The Trifecta

ANSI/ISA100.11a-2011

- Architected and standardized by the ISA
- IEC 62734
- Existing installed base

Wireless HART

- Architected and standardized by the HART Foundation
- IEC 62591
- Existing installed base

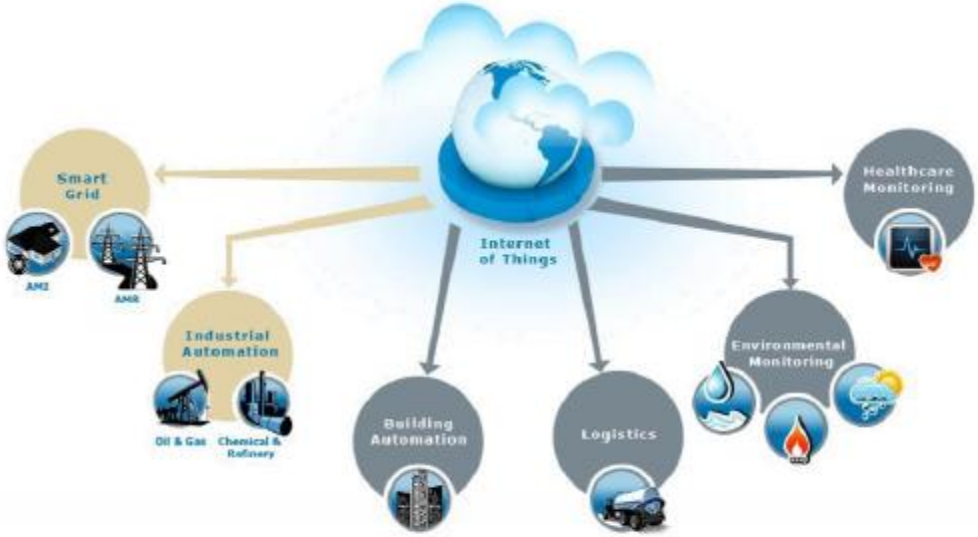
WIA-PA

- Architected and standardized by the Chinese Academy of Sciences
- IEC 62601
- Existing installed base (China)

Internet of Things (IoT)

- **A New Context !**
  - An extension of the Internet to constrained, embedded wired or wireless devices
  - Leverages vetted protocols utilized in the Internet
  - True **IoT** connectivity: no translating Gateways, only Edge (Border) routers

➢ IOT is coming to the Industrial World. You cannot ignore it!



The Trifecta – main commonalities

ISA100 Wireless

WirelessHART

WIA-PA

- **Wireless Networking**
  - Deterministic networks in which field devices rely on a central PCE and centralized network management
  - Define the same device types (logical roles)
  - Networks support mesh similar topologies (mesh, star)

- **Communication stack**
  - PHY: IEEE 802.15.4 – 2006 2.4 GHz
  - MAC: extended IEEE 802.15.4 MAC
  - Media access: TDMA with superimposed freq. hopping
  - Routing:
    - Mesh-under | Graph based | Determined by a central PCE
  - Two – layer security structure
    - Link-layer (hop-to-hop) – encryption based on IEEE 802.15.4
    - End-to-end

The Trifecta – main differences

- **PHY:**
  - RF Output Power: Fixed vs regulatory body specific
- **DLL:**
  - Time synchronization: ASN (absolute slot number) vs time stamp
  - Time slot: fixed versus configurable
  - Frequency hopping: fixed (ASN based) vs configurable
- **Network Layer:**
  - IETF Standards based: IPv6/6lowpan vs standard specific
- **Transport Layer:**
  - UDP vs standard specific
- **Security**
  - Link-layer: MIC computed differently
  - End-to-end transport layer vs application sub-layer, MIC computed differently

ISA100 Wireless

WirelessHART

WIA-PA

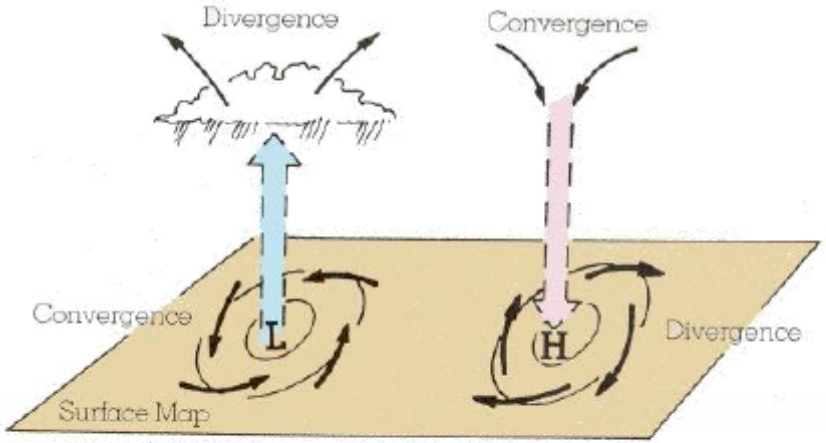
The Trifecta – main differences

- **Management**
  - Type: Centralized vs distributed
- **Provisioning:**
  - Media: wired vs wireless (OOB-infrared, OTA)
- **Application Layer:**
  - Paradigm: command driven vs object oriented
  - Protocol: single protocol vs multi-protocol

ISA100 Wireless

WirelessHART

WIA-PA

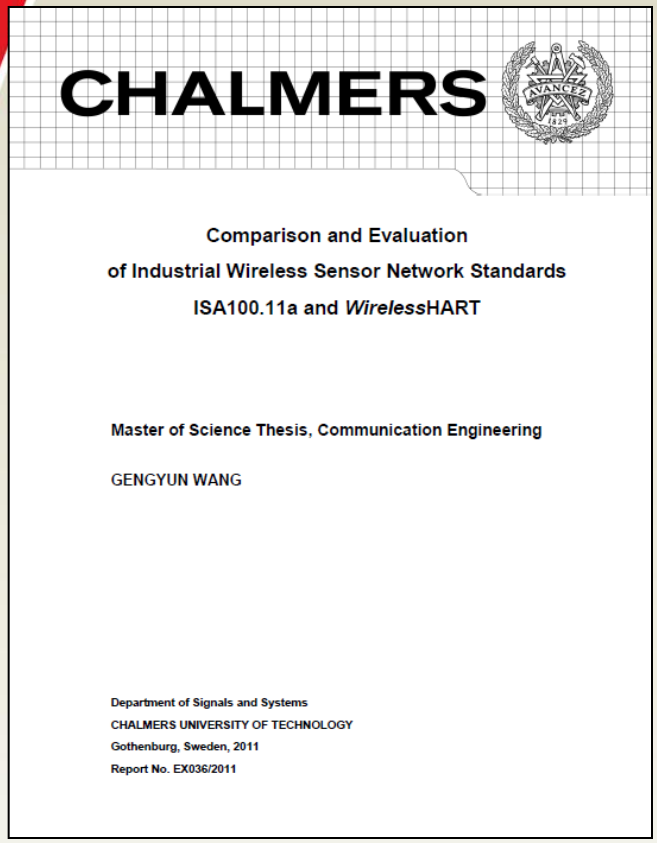


The Trifecta – alignment to existing standards

Standard	ISA100.11a	Wireless HART	WIA-PA
PHY	IEEE 802.15.4	IEEE 802.15.4	IEEE 802.15.4
DLL	IEEE 802.15.4 - extended	IEEE 802.15.4 - extended	IEEE 802.15.4 - extended
Networking	IPv6/6loWPAN	Standard specific	Standard specific
Transport	UDP	Standard specific	Standard specific
Routing	Mesh-under RPL ready	Mesh-under	Mesh-under
Web services	None	None	None
Management	Standard specific	Standard specific	Standard specific
Security	Link Layer Transport Layer	Link Layer Application sub-layer	Link Layer Application sub-layer
Backbone networking	IPv6 RPL Ready	Standard specific	Standard specific

↳ IoT Ready !

Comparison and Evaluation of Industrial Wireless Sensor Network Standards ISA100.11a and WirelessHART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Comparison and Evaluation
of Industrial Wireless Sensor Network Standards
ISA100.11a and *Wireless*HART

Master of Science Thesis, Communication Engineering

GENGYUN WANG

Department of Signals and Systems
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden, 2011
Report No. EX036/2011

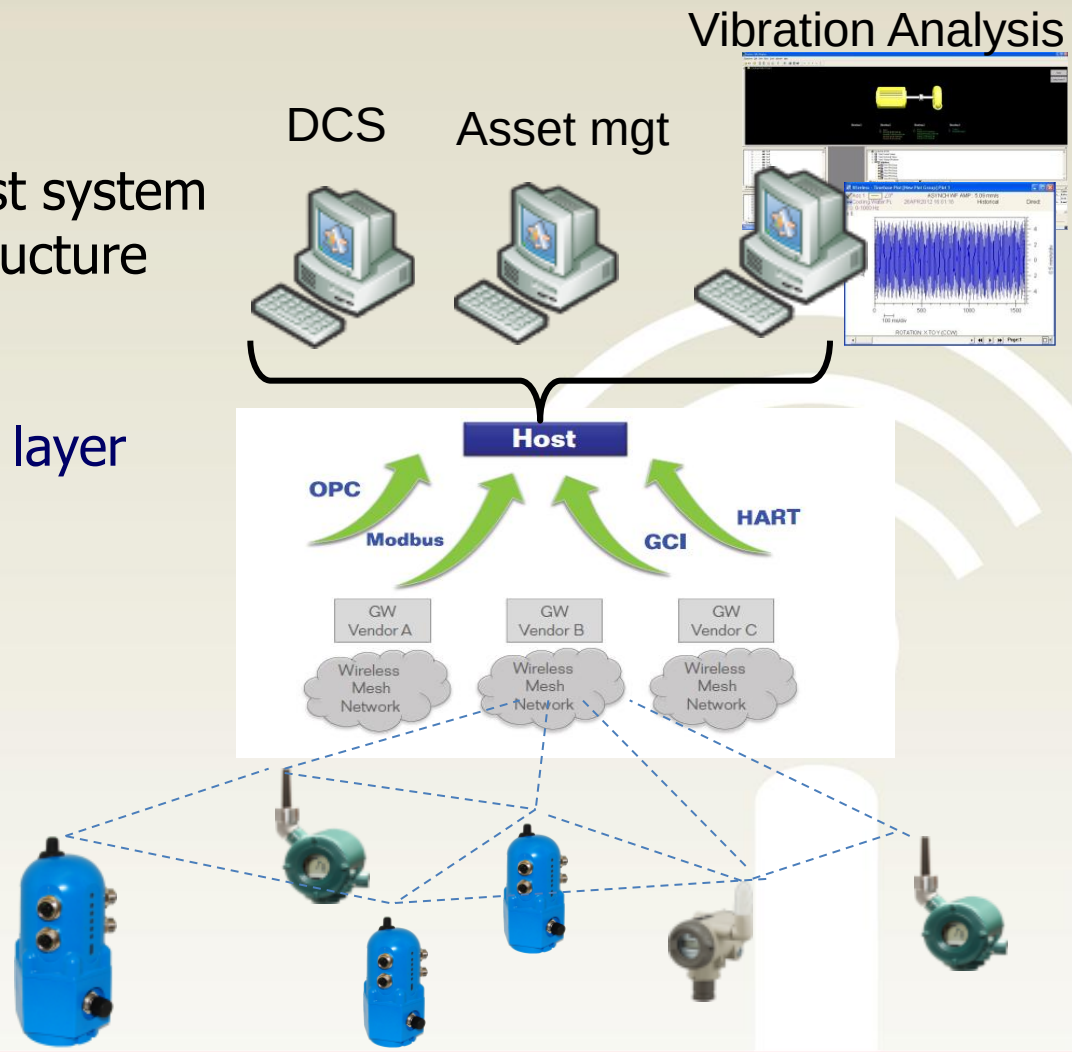
http://publications.lib.chalmers.se/records/fulltext/146427.pdf

- **Conclusion**
- In this thesis, we have pointed out and properly analyzed the differences between ISA100.11a and WirelessHART step by step from system architecture level to each protocol layer‟s functionality. In comparison with WirelessHART, ISA100.11a offers a vaster coverage and broader view of process automation solutions:
- Role profiles give birth to flexible device configuration according to on site needs;
- Backbone network consideration minimizes the latency of wireless mesh;
- Subnets connecting to the backbone network enable the linear scalability of the network;
- Contract agreed between device and System Manager facilitates control of field device and provides required QOS for device communication;
- Formative specification of security issues guides the security design of the system and enables elastic security deployment to meet different security-strength required;
- IPv6 compatibility extends the use of various internet technologies;
- Object-orientation unifies network management and enhance legacy systems‟ interoperability;
- Multiple options of length of timeslot, channel hopping, neighbor discovery, join and provisioning schemes;

Vibration sensor

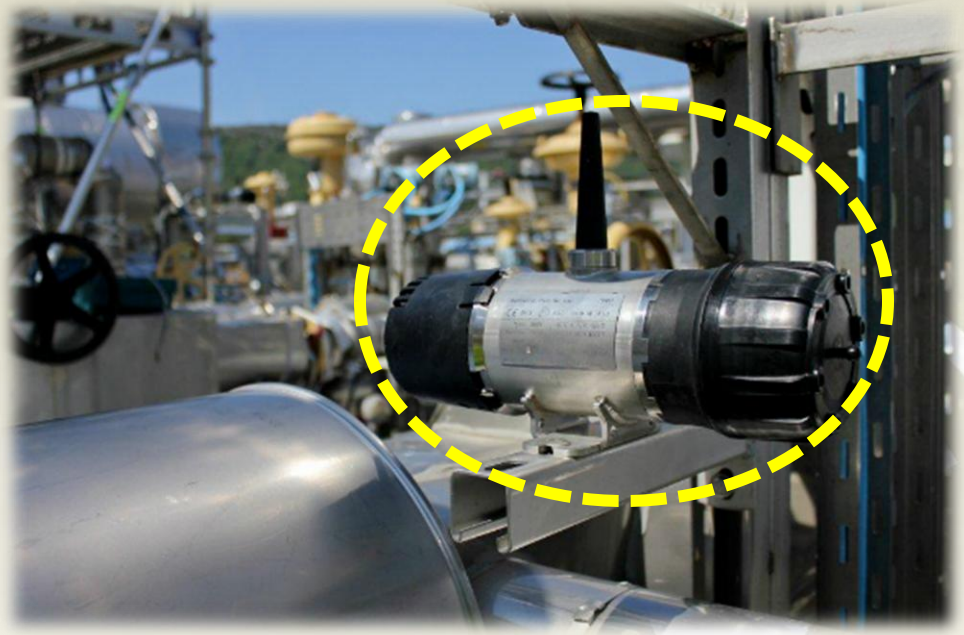
Flexible integration to connect any host systems

- **Challenge**
  - Integration of different host system into single wireless infrastructure
- **Solutions by ISA100**
  - Object oriented application layer



Gas detector

Deterministic performance to meet safety regulation



- **Challenge**
  - Deterministic performance
  - Rapid response: 5~7sec including gas-detecting time and communication
  - Low energy consumption

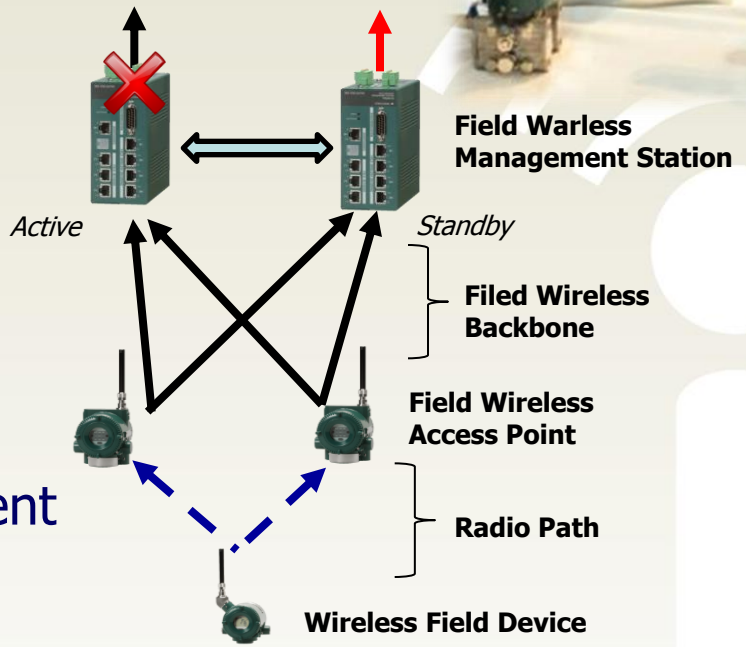
- **Solutions by ISA100**
  - Quality of services to manage bandwidth and latency
    - Time slot communication (TDMA) for deterministic response
  - Star topology / Backbone routing for short latency

Control ready

Full redundant system for control /critical applications

- **Challenge**
  - Full redundancy in both communication and hardware components
  - Deterministic communication
  - Reliable communication
  - Robust against interference

- **Solutions by ISA100**
  - DuoCast
  - Redundant Gateway
  - Channel hopping
  - Contract base QoS Management



Wireless adapter

Support existing protocols for diagnostics of legacy devices

- **Challenge**
  - Multi-protocol support
  - Protocol independent
  - Platform neutral

- **Solutions by ISA100**
  - Tunneling protocol (Protocol capsuling)
  - Object oriented application layer