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Industrial Ethernet trends and Industrial Wireless solutions

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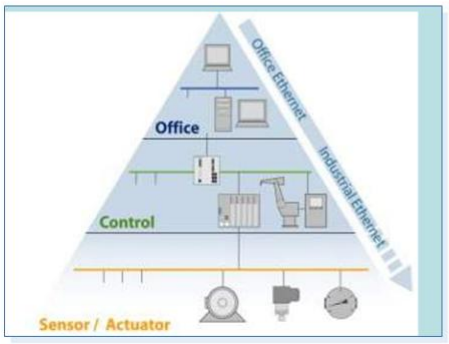
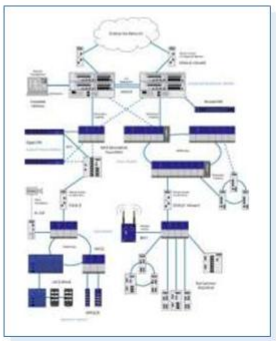
About Hirschmann Automation & Control

- A Belden Company "Industrial infrastructure solutions"
- Industrial Ethernet solutions wired and wireless
- Ethernet trends in the industry (PLC/ DCS, Safety, Video, VoIP Wireless)





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Hirschmann Automation and Control - Corporate Facts

Turnover 2007: € 202 million

Employees: 800

Headquarters: Neckartenzlingen, Germany

Locations worldwide:

- Germany
- France
- United Kingdom
- Netherlands/Belgium
- Spain
- Italy
- Switzerland
- Austria
- USA
- Singapore
- Japan
- China

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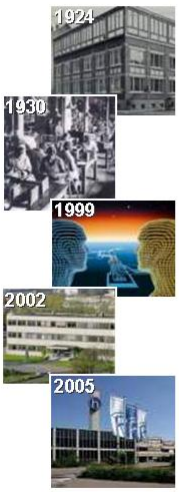
History of the Hirschmann group



Company Milestones

1924	The Hirschmann company is founded in Esslingen
1999	Hirschmann Automation and Network Solutions division
2005	Foundation of Hirschmann Automation & Control GmbH
2007	The **Belden Group**, Saint Louis (USA), acquires Hirschmann Automation and Control

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Industrial Networking Milestones

1980	Fiber Optic transmission
1984	First fiber optic-based ETHERNET
1990	Redundant ETHERNET-Ring
2000	Modular Gigabit ETHERNET Switch
2002	First IP 67 ETHERNET Switch
2004	First PTP (IEEE 1588) Implementation
2005	First Industrial Security Router, First Industrial WLAN Access Point
2006	First Managed IP67 ETHERNET Switches
2007	Ruggedized ETHERNET Switches for Substations
2008	IP67 WLAN Access Point for ATEX Zone 2

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Strategic Business Units of Hirschmann Automation and Control

Hirschmann Automation and Control GmbH

Industrial Networking		• Industrial Ethernet • Fiber Interfaces
Industrial Connectors		• Connectors for Industry
Electronic Control Systems		• Load Moment Indicator • Control Systems and Sensors • Graphic Control Panels and Displays

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About Hirschmann Automation & Control

A Belden Company "Industrial infrastructure solutions"

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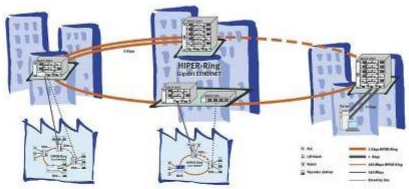
Hirschmann – Your Partner for Industrial Networks

Global Automation Partners

ABB
ALSTOM
EMERSON
Rockwell Automation
Schneider Electric
YOKOGAWA



Qualified for:

PROFINET
EtherNet/IP
Modbus TCP
IndustrialIT
ETHERNET POWERLINK
CIP
Experion PKS
ARCHESTRA
and more...

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Trends in Industrial Communication

- Topologies, Network Design, Availability
- Enhanced environmental conditions
- Security
- Wireless
- Quality of Service and Real-time
- Use of new IT technologies
- Increasing data rates
- Fiber Optic
- Remote Access
- Safety Applications over Ethernet
- Industrial Automation Profiles

Growing need in communication in industrial automation

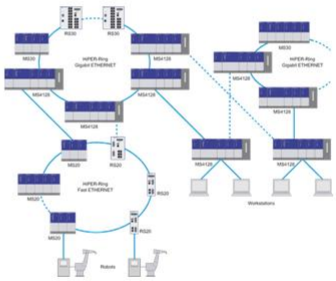
Industrial Ethernet will be the main communication platform in industrial automation

Topologies, Network Design, Availability

Automation networks need an other network design compared to office networks due to different topologies and requirements for reliability and determinism. Support of standards plus special automation-specific enhancements are needed.

Ring topology offers simple redundant structure combined with fast recovery time

IEC 62439 MRP specifies a deterministic ring redundancy protocol



Applications: Redundant communication networks from control networks in machine building up to distributed offshore wind parks

Enhanced Environmental Conditions

Ethernet will be used more and more in field applications or even in outdoor applications → Need for rugged product design

- Extended mechanical requirements
- Operation in humid or dusty environments
- Extended temperature requirements
- Hazardous locations

Applications: machine building, outdoor applications, products in harsh environments, oil and gas, chemical industry, food and beverage

Security

Use of integrated networks might lead to some risks, if security concepts are not taken into account.
A big risk potential comes from inside the network

Need for a decentralized security architecture

Applications: Remote access, protection of production segments

Quality of Service and Real-time

Industrial applications often require guaranteed Quality of Service or real-time behavior. Standard Ethernet offers this only in a limited way by use of:

- VLANs
- Priorisation, QoS
- big bandwidth
- clock synchronization (IEEE1588)

BUT:
Special real time Ethernet extensions can guarantee 100% deterministic behavior with sub- microsecond jitter and sub- millisecond cycle time

CIP Sync

ETHERNET POWERLINK

PROFINET IRT

Applications: Motion Control, instrumentation

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New IT Technologies

New protocols and technologies from information technology (IT) can be transferred to industrial automation, e.g.

- Power over Ethernet
  Energy transport over Ethernet cables to supply active devices
- IP routing
  Segmentation of communication networks
- IPv6
  Internet protocol extensions for improved addressing, security, …

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Increasing Data Rates

Bandwidth requirements will increase due to
- New protocols
- New services
- Growing number of devices within an Ethernet network
- Video applications
- Need for highly flexible automation applications

Data rate on Ethernet networks:
Ethernet 10 Mbps
⇒ Fast Ethernet 100 Mbps
⇒ Gigabit Ethernet
⇒ 10 Gigabit Ethernet
⇒ 100 Gigabit Ethernet (?)

Benefits:
Higher throughput
Lower latency

Applications: video surveillance, machine vision, automation backbone networks

Fiber Optic

Use of fiber optic interfaces will increase due to
- Better EMC robustness
- Longer distances
- Electrical protection

Glass optical fiber => long distance, high data rates
Plastic optical fiber => low cost, short distance

Applications: machine building, long distance communication, backbone networks

Remote Access

Remote interaction with automation components and plants for operation, diagnostics and maintenance promises to save money by avoiding the need to have highly skilled personal onsite.

Remote access can be via
- Internet access
- Telephone dial-in
- Cell phone
- Remote access services
- other …

and needs an appropriate security concept for access control and authentification.

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Safety

Integrating safety and control applications into one system and sending all information over the same network saves in infrastructure and enables new concepts of operation.

Safety protocols over Ethernet

Applications: machinery, production, transportation, ...

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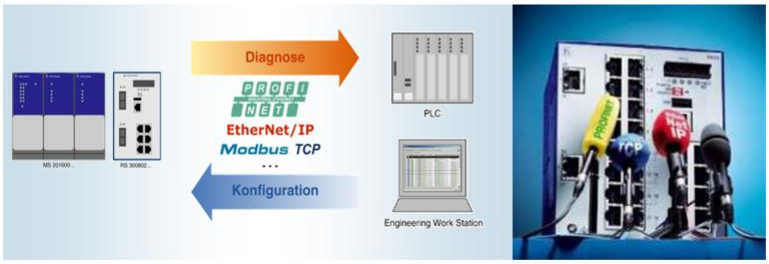
Industrial Profiles

Use of industrial profiles like PROFINET or EtherNet/IP for configuration, engineering and maintenance of network infrastructure

By integration in engineering tools like STEP7 (Siemens) or RSLogix (Rockwell) network equipment will be a integrated part of the automation solution.



Applications: Engineering and maintenance of Ethernet based automation networks

Wireless

Modern wireless technologies enable reliable and efficient communication structures even in industrial applications

WLAN products from standard to IP67 and with extended temperature range are already available

Wireless technologies combined with security concepts enable mobility and can reduce cost by avoidance of expensive cabling

Future technologies like 802.11n or wireless sensor networks will offer additional benefits for industrial automation

Applications: automatic warehouses, connectivity to mobile or remote devices, asset management

Benefits of Wireless

- **Mobility & increased efficiency:**
  - ❑ Remote access via laptops in the field (Commissioning)
  - ❑ Replacement of wired field terminals
- **Flexibility:**
  - ❑ Cranes in mining and steel companies
  - ❑ Moving bridges in water/ waste water basins
  - ❑ Moving transport & logistic solutions (Fork lifters, AGV's)
  - ❑ Robots in automotive applications
- ➢ **Cost savings:**
  - ❑ Where cables are not possible or flexible or to expensive (Specific Safety zone's etc)
  - ❑ Less TCO due to WLAN

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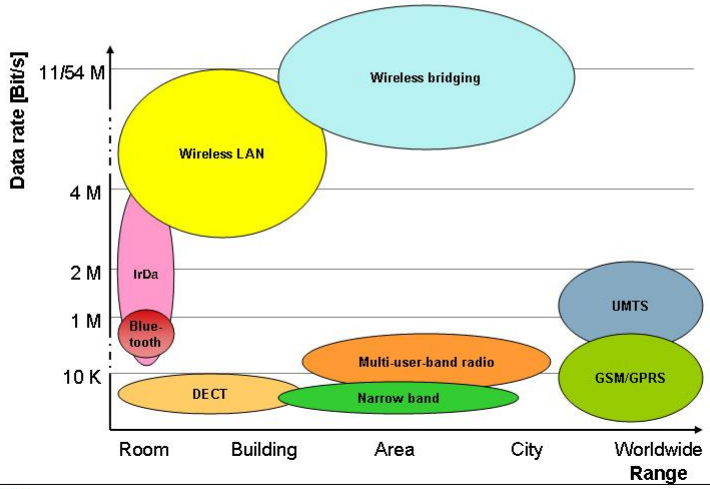
Wireless communication

Transmission of information over the AIR (Radio Waves)



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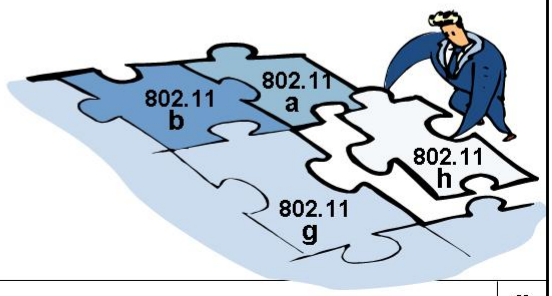
WLAN (WIFI)

- Ethernet network which does not rely on wired connections
- Speed up to 108 Mbit/s
- Wireless LAN (is standardized in the IEEE 802.11)
- Substandards for speed and transmission technology
  - 802.11a and .11h
  - 802.11b and .11g
  - 802.11n (in preparation)
- WLAN-Security : 802.11i
- 2,4 and 5 GHz



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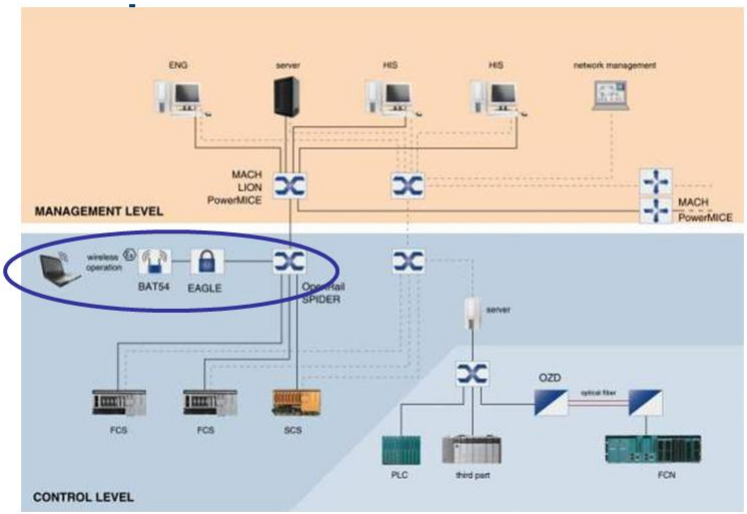
Reference in YOKOGAWA systems

YOKOGAWA



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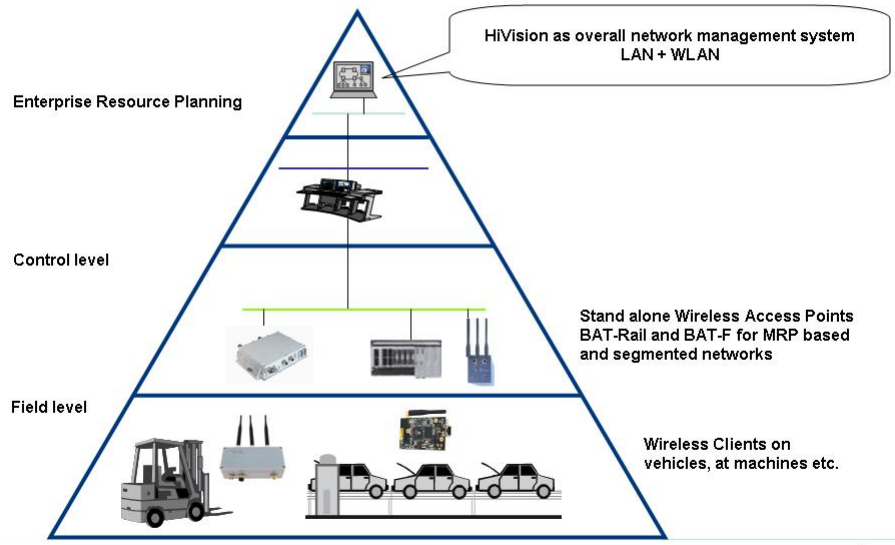
Stand alone AP for Factory Automation



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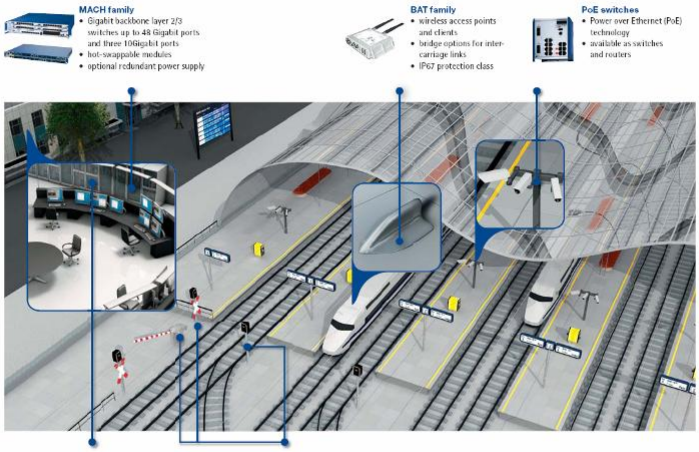
Stand alone AP for Transportation



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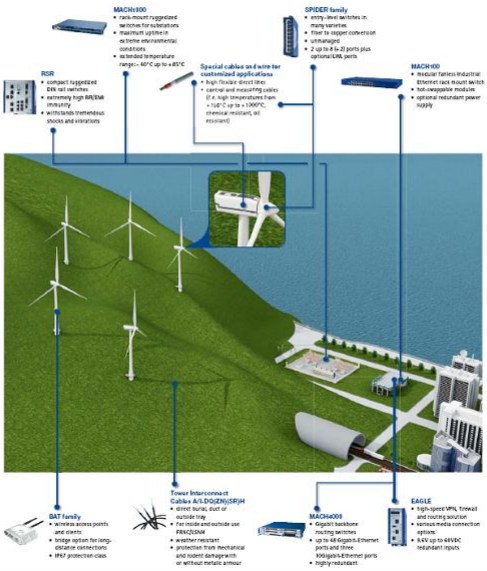
Stand alone AP for Wind Energy



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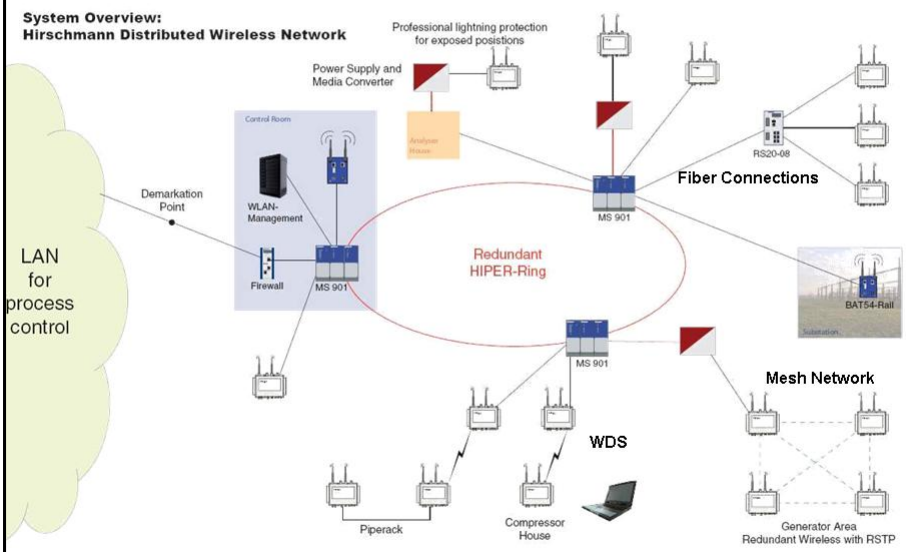
Stand alone AP for Refineries



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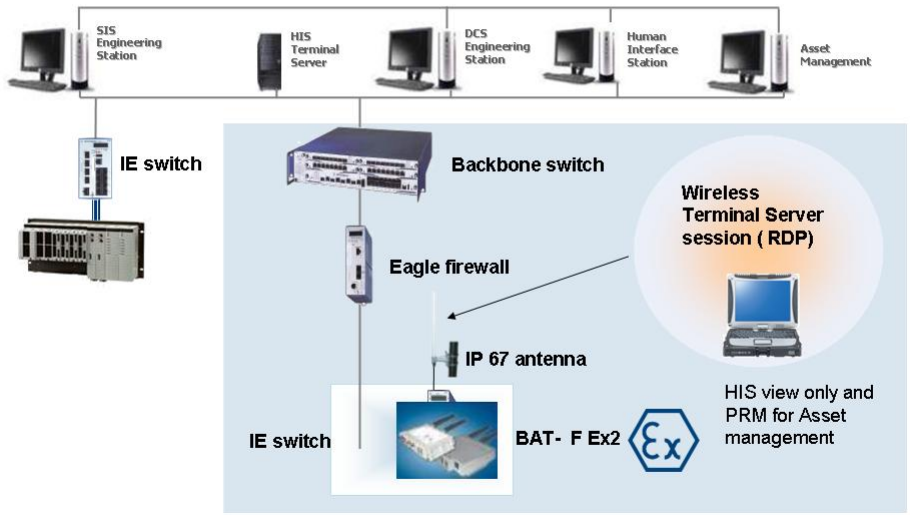
End to end solution

YOKOGAWA



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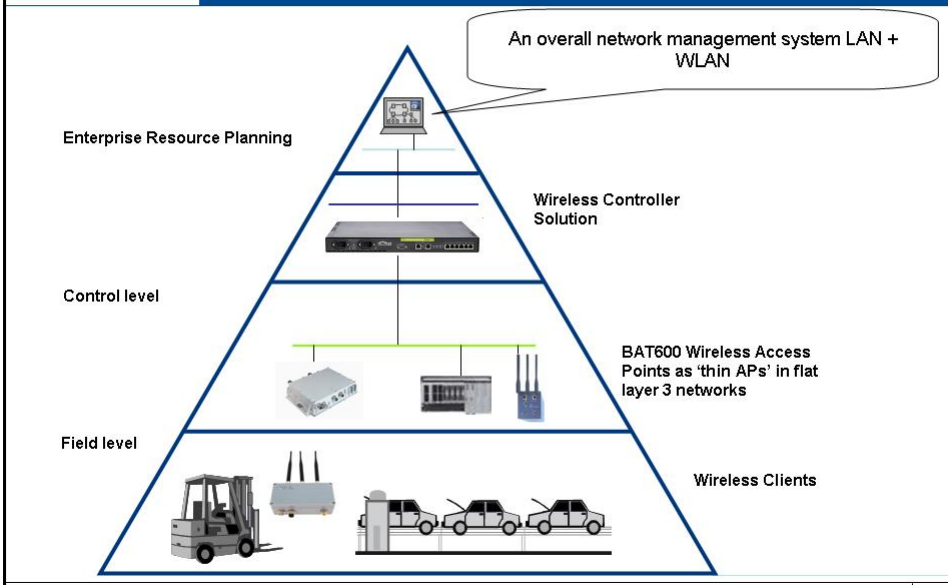
Factory Automation with WLAN Controller



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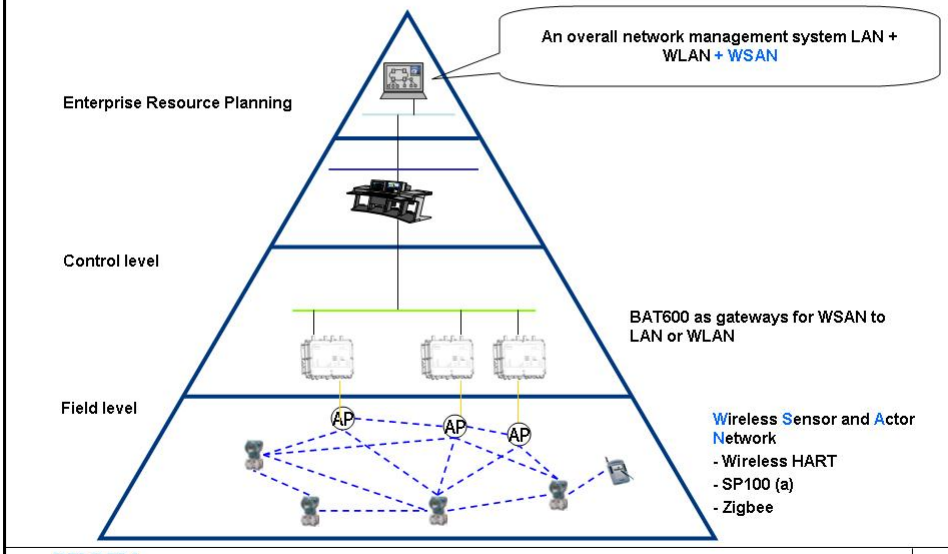
Wireless in Process Automation



Reasons for using wireless

- **Benefits**
- Less need for local panels
- Fast commissioning
- Increased field operability / visibility
- Local advanced diagnostics
  direct access to PRM “everywhere”
- Future proof multipurpose Ethernet
  backbone with LAN and WLAN connections
  (VLAN and Multi-SSID for Video, Voice,..)
- Flexibility and cost savings: Operators can react in the field and system is engineered for future expansions

Conclusion

- Hirschmann offers complete solutions for:
  scalable, redundant LAN and WLAN
- Entire WLAN system for end-to-end solution
- Full Project Management and services
- Improved operational efficiency
- Mobile workers and maintenance
- Cost reduction due to WLAN

Hirschmann and Wireless –
a future proof solution!

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