Information Revolution 2014

New Information Models for BACnet, AutoID and AutomationML

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Agenda

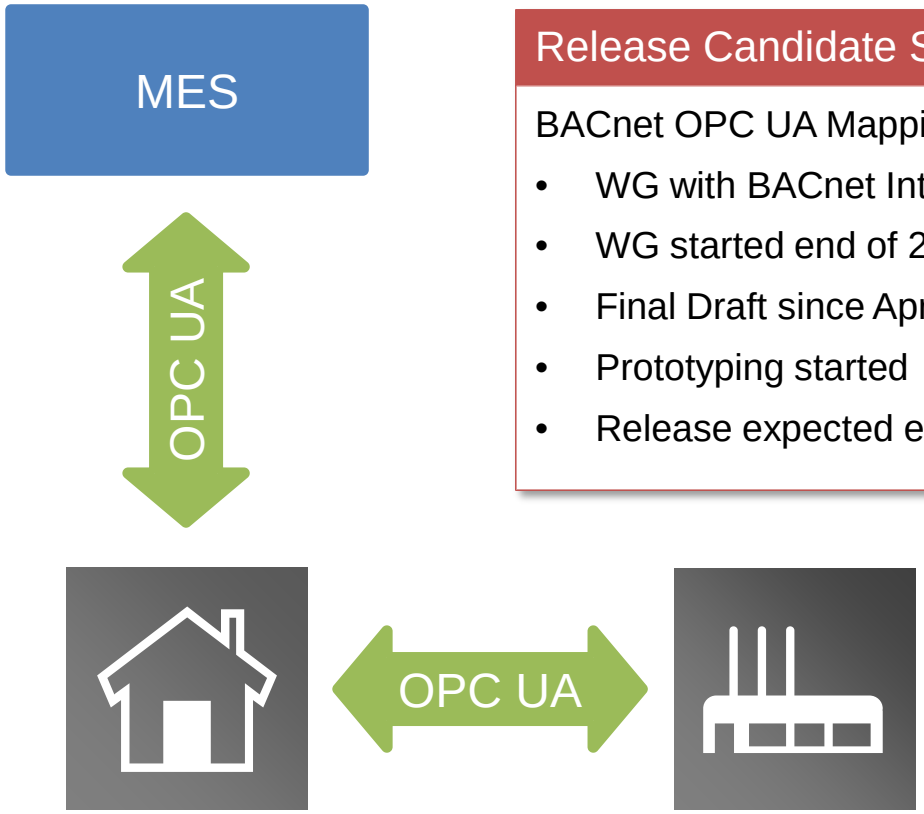
OPC UA for BACnet

OPC UA for AutoID Systems

OPC UA for AutomationML

Other Information Model Working Groups

BACnet – Building Automation



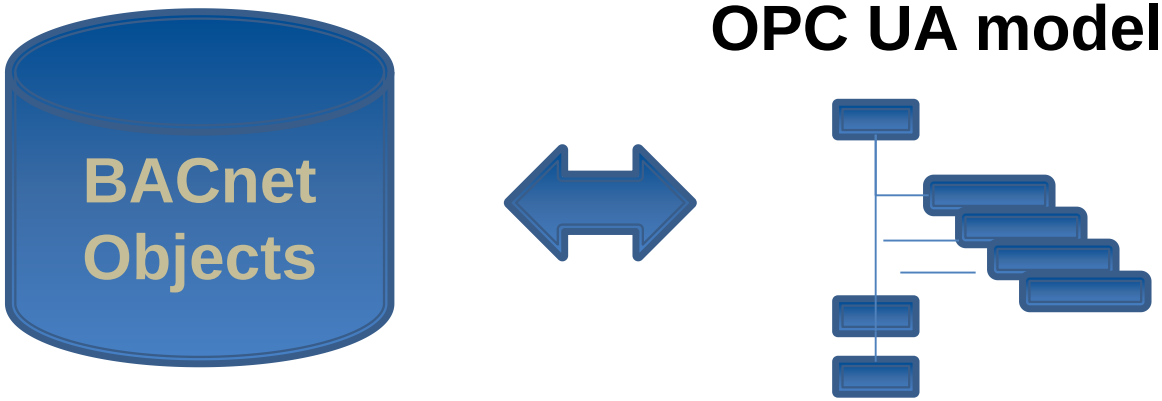
Release Candidate Specification

BACnet OPC UA Mapping

- WG with BACnet Interest Group Europe
- WG started end of 2012
- Final Draft since April 2014
- Prototyping started
- Release expected end of 2014

Mapping BACnet → OPC UA

BACnet Objects/Properties	→	OPC UA Object Types
BACnet Events	→	OPC UA Alarms & Conditions
BACnet Logging	→	OPC UA Historical Access
BACnet Data Structures	→	OPC UA Structure Data Types
BACnet Units	→	OPC UA Engineering Units



BACnet Objects → OPC UA Object Types

- **Mapping concepts**
  - BACnet defines flat list of object types
  - BACnet properties are duplicated across types
  - OPC UA allows type hierarchies
  - Mapping targets at avoiding duplicated definitions

- **Modeling concepts**
  - Type hierarchies and inheritance – share common properties via base type
  - Aggregation – combine groups of properties in separate type and aggregate them
  - Reuse of existing OPC UA types like AnalogItemType

AnalogInput

Property Identifier
Object_Identifier
Object_Name
Object_Type
Present_Value
Description
Device_Type
Status_Flags
Event_State
Reliability
Out_Of_Service
Update_Interval
Units
Min_Pres_Value
Max_Pres_Value
Resolution
COV_Increment
Time_Delay
Notification_Class
High_Limit
Low_Limit
Deadband
Limit_Enable
Event_Enable
Acked_Transition
Notifiy_Type
Event_Time_Stamps
Event_Message_Texts
Event_Message_Texts_Config
Event_Detection_Enable
Event_Algorithm_Inhibit_Ref
Event_Algorithm_Inhibit
Time_Delay_Normal
Reliability_Evaluation_Inhibit
Property_List
Profile_Name

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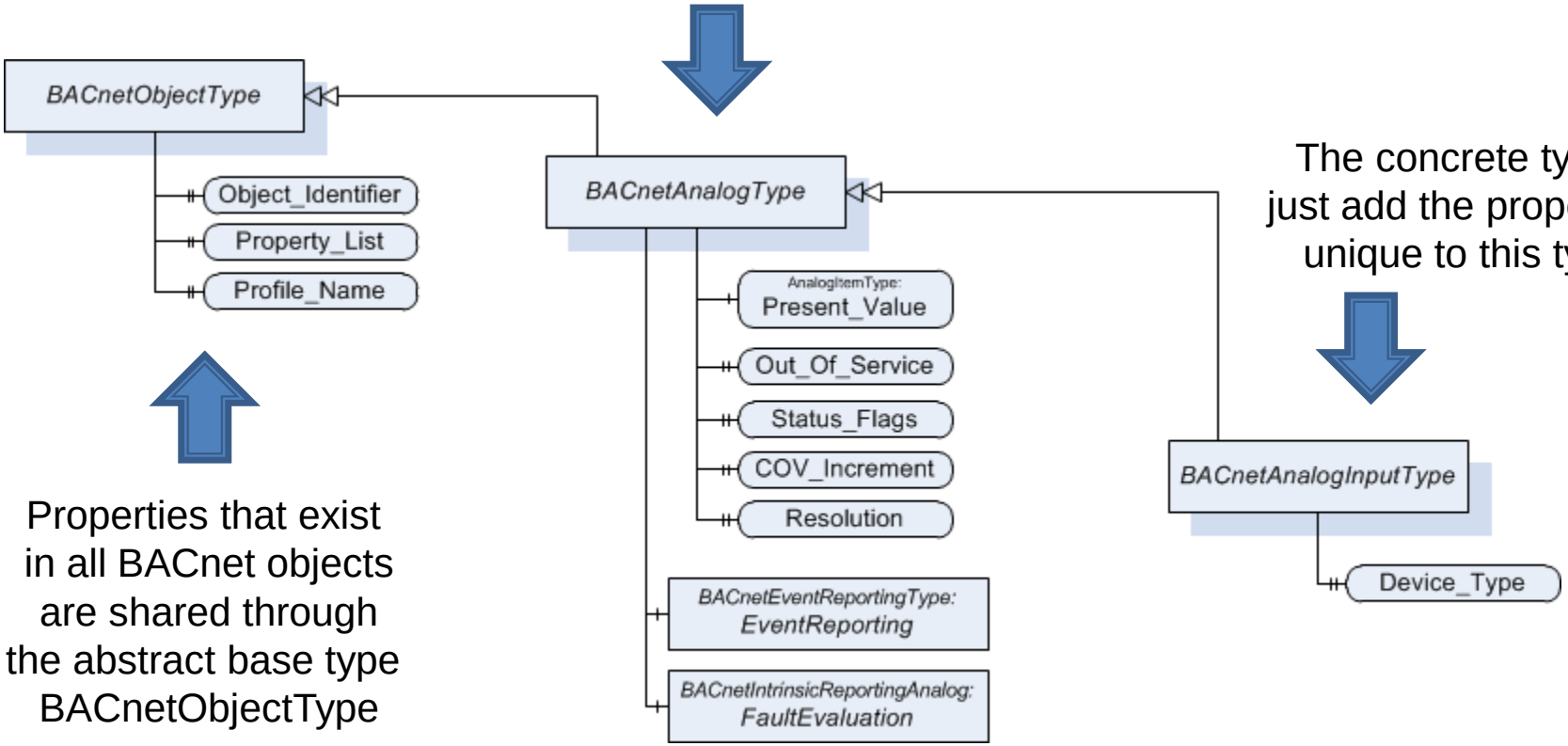
Type Hierarchies and Inheritance

AnalogInput, AnalogOutput and AnalogValue have common properties represented through the abstract type BACnetAnalogType

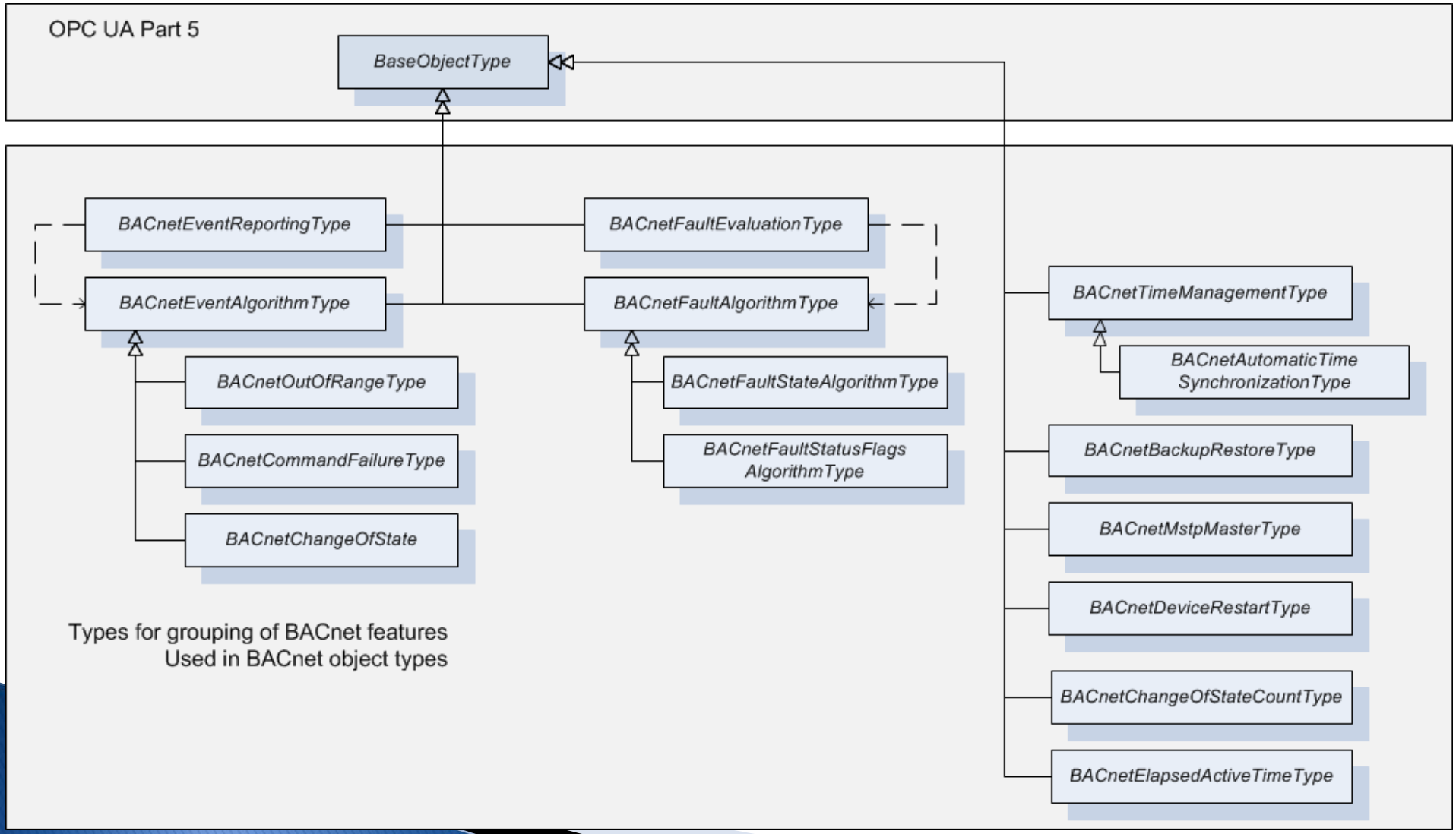


The concrete types just add the properties unique to this type

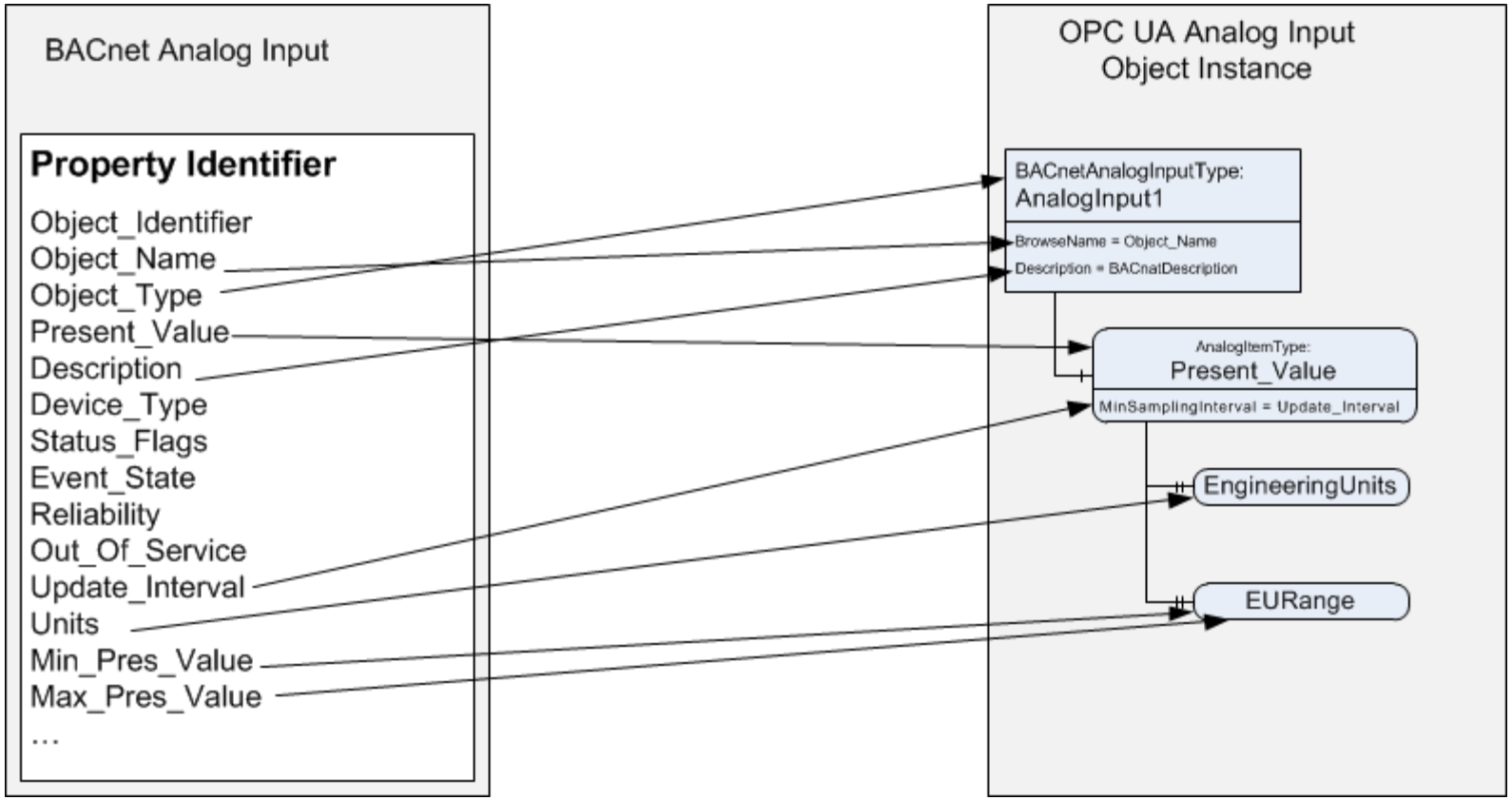
Properties that exist in all BACnet objects are shared through the abstract base type BACnetObjectType

More handled through aggregation

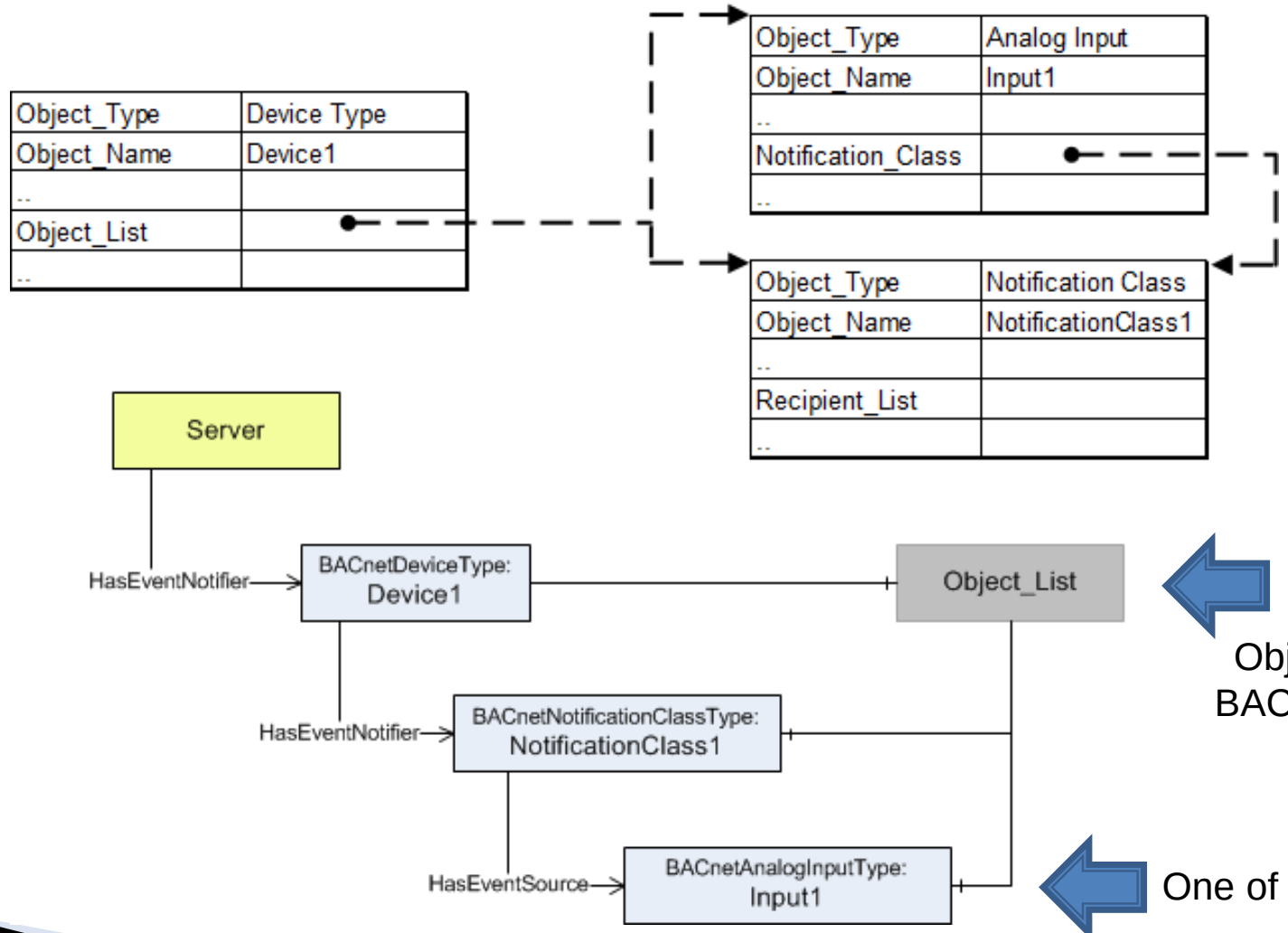
Aggregation – Property Groupings



Mapping to Existing OPC UA Constructs



Event Mapping

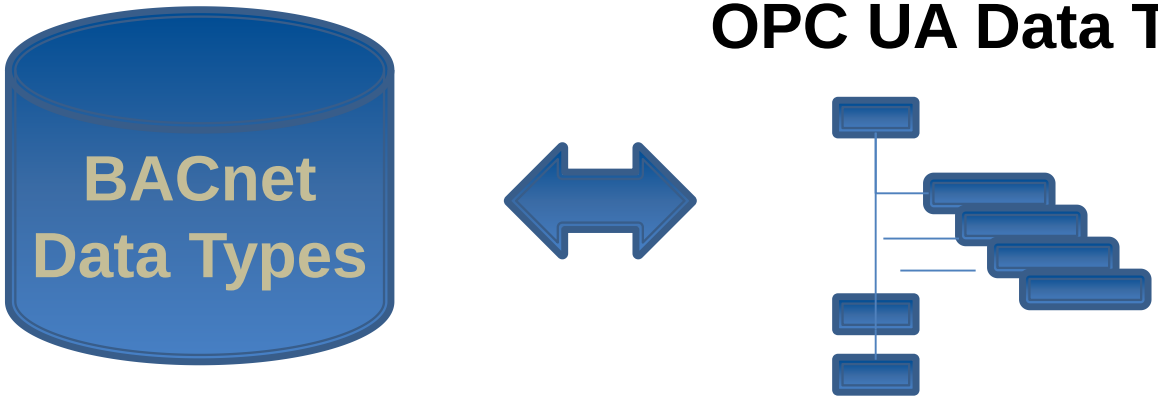


Object list of BACnet Device

One of the objects

Data Type Mapping

BACnet Primitive Types	→	OPC UA Built-In Data Types
BACnet Bit Strings	→	OPC UA OptionSet Data Types
BACnet Enumerations	→	OPC UA Enumeration
BACnet Sequence	→	OPC UA Structured Data Types
BACnet Choice	→	OPC UA Union Data Types



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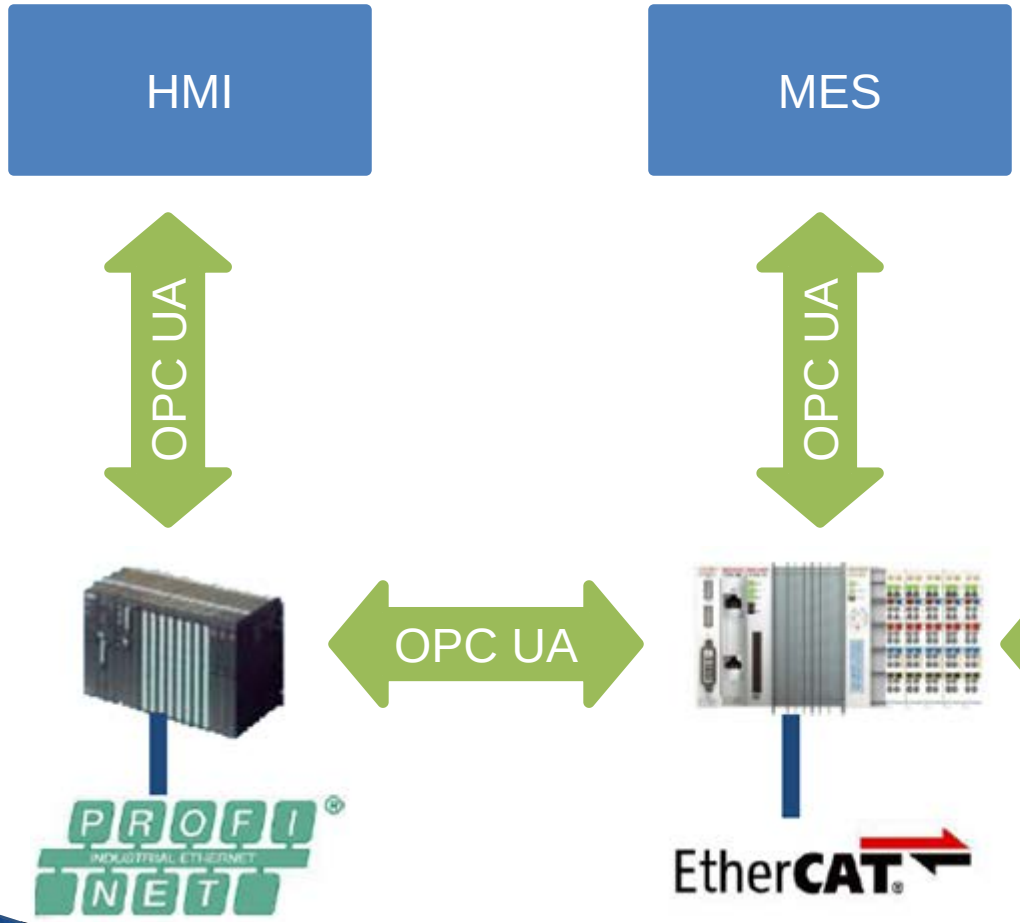
OPC UA for AutomationML

Other Information Model Working Groups

OPC UA for IEC 61131-3 (PLCopen)



Released

61131-3 Software Model mapped to OPC UA Information Model

→ PLC Data provided as UA Server

New Release April 2014:

OPC UA Communication
Function Blocks like Connect, Read, Call

→ PLC as OPC UA Client

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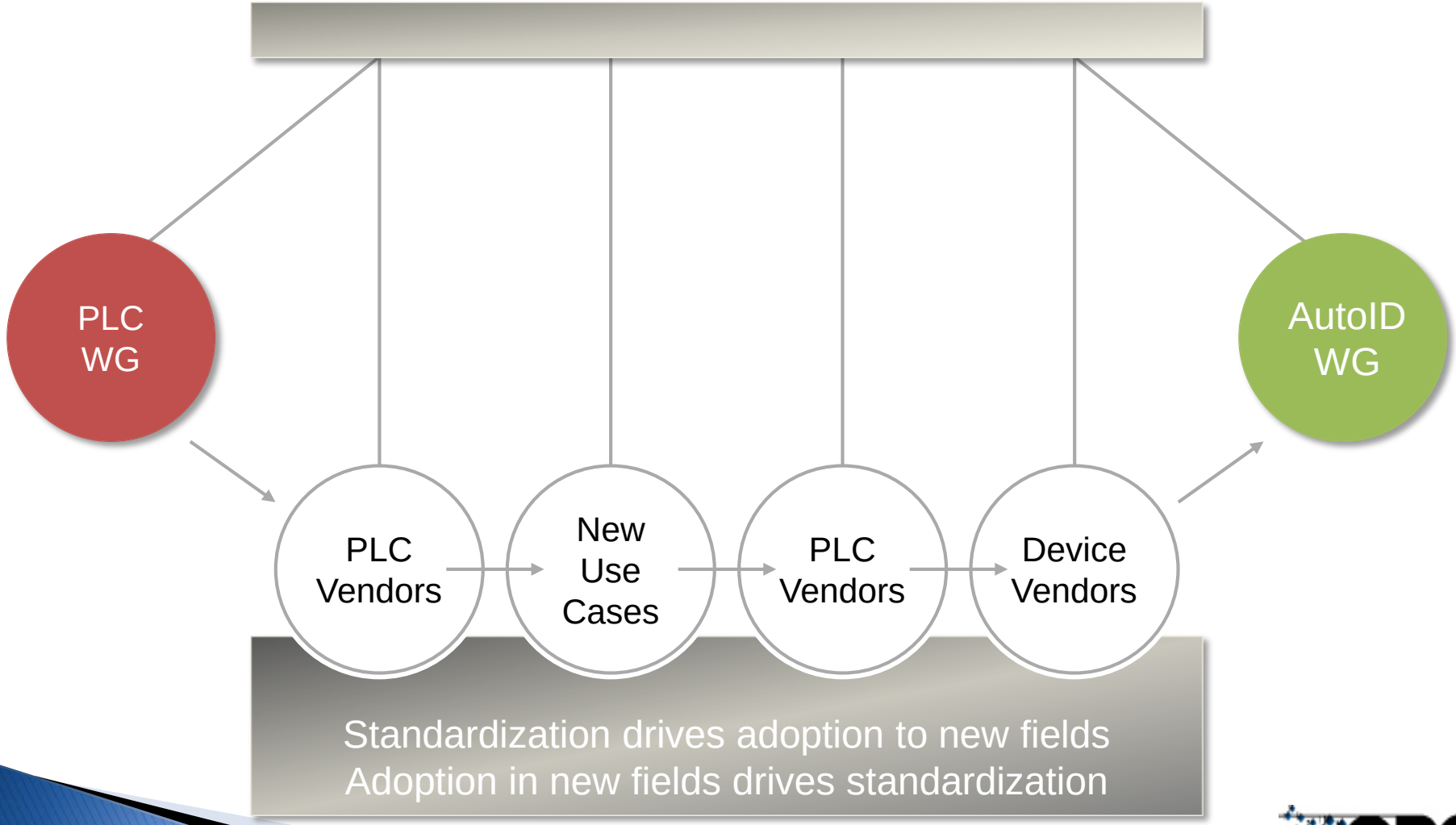
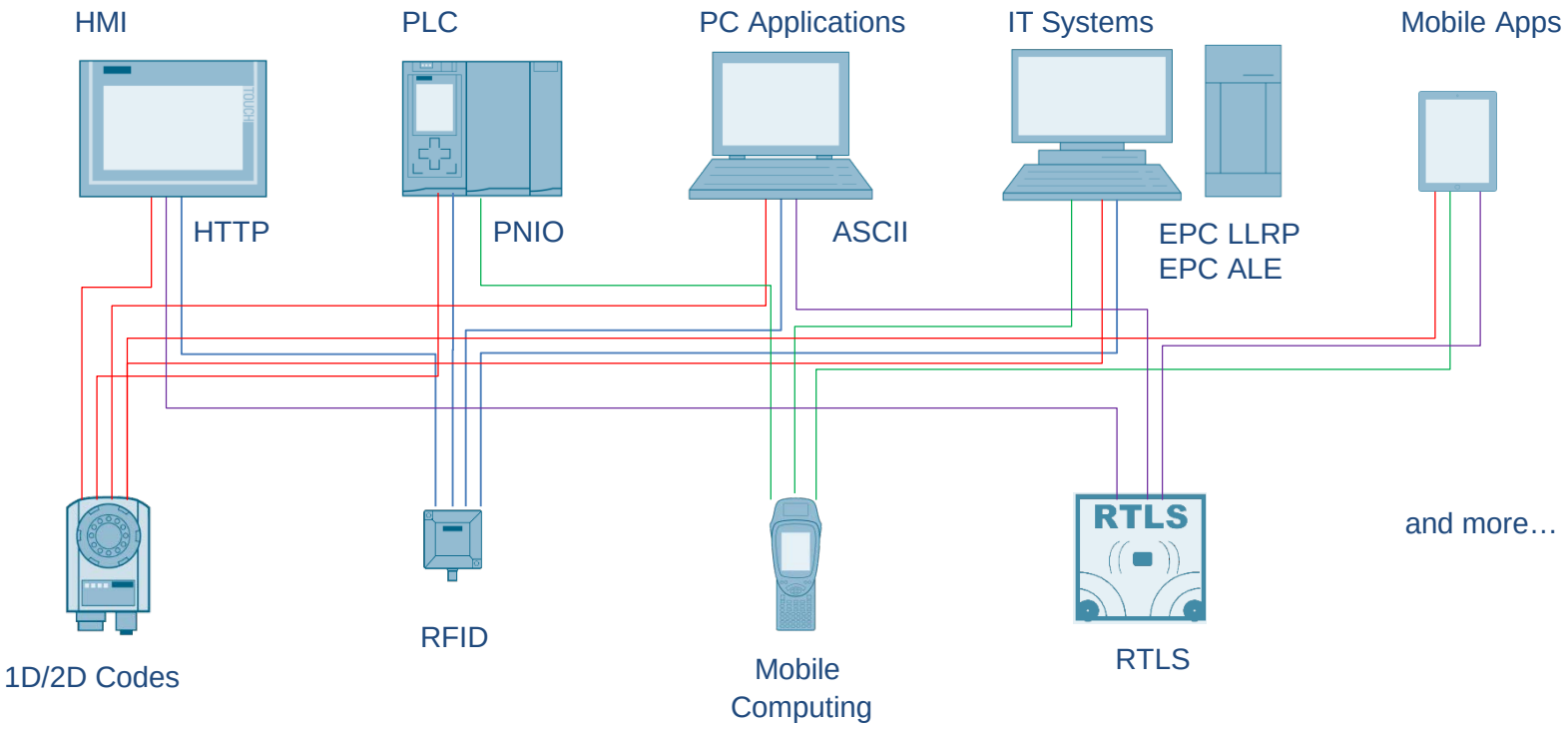
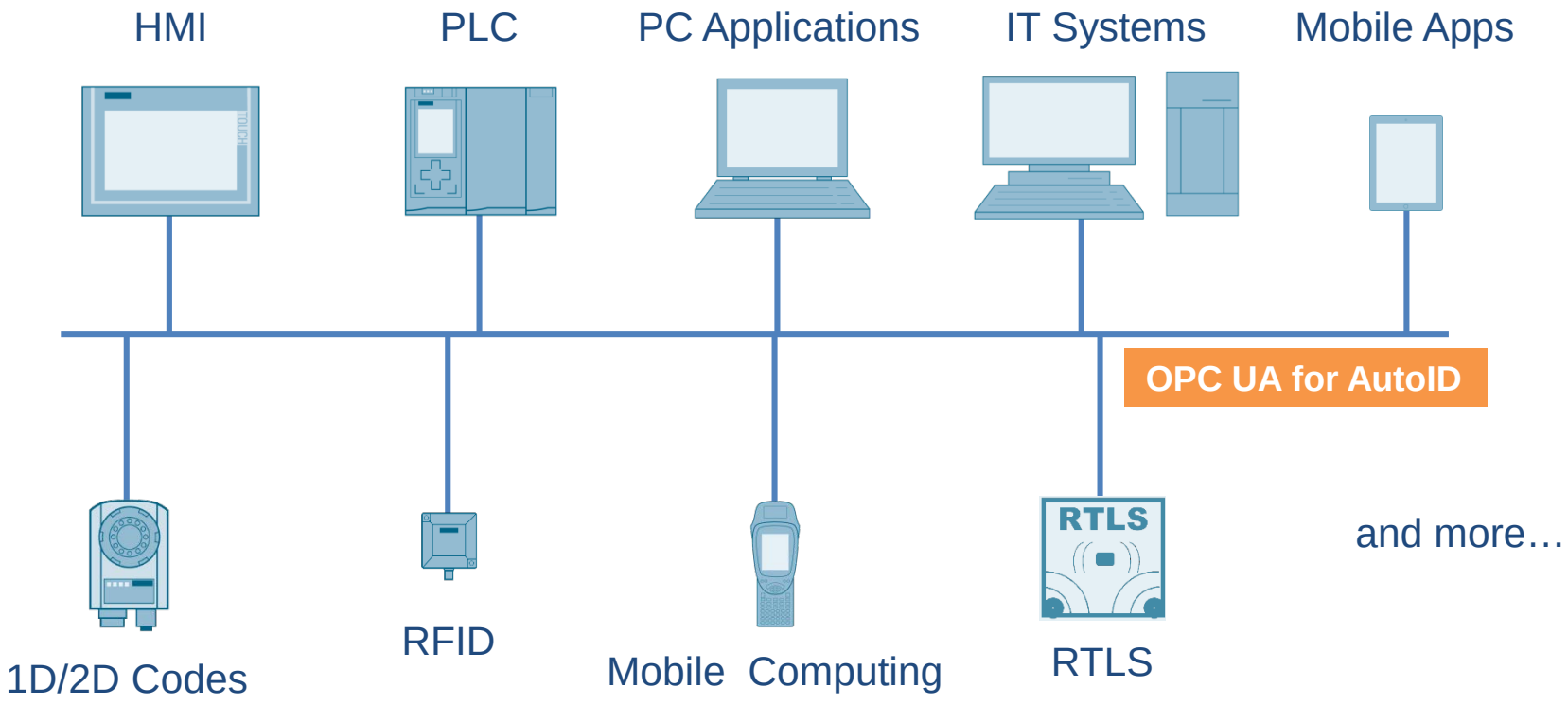
Dynamics of OPC UA Adoption



System Integration: a Major Hurdle in AutoID Projects

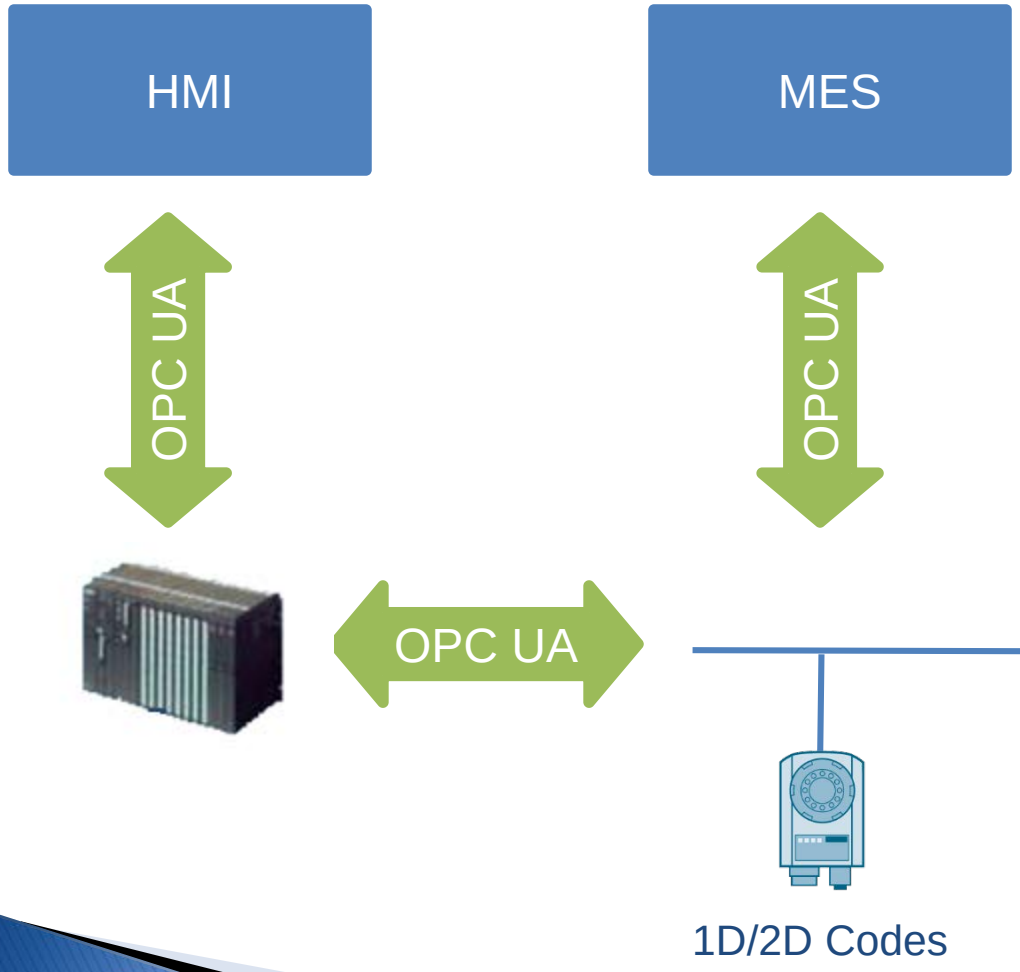


AIM – OPC UA for AutoID



Connect Smart Products with Smart Devices Working Group Started

AutoID Communication Use Cases



Who implements what

AutoID devices are OPC UA Servers

PLCs are OPC UA Clients

MES is OPC UA Client or Server

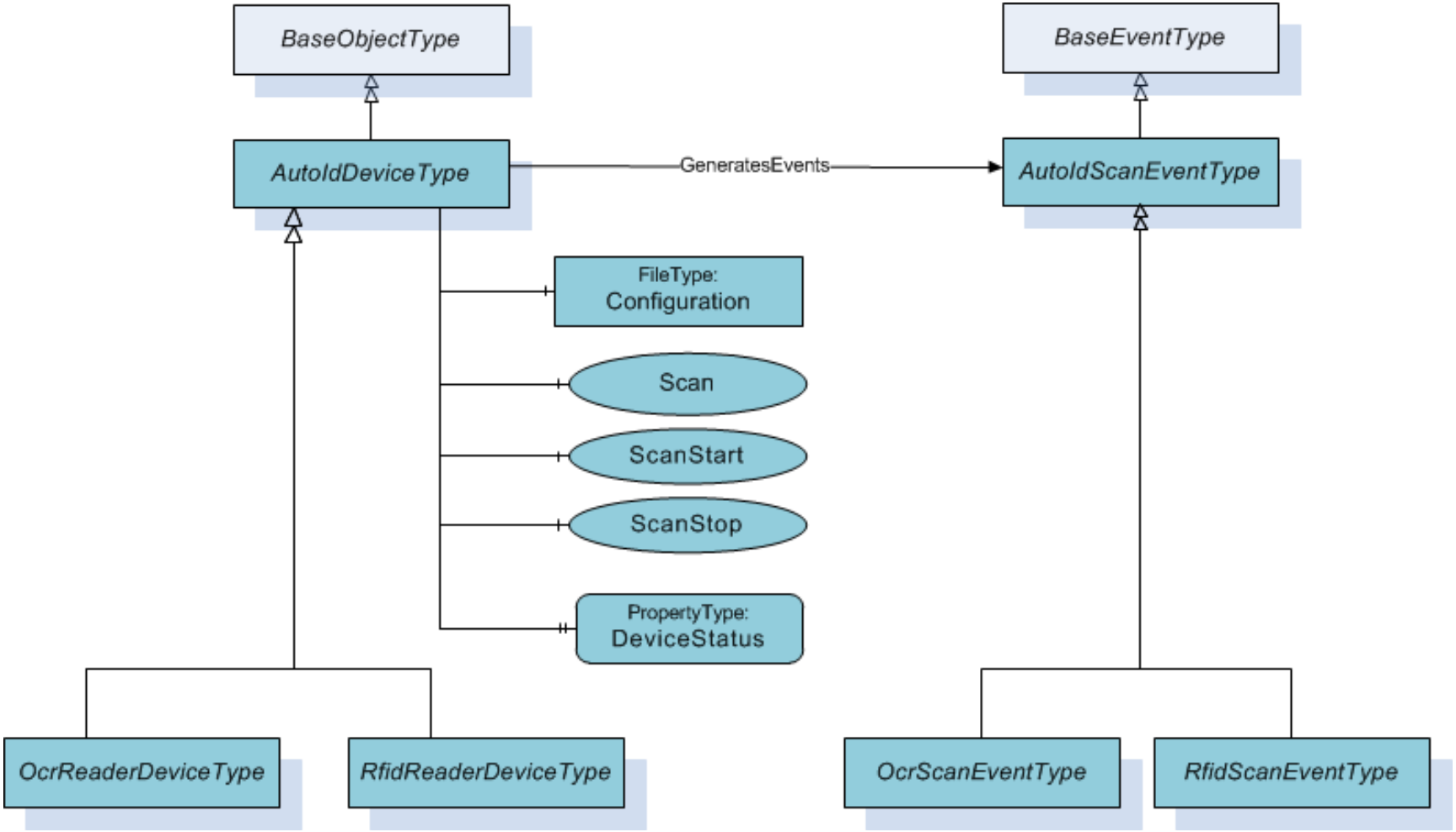
AIM – Association for Automatic Identification and Mobility

- Founded in 1972 in USA
- More than 700 members in 43 countries
- Represents the large majority of leading AutoID companies
- AIM-D: German chapter
  - more than 130 members
  - including automation specialists, technology providers, integrators, software engineers, and more
- More information: http://www.aim-d.de/

OPC UA for AutoID WG Status

- Cooperation agreement signed between AIM and OPC Foundation at Hannover Fair in April 2014
- Kick-off meeting with input from device vendors in May 2014
- First information model draft for OCR and RFID devices finished in two electronic meetings
- Prototype implementations started
- 2D and 3D barcode readers and draft specification planned for F2F meeting in September
- First specification release planned for Hannover Fair 2015

OPC UA for AutoID Overview



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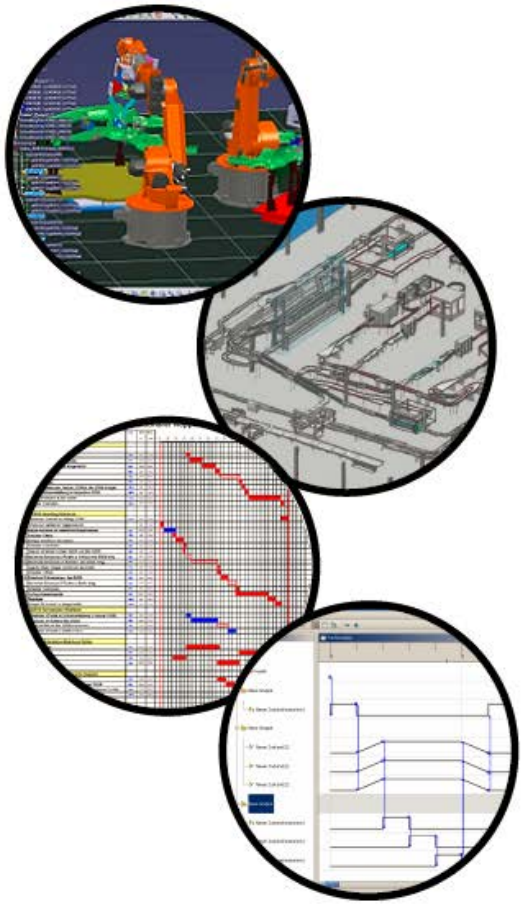
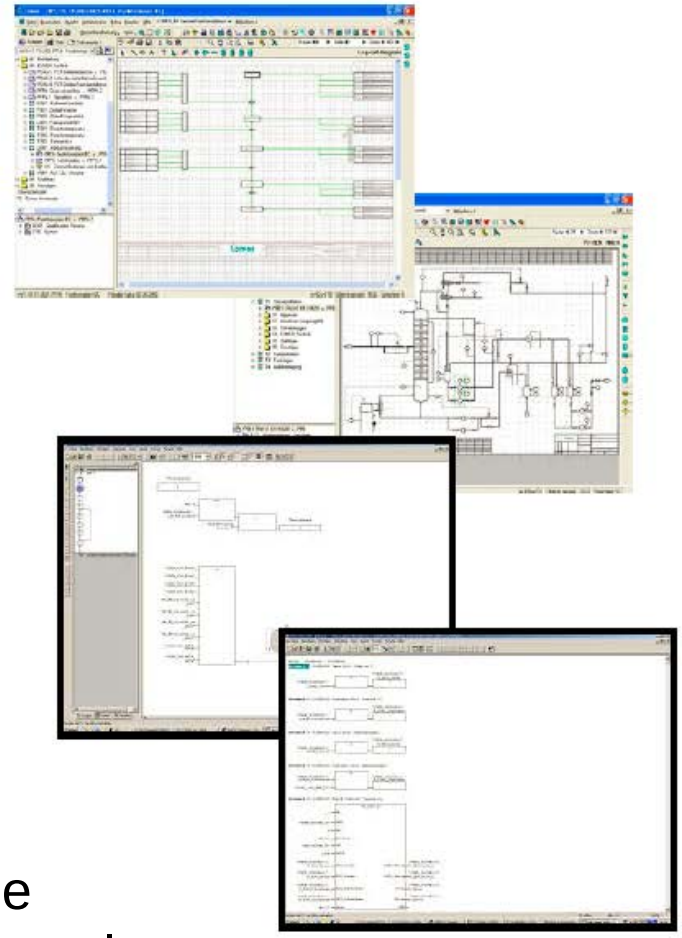
OPC UA for AutomationML

Other Information Model Working Groups

AutomationML Background





Information exchange
between engineering tools

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OPC UA for AutomationML – Abstract

AutomationML

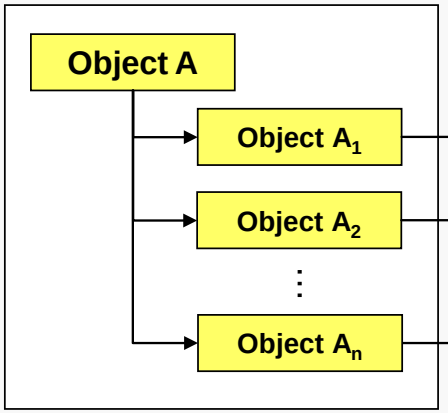
Engineering data

CAEX IEC 62424

Top level format

Plant topology information

- Plants
- Cells
- Components
- Attributes
- Interfaces
- Relations
- References

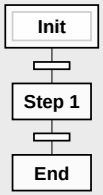


COLLADA

Geometry
Kinematics

PLCopen XML

Behaviour
Sequencing



Further XML Standard format

Further aspects of engineering information

DAIMLER
KUKA
SIEMENS
ABB
zühlke
empowering ideas
Fraunhofer IOSB
OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG
Universität Karlsruhe (TH)
Forschungsuniversität · gegründet 1825
NETALLIED SYSTEMS
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OPC UA for AutomationML

AutomationML

- XML based exchange format between engineering tools
- Uses and integrates other standards
  - Topology – IEC 62424 (CAEX)
  - Geometry and kinematics – ISO PAS 17506 (Collada)
  - Logic – PLCopen XML
  - Semantic – IEC 62424 (CAEX)

Working Group

- Cooperation signed November 2013
- Two electronic meetings
- Two face-to-face meetings

OPC UA for AutomationML - Abstract

Use Cases

- Create OPC UA Address Space from AutomationML data
  - Draft specification under development
  - Tool for transformation of AutomationML XML file to OPC UA NodeSet XML file under development
- Describe OPC UA communication relations in AutomationML
- OPC UA for storage, transfer, and management of AutomationML configuration files

Agenda

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Other Information Model Working Groups

OPC UA for Devices

Device Model

Defined in Version 1.0, extended in 1.1

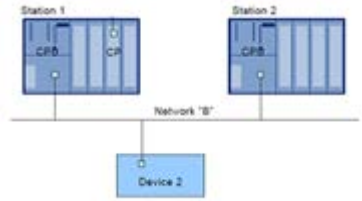
Configuration model for devices and configurable components

Device parameters and commands

Device Communication Model

Added to Version 1.1 (from FDI)

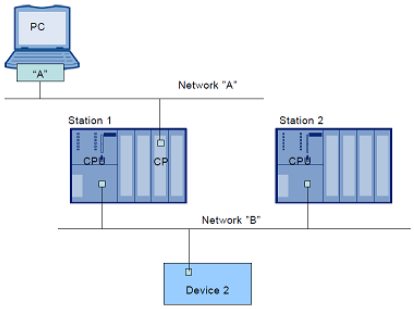
Creation and configuration of a device communication topology



Device Integration Host Model

Added to Version 1.1 (from FDI)

Configuration of a device network through a central configuration server



Version 1.1 Released July 2013

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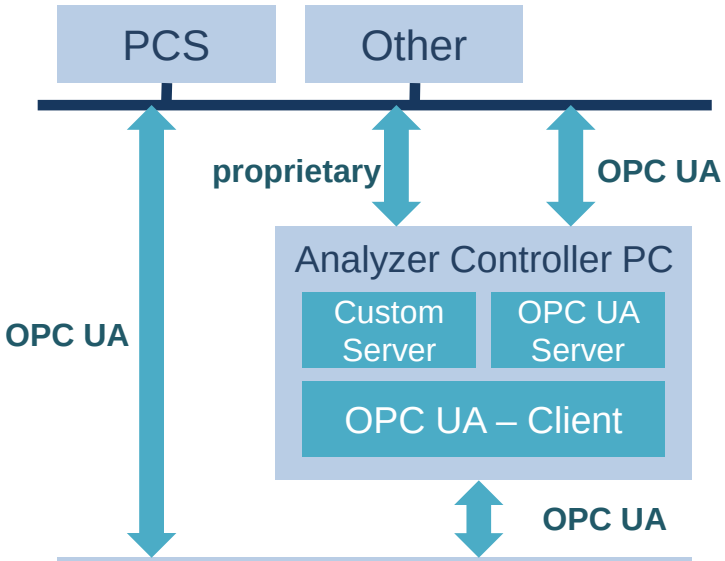
Analyzer Device Integration (ADI)

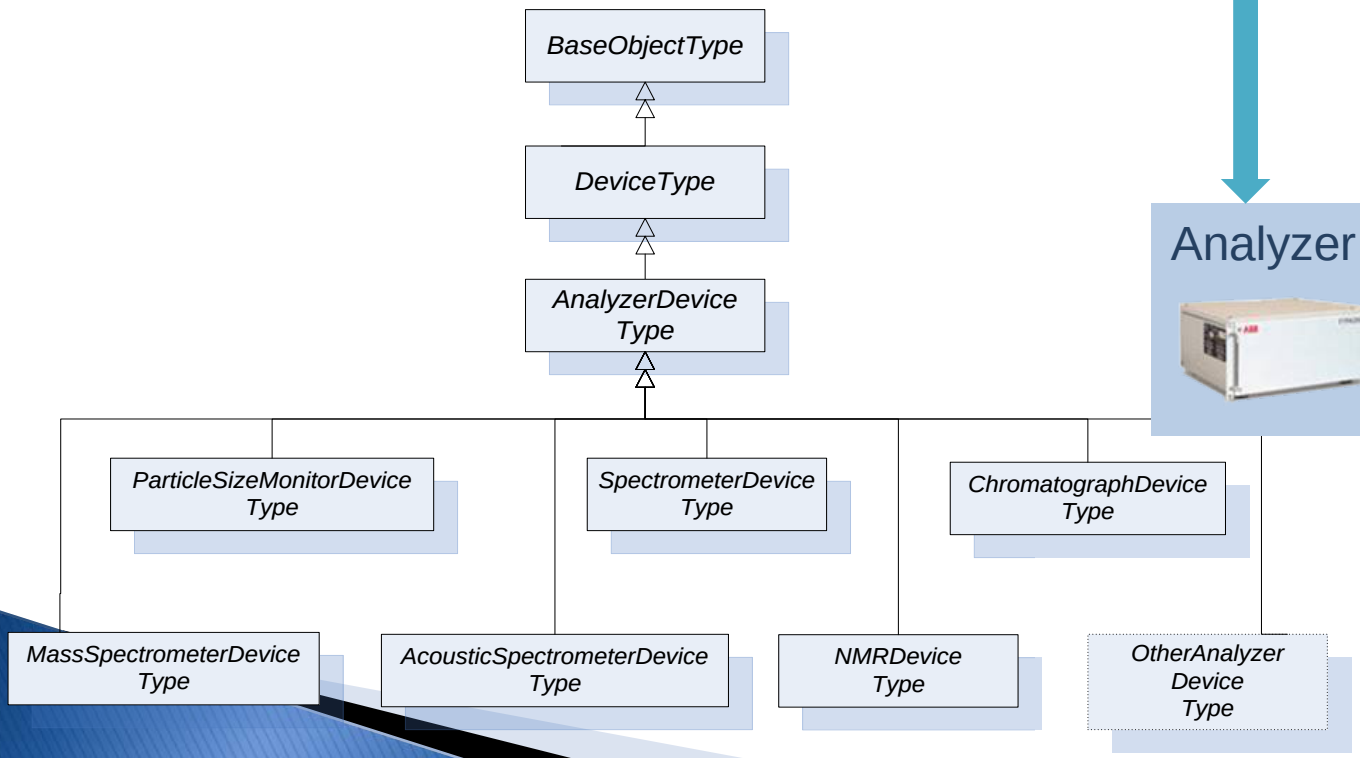
V 1.1 Released July 2013

Information Model for process analyzers

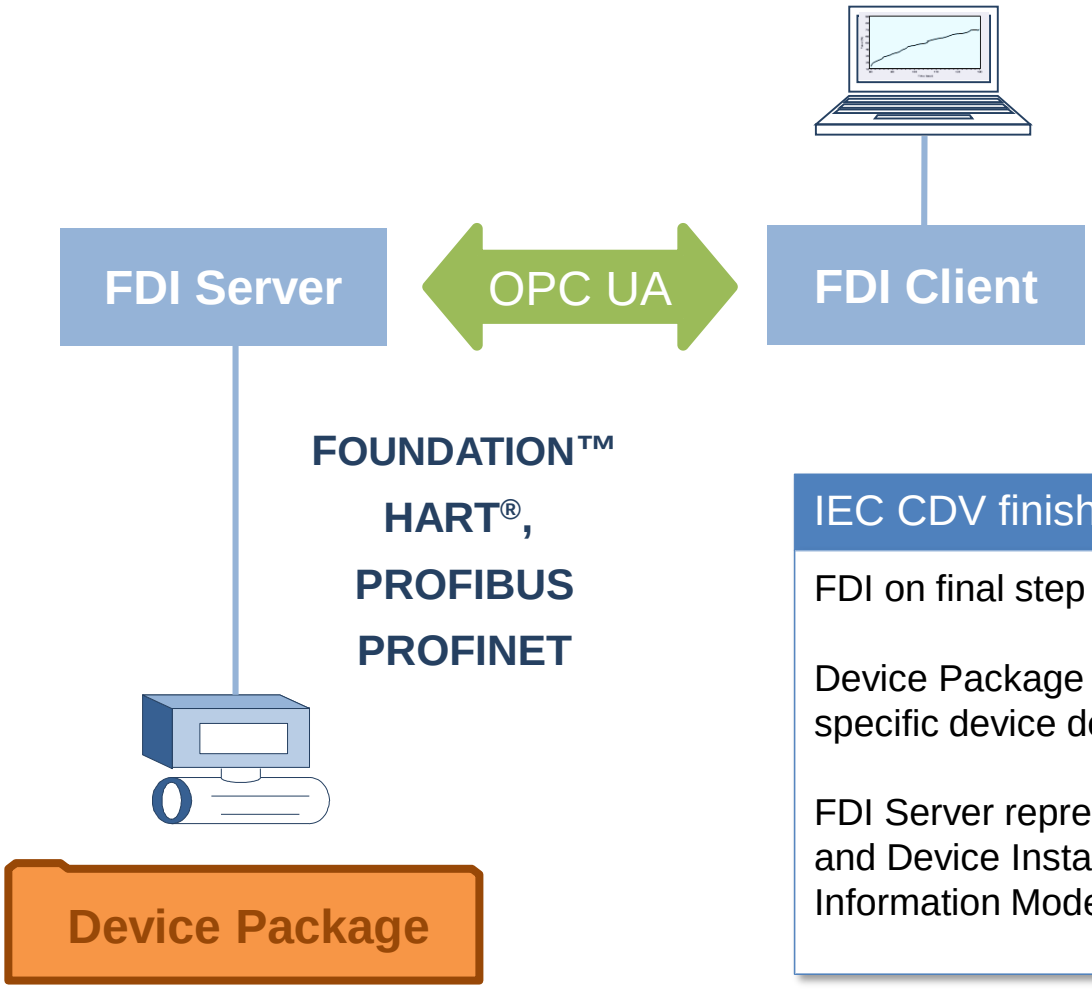
Update driven by vendors implementing the model

Generic Variable Types moved to OPC UA Part 8





Field Device Integration (FDI)



IEC CDV finished

FDI on final step to IEC Standard

Device Package contains vendor specific device description

FDI Server represents Device Types and Device Instances as OPC UA Information Model

Key Takeaways

- **Information Modeling is a key feature of OPC UA**
- **Semantic interoperability enabled using OPC UA**
- **Large number OPC UA Information Models for different domains**
- **Standardization drives adoption of OPC UA**
- **Adoption of OPC UA drives standardization**

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