



*Setting the Standard for Automation™*

# **New movement of the field wireless solutions to realize the "Wireless Anywhere"**

Standards  
Certification  
Education & Training  
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Conferences & Exhibits

7<sup>th</sup> October, 2014  
Toshi Hasegawa  
Yokogawa Electric Corporation

# Presenter



- Toshi Hasegawa is a Manager of industrial automation technology marketing, particularly with wireless. Toshi has been working for Yokogawa Electric Corporation for 26 years, and he has worked for development of Distributed Control Systems (DCS). His current activity is mainly on standardization and marketing of industrial wireless network. He is a voting member of ISA SP100 Wireless System for Automation. And he is a district leader of the ISA100 Wireless Compliance institute (WCI) Asia Pacific. Toshi is also member of the Japan national committee of IEC/TC65/SC65C/WG17 (Wireless communication network and communication profiles-Coexistence). He is a chairman of Wireless working group of Japan Electric Measuring Instruments Manufacturers' Association (JEMIMA).



# Today's topic



***The goal of this presentation is to introduce our technical approaches to realize "Wireless Anywhere". This our new concept is to expand and utilize the ISA100 Wireless in the field.***

## Contents

- Why industrial wireless?
- Why ISA100 Wireless?
- How to realize ISA100 wireless solutions?
- What are the advanced technology and solutions?
- How to utilize ISA100 Wireless technology?
- What is the "Wireless Anywhere" concept and its components?
- What are the benefits for vendors and end-users?
- Summary

# Why industrial wireless?



**Reduce blind spots** : Avoid guesswork, instability, sub-optimization

**SEE  
CLEARLY**

**KNOW  
IN ADVANCE**

**ACT  
WITH AGILITY**

*We are confident to the industrial wireless technology that will help customers to achieve Lifecycle Excellence over long-term. Industrial wireless is a key technology of the Field Digital Innovation to realize Vigilant Plant of our vision.*

Increase  
Productivity

Improve  
Flexibility

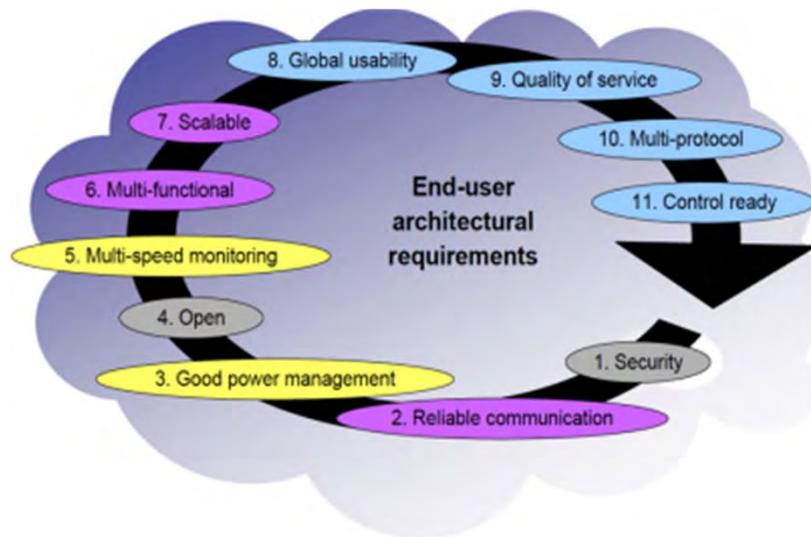
Reduce  
Costs

New  
Applications

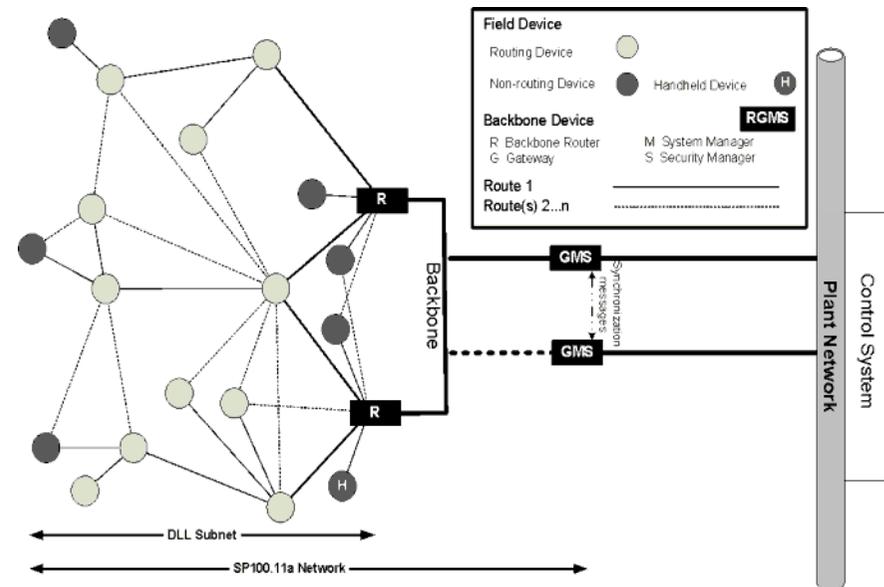
# Why ISA100 Wireless?



- User driven standard
- **Future proof, Scalable, Reliable and Flexible**
- Wide range of applications from monitoring to **control**
- **Multivendor interoperability** for best in class solution
- IEC approved as an international standard, **IEC 62734**.

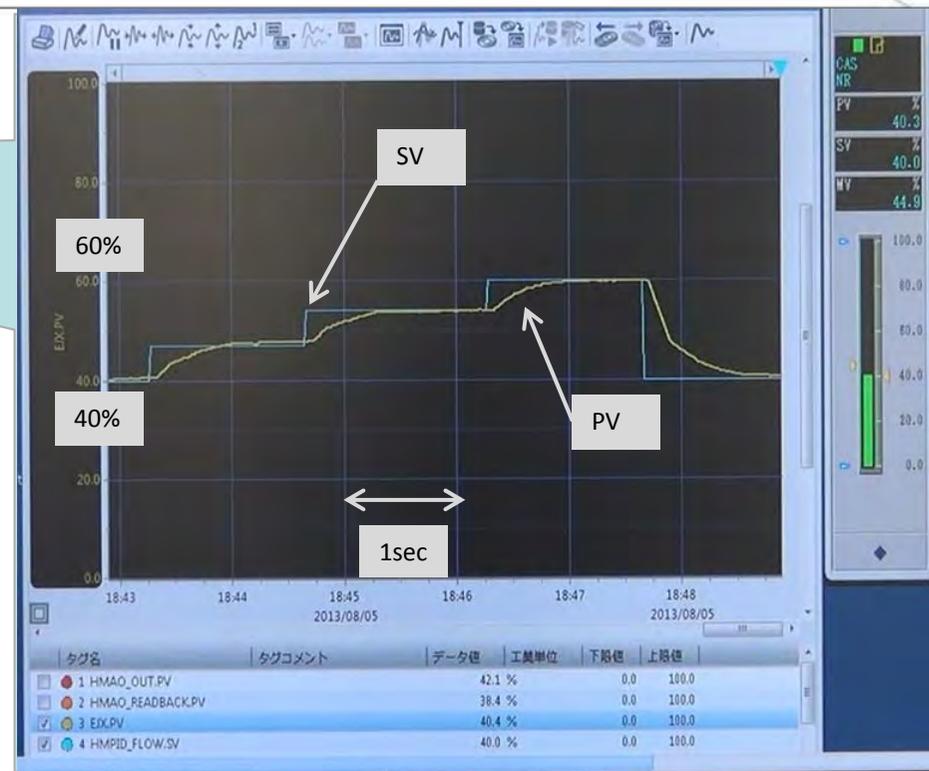
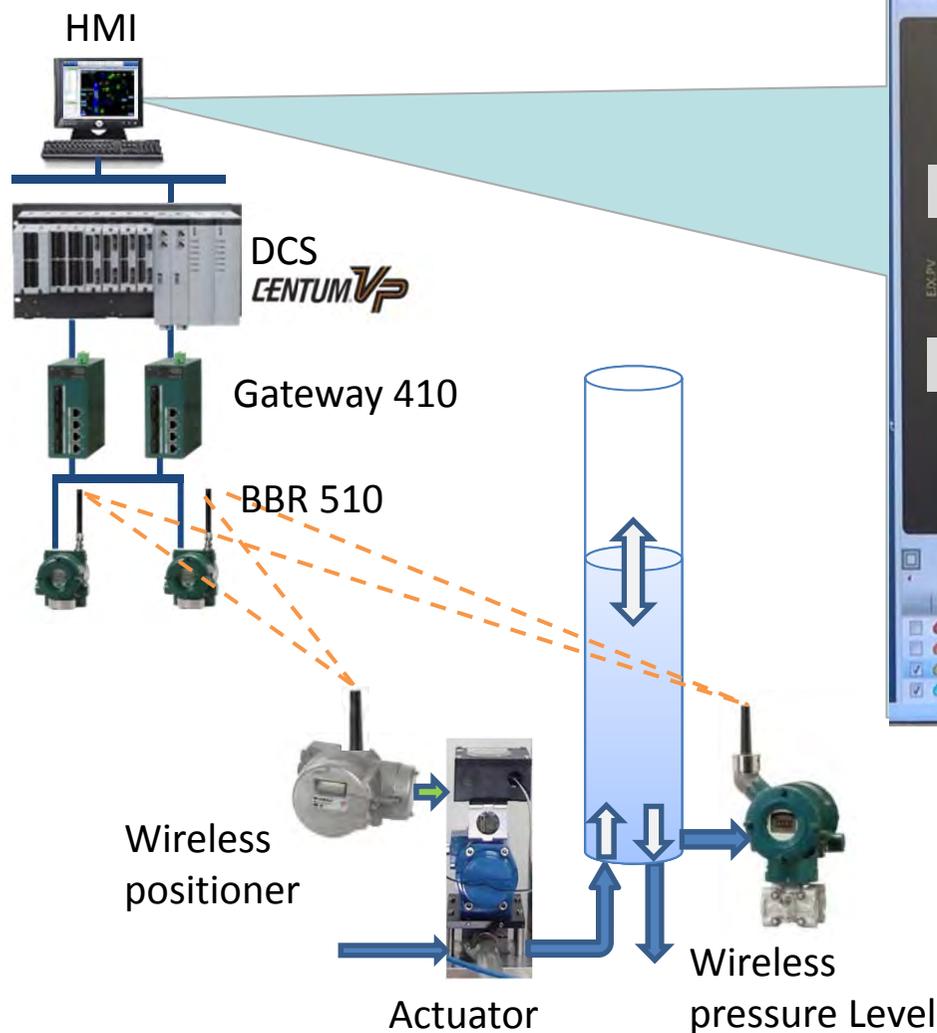


Input from End-users



Work for and/or with End-users

# ISA100 provides wide range of applications: Wireless Control (Committed highest reliability and availability)



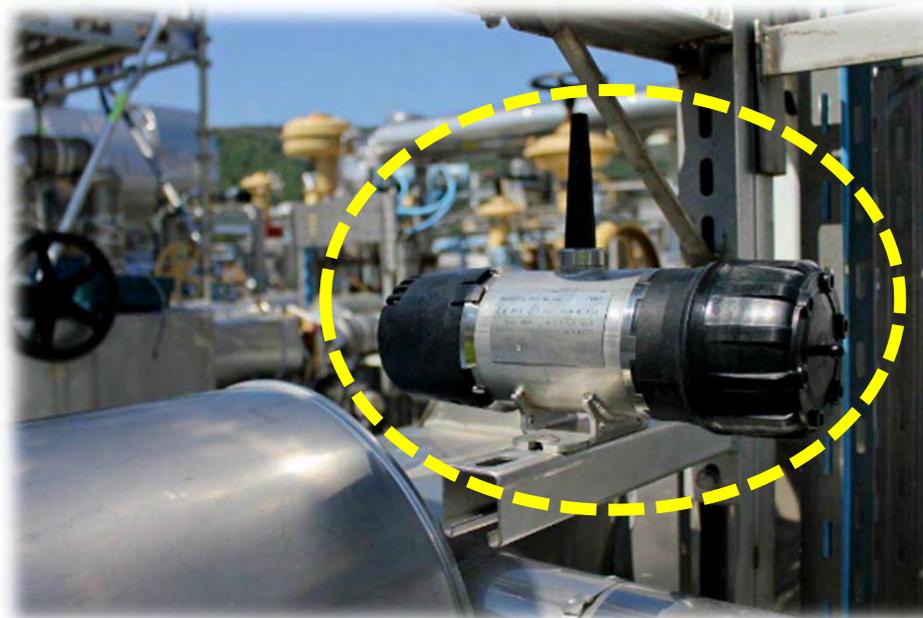
DCS trend data of SV and PV (pressure)

- ✓ Update rate 1second with DUO cast
- ✓ PID on DCS
- ✓ Redundant gateway
- ✓ Redundant BBR
- ✓ Wireless pressure device for water level measurement
- ✓ Wireless positioner device
- ✓ FDT/DTM technology for positioner setting

# ISA100 provides wide range of applications: Wireless Gas detector (Committed deterministic performance)

## ■ Challenge

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

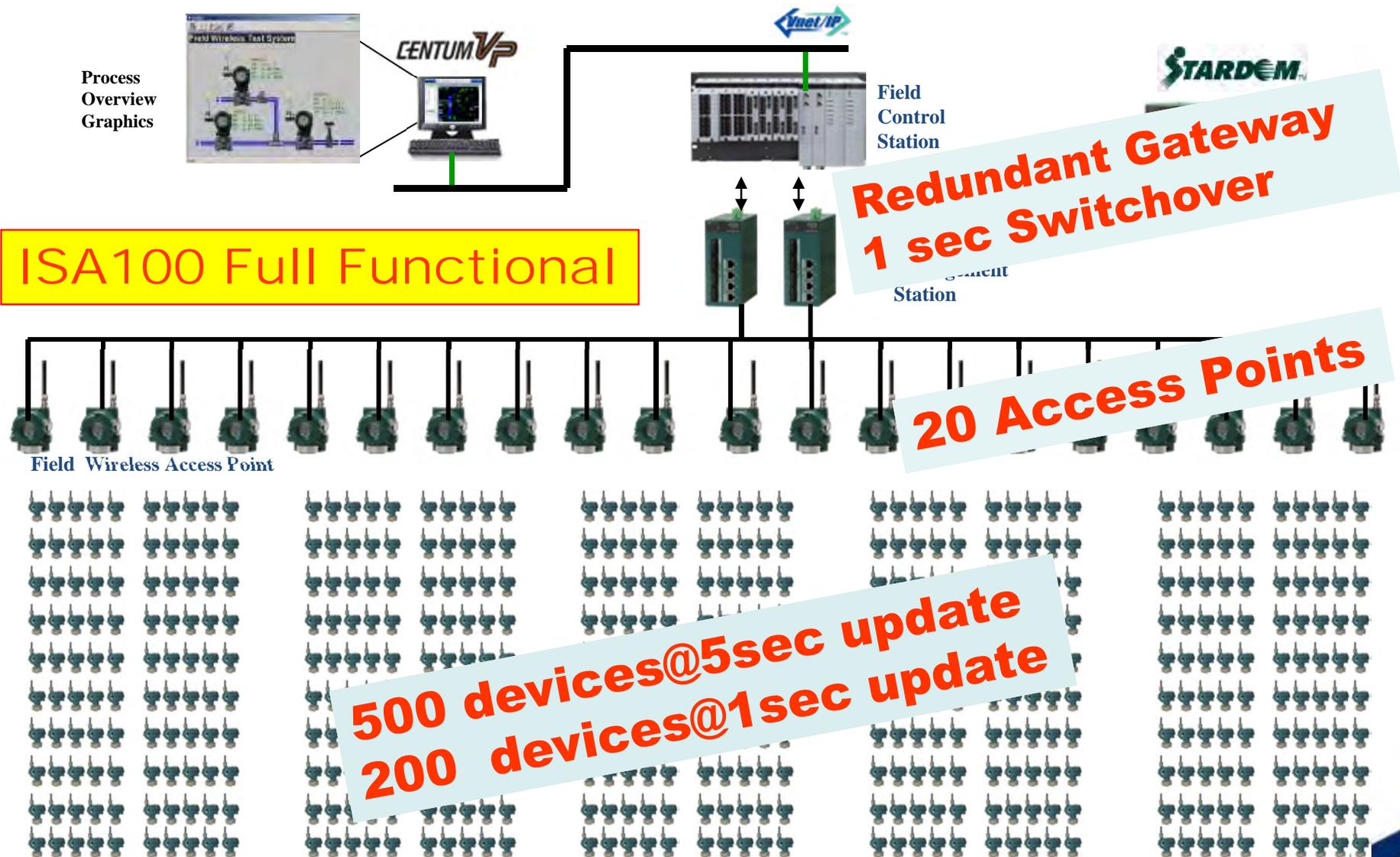


<http://www.gassecure.com>

## ■ 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
- Object-oriented application layer with protocol tunneling not limited to HART (SIL-certified safety protocols included)
- Multiple coexistence mechanisms, e.g. detection of general energy level in channel (including Wi-Fi)

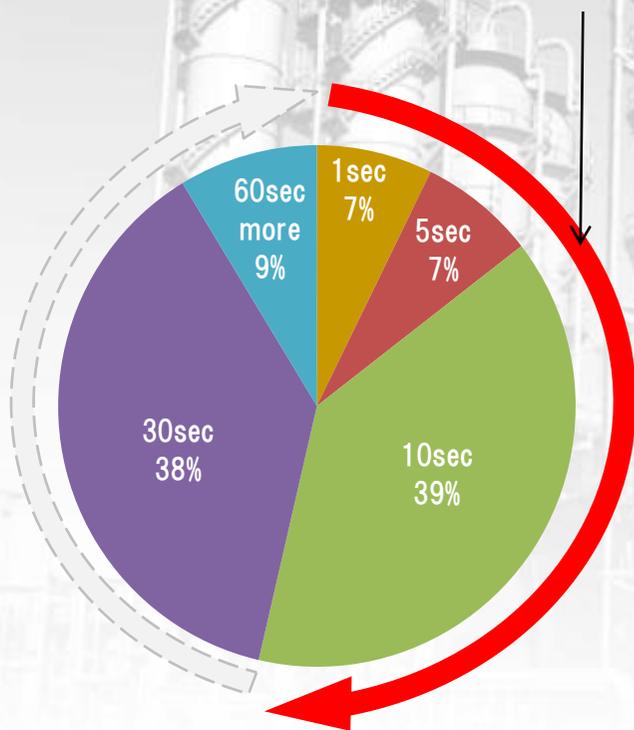
# ISA100 provides wide range of applications: Monitor many points (Committed large scale configuration)



# ISA100 meets end user requirements

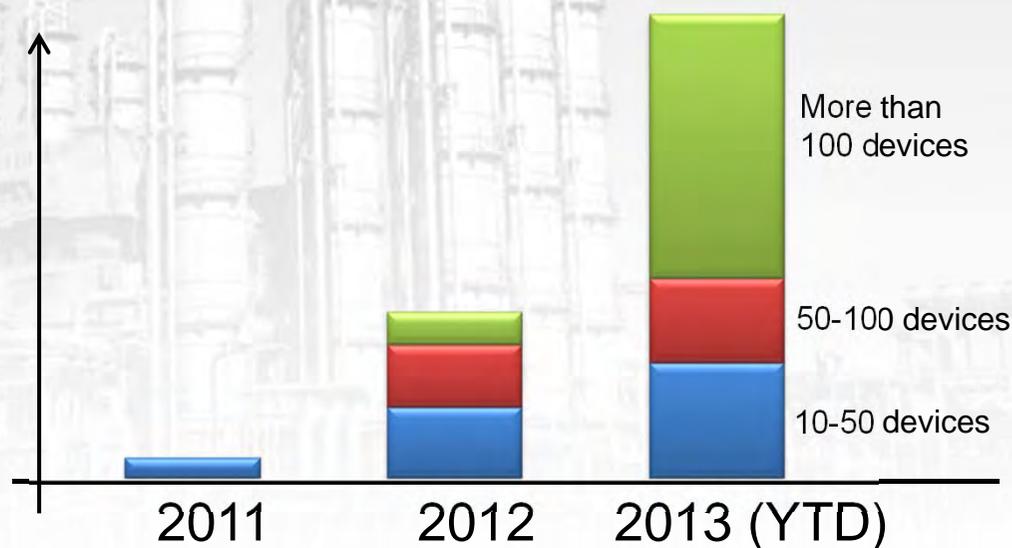
End user require high speed update time and number of devices

**53%** of our customers are required high speed monitoring from 1sec to 10 sec update period.



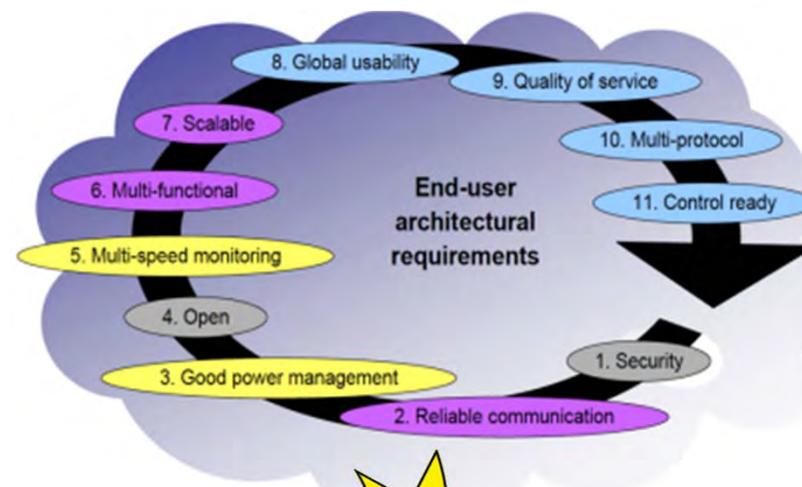
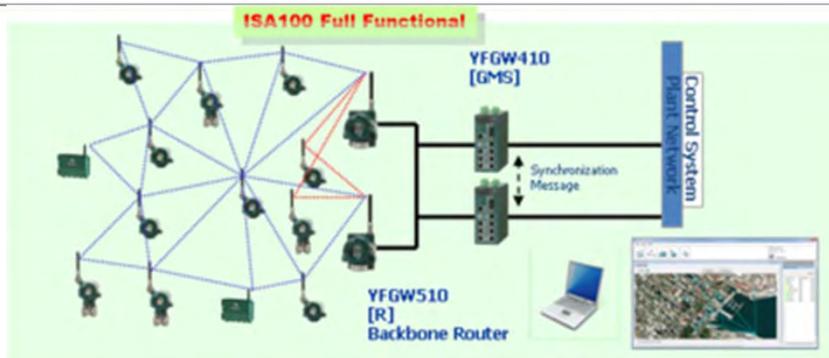
**End user require large scale network**

- The number of devices per one project are increasing in Asian market.
- Recently there are **more than one thousand devices** on several projects.



The trend of enquiries which require more than ten devices

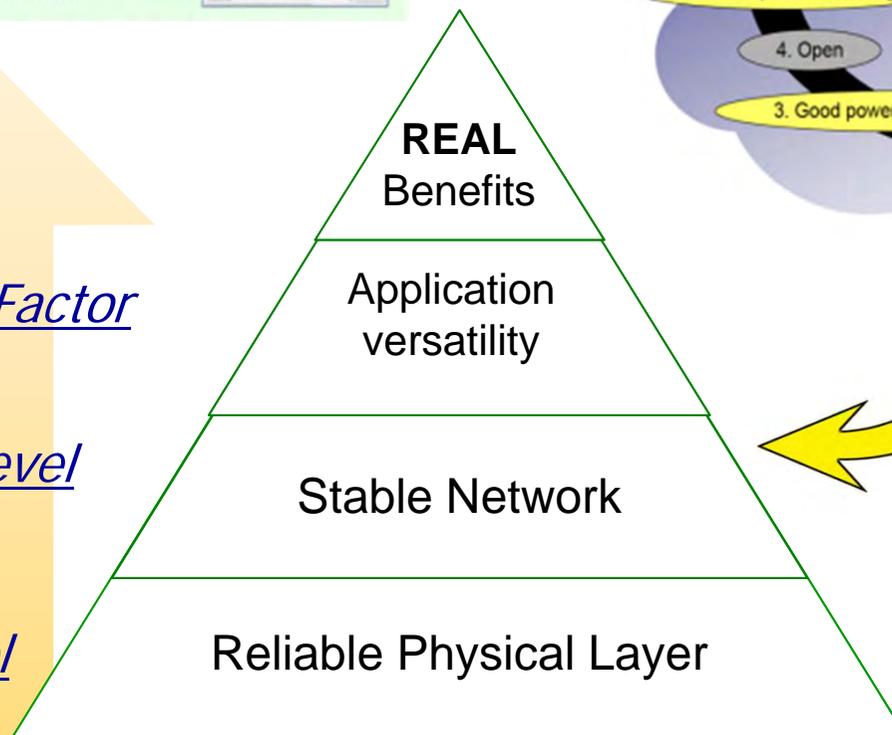
# How to realize ISA100 Wireless solutions?



(3) Operation Factor

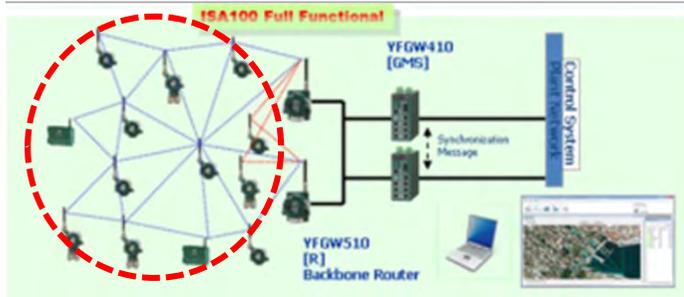
(2) Network Level

(1) Radio Level

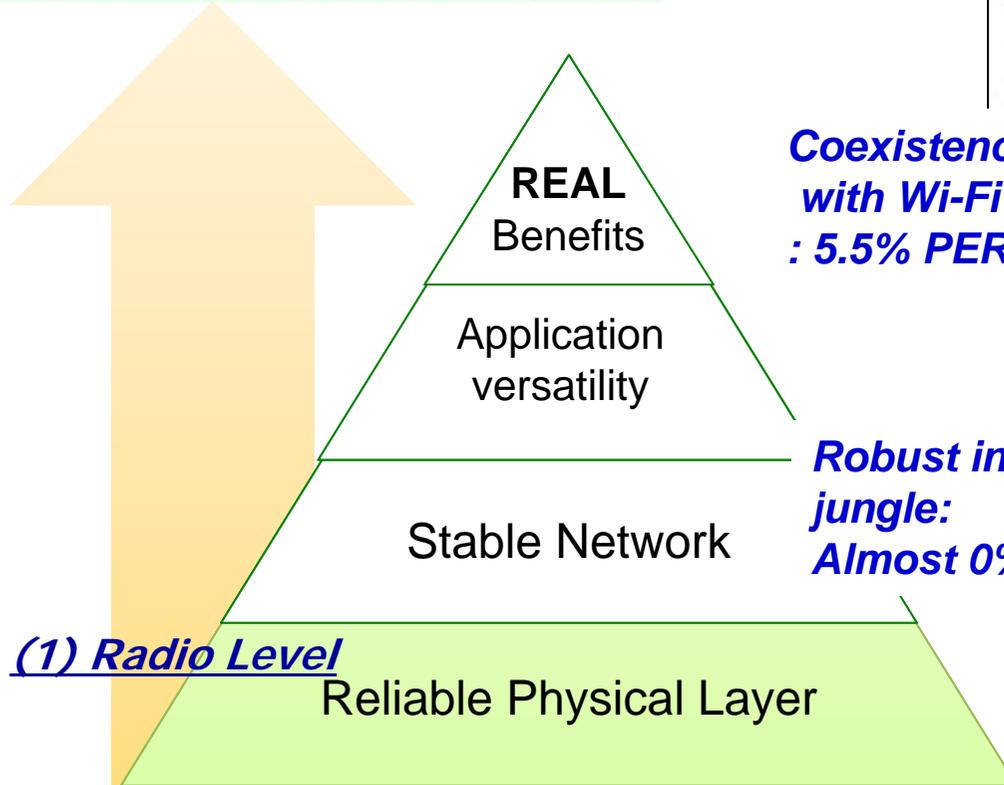


**We are taking bottom-up approach**

# (1) Radio Level

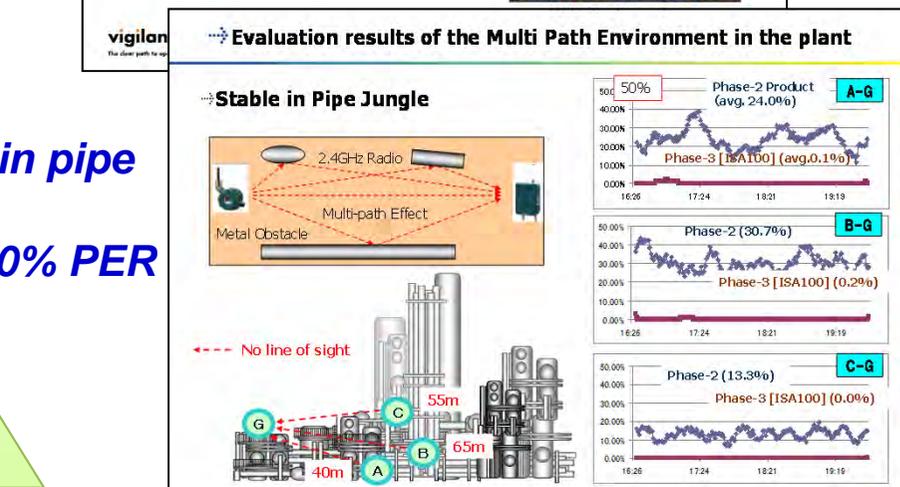
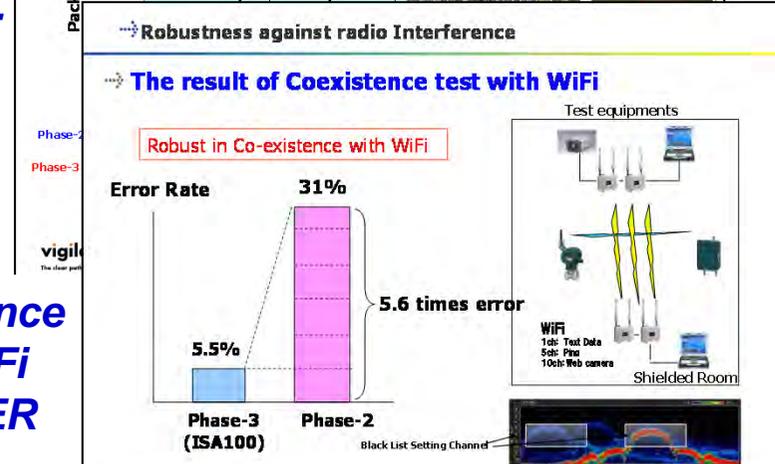
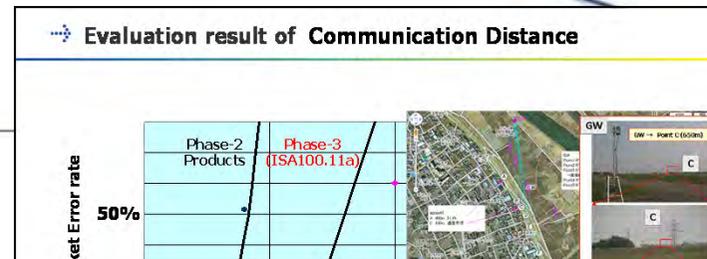


**Long range:  
600m**



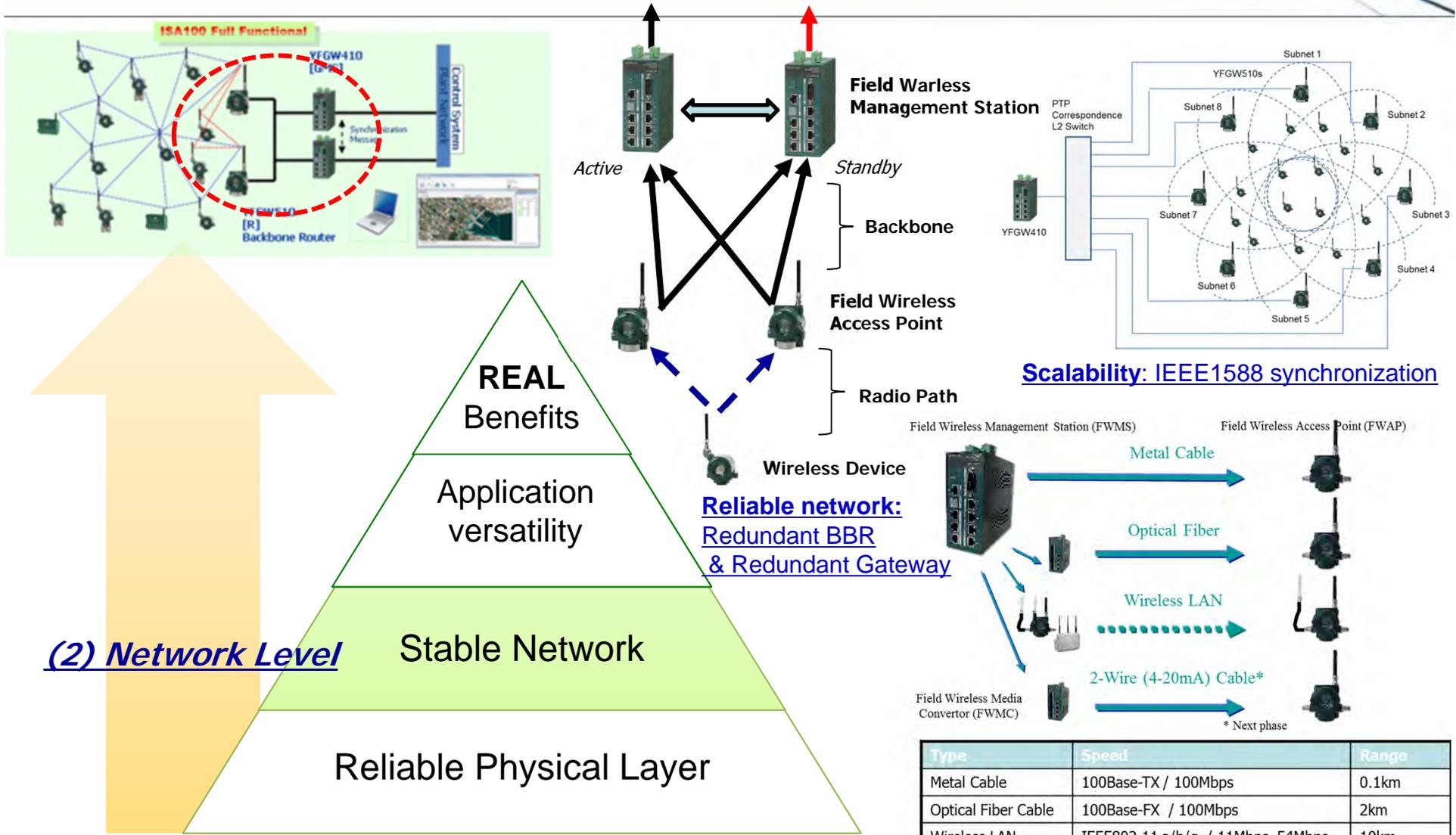
**Coexistence  
with Wi-Fi  
: 5.5% PER**

**Robust in pipe  
jungle:  
Almost 0% PER**



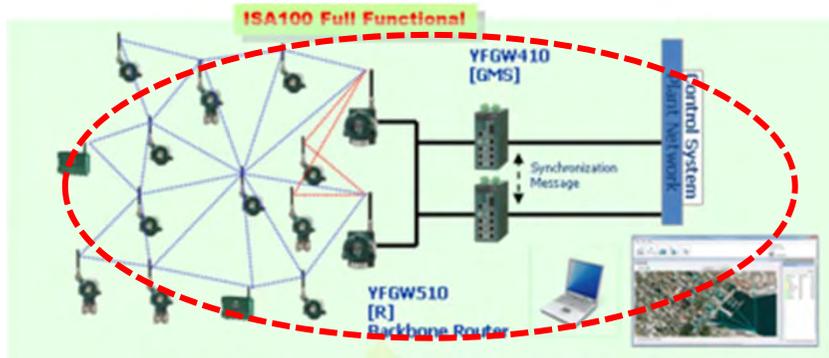
**Reliable radio is basis for stable network**

# (2) Network Level



**Stable network is basis for application versatility**

# (3) Operation Factor



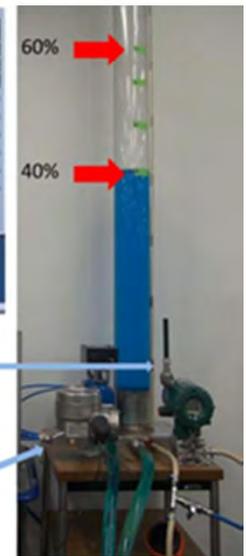
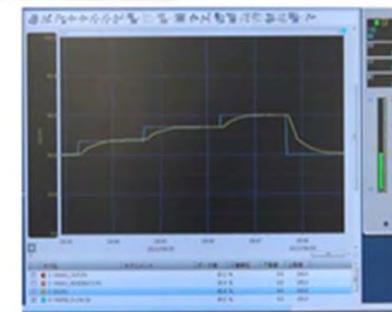
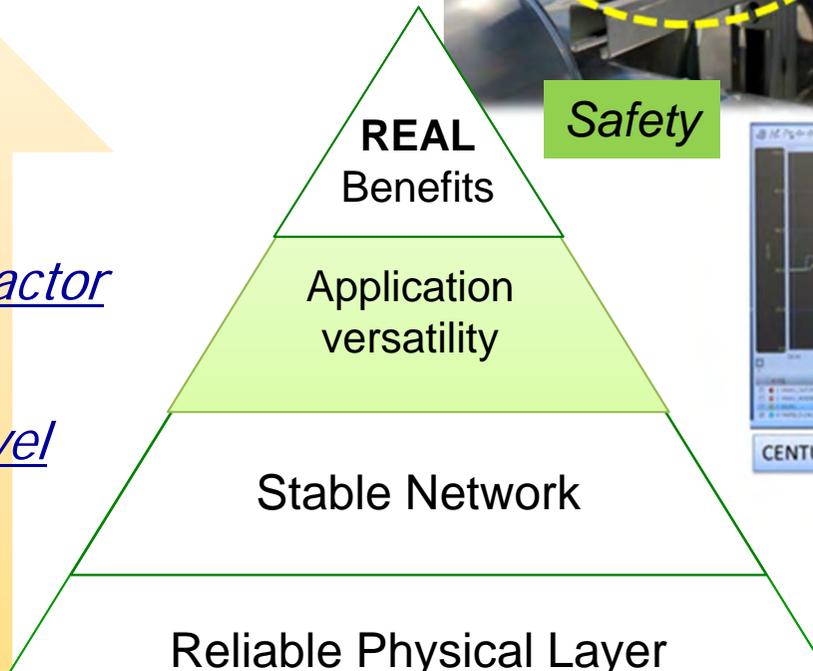
Utilize existing wired field devices

Safety

(3) Operation Factor

(2) Network Level

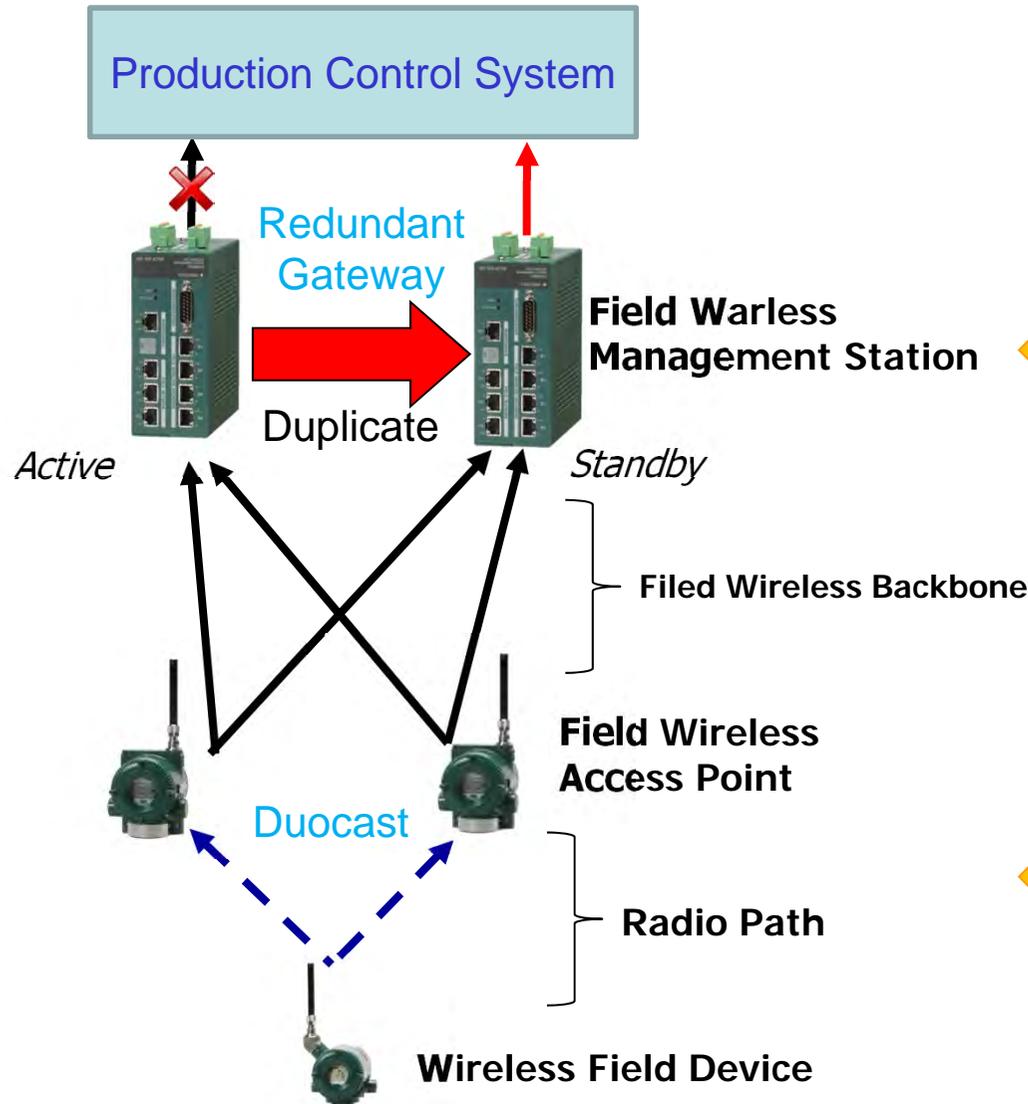
(1) Radio Level



Control

Application versatility provides real user benefits

# Breakthrough for High Reliability and availability Duocast and Redundant Gateway



## Evaluation of Redundancy

### Redundant Gateway

Switch over time is less than one second without any data losses of wireless network

### Duocast

Duocast provides reliable radio communication with short latency

# Breakthrough for large scale network IP base backbone network



Process  
Overview  
Graphics



CENTUM VP

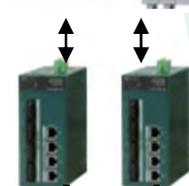


Field  
Control  
Station



**Redundant Gateway  
1 sec Switchover**

ISA100 Full Functional



Element  
Station



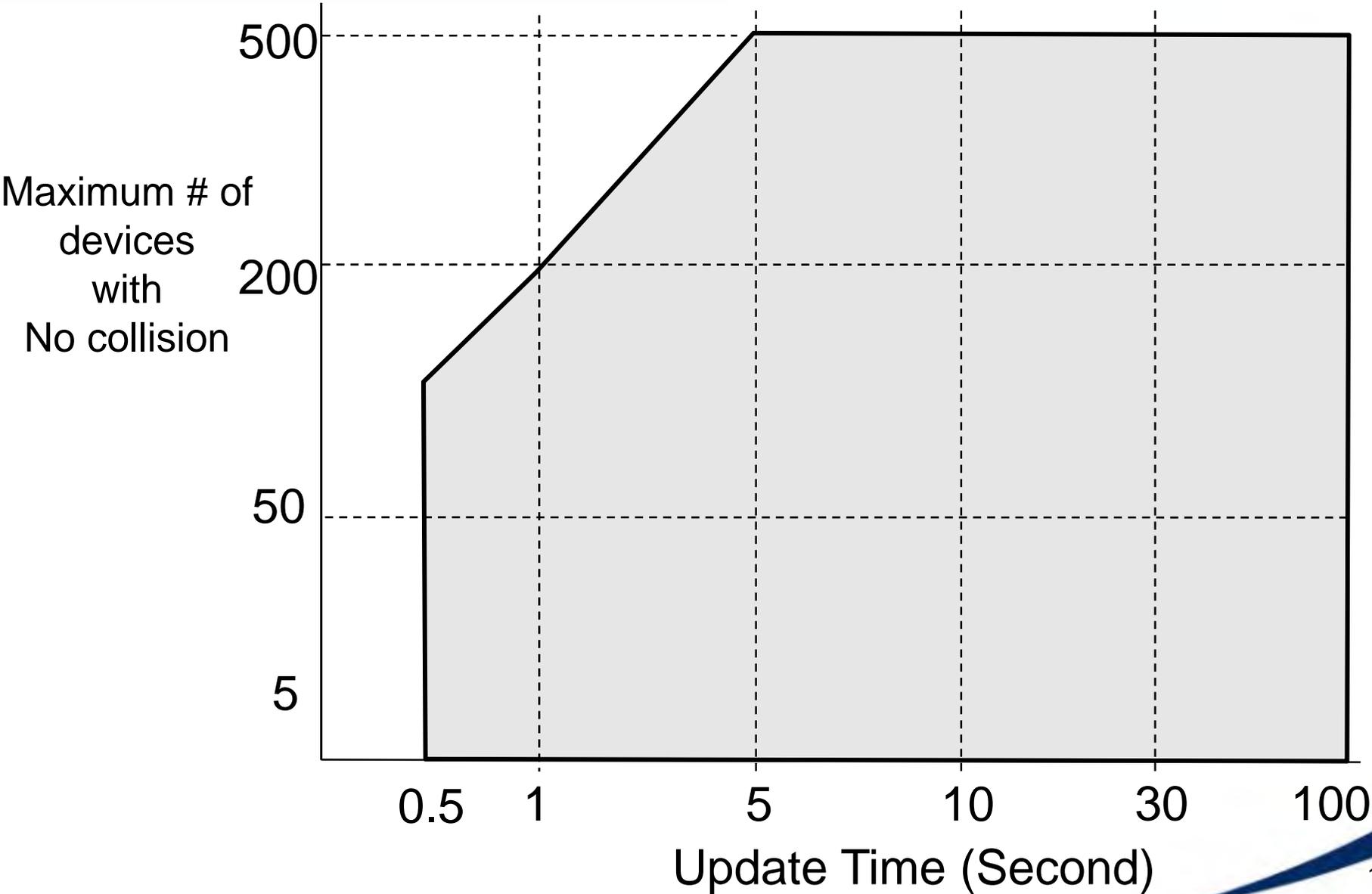
**20 Access Points**

Field Wireless Access Point



**500 devices @ 5sec update  
200 devices @ 1sec update**

# Performance of ISA100 Wireless Network

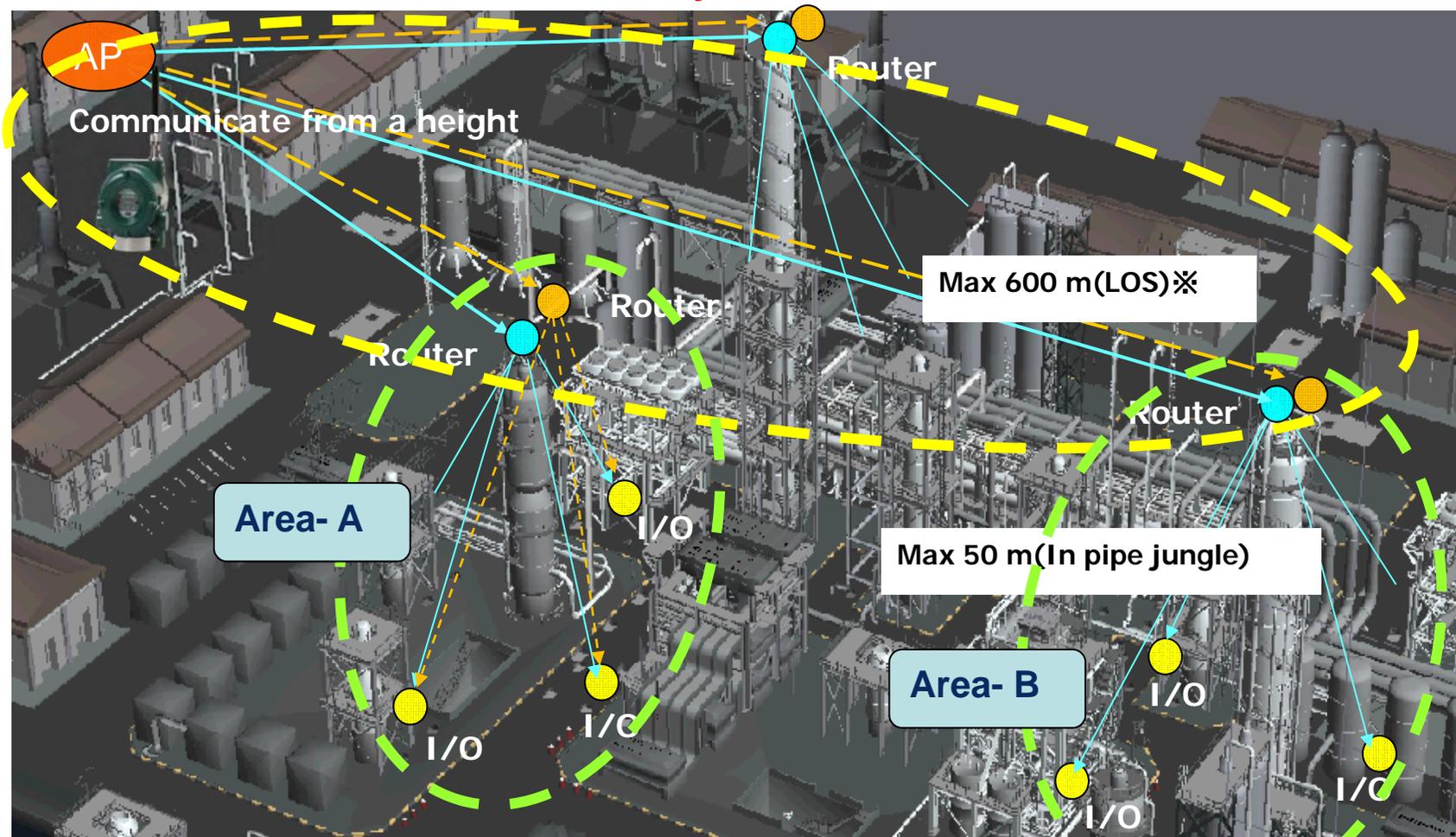


# Breakthrough for stable and scalable network

## “Sky Mesh” concept for wireless installation



Sky mesh enables **Scalable network, low latency, minimized number of routers, deterministic battery life and reliable wireless link**

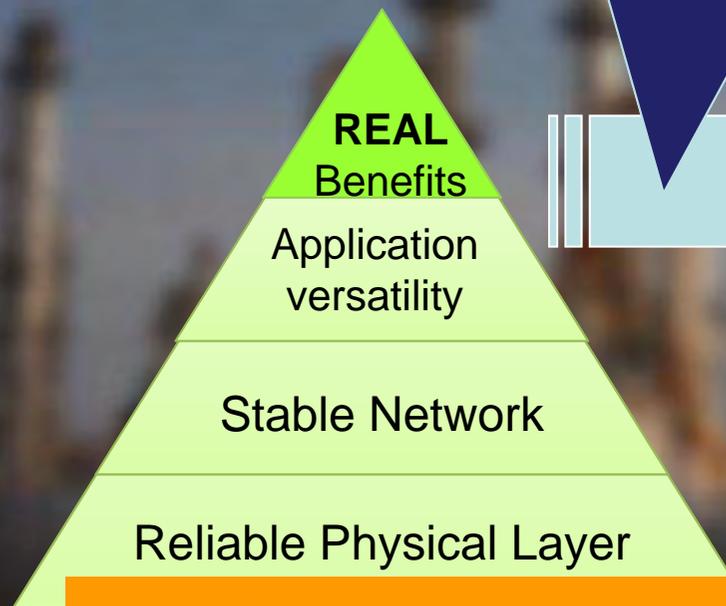


**Simple topology is easy for network management**

# How to utilize ISA100 Wireless technology?



- Widen adaptation of ISA100
- Support 3<sup>rd</sup> vendors with ISA100WCI
- Realize “Best in class solution”

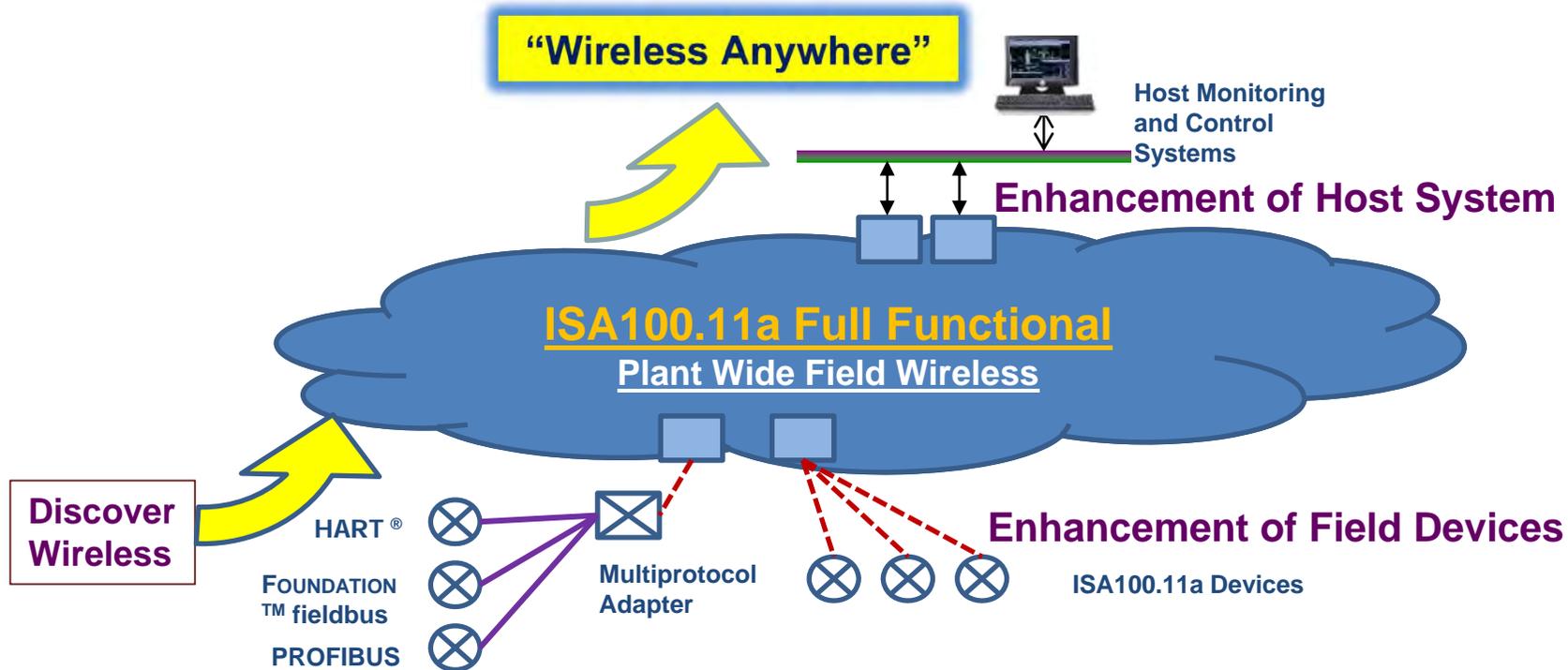


**“Wireless Anywhere” concept is to expand to utilize the ISA100 Wireless network in the field**

# Wireless Anywhere



Next initiative: To utilize the “ISA100 Full Functional”

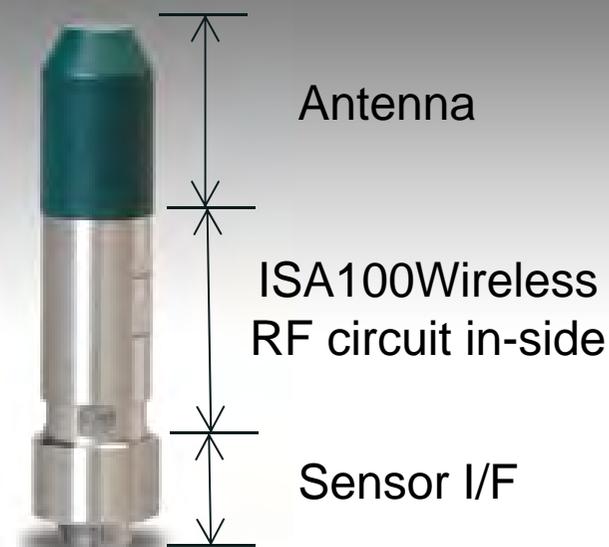


## *Three initiatives of Wireless Anywhere*

- ① **Support 3rd vendors with ISA100WCI**  
→ Modularizing wireless components to accelerate product development
- ② **Widen adaptation of ISA100**  
→ Promoting adoption of the ISA100.11a standard
- ③ **Realize “Best in class solution”**  
→ Facilitating host connectivity for both wired and wireless field networks

# ISA100 Wireless Module with built-in Antenna

Innovative approach and key component  
to realize “Wireless Anywhere”



**Wireless Enabler for 3<sup>rd</sup> party development**  
→ **Modularizing wireless components to accelerate  
product development**

**This is a new movement of industrial wireless**

# Specifications of ISA100 Wireless module



Item		Specifications
Wireless configuration	Communications protocol	ISA100.11a (IEEE802.15.4 compliant)
	Frequency range	2,400 MHz to 2483.5 MHz (max. 16 channels)
	Output	Max. +12 dBm (+2 dBi omni-directional antenna)
Sensor interface	Connection speed	9,600 bps (RS485 compliant)
	Cable length	Max. 20 m
	Input voltage	3.3 V (2.9 ~ 4.8V)
Operational configuration	Enclosure class	IP66, NEMA4x
	Operating temperature	Standard model: -40°C to +85°C Intrinsic safety and explosion protection model: -40°C to +70°C



Note: Specifications may differ depending on when the module is provided. The names of companies, products, and brands in this text are registered trademarks or trademarks of the respective holders

# Benefits for field device manufacturers



## 1. Speeds up development and neglected investments

This module is comprised of an antenna and wireless communications circuitry. By installing this module on a field device that includes components such as an interface circuit and power supply, a field device manufacturers can speed up the process of developing an ISA100 Wireless sensor.

## 2. RF designs are not required

Thus the sensor interface uses serial interface normally used with a plant because the both of antenna and the communication circuitry are installed in the wireless communications module with a built-in antenna, expensive RF cable and connector are not needed.

## 3. Complies with radio regulations and explosion protection standards

Based on its wealth of technologies and expertise in the development of field wireless devices, Yokogawa has been able to design a module that complies with over 100 countries' radio regulations as well as all the major explosion protection standards. Field device manufacturers thus do not need to certify that their sensors meet such regulations and standards, drastically shortening development time.

**This wireless module can help field device manufacturers significantly shorten the time needed for developing wireless field products**

# Neglected investments & 4-20mA like interoperability



Yokogawa provides a built-in antennae with the followings



Neglected investments (\$) + 4-20mA like interoperability of field devices



4-20mA interoperability



Field device manufacturers are easy to provide ISA100 Wireless solution, and focus on their investment to core competence business

# Multi-Protocol wireless adapter



**Multi-Protocol wireless adapter utilizes wired field instruments to function as ISA100 Wireless devices for various applications**

- **Features**

When the multi-protocol wireless adaptor is mounted on a wired field instrument or analytical sensor, the instrument or sensor is able to function as an ISA100 Wireless device. It may be used with any type of wired field instrument or analytical sensor commonly used in plants

- **Support of multiple standards**
- **Battery power source for field instruments and analytical sensors**
- **Environmental resistance**



# Benefits for end uses



## 1. Provide 4-20mA like interoperability

Greater range of field instruments and analytical sensors to choose from.

## 2. Enable best in class solution

Multi-protocol wireless adaptor will greatly facilitate the introduction of field wireless systems with best in class solution.

## 3. Minimize risk for wireless network management

ISA100 Wireless infrastructure provide large scale, high speed and reliable wireless network to support plant wide applications.

## 4. Easy to use wireless

In plants, enabling wired field instruments and analytical sensors to function as ISA100 Wireless devices



# Prototype of ISA100 wireless adapter for SENCOM communication



ISA100 Wireless  
pH/ORP sensor

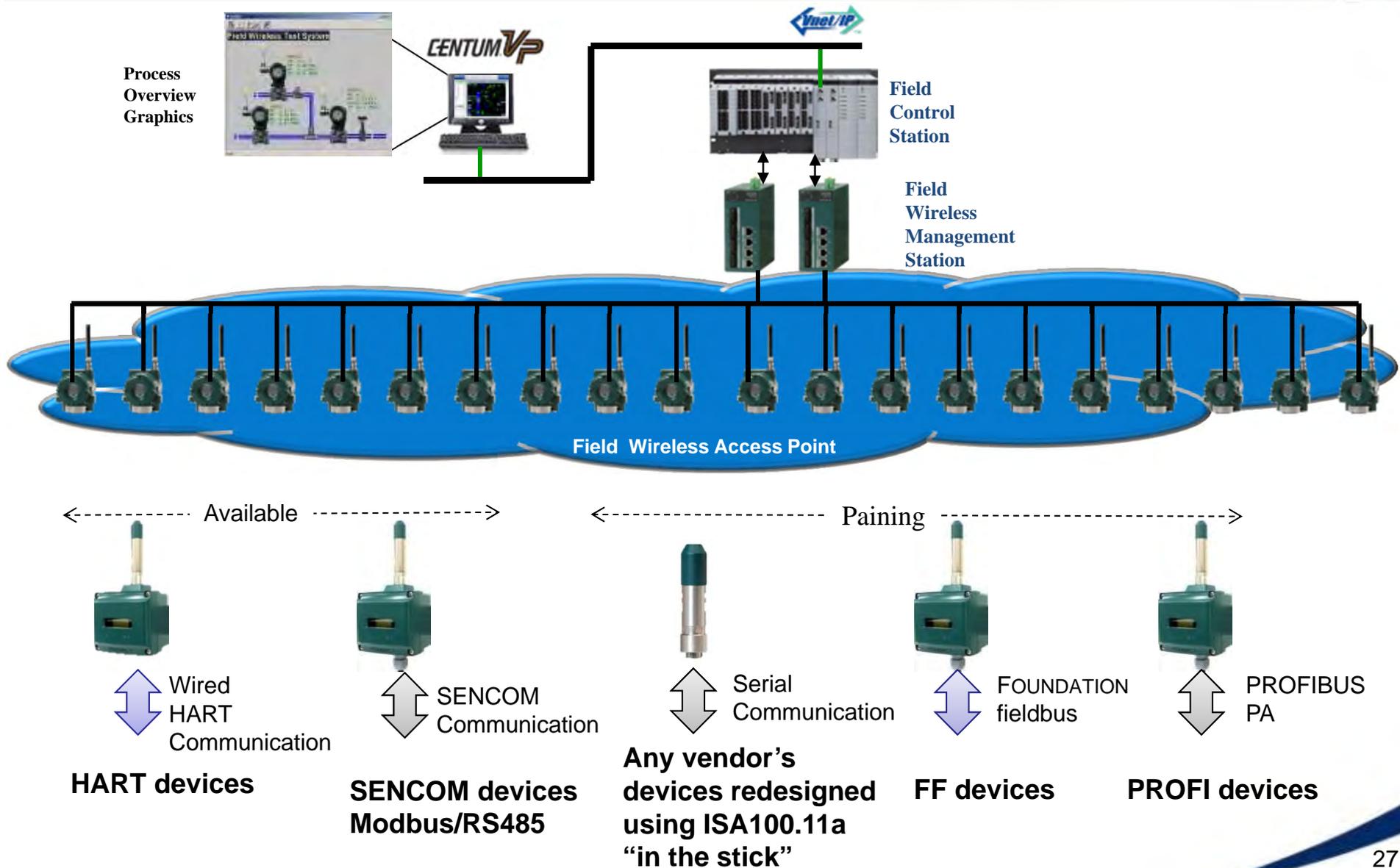


ISA100 Wireless adapter



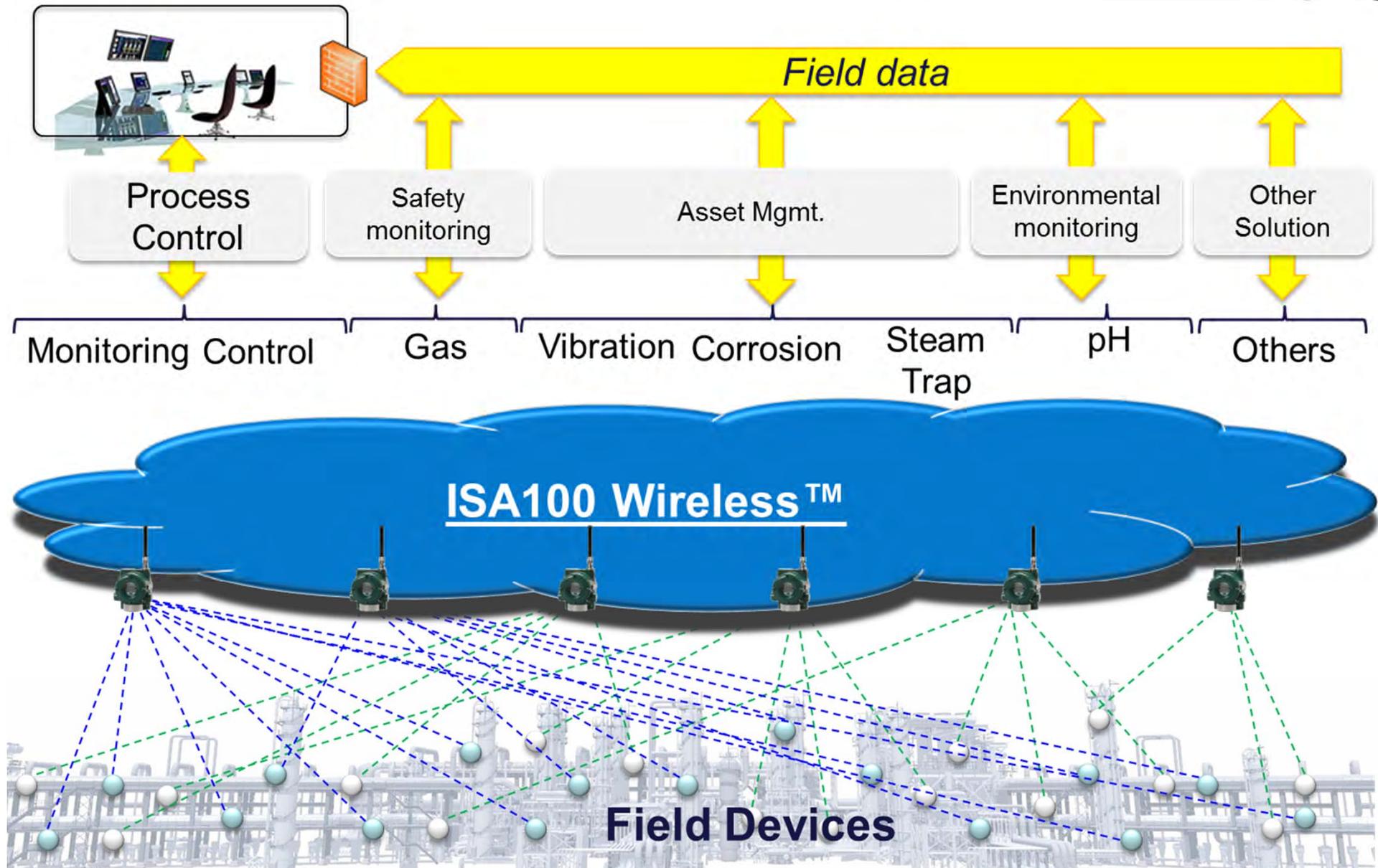
FU20F pH/ORP  
SENCOM sensor

# Easy to support any legacy devices and expand the wireless solution portfolio



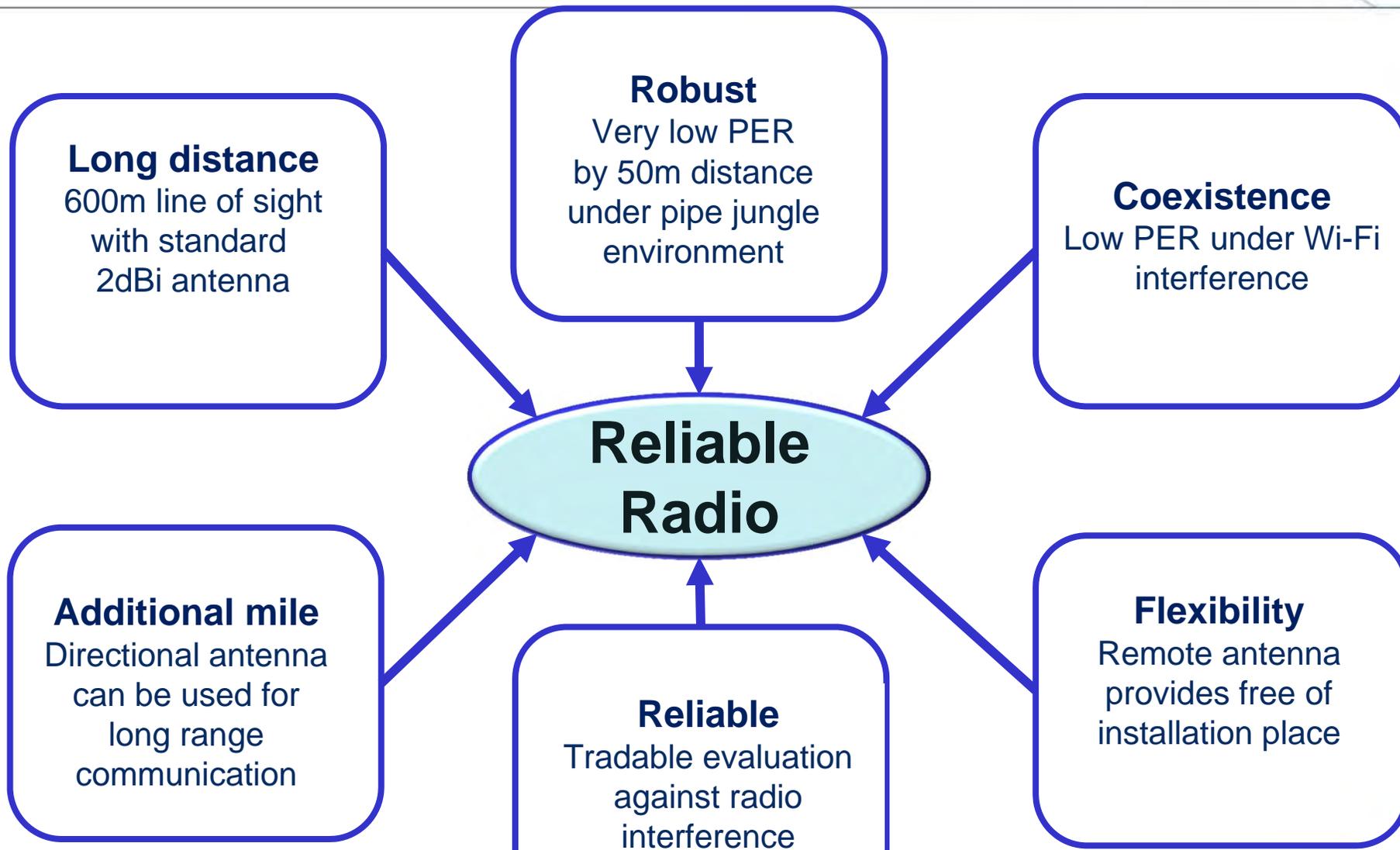
# Wireless Anywhere

is an enabler to gather variety of field data



# Summary of our approach (1)

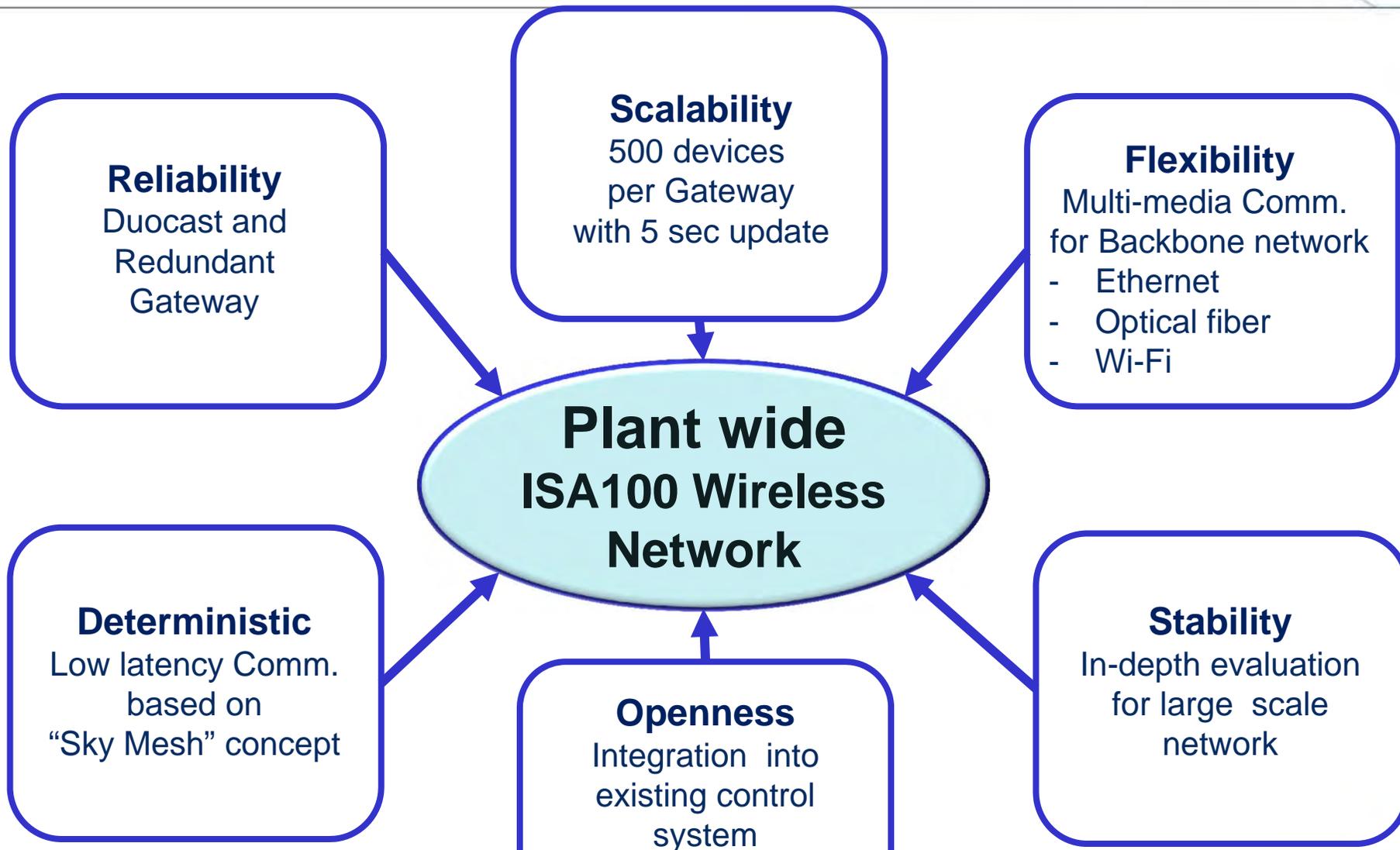
## To commit to Reliable Radio



We evaluated reliable radio thoroughly without compromise

# Summary of our approaches (2)

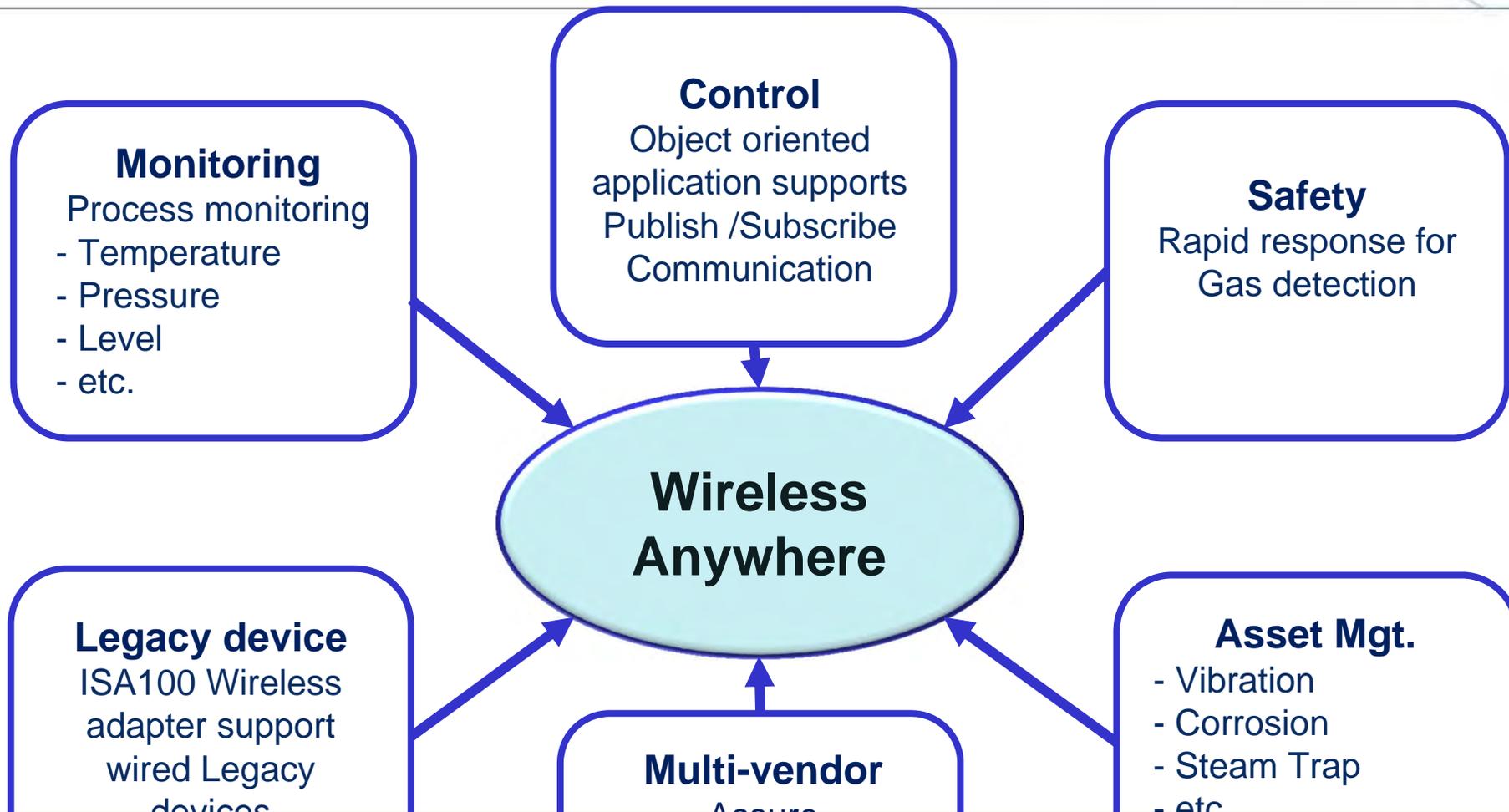
## To provide dependable infrastructure



Plant wide Wireless is an accumulation of many innovations

# Summary of our approach (3)

## To utilize ISA100 Wireless technology



“Wireless Anywhere” facilitates multi-vendor interoperability for best in class solution.  
Why don't you join the ISA100 wireless network!!

# Honored from Frost & Sullivan as 2014 Global Enabling Technology Leadership Award



February 18, 2014 - Frost & Sullivan recognizes Yokogawa with the 2014 Global Frost & Sullivan Award for Enabling Technology Leadership. The concept of a connected industry is increasingly becoming a reality as industries such as oil and gas, chemicals, power, pharmaceuticals, steel, water, mining, food, and beverage move towards a digital operating environment for better connectivity, productivity, and cost effectiveness. This wave of digitization has driven Yokogawa to focus on the concept of **"Wireless Anywhere"** by fusing openness, interoperability, and reliability into a total wireless solution.

# VigilantPlant – Our Vision for the Ideal Plant

**“ A well managed plant is quiet and boring ”**

*- Peter F. Drucker*



**Reduce blind spots**

**SEE  
CLEARLY**

**Avoid surprises**

**KNOW  
IN ADVANCE**

**Preempt bottlenecks**

**ACT  
WITH AGILITY**

We believe this new movement of “Wireless Anywhere” is a key enabler to realize VigilantPlant



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# Thank you for your attention

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