Le potenzialità delle connessioni wireless e i sistemi IOT

Wireless sensors per l'IoT nell'industria di processo

Francesco Zucca

Wireless Expert

Tecnimont Milano – 28 Febbraio 2019

Yokogawa Company

As of January 2017

YOKOGAWA *founded as electric meter research institute*

1915 YOKOGAWA

- 1917 ***First*** electronic meters in Japan
- 1924 ***First*** portable oscillograph in Japan
- 1950 ***First*** electronic recorders in Japan
- 1955
- 1969 ***World's 1st*** vortex flowmeter
- 1965
- 1975 ***World's 1st*** DCS: *CENTUM*
- 1975
- 1991 ***World's 1st*** fully digital transmitter with silicon resonant sensor
- 1985
- 1996 ***World's largest*** DCS-PJT
- 2002 ***World's 1st*** MAC-PJT
- 1995
- 2005 ***World's 1st*** integrated DCS-SIS
- 2005
- 2010 ***World's 1st*** ISA100 compliant field devices
- 2014 ***World's 1st*** smart configurable I/O : CENTUM VP
- 2015
- 2015 ***World's 1st*** compre-hensive security management solution
- 2016

Joined Yokogawa

KBC Advanced Technologies

founded as independent oil & gas consulting and technology company

1979

- 1986 Petrofine simulation software
- 1997 Went public on London Stock Exchange
- 1998 Profimatics SIM models
- 2004 ***World's 1st*** total refinery flowsheet simulator Petro-SIM
- 2006 Acquired TTS & Veritech
- 2014 Acquired FEESA

Industrial Evolution

founded as cloud –based data sharing service provider

1999

- 2002 ***World's 1st*** DaaS for Oil & Gas
- 2005 ***World's 1st*** DaaS for Chemical
- 2012 DaaS for Energy

SOTEICA VISUAL MESA

founded as modular energy system analyzer and energy management technology company

1981

- 1989 Energy optimizer
- 1992 Energy management & supply-chain management
- 2011 Multi-period optimization

Tokyo, Japan–February 1, 2017

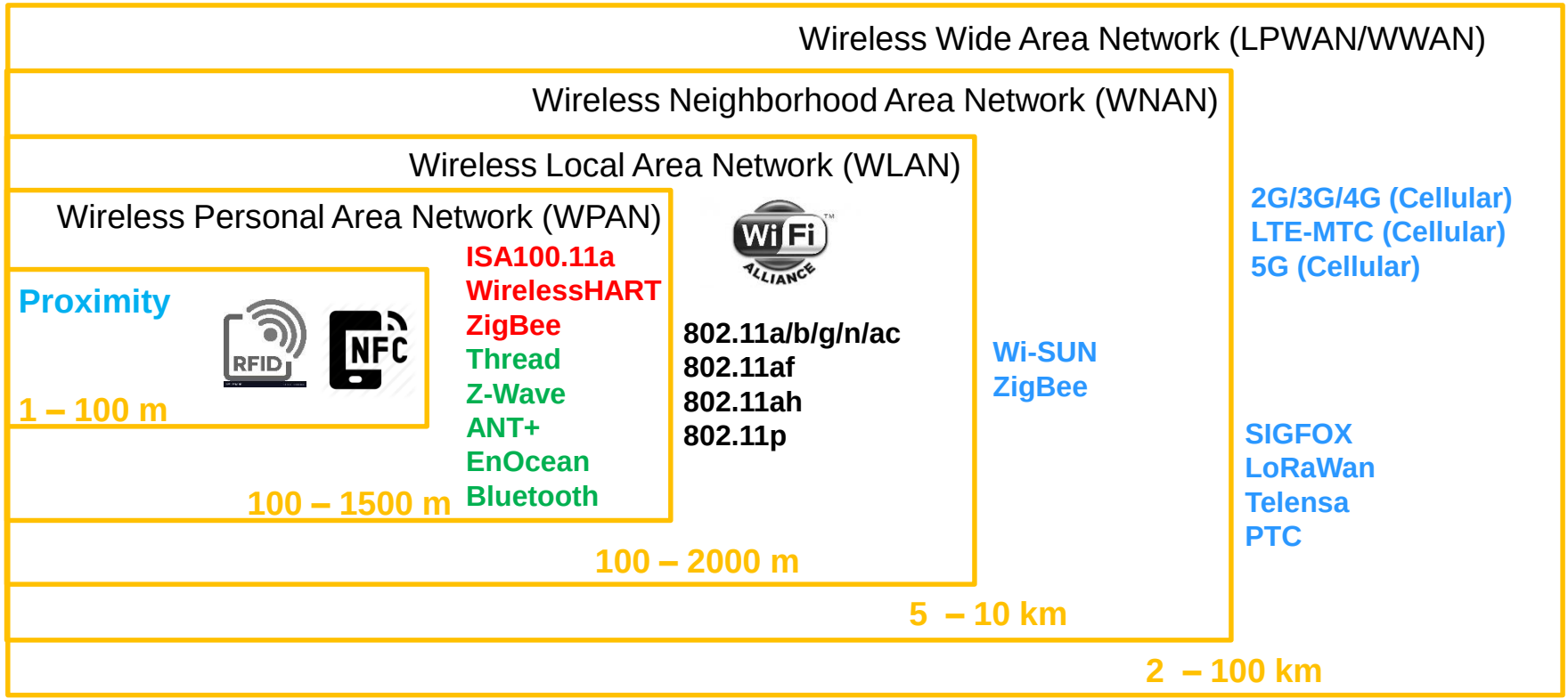
Yokogawa Collaborates with Four Companies to Develop IIoT Architecture

–Expanding the use of IIoT to help our customers run their businesses more efficiently–

Yokogawa Electric Corporation announces that it will work with Microsoft Corporation, FogHorn Systems, Inc., Bayshore Networks, Inc., and Telit IoT Platforms, LLC to integrate their technology into an industrial IoT (IIoT) architecture for the delivery of new services. With this architecture, Yokogawa aims to transform its business model, expand its business scope, and help its customers run their businesses more efficiently.

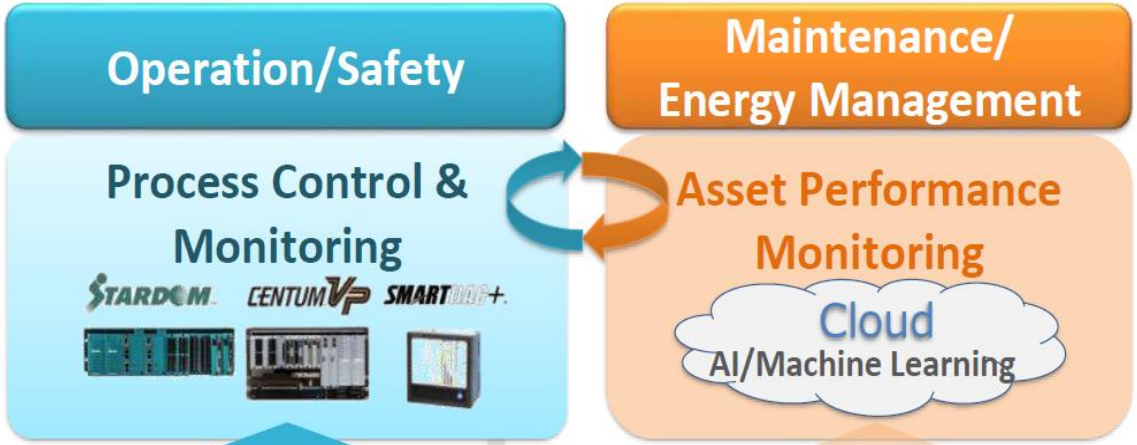
Microsoft FOGHORN Telit YOKOGAWA BAYSHORE

The world of Wireless



Building Automation/General IoT app | Process Automation | Smart City app & industrial monitoring long distance

Yokogawa IIOT Approch



- Enhance process monitoring
- Reducing blind spots make plant operation more efficient and safer

- Digitize asset condition to be utilized for predictive maintenance
- Assist effective patrol work

Technologies

ISA100 History

- ISA100.11° born in 2005 that set the standards and takes care of the implementation of wireless systems for automation and control
- 2009 born WCI for wireless testing and Interoperability cert.
- ISA100.11 in 2014 become standard IEC62734

f

Why Yokogawa selected LoraWan for IIOT app ?

Low Power, Wide Area Networking protocol (LPWAN)

Yokogawa is an adopter of the Lora alliance
See also https://lora-alliance.org/ more of 500 companies selected LoraWan
Main features

- Long range (deep indoor coverage, star topology)
- Maximum lifetime (low power optimized)
- Low cost (low cost end node)
- No Royalty
- High level of security EAS128
- Easy installation
- Global coverage
- Interoperability certification

DEKRA Certification Japan

DEKRA

LoRa Alliance

Test report No:
NIE: 420136900.002

Test Report
LoRa Alliance End Device Certification Requirements

Identification of item tested	:	LPWAN Sensor
Trademark	:	Yokogawa Electric Corporation
DUT	:	420136900_XS770
Model or type reference	:	XS770A
Final HW version	:	S1.01
Final SW version	:	N/A
Final FW version	:	R1.01.01
Standard	:	LoRaWAN specification V1.0.2 for AS 923MHz ISM Band
Manufacturer	:	Yokogawa Electric Corporation
Test method requested	:	LoRa Alliance End-Device Certification Requirements for AS923MHz ISM Band Devices ver1.1
Test Spec Errata(s)	:	v1.1/2017-07-19
Test procedure(s)	:	LoRaEndDeviceCertificationAS923v11
Summary	:	IN COMPLIANCE
Approved by (name / position & signature)	:	Miguel Delorme Manager
Date of issue	:	2018-02-09
Report template No	:	FLO001_01

Yokogawa wireless technology

Protocols	ISA100 WIRELESS COMPLIANCE INSTITUTE	LoraWan
System	500 (1 Gateway)	1000(1 Gateway) network 65000 nodes
Distance	600m, 1.5 km, 5km	1 km, 15 km (Free without cost)
Technology	6LOWPAN (IPV6)	LPWAN (Node)
Reliable Network	Mixed ,Star, Mesh	Star
Redundant	Full Redundant System	No renduntant system
Update Time	0.5sec max	1 min
Application Class	1 critical close loop, 2 control ,3,4,5	Class 4/5 monitoring
GW Interfaces	Modbus/TCP, RTU, Cloud	Cloud,OPC UA,MODBUS,MQTT
Security	EAS128,TAI,MIC,Autentication, TH	EAS128,64 bit UI, MIC
Frequency	2.4 Ghz Time Hopping	EU 863..870,US 902..928, CN 779..787, EU 433, AU 915..925, IN 865..869

Global Radio Coverage

Sushi Sensor Specification

Sushi Sensor®
XS770A
(Vibration+ Surface Temperature)

LoRaWAN CERTIFIED

(AS923 for Japan)

As of October 2018:
- AS923 (Japan) model is available.
- Other regions are TBD.

Unified machine management all over a plant.

- Scalable LoRaWAN is supported.
- Expected communication distance: 7km (Line of sight)
  - 1km is expected even in a plant area.
- Explosion proof (Japan TIIS model will be available soon)

4 years battery life (update period: 1 hour)

- Frequency range: 10Hz ~ 1kHz
- Temperature range: -20 ~ 85 degC
- Data Update Period: 1 min to 72 hours

ISO 10816-1

Collaboration with cloud (GRANDSIGHT™)

- Configuration, data monitoring and storing.
- Utilize it for plant maintenance optimization using AI[*].

[*] Future plan

Sushi sensor specification

- Environmental resistance for industrial use.
- Long term battery operation and explosion proof are supported by LoRaWAN low power features.

Environmental Resistance

- Water-proof, Anti-dust(IP66/67)
- Explosion Proof [**]
- Operation temperature range from -20 to 85 degC

ISO 10816-1

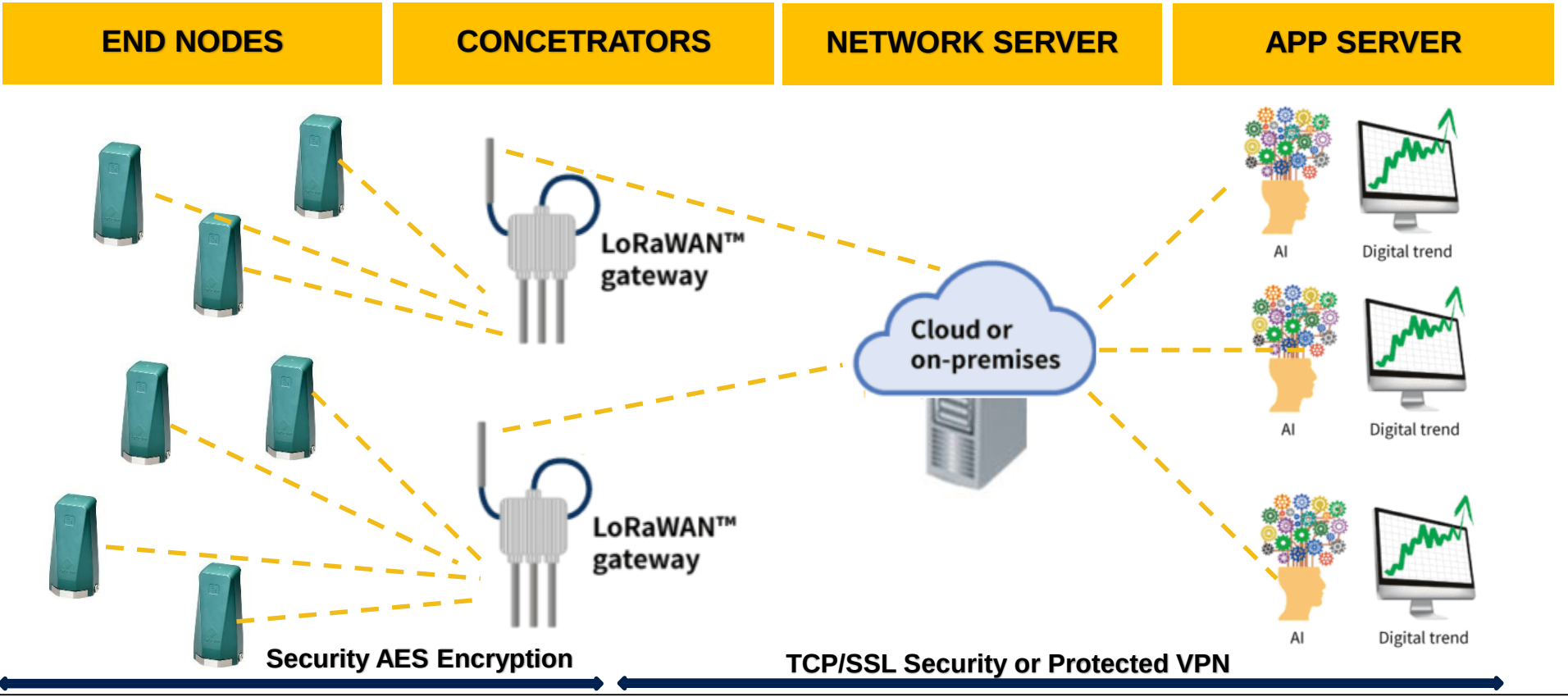
[*] Depend on environmental conditions
[**] TIIS (Ex Certification in Japan)

Long Battery Life

Data Update Period (Z-axis & Temp)	Estimated Battery Life
10 mins	1 year
30 mins	3 years
1 hour	4 years
3 hours	5 years
10 hours	6 years

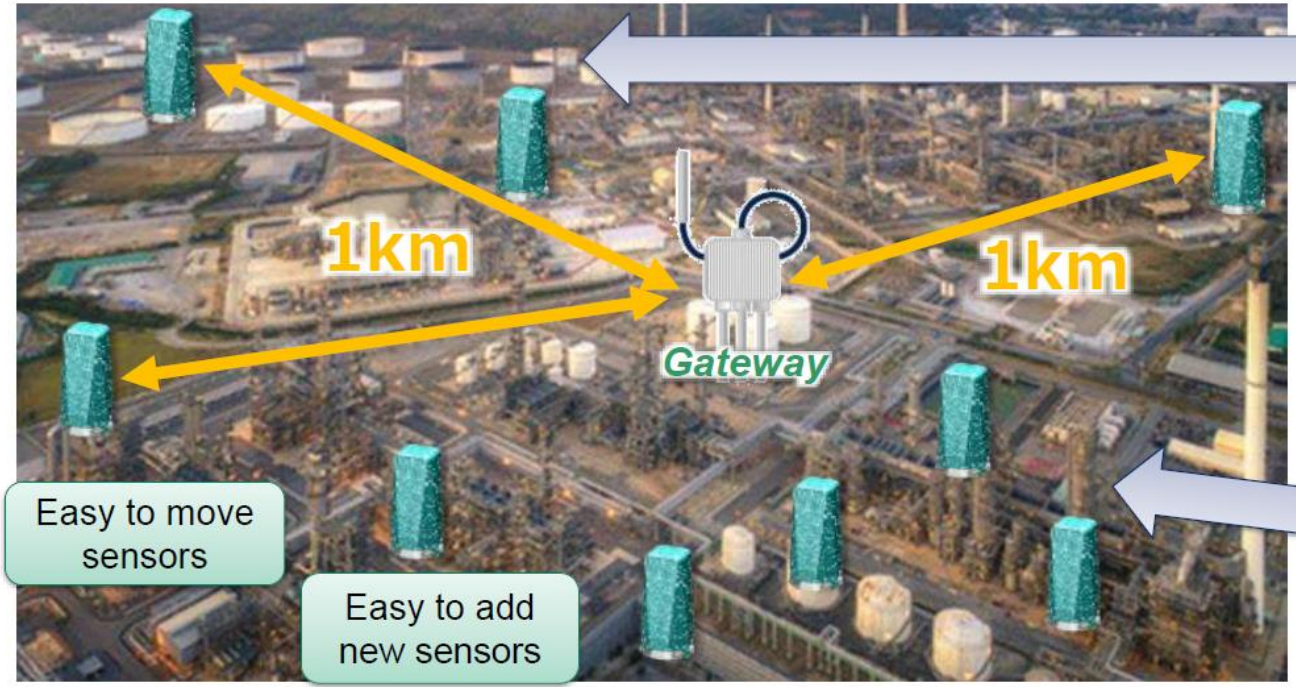
Interchangeable Battery

Network Lora



Network LoraWan

- 1km communication is expected even in heavy congested production facilities.



Tank yard

Heavy congested facility

Sushi sensor activation

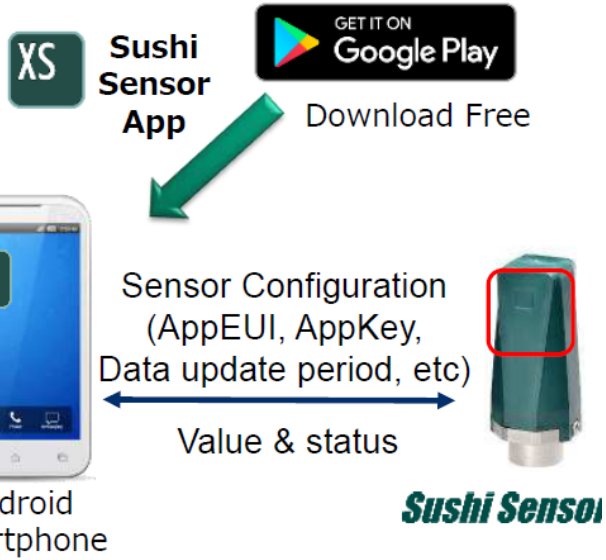
- Sushi Sensor App (Download free smartphone application)
  - NFC (Near field communication) is used between the app and a sensor.
  - Sensor configuration (incl. LoRaWAN configuration)
  - Sensor value & status confirmation

Top Screen

Sensor Value

Sensor Status

Key Installation



Applications

Applications – Asset Monitoring

ELECTIC MOTOR

PUMPS

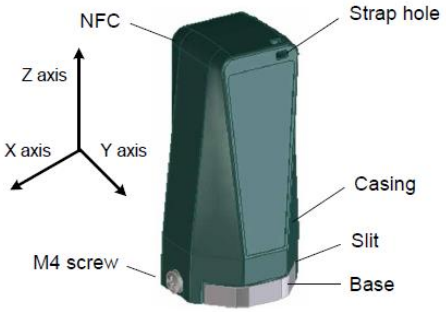
FAN

COMPRESSOR

GEAR BOX

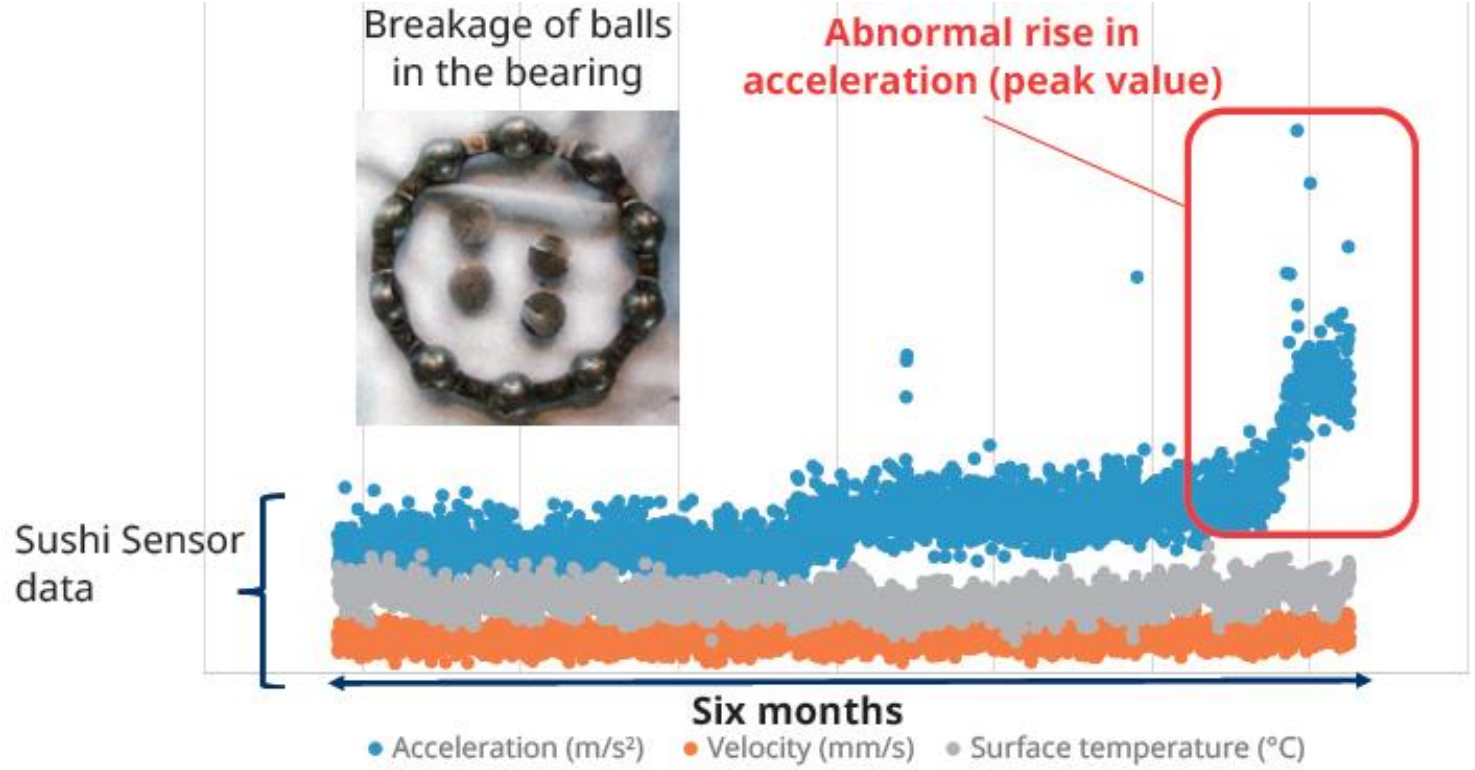
PIPELINES

- Machine Learning for Achieving Condition-based Maintenance (CBM)
- Automatic Data digitalization, trend Monitoring and data collection
- Automatic anomaly detection
- Reducing the loads to operators



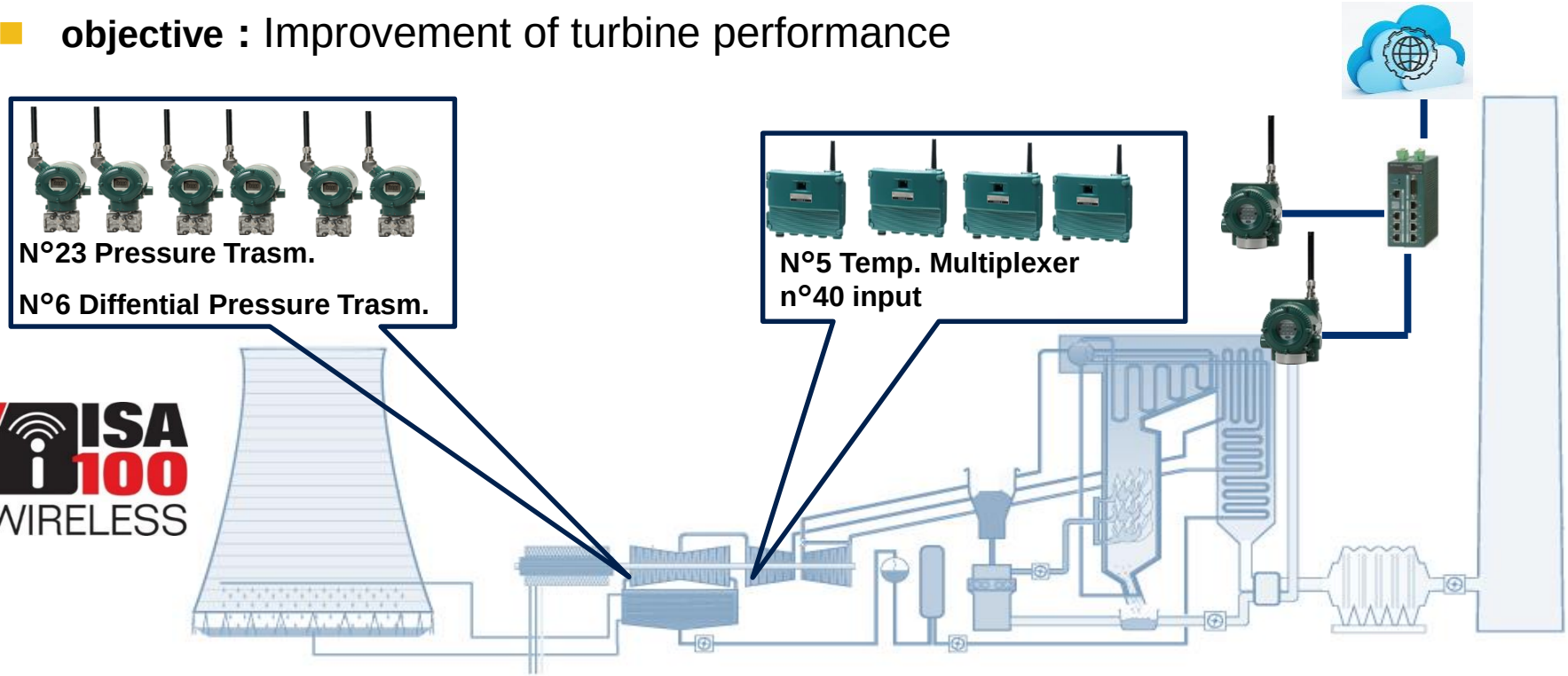
XS770A Sushi Sensor

Asset Monitoring

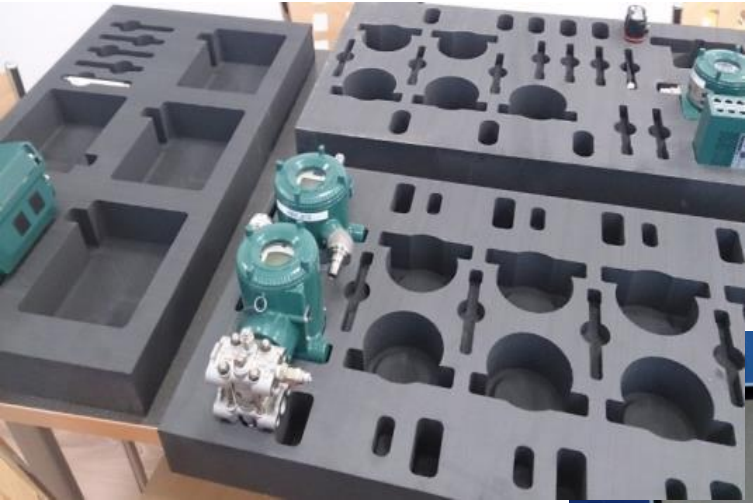


Check KPI of steam turbine

- **Problem:** Find a easy solution to implement the KPI monitoring system
- **objective :** Improvement of turbine performance



Yokogawa Solution



Benefit

Customer Benefit

- Reduce maintenance costs
- Check the components and extend the guarantee
- Improve performance
- Reduce energy consumption

Wireless Benefit

- Easy installation, Mounting in parallel with normal instrumentation.
- No costs for cable ducts, cables, detailed engineering, DCS operating costs, etc
- Reuse of assets once finished the months of testing
- Digital Multisensing Instrumentation, High Speed Instrumentation 0.5 sec duo cast

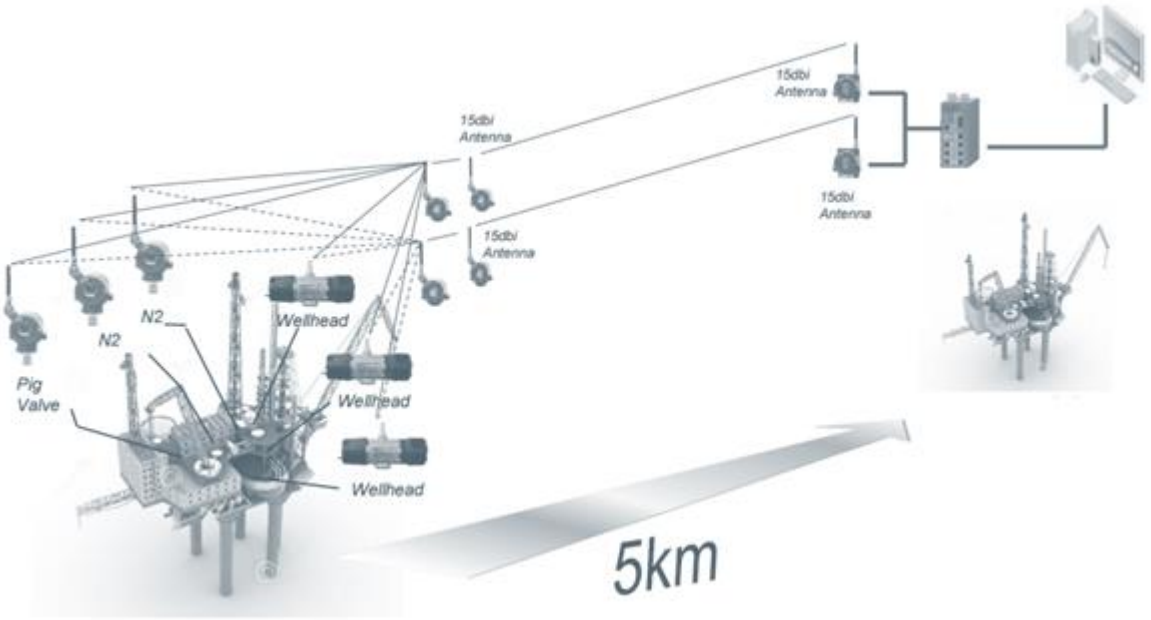
IoT benefit

- Real time data
- Share data with third-party companies
- Data access remotely

Remote platform monitoring

- Platform not attended by personnel
- **Problems :**Distance beetwenn two Platforms is > 5km,hard environment, congested metallic structure
- **Objective :**Reduction of HSE risks for operators, Redure the cost of maintenance

ISA 100 WIRELESS



Benefit

Customer Benefit

- Reduce maintenance costs
- HSE decrease operator risks
- Reduce the load of operators

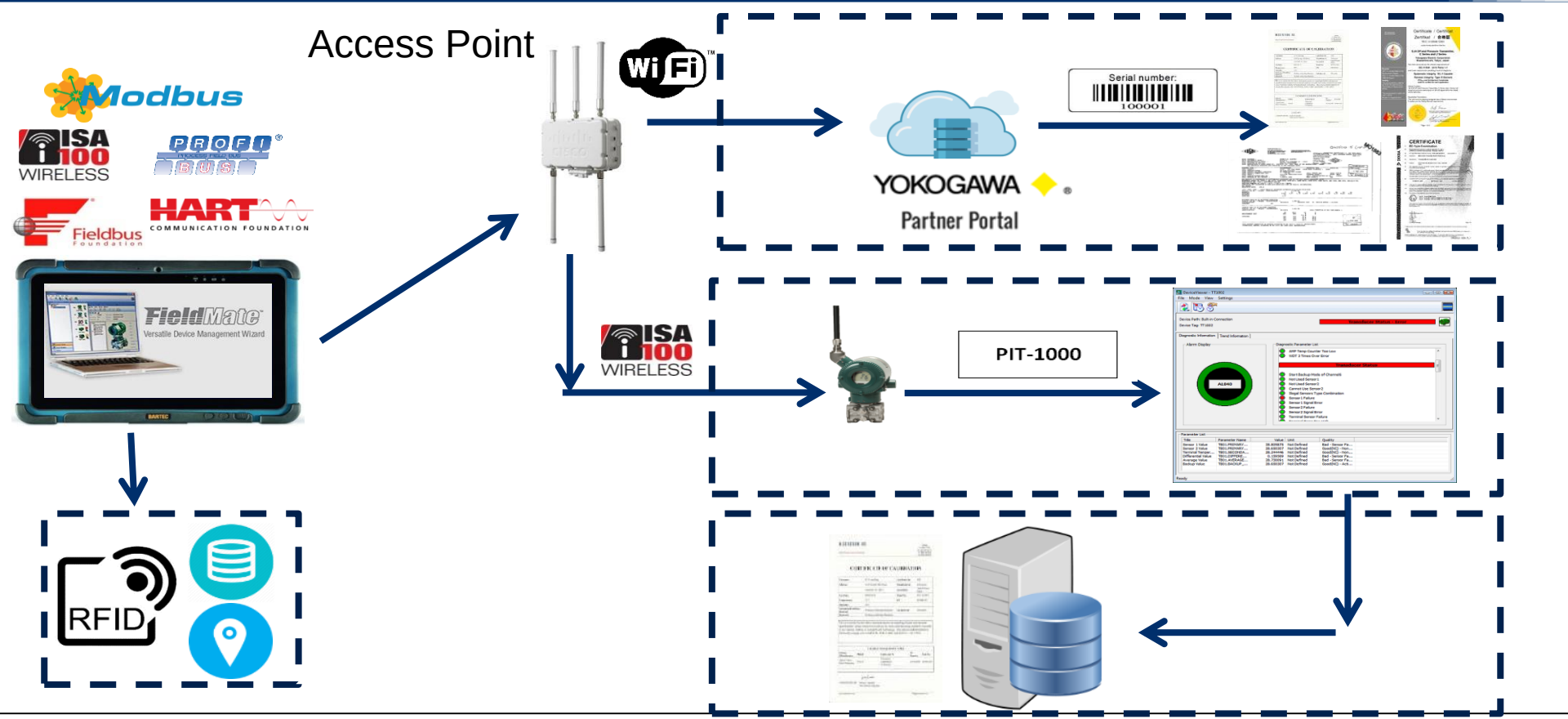
Wireless Benefit

- Easy installation, Mounting in parallel with normal instrumentation.
- No costs for cable ducts, cables, detailed engineering, DCS operating costs, etc
- Reuse of assets once finished the months of testing
- Digital Multisensing Instrumentation, High Speed Instrumentation 0.5 sec duo cast

IoT benefit

- Real time data
- Share data with third-party companies
- Data access remotely

Digitalizzation avantage in Instrum. Maintenance



Grazie dell’attenzione