

Practical Wireless Technology Options for the Field for the Oil & Gas Industry

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Agenda

- Why Wireless?
- Which Wireless?
- Applications
- Physical limitations
- Regulatory issues
- Economic considerations
- Examples
- Questions

How do I choose a wireless technology?

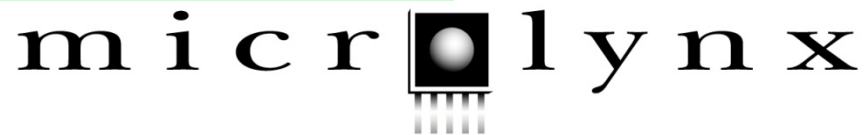
- First Question: Why Wireless?
- Second Question: Which Wireless?

Why Wireless?

- Wire is often better if you can use it:
 - Reliability (Quality of Service)
 - Security
 - Performance
- Wireless has advantages:
 - Mobility
 - Flexibility
 - Reduced wiring (and rewiring) cost
 - Reduced dependence on third parties
 - Safety
 - Strategic / marketing advantages

Which Wireless?

“Use the technology that best fits the application requirements while meeting physics, regulatory, legal and economic constraints.”



Application Requirements

- Data, voice or both
- Data throughput (bits/second)
- Data structure
- Range and propagation environment
- Network topology
 - Point to point
 - Point to multi-point
 - Mesh
 - Ad hoc vs. predefined
 - Self-contained system vs. part of bigger picture
- Quality of Service
- Security / Integrity
- Latency / time accuracy
- Environmental factors
- Power
- Size
- Safety

Physical Constraints

- Path loss
 - Generally, range decreases (for a given transmitter power) as frequency increases
- Multipath
- Interference
 - Man-made
 - Natural
- Bandwidth efficiency vs. power efficiency

Regulatory Constraints

- Licensed vs. unlicensed
- Allocated and restricted bands
- Maximum transmitter power
- Bandwidth vs. frequency
- International considerations

Economic Considerations

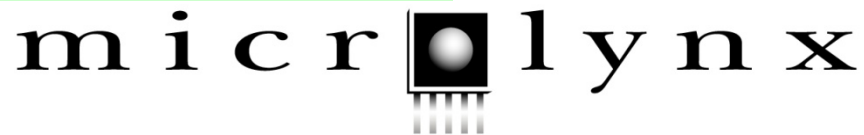
- Development costs
- Certification costs
- Deployment costs
- Operating costs
- (Disposal costs)
- “Cost of failure”

Off-the-Shelf Wireless Options

Technology	Max. Range	Max Data Rate	Comments
Bluetooth	200 m	10 Mb/s	Not very popular for industrial applications
Zigbee	500 m	250 kb/s	Mesh network
WiFi	500 m	30 Mb/s	Lots of options avail.
Cellular	15 km	1 Mb/s	Requires cell coverage
Proprietary	Depends	Depends	Typically single-vendor

Custom(ized) Solutions

- If no OTS technology available, custom can provide solution
- Custom solution can provide a sustainable competitive advantage
- Freedom to trade off performance and cost attributes within physical and regulatory limitations
- Can range from minor tweaks to existing protocol to complete new design
- Initial cost can range from “modest” to “high” depending on design effort



Example: Seismic Data Gathering

- Application : replace some of the seismic cabling with wireless
- Requirements:
 - long range (up to 50 km),
 - one master and multiple slaves,
 - very accurate “Time Zero”,
 - up to 500 kb/s, rugged
- Solution: fully custom system in 200 MHz licensed band

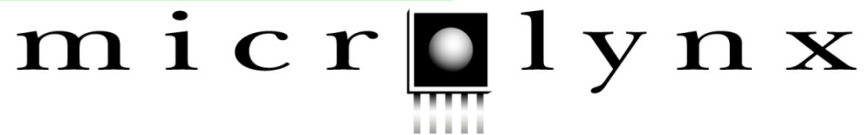
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Example: Wireless Data Link

- Application: Communicate real time sensor and control data
- Requirements:
 - One-to-one Master / Slave (bidirectional)
 - ~10 kb/s data rate with low error rate
 - Slave to be battery powered with 10 year life
- Solution: Custom 900 MHz unlicensed link with hardware options to support European frequency allocations

Example: Wireless Alarm System

- Application: Provide alarm status information from many customer sites to central monitor site
- Requirements:
 - Support 100's of subscriber sites per tower
 - Ease of access to frequencies
 - Highly reliable communication
 - Low data rate
 - Low cost
- Solution: Custom licensed 450 MHz in 6.25 kHz channel width



Summary

- There are many technological options available
- “Best” one will depend on requirements and constraints imposed by physical, regulatory and economic factors
- If budget is available, custom solutions **can** provide benefits

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Questions?



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