



Setting the Standard for Automation™

Wireless Standards Convergence – The Inside Story

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Standards
Certification
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 - Wireless Networks for Industrial Automation
 - Automation Network Selection
 - User Guide to Fieldbus Network Equipment for Process Control



The Problem With Standards



Too many wireless instrumentation standards:

1. ISA100 Wireless (ISA100.11a-2011, IEC 62734)
2. WirelessHART (IEC 62591)
3. WIA-PA (IEC 62601)

All directed at the same application:
Process control field instrumentation

- Networks may co-exist
 - Messages are not coordinated, they may collide
 - Positive acknowledgment requires retransmission
 - Some probability message will be delayed
- Cannot share messages between networks
 - Data sharing must be processed by store & forward at the host level
 - Message travels on its own network to the host
 - A host function is required to deliver the message to the target device

DCS suppliers support only one of the wireless networks

- ISA100 Wireless

Honeywell, Yokogawa, Invensys, General Electric,
Masoneilan, Yamataki, Fuji, S3

- WirelessHART

Emerson, ABB, Siemens, Endress+Hauser

- WIA-PA

Unannounced Chinese supplier

Data communications is defined in formal layers.

Layer	Name	Function
7	Application	Process Control Application
6	Presentation	Data Conversion
5	Session	Connections
4	Transport	Data Flow Control
3	Network	Logical Address
2	Data Link	Physical Address and Mastership
1	Physical	Media, Encoding

Standards organizations:

ISO – International Standards Organization

IEC – International Electrotechnical Commission

IETF/RFC – Internet Engineering Task Force / Request For Comments

ISA100 Wireless

WirelessHART

WIA-PA

All use IEEE 802.15.4 – 2006 chips with it's Medium Access Control and a 16-channel direct sequence spread spectrum radio with 128-bit AES security encryption.

All use the same channel hopping logic

WirelessHART uses a fixed channel hopping table

ISA100 Wireless and WIA-PA have multiple channel hopping tables including the one used by WirelessHART.

Wireless instruments are off 97% of the time and “wake up” to send/receive. The “awake” period is called the Slot Time.

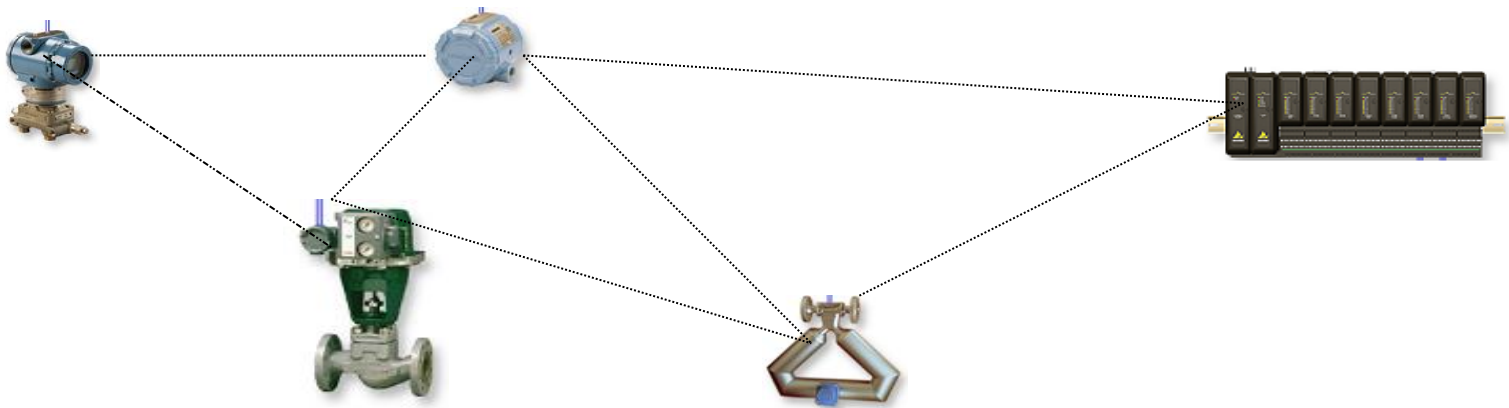
WirelessHART slot time is fixed at 10ms

ISA100 Wireless uses variable slot time, but defaults to 10ms

WIA-PA uses a variable slot time, but defaults to 10ms

Identical slot timing is necessary for networks to interoperate

- Mesh networks use multiple paths and relay messages from one node to another
 - overcome obstacles
 - reach longer distances
 - create resilient paths for increased reliability



ISA100 Wireless: meshing protocol of IEEE 802.15.4e

WirelessHART: proprietary meshing protocol

WIA-PA: proprietary meshing protocol

Mesh protocol must be identical for nodes to communicate.

Time slots must be synchronized between nodes to schedule awake time data communications.

ISA100 Wireless: same method as IEEE 802.15.4e

- Method defined by IEEE 1588

- Distributed network time

WirelessHART: Derives network time by counting time slots

WIA-PA: Proprietary protocol

Each network node must have a unique address:

ISA100 Wireless

- Each node has an IPv6 address
- Uses RFC 4944 6LowPAN protocol
- Nodes are Internet addressable

WirelessHART

- Proprietary address in the HART domain

WIA-PA

- Proprietary

Protocol to assure end-to-end delivery of messages

ISA100 Wireless

Confirmed service using UDP/IP (RFC 768) protocol

Network is capable of running TCP/IP but not used for real-time communications

WirelessHART

Proprietary confirmed service

WIA-PA

Proprietary confirmed service

Convergence would require agreement among all parties to adopt the same protocols for:

- Slot timing
- Meshing protocol
- Clock synchronization
- Slot timing
- Addressing
- Transport protocol

Unlikely to occur due to lack of compatibility with the installed base of instruments.