m	Light Obstruction - Typical of tank farms. Despite tanks being big obstructions themselves, lots of space between and above makes for good RF propagation.
	~250ft 80m	Medium Obstruction - Process areas where lots of space exists between equipment and infrastructure.
	~100ft 30m	Heavy Obstruction - Heavy density plant environment; where a truck or equipment cannot be driven through.

Network Design “Good Practice” Recommendations



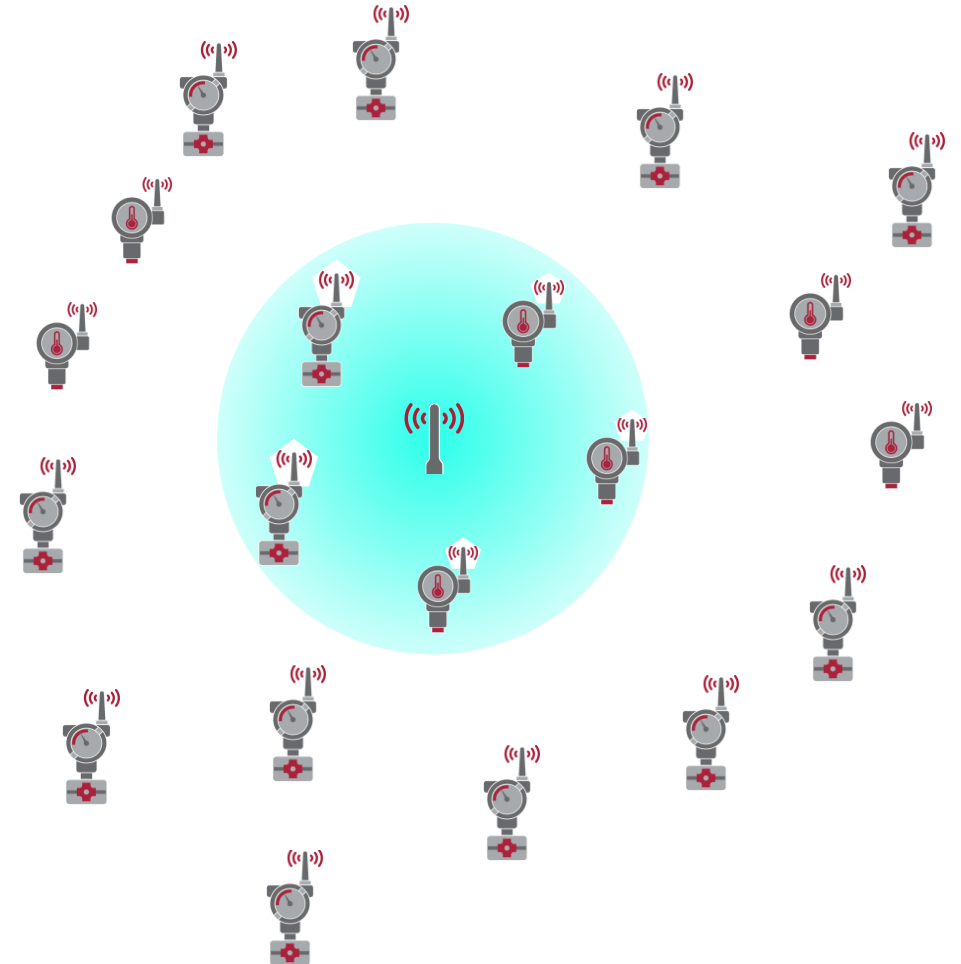
Network Design “Good Practice” Recommendations

1. Locate gateway antenna near the center of a network



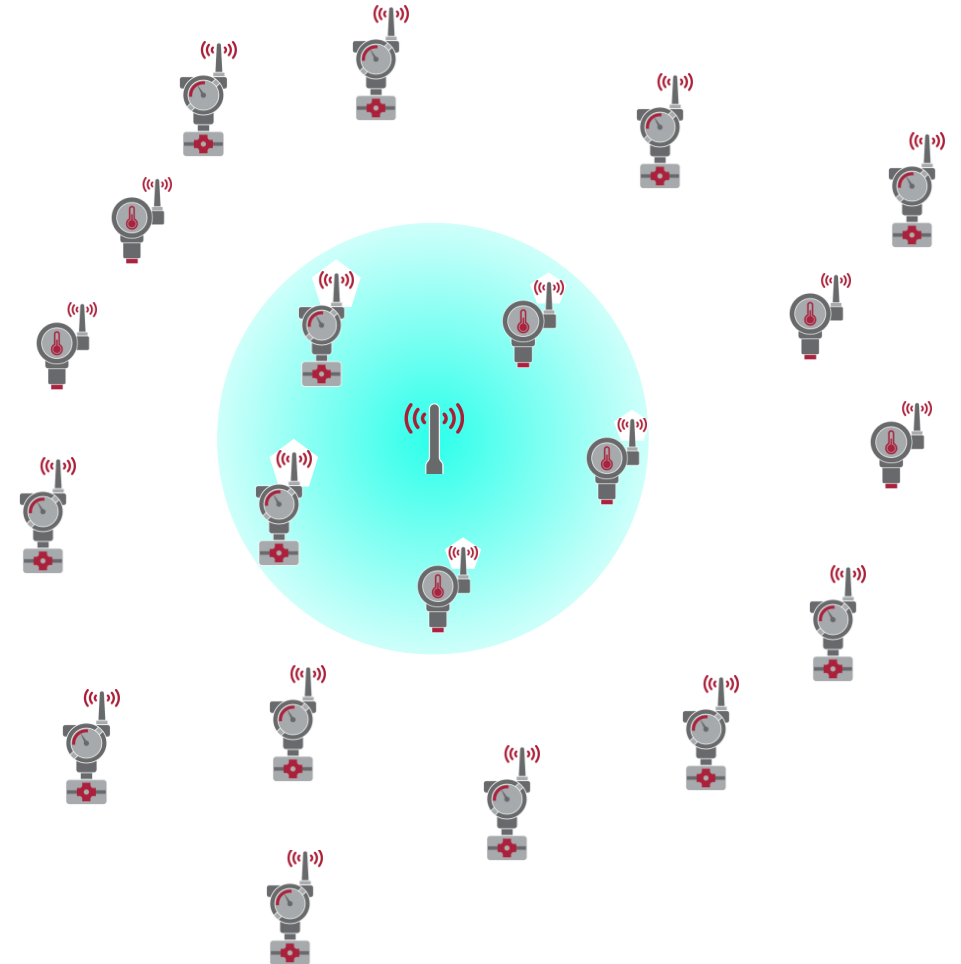
Network Design “Good Practice” Recommendations

1. Locate gateway antenna near the center of a network



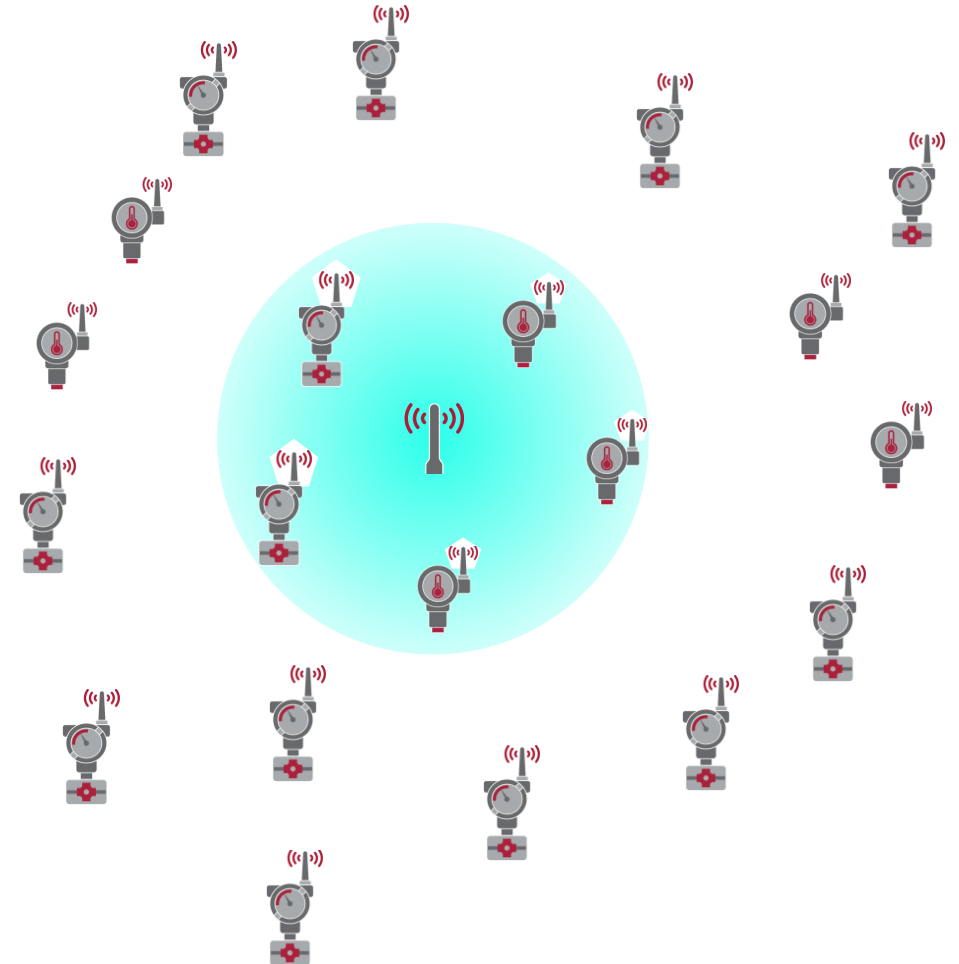
Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network



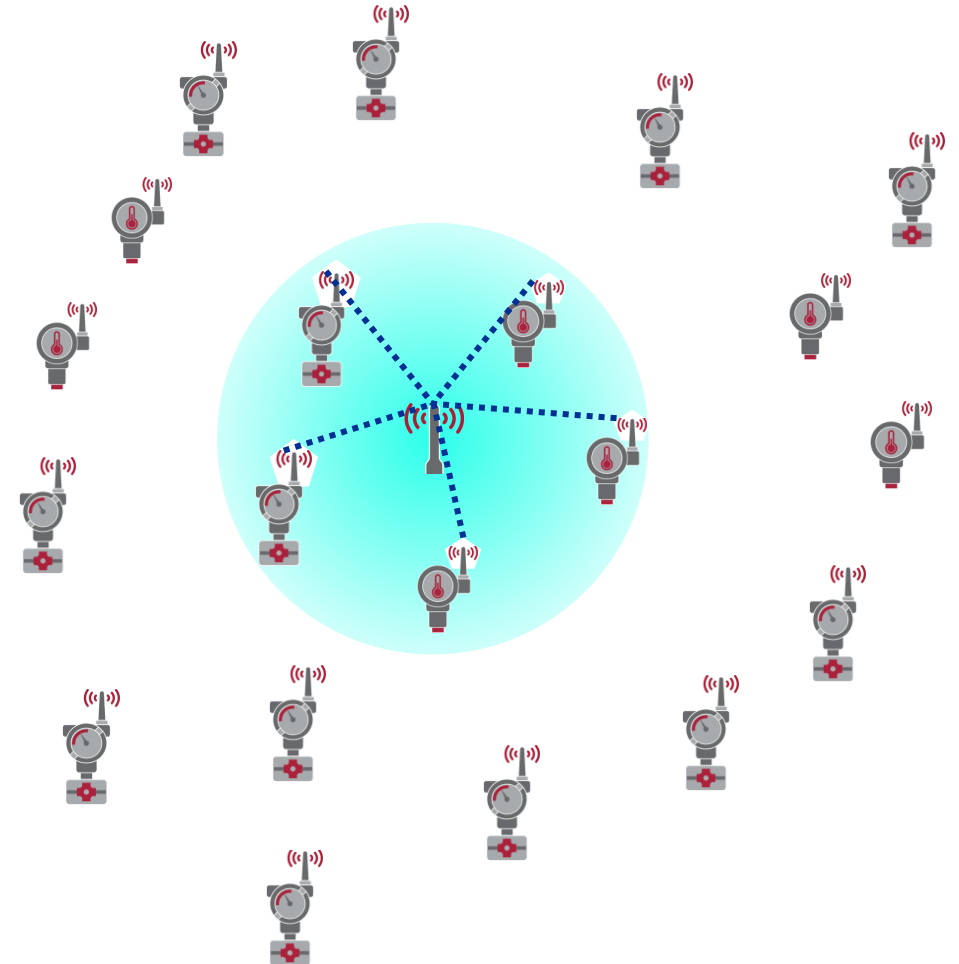
Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- 2. 5 devices within direct range of the gateway antenna



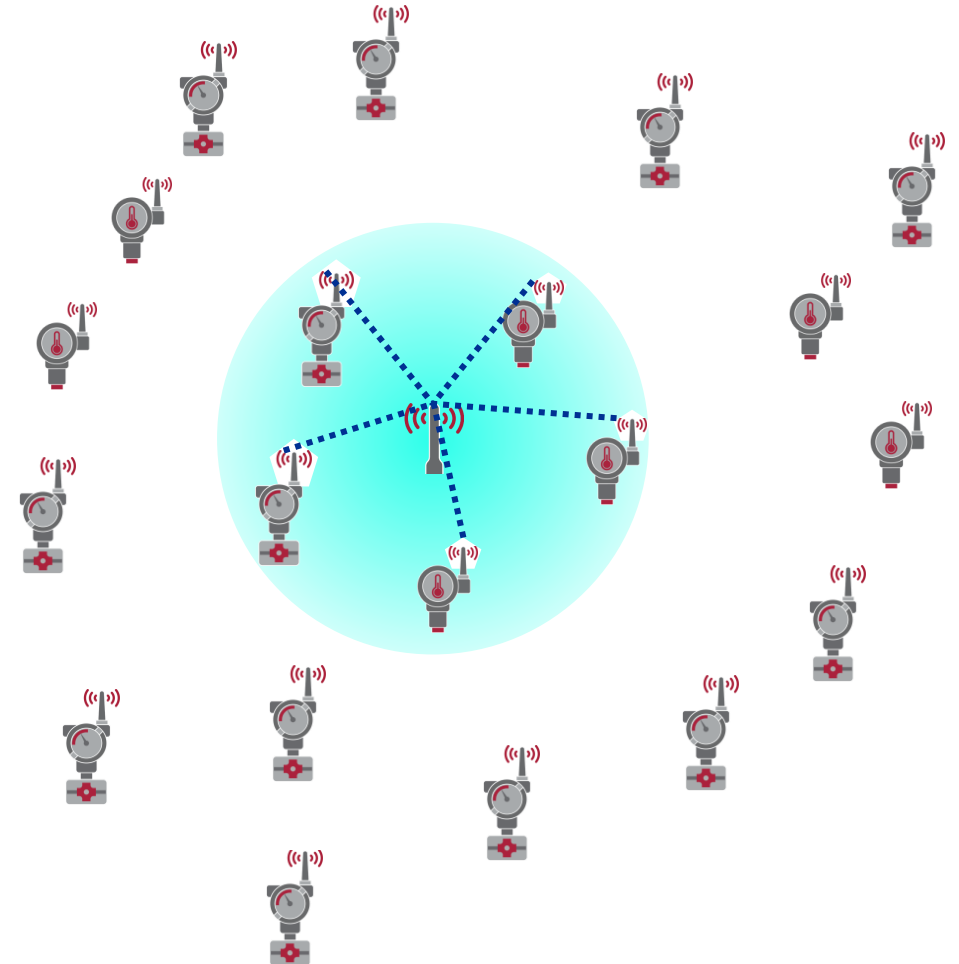
Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- 2. 5 devices within direct range of the gateway antenna



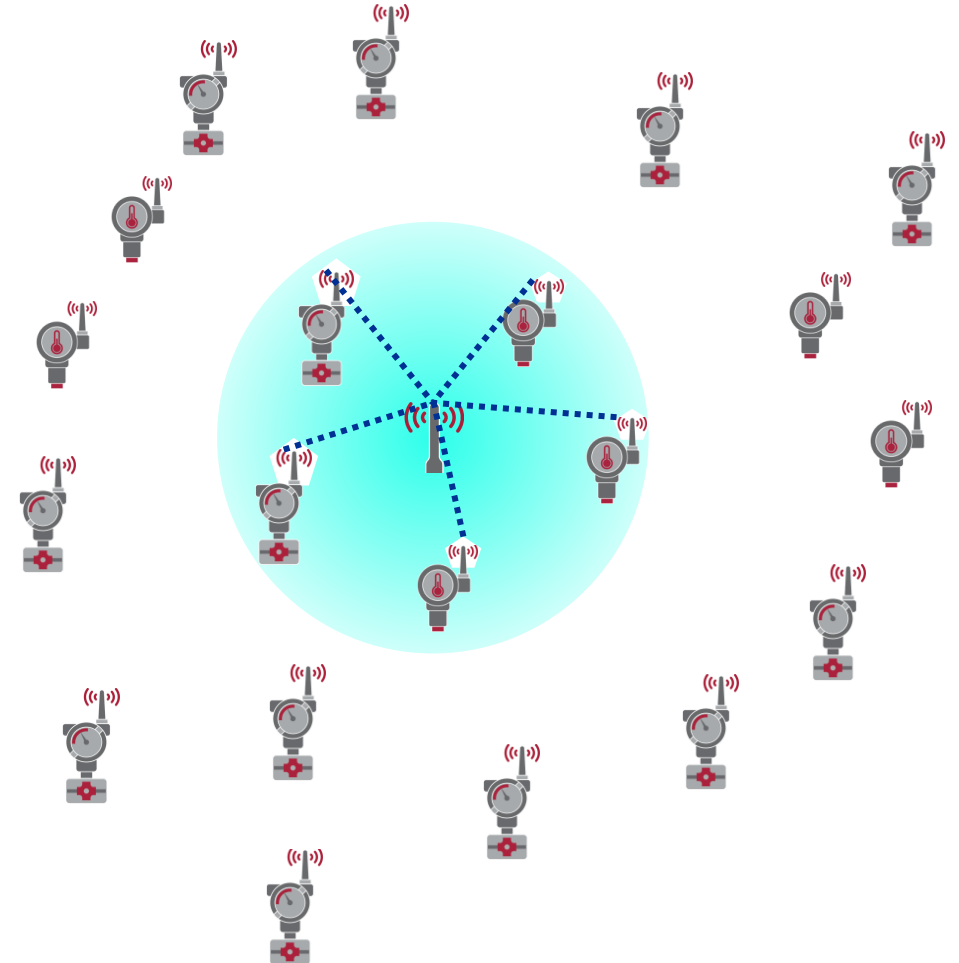
Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna



Network Design “Good Practice” Recommendations

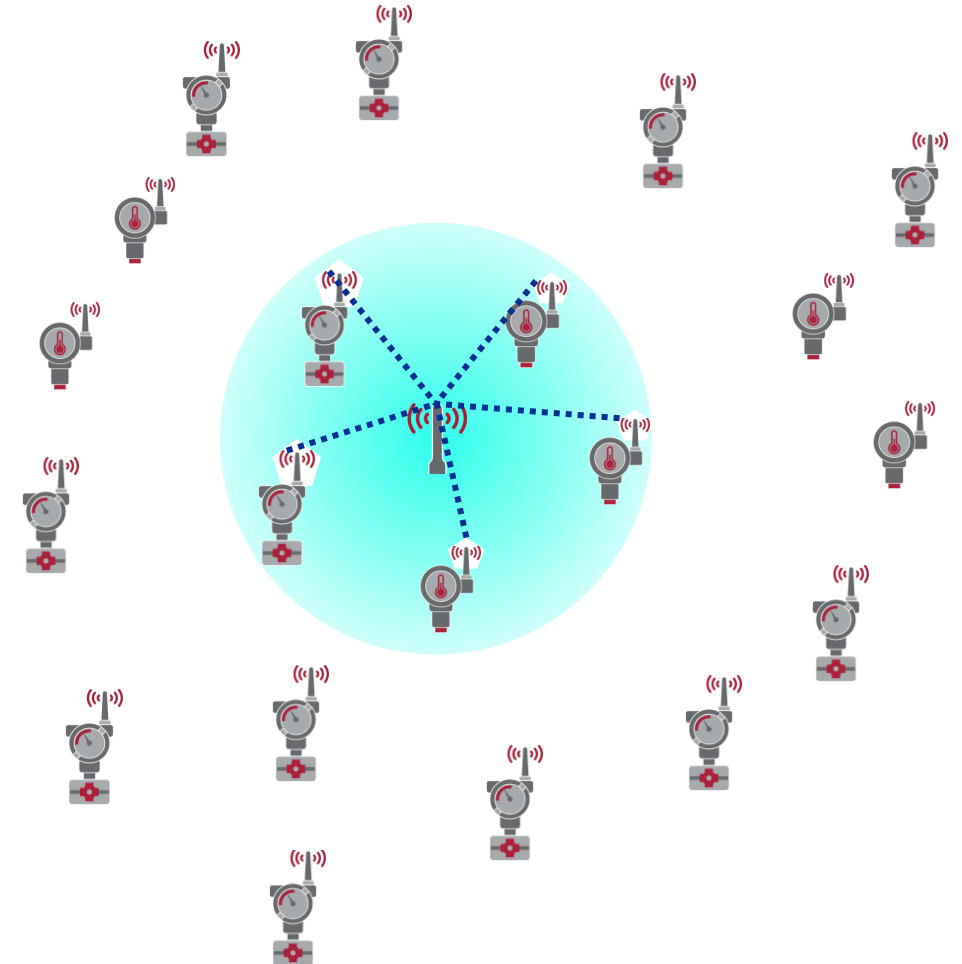
- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- 3. 25% of network within range of the gateway antenna



Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- 3. 25% of network within range of the gateway antenna

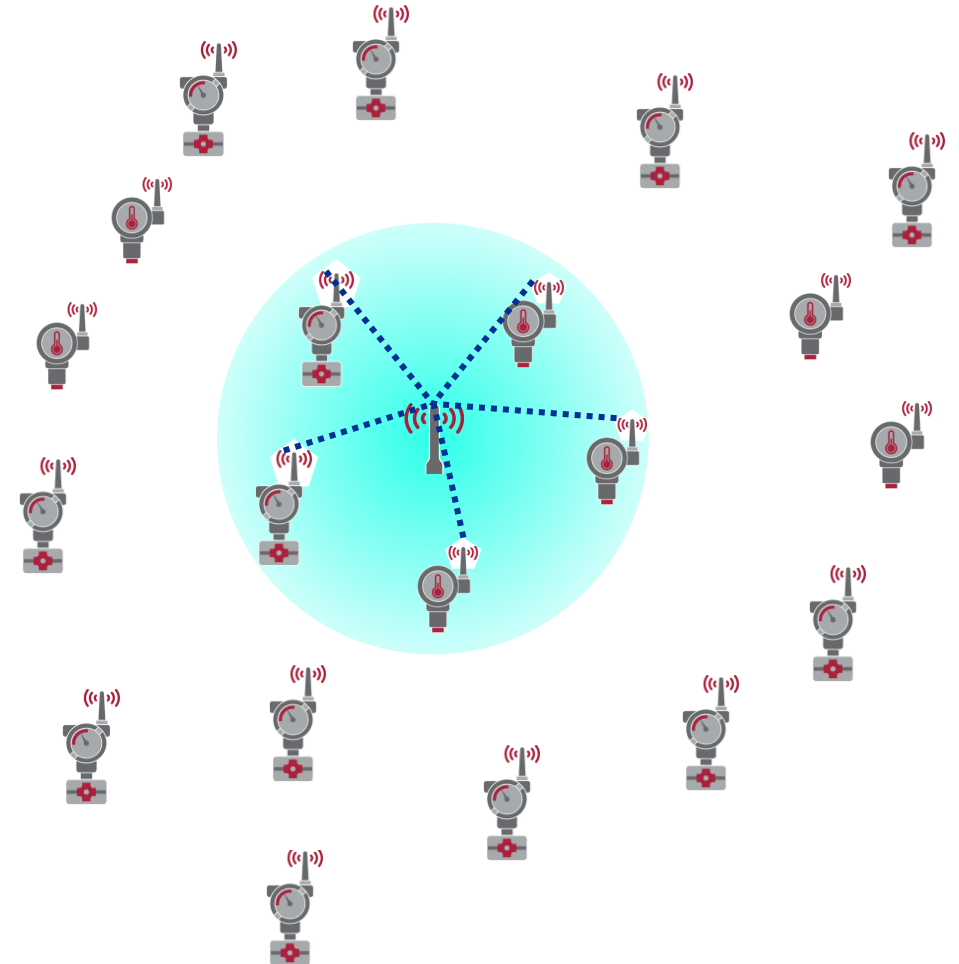
Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%



Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

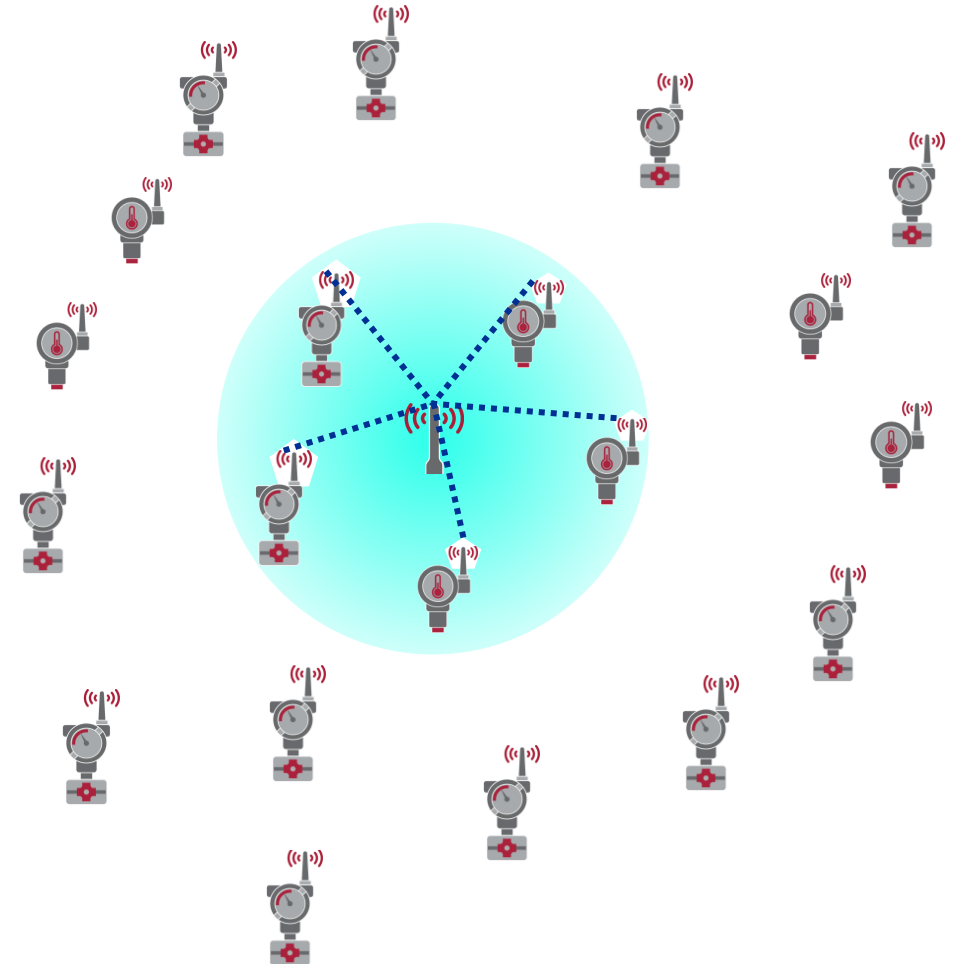


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

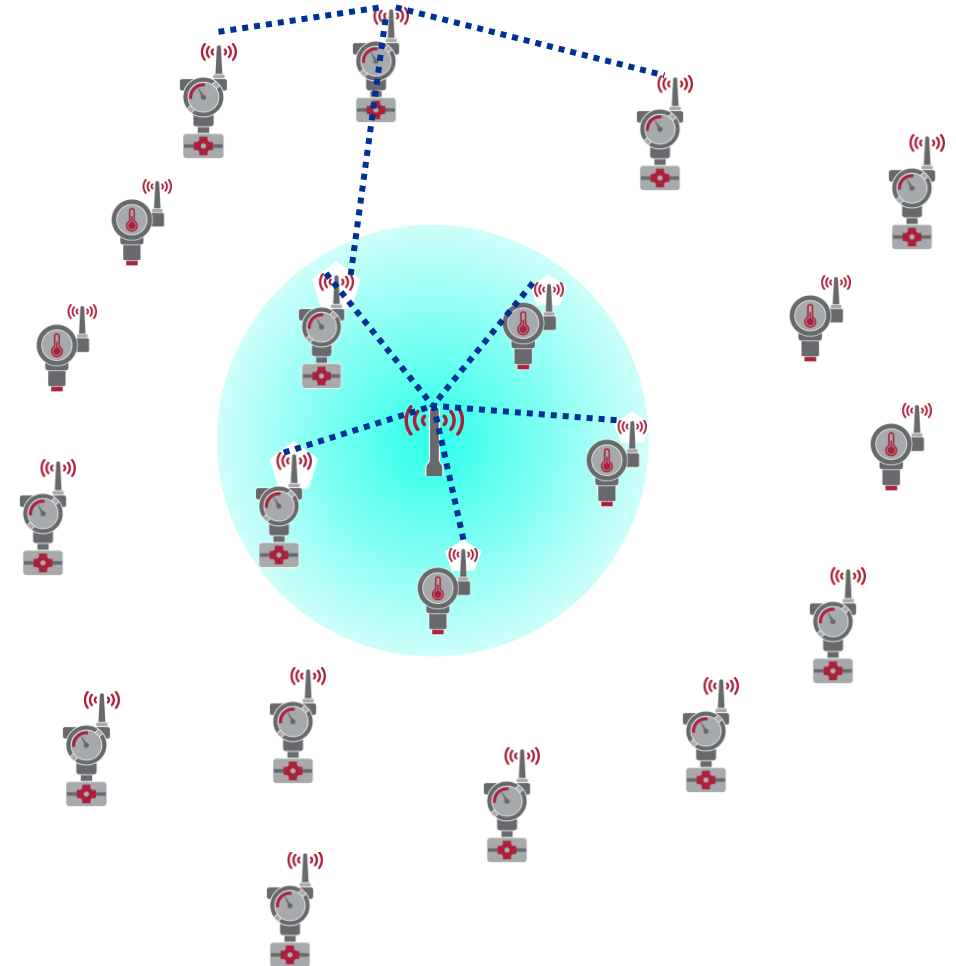


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

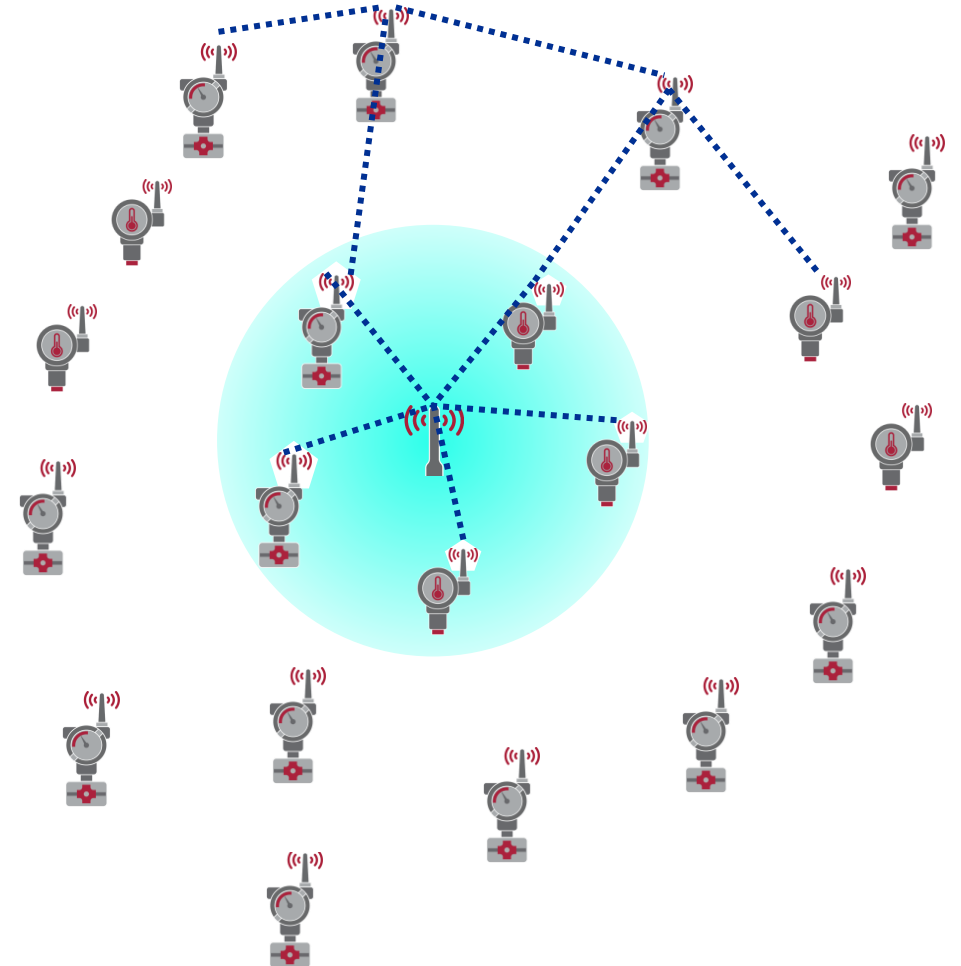


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

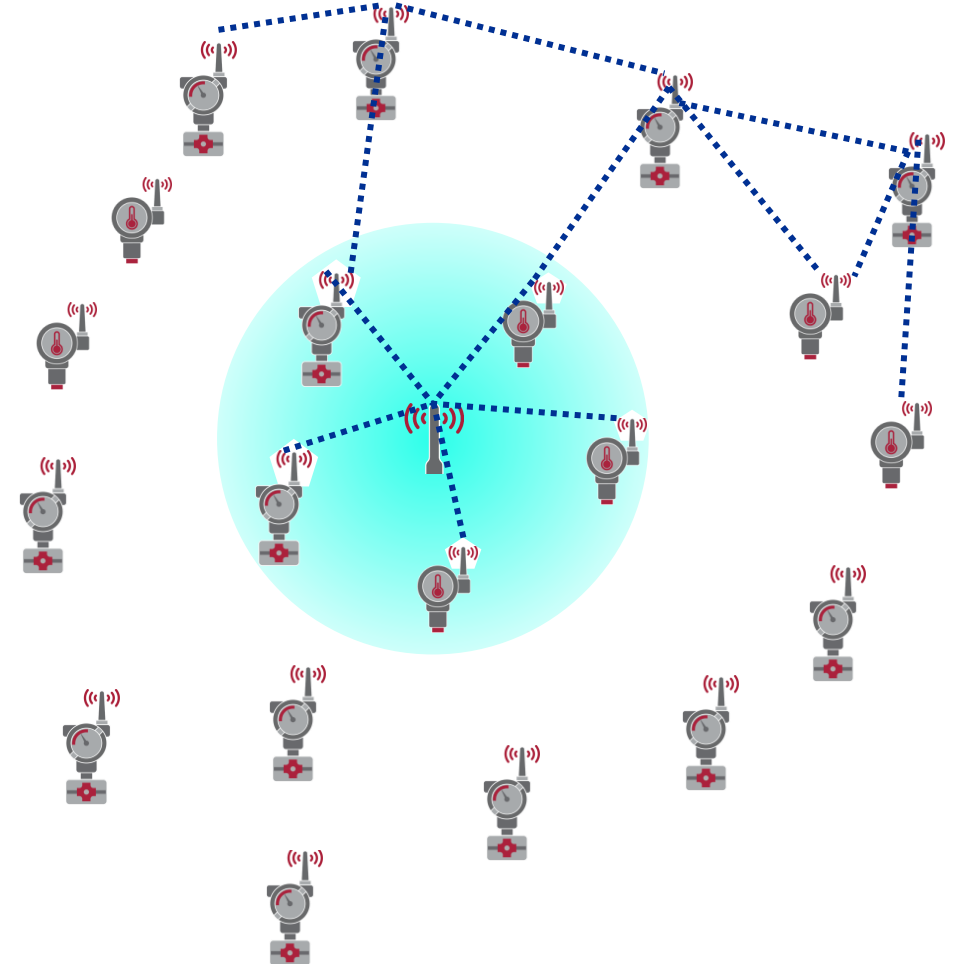


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

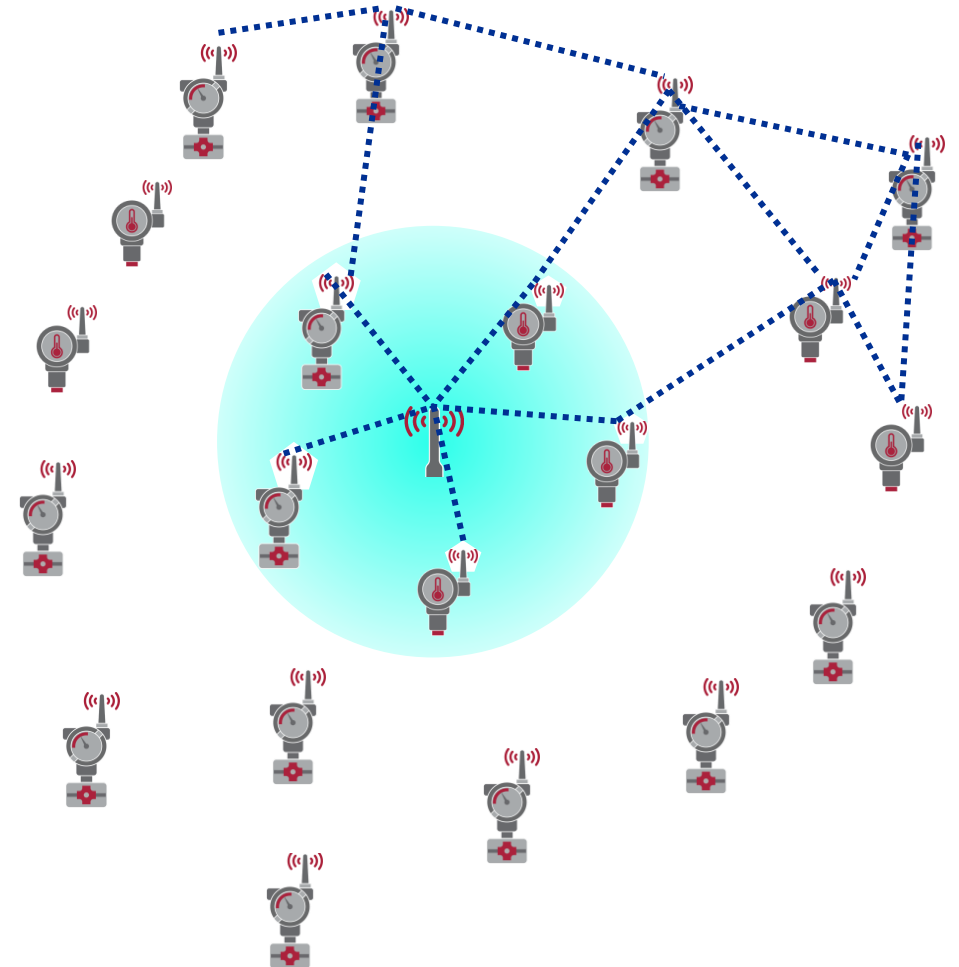


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

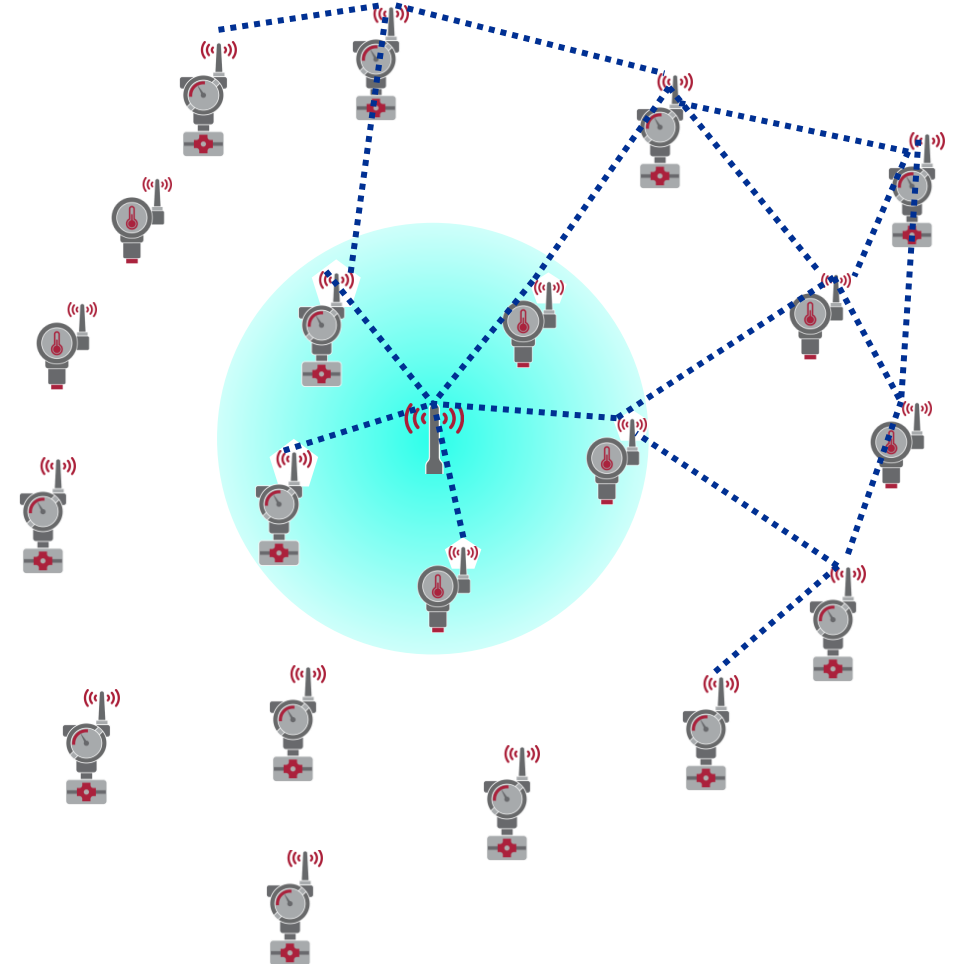


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

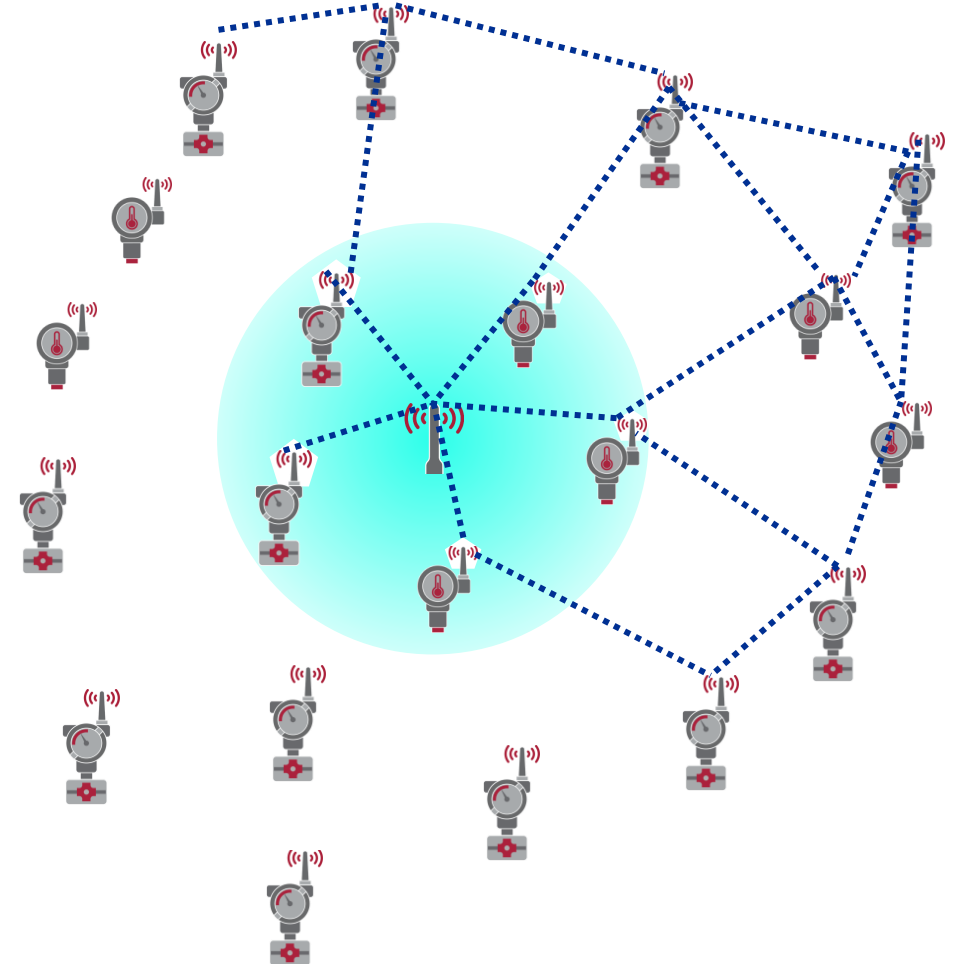


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

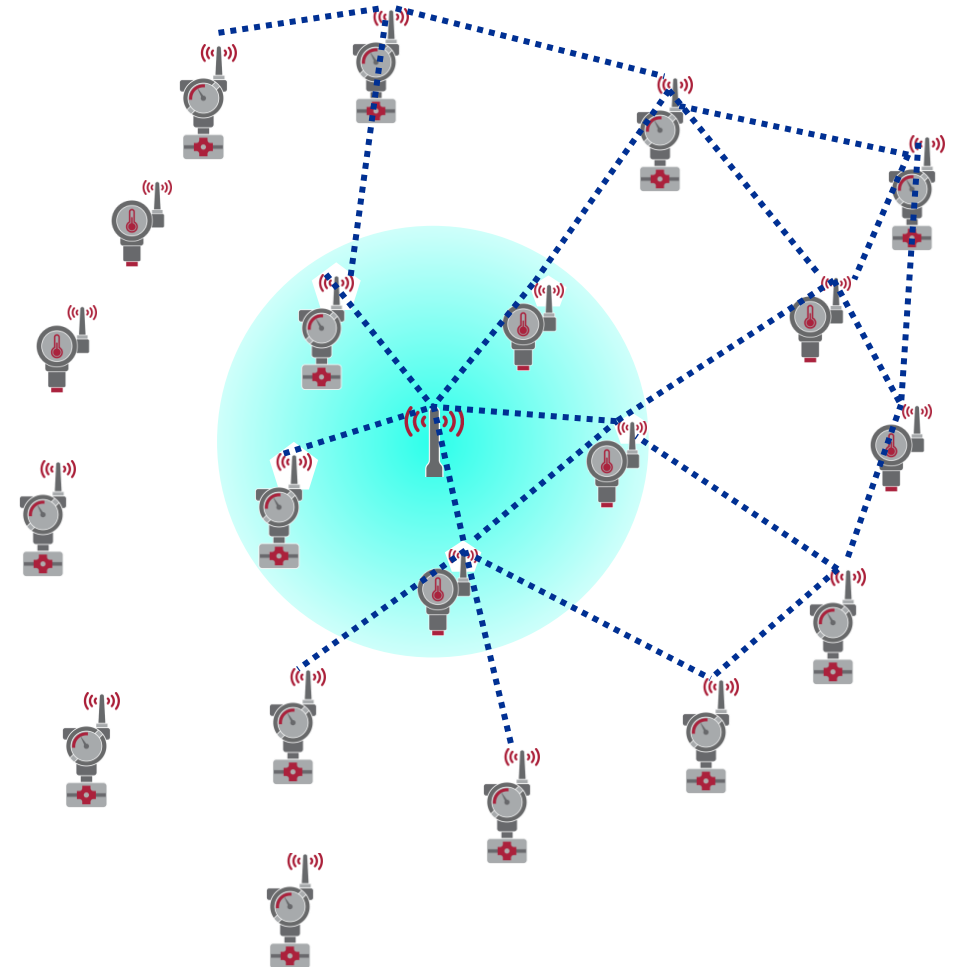


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

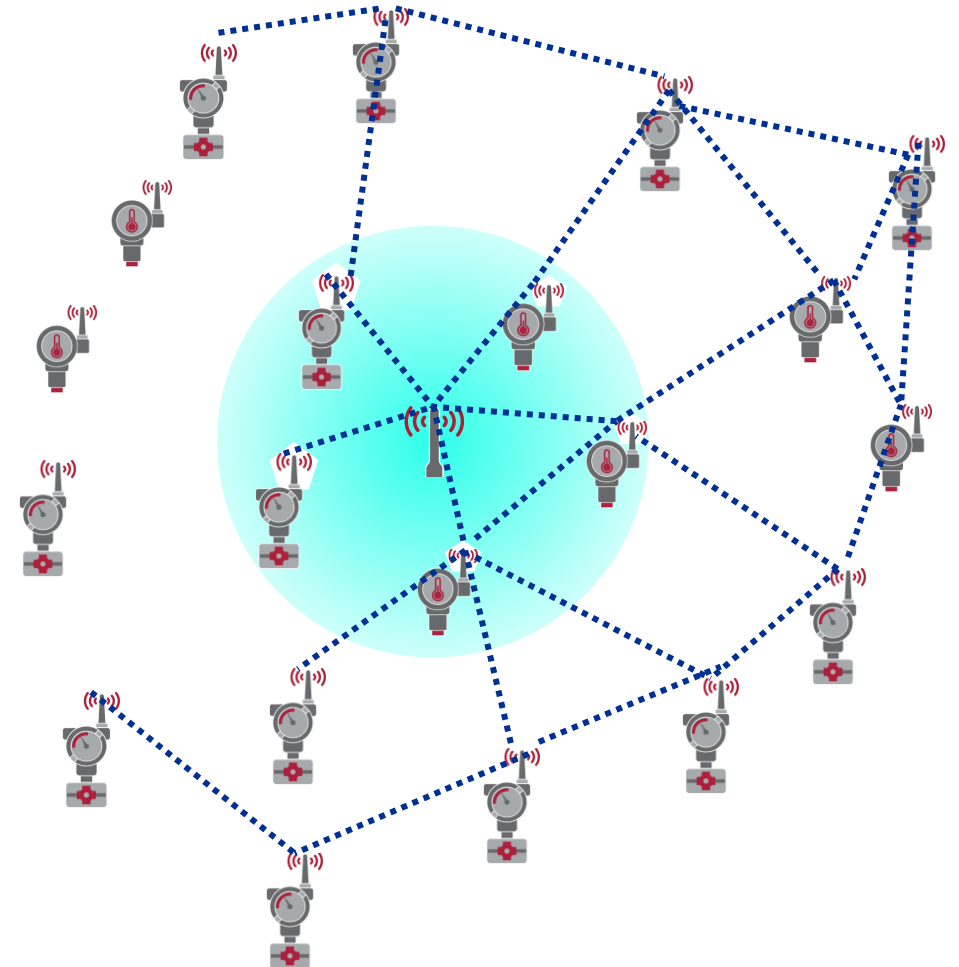


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

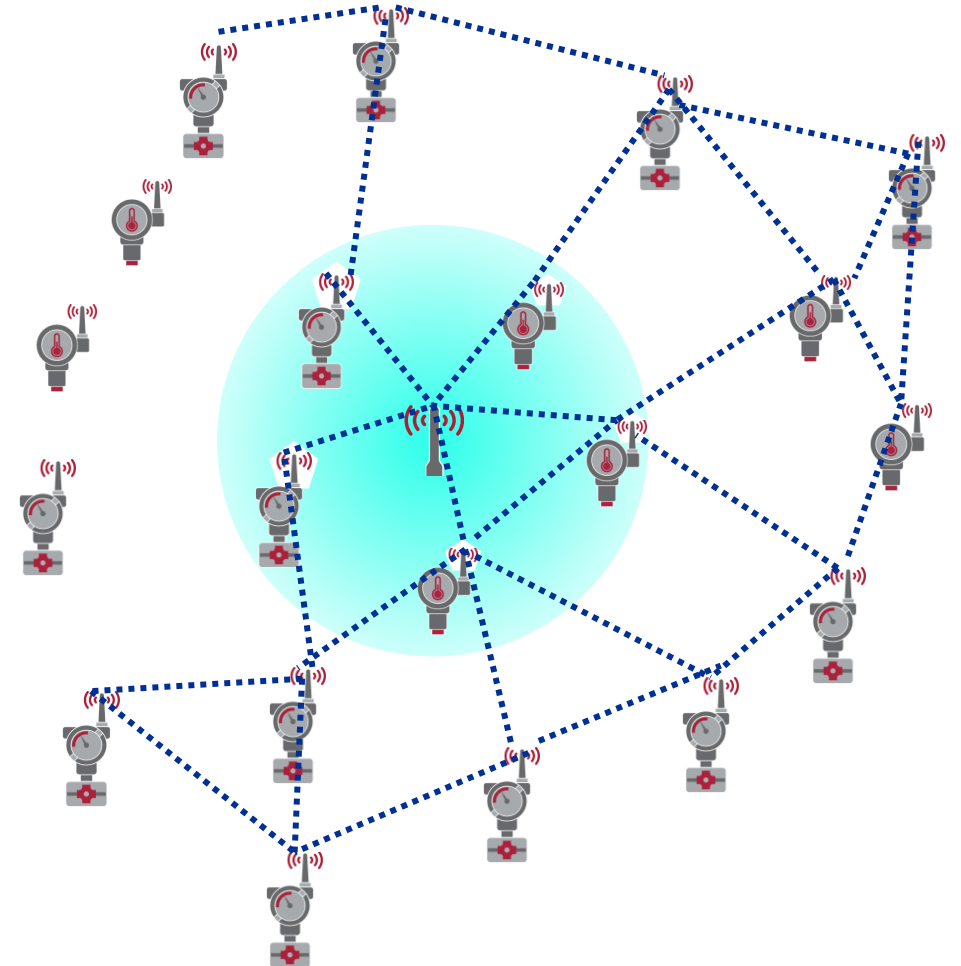


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

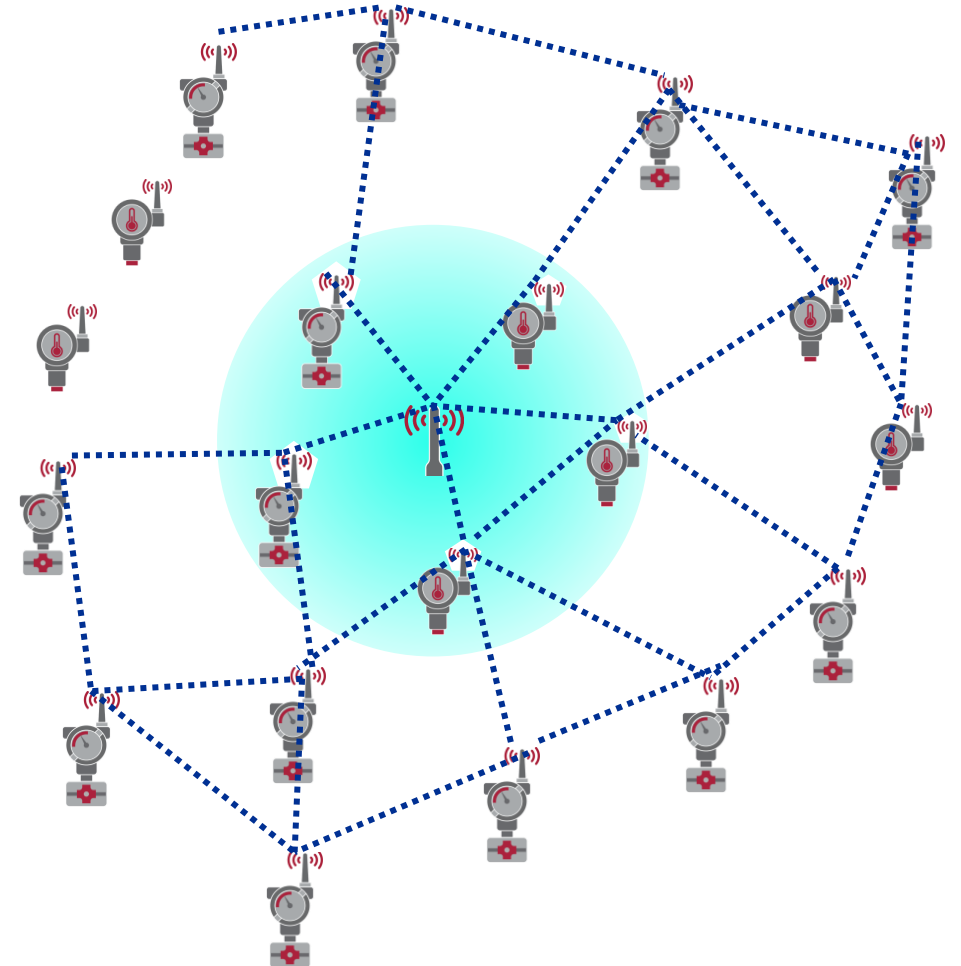


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

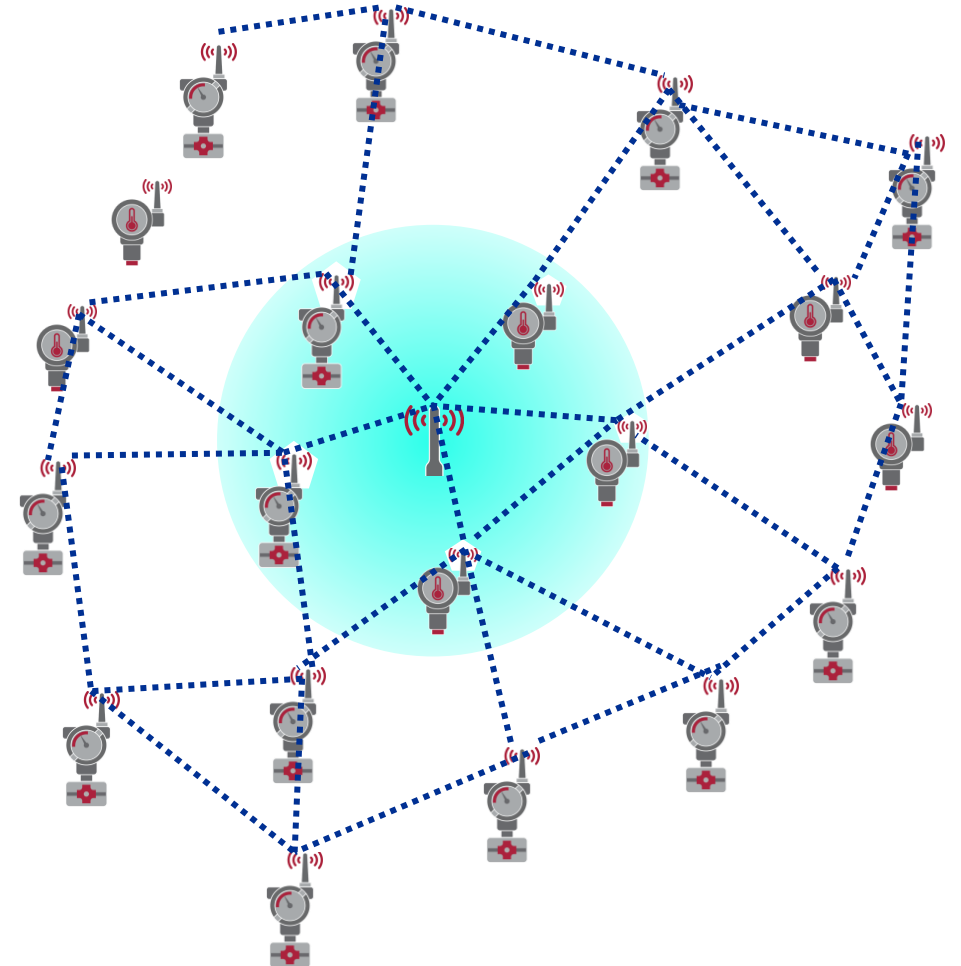


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

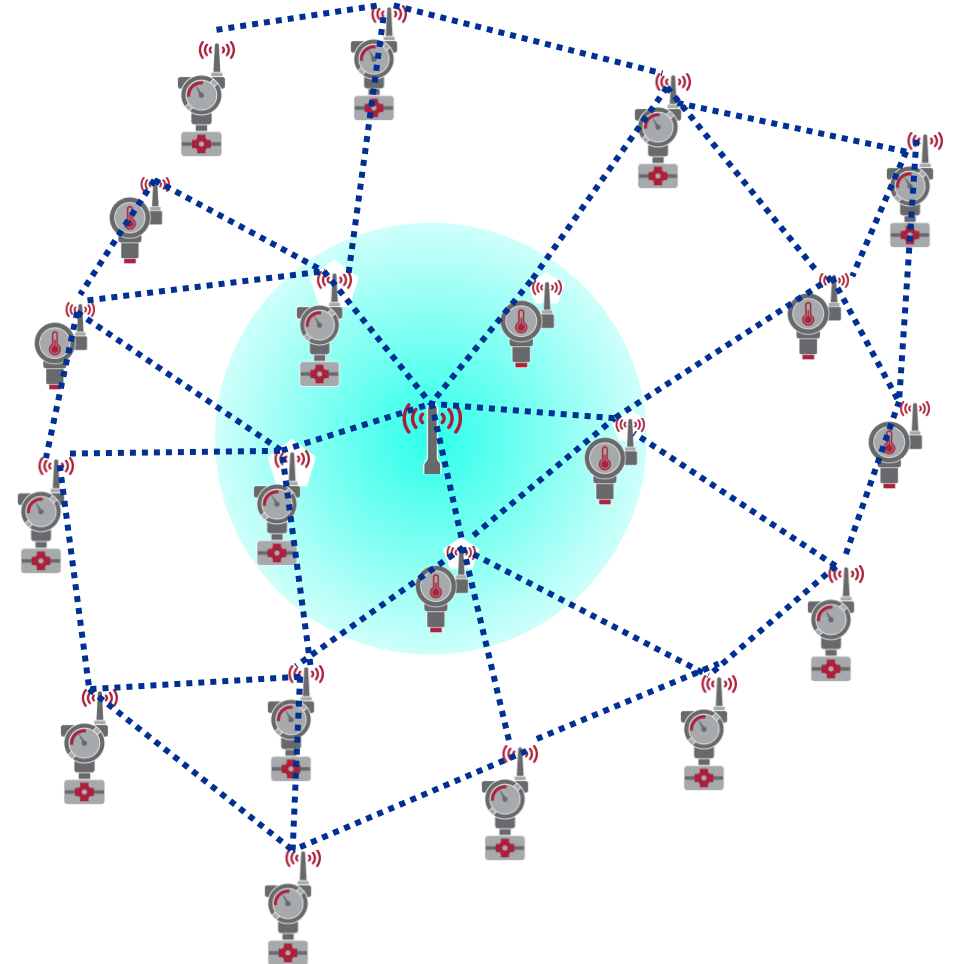


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

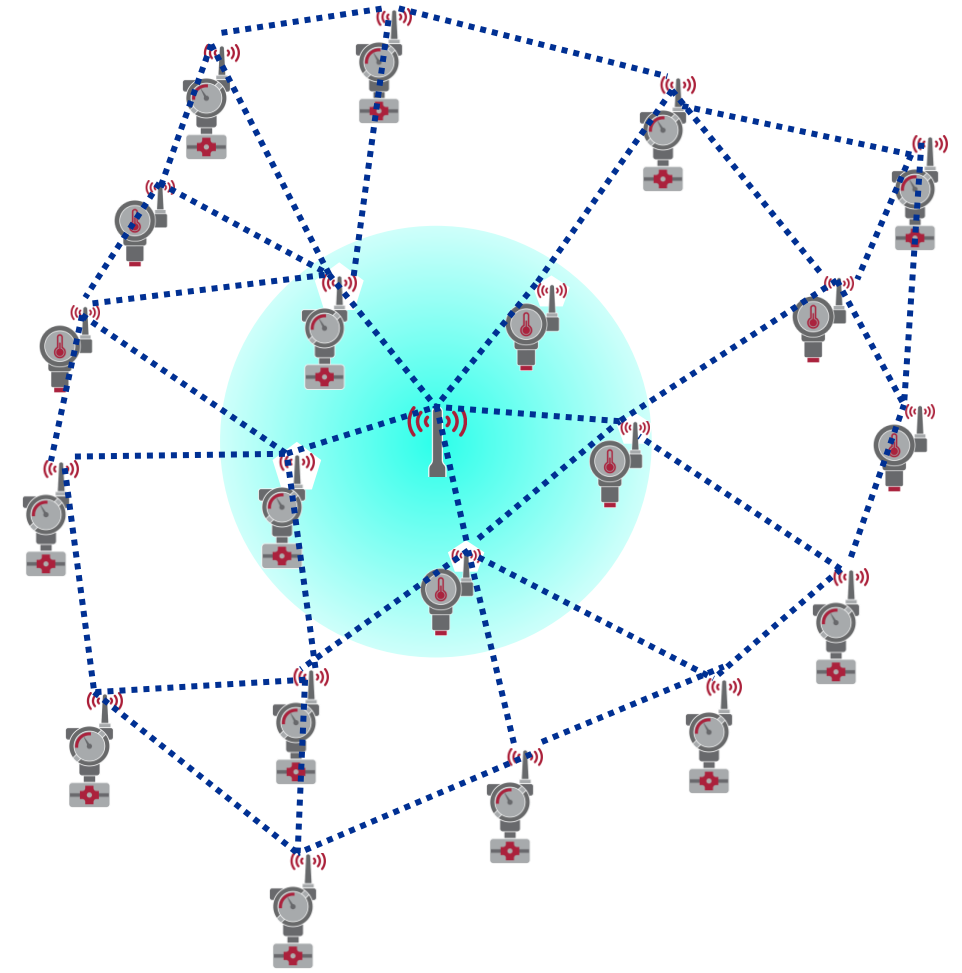


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- 4. 3 good neighbors for every device

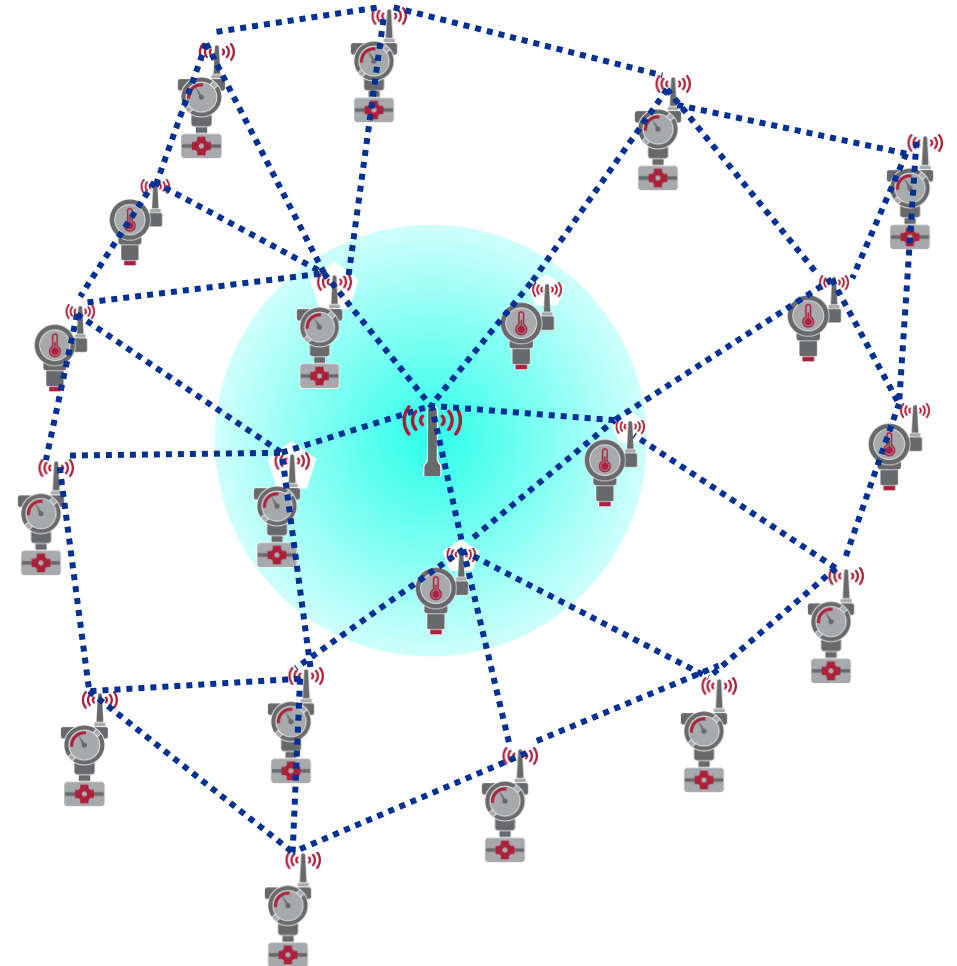


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

- ✓ 4. 3 good neighbors for every device

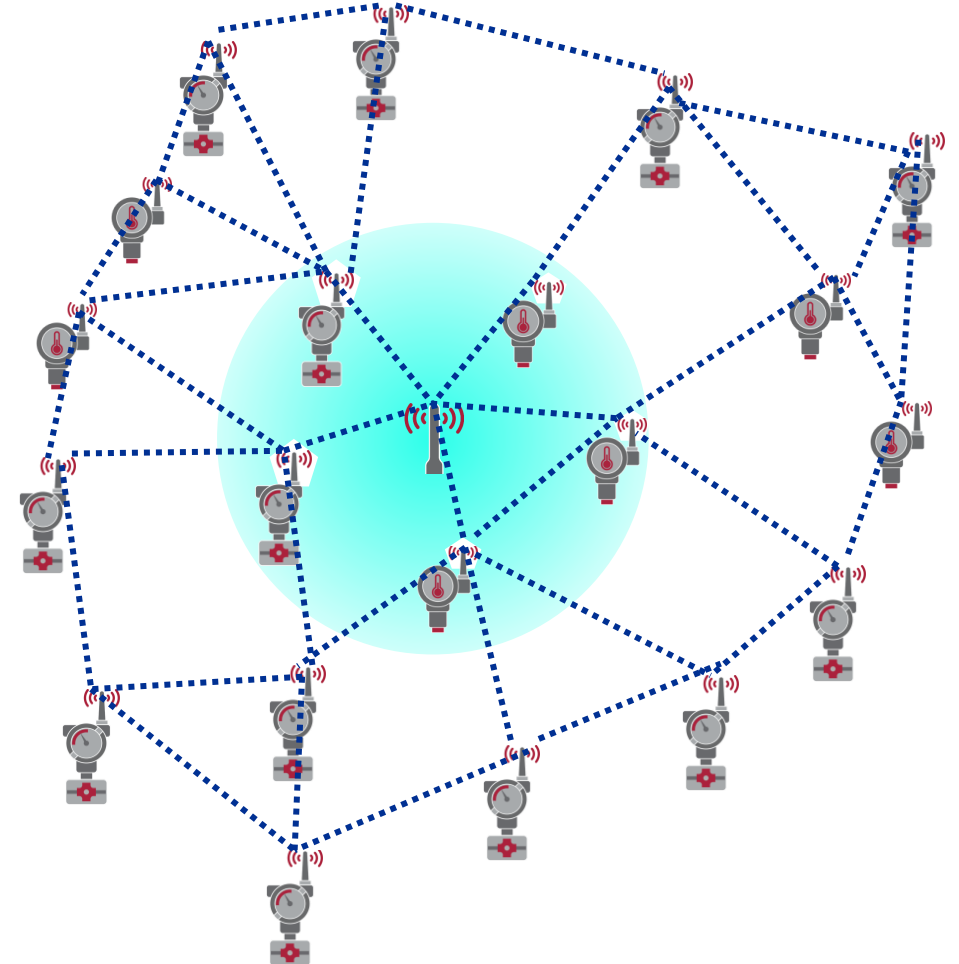


Network Design “Good Practice” Recommendations

- ✓ 1. Locate gateway antenna near the center of a network
- ✓ 2. 5 devices within direct range of the gateway antenna
- ✓ 3. 25% of network within range of the gateway antenna

Number of Devices	20
Devices Connected to Gateway	5
Percent Direct Connect	25%

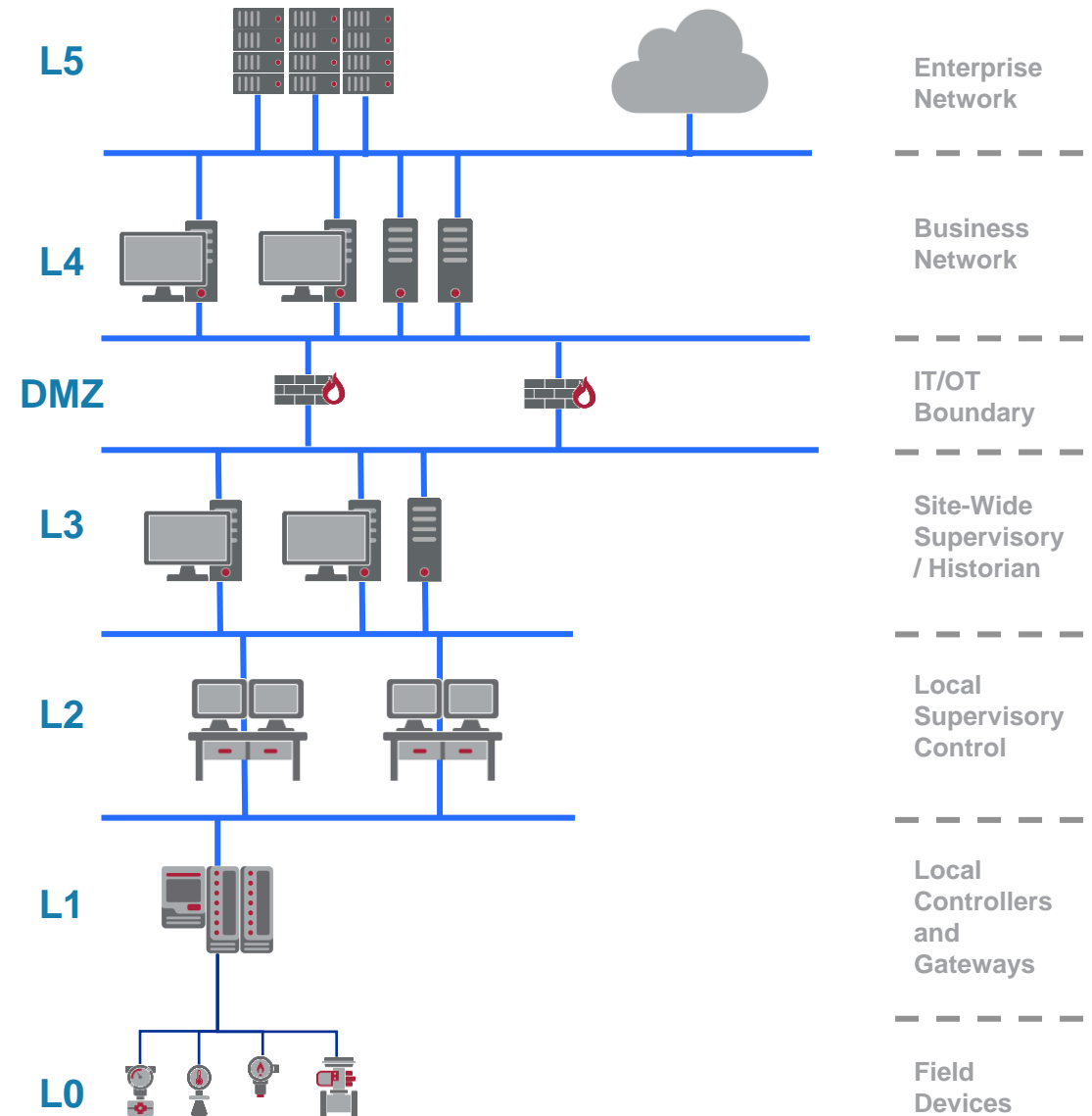
- ✓ 4. 3 good neighbors for every device



A well-formed network will easily achieve 99% Data Reliability

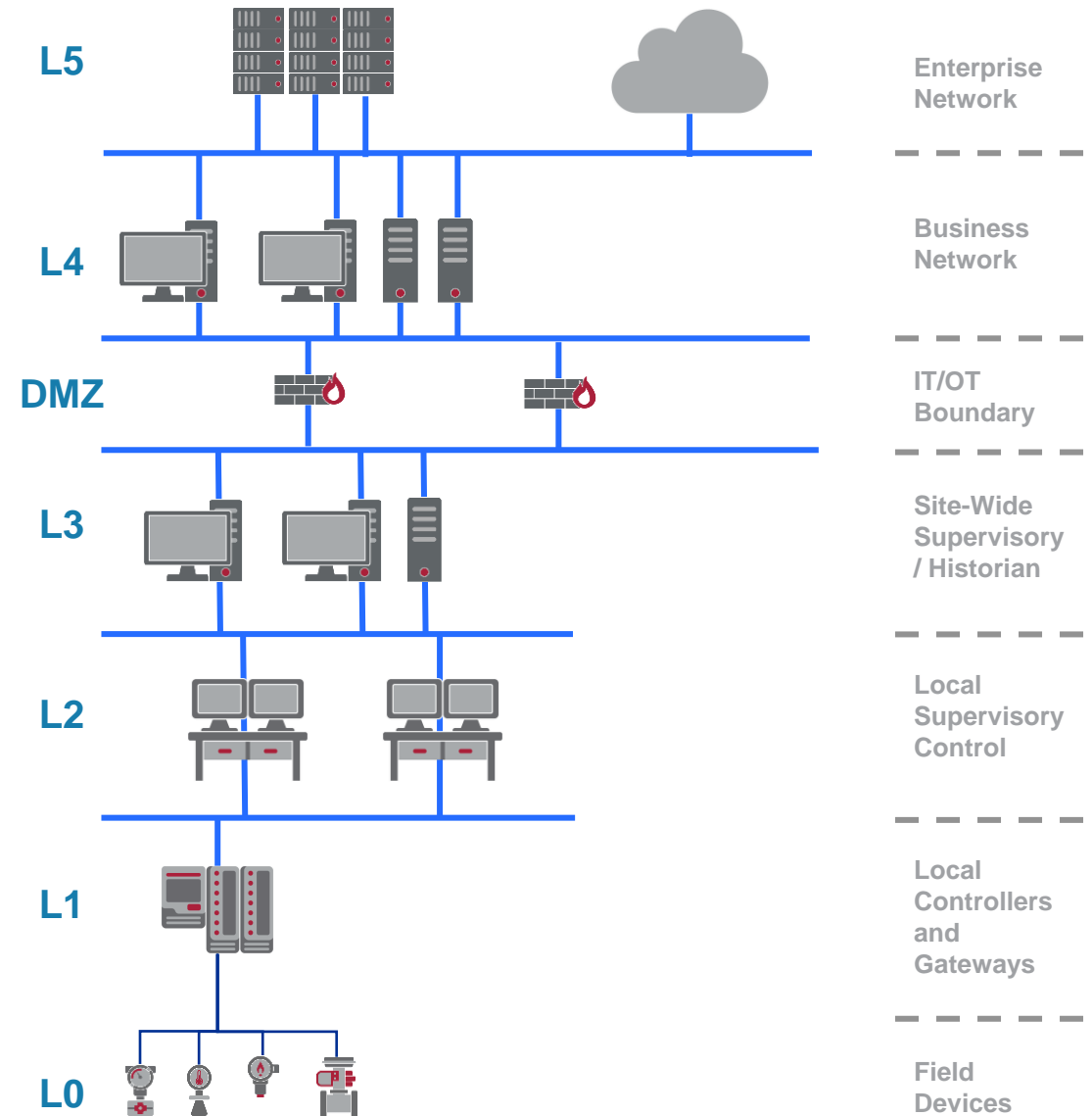
Network Connections

- Network connection depends on what is the sensor data being used for?



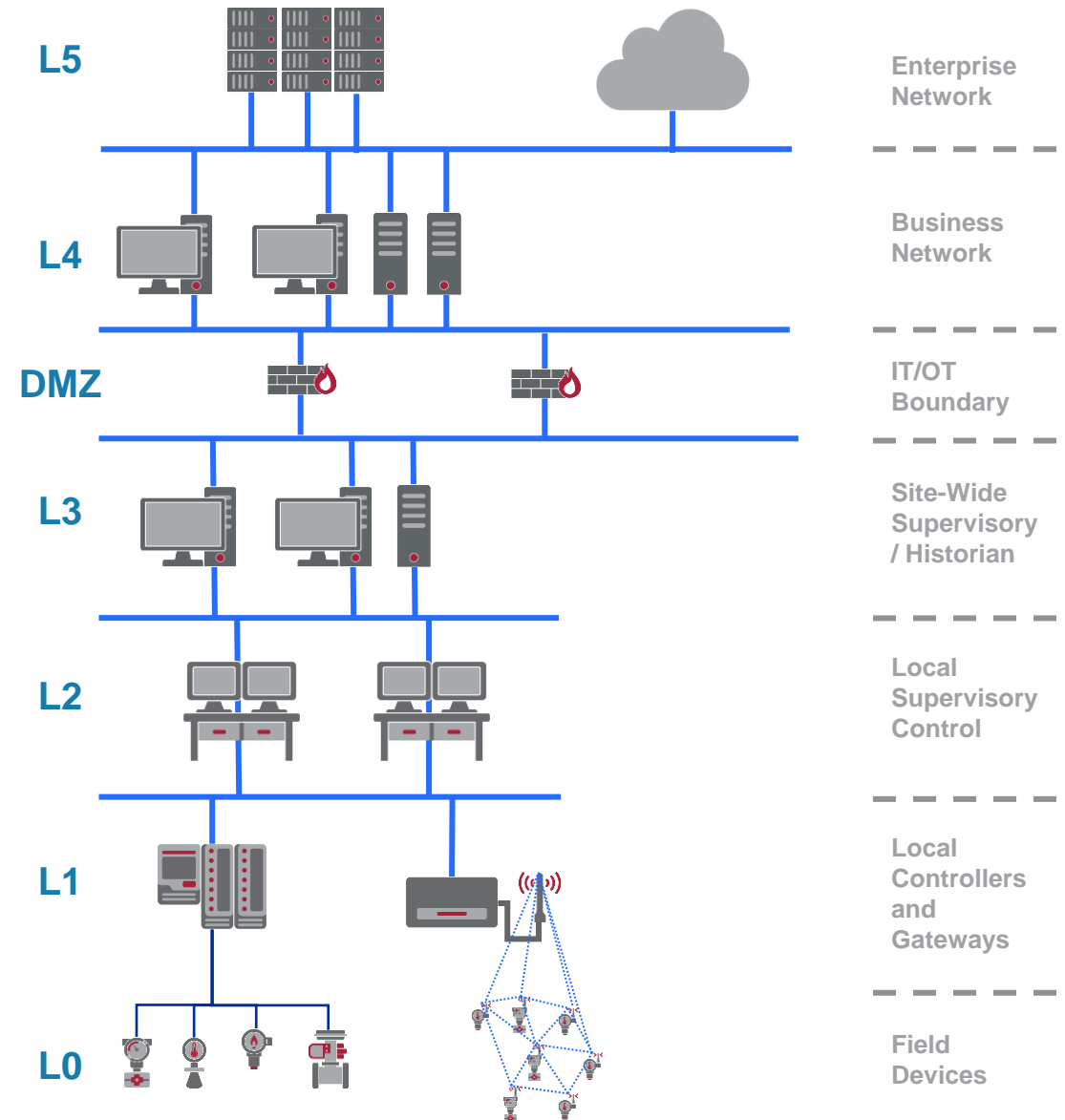
Network Connections

- Network connection depends on what is the sensor data being used for?
 - **Process Monitoring or control:** Gateway connection should be connected to the Control System control network (level 2)



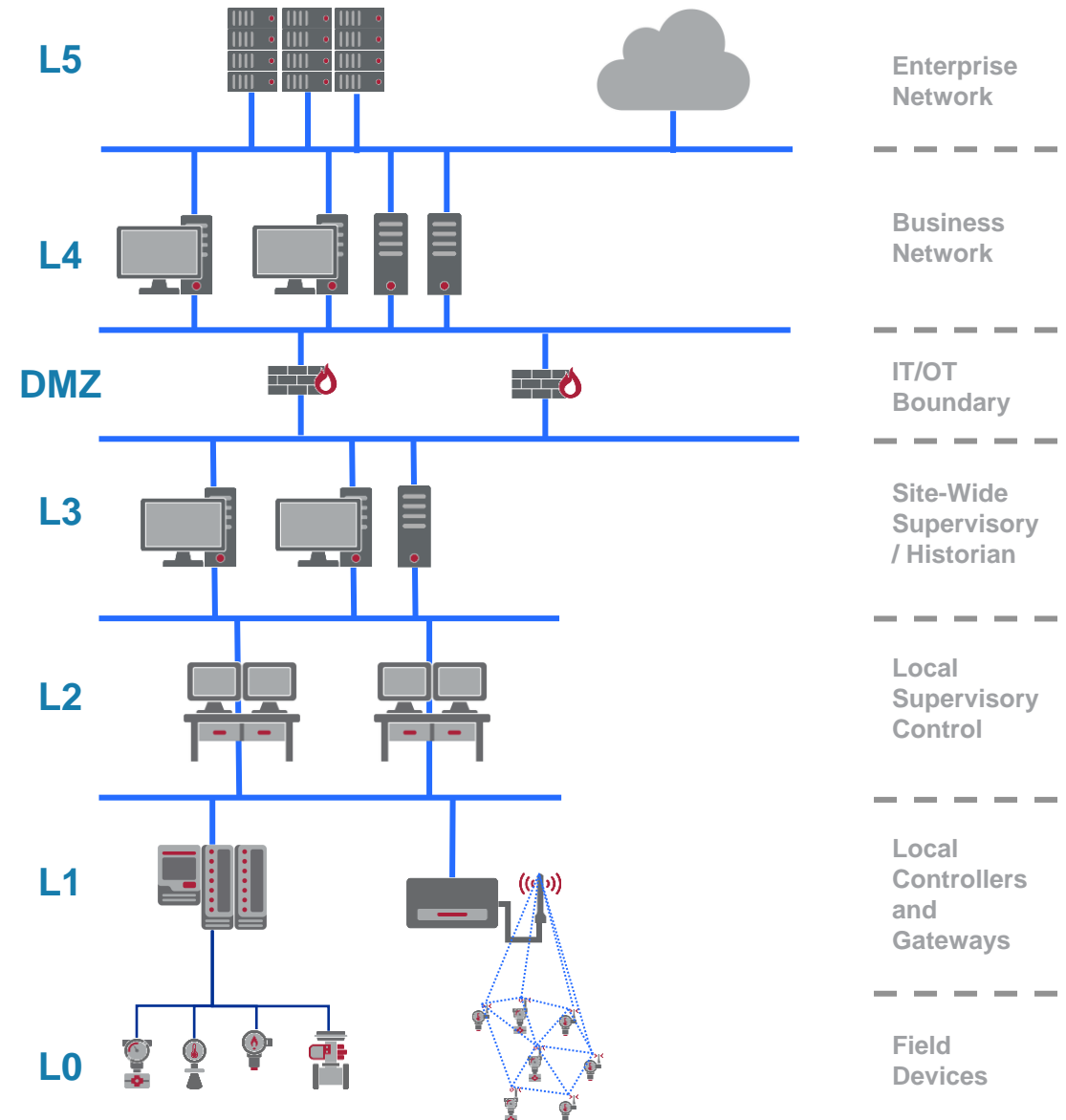
Network Connections

- Network connection depends on what is the sensor data being used for?
 - **Process Monitoring or control:** Gateway connection should be connected to the Control System control network (level 2)



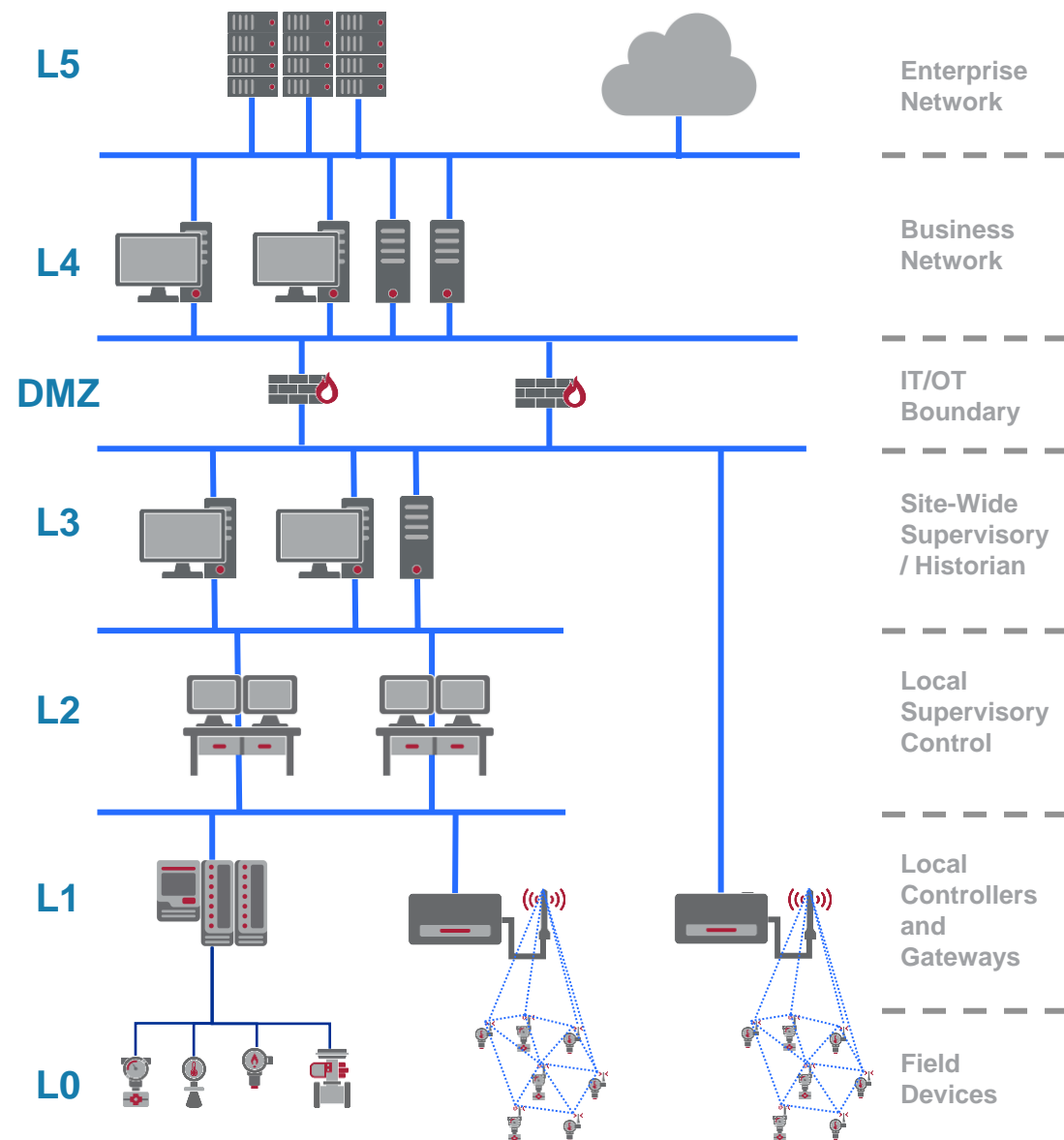
Network Connections

- Network connection depends on what is the sensor data being used for?
 - **Process Monitoring or control:** Gateway connection should be connected to the Control System control network (level 2)
 - **Reliability Monitoring:** Gateway communication should be connected directly to the business network through a DMZ (Typically level 3 or 4)



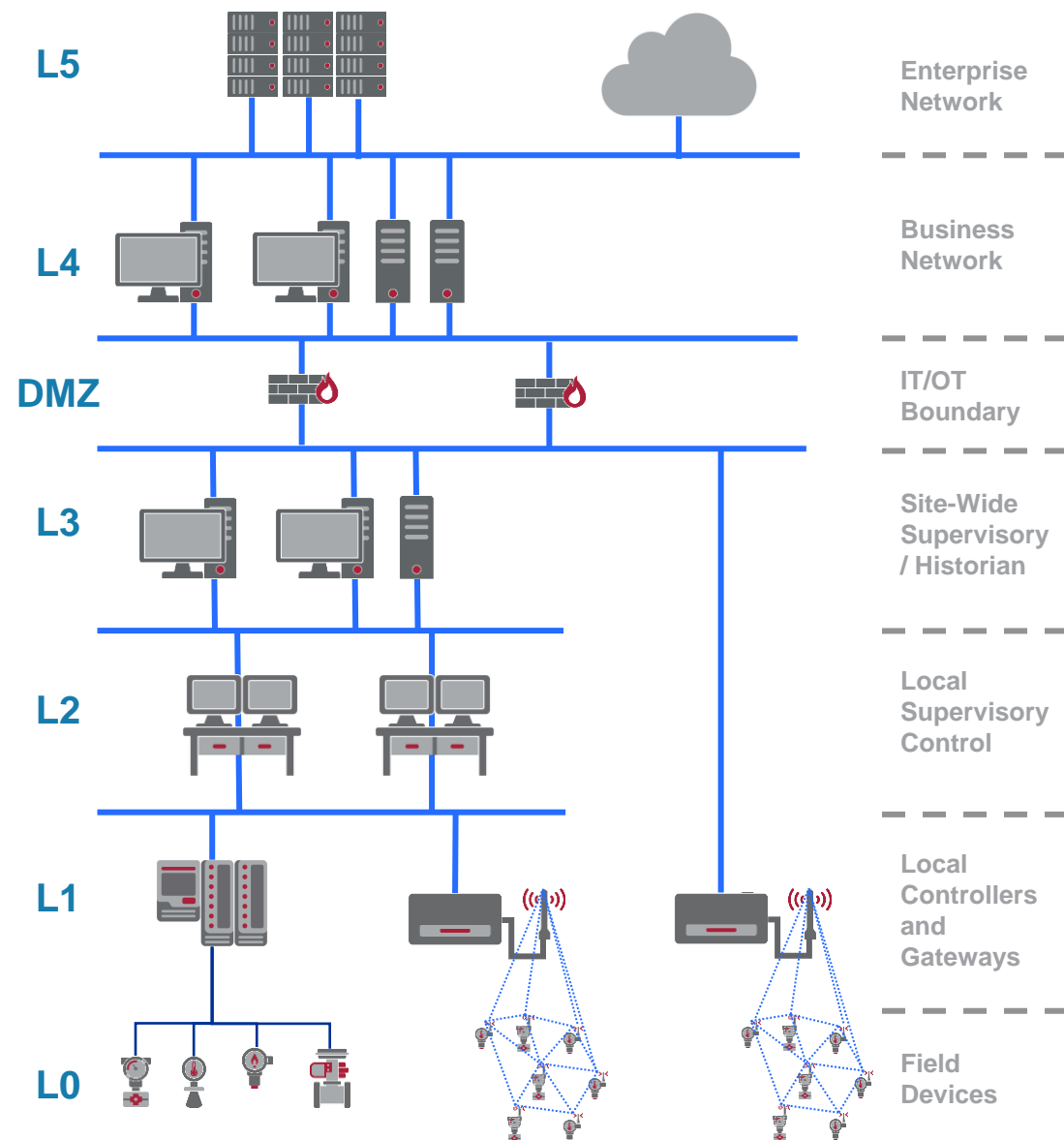
Network Connections

- Network connection depends on what is the sensor data being used for?
 - **Process Monitoring or control:** Gateway connection should be connected to the Control System control network (level 2)
 - **Reliability Monitoring:** Gateway communication should be connected directly to the business network through a DMZ (Typically level 3 or 4)



Network Connections

- Network connection depends on what is the sensor data being used for?
 - **Process Monitoring or control:** Gateway connection should be connected to the Control System control network (level 2)
 - **Reliability Monitoring:** Gateway communication should be connected directly to the business network through a DMZ (Typically level 3 or 4)
- Multiple WirelessHART networks can co-exist so that some devices can be connected to the control network, and others to the Reliability network



Network Commissioning Phase

- Install the Gateway first
 - Locate the gateway near the center of where sensors will be located, with line-of-site to as many devices as practical
- Install wireless devices nearest the Gateway first, then expand outward
- Install power modules into sensors after the Gateway is powered on
- Turn on active advertising in the Gateway when adding devices to a network
- Enter the WirelessHART Network ID and the Join Key into each sensor
 - Sensors can be ordered with the Network ID and Join Key pre-configured
- Confirm communication to Host Device (HART-IP, Modbus, OPC, etc.)

Network Settings

WiHART Network name

WiHART Network ID

WiHART Join Key

Show join key

Rotate network key?
 Yes
 No

WiHART Change network key now?
 Yes
 No

WiHART Security mode
 Common join key Access control list

WiHART Active Advertising
 Yes No

Network Commissioning Phase

- Once network is formed, confirm network best practices

	Regular Network (all devices are 4 seconds or more)	Fast Update Network (>20% of devices are 1 or 2 seconds)	Blended Network (<20% of devices are 1 or 2 seconds)
Minimum # of devices within range of the Gateway	5	5	5
Minimum # of good Neighbors (min. path stability)	3 (each path >60%)	3 (each fast path >70%)	3 (each fast path >70%)
% of network within range of the Gateway	25%	50%	25%

- Turn on “Rotate Network Key” option to improve cyber-security
- Save backup of gateway for future reference

Network Operation and Maintenance



Monitor Wireless Health Status

Wireless Health Reports



Device Reports – Field Instruments, Repeaters, Gateways
Network Health Reports

Wireless Link Health Indicators
(Field instruments, repeaters, Gateways)



Packet Success Rates (PSR)
RSSI – Received Signal Strength Indicators

Monitor Wireless Interference
Wireless Co-existence Mechanisms



Clear Channel Assessment Backoffs
Proactive Spectrum Management through channel
admission/exclusion mechanisms

Monitor Gateway Load



Gateway Load should be below 80% to ensure reliable
communication during high traffic periods

Network Operation and Maintenance



Software and Firmware Upgrades

Gateway Software/Firmware Upgrades



Gateway software/firmware updates will require the network to re-form, and which can take up to 1 hour for large (>50 devices) networks

Field Instrument Upgrades
(Wired or Over-the-Air OTA)



WirelessHART Communication Stack Upgrades
Application Processor Upgrades



Battery Life Monitoring and Replacement

Field Instrument Battery Status



Part of the field instrument health report
Replace batteries as needed

Aggregate Field Mesh Network Energy



Ensure the wireless traffic in mesh network is balanced and does not cause high battery drain on particular instruments
Enforce mesh topology if needed

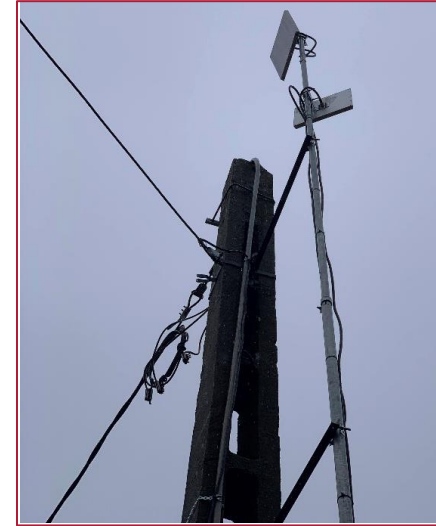
Practical Deployment Considerations

Antennas

- WirelessHART: 2.4 GHz, high-gain omni-directional antennas
- WiFi: 5 GHz, high—gain omni-directional or directional antennas
- Installation height matters – the higher the better
- Always have RF qualification tests assemblies of antenna + extension cable + arrestor + all connectors

Surge Arrestors

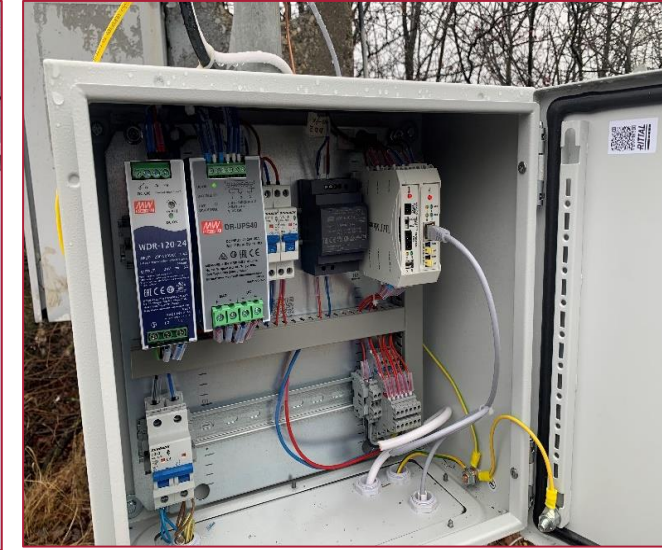
- Install surge arrestors as close to the RF port as possible
- Always weatherproof RF connections with appropriate tools and materials



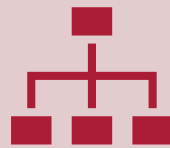
Practical Deployment Considerations

Power

- Undervoltage and over-voltage protection
- Power conditioning components
- Surge protection
- Battery backup desired – especially in upstream applications



Conclusion



WirelessHART network deployment is greatly simplified if recommended guidelines are being followed.



Network planning and design decisions have a significant impact on the wireless health of the networks and battery life of field instruments.

INTREPID WirelessHART Gateway Product Line



- WirelessHART Network/Security Manager, Gateway and Access Point
- Includes both WirelessHART and WiFi MESH+ high throughput backbone connectivity
- Intuitive INTREPID application modeled after field device lifecycle
- Supports scalable deployments of up to 250 field instruments per Gateway
- Extended WirelessHART connectivity range to field instruments – up to 1.2 miles (2,000 meters) LOS
- Supports Over-the-Air upgrades for field instruments
- Supports transfer of large files for condition/vibration and corrosion monitoring
- Secure HART-IP (HART 7.7) high-side connectivity to the plant network or cloud-hosted applications
- Power redundancy (DC and PoE)

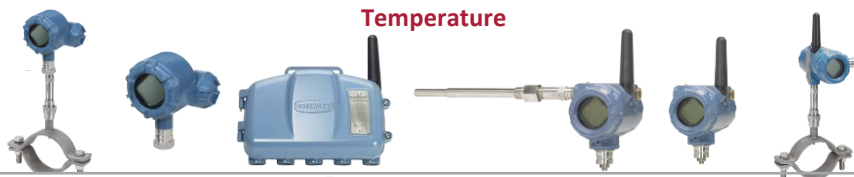
<https://centerotech.com/product/intrepid-wirelesshart-field-gateway/>

Emerson's Wireless Transmitter Portfolio



Process Monitoring

Measurements in lieu of traditionally wired monitoring points, routed through wireless gateways to the PLC/DCS saving on signal wiring and I/O costs

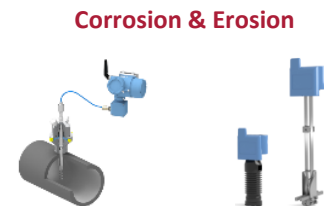


Reliability Monitoring

Measurements that aid in Maintenance, Reliability, and Safety, connected to the business network rather than traditional (and expensive) Control I/O



THUM Stranded Diagnostics



Connected Lighting





Emerson WirelessHART Gateways

1410S + 781S



- 200+ devices
- AC/DC/PoE (Powered Device Only)
- RS-485, Ethernet
- Modbus TCP, OPC-DA, OPC-UA, Ethernet/IP, HART-IP *WirelessHART*
- Intrinsic safety barrier (option)
- ISA 100A (Option)

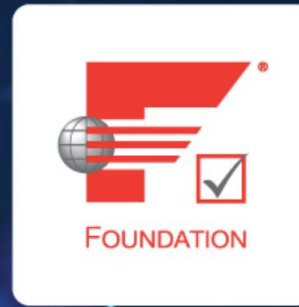
IW6300



- Class 1 Div. 2 / ATEX/IEC-Ex Type n
- 5Ghz and 2.4GHz Wi-Fi-Mesh Networks
- Power over Ethernet
- RS-485, Ethernet
- Modbus TCP, OPC-DA, OPC-UA, Ethernet/IP, HART-IP
- Fiber-Optic



WirelessHART Registered Products from FCG Members



Wi-Corr Bond
 Manufacturer: 3-Sci
 Protocol: HART
 Category: Ultrasonic , WirelessHART , WirelessHART Field Device , Acoustic , Diagnostic, Health Monitoring , Temperature



FieldKey NHU200-WL
 Manufacturer: ABB
 Protocol: HART
 Category: WirelessHART Adapter , WirelessHART Adapter



702 Wireless Discrete Transmitter
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART , WirelessHART Field Device , Analog and Discrete IO



3308A
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART Field Device , Level



M1100S DEV-WH-X
 Manufacturer: Microcyber Corporation
 Protocol: HART
 Category: WirelessHART , WirelessHART Field Device , Development Solutions , Stack



CALIPERAY
 Manufacturer: MISTRAS Group, Inc.
 Protocol: HART
 Category: WirelessHART Field Device , Analytical



AD5000 Acoustic
 Manufacturer: Armstrong International
 Protocol: HART
 Category: WirelessHART , WirelessHART Field Device , Acoustic



ST5700 SteamTrap
 Manufacturer: Armstrong International
 Protocol: HART
 Category: WirelessHART , WirelessHART Field Device , Steam Trap Monitor , Acoustic



3051 SMV PDP Wireless
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART Field Device , Absolute or Gauge Pressure , Differential Pressure , Flow , Multivariable , Pressure



3051S Wireless
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART Field Device , Absolute or Gauge Pressure , Differential Pressure , Flow , Level , Pressure



OTIS 7543-6 W-HRT
 Manufacturer: Otis Instruments
 Protocol: HART
 Category: WirelessHART Field Device , Analytical



BULLET WirelessHART Adapter
 Manufacturer: Pepperl+Fuchs SE
 Protocol: HART
 Category: WirelessHART Adapter , WirelessHART Adapter



Vector
 Manufacturer: Baker Hughes Oilfield Operations LLC
 Protocol: HART
 Category: WirelessHART Adapter , WirelessHART Adapter



4390 Series Wireless Corrosion and Erosion Transmitter
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART , WirelessHART Field Device , Corrosion and Erosion Monitoring , Analytical



248X Wireless
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART Field Device , Temperature



705 Wireless Totalizing Transmitter
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART Field Device , Flow



SITRANS AW210
 Manufacturer: Siemens AG
 Protocol: HART
 Category: WirelessHART Adapter , WirelessHART Adapter



WITECK Stack Starter Kit
 Manufacturer: Softing AG
 Protocol: HART
 Category: WirelessHART , WirelessHART Field Device , Development Solutions , Stack



648 Wireless
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART , WirelessHART Field Device , Temperature



848T Wireless
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART , WirelessHART Field Device , Temperature



WPG Wireless Pressure Gauge
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART Field Device , Absolute or Gauge Pressure , Pressure



FieldPort SWA50
 Manufacturer: Endress+Hauser
 Protocol: HART
 Category: WirelessHART Adapter



WirelessTEG Module
 Manufacturer: Spirax Sarco
 Protocol: HART
 Category: WirelessHART Field Device , Flow



TCD50
 Manufacturer: United Electric Controls
 Protocol: HART
 Category: Gas Detection , WirelessHART Field Device , Analytical , Concentration , Gas , Measurement



248 (Wireless)
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART Field Device , Temperature



2160 Wireless vibrating fork level switch
 Manufacturer: Emerson Automation Solutions
 Protocol: HART
 Category: WirelessHART Field Device , Level



SWA70
 Manufacturer: Endress+Hauser
 Protocol: HART
 Category: WirelessHART , WirelessHART Adapter



AWTMS-WIH
 Manufacturer: Forbes Marshall
 Protocol: HART
 Category: WirelessHART Field Device , Acoustic , Temperature



VEGAPULS WL 61
 Manufacturer: VEGA Grieshaber KG
 Protocol: HART
 Category: WirelessHART Field Device , Level



WirelessHART Products from FCG Members

Fieldbus International AS

- [T810 Built-in WirelessHART adapter](#)
- [T910 DIN-rail mounted WirelessHART converter,](#)



Manometer Factory LLC

- [Safir W, pressure transmitter](#)



Metal Samples Company (a Division of Alabama Specialty products, Inc.)

- [MS800XUT-HRT Ultrasonic Corrosion/Erosion Monitoring instrument](#)
- [High Resolution Wireless HART ER Transmitter, MS50XXE-HRT](#)



ProComSol, Ltd

- [DevCom2000 - HART Communicator Software, Windows, Software](#)
- [DevComDroid - HART Communicator App, Android, Software](#)
- [DevCom.iOS - HART Communicator App, iOS \(Apple\), Software](#)

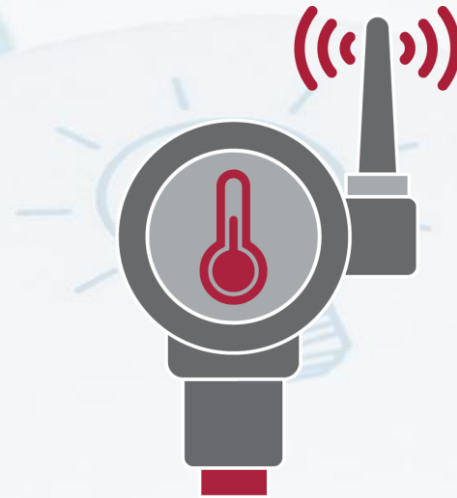


United Electric Controls Company

- [Vanguard WirelessHART Fixed Point Gas Detector](#)



THANK YOU FOR YOUR ATTENTION!



Q&A Session

Copyright

Copyright © 2023 FieldComm Group®

This document contains copyrighted material and may not be reproduced in any fashion without the written permission of the FieldComm Group®.

Trademark Information

FDI™ and FOUNDATION™ Fieldbus are trademarks and FieldComm Group®, HART®, HART-IP®, HART Registered®, PA-DIM® and WirelessHART® are registered trademarks of FieldComm Group, Austin, Texas, USA.

Any use of these terms hereafter in this document or in any document referenced by this document implies the trademark/registered trademark. All other trademarks used in this or referenced documents are trademarks of their respective companies. For more information, contact FieldComm Group at the address below.

Attention: FieldComm Group President
FieldComm Group
9430 Research Blvd., Ste. 1-120
Austin, TX 78759, USA
Voice: (512) 792-2300
Fax: (512) 792-2310
<http://www.fieldcommgroup.org>

Intellectual Property Rights

The FieldComm Group (the Group) does not knowingly use or incorporate any information or data into the HART, FOUNDATION Fieldbus and FDI protocol standards, which the Group does not own or have lawful rights to use. Should the Group receive any notification regarding the existence of any conflicting private IPR, the Group will review the disclosure and either (A) determine there is no conflict; (B) resolve the conflict with the IPR owner; or (C) modify the standard to remove the conflicting requirement. In no case does the Group encourage implementers to infringe on any individual's or organization's IPR.