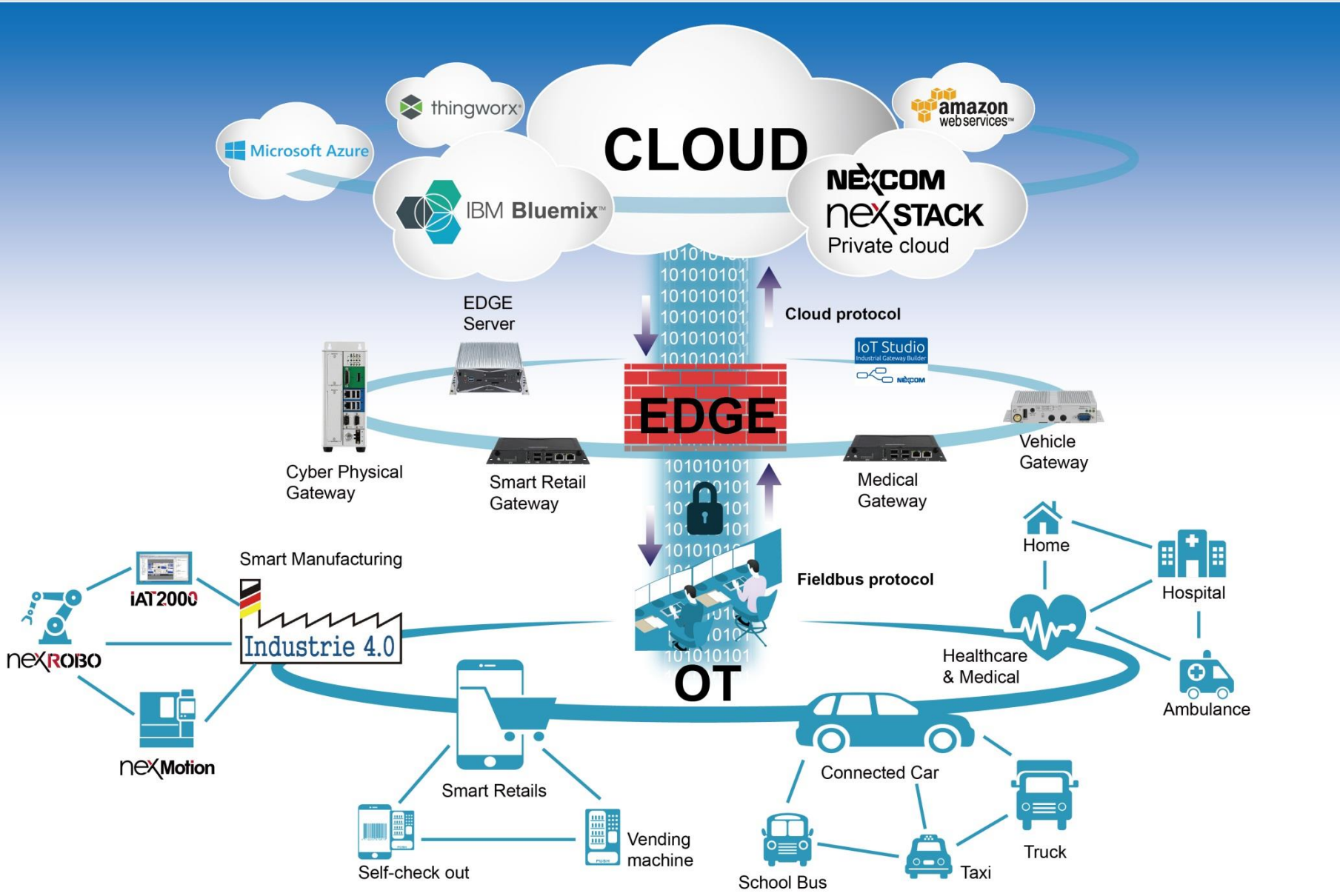
NEXCOM
The Intelligent Systems

Hybrid Mesh Ensures the Reliability of ISA100 Connectivity

YC Cheng

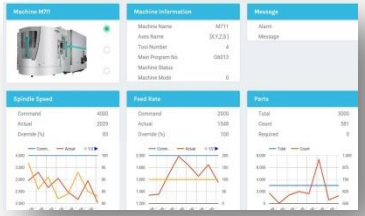
Oct., 3rd , 2017

NEXCOM's Value Proposition



NEXCOM Automation System Diagram

Cloud Layer



CNC Dashboard

SCADA Layer

SCADA

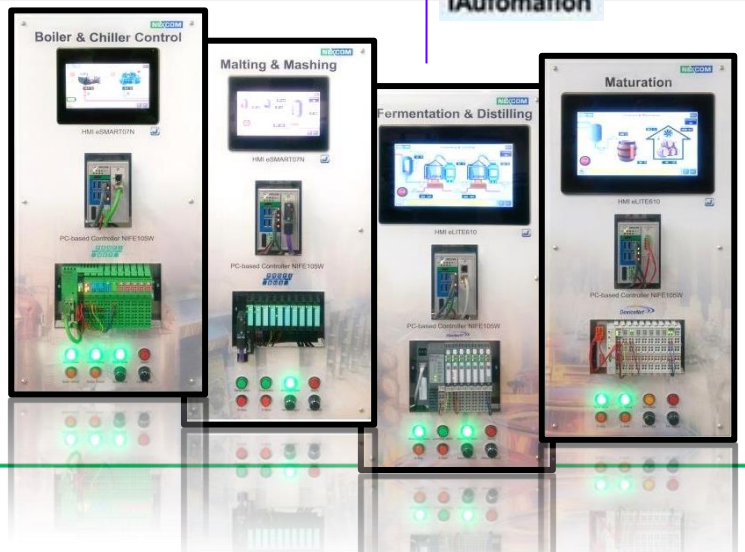
IoT Studio
Industrial Gateway Builder
NEXCOM

OPC UA
MQTT

IIoT Gateway
CPS Series

iAutomation

Control Layer



nexMotion
EtherCAT

NControl

Focas
Modbus/TCP

nexROBO

EtherNet/IP
PROFINET

ISA100 WIRELESS

NIO20I

ISA100 Adaptor

GRC

Industrial Wireless in Ex Industries

- Keep people, plants and the environment safe
- Improve plant and asset reliability
- Optimize through efficient employees, equipment and processes

ISA100.11a (IEC 62734) user cases

- Improved control of plant steam supply by detecting "cool spots" in cross plant steam lines
- Reducing risk of overfilling tanks by adding redundant level measurements (in oil and petroleum refineries)
- Monitor and control safety valves
- Monitor and control pressure and temperature of process fluids and gases

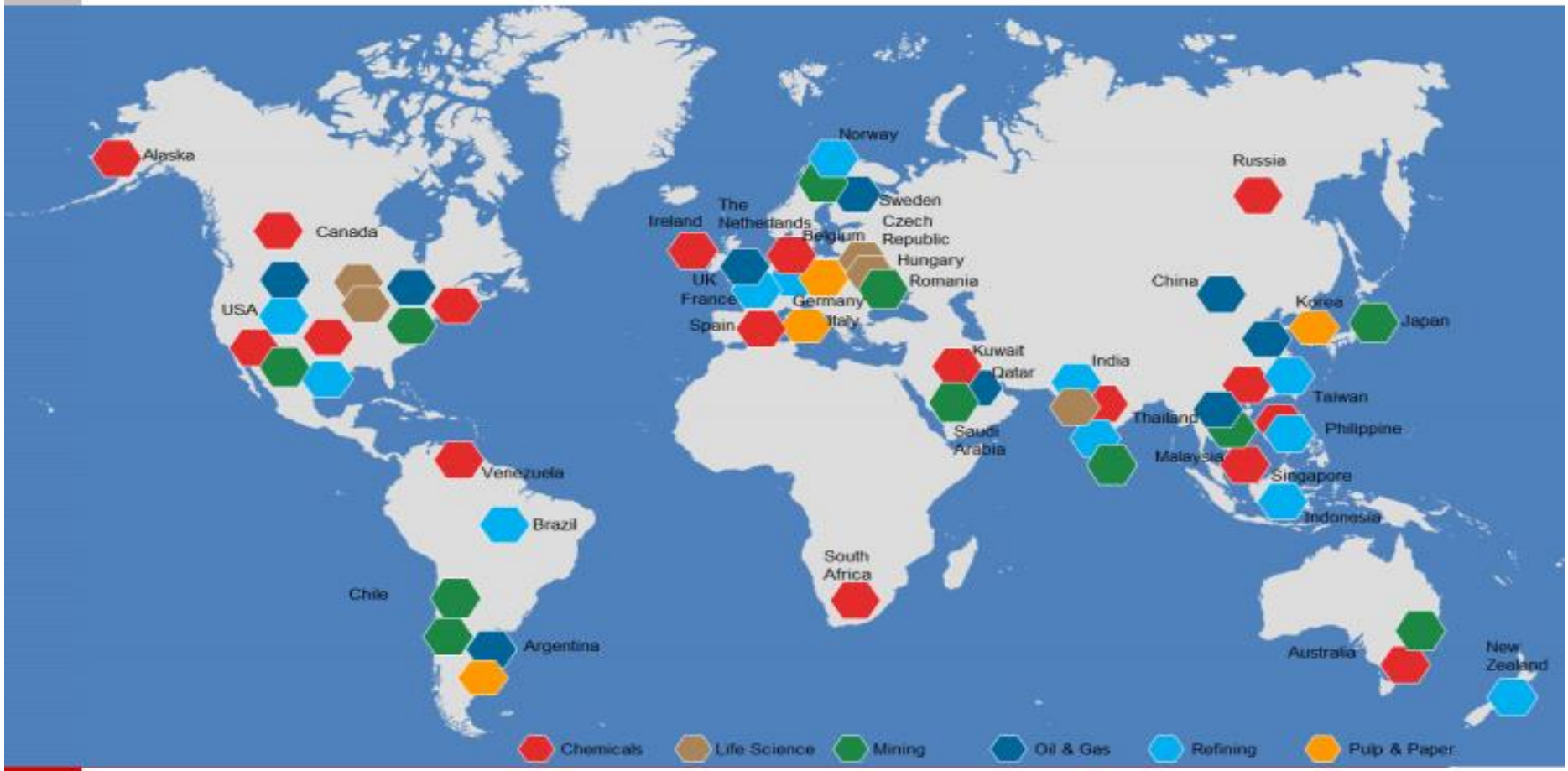
Usage Classes for ISA100a (Class2~Class5)

Safety	**Class 0 : Emergency action** *(always critical)*	Importance of message timeliness increases ↑
Control	**Class 1: Closed loop regulatory control** *(often critical)*	
	Class 2: Closed loop supervisory control *(usually non-critical)*	
	Class 3: Open loop control *(human in the loop)*	
	***NOTE:* Batch levels* 3 & 4 could be class 2, class 1 or even class 0, depending on function** *****Batch levels as defined by ISA S88; where L3 = "unit" and L4 = "process cell"*	
Monitoring	**Class 4: Alerting** *Short-term operational consequence (e.g., event-based maintenance)*	
	Class 5: Logging & downloading/uploading *No immediate operational consequence (e.g., history collection, SOE, preventive maintenance)*	

Market

ISA100 Wireless Global Installation Map

Many Billions of Operation Hours



Examples of Ex Industries Covered

- Automotive, Train Refuel Stations or Petrol Station
- Oil & Gas Extraction, Drilling Ships
- Oil Refineries, Rigs, & Processing Plant
- Gas Pipelines and Distribution Centers
- Petrochemical & Chemical Processing Plants
- Printing Industries, Paper and Textiles
- Marine, Aircraft Refuel and Hang
- Hospital Operating Room
- Surface Coating Industries
- Underground Coal Mining
- Sewerage Treatment Plant
- Sugar Refineries, Storage, Packaging and Distribution
- Metal Surface Grinding, Especially Al dusts and Particles
- Woodworking Areas, Furniture Manufacturer
- Grain Handling and Storages and Processing
- Transportation
- Pharmaceuticals
- Food Processing



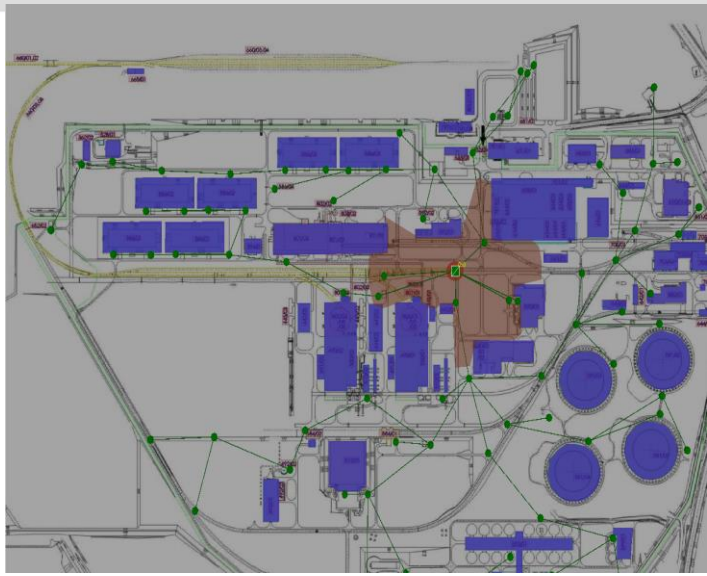


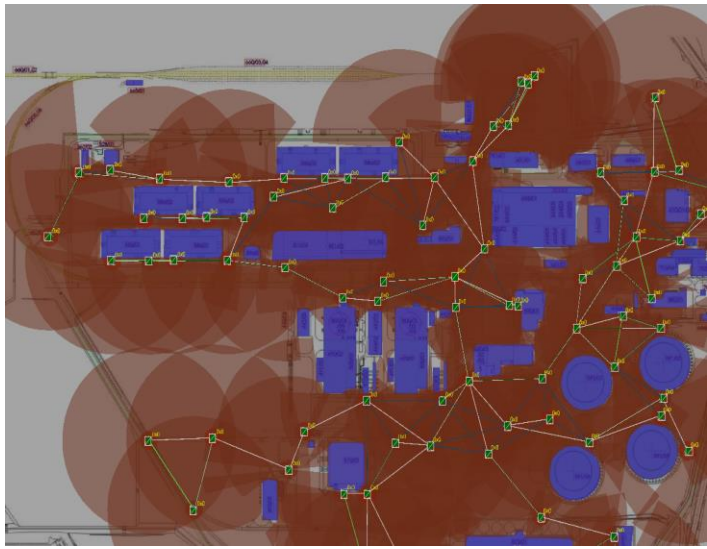




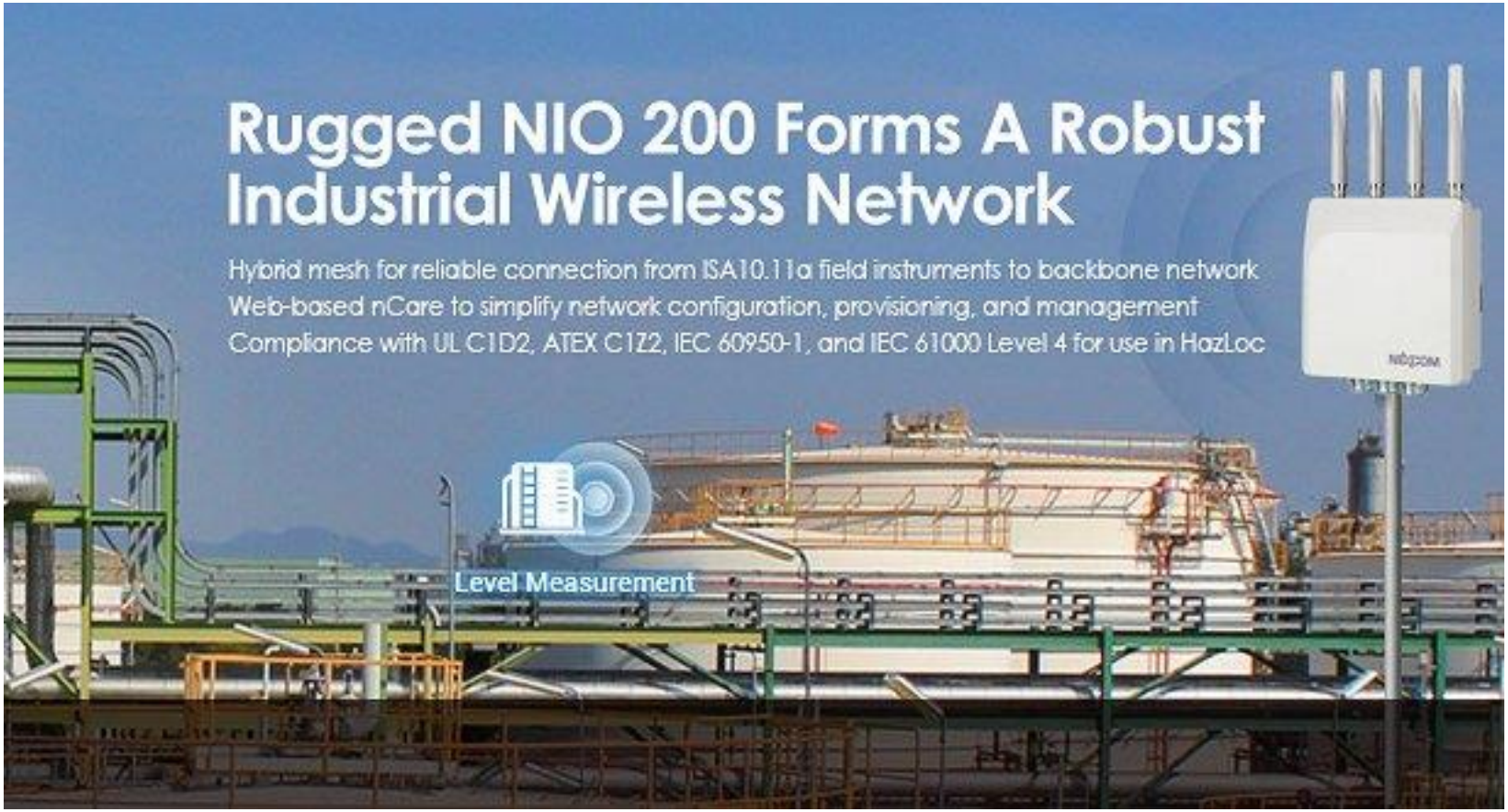
Current Status Quo

- **Recent trend - deployments require**
  - Increased scalability
  - Support for higher network throughput
- **Due to the emergence of novel ISA100 Wireless compliant instruments such as**
  - Stream trap monitoring
  - Safety – gas detection
  - Corrosion monitoring
  - Condition monitoring

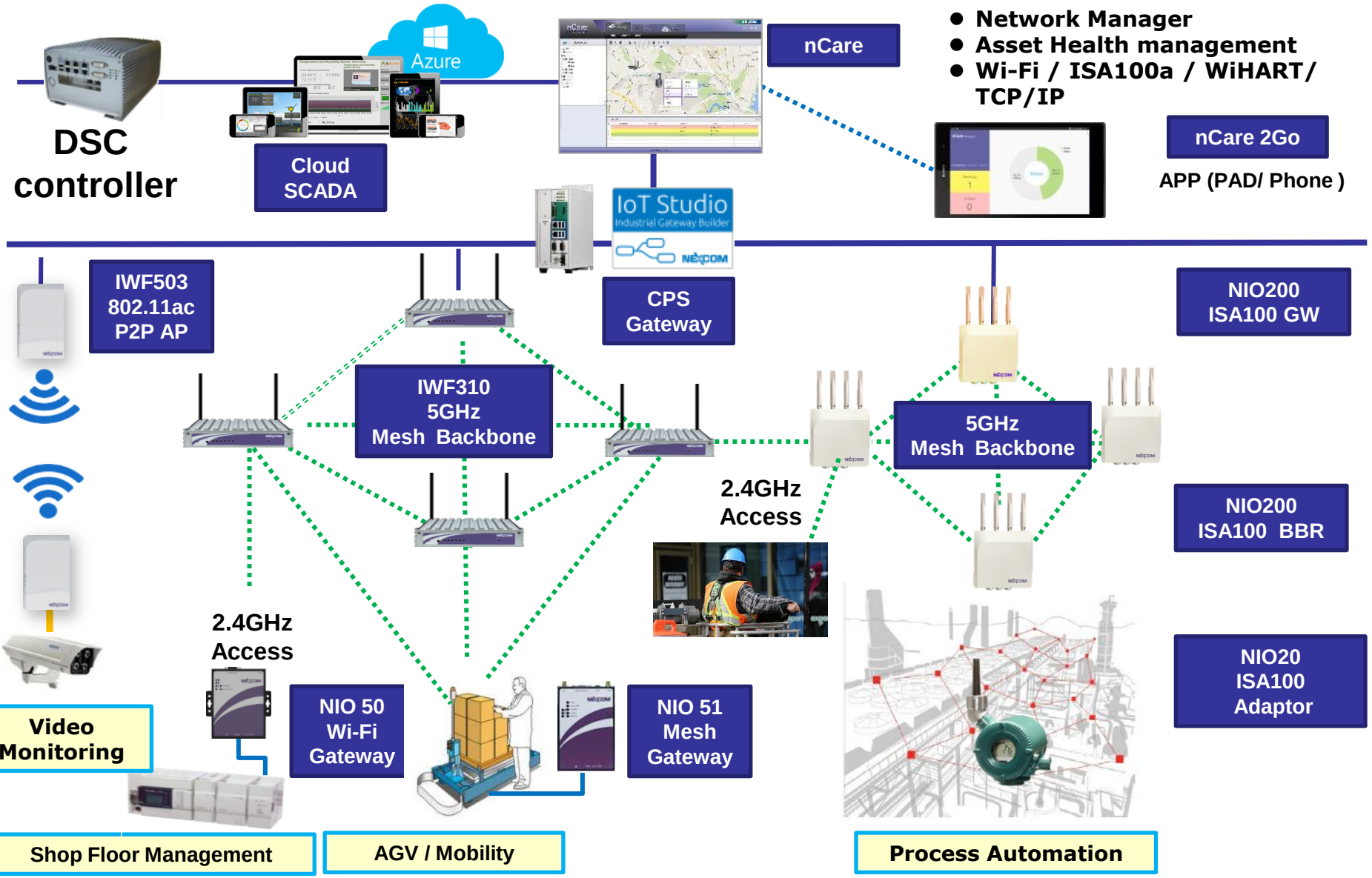




Wireless Built for Reliable performance



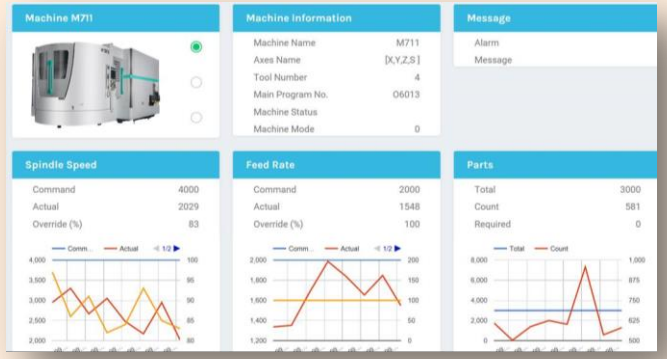
ISA100a Connectivity Architecture



IoT Studio – CloudSCADA

Application Layer

IoT Studio + Azure App Service
+ IoT Hub + Document DB



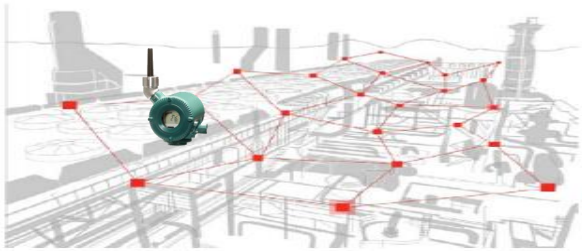
Communication Layer

Device Layer

Devices/ PLC

Sensors

Injection Machine LV250



IoT Studio – CloudSCADA (Sanmin Factory – 7F-SMT)

NEXCOM

Smart Factory (Sanmin-7F-SMT)

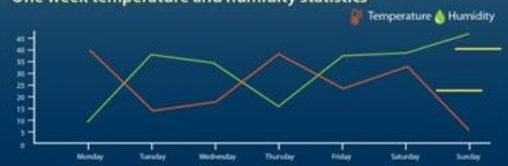
Allan Chen
allanchen1971@gmail.com

Asset Sensor Detsils

Asset Health Detsils

89% Overall Status	747.5 Barrels/hour	26.8 BS&W (%) Purity
100 AMPS/Rated (%)	39.2 APt Gravity (%)	237K Barrel count (month)
176.1 Mean Temperature	26.1 H25 (%)	19.6M Barrel Count (total)

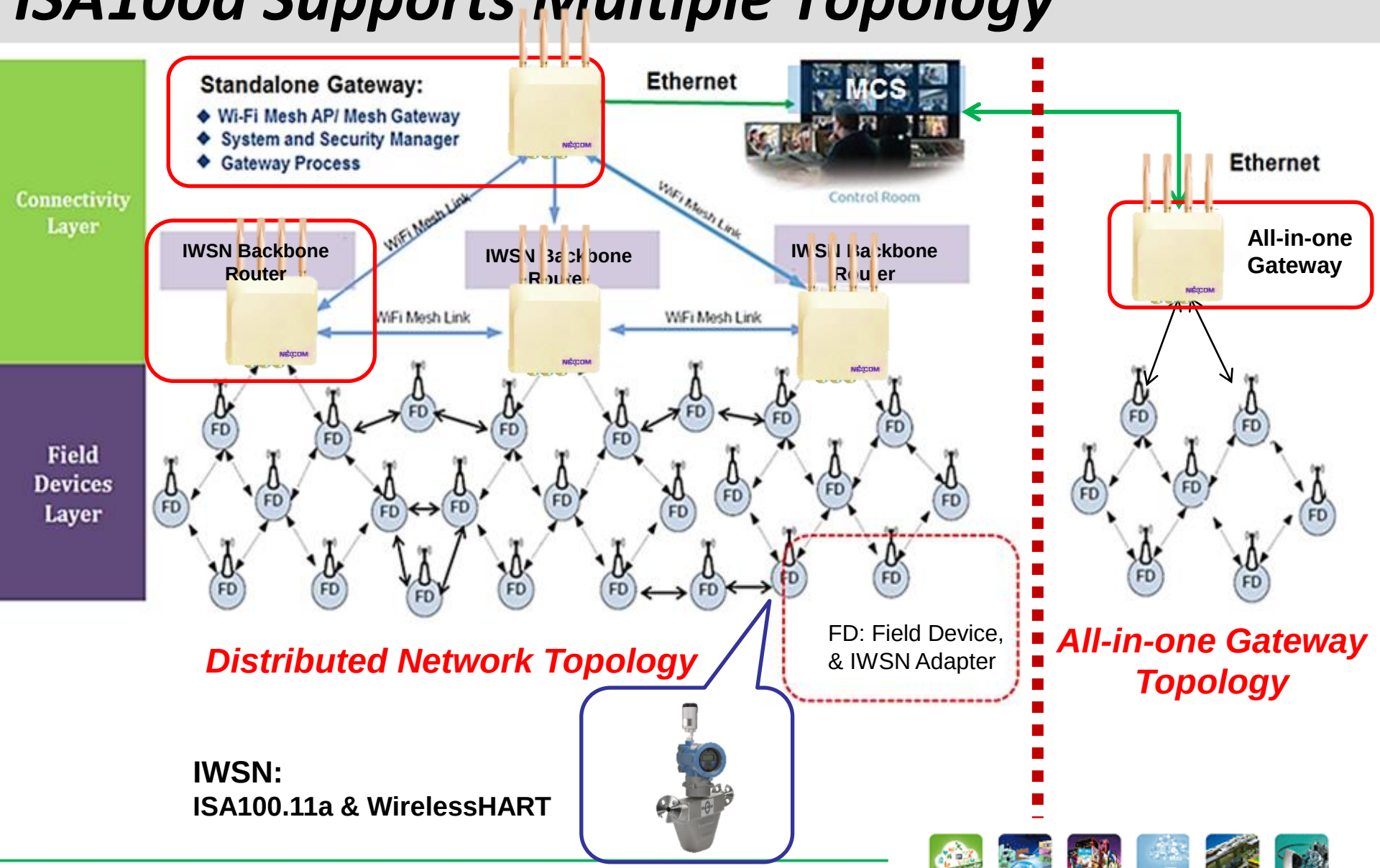
One week temperature and humidity statistics



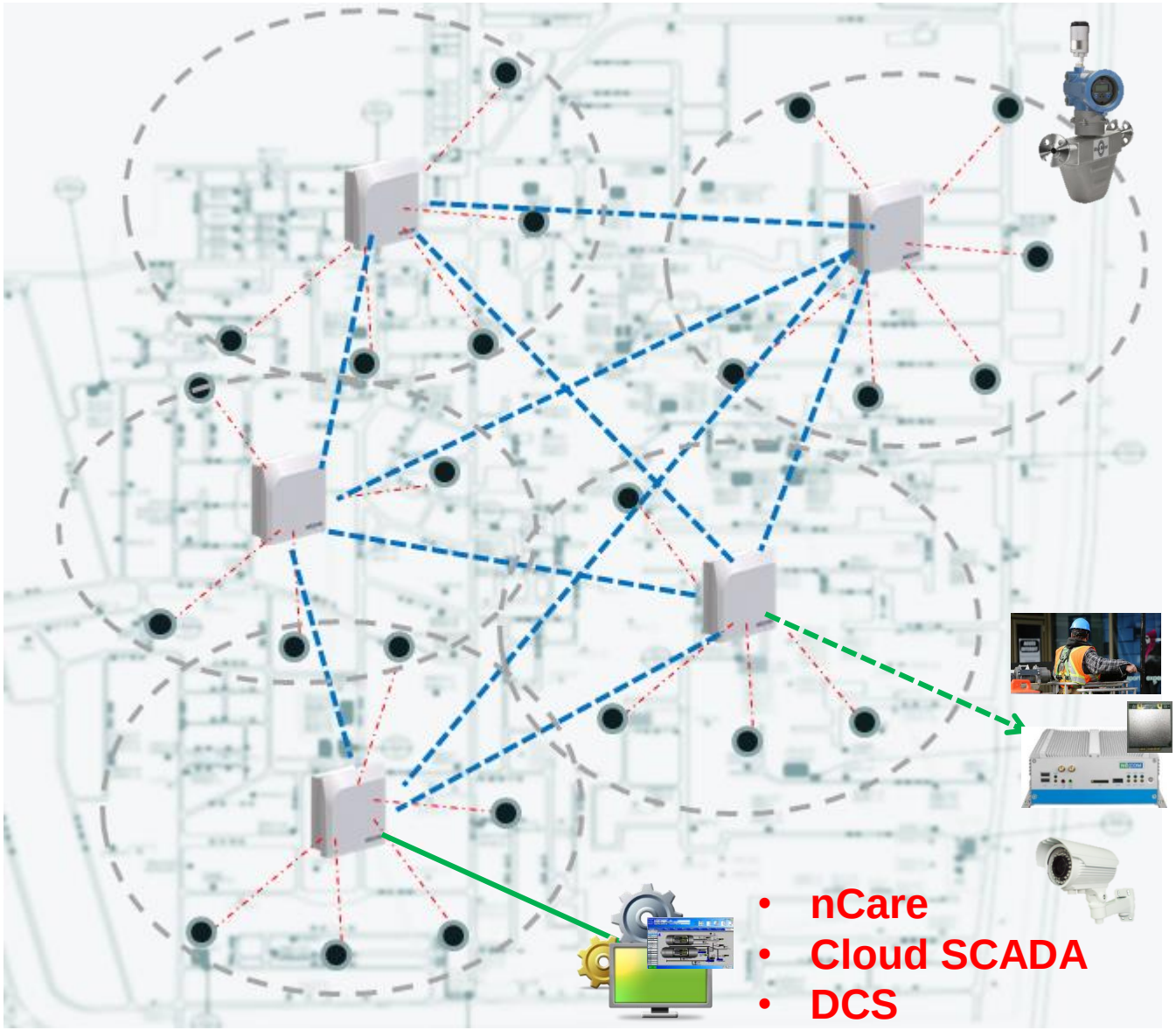
Alarm History

Local Time	ID	Alarm Type
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	
01/19/2017 10:57:58	AIMochine001	

ISA100a Supports Multiple Topology



Hybrid network of Wi-Fi & ISA100



One gateway, Multi network:

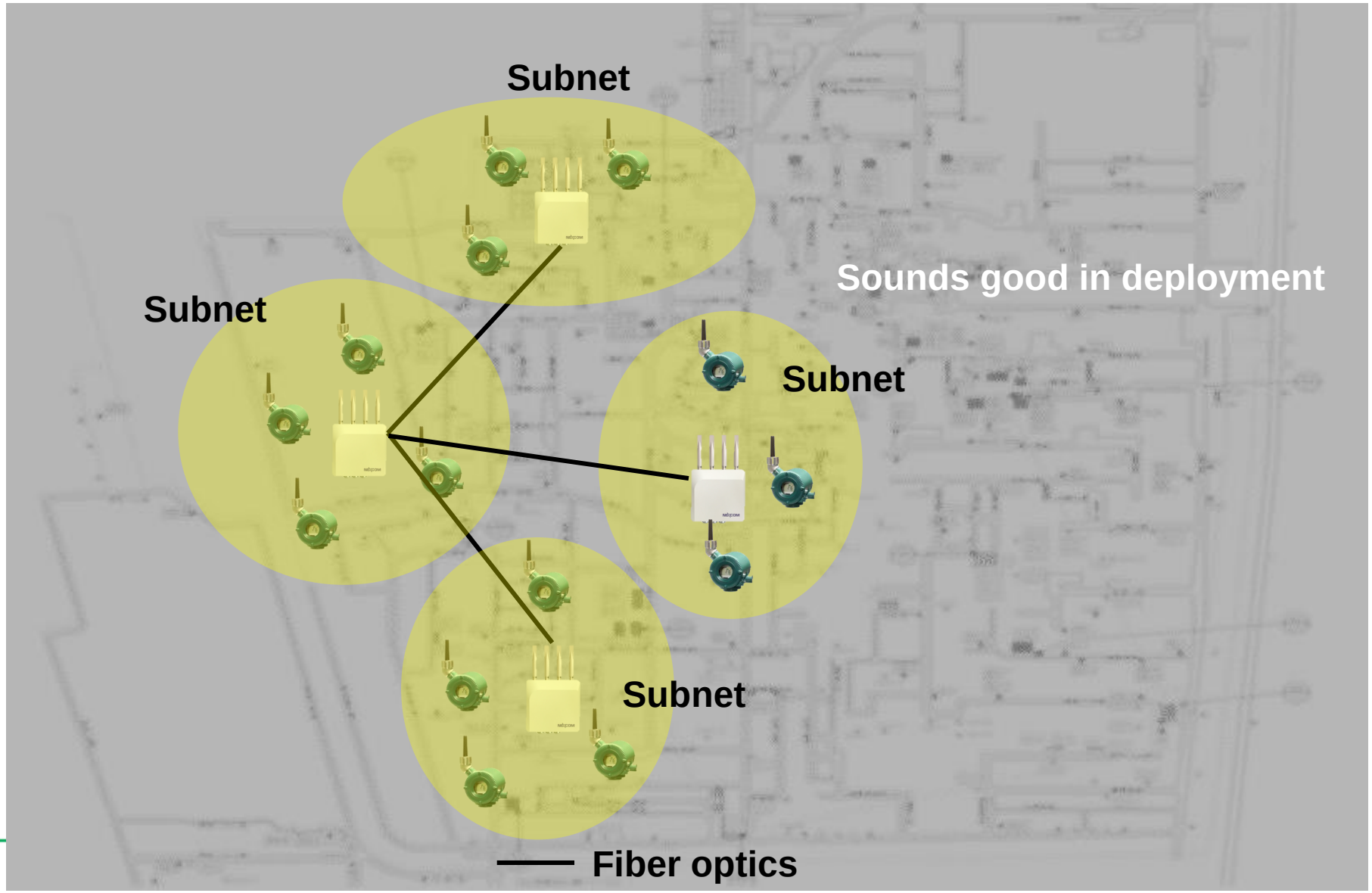
- Wi-Fi Mesh
- Wi-Fi Access
- ISA100a Mesh
- Ethernet

Multi-link, more reliable

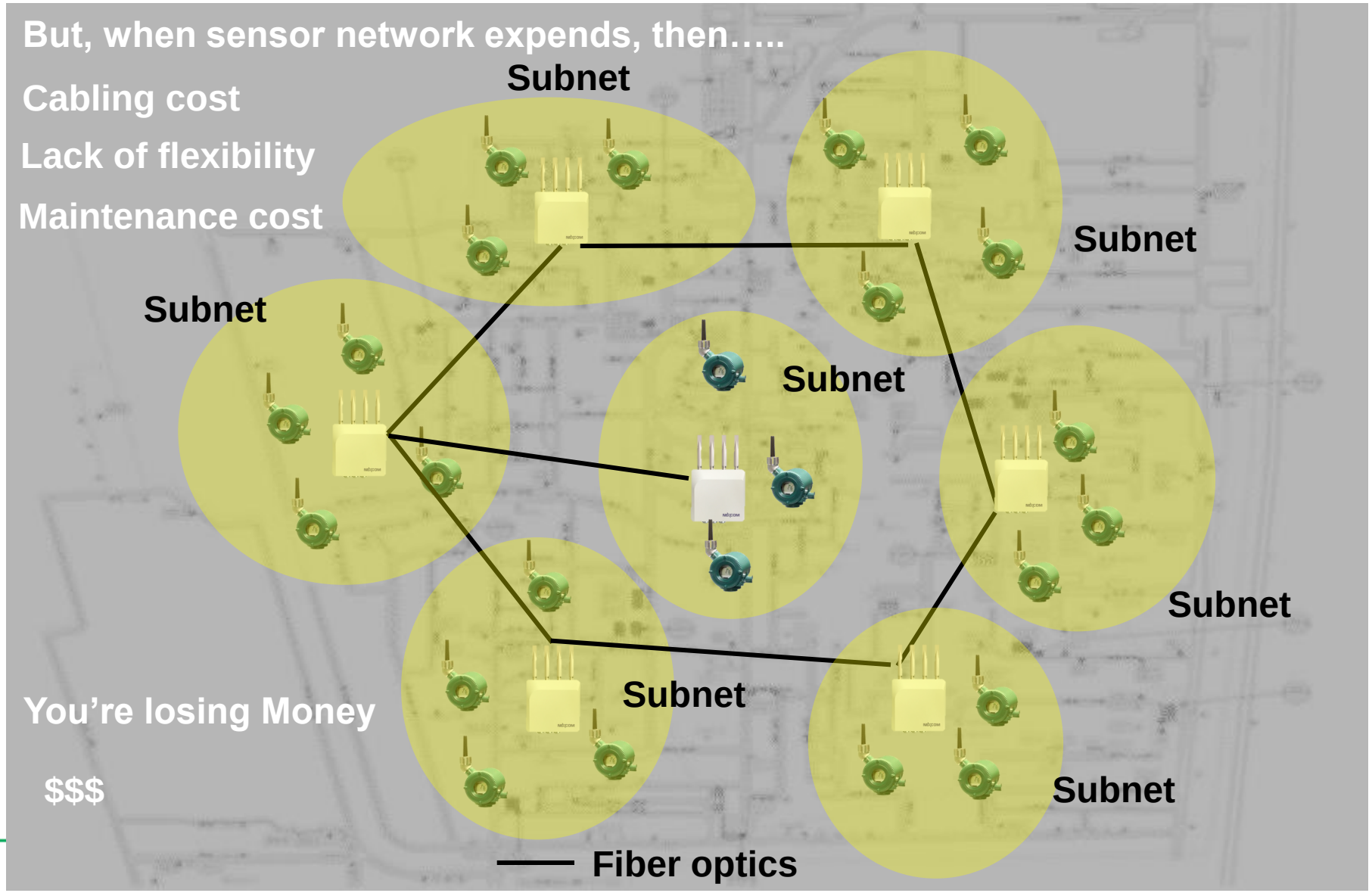
- Redundancy
- Flexible to expand
- Less maintenance cost
- High throughput

- nCare
- Cloud SCADA
- DCS

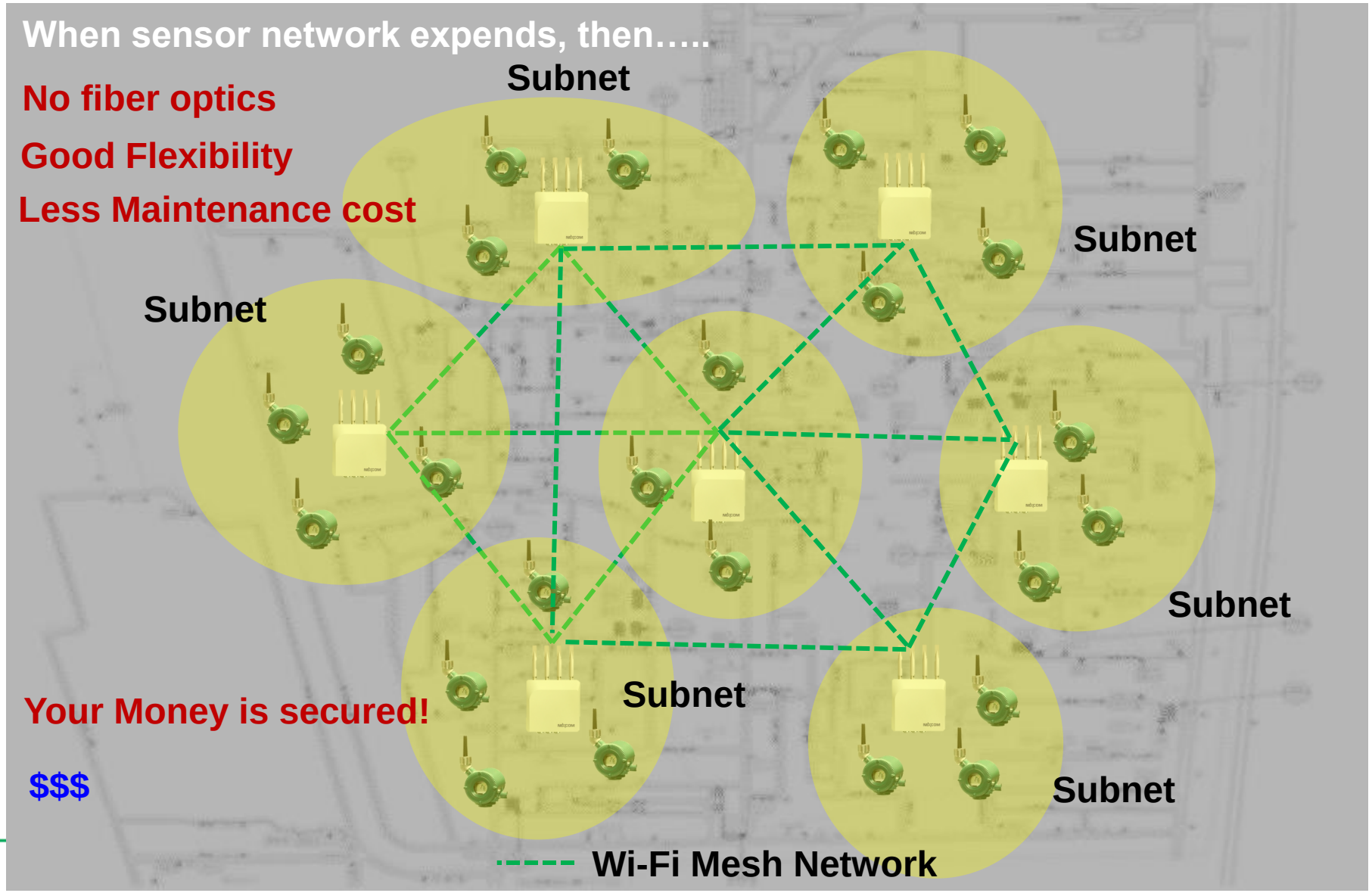
IP-Based ISA100 Connectivity- Fiber Backbone



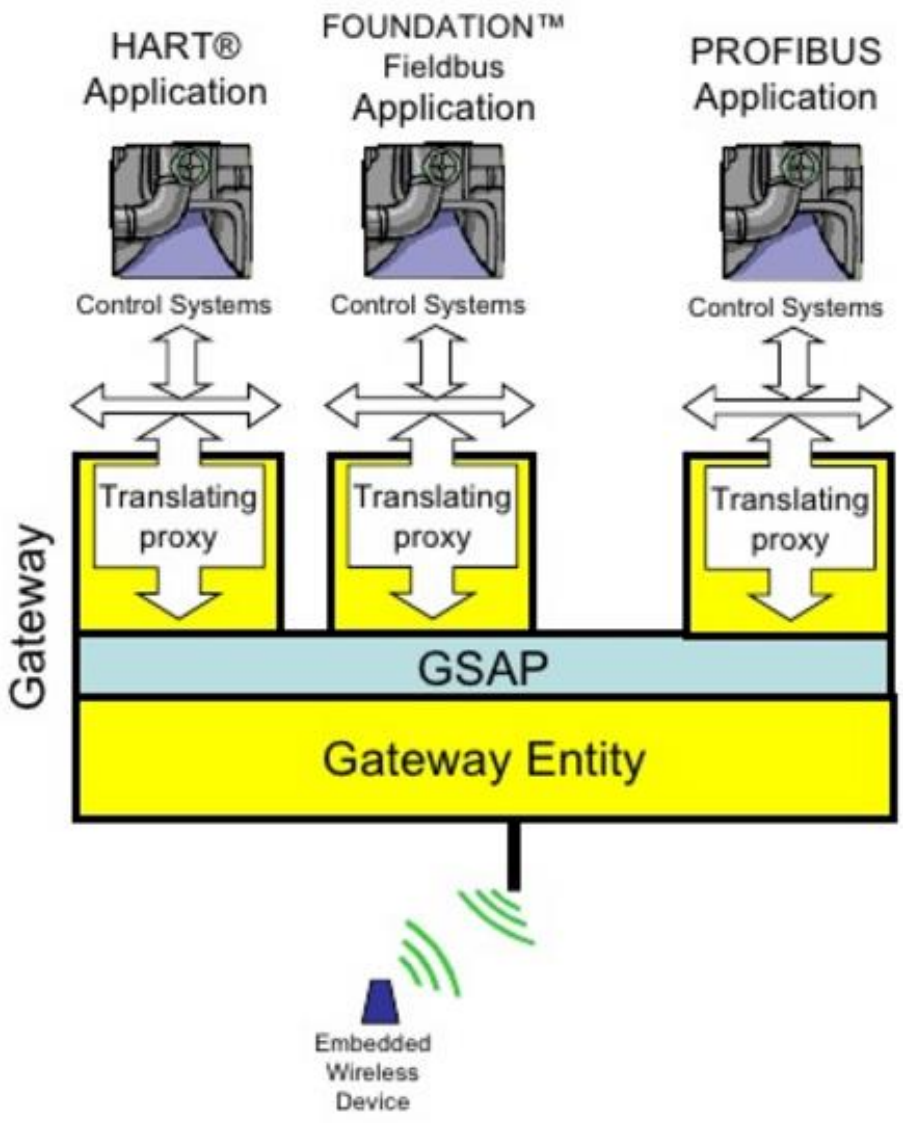
IP-Based ISA100 Connectivity- Fiber Backbone



IP-Based ISA100 Connectivity- Hybrid Mesh Backbone



GSAP for Field Device Tunneling via ISA100



Multiple Systems

Multiple Protocol Translators

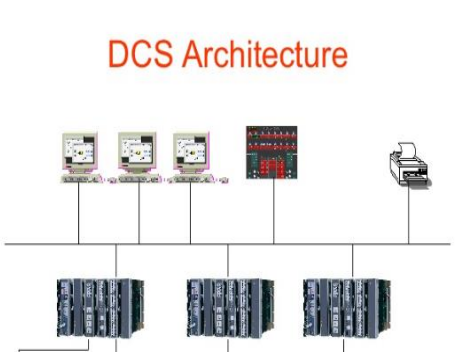
Single Generic Device

A single wireless device (single catalog number) can operate across multiple systems.

A specific protocol translator is required in the gateway for each system.

ISA100.11a provides an efficient application model that native devices can use for this purpose.

Open Standard I/F with OPC UA & DCS



Modbus

GSAP Tunneling

ISA100 Distributed Gateway

ISA100 All-in-One Gateway

NIO200IDG

NIO200IAG

NIO20I

NIO200IDR

ISA100 Backbone Router

NIO200IDR

ISA100 Backbone Router

NIO20I

ISA100 Adaptor

ISA100 Adaptor

About EMC Immunity

	ESD	Surge	EFT
Level-1	Contact: +/- 2KV Air: +/- 2KV	+/- 0.5KV	+/- 0.5KV
Level-2	Contact: +/- 4KV Air: +/- 4KV	+/- 1KV	+/- 1KV
Level-3	Contact: +/- 6KV Air: +/- 8KV	+/- 2KV	+/- 2KV
Level-4	Contact: +/- 8KV Air: +/- 15KV	+/- 4KV	+/- 4KV

- EMC level-4 protection prevents devices from damage and possible malfunctioning due to ESD, Surge and EFT
- Normally, EMC protection level is only up to level-2.
- Level-4 provides almost the strongest protection to devices in the field.

EMC Level-4 Test Result of NIO200

Air Discharge

Test Points	Test Levels ± 2 KV	± 4 KV	± 8 KV	± 12 KV	± 15 KV	Results Performance Criterion				Pass	Fail	Observation
LED	☐	☐	☐	☐	☒	☒A	☐B	☐C	☐D	☒	☐	
Rset port	☐	☐	☐	☐	☒	☒A	☐B	☐C	☐D	☒	☐	
	☐	☐	☐	☐	☐	☐A	☐B	☐C	☐D			
	☐	☐	☐	☐	☐	☐A	☐B	☐C	☐D			
	☐	☐	☐	☐	☐	☐A	☐B	☐C	☐D			
	☐	☐	☐	☐	☐	☐A	☐B	☐C	☐D			

ESD
Contact: +/- 8KV
Air: +/- 15KV

Contact Discharge

Test Points	Test Levels ± 2 KV	± 4 KV	± 8 KV	± 12 KV	± 15 KV	Results Performance Criterion				Pass	Fail	Observation
Ant port	☐	☐	☒	☐	☐	☒A	☐B	☐C	☐D	☒	☐	
Screw	☐	☐	☒	☐	☐	☒A	☐B	☐C	☐D	☒	☐	
	☐	☐	☐	☐	☐	☐A	☐B	☐C	☐D	☐	☐	
	☐	☐	☐	☐	☐	☐A	☐B	☐C	☐D	☐	☐	
	☐	☐	☐	☐	☐	☐A	☐B	☐C	☐D	☐	☐	
	☐	☐	☐	☐	☐	☐A	☐B	☐C	☐D	☐	☐	

■ AC power ports

Tested on	Test voltage level	Pulse rate	Performance Criteria	Result
L	±2.0KV	5KHZ	A	PASS
N	±2.0KV	5KHZ	A	PASS
PE	±2.0KV	5KHZ	A	PASS
L+N	±2.0KV	5KHZ	A	PASS
L+N +PE	±2.0KV	5KHZ	A	PASS

■ I/O signal, data and control line ports

Tested on	Test voltage level	Pulse rate	Performance Criteria	Result
RJ-45	±4.0KV	5KHZ	A	PASS

EFT
DC: +/- 2KV
Ethernet: +/- 4KV

Surge Immunity Test Record

Test Standard ☒ IEC 61000-4-5: 2005 ☐ EN 61000-4-5: ____ ☐ Other ____

Customer : 新漢 *Project No. :* 洛到
EUT Name : NIO200
M/N : NIO200
Input Voltage : DC 12 V
*Temp:*26 ℃;*Hum:*46 %;*Press* 999 mbar

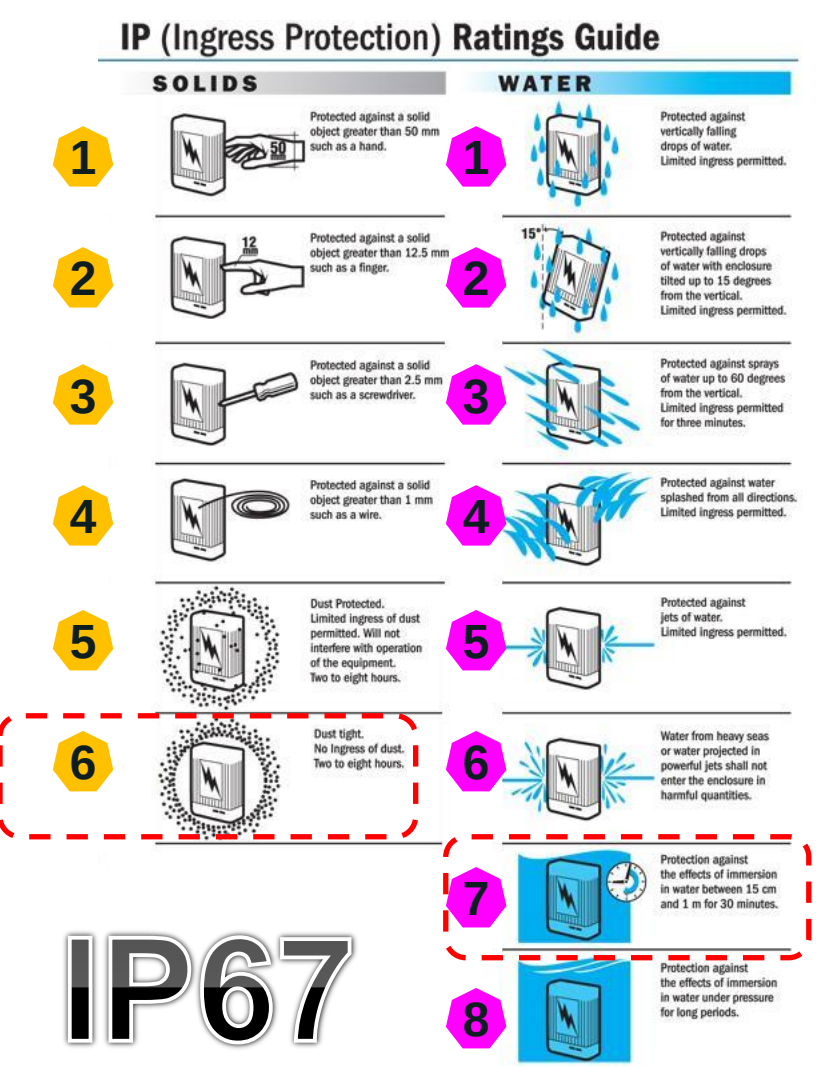
Surge: +/- 4KV

Polarity	Inject Line	Pulse Position (degree)	Voltage (kV)	Criteria
+	"1.2/50us" Line to ground	LAN	4	☐ A ■ B ☐ C ☐ D
–	"1.2/50us" Line to ground	LAN	4	☐ A ■ B ☐ C ☐ D
+	"1.2/50us" Line to ground	WAN	4	☐ A ■ B ☐ C ☐ D
–	"1.2/50us" Line to ground	WAN	4	☐ A ■ B ☐ C ☐ D

Remark：Criteria B:測試中 LAN 連線中斷 會自動恢復連線

Test result : ■ Pass ☐ Fail

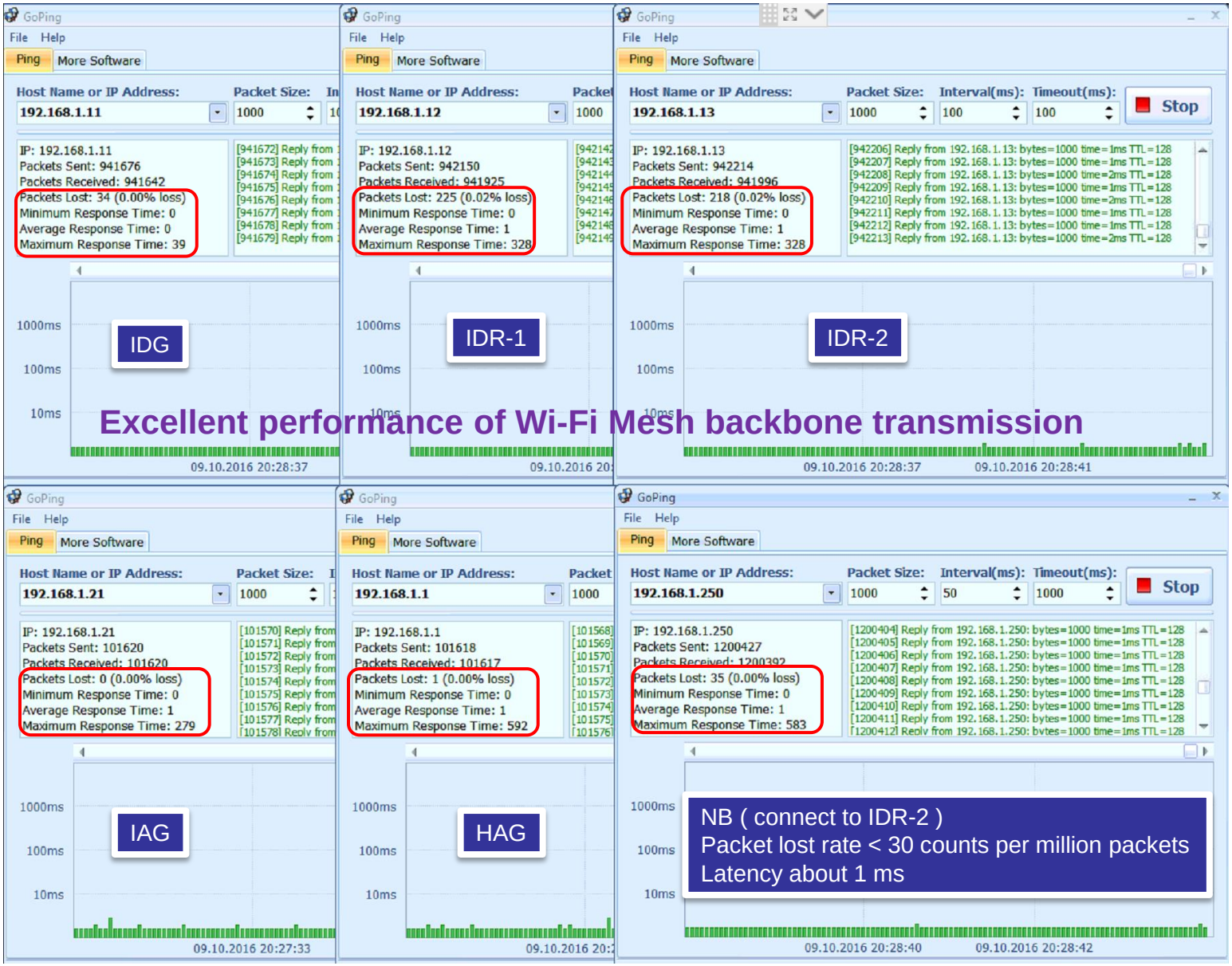
IP Protection Tests @ UL Lab



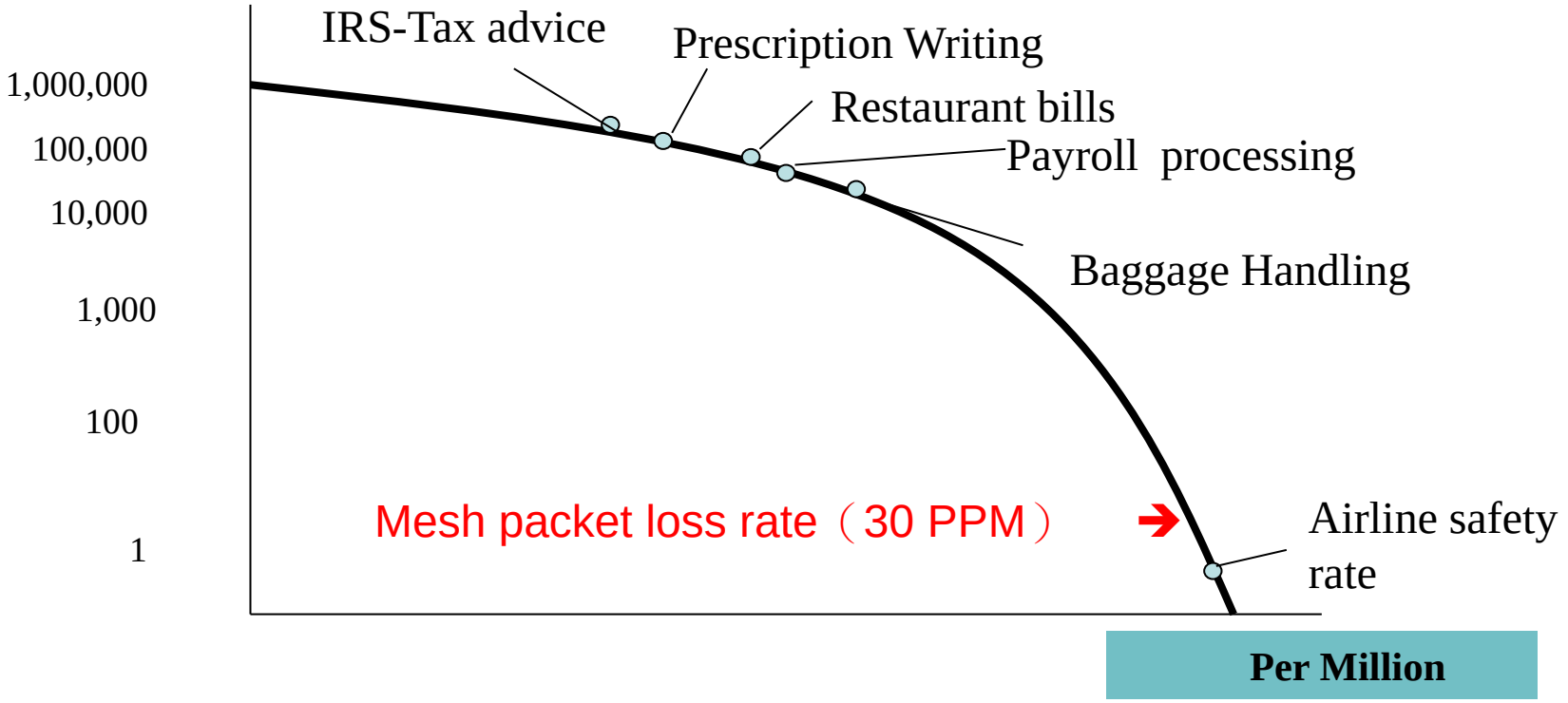
IP67

- Drilling a hole in NIO200 and evacuating for dust test (3 hours).
- With measuring particle density inside to evaluate solid particle protection.
- **Result: PASS**

Packet Loss Validation Result



Wi-Fi Mesh Reliability Illustration

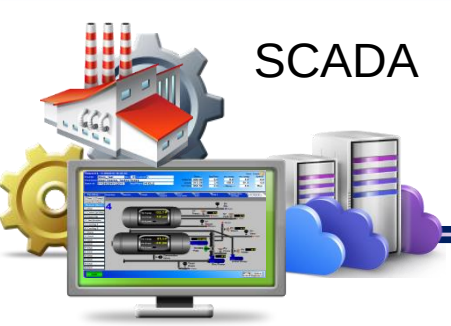


High reliability of EZ Mesh connectivity

nCare in I4.0 factory

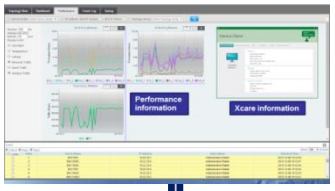
- **Central Management**
  - **Visual Topology:** in-time status monitoring /Traffic Management
  - **Device management:** Remote Provisioning for fast deployment
  - **MAC Filter Security:** Unauthorized AP / Device Access Control
  - **Auto Notice:** Notification for any user-defined abnormal events
  - **nCARE-to-go:** React & Resolve anywhere
- **Device (Asset) Health Monitoring**
  - **Threshold based** Device healthy monitoring for Predictive maintenance
  - **Multiple Device type** supported: Wired, Wireless, Industrial devices
- **Maintainace assistance**
  - **Event Playback:** Easier Troubleshooting
  - **Remote Desktop** Access
  - **Remote Configuration & Upgrade**
  - **Setting Backup & Restore**

nCare for all Connectivity



SCADA

MQTT/AMQP



(nCARE)

- Network Manager
- Device Manager

nCARE to Go

TCP/IP

IWF Mesh Point

Access Point

L3

Switch

DTM

IWF Backbone Mesh

Wi-Fi Modbus

Mesh Modbus

Xcare (IPC)

WMI (NB)

Modbus

ISA100 IWSN Mesh

DTM

Modbus Device

AGV

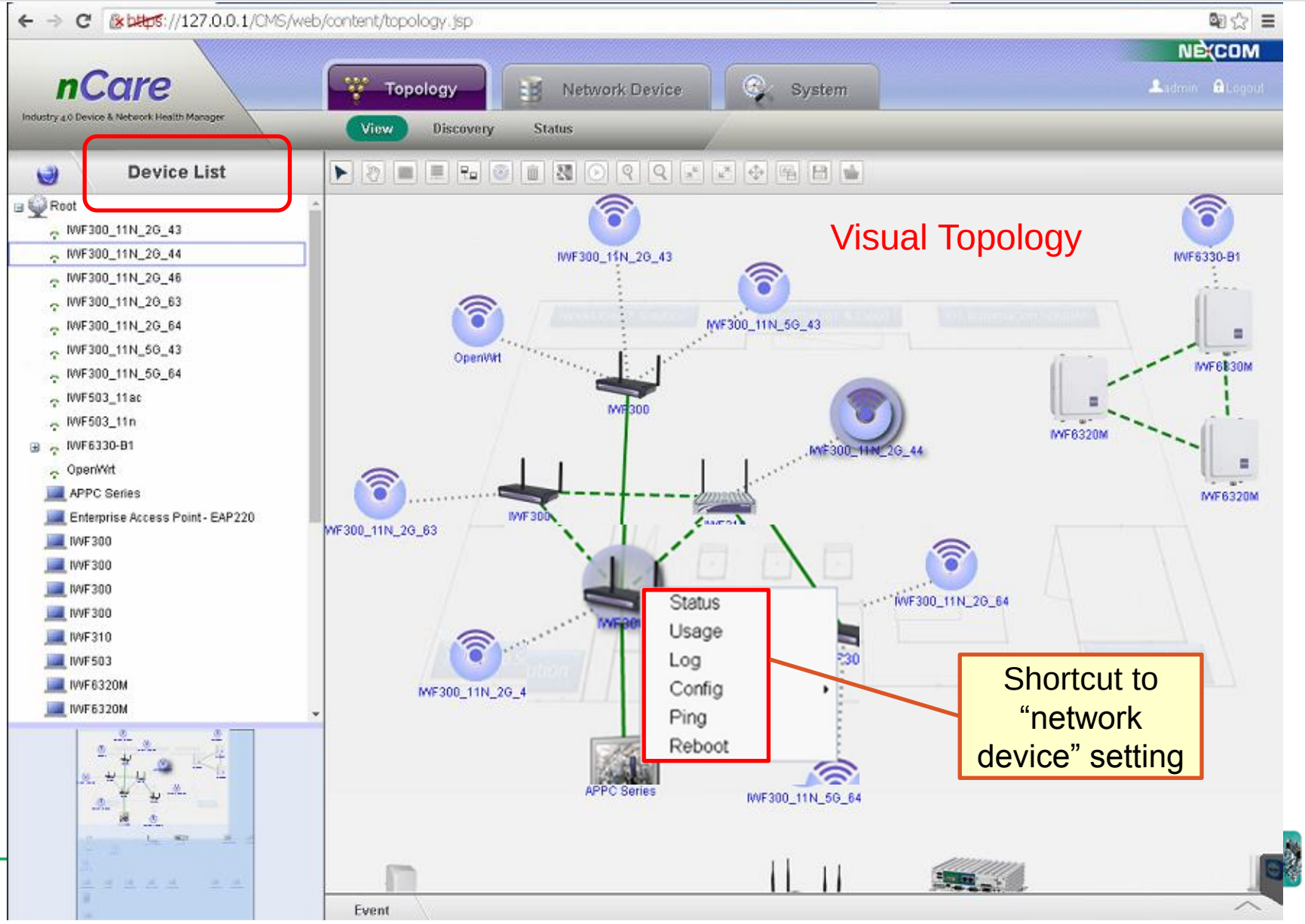
Machine

IP CAM

Meter

Wireless Instruments

Visual Topology



Bundle Google & Customer Site Map

Device Configure

Modify Device

General | Wlan | Vlan

IWF

General Setting

IP Address:	10.211.10.54
Device Name:	IWF300
Latitude:	25.007861
Longitude:	121.483502
Read Community:	public
Write Community:	private

If you change community,device will reboot.

Modify Device

General | Wlan | Vlan

IWF

WifiRadio:	wlan0
ESSID / Mesh ID:	NEX_2G
Mode:	Access Point

Operating Frequency

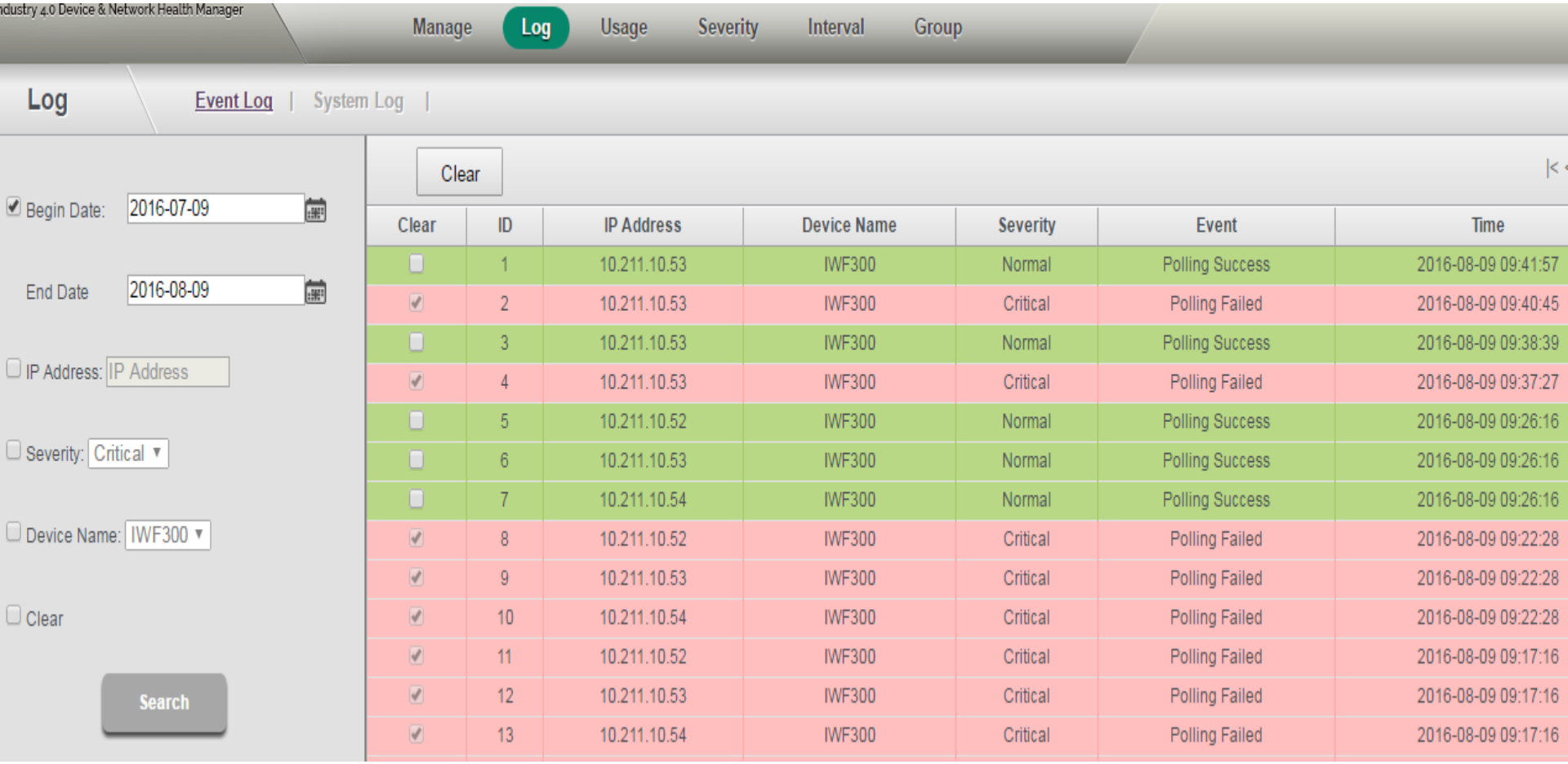
Mode:	11n
Channel:	11 (2.462 GHz)
Width:	40 MHz(AP or Client mod
TxPower:	7 dBm (5mW)

Wireless Security

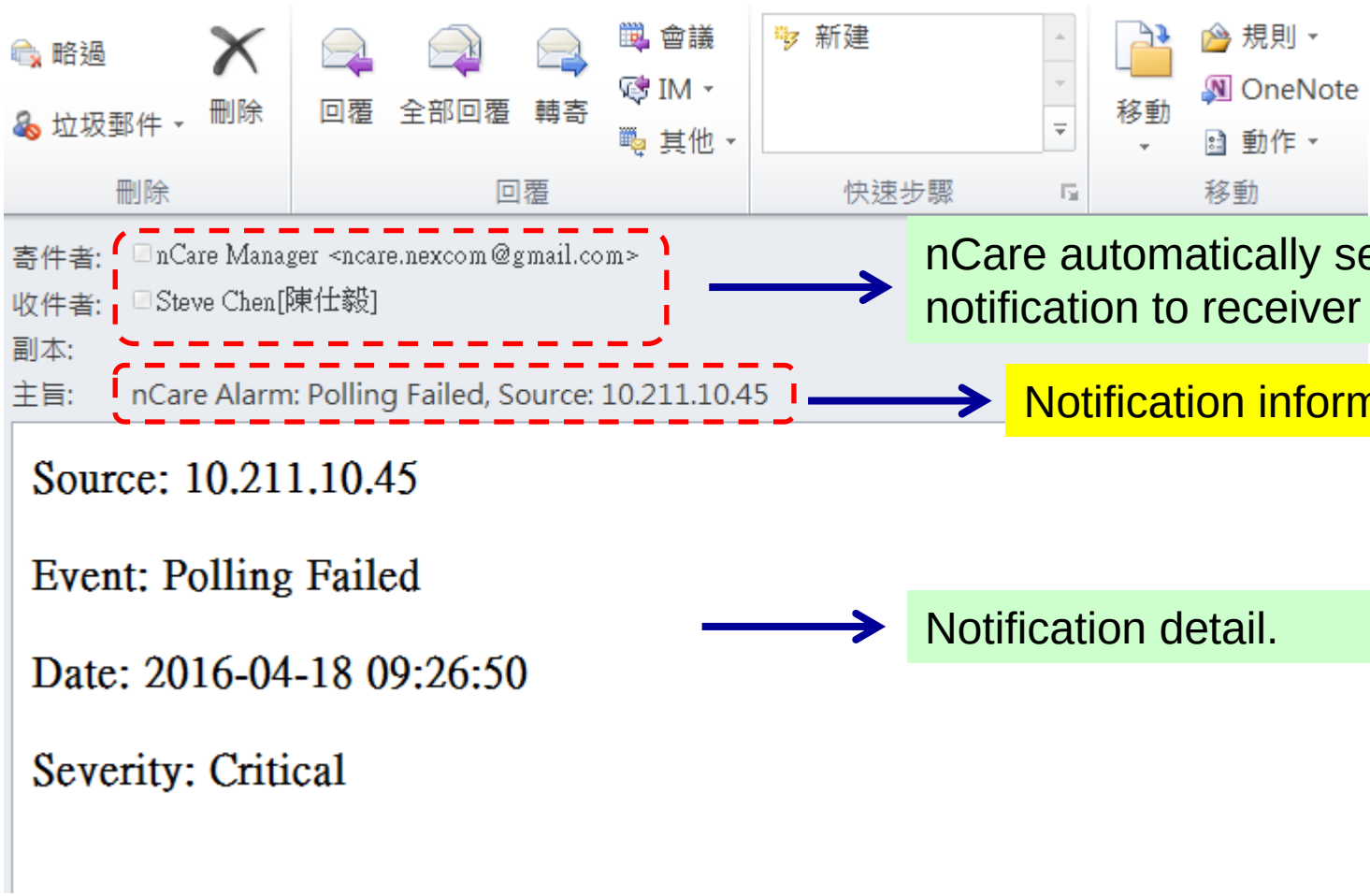
Encryption:	WPA2-PSK
Cipher:	auto
Key:	••••••••••••

It will take few seconds to modify.

Log


ndustry 4.0 Device & Network Health Manager
Manage
Log
Usage
Severity
Interval
Group
Log
Event Log | System Log |
Clear
Begin Date: 2016-07-09
End Date 2016-08-09
IP Address: IP Address
Severity: Critical
Device Name: IWF300
Clear
Search
Clear ID IP Address Device Name Severity Event Time
1 10.211.10.53 IWF300 Normal Polling Success 2016-08-09 09:41:57
2 10.211.10.53 IWF300 Critical Polling Failed 2016-08-09 09:40:45
3 10.211.10.53 IWF300 Normal Polling Success 2016-08-09 09:38:39
4 10.211.10.53 IWF300 Critical Polling Failed 2016-08-09 09:37:27
5 10.211.10.52 IWF300 Normal Polling Success 2016-08-09 09:26:16
6 10.211.10.53 IWF300 Normal Polling Success 2016-08-09 09:26:16
7 10.211.10.54 IWF300 Normal Polling Success 2016-08-09 09:26:16
8 10.211.10.52 IWF300 Critical Polling Failed 2016-08-09 09:22:28
9 10.211.10.53 IWF300 Critical Polling Failed 2016-08-09 09:22:28
10 10.211.10.54 IWF300 Critical Polling Failed 2016-08-09 09:22:28
11 10.211.10.52 IWF300 Critical Polling Failed 2016-08-09 09:17:16
12 10.211.10.53 IWF300 Critical Polling Failed 2016-08-09 09:17:16
13 10.211.10.54 IWF300 Critical Polling Failed 2016-08-09 09:17:16

Email Notification

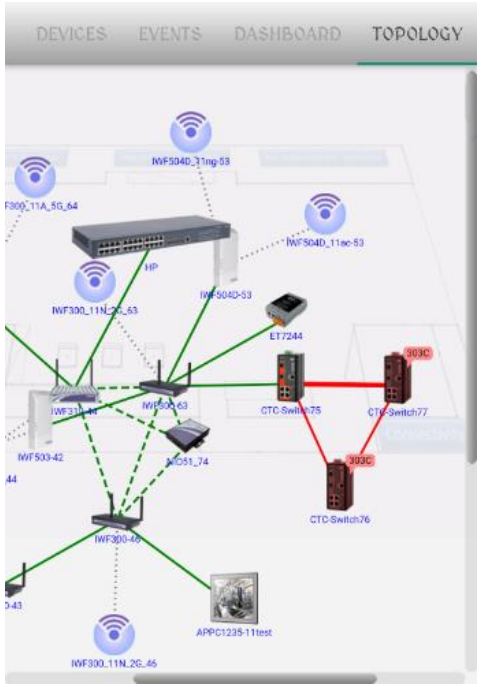


nCare automatically sends notification to receiver by mail.

Notification information

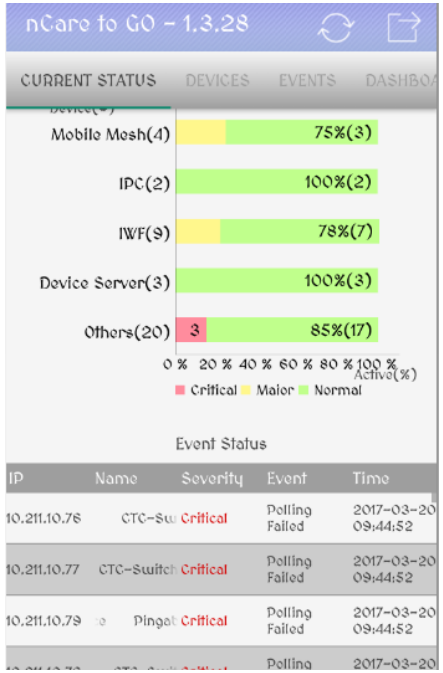
Notification detail.

Easy Management- Mobile APP

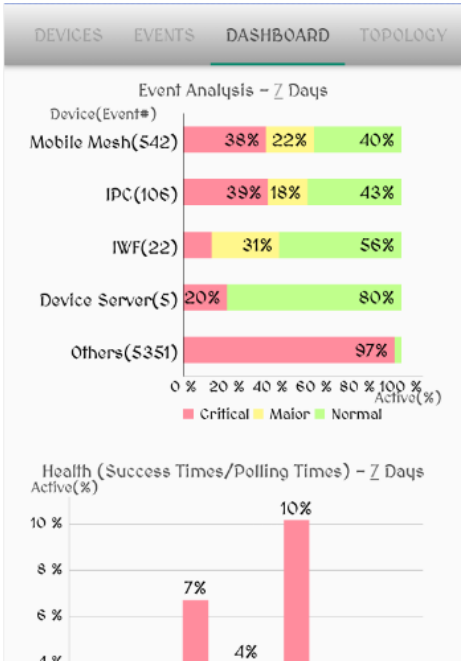


Topology View

Device List



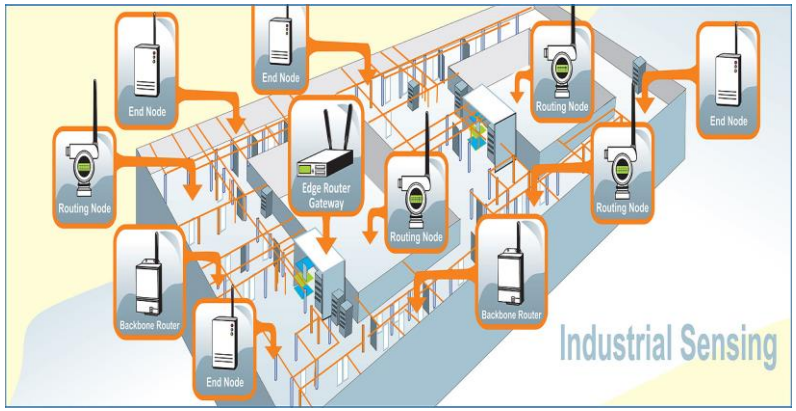
Status View



Dash board

Android version: Available
IOS version: In process with Apple Store

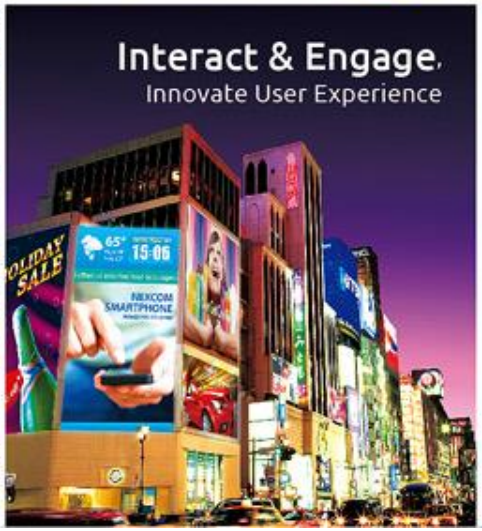
Go Industrial Wireless for IIOT



- Industrial Wireless ISA100a
- Industrial Wi-Fi Mesh Backbone
- Industrial Network& Asset Management nCare
- Industrial IoT Cloud SCADA

Stay Safe All the time

NEXCOM
The Intelligent Systems



Thank You!