NEXT GENERATION OPC UA ENABLES INTERNET OF THINGS (IoT)

A LEADING GLOBAL TECHNOLOGY CLUSTER

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Arnt Aske
Business Development Digitalization
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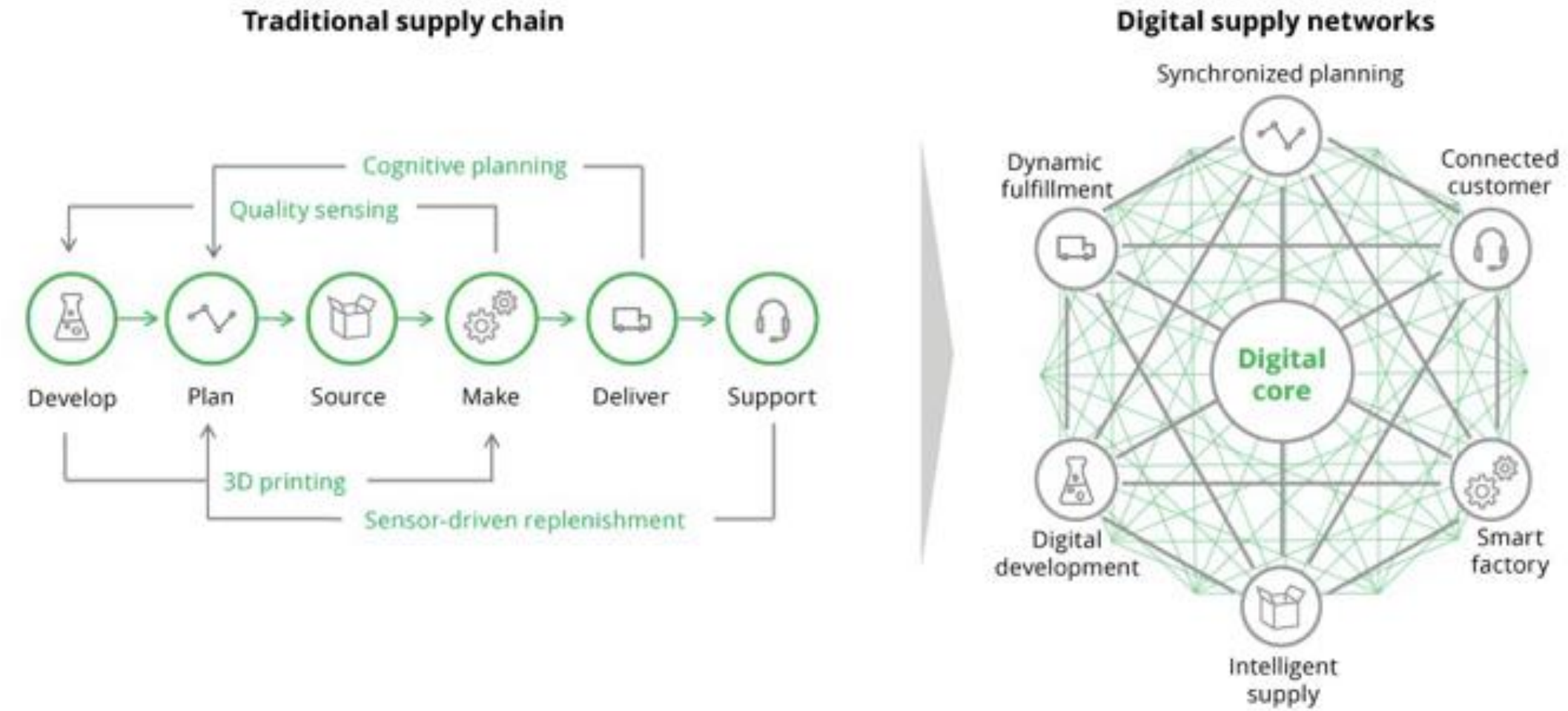
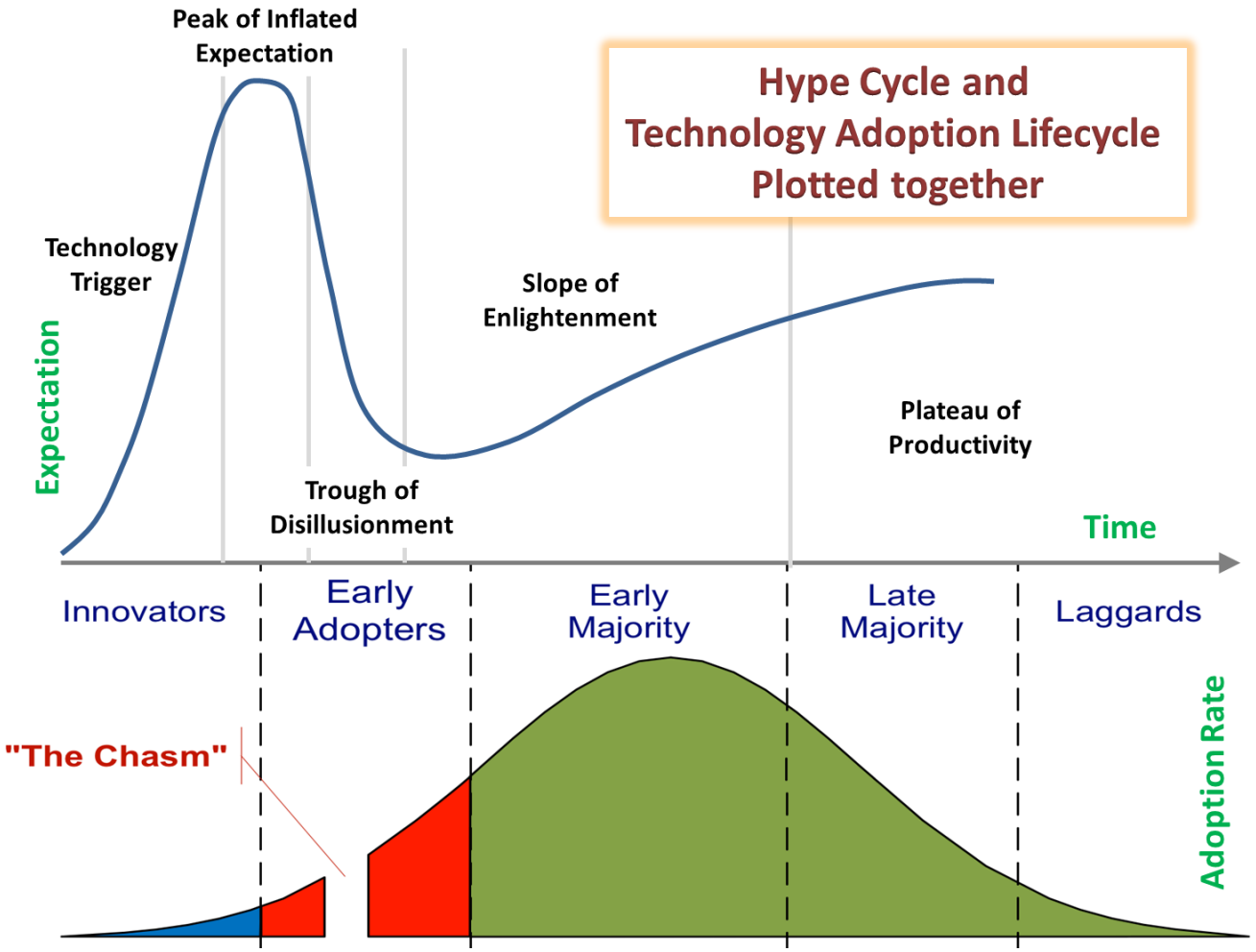
From traditional to digital supply networks

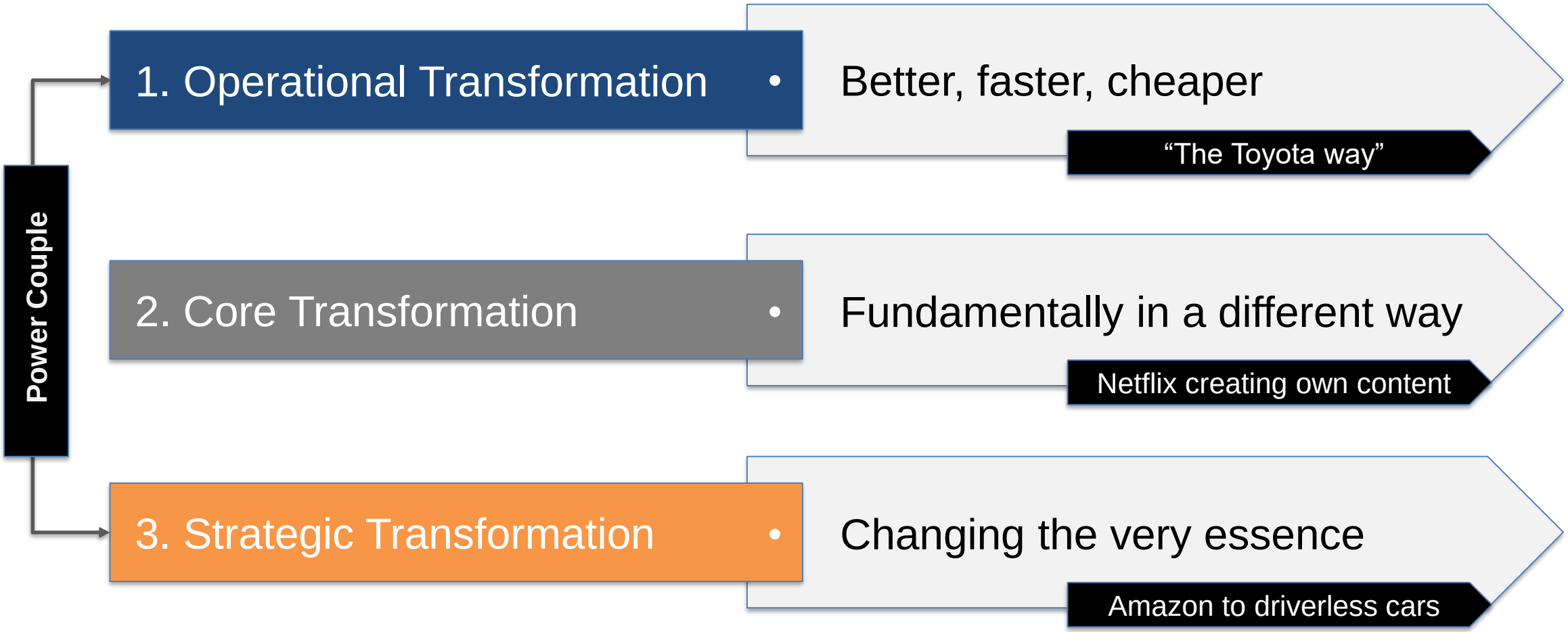


The gap is wide between digital leaders and laggards.



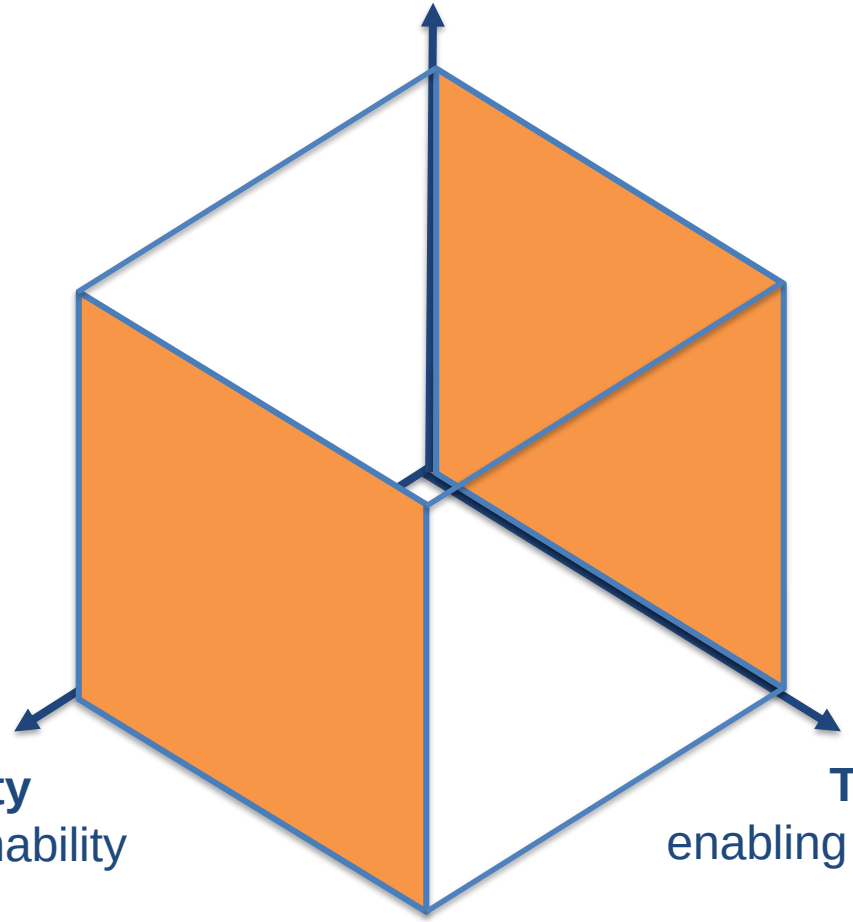
Digital leaders anticipate much higher business impact from digital technologies between now and 2020 than digital laggards do.

Transformation in digital age



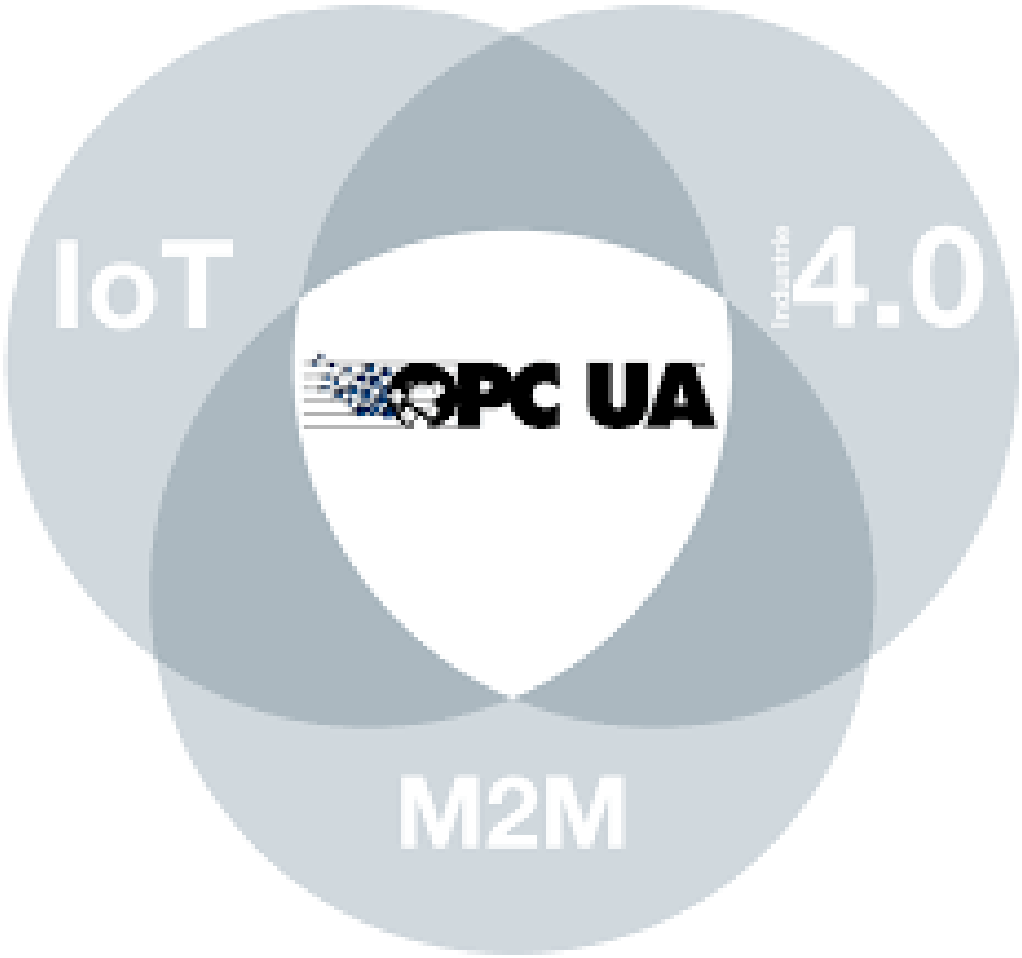
The “volume” of transformation

Culture & Operational DNA
foundation for innovation & transformation

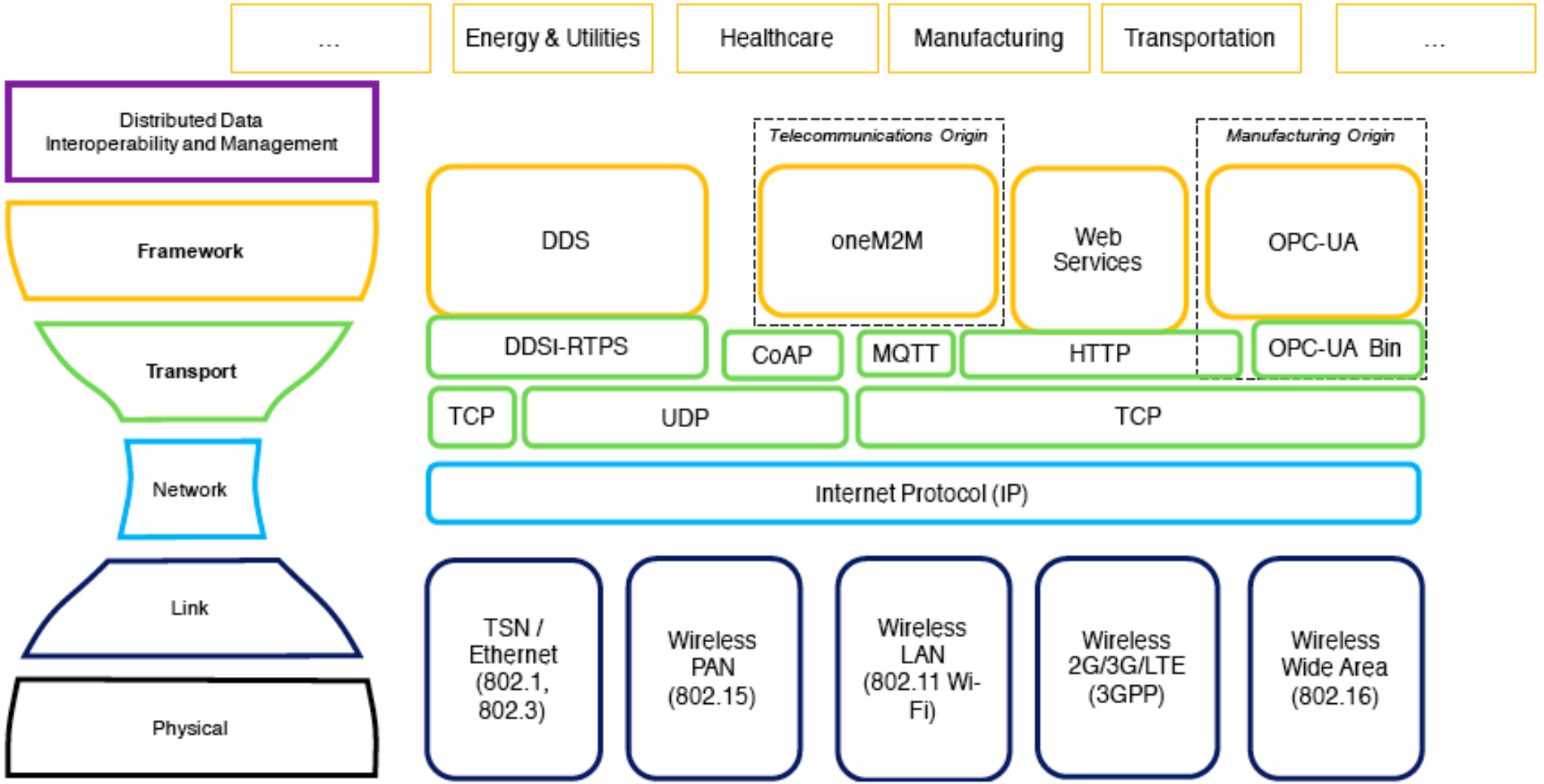


Scalability
driving sustainability

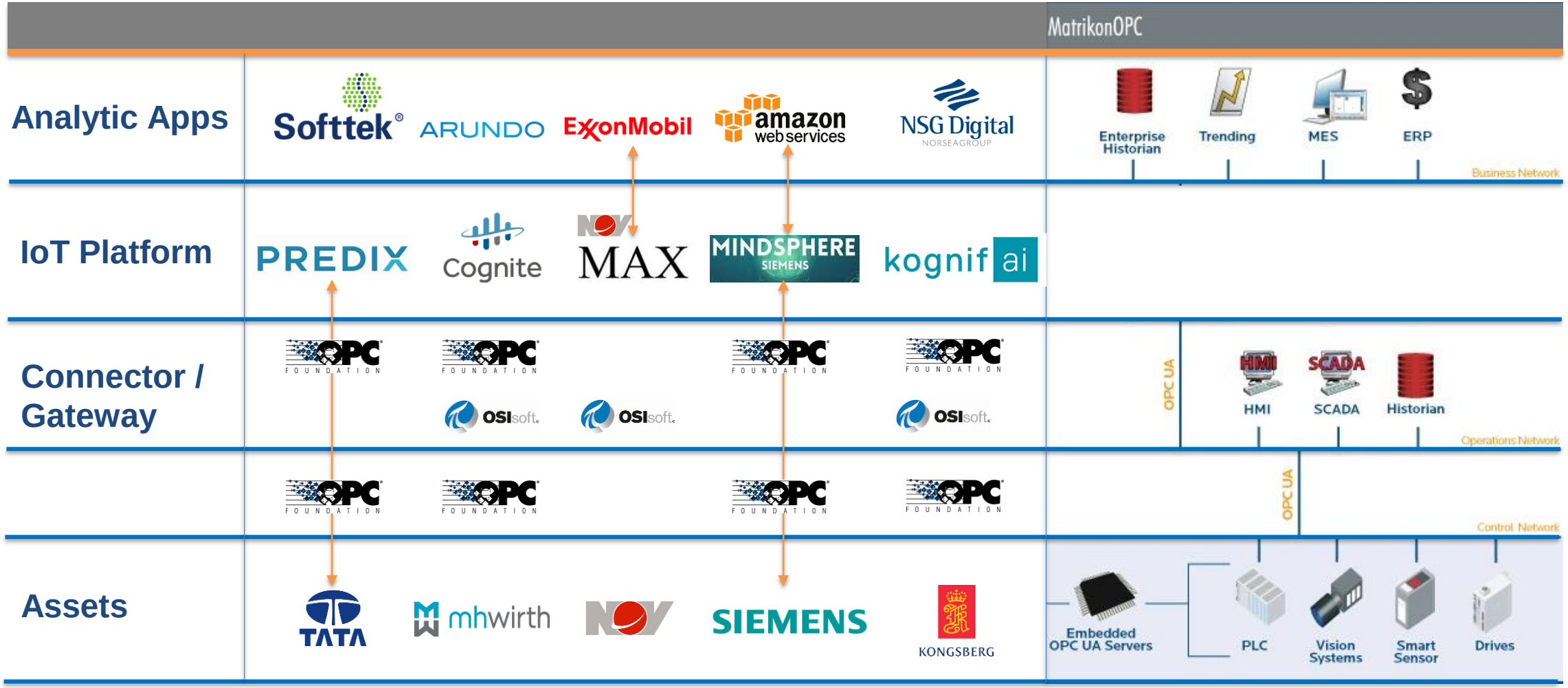
Technology
enabling business outcomes


IoT
Industrie 4.0
OPC UA
M2M

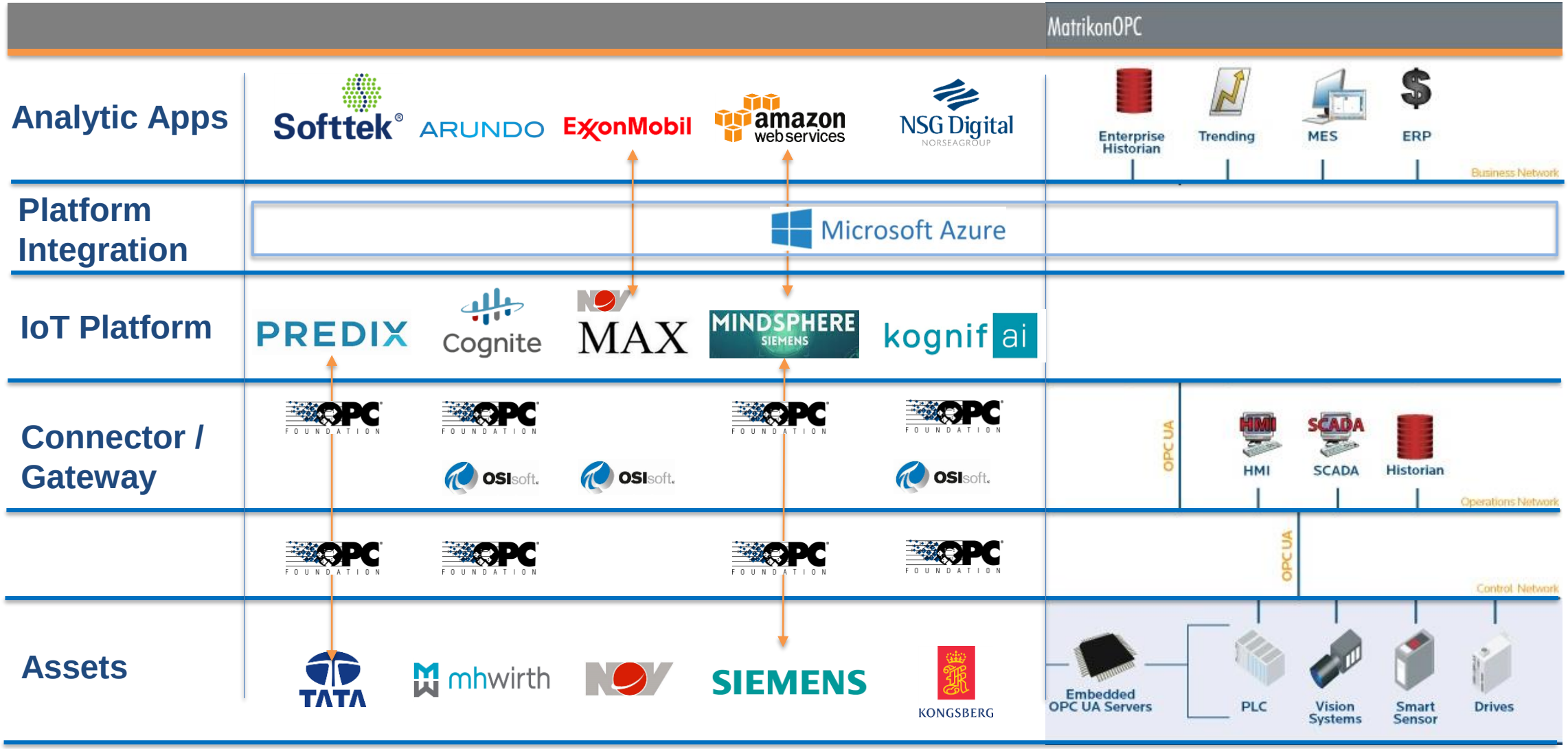
The IIC Connectivity Framework from 2017



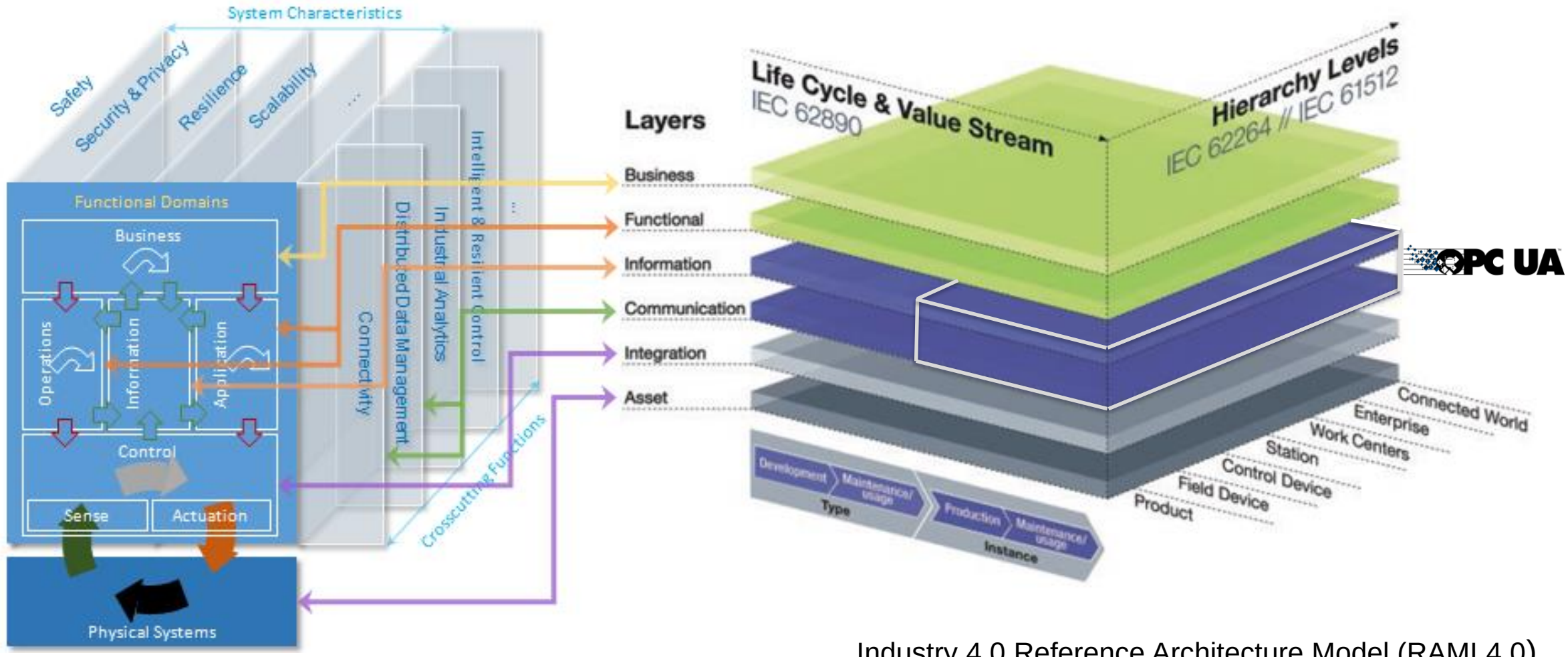
Current IoT landscape



Future IoT landscape?



OPC UA – A scalable technology

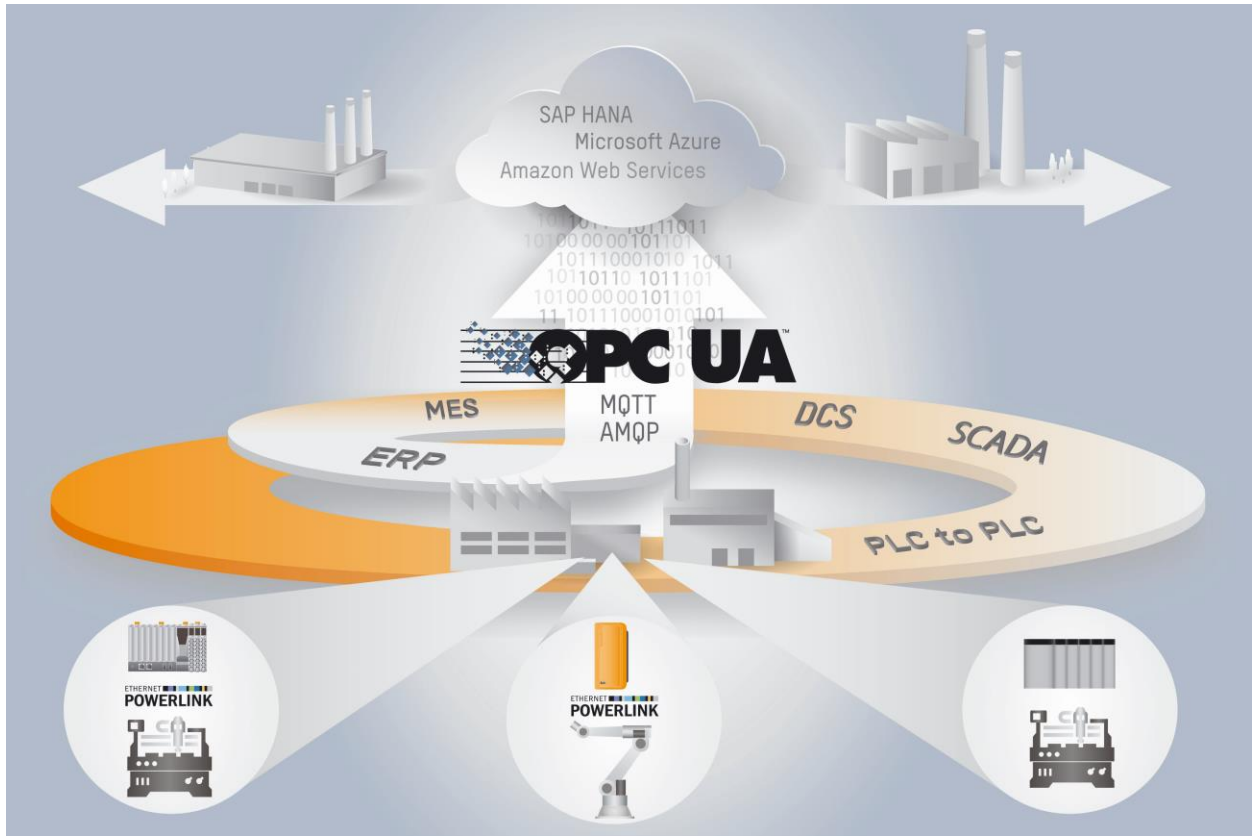


Industry 4.0 Reference Architecture Model (RAMI 4.0)

When Operational and IIoT Data Collide at the Edge

Combining operational and IIoT data is important to maximizing the value of edge analytics.

Next generation OPC UA



The OPC Foundation is attacking the real-time behavior on Ethernet from two fronts:

1. The introduction of a ***publish-subscribe model***

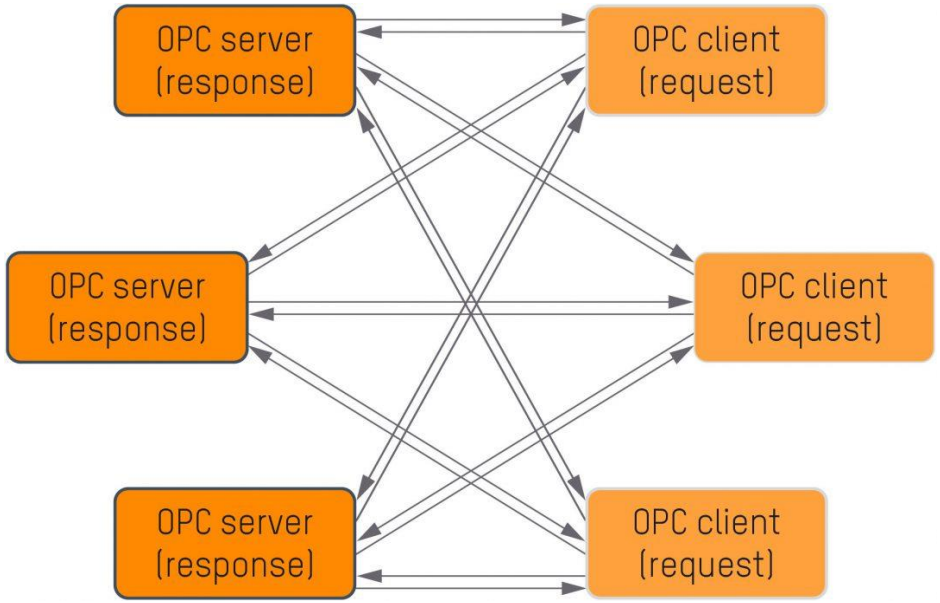
2. The implementation of the IEEE 802.1 standards for ***TSN*** that add deterministic behavior to standard Ethernet.

OPC UA pub / sub

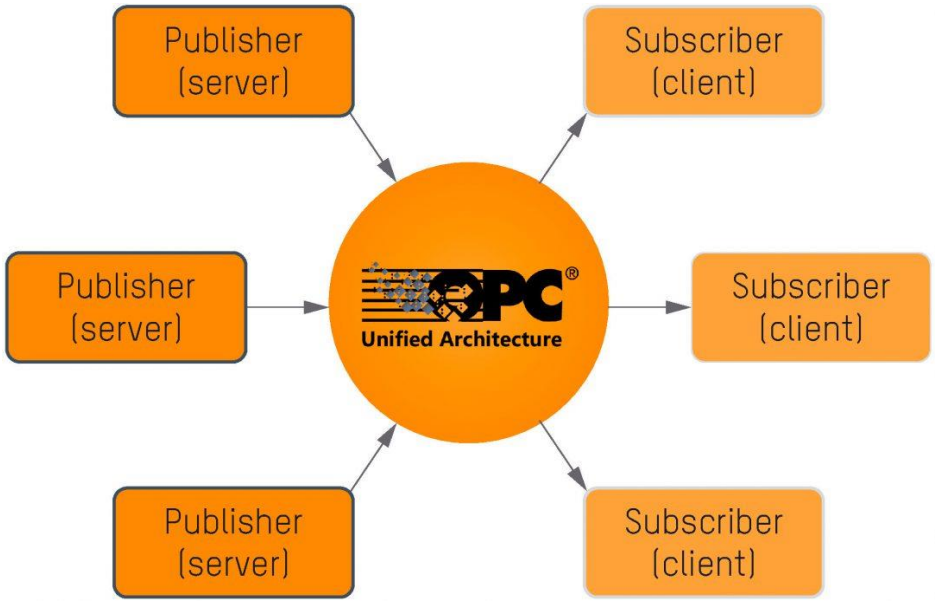
- OPC UA pub/sub provides a framework that is capable of simultaneously supporting multiple protocols while providing a standard architecture for complex information, including AMPQ and MQTT:
  - The pub/sub extension enables public subscriptions for larger numbers of devices.
  - The OPC UA pub/sub specification remains compatible to all previous versions; thus communication via the client-server model is still possible
  - OPC specifications work with multiple transport and message protocols

- OPC UA pub/sub together with UDP is a solution that fits the needs of complex automation set-ups and can be integrated vertically across all OT layers and embedded systems

Publish/Subscribe model reduces network traffic



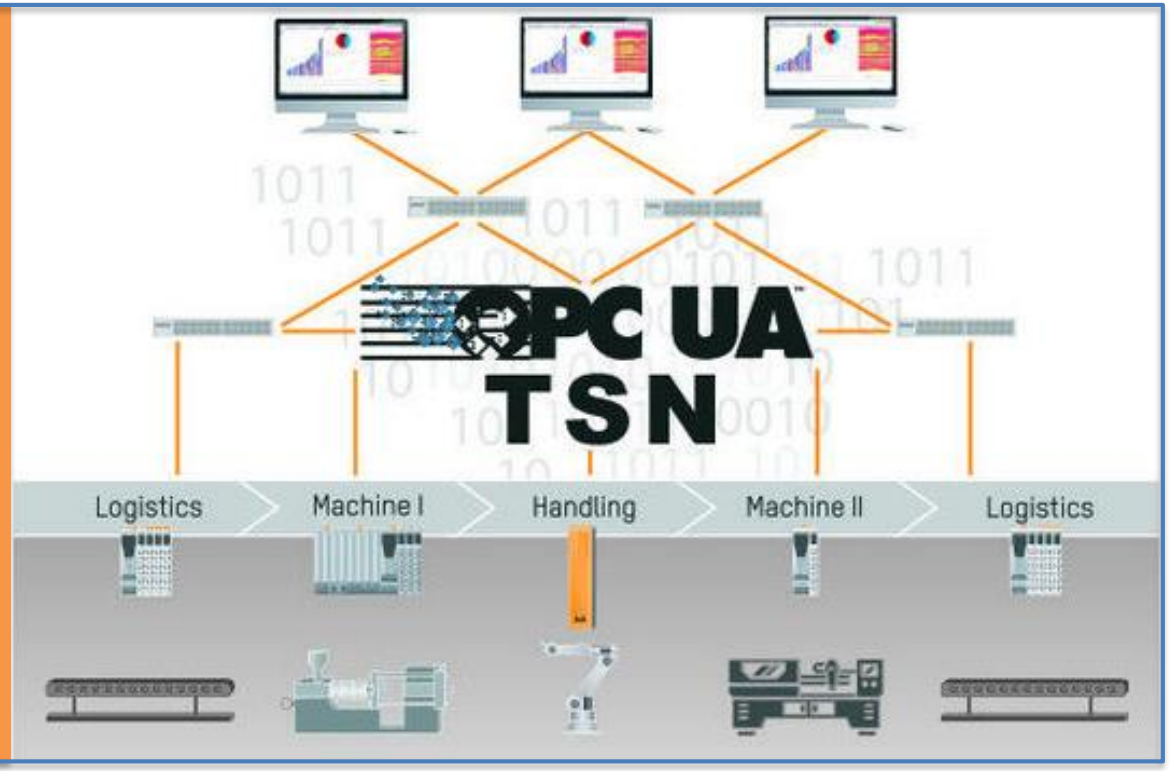
OPC UA communication via client-server mechanism, where a client requests information and receives a response from a server.



The pub/sub model enables both one-to-many and many-to-many communication. Server data will be sent to the network (publisher), which can be received by every client (subscriber)

OPC UA TSN

The marriage of the OPC UA protocol with pub/sub extension and IEEE TSN Ethernet standards there should be no more excuses not to upgrade your systems.



OPC UA TSN – The most relevant elements

TSN standard consists of many elements. The following elements are the most relevant for the demands on industrial applications:

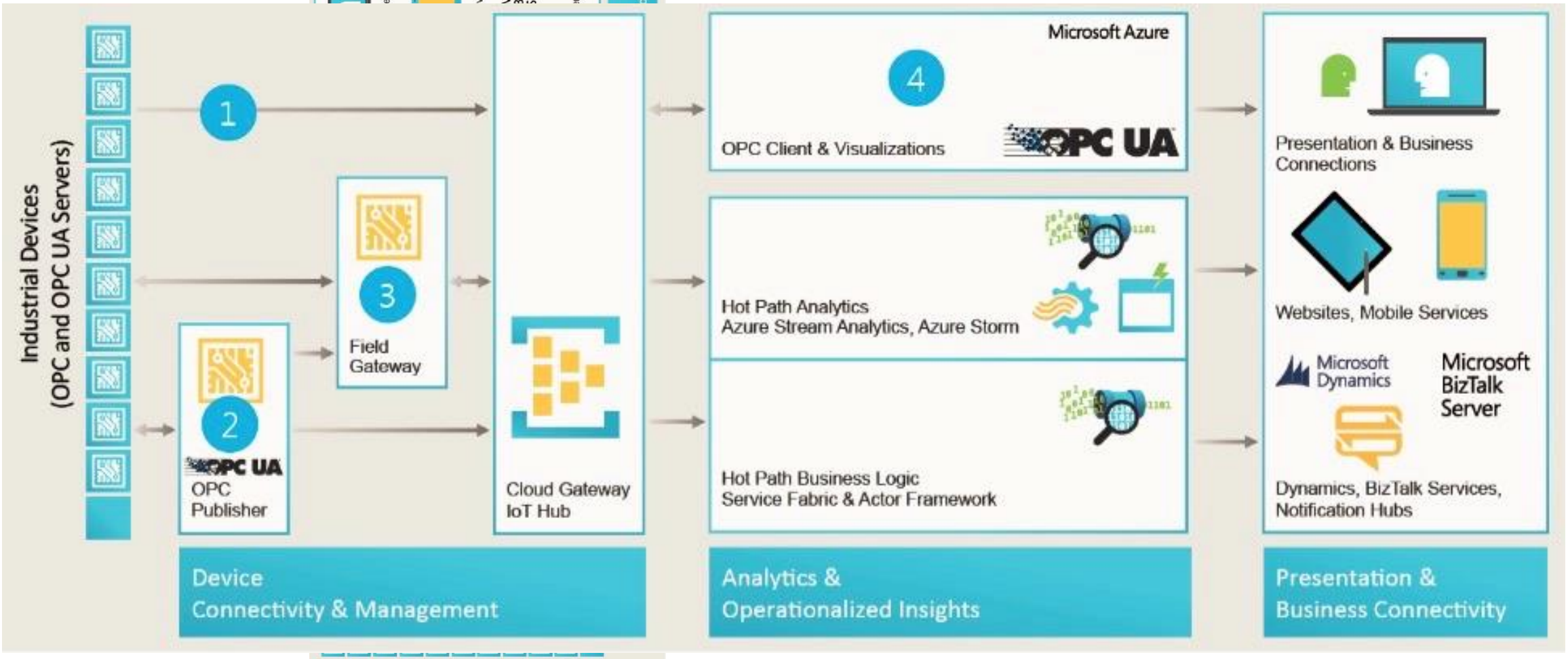
- AS: Time synchronization
- Qbv: Scheduling
- Qcc: Network configuration

IEEE TSN STANDARDS		
Standard/IEEE draft	**Title**	**User's advantage**
IEEE 802.1AS (evolving to P802.1ASrev)	Network Time Synchronization	All nodes share the same time
IEEE 802.1Qbv	Scheduled Traffic	Scheduled Ethernet frames never collide
IEE 802.1Qci	Filtering & Policing	Removes babblers from the network (security)
P802.1CB	Seamless Redundancy	Zero-loss switch-over
P802.1Qcc	Stream Reservation	Path provisioning according to IEEE
IEEE 802.1Qbu and IEEE 802.3br	Frame Pre-emption	Maximum bandwidth without compromising real-time behavior

Protocols

OSI Model	TCP / IP Model				
Layers	Layers	Data Encapsulation		What	Protocols	Devices
1. Application 2. Presentation 3. Session	1. Application	Data	Upper Layer Data	Facebook, Email, Printer servers, Outlook, Crome	SOAP, REST, JSON HTTP, HTTPS RSVP, FTP, TFTP	Application Layer Gateway (ALG)
4. Transport	4. Transport	TCP Data	Segment	Block size, Send/receive ctr.	TCP, UDP	Firewalls, Ports
5. Network	5. Internet	IP TCP Data	Packet	IP addresses	IPv4, IPv6, ARP, IPSec	Routers, Layer 3 switches
6. Data Link 7. Physical	6. Network Accesss	Header IP TCP Data Trailer	Frames & Bits	Physical addresses	Ethernet, MAC WiFi, Bluetooth, USB	Bridges, Switches, Transceivers, Cables, Connectors

Example of the new OPC-UA Stack



Protocols & Interoperability

OSI Model	TCP / IP Model	
Layers	**Layers**	**Interoperability**
1. Application 2. Presentation 3. Session	1. Application	*Syntactic interoperability* is the ability to exchange structured data (e.g. using words from language, WITSML, etc), assuming common protocols (e.g. rules of grammar) and the structure of the information exchange is unambiguously defined
4. Transport	4. Transport	*Technical interoperability* is the ability to exchange information as bits and bites (e.g. pencil, scribbles, i/o ports, API's, etc.), assuming that the information exchange infrastructure is established using a defined communication protocol
5. Network	5. Internet	Packets shared between endpoints that may not be on the same physical link. Packets are routed between physical links by a "network router"
6. Data Link 7. Physical	6. Network Accesss	Digital frames and analog signals shared between endpoints on a shared substratum (Link).

IKEA's new wireless light bulbs communicate on an open standard called Zigbee Light Link

- App controlled light bulbs -

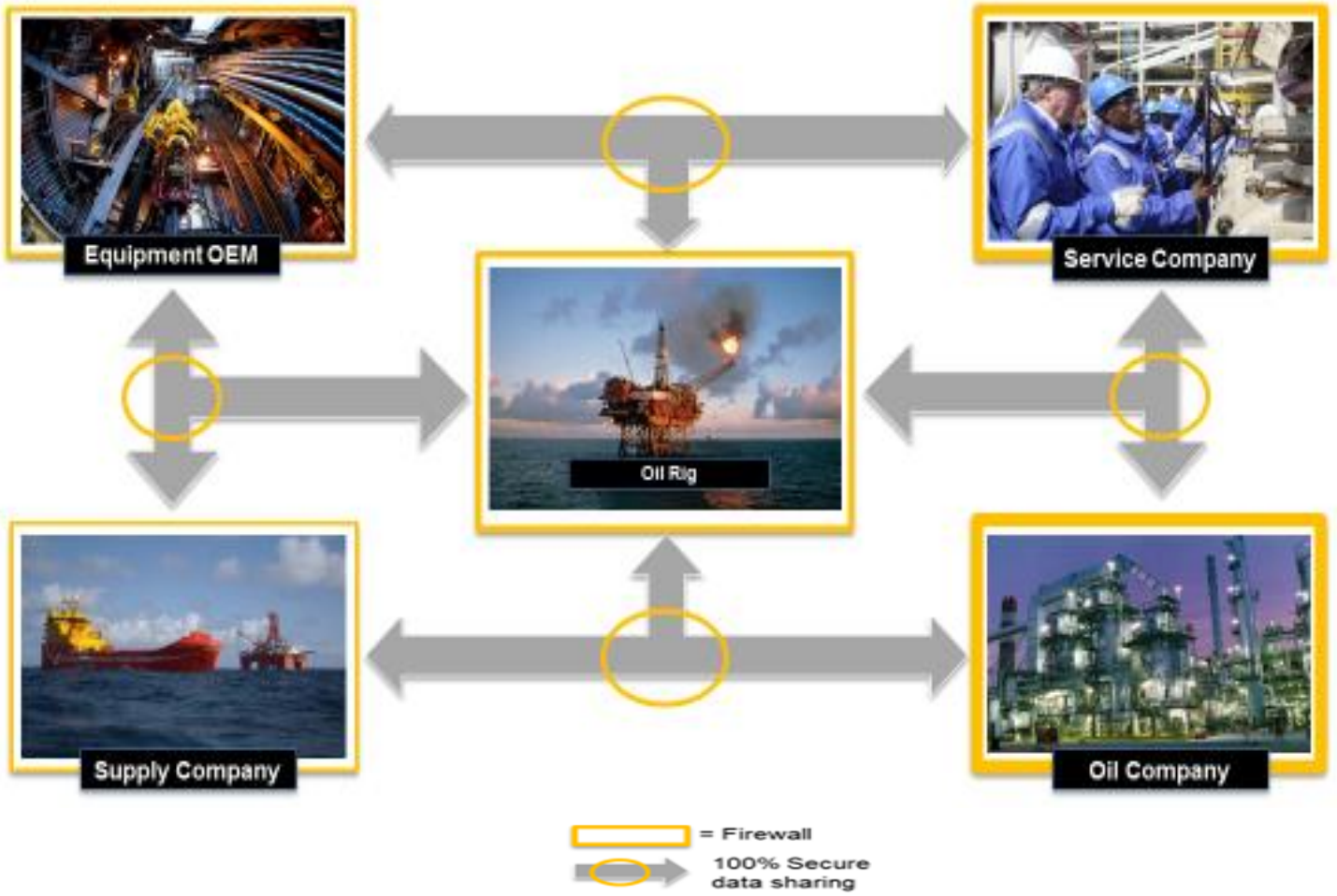
- Supported by the large smart-house platforms & disrupts expensive solutions
- Multiple manufacturers compete, lowering products costs and wider adoption
- Ensures different manufacturers remotes operates other manufacturers products
- ZigBee Light Link provides a global standard for interoperable consumer lighting
- MatrikonOPC is currently seeking beta testing for the OPC Server for Zigbee Wireless Devices

Google ASSISTANT amazon echo Works with Apple HomeKit GE OSRAM PHILIPS Greenwave

The OPC UA data model and services provide semantic interoperability. This enables clients and servers to exchange data with an agreed and shared meaning, rather than just mapping bits and bytes.

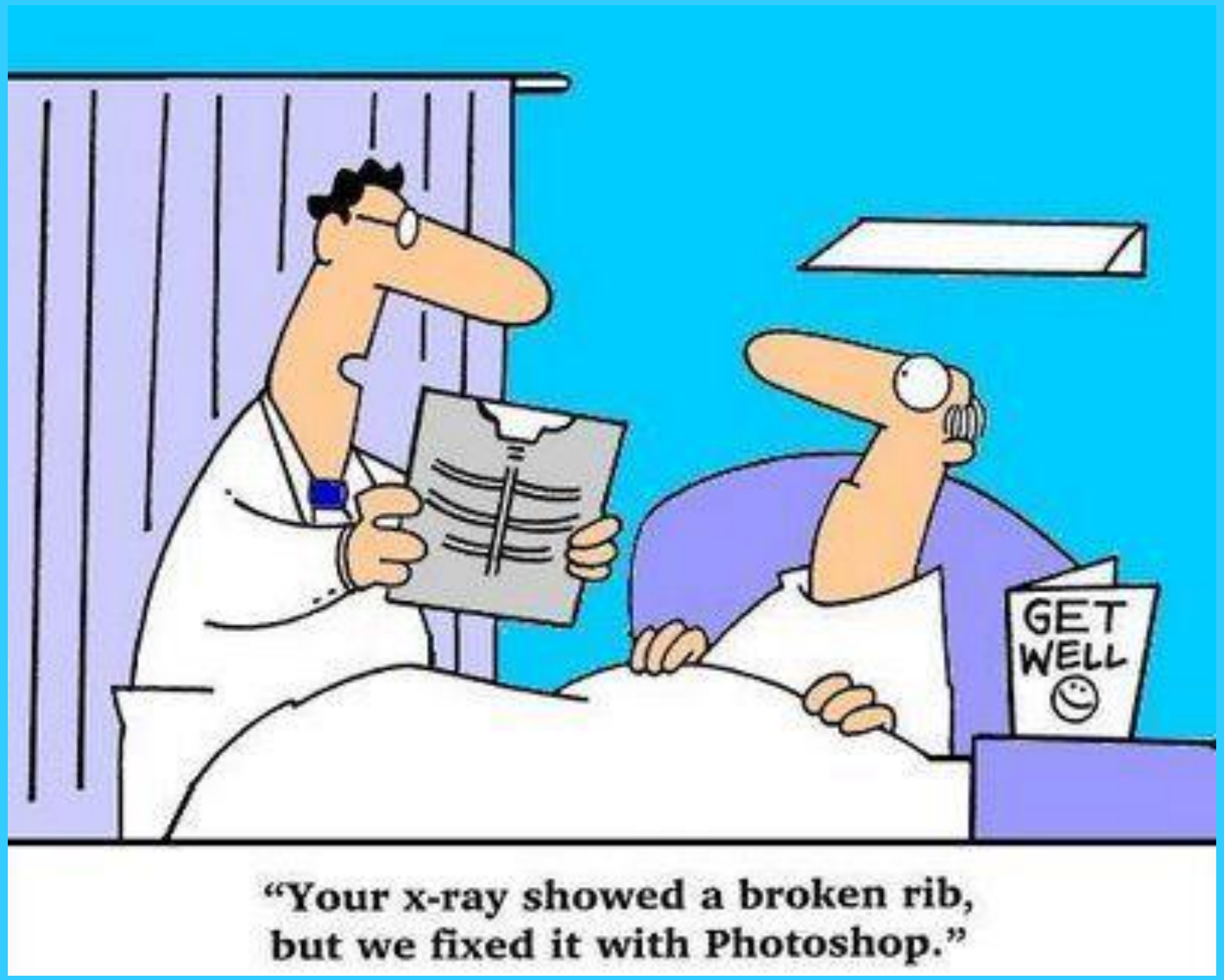
Data highway – Pilot project

An industry logic for effective and secure information sharing in real time



Participants:

- Schlumberger
- Weatherford
- Baker
- Halliburton
- Statoil
- NOV
- MHWirth
- Cameron
- GCE NODE



"Your x-ray showed a broken rib,
but we fixed it with Photoshop."

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