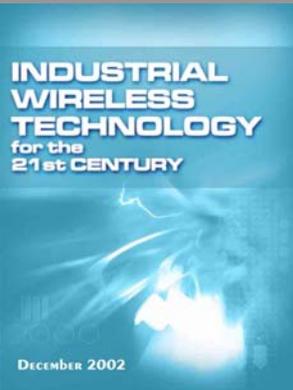




Human Hair



Industrial Wireless Technology: WINA Makes It Happen!

Wayne W. Manges

DOE/ITP Industrial Wireless Program
Manager

June 7, 2004





Why, Why, Why?

- **Why are we here? – Vision, Unique needs**
- **Why Now? - Market forces, Technology Nexus**
- **Why Us – EPRI, DOE, NRC, NIST, Users, WINA**

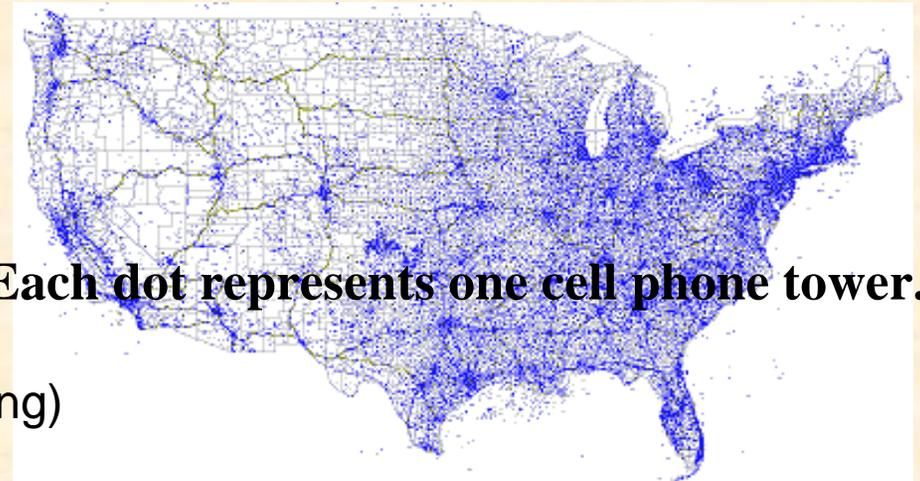


www.oldcolo.com



Wireless Sensor Networking

...it's not cellular telephony



...it's not WiFi

...(and it just may be the next big thing)



Wireless devices circa 1930



RF Tags – expected to be >\$2.6B by 2005



Industrial Wireless – Who Cares?

- **EPRI/Users – Wire is at \$2,000 per foot and increasing, New Agility, Mobility, Flexibility - scream for deployment!**
- **Suppliers – cheap hardware, ready market, broad impact potential – scream for deployment**
- **Government – Opportunity for impact on environment, conservation, global competitiveness and jobs!**

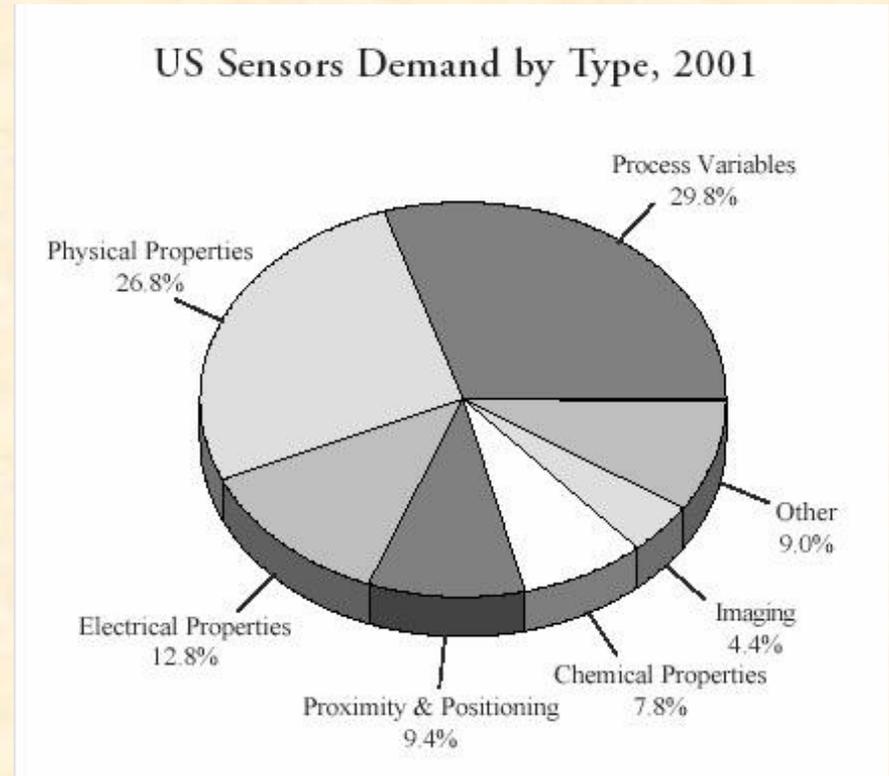


So, What's the Holdup??!



Why Not Just Let the Market Decide?

- **Beta Vs VHS – I still have Beta HiFi on my set top and it's still better!**
- **Ethernet on the factory floor – Took 20 Years to get the performance required!**
- **Fragmented Market not Appealing – We hang together or we hang separately?**



Freedonia Group report on Sensors, April 2002



Deployment Demands Performance

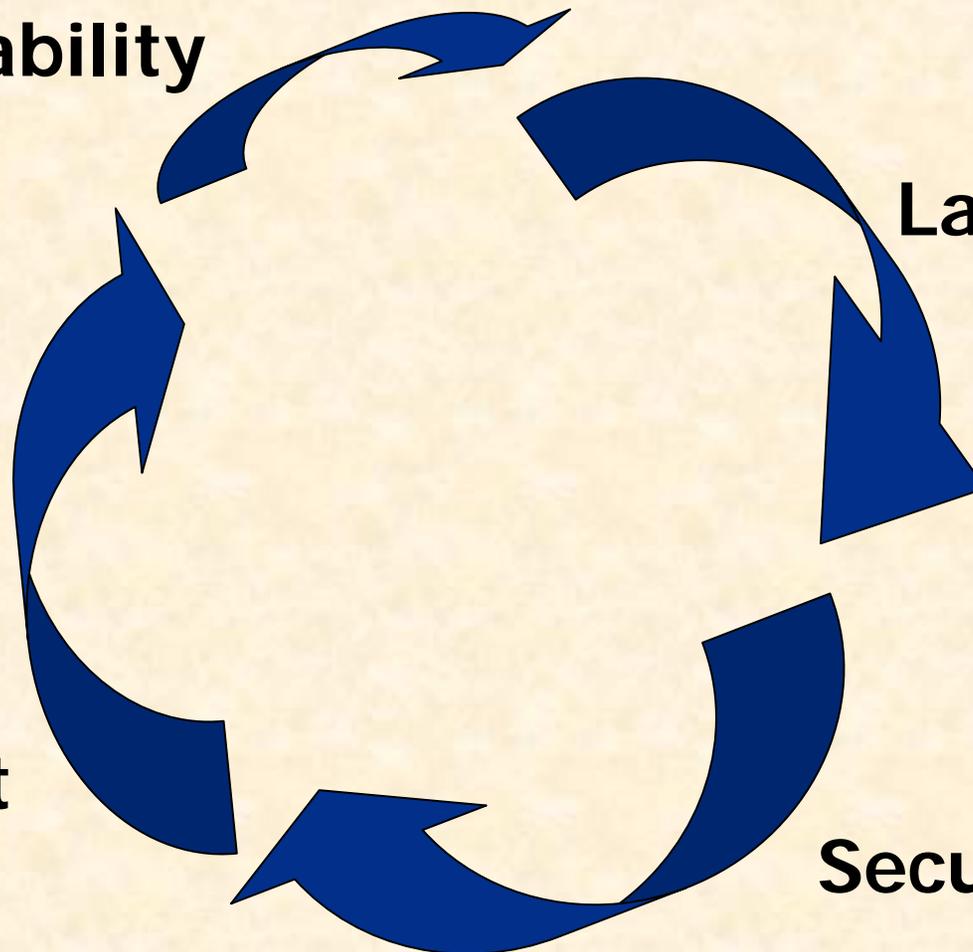
Reliability

Latency



Security

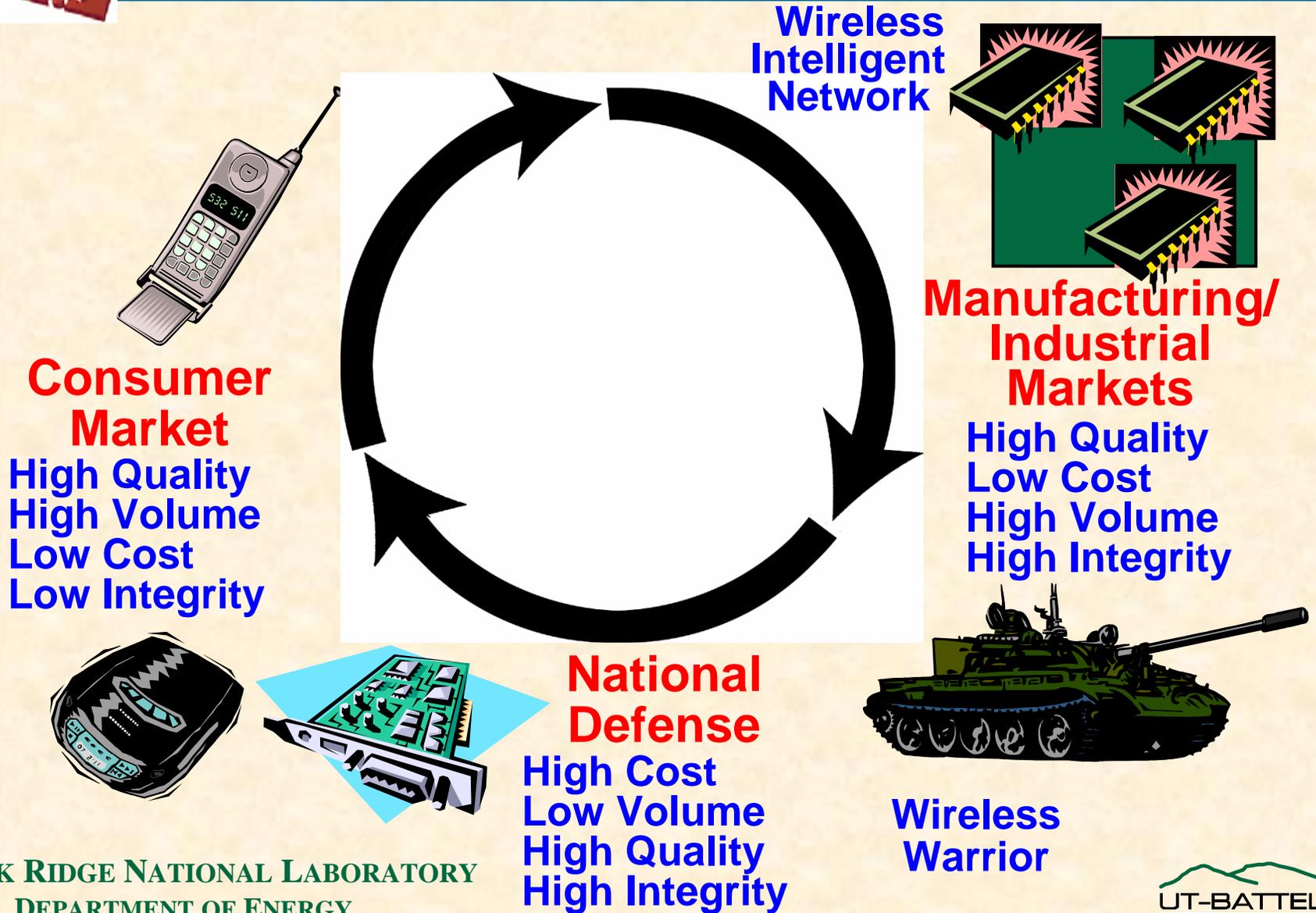
Throughput



Market Forces Determine Performance Balance and Cost!



Can Commercial Grade Cut It?





WINA Formation

WIRELESS
INDUSTRIAL
NETWORKING
ALLIANCE



In the spring of 2003, the Wireless Industrial Networking Alliance (WINA) was formed to promote the adoption of wireless networking technologies and practices that will help increase industrial productivity and efficiency.



The End User (a.k.a the Customer)

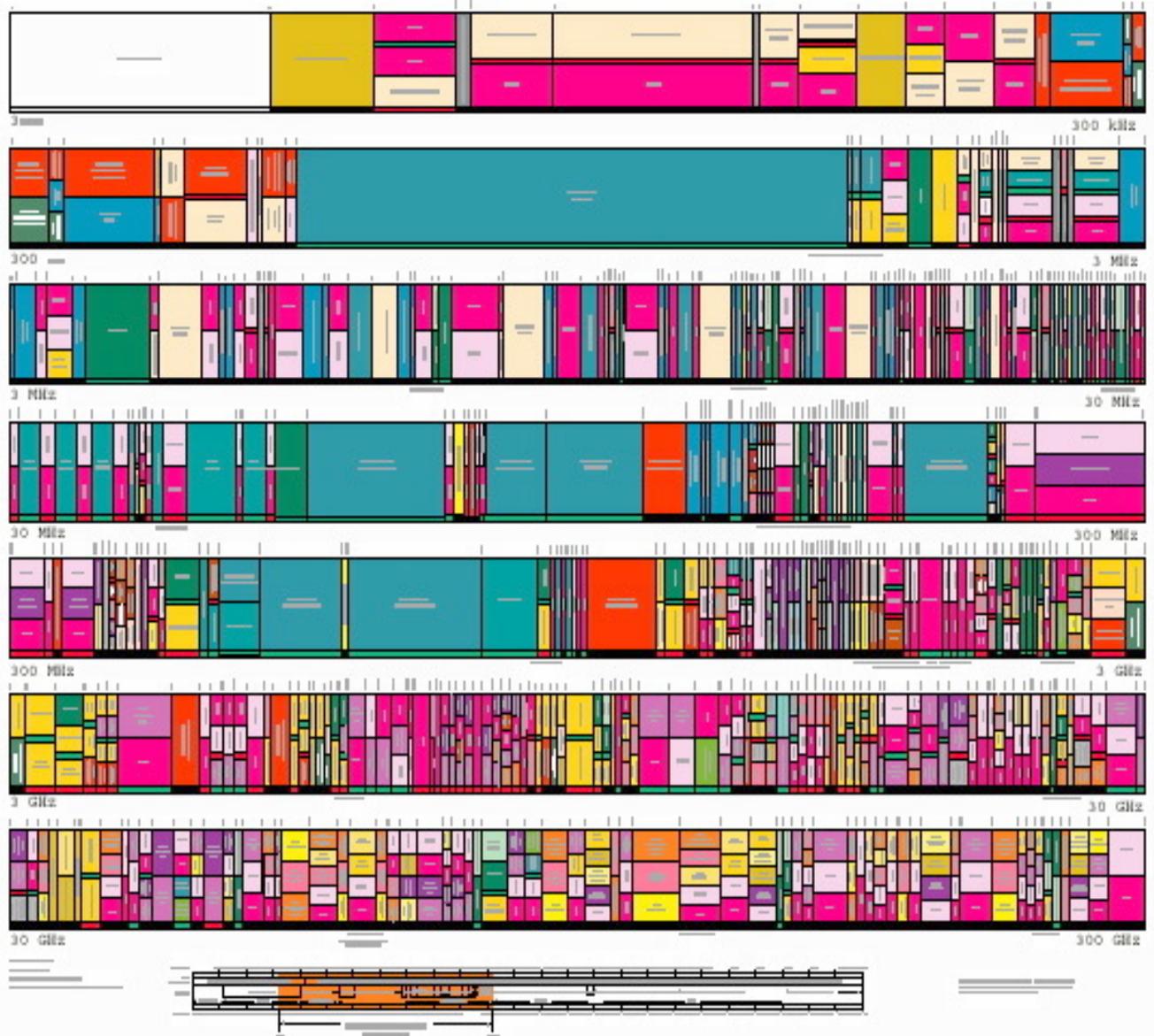
Is frequently asked to decide between things like...



Choose the Frequency

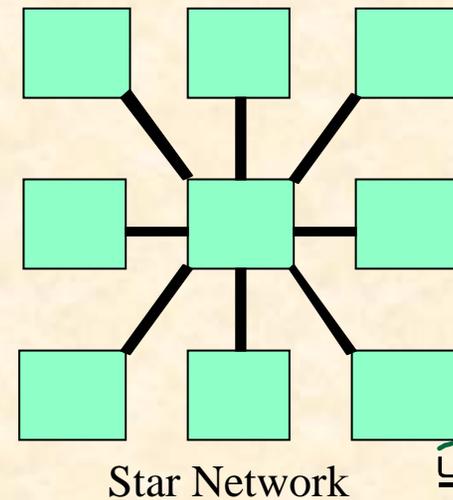
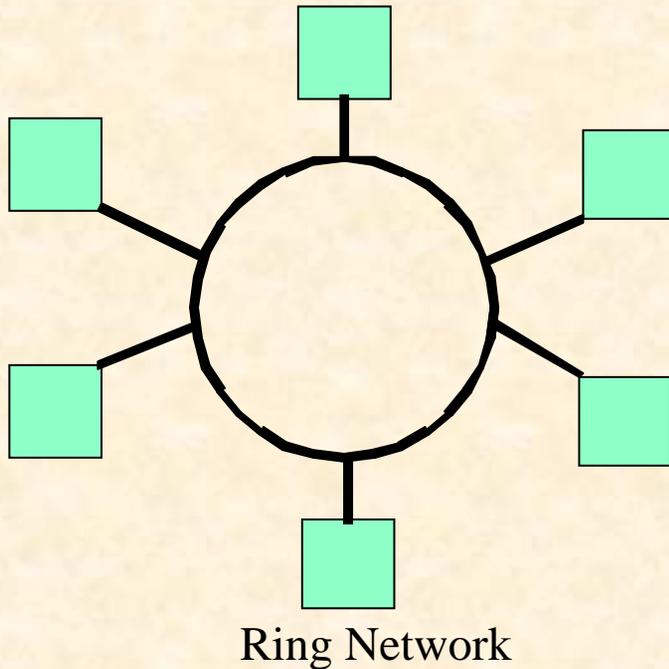
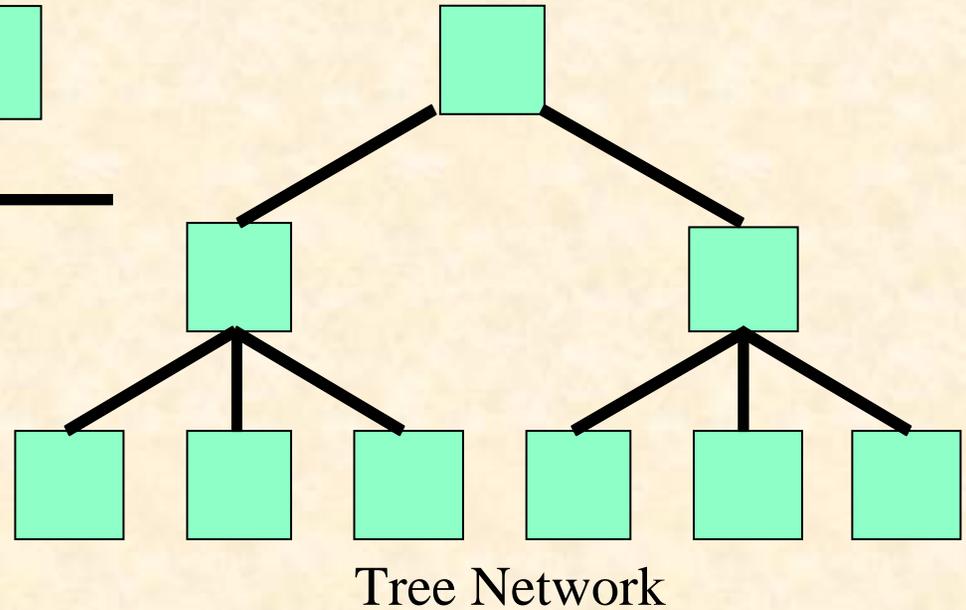
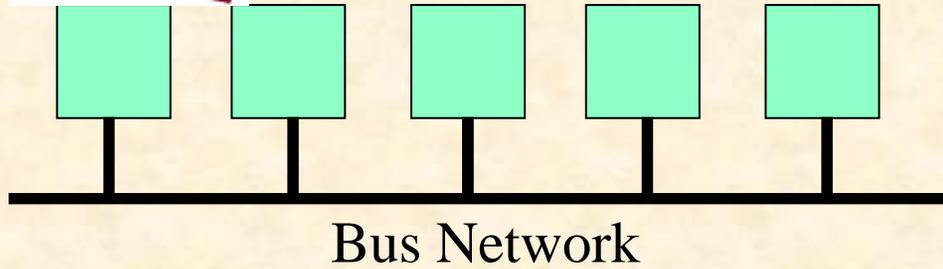
UNITED
STATES
FREQUENCY
ALLOCATIONS

THE RADIO SPECTRUM





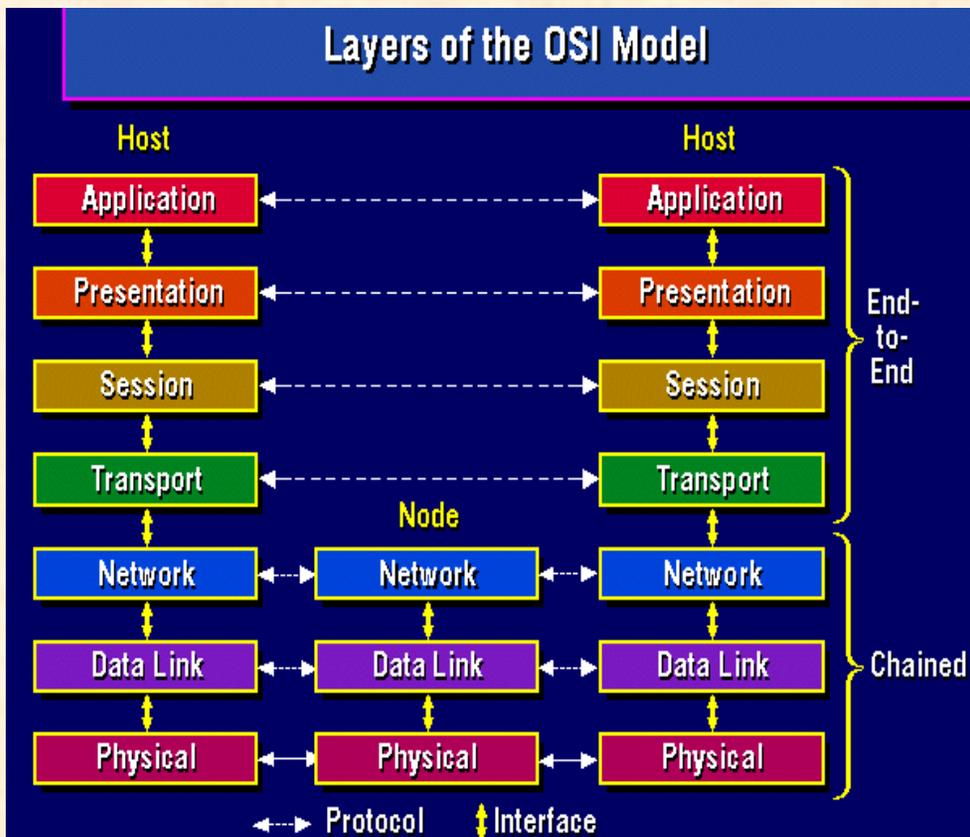
Possible Sensor Network Topologies



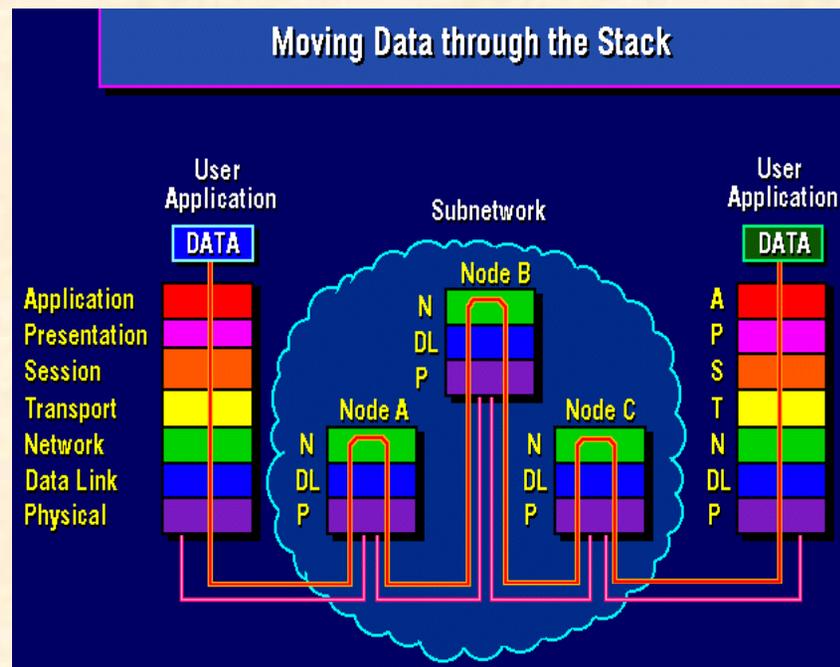


A few details...

Layers of the OSI Model

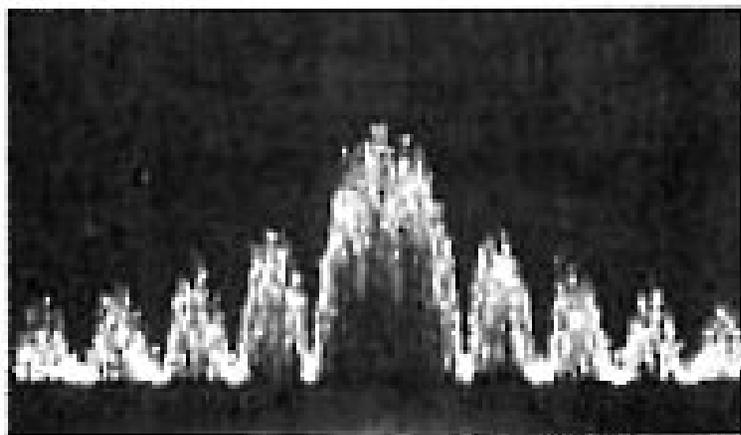


Layered Communications

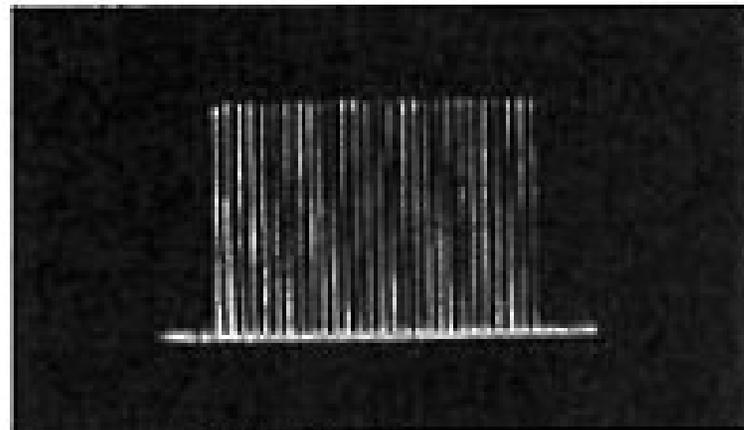




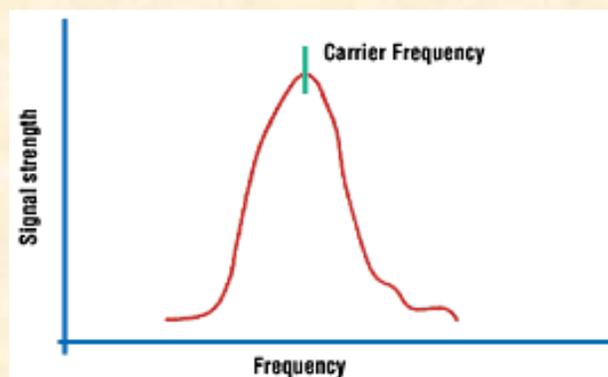
Narrowband? Spread Spectrum (what flavor) ?



DSSS



FHSS



NarrowBand



The Implementation:

Selected ISM Frequencies

Frequency (MHz)	Bandwidth (MHz)	Applicable Countries	Regulatory Institute	Reg Doc
433.5-437.9	1.740	Europe	ETSI	ETS300/220
868.0-868.6	0.600	Europe	ETSI	ETS 300
902-928	26	USA	FCC	
2400-2483.5	83.5	Europe,USA	FCC/ETSI	ETS300/228

Frequency (MHz)	Max Rad Power EIRP	Channel Spacing	Modulation technique	Bitrate
433.05-434.79	10mW/10dBm	not defined	free	free
868.0-868.6	25mW/14dBm	25kHz	free	free
868.0-868.6	25mW/14dBm	100kHz	SS	free
902-928	1W/30dBm		FHSS/DSSS	
2400-2483.5(US)	1W/30dBm		FHSS/DSSS	
2400-2483.5(Eur)	100mW/20dBm	100kHz	FH/DSSS	>250kbps
2400-2483.5(Eur)	10mW/10dBm	free	free	free



As A WINA Member, You Get To...

- **Influence Standards – 1451.5, ZigBee, Bluetooth, others**
- **Influence Markets – suppliers, features, performance**
- **Influence National Research Agenda – DOE, DOD, NSF, NIST**
- **Influence WINA – technical, user, and marketing subcommittees**
- **Access – experts in all areas sited above**



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Accelerating the adoption of wireless technologies in industry




WINA

WIRELESS INDUSTRIAL NETWORKING ALLIANCE

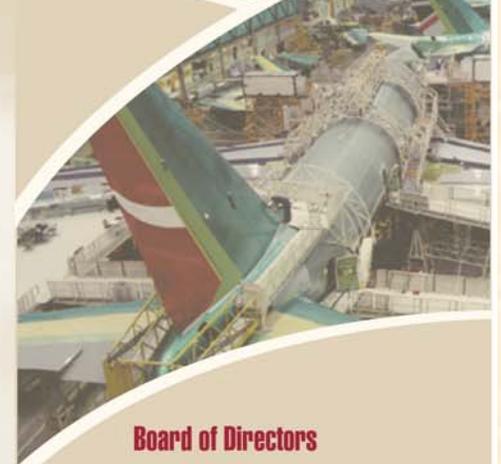
ISM frequencies

ZigBee™ 802.11 a/b/g
802.15.4
spread spectrum

1451-5
cyber-
security

Bluetooth®

WWW.WINA.ORG



Board of Directors

- ◆ 3e Technologies International
- ◆ Eaton Corporation
- ◆ Ember Corporation
- ◆ Honeywell International
- ◆ Invensys
- ◆ Oak Ridge National Laboratory
- ◆ Omnex Controls
- ◆ RAE Systems
- ◆ ZigBee Alliance



So Why WINA?

- **Dance of the Elephants – users, suppliers, government, standards, technologists**
- **Focus – Deployment, deployment, deployment – everyone wins**
- **Impact – Reduced cost, increased profits, improved efficiencies in energy, raw material, and emissions control**



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What WINA Means

- **WINA's Charter**
 - Accelerate Adoption
 - Identify, recommend, and certify appropriate technologies
 - Focus on Customer Requirements
 - Promote effective standards, regulations, and practices
 - Quantify and communicate benefits and impacts



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How WINA Works

- **Board Of Directors – funding, guidance**
- **Subcommittees**
 - Technical – standards, testing, security, etc.
 - Marketing – membership, outreach, partnerships
 - End-User – focus, value, relevance
 - Others? – need members

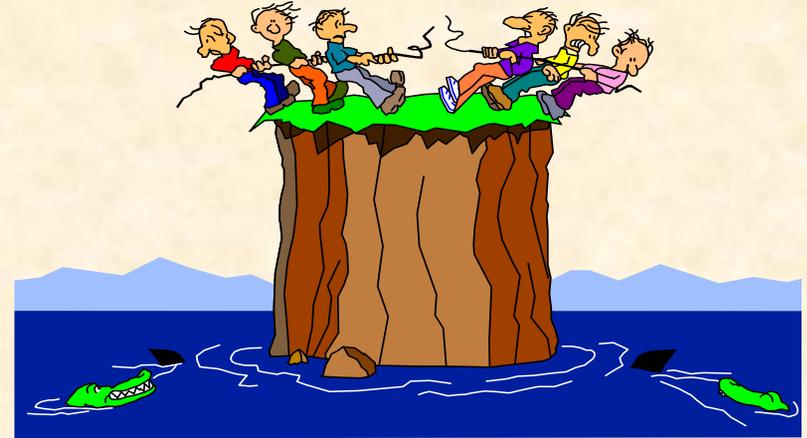


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Who Will Lead, Who Will Follow, Who Will Whine?

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



**“Anyone not making wireless sensors will be out of the sensors business in five years” –
Guess who?**