Demystifying Wireless Ethernet

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Overview

• Ethernet is quickly becoming de facto standard for industrial communications, replacing serial and data bus technologies.

• Why?
  – Ethernet accommodates a wide range of applications
  – Universally supported by communications equipment manufacturers
  – Encapsulates industrial equipment protocols
  – Ease of configuration and low cost of implementation
**Drawback**

- For all its advantages, wired Ethernet shares one significant drawback with other wired industrial networking approaches: **Cabling**
Solution

- Distance and cost limitations associated with wired links have led many to seek a longer range and more flexible alternative: Wireless Ethernet.

Figure 1. Material and installation cost comparison between cable and wireless connectivity. Between approximately 50' and 100' distances, wireless modems rapidly become the most cost effective choice. Wireless will also provide additional service, support, and reconfiguration savings over the product lifetime.
Purpose

• Given the cost benefits and flexibility of Wireless Ethernet communications, many SCADA professionals are looking to migrate to IP out to the field and convert existing serial communications to Ethernet.

• The purpose of this presentation is to answer the more common questions associated with Wireless Ethernet to help demystify the subject.

de-mys-ti-fy - To make less mysterious; clarify
Why Wireless Wellhead Optimization?

- In the world of Well Optimization real time information is critical to performance.
- The more data you can see on your performance, the more finely you can tune your wells.
- Ethernet allows you to see “Near Real time Data”.
- Polling 200 wells with serial radios can take hours, with Ethernet it takes seconds.
- Major Producer in Colorado has 1800 wells, it took them 5 hours to poll the field once with serial radios, with Ethernet it takes 5 minutes.
What do I gain by going Wireless?

• Better (Faster) Plunger control at lower cost
• Real Time pressure and line status
• Lower Cost
  – No trenching
  – No Wiring

– Real Time Alarms
  • Tank Levels
  • Pump Shut down
  • Compressor Shut down
Question # 1

• Is this technology secure?
  – YES, but not all radios are created equal.
  – Commonly accepted security features include:
    • AES Encryption
    • Central Radius Authentication
    • MAC Address Filtering
    • Dynamic Key Substitution
    • VLAN Tagging
Question # 2

How do I integrate Ethernet in my existing serial network?

• First, why not just go all Ethernet?
  – Millions of dollars invested in legacy serial systems
  – Easy migration path

• Two Options
  – IP Addressability in serial radios

![Diagram showing Ethernet integration]

- Ethernet Options:
  - ON
  - OFF
  - Ethernet Mode
  - Slave IP Stack
  - Slave UDP Mode
  - Duplex

- Local IP Address And Port Address:
  - 255.255.255.255
  - Port Number: 4131

- Power ON Reply IP Address And Port Number:
  - 255.255.255.255
  - Port Number: 4131
Question # 2 (cont’d)

- **Second Option:**
  - Ethernet Radio with built-in Terminal server
Question # 3

• What advantages can I expect?
  – Speed, translating into faster polling times
Question # 3 (cont’d)
Question # 4

• What does it cost?
  – Many solutions available
    • Average around $1K per radio for approx. 1Mbps throughput
    • Typically the higher the throughput, the more expensive
  – Other associated costs
    • Antenna
    • Coax
    • Battery and solar, if applicable
      – Power consumption
Question # 5

- Can I have mobile connectivity?
  - Absolutely, wireless Ethernet offers a significant advantage in terms of workforce mobility.
    - Allows mobile workers to access applications and perform their job where they work.
  - Keep in mind line-of-sight will offer best throughput.
    - Depending on topography, at times, technicians will be required to drive to a nearby hill top or open area.
Question # 6

- Can I speed my polling times and if so, by how much?
  - YES.
    - However, two factors come into play with hybrid systems
      - Serially, only one connection at a time
      - How many connections can the host software support?
Question # 7

- Can I have multiple sites polling the sites?
  - YES.
    - IP addressability of Ethernet allows packets to be routed.
    - Example:
      - A Local Area Network (LAN)
Question # 8

• Can I communicate with legacy serial devices?
  
  – YES.
  
  • Two options
    
    – Wireless Ethernet (with serial interface) to the field, or
    
    – Use of a serial radio with IP addressability
Question # 9

• Can I communicate Modbus through Ethernet?
  
  – YES.
    • The radio system is replacing the physical communications layer.

Modbus
Question # 10

- Can I communicate with remote instrumentation?
Question # 11

• What frequency backbone should I use?
  
  – Options include 900MHz, 2.4 GHz, 5.8GHz
    • The lower the frequency, typically the better propagation characteristics
    • However, lower frequencies are much more congested
    • Recommendation to perform spectral analysis for area
Question # 12

- How do I plan a backbone?

  - First Consideration is Line-of-Sight
    - Towers
    - Path Study
Question # 13

• How many repeaters can I use?
  – Many manufactures do not support repeaters in Ethernet products.
  – However, if repeaters are supported, an unlimited number may be used.
  – If repeaters are enabled, users will typically take a throughput
Question # 14

• Who can design and install a backbone for me?
  – This may be the hardest question of all to answer.
  – Many companies that design and install one brand of radio are often aligned with specific manufactures.
  – Often the best choice is to discuss performance expectations with several vendors and have the manufacture recommend a factory trained and certified reseller in the area.
Question # 15

• Is this technology reliable?
  – A properly designed and installed wireless Ethernet system should be 99.9999% reliable.
  – Discuss return rates with potential suppliers.

  – Temperature Range
    • Reliable Operation within industrial temperature ranges (i.e. -40° to +75° C).

  – Operation in Hazardous Environments
    • UL certification for Class 1, Division 2 environments permitting radio operation in the presence of flammable or explosive gases, fluids or vapors.
Summary

• Ethernet is becoming the standard for communications

• Wireless Ethernet offers significant advantages

• When implementing new wireless architecture, asking all the right questions is a great place to start.

• Information is Power

• The ability to gather time critical information, digest it and react to it is the key to continuously adapting to change with increasing reliability and profitability.

• Wireless Ethernet offers this ability
Questions
Thank You!

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