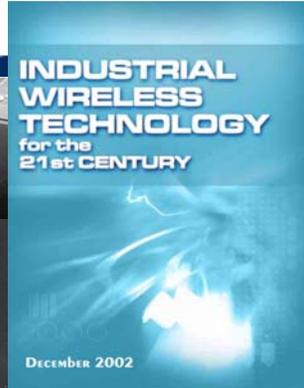




*Setting the Standard for Automation™*



# ISA100 – A Roadmap for the Family of Universal Wireless Standards

Wayne W. Manges

Oak Ridge National Laboratory

Standards  
Certification  
Education & Training  
Publishing  
Conferences & Exhibits

July 23, 2007

1#

# Early Adopters – Blazing the Wireless Trail!



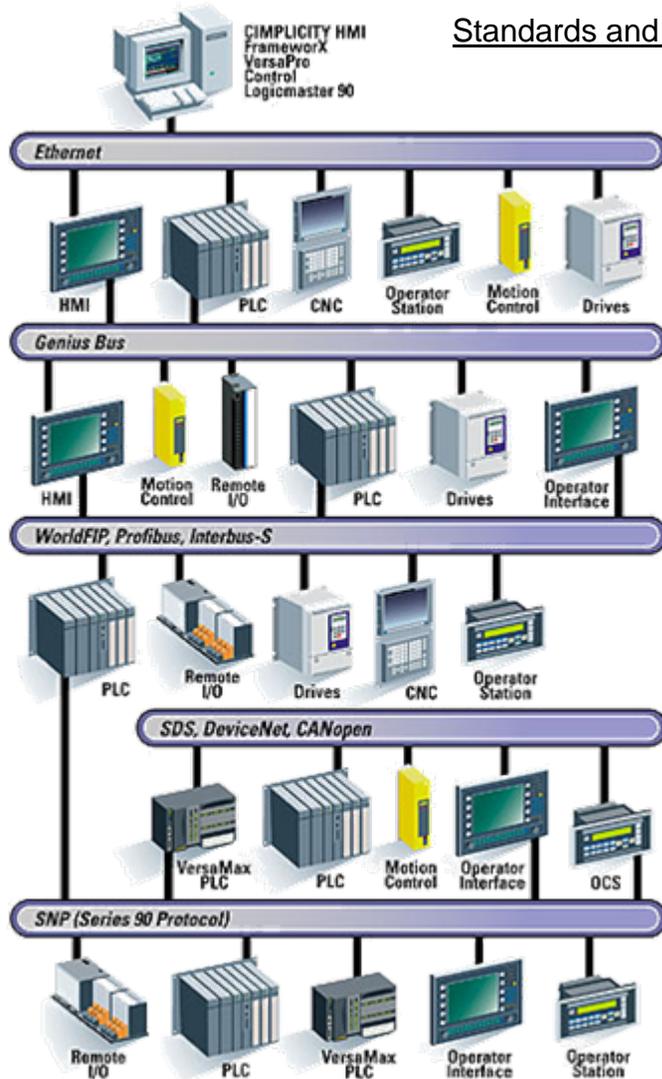
# Why Here? Why Now? Why Us!

- **It's a Hard Problem!**
  - It's interdisciplinary
  - It's the new guy
  - Much emotion surrounding issues
- **But Not Too Hard!**
  - Huge investments – government, commercial, private
  - Successes Emerging – Comanche Peak, one-day ROI!
  - Standards emerging – ISA, others
- **Why Now?**
  - Still failures,
  - Still can be costly,
  - Expectations are high,
  - Standards slow to emerge
- **Impact! – Moving Forward**
  - Guidelines – Physics of Radio
  - First Release – ISA100.11a
  - Follow-on Releases – Users' Guide, Discrete Manufacturing, RFID, ...



***One of the reasons we're all here!***

# Industrial Network Topology



## Plant Data Network

- SP95 Enterprise Control Systems Integration
- ISA99 Control Systems Security
- OPC Foundation

## Control and I/O Networks

- Foundation Fieldbus ext.
- Open Automation & Control Group (OAGC)
- ISA100

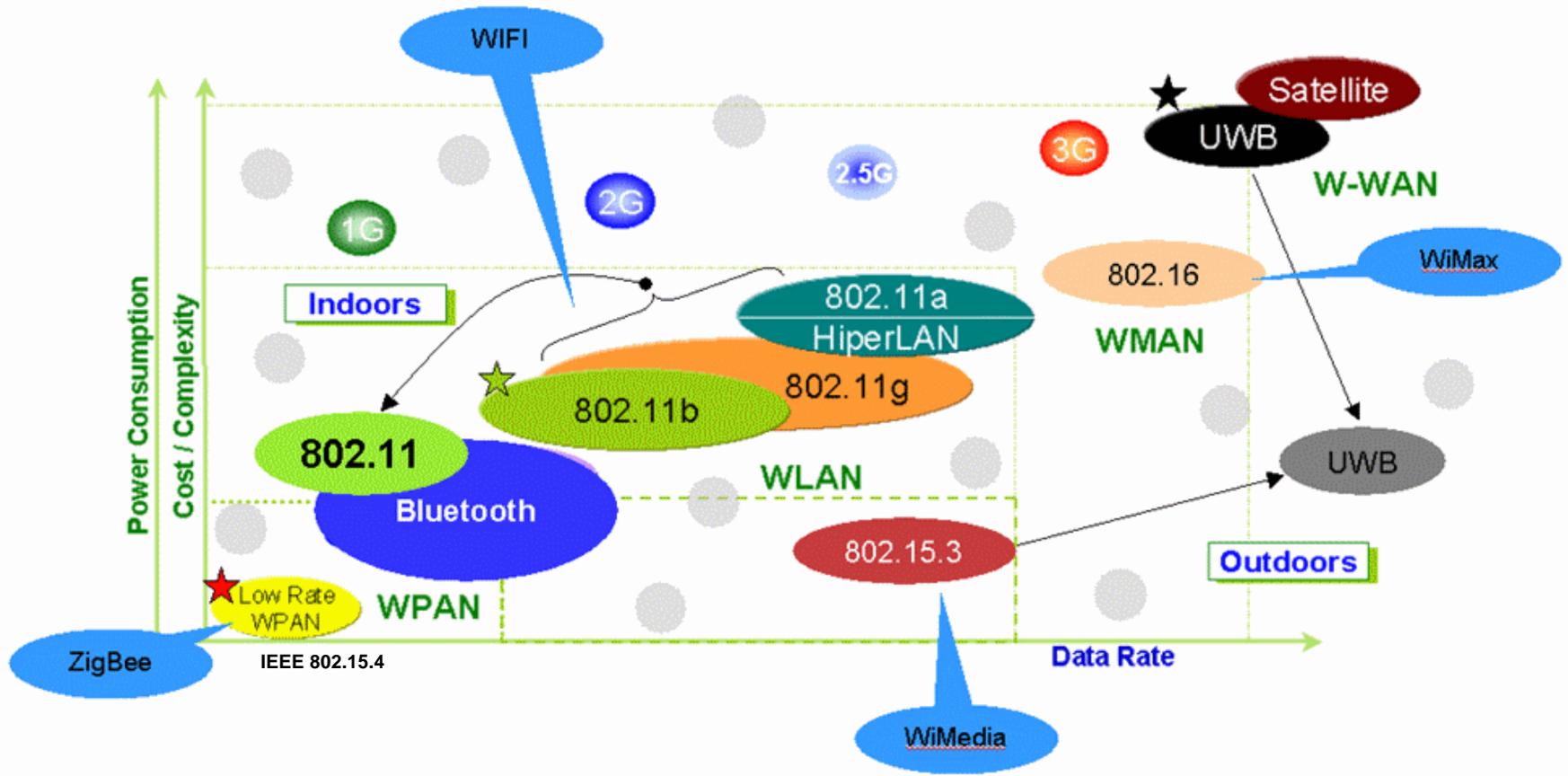
## Device and sensor Networks

- IEEE 1451
- DeviceNet
- HART (WiHART)
- ISA100

## Operator Interface Networks

- SP65 Industrial Process Measurement and Control
- SP50 Foundation Fieldbus

# The Wireless Landscape – Can You Hear Me Now?



● = Proprietary Wireless Networks

# Wireless Industrial Sensor Networks – Pick Any Four!



- Wireless – radio, packaging, antenna
- Industrial – harsh environment, fault tolerant, safety related, cost
- Sensor – filters, sampling, sensitivity, interferers, controls
- Networks – real-time, latency, throughput, security, integrity, vertical integration



# Balancing Performance Is Critical To Success



## Reliability

(Not BER,  
Not Accuracy)

## Latency

End-to-end? Or  
Node-to-node? One-way?  
Round-trip?



*Market  
Forces  
Determine  
Performance  
Delivered!*

## Throughput

Bits-per-second or Goodput?  
End-to-end?

## Security

Performance Based?  
Procedure Based?  
Proprietary or Open?



# Leveraging Huge Defense and Commercial Wireless Investments for Industrial Applications

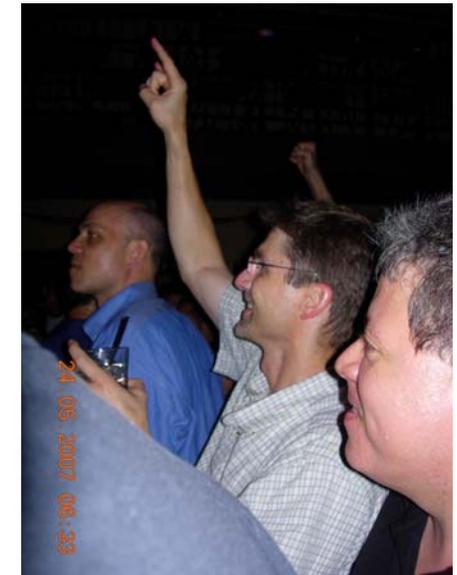


- Reliability -
  - Mesh – Billions of \$ from DOD
  - Spread Spectrum – FHSS, DSSS, Ultra-Wideband
- Power
  - Harvesting – vibration, RF, PV
  - Low-power designs – ASICs, FPGAs, DSP
  - Protocols – low-duty cycle – ZigBee
- Security
  - Encryption – AES, WPA, WEP
  - Physical – RF layer, FIPS 140-2
  - Integrated – impacts on throughput, latency, reliability



# ISA Got The Call!

- An international nonprofit member association of 30,000+ automation professionals engaged in the design, development, production, and application of devices and systems that sense, measure, and control industrial processes and manufacturing operations.
- Provides professional education and training, certification, conferences and exhibits, and book and journal publications.
- Accredited by the American National Standards Institute (ANSI) to develop industry standards in key areas including process safety, control system cyber security, enterprise-control system integration, engineering documentation, and wireless systems for automation (ISA-SP100).
- Headquarters: Research Triangle Park, NC. Visit [www.isa.org](http://www.isa.org).



# Standardization Process – From ISA

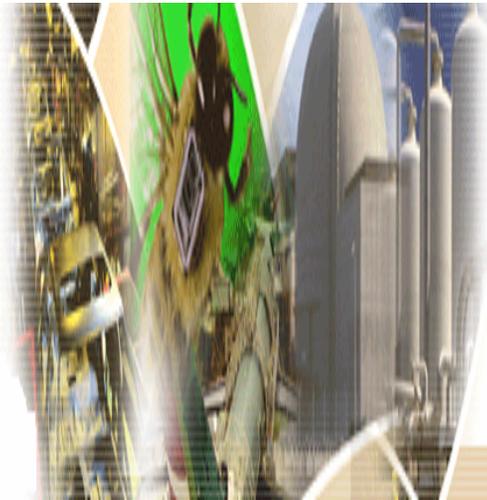
- **Consensus Driven – progress not stagnation**
- **Structured – controls chaos, alligators, firestorms**
- **Proven – established over years**
- **Flexible – supports our parallel approach to rapid progress**



# Standards – Fueling Collaboration

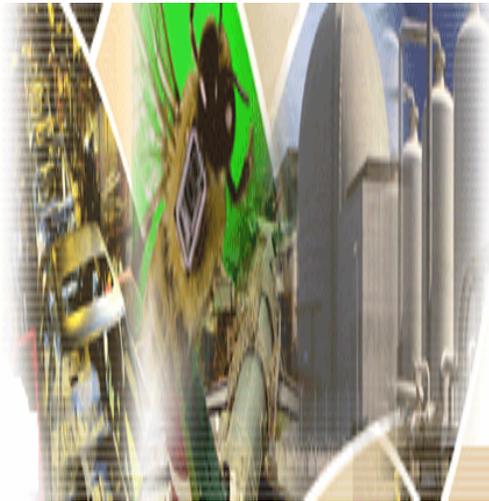
ISA100 – DOE/WINA/ISA/Commercial collaboration for an introduction of entire suite of wireless standards

- ISA100 vision - a standardized methodology to
  - Assess environment – light to harsh, RF and other
  - Assess application – latency, throughput, etc.
  - Assess options – technologies, products, standards
  - Assess deployment – initial stability, ease
  - Assess performance – against requirements
  - Maintain – tools, costs, upgrades



# Standards – Results Focus

ISA100 efforts will result in standards, recommendations, and technical reports focused on assuring successful wireless deployments in industrial environments

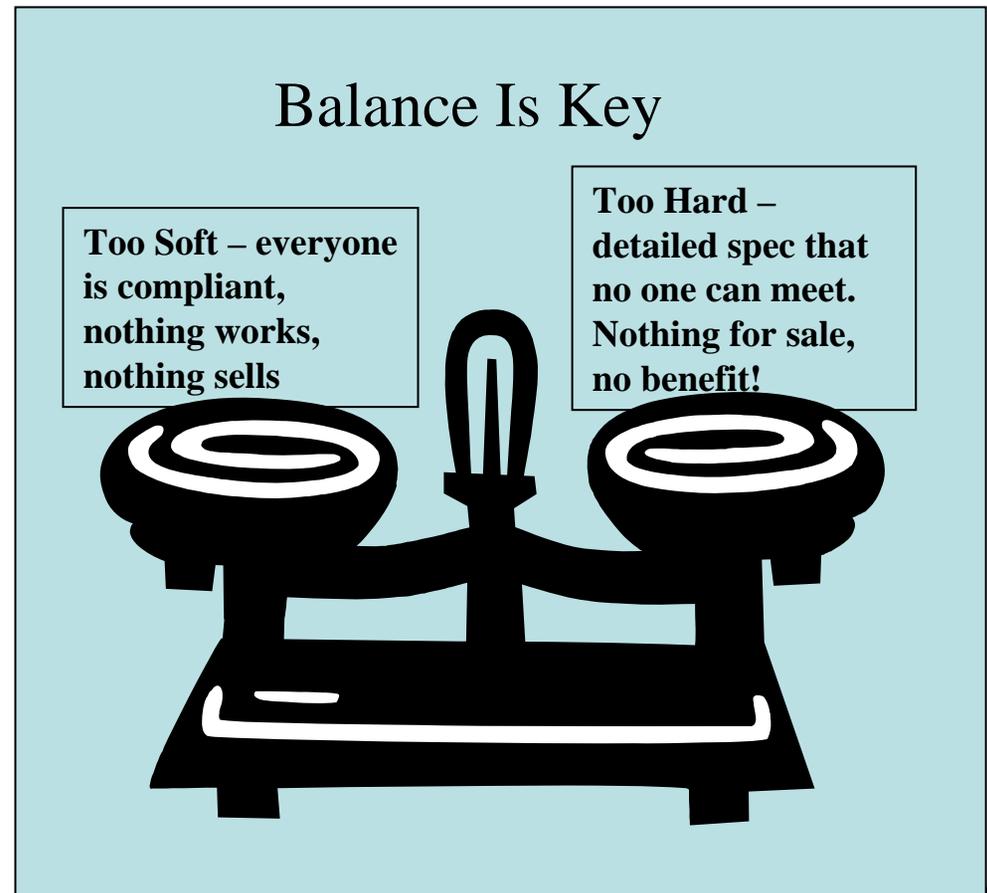


- **ISA100 Compliance will assure:**
  - Supplier specifications are consistent and easy to interpret
  - User requirements are succinct, relevant and easy to interpret
  - Options are clear and easily differentiable
  - Probable outcomes are quantitatively evaluated against options

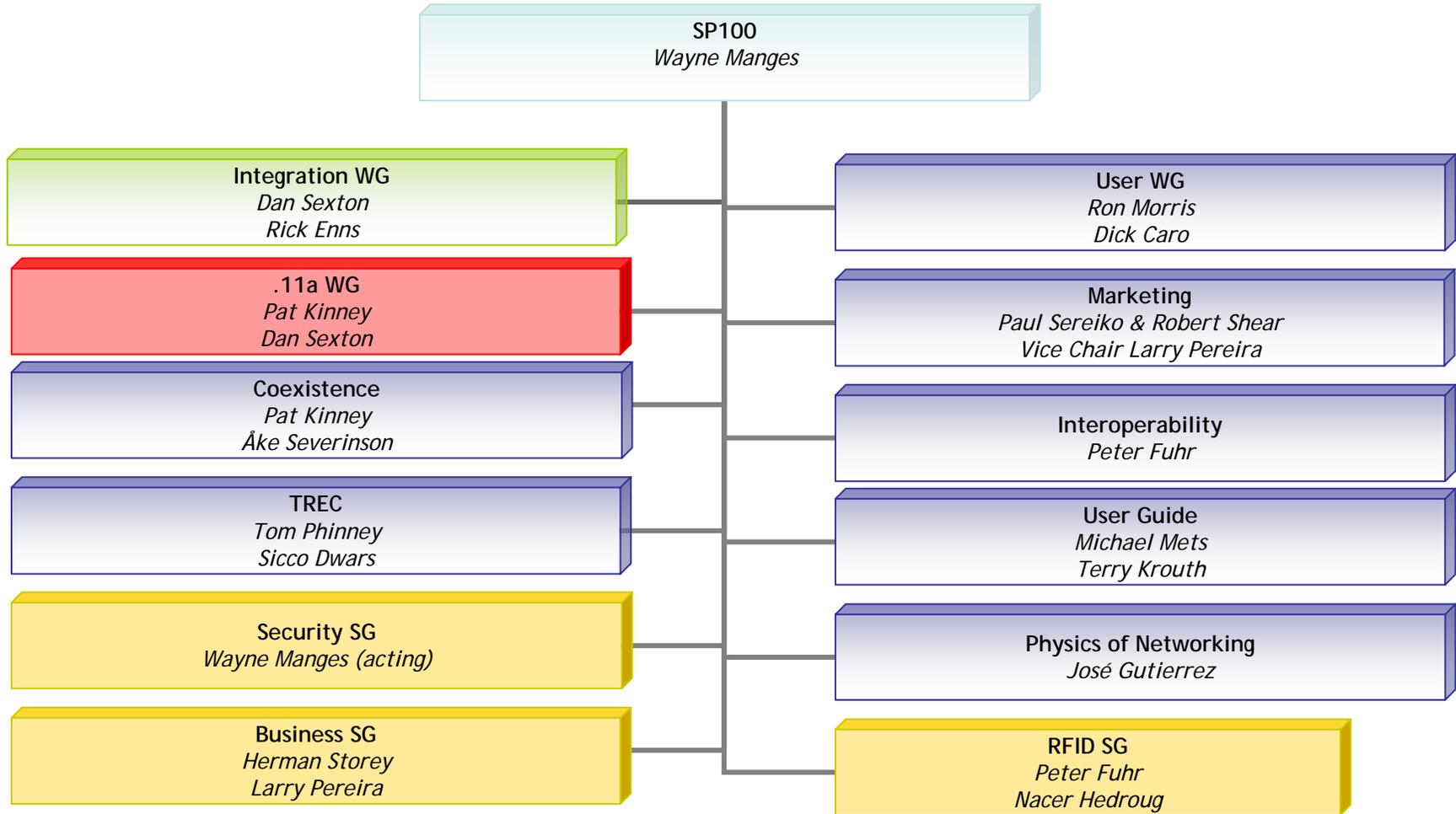
# ISA100 - Success Oriented

ISA100 efforts will leverage other standards, as appropriate, to produce a relevant result in as short a time frame as possible

- ISA100 leverages
  - ISA99 – Security
  - IEEE 1451 – Smart sensor
  - FIPS 140-2 – Security
  - ISO/OSI 7-layer model for network connectivity
- ISA100 encourages
  - New technology
  - Deployment
  - Communication among practitioners

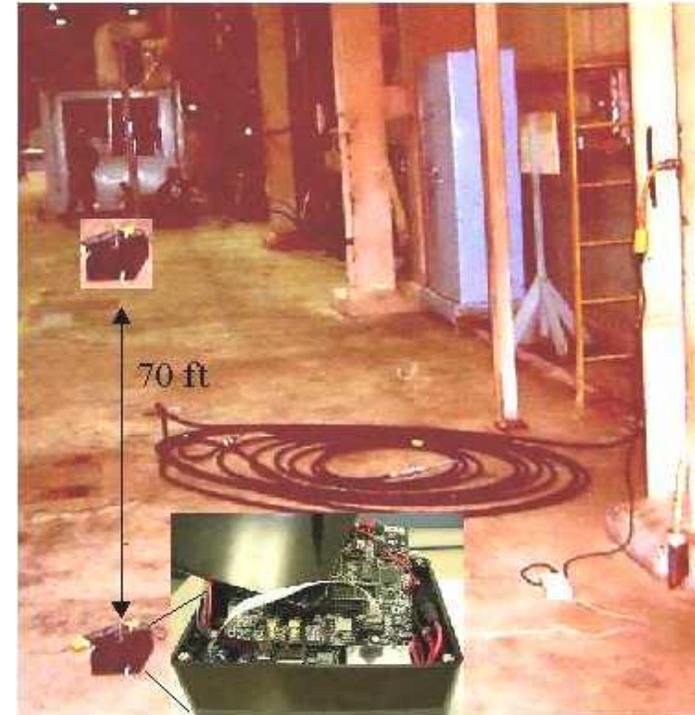


# ISA100 Organization – Work Groups & Study Groups



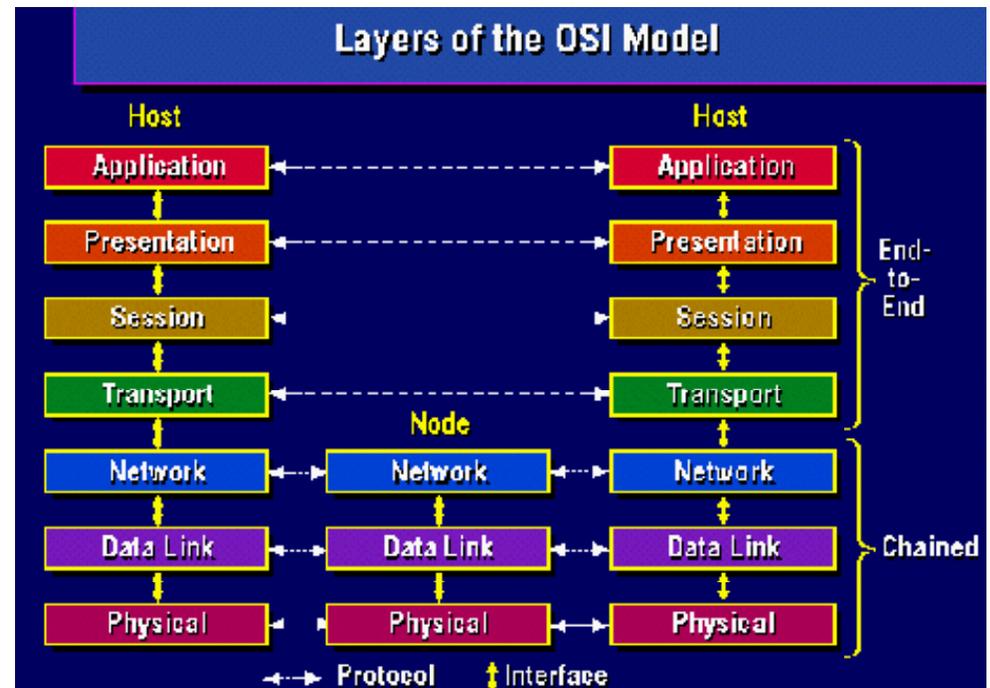
# The First Step – ISA100.11a!

- Immediate – non-standard products to be upgraded later
- Near-Term – ISA100.11a released for process monitoring and “soft” (>100ms) control
- Mid-Term – ISA100.11a adapted to other applications
- Longer Term (~2009) – New ISA100 standards released for:
  - Discrete manufacturing – tighter timing
  - Tracking (RFID) – passive, active, integrated
  - Security – integrated, scaleable, cost-effective
  - SCADA – geographically distributed



# Interoperability – The Holy Grail!

- Universal Application Layer Interface – defined early allowing future development in lower layers
- Multiple PHY layers – radios develop rapidly
- Special Purpose Layers – Highly secure, highly reliable, etc.
- ISO/OSI 7-layer driven – leverage Internet, Web services, etc.



# Wireless Wins – Just Make It Work!



# Who Will Lead, Who Will Follow, Who Will Whine?

- Technology is ready - driven by cellular personal/business/DOD communications
- Market is ready – over \$2000/ft for wires in some plants
- Are we ready? - partnerships, consortia, standards and collaborations – 400 members strong

