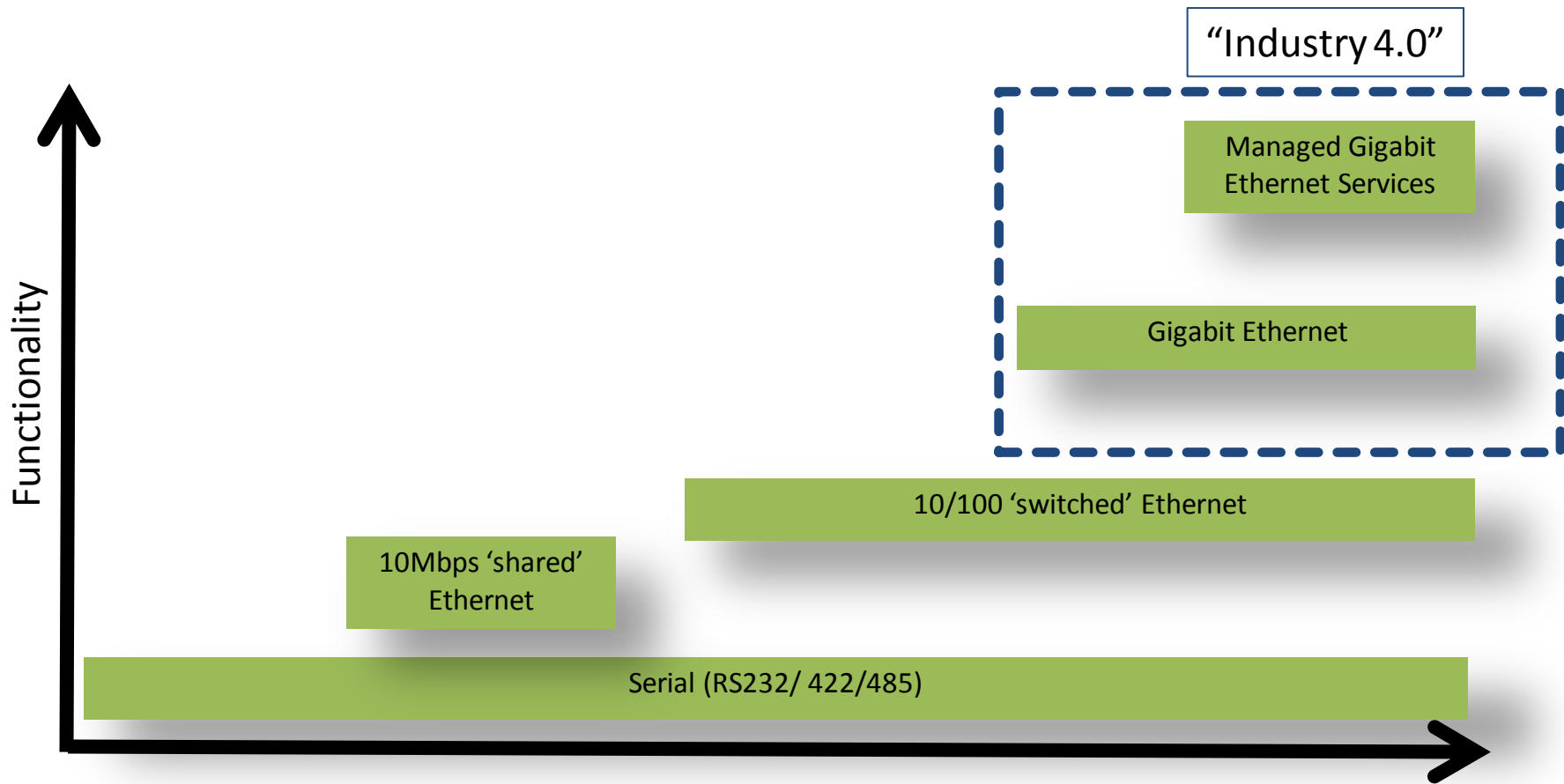


Provisioning and maintaining OT networking equipment, the view from IT

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Europe BV

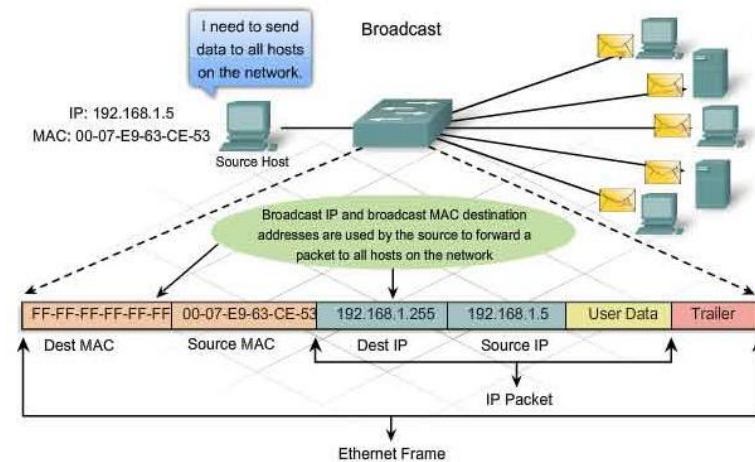
Agenda

- Historical perspective:
 - OT connectivity - from serial to Gigabit Ethernet (and beyond)
- 1st Generation Ethernet
- 2nd Generation Ethernet
- Deployment of IT techniques
- Conclusions



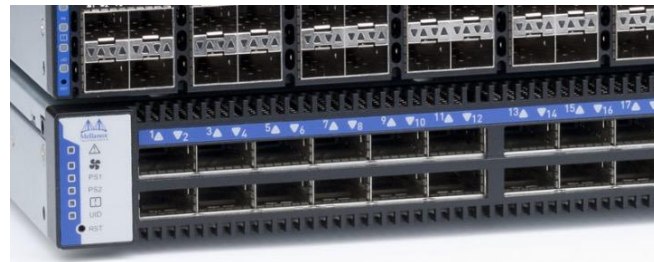
1st Gen Ethernet

- The ‘rush’ to Ethernet wasn’t about speed:
 - Ethernet became cheap
 - But, the implementation were poor:
 - **Broadcasting** as opposed to unicast or multicast
 - Designers viewed Ethernet as a “faster/cheaper” version of serial



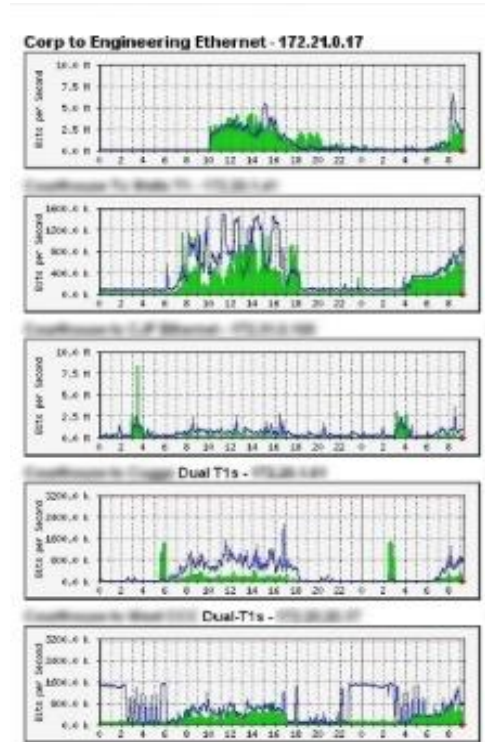
2nd Gen Ethernet

- Realisation of physical infrastructure capabilities of Ethernet:
 - Fault tolerant star topologies vs. linear bus
 - Fiber for long haul or **EMI**
 - Switched Ethernet offering better performance



2nd Gen Ethernet - issues

- Security:
 - connectivity to the 'Internet'
- Installation issues:
 - Switch configuration
 - At PHY level
 - At traffic level
- Management & monitoring:
 - Performance measurement
 - Fault finding/trouble shooting



Deployment of IT

- OT/Automation networks now require:
 - Speed – new applications e.g. vision high bandwidth
 - IIoT/Sensor implementations - require QoS
 - Maintenance and Provisioning – we're no longer dealing with a handful of switches
 - Management – 24/7/365 availability is required
 - Repair/replace issues
 - Vendor integration

Bandwidth

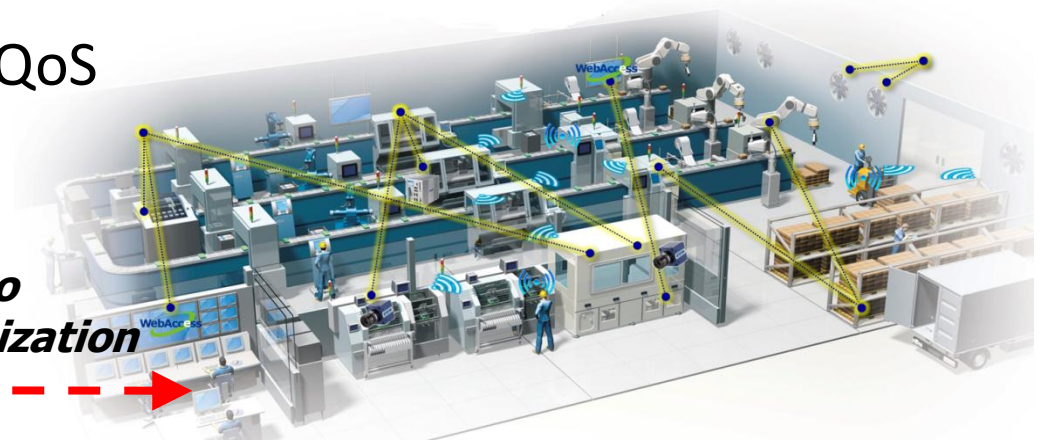
- The days of 10Mbps are gone – GigE interconnects are now compulsory, first 10GigE in use
- But, bandwidth is not the whole story:
 - QoS (traffic grooming), VLAN segmentation, LACP are all being deployed
 - Local (horizontal), links @ 100Mbps, or GigE for vision
 - Interconnect (backbone), @ 1GigE (minimum), 10GigE for vision

Maintance and Provisioning

- Firmware updates –
 - rolls outs need to be done, in use testing, backups
- Provisioning –
 - deployment of VLAN/QoS
 - PoE management



**Auto
Synchronization**



Management & Monitoring

- Network availability is key –
 - Traditional unmanaged switches do not offer the capabilities
 - Pre-emptive troubleshooting is now critical
 - SCADA is a reactive system, SNMP monitoring provides pro-active functionality



Control Room

Vendor agnostic networking

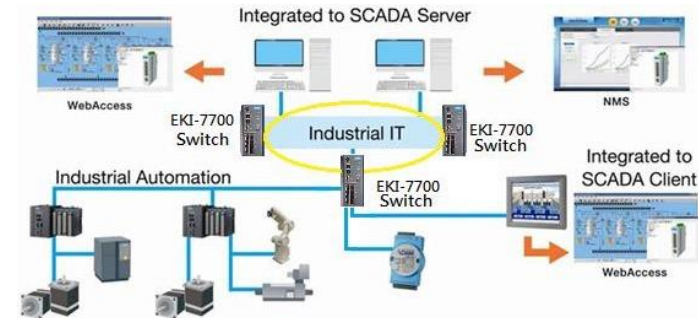
- We live in an 'open' world once Ethernet appeared
 - Device compatibility assured if standards are followed, however..
 - Optical ring issues exist (802.1w – best case +/- 5 seconds healing), can be solved with vendor specific protocols or..
 - G.8032
 - HSR/PRP (High-availability Seamless Redundancy/Parallel Redundancy Protocol)

OT Networking challenges

- Summary - no longer a dumb switch + cables:
 - Access speeds – GigE becoming dominant
 - Management – of both device and traffic is now critical
 - New applications – vision, IIoT
 - Security & protection – keep the network safe

The IT approach

- Deployment of full managed devices
 - VLAN integration, QoS tuning and monitoring
 - Ensure critical traffic is separated and prioritized across the network
 - SNMP
 - SCADA cannot offer the traffic analysis and device management functionality



The IT approach

- Devices must be protected:
 - At point of ingress/egress
 - On the network itself (DoS/DDoS)
- Provisioning/maintenance:
 - Critical for ensuring the infrastructure keeps running



Conclusions

- OT/automation networking –
 - We now have to take a **proactive approach** to network design
 - Bandwidth needs to be ensured and guaranteed
 - Network management is now critical

**The OT network is now merging
to the IT network**