



Human Hair

INDUSTRIAL  
WIRELESS  
TECHNOLOGY  
for the  
21st CENTURY

DECEMBER 2002



# Industrial Wireless Technology: Agility, Mobility, and Security

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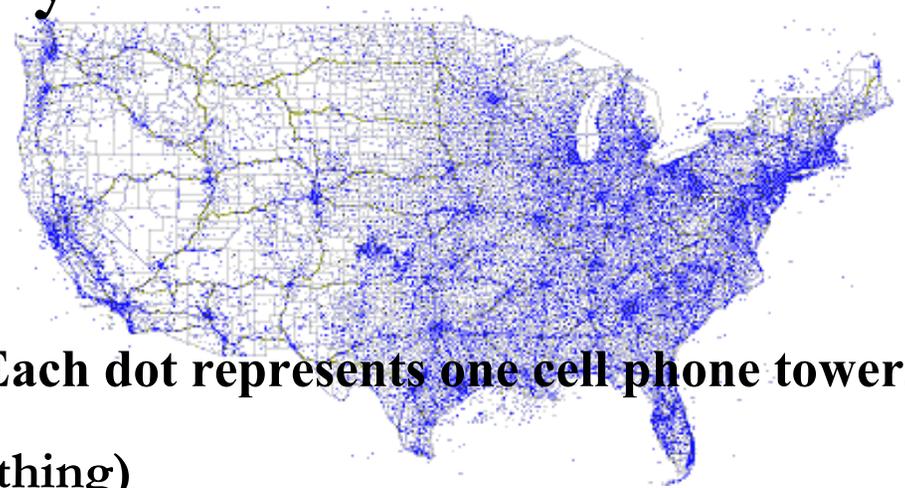


May 17, 2004



# Wireless Sensor Networking

...it's not cellular telephony



Each dot represents one cell phone tower.

...it's not WiFi

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



Wireless devices circa 1930

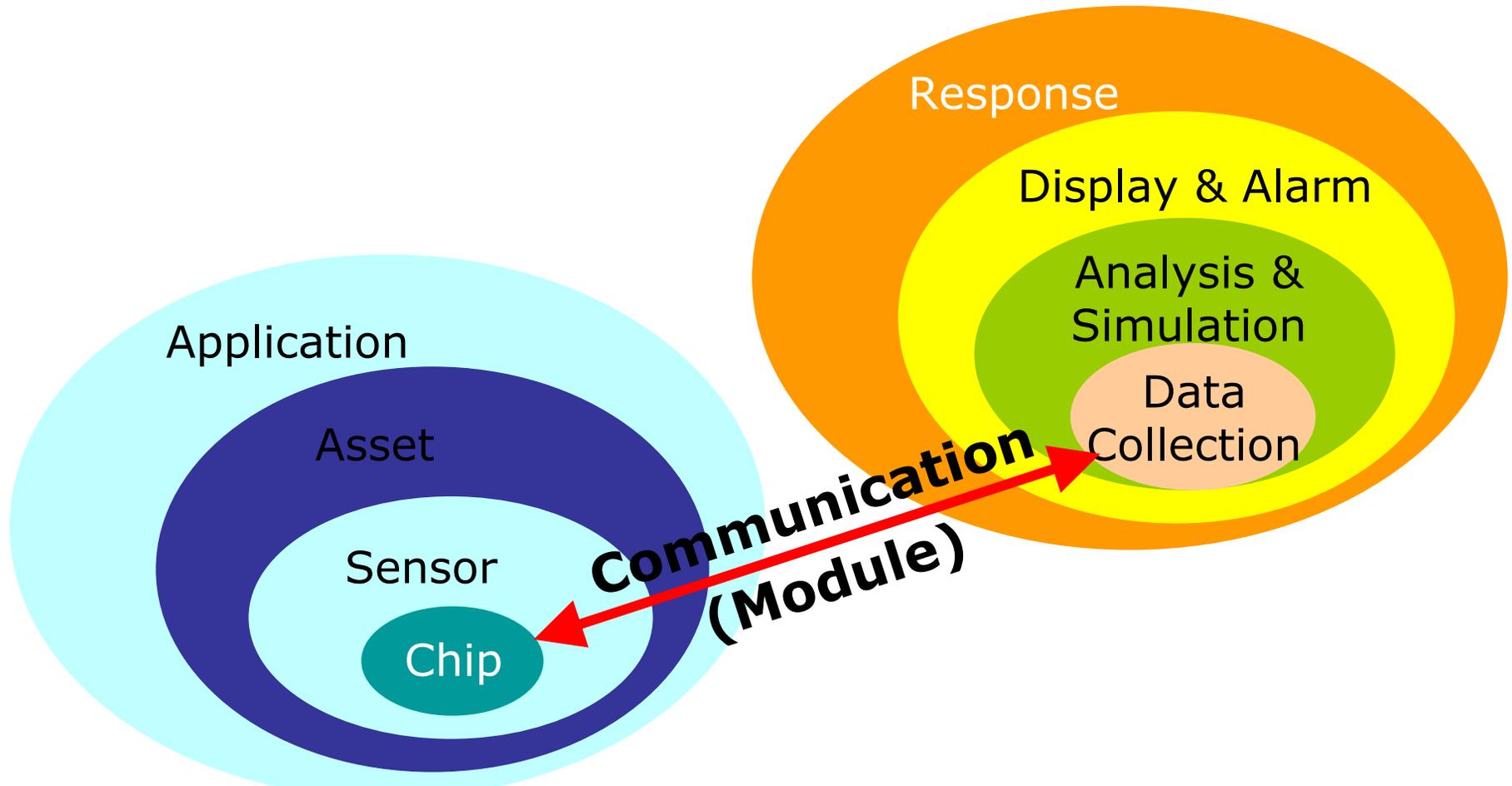


RF Tags – expected to be >\$2.6B by 2005



# Wireless Ecosystem

*Replacing the Wire is Only the First Step!*





# Deployment Demands Performance

**Reliability**

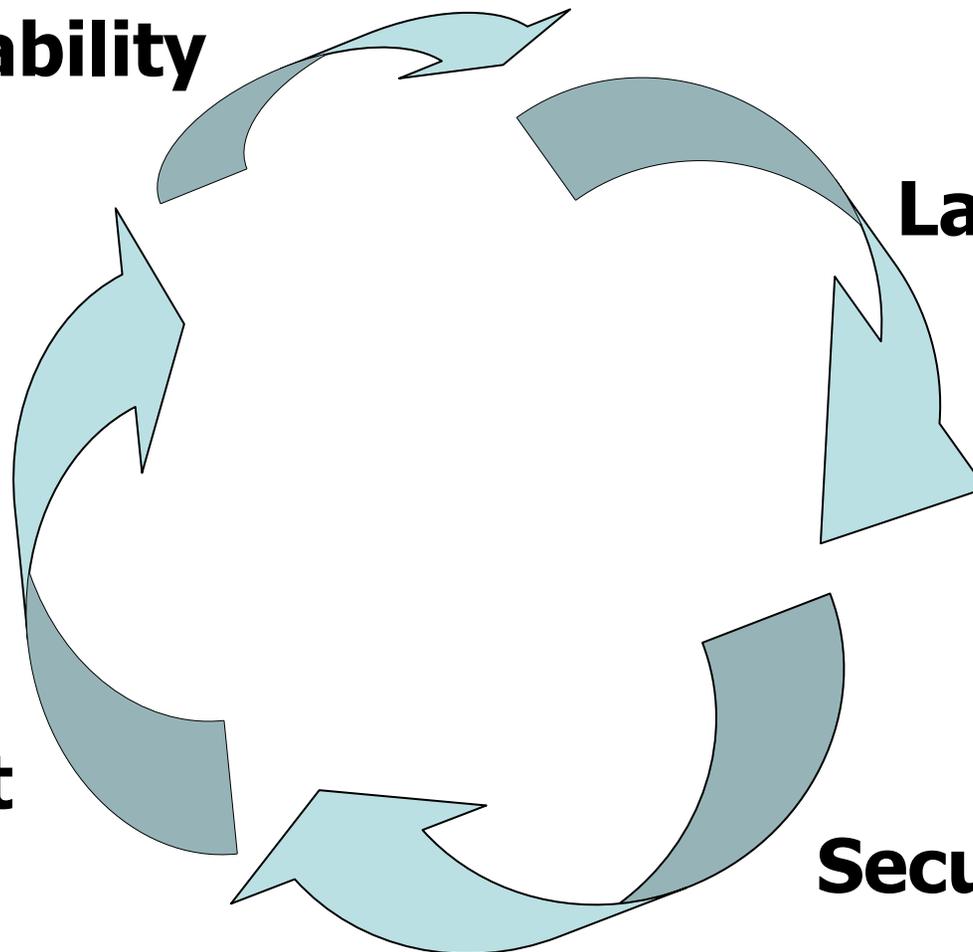
**Latency**



**Security**



**Throughput**



***Market Forces Determine Performance Balance!***



# The DOE ITP Wireless Program Focuses on Critical Needs

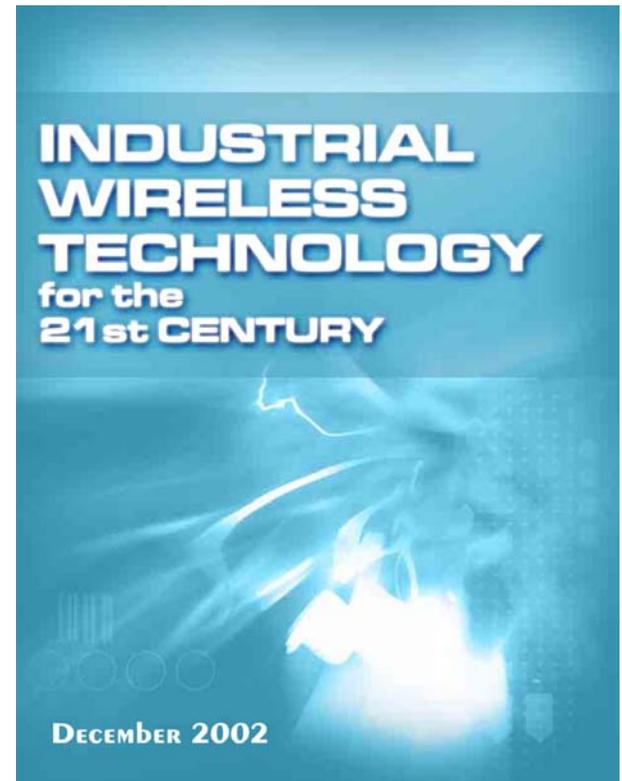
- > National Research Council – “advanced wireless sensors” identified as a critical research need.
- > President’s Committee of Advisors on Science and Technology – “wireless sensors can improve efficiency by 10% and cut emissions by more than 25%”
- > Industrial Wireless Workshop – trade throughput for reliability

***Wireless Enables Ubiquitous Sensing!***



# National Research Council Identified Research Needs

- > **Interference Rejection – self-interference from metal surfaces, lots of sparks and other sources**
- > **Integrated Intelligence – reduces need for host communication**
- > **Reliable Networks – ad hoc routing, security**
- > **Power – harvesting and new batteries**
- > **Standards – communication, interfaces, and protocols**

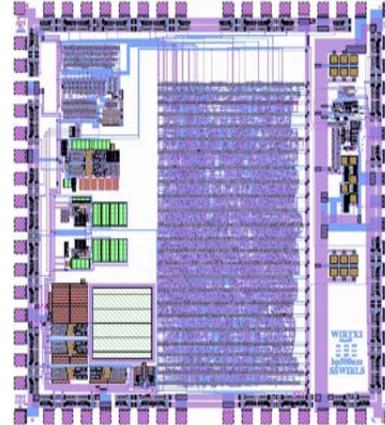


**DOE/ITP Industry Vision**



# Emerging Technologies

- > Poised to Impact
  - > Security – bury it in the noise!
  - > Throughput – UltraWideBand
  - > Latency – CDMA
  - > Reliability – Hybrid Spread Spectrum





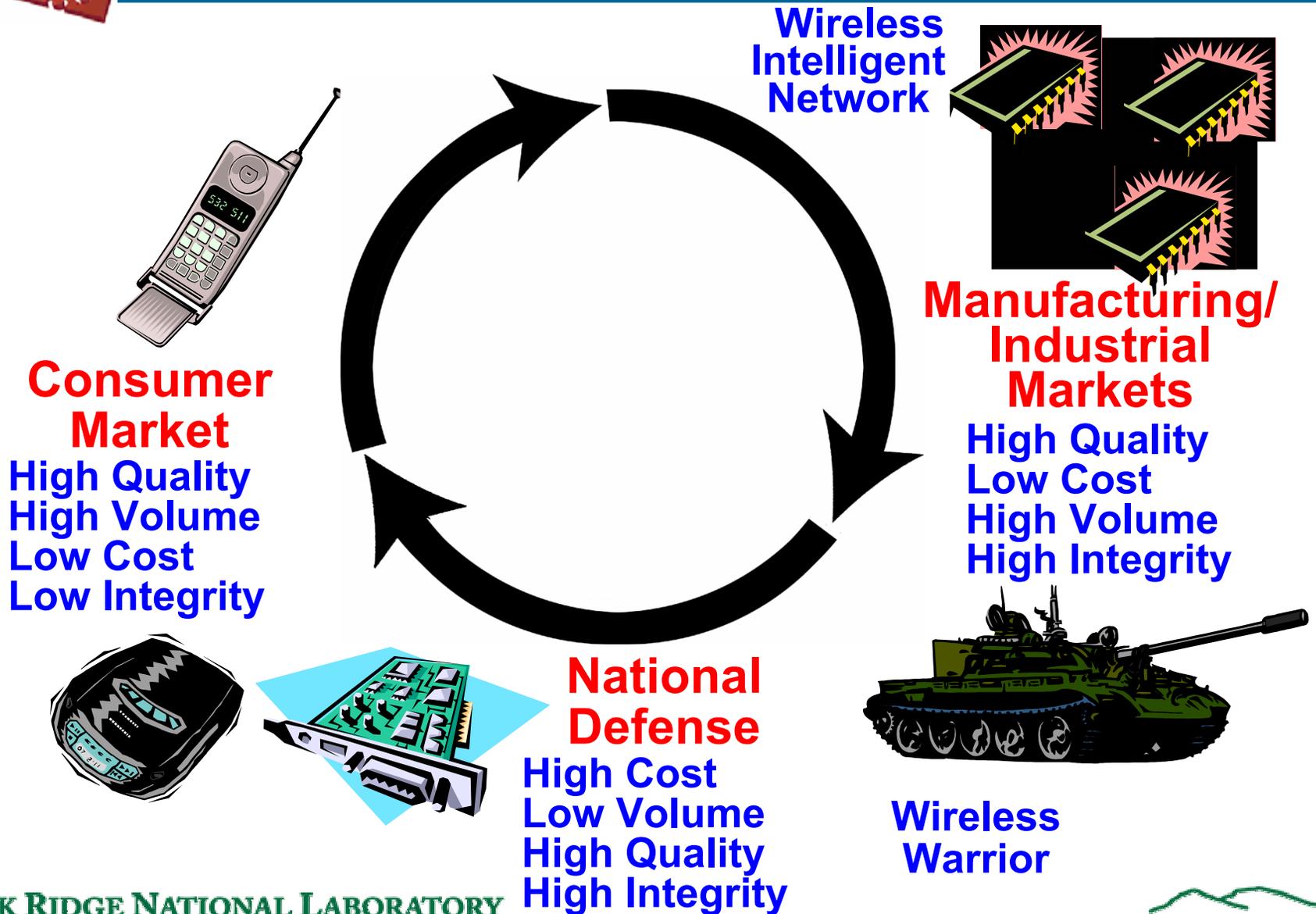
# Emerging Standards

- > **Poised to Impact**
  - > **IEEE 1451.5 – Sensors!**
  - > **ZigBee – Personal Area Networks – Sensors?**
  - > **Bluetooth – Office, Sensors?**
  - > **Wireless USB – Video, Sensors?**





# Can Commercial Grade Cut It?





# Organizations Are Standing By



# EMC<sup>2</sup>

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.

Available at ORNL in June 2004  
– DOE/EERE Extreme Measurement Communications Center – providing technological tools for engineered solutions to sensor networks and communications in harsh environments.

**[www.wina.org](http://www.wina.org)**



# NNSA - Secure Wireless?

1. Install as Back Up to Wires.
2. Justify as Disaster Recovery.
3. Demonstrate Reliability and Security over time.
4. Migrate to Ubiquity.



*Per Roger Lewis – NNSA Headquarters ...*



# Can We Get There From Here?

- > **Emerging Technologies  
Bringing Security**
- > **Markets and Standards  
Driving Costs Down**
- > **Advantages Being  
Demonstrated**
- > **Objections Disappearing**

