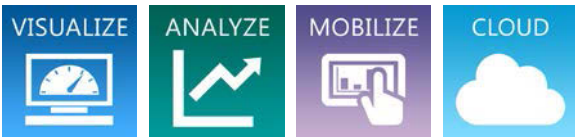




# Building Interoperability

**Gary Kohrt**

Vice – President of  
Solutions and Services



# Agenda



# About ICONICS

## Global Presence

**Established 1986**

**HQ  
Foxborough, MA USA**

Largest Independent  
provider of HMI/SCADA  
worldwide

Offices  
USA, UK, France, Italy,  
Netherlands, Germany, Czech  
Republic, China, India, Australia



## Microsoft Alliance



**Award Winning Partner**



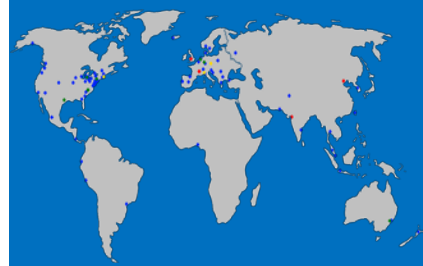
**Microsoft Partner**  
Special Application Development

## Partner Ecosystem

**80+ Countries**

**400+ Partners**

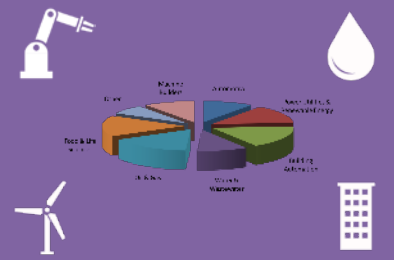
- Distributor
- OEM
- Systems Integrator



## Diverse Industries

**300,000 Licenses  
Installed**

Manufacturing  
Building Automation  
Energy  
Water Treatment  
Electric Utilities  
Renewable Energy  
Oil, Gas and Chemical  
Metals and Mining  
Public Infrastructure

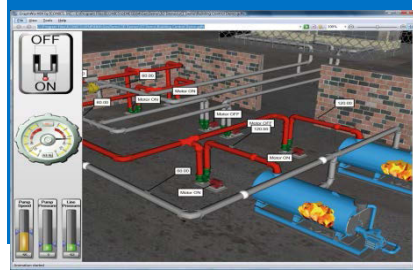


## Factory Automation

GENESIS64™

Human Machine Interface  
Supervisory Control & Data  
Acquisition

- WebHMI™ Portal Dashboards
- Advanced Graphics in 2D and 3D
- Alarm Management
- Trend Charting
- GEO SCADA Mapping
- Asset Management

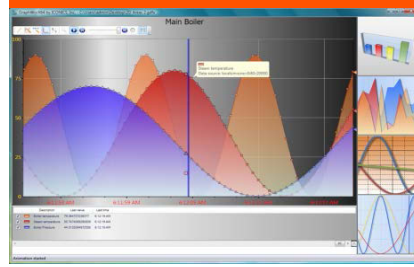


## Historian

Hyper Historian™

Enterprise Historian

- High Capacity 100 000 Samples/Sec
- Mission Critical Redundancy
- Virtualization
- SQL Query Interface
- Advanced Archival
- Distributable Architecture
- Real Time Statistical Calculation



## Analytics

AnalytiX™



Analytics and  
Manufacturing Intelligence

- Energy Management
- Asset Fault Detection & Diagnostics
- Manufacturing Productivity (OEE)
- Alarm Analysis
- Reporting
- Enterprise Data Integration



## Mobility

MobileHMI™

WebHMI™

Remote Visualization and Control

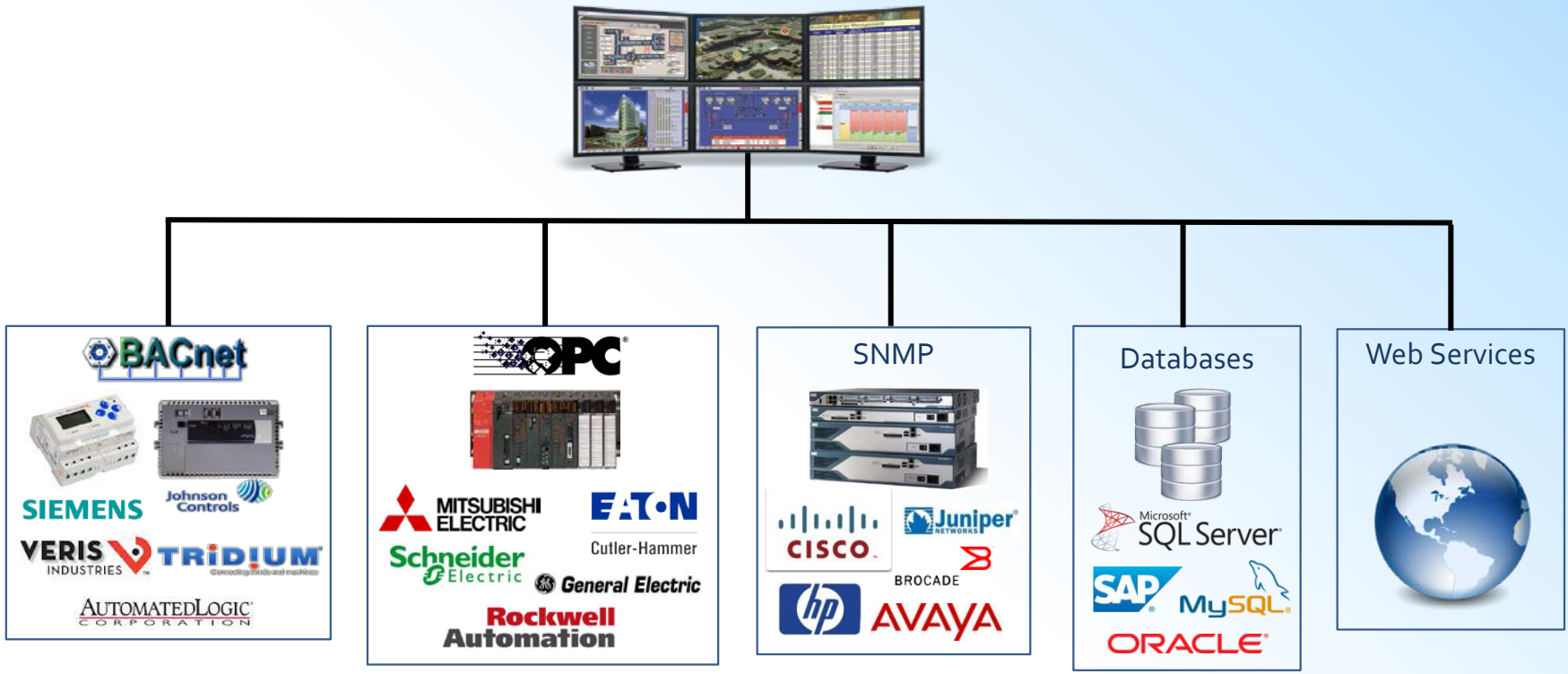
- Role Based Security
- Any Place
- Any Time
- Any Device



Modular • Interoperable • Secure • Reliable • Scalable • Unified



# ICONICS Software Integration Platform

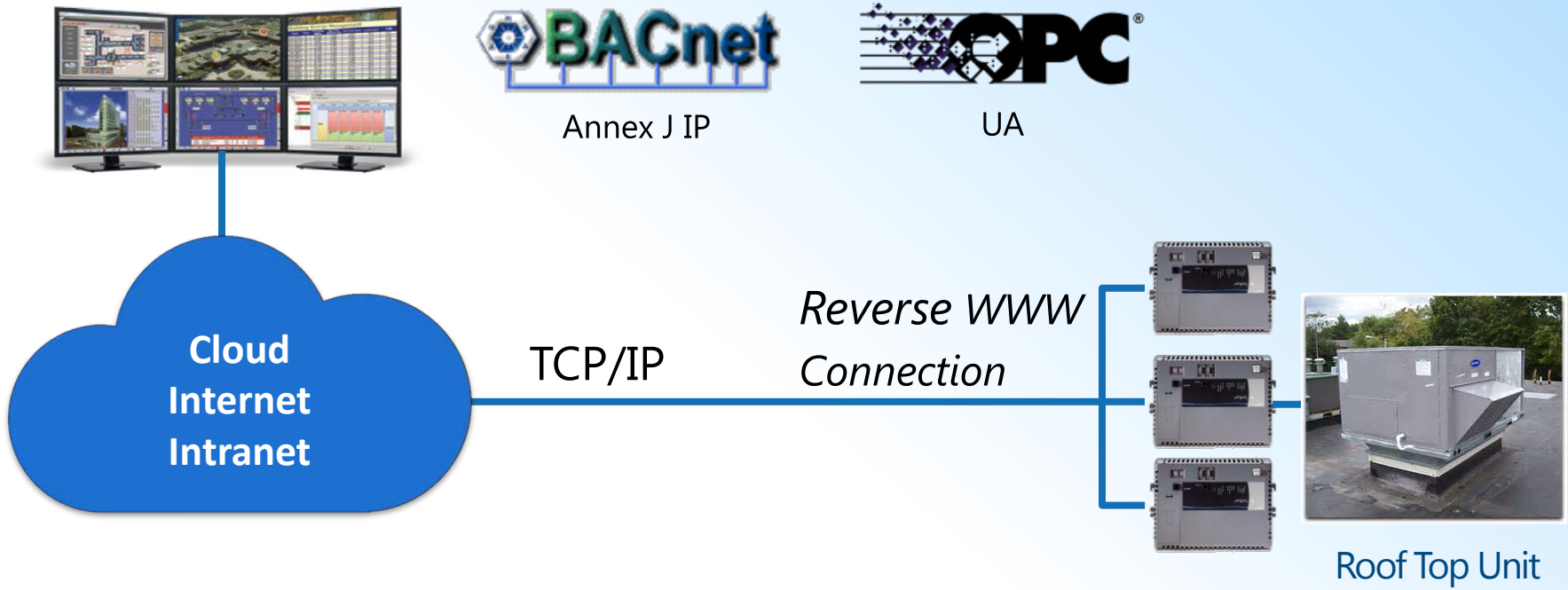




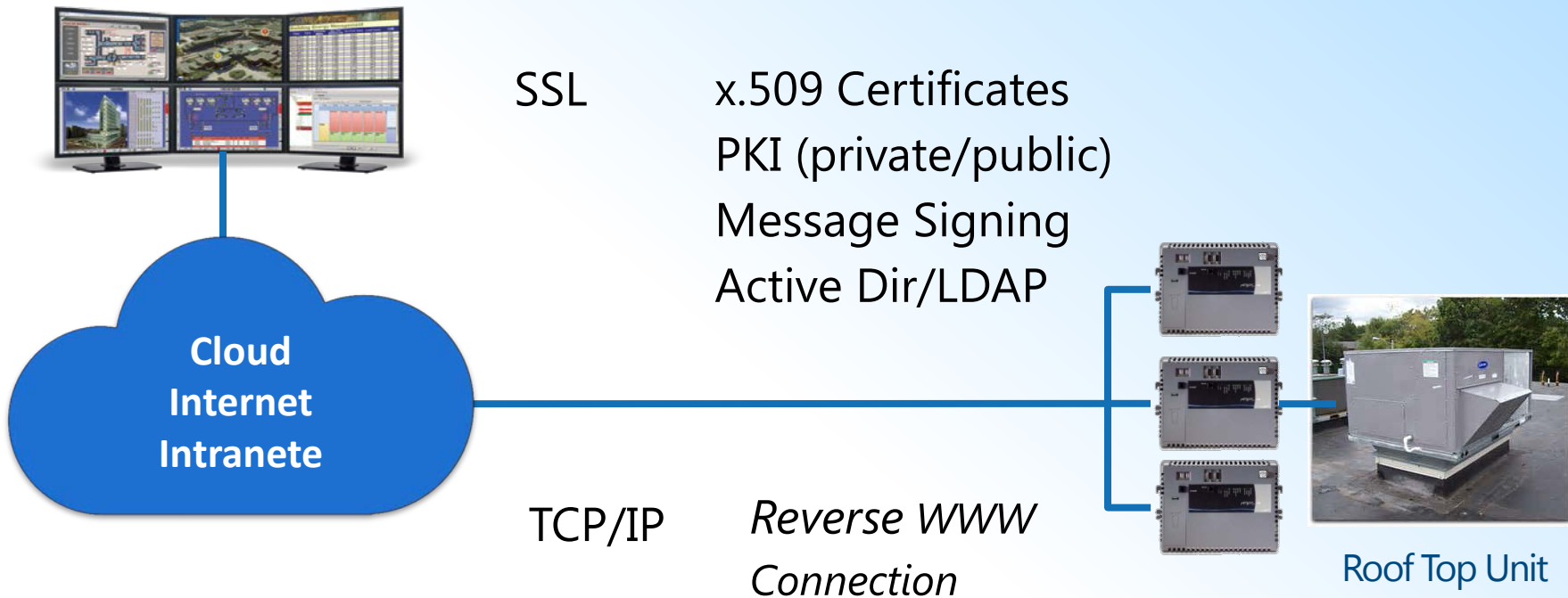
# Interoperability Requirements

- ▶ Standard Transports
- ▶ Secure Transports
- ▶ Application Protocols – Point/Value Interoperable Services
- ▶ Application Protocols – Full Object Discovery
- ▶ Application Protocols –Independent Certifications
- ▶ Application Standards – Information Models
  - Standardized Objects/Classes
  - Standard Properties, Standard Naming, Standard Logic
- ▶ Hardware Availability

# Standard Transports



# Standard Secure Transports





# OPC UA – Security Functions

## ▶ **Application Authentication**

- All application must have a unique Application instance Certificate
- URI should identify the instance, vendor and product

## ▶ **User Authentication**

- Username / password, WS-Security Token or X.509
- Fits into existing infrastructures like Active Directory

## ▶ **User Authorization**

- Granular control over user actions: read, write, browse, execute



## ▶ **Server Availability**

- Minimum processing before authentication
  - ▶ Restricting message size
  - ▶ No security related error codes returned
  - ▶ ...

## ▶ **System Auditability**

- Generating audit events for security related operations



# OPC UA Applied Standards

	Main goal(s)	Algorithm(s)/ Standard(s)	Usage
MACs	<b>Authentication, Integrity</b>	▶ HMAC-SHA1 ▶ HMAC-SHA256	▶ Message authentication
Signature	<b>Authentication, Integrity</b>	▶ RSA-SHA1	▶ Signing certificates, security handshaking
Symmetric Encryption	<b>Confidentiality</b>	▶ AES-128-CBC ▶ AES-192-CBC ▶ AES-256-CBC	▶ Message encryption
Asymmetric Encryption	<b>Confidentiality</b>	▶ RSA-PKCS1 ▶ RSA-OAEP	▶ Security handshaking
Key Generation	<b>Confidentiality</b>	▶ P-SHA1	▶ Session key generation (for message encryption)
Certificates	<b>Authentication, Authorization</b>	▶ X.509 ▶ X.509v3 (Extensions)	▶ Application authentication, user authentication, key exchange

# Application Protocols - Real-Time Services

## Communications Services

Read Property

Read Property Multiple

Subscribe COV

Confirmed Event Notification

Get Alarm Summary

Get Event Information

## Primitive Objects

Analog Input

Floor3.Room7.AHU3.Zone\_Temp

74.3 DegF

Analog Value

Analog Output

Binary Input

Binary Value

Binary Output

Multi-State Input

Multi-State Value

Multi-State Output

Schedule

Calendar

Trend



## Fault Detection and Diagnostics Dashboard



# Application Protocol – Information Models



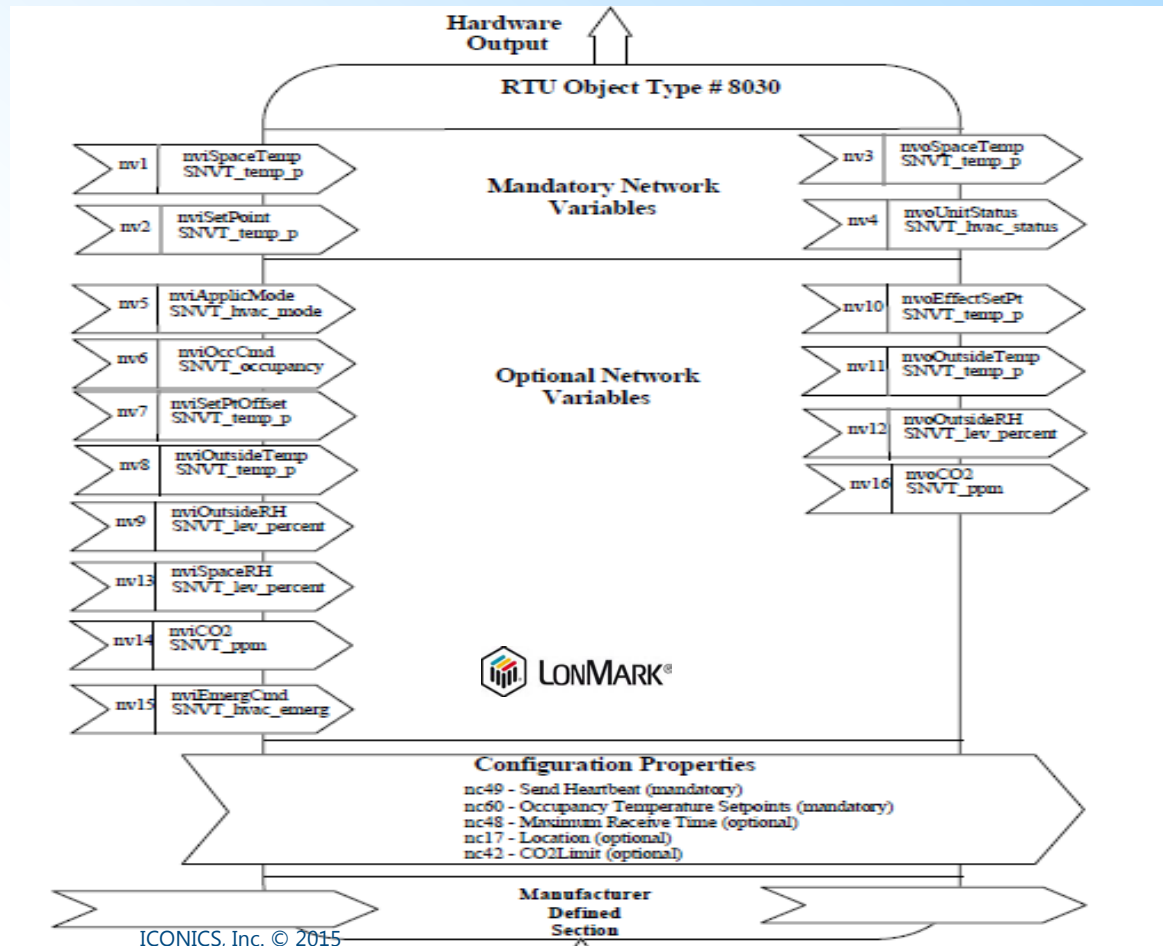
## Roof Top Unit Functional Profile

Standard Input/Output Set

Standard Naming

Standard Methods Calculations

Standard Commands





# Today – Lack of Standardized Classes

Example – On a single campus



Roof Top Unit  
Functional Profile

<u>Space Temperature</u>	<u>Occupied Status</u>	<u>Discharge Air</u>
Zone_Temp	OCC	DA_Temp
Z_Tmp	Occupied	DA-Temp
SpaceTemp	OCC_MOD_STS	SA-Temp
Space_Temp	OCC-Flag	Supply_Temp
Room_Tmp	OCC Mode	
Room_Temp		



# Applications Protocol – Independent Certification





# Application Protocol - Hardware Availability

## Commercial



## Industrial



## Metering



Cutler-Hammer







# OPC Foundation International

- ▶ OPC Technology Started in 1995
- ▶ OPC Foundation Incorporated January 1996
- ▶ OPC Classic 1995 –
- ▶ OPC Unified Architecture 2004 -
- ▶ OPC Unified Architecture & The Internet, Industrie 4.0 and .... 2014 -

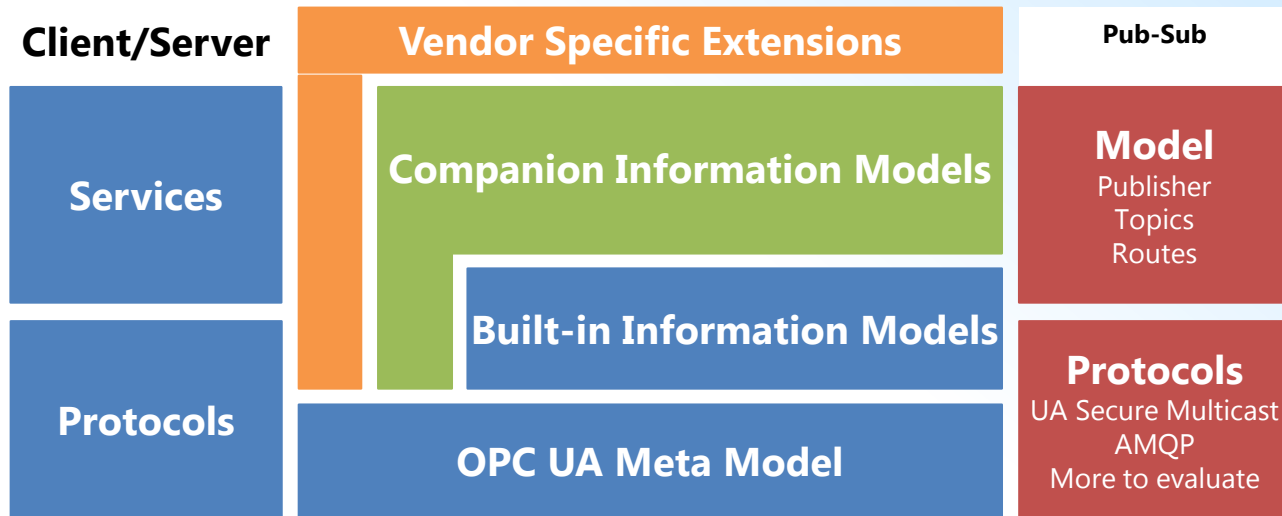


OPC UA is IEC 62541.



# OPC Unified Architecture

- ▶ OPC UA Publish/Subscriber Communication Model
- ▶ Generic Pub-Sub Information Model under development
- ▶ Evaluation of existing protocols ongoing



# OPC Unified Architecture

- ▶ OPC Foundation collaborations with organizations and domain experts
- ▶ OPC UA defines HOW
- ▶ Domain experts define WHAT

## Companion Information Models

PLCopen, ADI, FDI, FDT, BACnet, MDIS, ISA95, AutomationML, MTConnect, AutoID, VDW, IEC 61850/61400, ODVA/Sercos and more coming

## Built-in Information Models

## OPC UA Meta Model

### MDIS –

Oil Platforms



### IEC61850

Electric Substations



### IEC61400

Wind Turbines



### FDT

Factory Devices



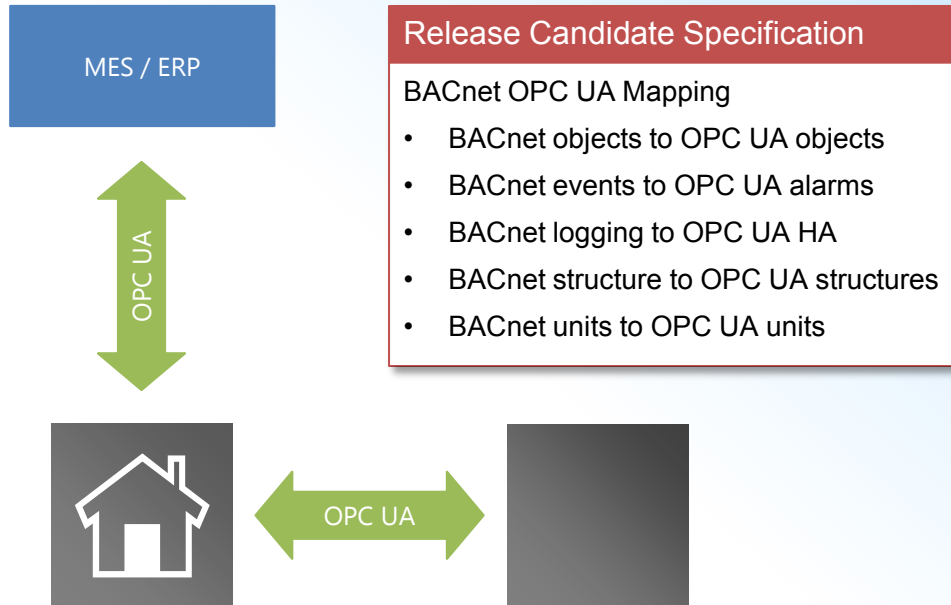
# Working Group OPC UA / BACnet

In September 2012 the OPC Foundation and BACnet Interest Group founded a new WG.

The main task was to create a mapping model for OPC UA and BACnet.



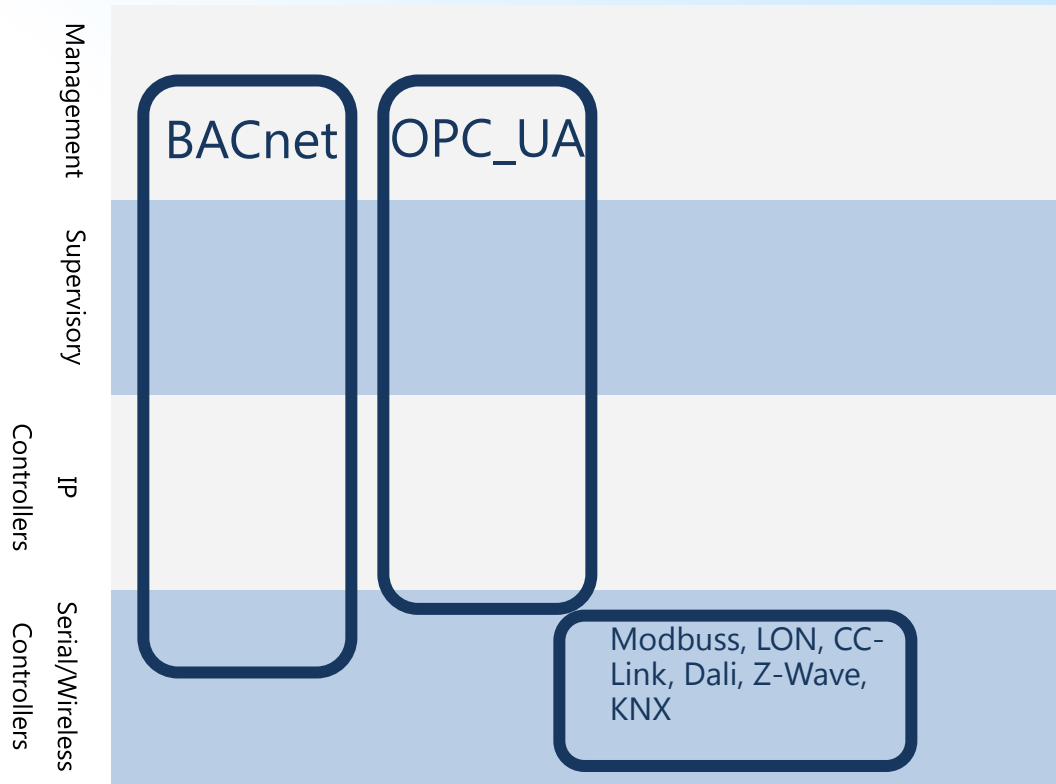
# BACnet – Building Automation



# Interoperability Analysis



# Interoperability Analysis





Requirements	BACnet IP Annex J		OPC-UA
Standard Transport	√		√
Secure Transports			√
Reverse WWW Connection			
Application Protocols- Real-Time Services	√		√
Application Protocols- Full Discovery			√
Applications Protocol Certification Agencies	√		√
Applications – Standardized Complex Objects			Capable
Hardware Availability		Commercial BAS	Industrial

# Hardware Availability

## Commercial



## Industrial



## Metering



Cutler-Hammer



# Thank you!

