

Industrial & Mission-Critical Networking Solutions

Communications Portfolio Overview



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Transitioning through acquisitions

Migration timeline

	2007	2010	2011	2014	2017	2021	2022	2023	2024
	 HIRSCHMANN A BELDEN BRAND  lumbergautomation A BELDEN BRAND	 GarrettCom A BELDEN BRAND	 TOFINO SECURITY A BELDEN BRAND	 ProSoft TECHNOLOGY	 thinklogical A BELDEN BRAND	 OTN Systems	 NET MODULE  macmon nac smartly simple	 CloudRAIL  SICHERT	 PRECISION OPTICAL TECHNOLOGIES  VOLEATECH NETWORKING LINUX COMPANY



Layer 2 & 3 Ethernet Switches




Backbone Switches & MPLS-TP Nodes



Wireless Networking



Security Software & Appliances



HiVision NMS Software



Remote Access



Edge & Cloud Computing



Protocol Conversion



Ethernet IO & Connectivity

 **HIRSCHMANN**
A BELDEN BRAND

 **GarrettCom**
A BELDEN BRAND

 **HIRSCHMANN**
A BELDEN BRAND

 **OTN Systems**

 **HIRSCHMANN**
A BELDEN BRAND

 **ProSoft**
TECHNOLOGY

 **NET MODULE**

 **HIRSCHMANN**
A BELDEN BRAND

 **TOFINO SECURITY**
A BELDEN BRAND

 **macmon**
nac | smartly simple

 **HIRSCHMANN**
A BELDEN BRAND

 **OTN Systems**

 **HIRSCHMANN**
A BELDEN BRAND

 **ProSoft**
TECHNOLOGY

 **HIRSCHMANN**
A BELDEN BRAND

 **CloudRAIL**

 **ProSoft**
TECHNOLOGY

 **lumbergautomation**
A BELDEN BRAND



Layer 2 & 3
Ethernet
Switches



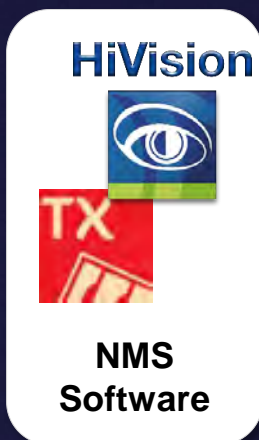
Backbone
Switches &
MPLS-TP
Nodes



Security
Software &
Appliances



Wireless
Networking



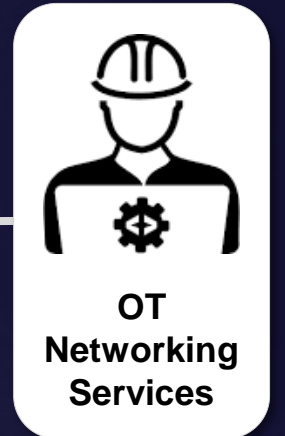
NMS
Software



Remote
Access



Edge &
Cloud
Computing

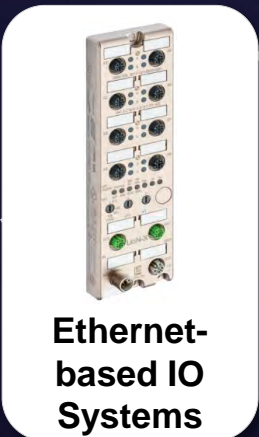


OT
Networking
Services

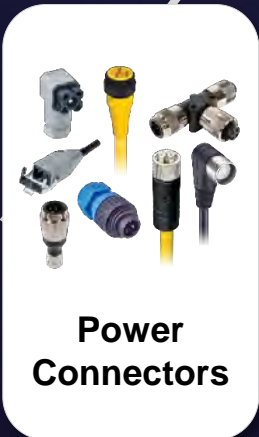
Offering a complete solution
for secure networking and connectivity
in **YOUR** harsh and mission-critical
applications



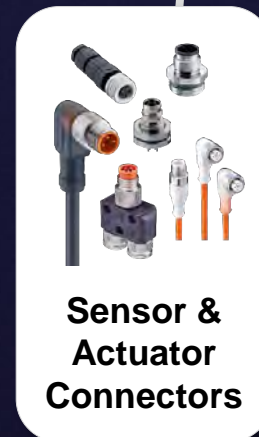
Protocol
Conversion
Gateways



Ethernet-
based IO
Systems



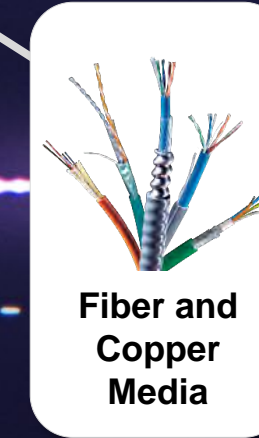
Power
Connectors



Sensor &
Actuator
Connectors



Data
Connectors



Fiber and
Copper
Media



Racks &
Enclosures
to NEMA12



Layer 2 and Layer 3 Switches

Unmanaged simplicity with SPIDER

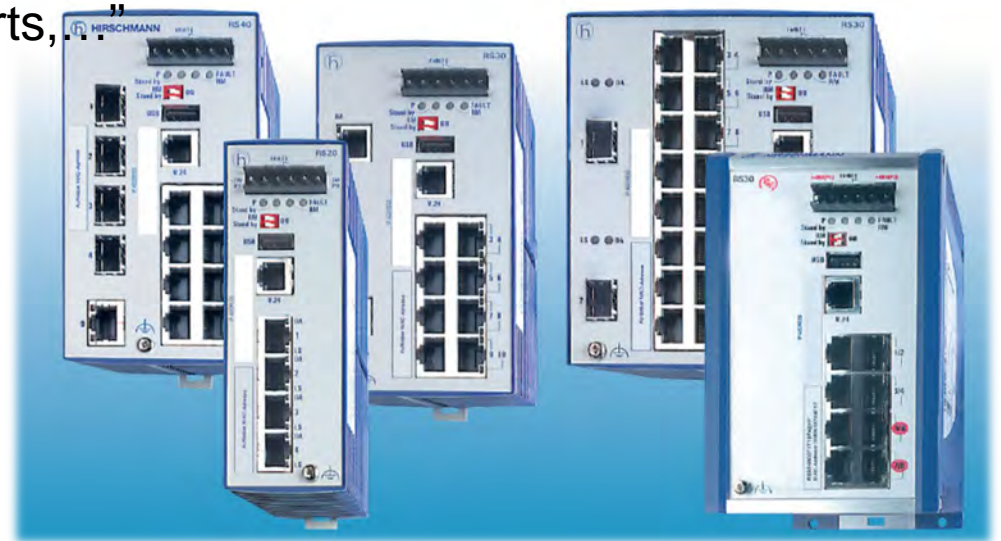


Features/Benefits

- Low-cost entry-level unmanaged industrial switch
- 100 Meg or Gigabit speeds
- Multitude of RJ45/fiber ports combinations
- Optional PoE/PoE+ w/ 24VDC input
- Premium Line offers configurable features
 - QoS
 - Port control (on/off, duplex, speed)
 - Rate limited for multicast and broadcast
 - Link loss alarm to fault relay
- Excellent for use at network edge or stand-alone applications that do not require monitoring or security

A Testament to Long Product Lifecycles

- RS Series of managed Layer 2 switches is a testament to our long product life cycles – 1st RS20 shipped in fall of 2005!
- In excess of **1.3 MILLION** managed RS-series switches sold since product family's inception
- Several hardware increments “Gig-ports, PoE, fiber ports, ...”
- Approx. 20 major and minor software releases to keep the products features current and secure
- Massively low COO (cost of ownership)
- After 18 years, main components like CPU and switching chips are starting to become obsolete or discontinued
- Application requirements are calling for more security, redundancy options, and ease-of-use



Classic (Java-based) vs HiOS (HTML5)

The screenshot shows the classic Java-based HiView interface. On the left is a tree view with categories like System, Network, Software, Port Configuration, Power over Ethernet, Load/Save, Restart, Security, Time, Switching, VLAN, QoS/Priority, Redundancy, Diagnostics, and Report. The main area displays system information for 'Upift pumps' at 'Hirschmann Railswitch'. A 'Device View' window shows a physical switch with 16 ports, with ports 1-8 highlighted in blue. The interface has a traditional desktop layout with a menu bar and a 'Set' button at the bottom.

The screenshot shows the modern HTML5-based HiOS interface. It features a clean, modern design with a dark blue header and a sidebar on the left containing menu items like Basic Settings, Network, Out of Band over USB, Software, Load/Save, External Memory, Port, Restart, Time, Device Security, Network Security, Switching, Diagnostics, Advanced, and Help. The main area displays a dashboard with three status cards: Device status (0), Security status (6), and Signal contact 1 status (0). Below these are sections for System data, LED status, and Port status. The interface is more intuitive and user-friendly than the classic version.

Rings, rings and more proprietary rings

X-Ring

N-Ring

Ultra-Ring

OnTime-Ring

M-Ring

P-Ring

ICON

Ring



T-Ring

HSR*
Siemens



REP

HIPER

Rapid Super
Ring

Open-Ring

Real-Time Ring

Z-Ring

FRNT



The IEC 62439 Standard



IEC 62439 defines redundancy protocols: RSTP, MRP, PRP/HSR, CRP, BRP, DRP

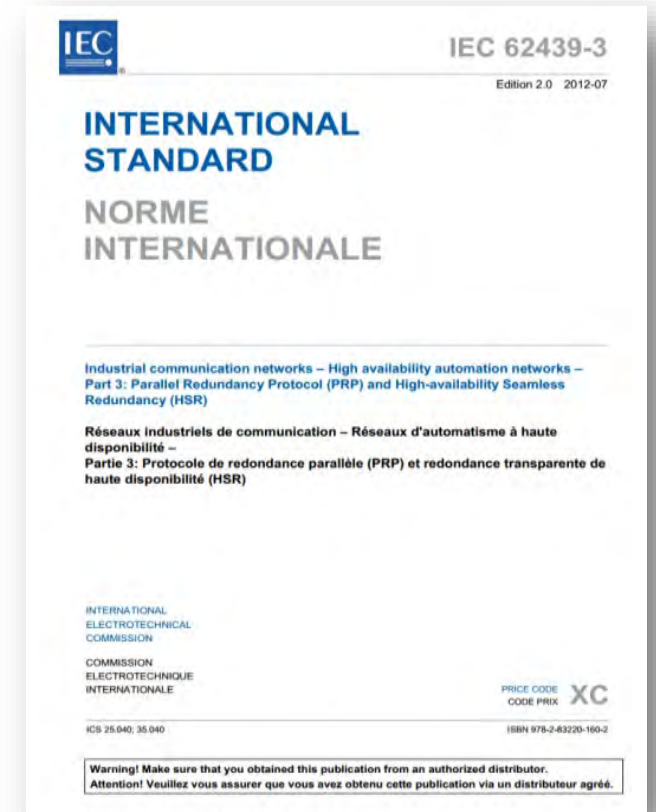
2

65C/519/CDV

INCLUDED SUBPARTS

NOTE: The Contents of each subpart begins on page xxx3, so that the page numbering will be unchanged when the final International Standard is issued with its IEC-Central-Office-provided cover sheet.

IEC 62439-1 Ed1.0,	Industrial communication networks high availability automation networks - Part 1: general concepts and calculation methods (Including RSTP)	1003
IEC 62439-2 Ed1.0,	Industrial communication networks high availability automation networks - Part 2: Media Redundancy Protocol (MRP)	2003
IEC 62439-3 Ed1.0,	Industrial communication networks high availability automation networks - Part 3: Parallel Redundancy Protocol (PRP) and High availability Seamless Ring (HSR)	3003
IEC 62439-4 Ed1.0,	Industrial communication networks high availability automation networks - Part 4: Cross-network Redundancy Protocol (CRP)	4003
IEC 62439-5 Ed1.0,	Industrial communication networks high availability automation networks - Part 5: Beacon Redundancy Protocol (BRP)	5003
IEC 62439-6 Ed1.0,	Industrial communication networks high availability automation networks - Part 6: Distributed Redundancy Protocol (DRP)	6003

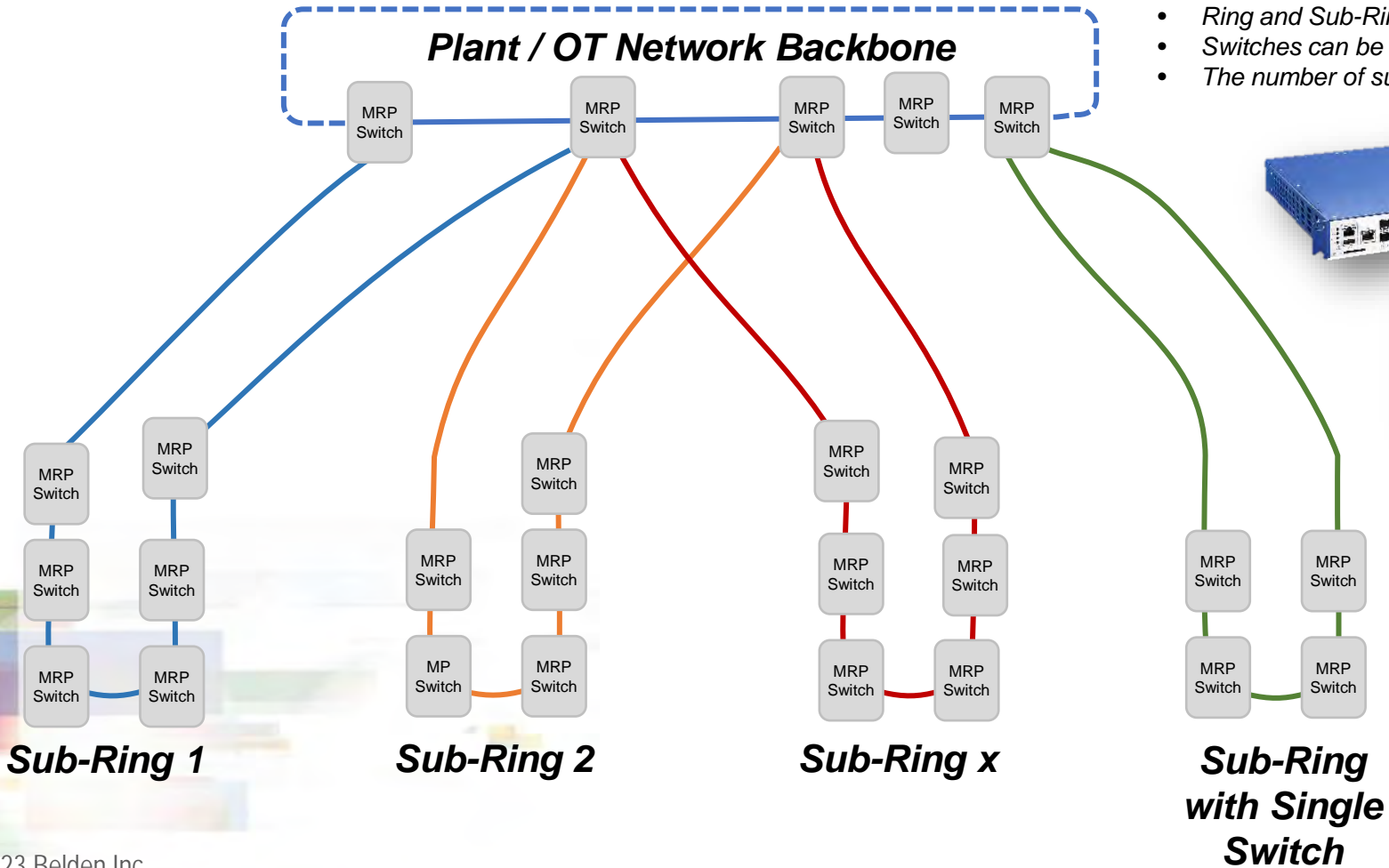


IEC 62439-standardized redundancy protocols

Protocol		Most current Standard	Typical re-config	Remark	Available since
STP	Spanning Tree Protocol	IEEE 802.1d	30s	any topology/mesh, diameter limited	1990
RSTP	Rapid Spanning Tree Protocol	IEEE 802.1D-2004	2s	any topology/mesh, diameter limited	2004
CRP	Cross-Network Redundancy Protocol	IEC 62439-4:2010	1s worst case for 512 end nodes	any topology/ duplicated networks	2007
BRP	Beacon Redundancy Protocol	IEC 62439-5:2010	4...8ms worst case for 500 end nodes	Two top level switches with star, line or ring topologies	2007
DRP	Distributed Redundancy Protocol	IEC 62439-6:2010	100ms worst case for 50 switches	ring, double ring	2010
MRP	Media Redundancy Protocol	IEC 62439-2:2010	200ms worst case for 50 switches	ring	1998/2007
Fast MRP	Media Redundancy Protocol	IEC 62439-2:2010	30ms worst case for 50 switches 10ms worst case for 15 switches	ring	2010
Optimized RSTP	Rapid Spanning Tree Protocol	IEEE 802.1D-2004 (configuration requirements described in IEC 62439-1:2010)	5...20ms per switch	ring	2010
HSR	High-Availability Seamless Redundancy	IEC 62439-3:2012-07	0ms	ring	2010
PRP	Parallel Redundancy Protocol	IEC 62439-3:2012-07	0ms	any topology/ duplicated networks	2010



Standards-based Redundancy with MRP



- Ring and Sub-Ring segments can be any mix of copper and/or fiber and speed
- Switches can be any mix of managed DIN rail, 19" rack and/or on-machine
- The number of sub-rings that can be managed by a switch varies (0-20)

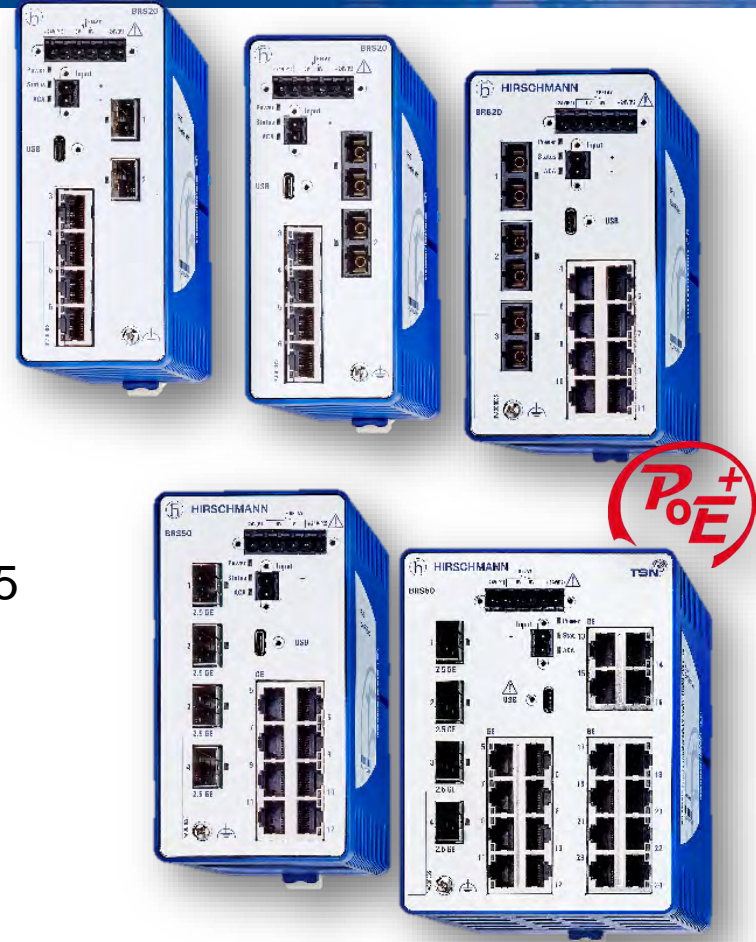


*Hardware selection
Typically Layer 3 on the backbone to provide routing for VLANs (segmentation), with rack-mounted styles preferred for engineering offices and IT/OT closets. Several options for AC/DC power input, fiber port and connector types and operating temps*

High-runner: BOBCAT BRS

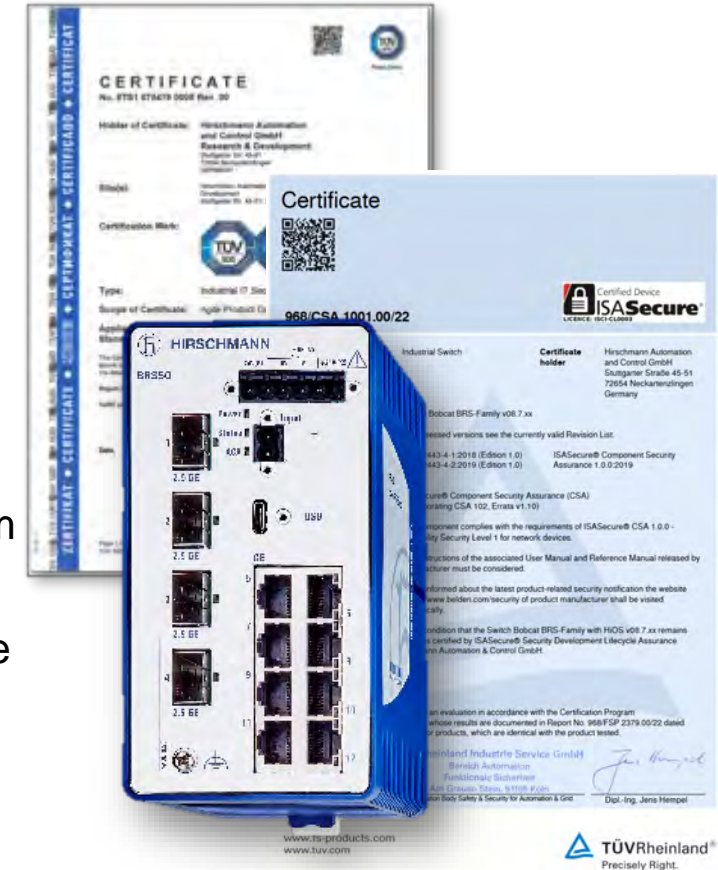
Maximizing backwards compatibility

- Managed Layer 2 DIN rail switch with 4 - 24 ports
- Max 4x FE/GE SFP or 3x legacy embedded SC/ST (100 Mbps)
- Optional PoE/PoE+
 - 90W budget w/ 24VDC variant
 - 240W budget w/ 48/52VDC variant
- Temperature range -40 to +74 deg C, opt. conformal coating
- Sub-2 mins from box to 1st log-in with Linux-based HiOS HTML-5 GUI
- Industrial profiles for EtherNet/IP, ModbusTCP, Profinet
- L2A product configurations add OPC UA server



High-runner: BOBCAT BRS

- Digital input for panel door access monitoring (or other uses)
- Advanced cybersecurity features, incl. ACLs
- Meets industrial cybersecurity standard IEC 62443-4-2 SL-C2
- US manufacturing cells (Mooresville, NC) planned for early 2024
- USB-C is dual-role port –
 - As an out-of-band management port. Connected with USB-C cable to Windows PC, the connection is seen as a network interface. The pre-defined IP for that USB-C management interface is isolated from the LAN.
 - An inserted USB-C ACA (Automatic Configuration Adapter) will store any saved configurations for easy device replacement/cloning, optionally down to the firmware. Prerequisite is that this is inserted prior to powering up the replacement/new switch.
 - The USB-C ACA can also serve as a storage medium for persistent logging.



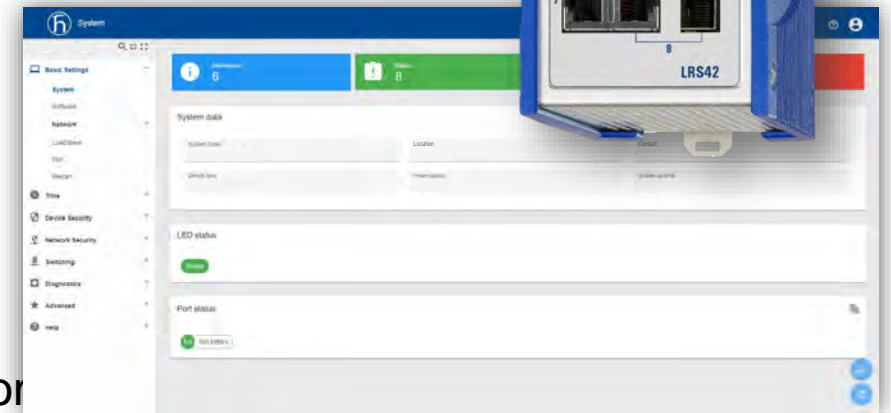
LEMUR LRS Entry-level Managed Switch

Basic, yet most commonly used functions

- Up to 11 Ports (16 ports Q2 2024)
 - 1x RJ45/SFP FE combo + 3x FE SFP + 7x 10/100 RJ45
 - 1x RJ45/SFP GE combo + 3x GE SFP + 7x 10/100 RJ45
- Optional PoE/PoE+ with 48/52VDC, 180W power budget
- Basic approval set (CE, EN61131, FCC, UL)
- Hirschmann SDL compliant
- IP30, -40 to +60 deg C
- Redundancy protocols incl. ERPS*, RSTP, MRP Client
- Interfaces like CLI, SNMP, JSON-RPC and the platform console

*Ethernet Ring Protection Switching

HiEOS
Hirschmann™ Entry Operating System



RSP and RSPE Series

- First switches with HiOS, Layer 2 or Layer 3
- Single/dual low or high voltage AC or DC,
- -40 to +70 deg C operation
- Optional supports for DLR, HSR, PRP, Fast MRP
- **RSP20**
 - 3x FE SFP + 8x 10/100 RJ45
 - 3x FE SFP + 4x 10/100 RJ45 + 4x FE SFP
- **RSP30**
 - 3x GE SFP + 8x 10/100 RJ45
 - 3x GE SFP + 4x 10/100 RJ45 + 4x FE SFP
- **RSPE30** (modular)
 - 4x GE RJ45/SFP combo + 8x 10/100 RJ45 + 2x slots for 8-port hot-swap RJ45, SFP, PoE media modules



Modular DIN Rail Switch – MSP40



- Backplane-based managed modular switches with Layer 3 option
- Up to 28 ports (any copper/fiber mix)
- Available as all-Gigabit which has 4x 2.5 Gig SFP sockets
- Optional 2x 10 Gigabit SFP module
- Hot-swap media modules, each providing up to 4 ports max. in diverse mix of copper/fiber
- DIN rail mounted or special high shock/vibration tolerant version available with M12 Ethernet
- Available Poe/PoE+ modules

GREYHOUND103 (GRS103)

GRS103

- Two chassis options
 - **Modular w/** 4x Gig RJ45/SFP + 6x 10/100 RJ45s + 2 media module slots (uses MACH102 media modules!)
 - **Fixed w/** 4x Gig RJ45/SFP + 22x 10/100 RJ45s
- Single or dual AC (no DC) -10 to 60 deg C, fanless
- Signal contact, management USB-C port
- HiOS L2S and L2A
- US manufacturing cells planned for 2026 in NC 🇺🇸



GREYHOUND105/106 (GRS105/106)

GRS105 / GRS106

- Two core chassis options, each with two copper/fiber mix options, up to 30 ports
 - GRS105 = up to 6x 2.5 Gig
 - GRS106= up to 6x 10 Gig + 8x 2.5 Gig

Note that GRS105/106 has no 100 Mbps SFP support

- Single or dual AC and/or DC (low/high voltage)
- Pending PoE++, 60W/port, budget ~800 W (Q4 2024)
- Relay output, out-of-band USB-C mgmt, SD card
- Secure Boot and optional MACsec
- Software level L2S – L3A (UR – Q3 2023, MR incl. IPV6 - Q3 2024)
- Operating temperature -10 to 60°C (fanless)
- UL61010, EN 50121-4 (track side)
- Pending US final assembly for 2026 in NC



GREYHOUND 125/126 (GRS125/126)

A GRS w/ 600W PoE/PoE+ budget (PoE++hardware ready)

- HiOS L2S, L2A, L3A-UR
- Up to 30 ports, thereof max 24x PoE ports
 - GRS 125: 6x 1/2.5GE SFP + 24x 1GE TX PoE
 - GRS 126: 6x 1/2.5/10GE SFP + 8x 1/2.5 GE TX PoE + 16x GE TX PoE
- High 500-600W PoE budget requires active cooling (fans!)
- Temperature range of -10...+60 °C
- 100-240V AC power supply

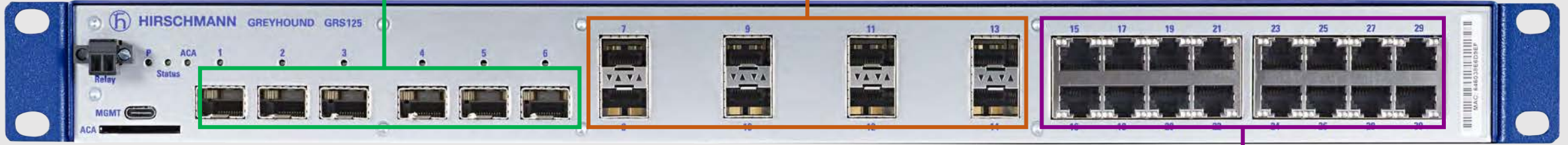


GRS105: 6x 1/2.5GE SFP
GRS106: 6x 1/2.5/10GE SFP

GRS10x: 16x 1GE TX
PoE Powered

GRS105: 8x 1GE TX
GRS106: 8x 1/2.5GE TX
PoE Powered

GRS125

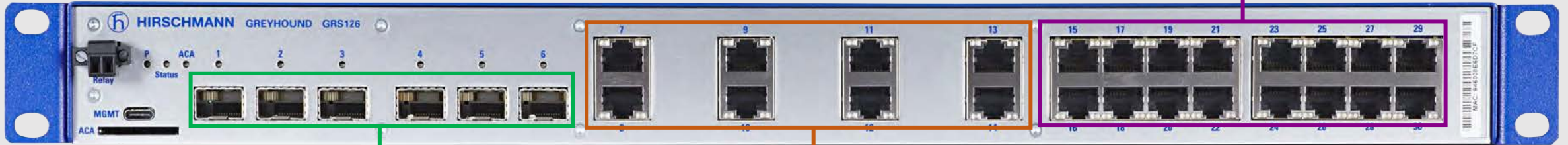


Port Group I:
6x 1/2.5 GESFP ports

Port Group II:
8x 1 GE SFP ports
OR:
8x 1 GE TX PoE++ ports

Port Group III:
16x 1 GE TX PoE++ ports

GRS126



Port Group I:
6x 1/2.5/10 GE
SFP ports

Port Group II:
8x 1/2.5 GE TX PoE++ ports
OR:
8x 1/2.5 GE SFP ports

GREYHOUND GRS1040



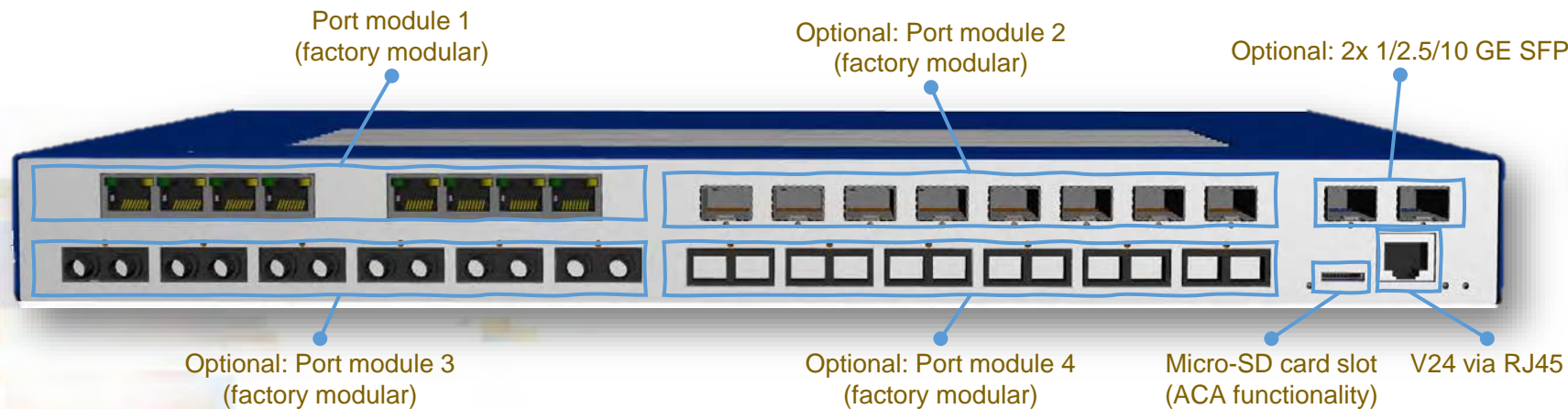
GRS1040

- Hardened rack-mount HiOS Layer 2 or 3 switch
- All-Gigabit chassis
 - 2x Gig/2.5 Gig SFP + 10x Gig RJ45 ports
 - 4x Gig/2.5 Gig SFP + 2x FE/GE SFP + 6x Gig RJ45
- 2x media module slots (8x ports RJ45/SFP/FX each)
- Out of band management port
- PoE/ PoE+ capable (180W)
- Hot-swap/plug AC/DC power supplies (optional redundant)
- 24 - 48 VDC or 110 – 240 VAC/DC
- 0 to 60 deg C or -40 to 70 deg C

GREYHOUND GRS2000

LAUNCHED
Q2 2025

- Hardened factory-modular rack-mount switch
- HiOS L2S, L2A, L3-UR (L3-MR pend. Q4 2025)
- Up to 34 ports, SFP, ST/SC, or RJ45
 - Optional 1GE, 2.5GE uplinks (GRP will have 10GE)
 - Max. 24 SC/ST embedded fiber ports
 - Optional 2x SFP uplink ports up to 10GE
 - Option w/ preloaded and discounted SFPs !
- Fanless -40 to +70 °C temperature range, optional conformal coating
- Supports 61850 and GOOSE messaging
- Redundant power supplies (optional)
 - HV: 110-240 VAC, 60-250 VDC
 - LV: 24-48VDC pend.
- Hardware supports HSR / PRP on all ports, incl. QuadBox (pend. firmware release late '25/early '26)



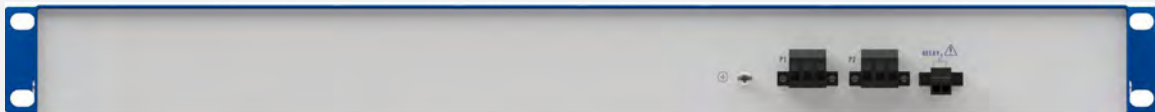
GREYHOUND GRS2000

GRS20x0

Front

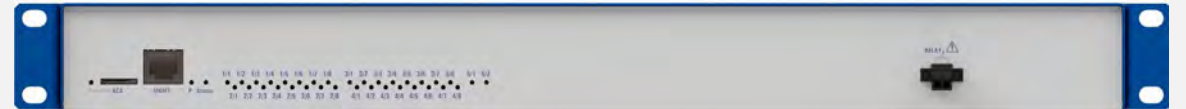


Back



GRS21x0

Front



Back



Media modules available

- 8x FE/GE RJ45
- 8x FE/GE SFP
- 4x FE/GE RJ45 + 4x FE/GE SFP
- 6x FE MM/SM embedded SC
- 6x FE MM/SM embedded ST

DRAGON MACH4000 / 4500

- DRAGON MACH4000 → Up to 48x 1GE + 4x 10GE ports
- DRAGON MACH4500 → Up to 80x 1GE + 8x 10GE ports
- Single/dual hot-swap 110/220VAC power supplies
- 2U height for replacement without changing cabinet design
- Fan module, hot-swap, included with chassis for 0-60°C
- Rear external interfaces on rear : USB/SD ACA, serial
- HiOS L2A and L3A software with unicast and multicast routing options



DRAGON MACH4000 / 4500 Chassis

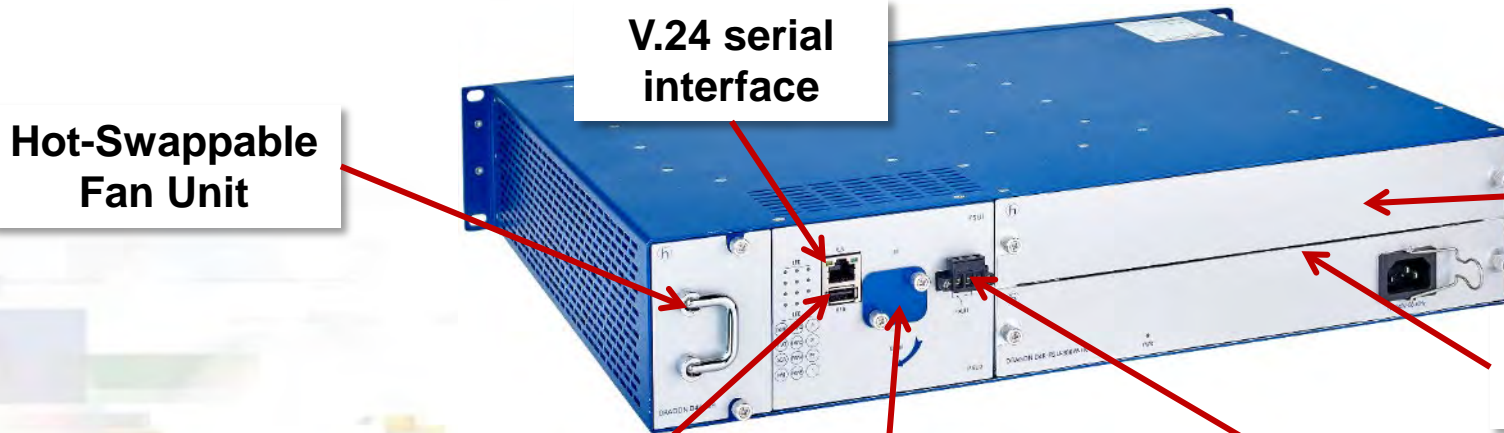


Out-of-band management port

Up to four swappable media modules

DM4000: 4x 10GE SFP+
DM4500: 8x 10GE SFP+
(1 / 2.5GE compatible)

DM4500: 32x 1GE



Hot-Swappable Fan Unit

V.24 serial interface

Power supply cover panel

Slots for two internal power supplies

ACA USB

ACA SD card

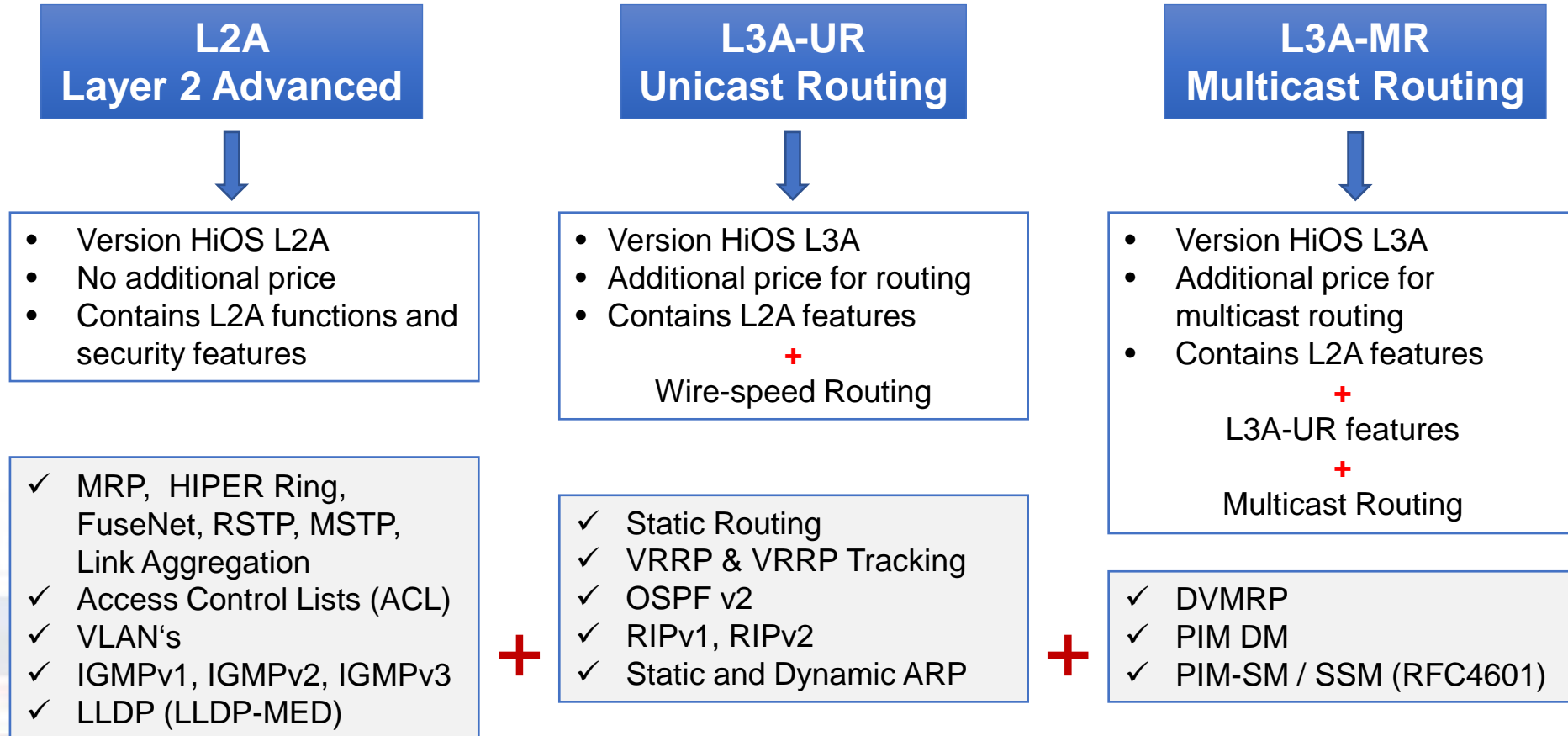
Fault relay contact

DRAGON MACH Media and Power Modules

- **D4K-12TP-RJ45** – 12x GE RJ45
- **D4K-12SFP** – 12x FE/GE SFP
- **D4K-10TP-PoE** – 10x GE RJ45 w/ PoE/PoE+ (provided from external source, 300W POE budget)
- **D4K-PSU-300W-HV** – Modular power supply, 300 Watts, 110/220 VAC (not included with chassis, two can be used for redundancy)



DRAGON MACH Feature Level Highlights





On-Machine and Onboard Vehicle Switches with M12 Connectivity

OCTOPUS IP67 Switches



Onboard Rail

Besides the common Ethernet standards, the OCTOPUS complies with these industry specific requirements:

- EN 50155 for operating conditions onboard trains,
- EN 50121-4 for operation along railroad tracks,
- EN 45545 for fire and smoke in trains,
- e1 for road vehicles.
- ECE R118 for fire and smoke in cars.

Machine building

The OCTOPUS saves space as it needs no cabinet

- M12 connectors are well-proven on the factory floor
- Machine builders are familiar with the housing style



OCTOPUS Onboard Switches



- EN50155-rated switches for on-machine or onboard rail use
- Port densities from 5 – 28 ports
- Managed and unmanaged variants, with or without PoE/PoE+
- Layer 3, shrouded optical ports and bypass ports optional
- Optional DLR, HSR, PRP enhanced redundancy protocols
- 100 Mbps M12 D-code and Gigabit X-code ports
- Various AC and DC power input options
- Ideal for carriage retrofits



BXS – Vibration-prone Applications

Cost-effective EN50155 Gigabit Uplinks and Fast Ethernet



All Gig BXS

- IP40 Metal Enclosure w/ M12 D- and X-code connectors
- Optional 60W total PoE/PoE+
- Extended temperature range, conformal coating
- M12 connector push pull / screw-down on all ports
- Low and high voltage power supplies
- Full rail transportation approvals

BXP – All-Gig for Vibration-prone Applications

Feature-rich and performance-oriented EN50155 networking solutions

High performance 10 GE switch for onboard rail, vehicle, or high vibration environments

- 12, 20 or 28 port variants
- IP40 housing w/ multiple variants up to 6x 10 Gig speeds
- Optional PoE++ with 120 W power budget
- Layer 2 (L2A) and Layer 3 (L3A) hardware options
- TSN ready
- Supports HSR and PRP redundancy protocols
- 24VDC – 110 VDC wide range power supply

Features of initial release (Q4/2023):

- 28 ports (6x 10 GE, 22x 1 GE, PoE++)
- L2A software level
- 110 VDC power supply

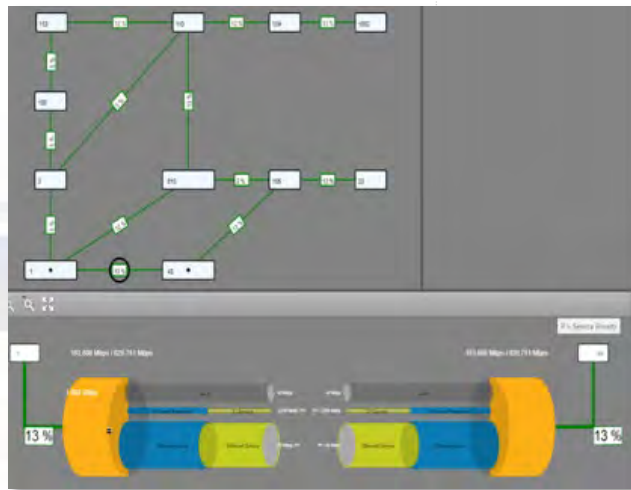




Core Backbone Solutions with MPLS-TP

Core Backbone MPLS-TP

XTran Nodes and TXCare NMS



OTN Systems

- XTran hardware solution and TXCare Networking Management System
- Easy provisioning and maintenance, MPLS-TP based
- Guaranteed bandwidth and availability per application
- Scalable platform up to 100G interfaces
- Support of Ethernet and Legacy interfaces (E.g., RS232, FXS, T1, etc.)
- Hot-pluggable redundant power supplies
- Dual Ethernet controller (true redundancy)
- Integration with Hirschmann



Core Backbone MPLS-TP

XTran Node **Scalability**

720 Gbps

Smooth **migration** from access over aggregation to core and transport

XTD/XTR

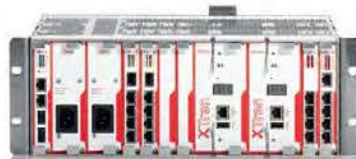


2x 10GE

XT1104A



XT2206A



2x 10GE

XT2210A
XT2209A



4x 10GE

XT2215A

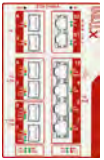



44x 10GE



Core Backbone MPLS-TP


XTran – Core to Edge Solutions

MPLS-TP GE access device


- L2/L3 features
 - PoE support
 - 30°C to +65°C // -22F to 149F

Hirschmann Ethernet Switches and Routers


- Fanless
- 30 to +65°C
- 22F to 149F
- 19" or DIN Rail
- EMC hardened

Central Switching



- MPLS-TP compliant
- Protection <50ms
- Hardware OAM
- 64 Gbps

Power options



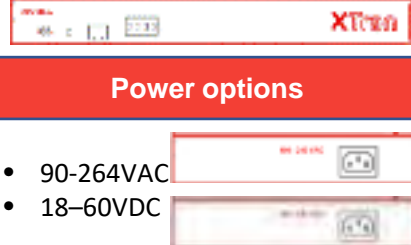
90-264VAC/18-300VDC



Central Switching


- MPLS-TP compliant
- Protection <50ms
- Hardware OAM
- 720 Gbps

Power options



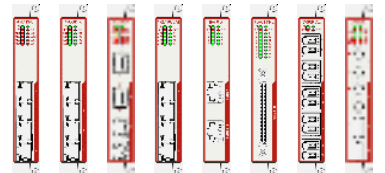
- 90-264VAC
- 18-60VDC

Ethernet Interfaces




- 1G – 40G WAN
- Layer 2/3
- Cu or FO
- Power over Ethernet

Legacy interfaces




- Sync interfaces: X.21 / V.35
- Low speed: RS232, 422, 485
- Voice: E1, 4WE&M, FXS, FXO
- Teleprotection: C37.94
- SDH interworking: STM1/4
- SHDSL interface

Management



- Graphical User Interface
- Zero touch deployment
- End-to-End provisioning
- Traffic Engineering
- Assurance OAM
- Alarm handling
- User management

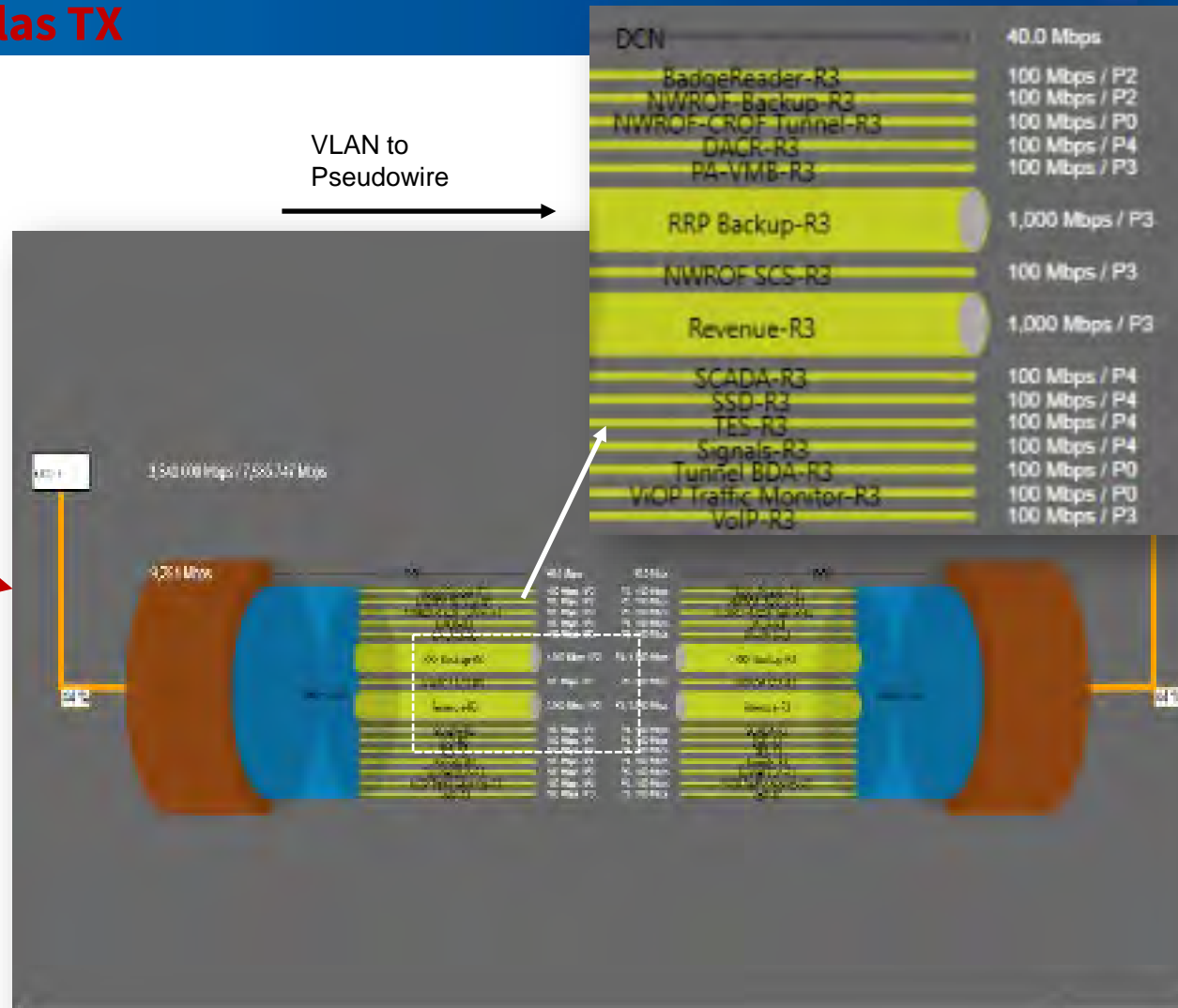


Core Backbone MPLS-TP

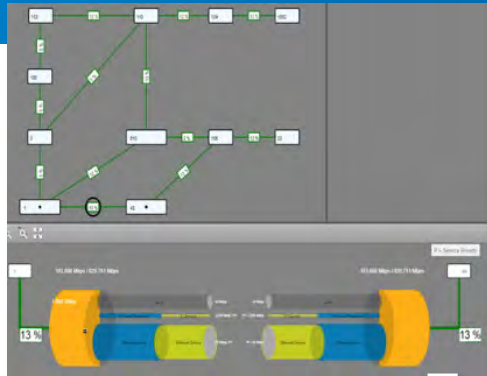
Customer Use Case – **DART, Dallas TX**

Bridge-Group/VLAN	Description
1	Reserved
2	SCADA
3	TES
4	FUTURE USE
5	FCOL
6	SIGNALS
7	PA/VMB
8	NWROF SCS
9	NWROF BACKUP
10	NWROF-CROF TUNNEL
11	RRP BACKUP
12	VOIP
13	STARTER SYSTEM DATA
14	AVAILABLE FOR USE
15	TUNNEL BDA
16	AVAILABLE FOR USE
17	AVAILABLE FOR USE
18	VALIDATOR
19	DACR
20	BADGE ENTRY
21	SIGNALS BACKUP
22	TRAFFIC MONITOR
23	CITYPLACE INTERCOM

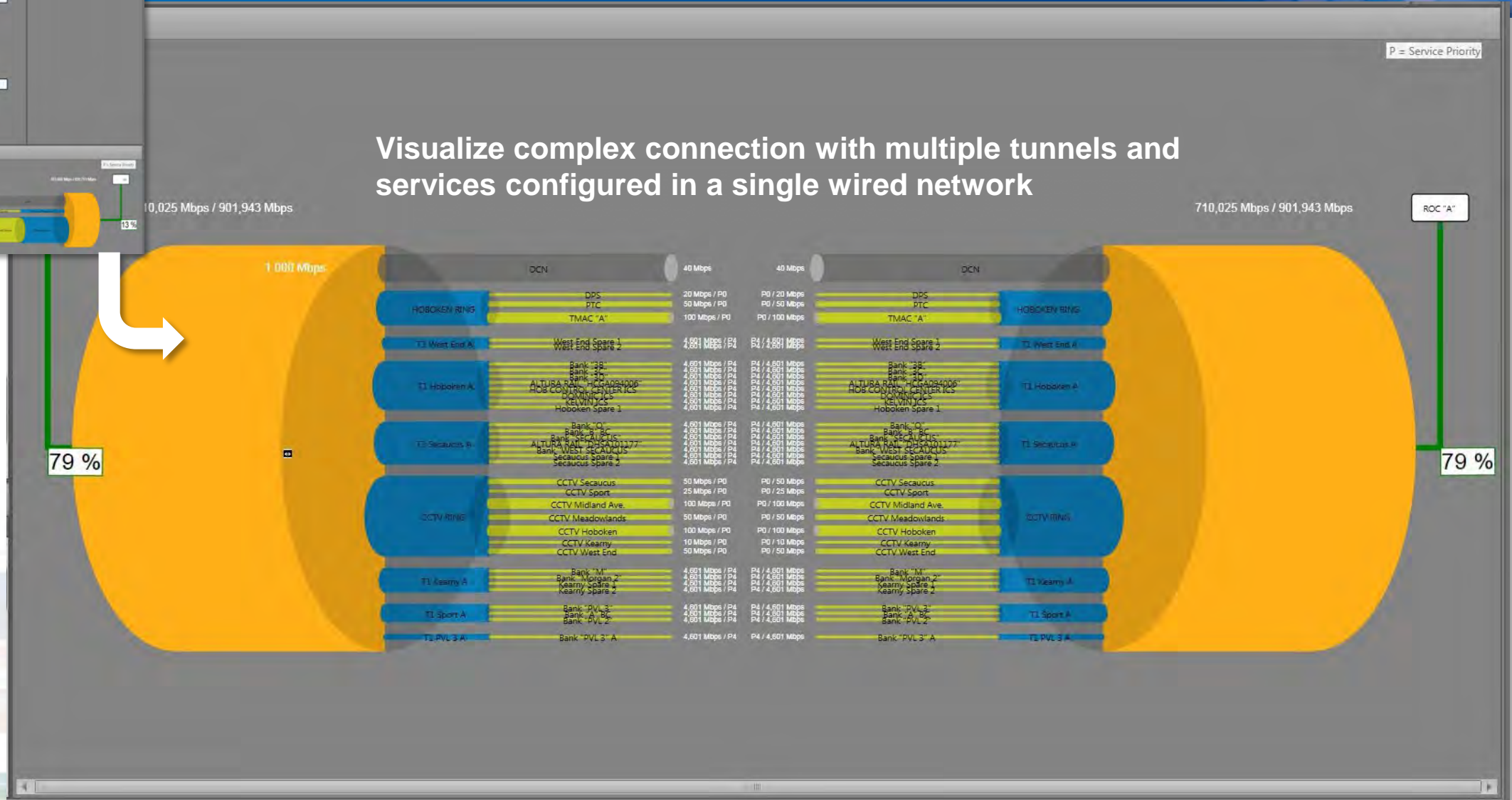
VLAN to Pseudowire



TXcare – NMS for OTN System



Visualize complex connection with multiple tunnels and services configured in a single wired network



Core Backbone MPLS-TP

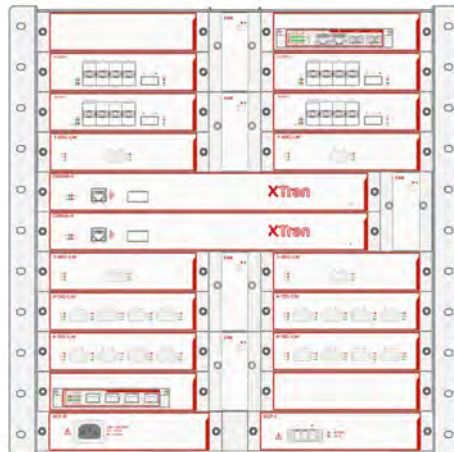
Customer Use Case – **Hamburger Hochbahn, Hamburg Germany**

Replacement of complete Operational Telecom backbone by OTN Systems solution.

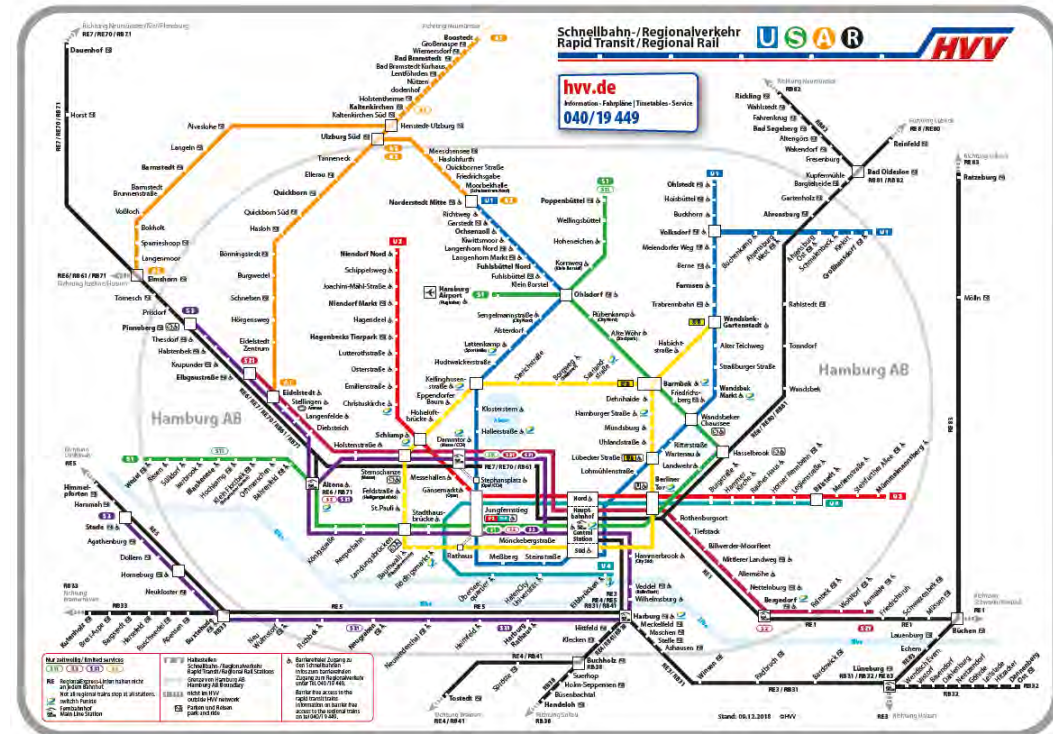
- **+250 XT2209**



- **+30 XT2215**



- **+1000 ETS**



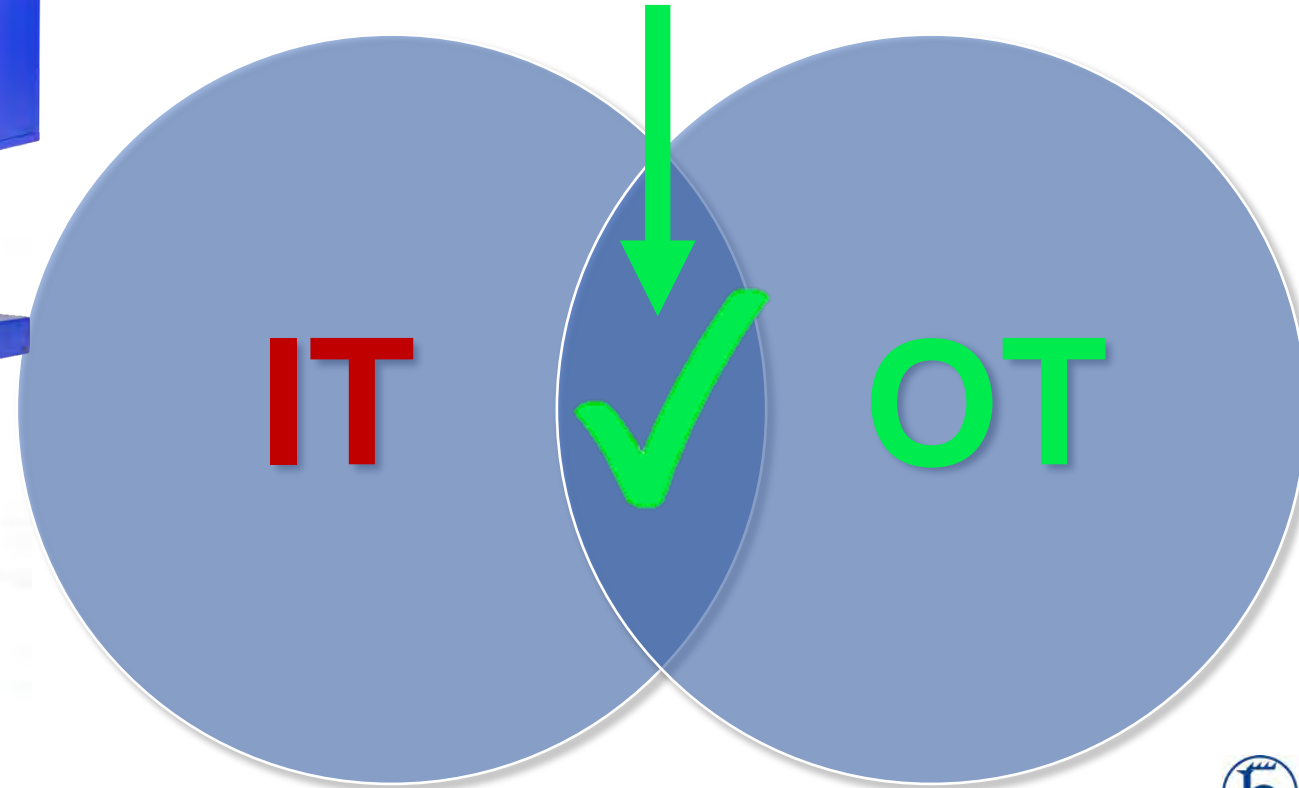


Now for something
completely different...
Hirschmann IT

Hirschmann IT *(not a typo)*

HIRSCHMANN IT

A **BELDEN** BRAND



Hirschmann IT – Brand Positioning



HIRSCHMANN IT

A BELDEN BRAND

Environment

- Use in harsh environments
- Resistance to EMC interference
- Protected against water and dust

- 19" Cabinet installation
- High port density & scalability
- Stackable

Performance

- Medium throughput
- Rapid failure recovery
- Time sensitive

- High performance & bandwidth
- Redundant switching cores
- Non-blocking architecture
- Hot swap power

Applications

- Railway trackside, rolling stock
- O&G, chemical plants control
- Factory production floor
- Power utilities
- Other industrial control systems

- IT networks in industrial facilities
- Smart building
- CCTV
- Railways, highways, airports

MTS Series – Enterprise-grade Networking



MTS 2600



- Low cost
- Stackable

MTS 2700



- Non-block uplink
- PoE/PoE+
- ERPS Ring link and NNI/UNI
- Persistent PoE
- Low noise
- Rich L2 and L3 feature

MTS 2800



- Non-block uplink
- ERPS Ring link and NNI/UNI
- Low noise
- Rich L2 and L3 feature

MTS 2900



- 1.44T in 1RU
- 6*QSFP uplink
- 48*SFP+ downlink
- SDN ready
- Rich L2 and L3 feature

MTS 8003



- Dual active engine
- 3 traffic slots
- GE TX to 40GE QSFP
- SDN ready
- High performance
- Non-block forwarding matrix
- Hot-swap slot
- 4 redundant PSU

HIRSCHMANN IT - MTS Switches

No.	Product Category	Hirschmann Product Number	Hirschmann Product Code	GE TX	1G SFP	10G SFP+	40G QSFP	PSU	Heat radiation	Software level
1	40G Core Switch	942999824	MTS2948X-6Q-A	/	/	48	6	2*Modular redundant PSUs	4*Modular fans	Advanced
2	10G Aggregation Switch	942999841	MTS2848-6X-E	48	/	6	/	2*Fixed redundant PSUs	Fixed fan	Enhanced
3		942999842	MTS2824-6X-E	24	/	6	/	2*Fixed redundant PSUs	Fixed fan	Enhanced
4		942999843	MTS2848-6X-S	48	/	6	/	2*Fixed redundant PSUs	Fixed fan	Standard
5		942999844	MTS2824-4X-S	24	/	4	/	2*Fixed redundant PSUs	Fixed fan	Standard
6		942999845	MTS2824F-4X-S	/	24	4	/	2*Fixed redundant PSUs	Fixed fan	Standard
7		942999846	MTS2832TF-4X-E	8	24	4	/	2*Fixed redundant PSUs	Fixed fan	Enhanced
8	10G Aggregation/Access Switch with POE	942999831	MTS2748-6X-MP-E	48	/	4	/	2*Modular redundant PSUs	Fixed fan	Enhanced
9		942999832	MTS2724-6X-MP-E	24	/	4	/	2*Modular redundant PSUs	Fixed fan	Enhanced
10		942999835	MTS2724-4X-FP-S	24	/	4	/	2*Fixed redundant PSUs	Fixed fan	Standard
11		942999836	MTM2700-2X	/	/	2	/	/	/	/
12	10G Access Switch	942999847	MTS2624-4X-B	24	/	4	/	Fixed single PSU	Fixed fan	Basic

HIRSCHMANN IT – PSU & Fan

No.	Product Category	Hirschmann Product Number	Hirschmann Product Code	Description
1	40G Core Switch	942999822	MTM2900-PSU250	AC/DC 250W PSU; AC Input 100-240V; DC Input 192~288V, 3.5A; Output 12V/20.8A, 5VSB/2A; Hot-Swap supported.
2		942999823	MTM2900-FAN	Modular Fan, Hot-Swap supported, 4 units fan are mandatory for MTS2948
3	10G Aggregation/Access Switch with POE	942999833	MTM2700-PSU500	AC/DC 500W PSU; Input 100-240V/7.0A; Output 12VDC/10A, 53.5VDC/7A; POE supported
4		942999834	MTM2700-PSU120	AC/DC 120W PSU; Input 100-240V/2.0A; Output 12V/10A; Without POE support

HIRSCHMANN IT – MTS8000 Switches

No.	Product Category	Hirschmann Product Number	Hirschmann Product Code	Description
1	40G Core Modular Switch	942999801	MTS8003-Chassis	MTS8003 Chassis, 6U, MUST have 2*FAN Modules
2		942999802	MTM8000-Engine	MTS8000 Engine Module, Max. 2*Engines
3		942999803	MTM8000-PSU800	MTS8000 800W Power Supply, Min. 1*PSU, Max. 4*PSUs
4		942999804	MTM8003-FAN	MTS8003 Fan Modules
5		942999806	MTM8000-48F2X-S	Switch module; 48*Gbit SFP slots, 2*10Gbit SFP+ slots
6		942999807	MTM8000-48T2X-S	Switch module; 48*Gbit RJ45 ports, 2*10Gbit SFP+ slots
7		942999808	MTM8000-48TP2X-S	Switch module; 48*Gbit RJ45 PoE ports, 2*10Gbit SFP+ slots
8		942999809	MTM8000-24T24F2X-S	Switch module; 24*Gbit RJ45 ports, 24*Gbit SFP slots, 2*10Gbit SFP+ slots
9		942999810	MTM8000-16X-S	Switch module; 16*10Gbit SFP+ slots
10		942999811	MTM8000-16X4Q-S	Switch module; 16*10Gbit SFP+ slots, 4*40G QSFP+ slots
11		942999812	MTM8000-16Q-A	Switch module; 16*40G QSFP+ slots, high performance
12		942999814	MTM8000-52X-A	Switch module, 52*10Gbit SFP+ slots, high performance
13		942999815	MTM8000-ModuleCover	Switch module slot cover
14		942999816	MTM8000-EngineCover	Switch Engine slot cover
15		942999817	MTM8000-PSUCover	Switch PSU slot cover

Mammuthus – Product Matrix



MAMMUTHUS

	MTS2600	MTS2700	MTS2800	MTS2900	MTS8003
Stackable	YES	YES	YES	YES	YES
PoE	NO	YES	NO	NO	YES
-B (Basic) Feature set	YES	NO	NO	NO	NO
-S (Standard) Feature set	NO	YES	YES	NO	NO
-E (Enhanced) Feature set	NO	YES	YES	NO	NO
-A (Advanced) Feature set	NO	NO	NO	YES	YES
Modular PSU	NO	YES	NO	YES	YES
Extended slot	NO	YES	NO	NO	YES

MTS Switches Software Functionality: Switching

Switching	Basic	Standard	Enhanced	Advance
MAC limitation	●	●	●	●
Static MAC address entry	●	●	●	●
MAC blackhole	●	●	●	●
Static/Dynamic ARP	●	●	●	●
GARP	●	●	●	●
ARP proxy	●	●	●	●
VLAN (802.1Q)	●	●	●	●
Flow control (802.3x, 802.3p)	●	●	●	●
LAG	●	●	●	●
QinQ	●	●	●	●
Flexible QinQ	●	●	●	●
VLAN mapping	●	●	●	●
STP/RSTP/MSTP	●	●	●	●
GARP VLAN Registration Protocol (GVRP)	●	●	●	●
Super VLAN	●	●	●	●
Private VLAN	●	●	●	●
Voice VLAN	●	●	●	●
BPDU Tunnel	●	●	●	●
N:1/N:N port monitoring	●	●	●	●
SPAN	●	●	●	●
ERSPAN				●
Flow mirroring	●	●	●	●
ERPS	●	●	●	
UDLD	●	●	●	●
OAM	●	●	●	●

MTS Switches Software Functionality: Routing

Routing	Basic	Standard	Enhanced	Advanced	MTS8000
Static route	●	●	●	●	●
RIP v1/v2		●	●	●	●
OSPF		●	●	●	●
BGP			●	●	●
ISIS			●	●	●
RIPng			●	●	●
BGP4+			●	●	●
OSPF v3			●	●	●
ISIS v6			●	●	●
IGMP v1/v2			●	●	●
IGMP v3			●	●	●
IGMP filter			●	●	●
MLD v1/v2	●	●	●	●	●
IGMP snooping	●	●	●	●	●
MLD v1/v2 snooping	●	●	●	●	●
PIM DM			●	●	●
PIM SM			●	●	●
PIM SM v6				●	●
PIM SDM			●	●	●
PIM SSM			●	●	●
DHCP Client	●	●	●	●	●
DHCP Server		●	●	●	●
DHCP relay		●	●	●	●
DHCP v6 Server/Client		●	●	●	●
DHCP v6 relay		●	●	●	●
DNS	●	●	●	●	●
FTP Server/Client	●	●	●	●	●
NTP	●	●	●	●	●
IPv6	●	●	●	●	●
IPv6 tunnel			●	●	●
GRE			●	●	●
6to4 tunnel			●	●	●
ISATAP tunnel			●	●	●
BFD			●	●	●
VRRP		●	●	●	●
VRRP v6			●	●	●
IRMP				●	●

MTS Switches Software Functionality: IPv6

IPv6	Basic	Standard	Enhanced	Advanced	MTS8000
Static Routing v6	●	●	●	●	●
IPv6	●	●	●	●	●
IPv6 tunnel			●	●	●
PIM v6-SM			●	●	●
IP v6 Multicast			●	●	●
GRE v6			●	●	●
TCP v6	●	●	●	●	●
UDP v6	●	●	●	●	●
RIPng		●	●	●	●
BGP4+			●	●	●
OSPF v3		●	●	●	●
ISIS v6			●	●	●
DHCP v6 Server/Client		●	●	●	●
DHCP v6 relay		●	●	●	●
Prefix List v6		●	●	●	●
BFD v6				●	●
VRRPv3			●	●	●

MTS Switches Software Functionality: Management

Management	Basic	Standard	Enhanced	Advanced	MTS8000
Console	●	●	●	●	●
Telnet	●	●	●	●	●
SSH v1/v2	●	●	●	●	●
SNMP v1/v2	●	●	●	●	●
SNMP v3	●	●	●	●	●
RMON	●	●	●	●	●
TRO69	●	●		●	●
IPFIX				●	●
OAM (802.3ah, 802.1ag, ITU Y.1731)	●	●	●	●	●
EEP	●	●	●	●	●
Syslog	●	●	●	●	●
Web UI	●	●	●	●	●
DHCP Client	●	●	●	●	●
DHCP Server			●	●	●
DHCP relay			●	●	●
DNS	●	●	●	●	●
FTP Server/Client	●	●	●	●	●
NTP	●	●	●	●	●
TFTP	●	●	●	●	●
E-LMI	●	●	●	●	●
LLDP	●	●	●	●	●
SLA		●	●	●	●

MTS Switches Software Functionality: Security

Security	Basic	Standard	Enhanced	Advanced	MTS8000
Login security	●	●	●	●	●
AAA	●	●	●	●	●
802.1x	●	●	●	●	●
RADIUS	●	●	●	●	●
TACACS+	●	●	●	●	●
SSH Client	●	●	●	●	●
Port security	●	●	●	●	●
Port isolation	●	●	●	●	●
UNI/NNI isolation	●	●	●	●	●
DHCP snooping	●	●	●	●	●
Dynamic ARP Inspection (DAI)	●	●	●	●	●
IP Source Guard	●	●	●	●	●
CPU protection	●	●	●	●	●
uRPF	●	●	●	●	●
LAND attack protection	●	●	●	●	●
SYN flooding protection	●	●	●	●	●
Ping flooding protection	●	●	●	●	●
TearDrop protection	●	●	●	●	●
Ping of Death protection	●	●	●	●	●
TCP flooding protection	●	●	●	●	●
ICMP flooding protection	●	●	●	●	●
Unicast storm control	●	●	●	●	●
Multicast storm control	●	●	●	●	●
Broadcast storm control	●	●	●	●	●
IPv4/v6 Standard/Extended ACL	●	●	●	●	●
MAC ACL	●	●	●	●	●
Port ACL	●	●	●	●	●
ACL log	●	●	●	●	●
Mac Forced Forwarding	●	●	●	●	●
Loopback Detection	●	●	●	●	●
VLAN Isolation	●	●	●	●	●
HMAC-SHA256 (RIP, OSPF)	●	●	●	●	●
Key Chain	●	●	●	●	●
APR Check	●	●	●	●	●
AARF	●	●	●	●	●

MTS Switches Software Functionality: QoS, Virtualization, SDN

QoS	Basic	Standard	Enhanced	Advanced	MTS8000
Class based QoS schedule	●	●	●	●	●
CAR	●	●	●	●	●
SP	●	●	●	●	●
WRR	●	●	●	●	●
SP + WRR	●	●	●	●	●
RED	●	●	●	●	●
WRED	●	●	●	●	●
Traffic Shaping	●	●	●	●	●
Traffic policy	●	●	●	●	●
802.1p mapping	●	●	●	●	●
DSCP mapping	●	●	●	●	●

Virtualization	Basic	Standard	Enhanced	Advanced	MTS8000
Stack	●	●	●	●	●
M-LAG	●	●	●	●	●
MAD	●	●	●	●	●
Vertical Virtualization	●	●	●	●	●

SDN	Basic	Standard	Enhanced	Advanced	MTS8000
OpenFlow				●	●
XML API/NETCONF	●	●	●	●	●

SDN is fully supported on MTS8000 series -A high performance media modules and MTS2XXX-A products.

MTS2824-6X-E, MTS2848-6X-S, MTS2748-6X-MP-E, MTS2724-6X-MP-E, MTS2848-6X-E and MTS2832TF-4X-E are hardware ready for Openflow only.

MTS Series – Management

- Primary configuration via CLI that mirrors Cisco's
- Light, web-based GUI
- MTS has been integrated into Industrial HiVision



Type	Status	Name	Value
Interfaces			
		Serial Number	942999847011001024
	✓	Temperature	73
		System Start	2023-08-22 11:35:43
		Contact	Mark Cooksley
		Location	Neckartenzlingen
		Name	switch
		Location Coordinates	
		Chassis	MTS2624-4X-B
		Product	MTS
		Vendor	Hirschmann IT
		Agent	
	✓	Fan 0	
	✓	Module Engine 0	
		Port 19	
		Port 18	
		Port 17	

CLI example of VLAN Configuration

```
!create vlan
vlan 2
  name VLAN_2
  exit

vlan 3
  name VLAN_3
  exit

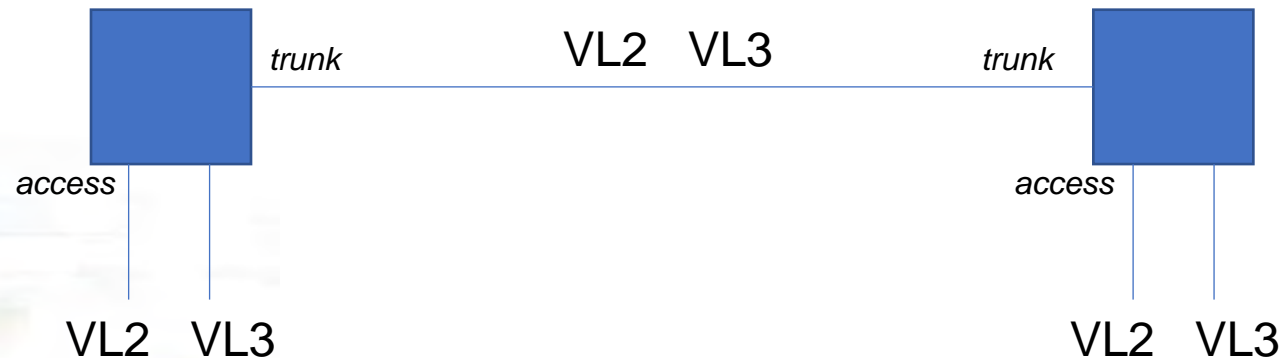
!remove vlan
no vlan 2
no vlan 3
```

```
!assign VLAN to access port
int g0/1
  switchport mode access
  switchport access vlan 2

int g0/2
  switchport mode access
  switchport access vlan 3
```

```
!assign VLAN to trunk port
int g0/3
  switchport mode trunk
  switchport trunk allowed vlan add 2,3
```

```
!remove VLAN from trunk port
int g0/3
  no switchport trunk allowed vlan 1
```

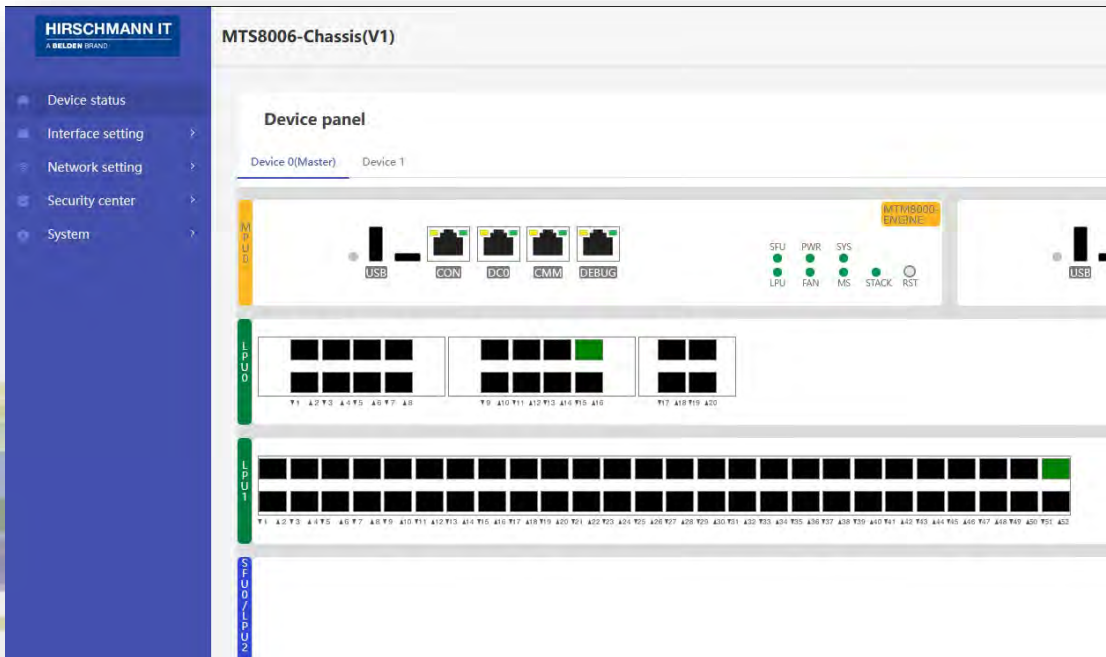


MTS Series – Management Web GUI

```
!enable http server
ip http server

!enable https server
ip http secure-server
```

- Security Center
 - User Management
 - Storm suppression [enabled by default]
 - Port isolation
 - Device Access Control
- System
 - Configuration [Firmware upgrade]
 - Mac Address Table
 - Information Center [Log & Settings]
 - Port Mirror
 - Tool [Ping Test]
- Interface Status
- Device Status
 - CPU Utilization
 - Memory/Flash usage
 - CPU/Environment Temperature
- Interface
 - Ethernet Settings [MTU, Speed, Duplex]
 - Configure LAG
 - L3 Interface
- Network
 - Static Route
 - ARP
 - SNMP
 - ACL
 - VLAN



Web GUI example of VLAN Configuration

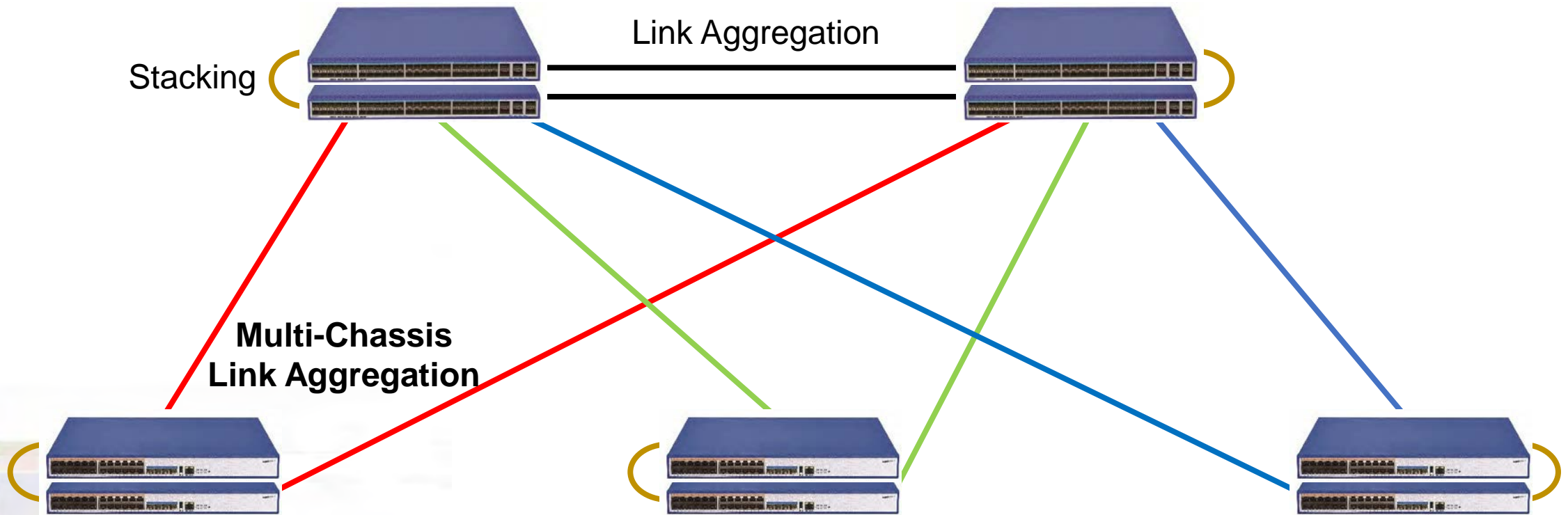
The screenshot displays the Hirschmann IT web GUI for device MTS2648-6X-B. The left sidebar shows navigation options: Device status, Interface setting, Network setting (selected), Static route, ARP, SNMP, ACL, VLAN (highlighted), Security center, and System. The main content area shows the 'VLAN' configuration page with a table of existing VLANs.

VLAN ID	Description	mode	interface
1	DEFAULT	Untagged	g1/0/1, g1/0/2, g1/0/3, g1/0/4, g1/0/30, g1/0/31, g1/0/32, g1/0/33, g1/0/34, g1/0/35, g1/0/36, g1/0/37, g1/0/38, g1/0/39, g1/0/40, g1/0/41, g1/0/42, g1/0/43, g1/0/44, g1/0/45, g1/0/46, g1/0/47, g1/0/48, te0/50, te0/51, te0/52, te0/53, te0/54

Two modal windows are overlaid on the main page:

- Add VLAN:** Shows a form to add a new VLAN. The 'VLAN ID' field contains '110' (Range: 1~4094). The 'Support remote-span' checkbox is unchecked. The 'Description' field contains 'Test VLAN' (Length: 0~32 characters). A 'Cancel' button is visible.
- Batch add VLAN:** Shows a form to add multiple VLANs. The 'VLAN ID' field contains '111,112,113,114' (Format: 1-5,7,9). 'Cancel' and 'OK' buttons are visible.

Multi-Chassis LAG (MC-LAG) Redundancy



Management via CLI

- Open Tera Term
- Enter the VLAN IP address for your switch

- Password will have to be changed on first use
- Type enable to enter the privileged exec mode
- Confirm the switch can ping other devices

The image shows a sequence of steps for connecting to a switch via Tera Term. On the left, the 'New connection' dialog is open, showing 'TCP/IP' selected with Host '192.168.10.1' and 'SSH' selected as the service. In the center, the 'SSH Authentication' dialog is open, showing 'admin' as the user name and a masked password. On the right, the terminal window shows the login process: 'Current user first login, please modify password.', followed by prompts for old and new passwords, and a successful login message. The user then enters 'enable' to reach privileged mode, followed by 'password:' and 'ping 192.168.10.10', which returns a 100% success rate.



Wireless Ethernet WiFi 802.11 and Cellular

Industrial Wireless Offering



NB2800, NB3800
Railway and Vehicle

High performance platform for rapid and inter city lines. Allows for multiple 4G and 5G uplinks to split customer from vehicle data. Serves passengers with Infotainment and WiFi.



NB800, NB1601, NB1800
Industrial

Wide range of compact and DIN-Rail variants allowing for multiple 4G and WiFi combinations. Software SDKs and Container deployment is used for condition monitoring integration into any environment.



RLX2
PLC Safety over WLAN

Market-leading sub 10ms roaming in a compact and robust design allows for maximum availability of safety applications over WiFi. A seamless roaming buffer completes the solution.



ProLinux Edge Mini (ELXM)
AGV

Fast roaming WiFi6 client device for mobile applications like autonomous guided vehicles in material handling applications.



Industrial Access Point (IGX)
AGV

Watertight IP65 Indoor Access Point for Wi-Fi7 that is used in warehouses and factories to provide newest 6GHz and 5GHz channels at the same time. This allows for extended Wi-Fi capacity in 6GHz as well as backward compatibility in 5 GHz.

Industrial Wireless Positioning

Transportation

Industrial

NetModule

Clients

Infrastructure



NB2800, NB3800



NB800, NB1601, NB1800



ELXM

RLX2

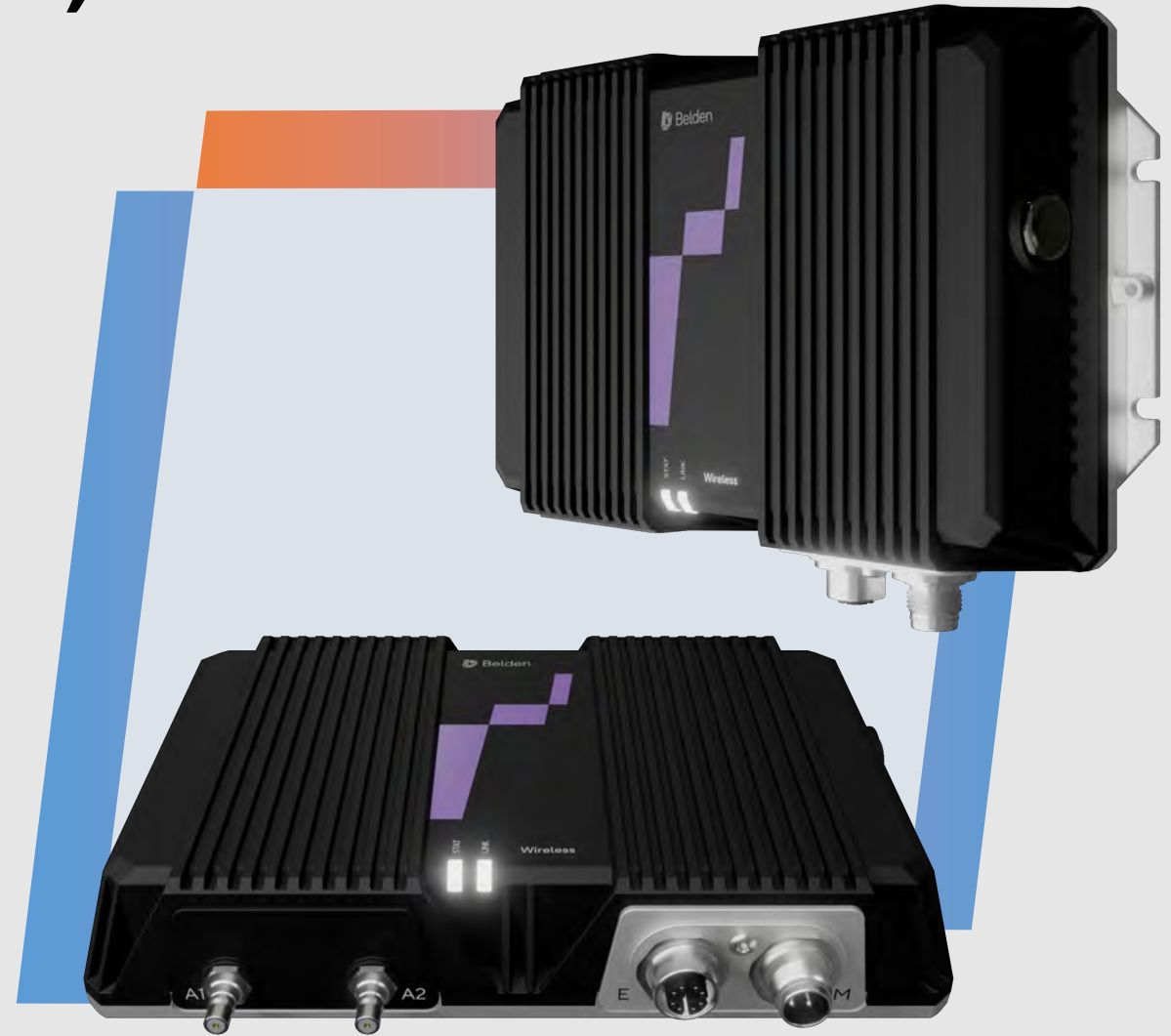
IGX

Industrial Access Point (IGX)

The IGX Wi-Fi 7 Indoor Access Point is targeted to be a market leading solution in mobile applications like AGV in material handling and discrete automation.

- Key features

- 6 GHz channels allowing bigger projects and to work around busy 5 GHz deployments
- Internal Sector Antenna reduces TCOO
- Fast roaming with 802.11r, k and v
- 5 GHz in parallel to 6GHz for backward compatibility





BAT Family

Notice: Series is EOL 2025
Refer to ProSoft or NetModule



- WiFi 4 or 5 chip, Full 3x3 (dual) or 2x2 MIMO
- (Dual) Gigabit Ethernet
- 10-30 VDC
- Operating temperature: -40°C to +70°C
- Compact, DIN-Rail, Wall mount, IP30 or IP67

- Highest WPA3 Security
- Fast Roaming
- Expert Diagnostics
- Controller Support

Optimized for industrial applications

ELXM & RLX2 – 802.11 WLAN Solutions





WLAN Modes



- **Access Point**
Used as Infrastructure Access Point.
- **Repeater**
Used as Client in purely ProSoft infrastructure. Can extend the WiFi like a mesh network.
- **Bridge**
Third-party infrastructure with multiple ethernet devices attached. Performs ARP-NAT.
- **Client**
Third-party infrastructure with a single ethernet device attached. Performs MAC-cloning.

Features	ELXM-SW6	RLX2-IHNF
Access Point	-	250 connections
Repeater	-	Yes
Bridging Client	Yes	Yes
Client	Yes	Yes



Comparison to RLX2-IHNF



Features	ELXM-SW6	RLX2-IHNF
WLAN	11ax chip, 2x2:2 MIMO	11n chip, 3x3:2 MIMO
Access Point	-	250 Clients
Repeater	-	Yes
Bridging Client	Yes	Yes
Client	Yes	Yes
Roaming Times	70 ms	3 ms
Power Supply	10-30 VDC	10-24 VDC, PoE PD
Throughput	High	Medium
Op. Temp.	-20 to +65°C	-40 to +75°C
Serial Port	-	RS232



RLX2 or ELXM? Application Overview



Features	ELXM-SW6	RLX2-IHNF
Profinet, Profisafe	-	Yes
Ethernet/IP Safety	-	Yes
Custom Safety	Yes	Yes
High Throughput	Yes	-

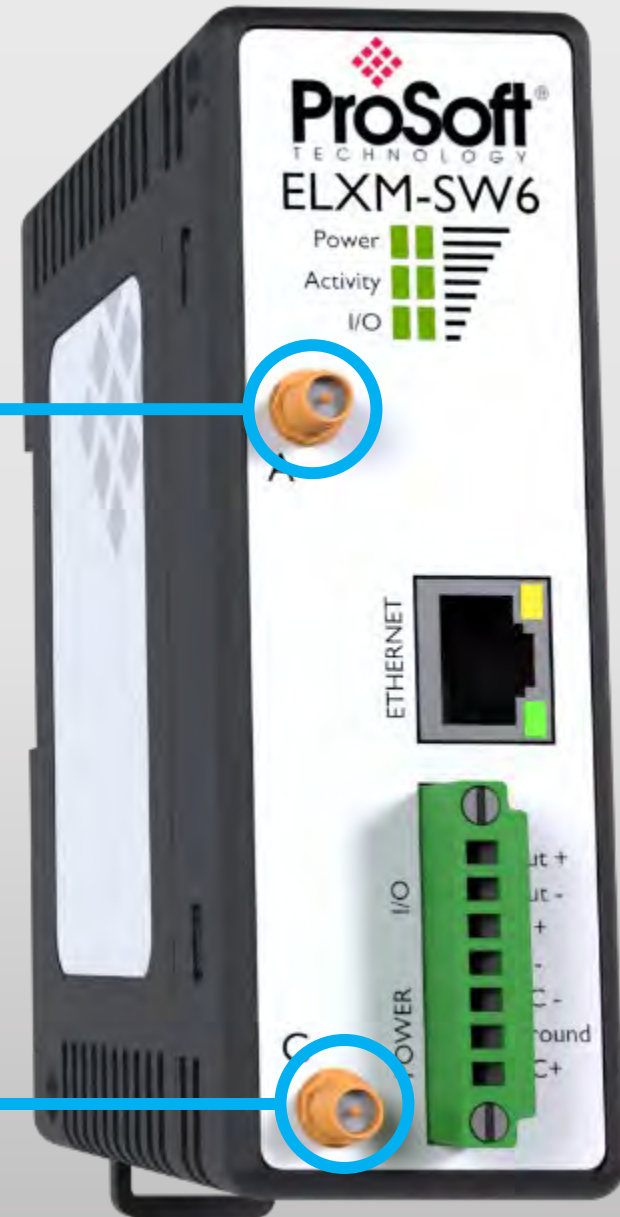
WiFi 6 Chipset

- 2 Antennas - full 2x2 MIMO with RP-SMA
- Dual Band 2.4 & 5 GHz, 802.11n
- 20 & 40 MHz Channel Bandwidth
- Max Output Power: 20 dBm per chain, 23 dBm combined

In upcoming software releases:

- 80 MHz Channel Bandwidth
- 802.11ax, backward compatible to 802.11ac Wave 2 and 802.11abgn
- WPA3 security
- 1024 QAM with up to 510 Mbit/s gross data rates

Protect your investment



RLX2-IHNF

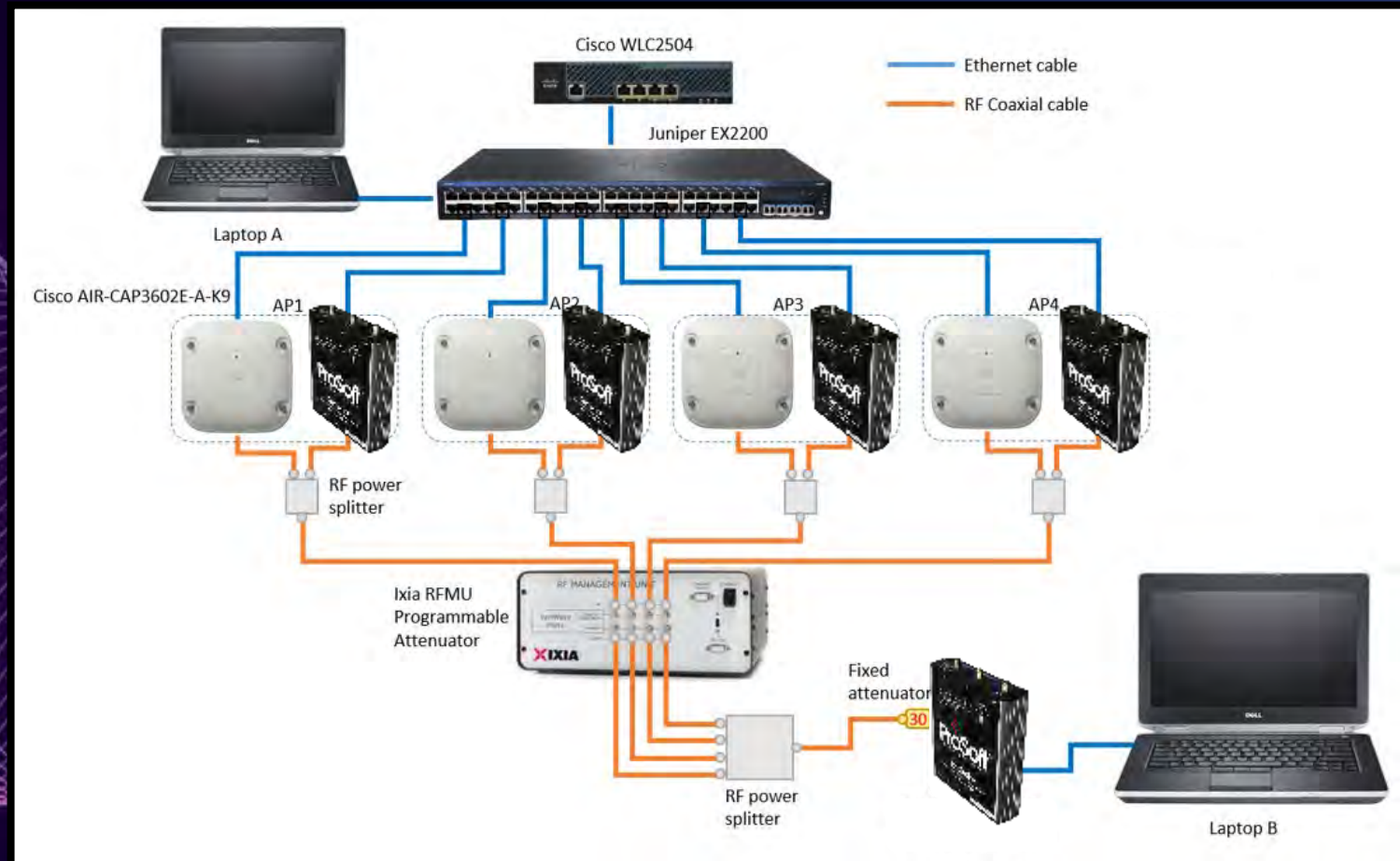
- Full 3x3 MIMO WiFi
- Fast roaming for Safety over WiFi
- Gigabit Ethernet RJ45, Serial RS-232
- 10-24 VDC or PoE powered
- MicroSD for easy device replacement
- Operating temperature: -40°C to +70°C
- Compact, DIN-Rail, metal housing
- Industrial mesh “Repeater” mode

Optimized for industrial safety applications



Competency – Fast Roaming

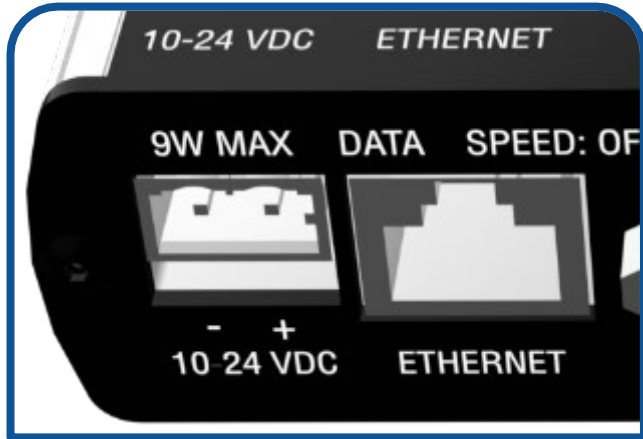
- Fast Roaming PoC setup proves roaming in <10 milliseconds
- Allows for factory deployments with safety
- Cross-vendor compatibility to support existing infrastructures
- Available in CICs around the world for PoC



Detailed measurements available

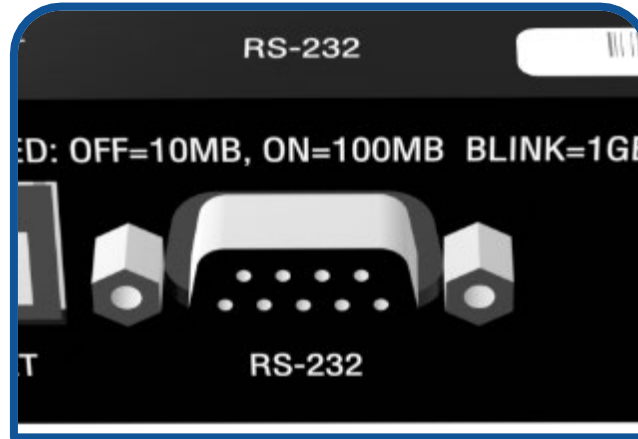


Device Handling



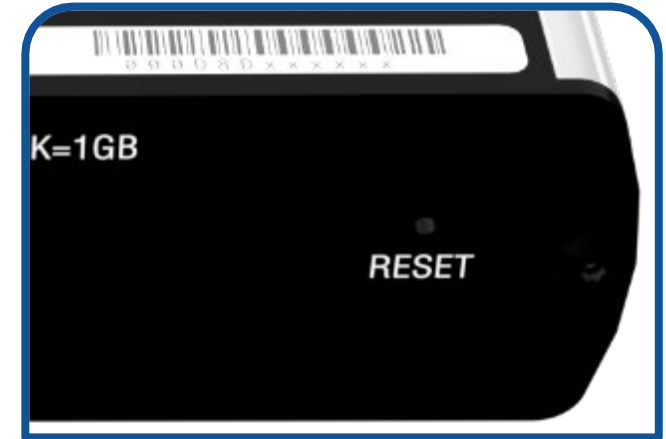
Conveniently Powered

10-24 VDC as well as PoE power inputs



Serial RS-232 Port

Integrated RS232 internal gateway allows IP communication via TCP or UDP



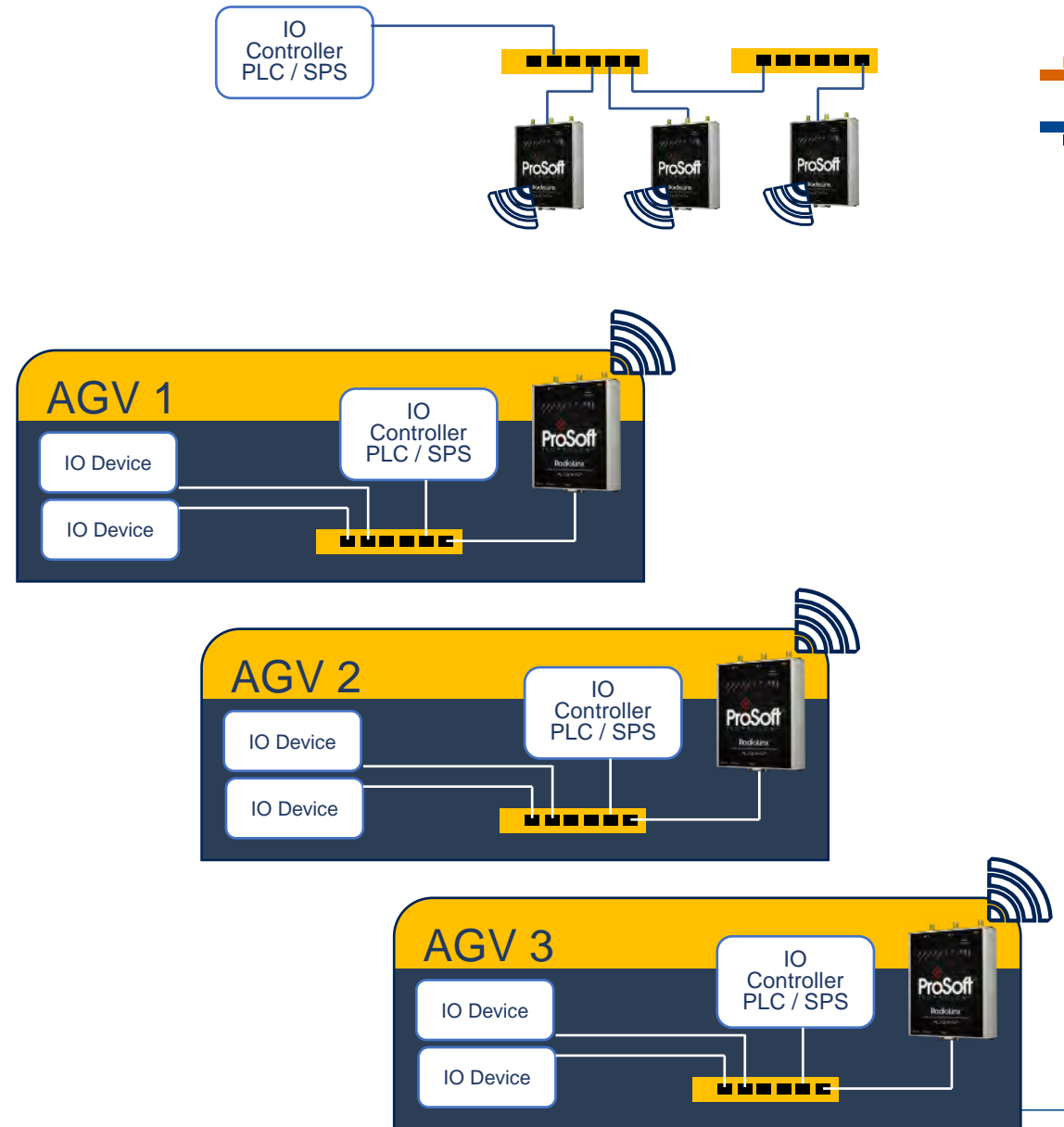
Easy Device Replacement

Reset button and a microSD card make replacement easy – insert microSD in replacement device and press reset button!

Profinet AGV Challenge

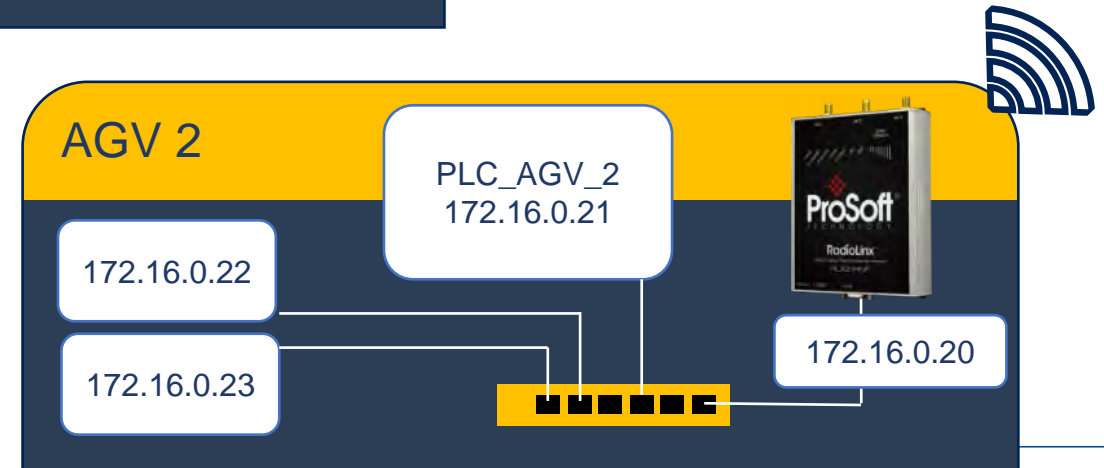
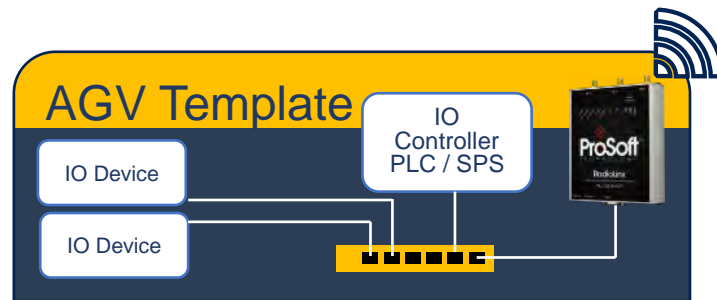
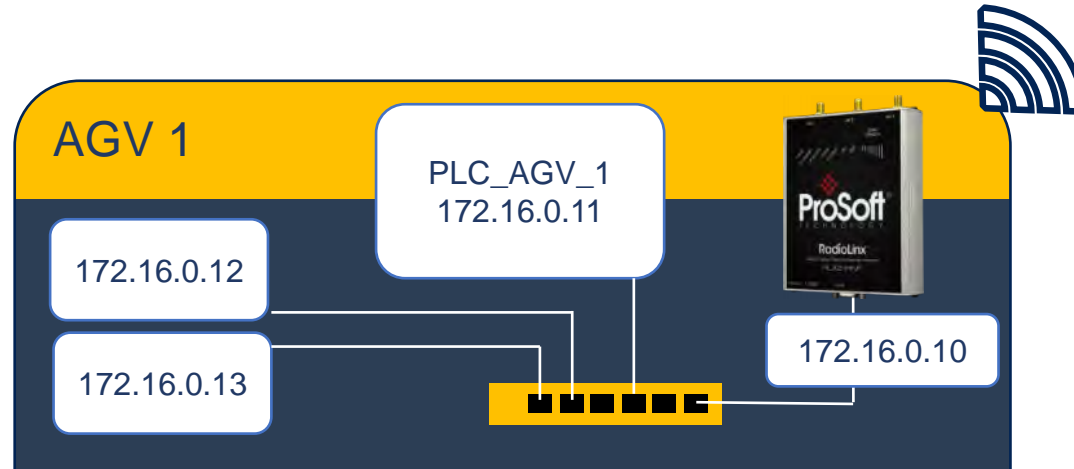
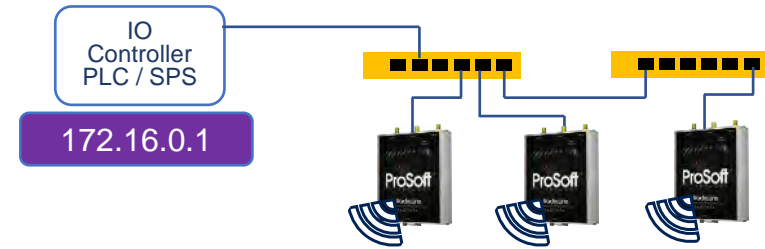
How do we ___?

- simplify each AGV's configuration
- secure isolation between AGVs



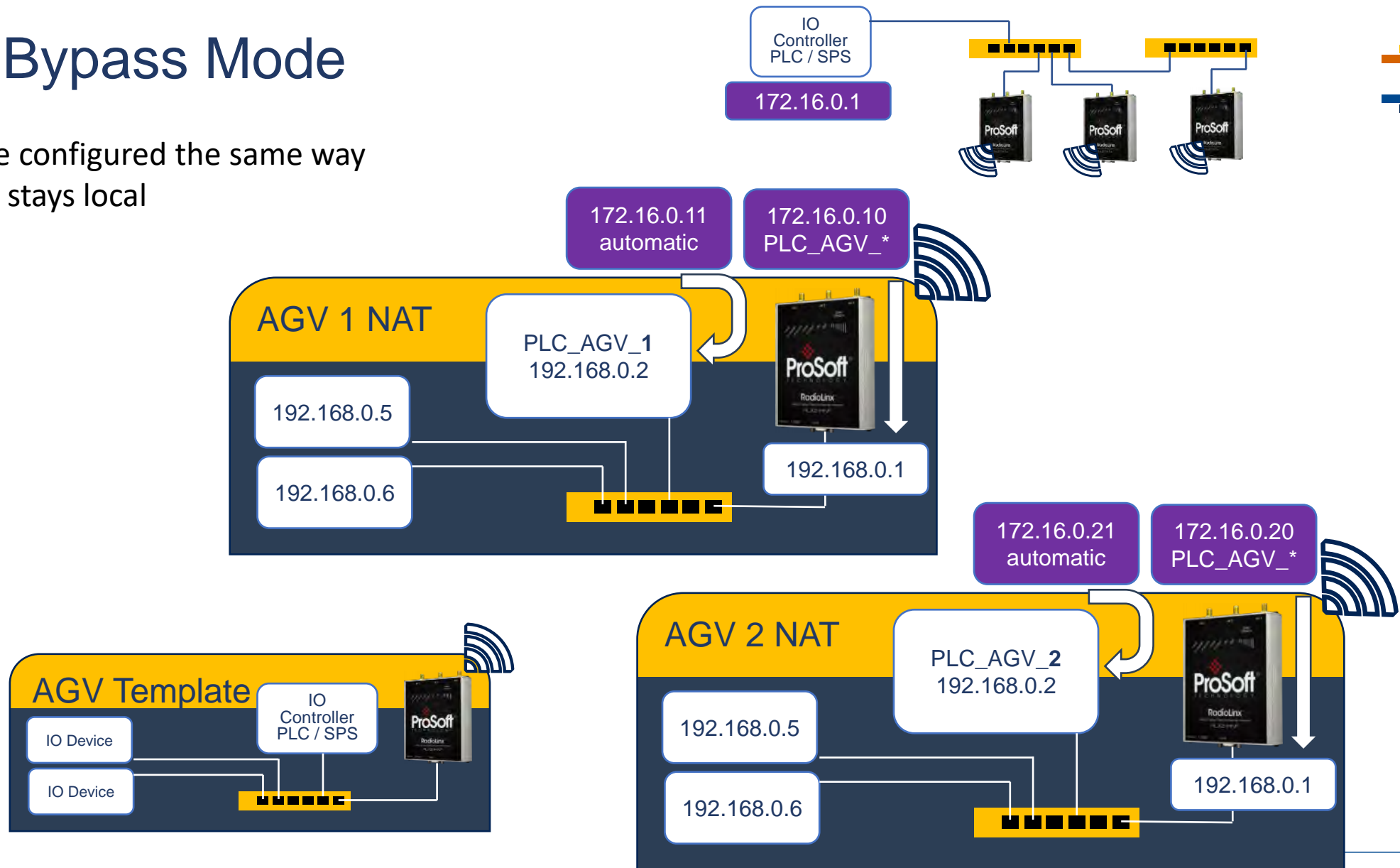
Profinet AGV Challenge Detail

- Each IP address has to be unique
- All devices can talk to each other



Profinet Bypass Mode

- Each AGV can be configured the same way
- IO Device traffic stays local





NET

MODULE

Wireless Solutions
for Mass Transit

NB3800 Railway Gateway Family

Powerful wireless router with multiple 5G / LTE WiFi, Ethernet, SSD storage, GNSS

- 2x 5G-NR or 4x LTE, 4x mini-SIM
- 1x Dual Band Wi-Fi 5 in AP or client mode
- 2x Gigabit Ethernet, 3x Fast Ethernet,
- 2x extension for additional interfaces such as RS-232, RS-485, digital I/O, IBIS, CAN, audio
- Up to 1 TB SSD storage expansion
- Operating environment: -40 °C/-40 °F to +70 °C/+158 °F
- Input voltage: 24 VDC to 48 VDC or 72 VDC to 110 VDC

[Datasheet](#)



EN50155
EN45545



AP3400 WiFi6 Access Point

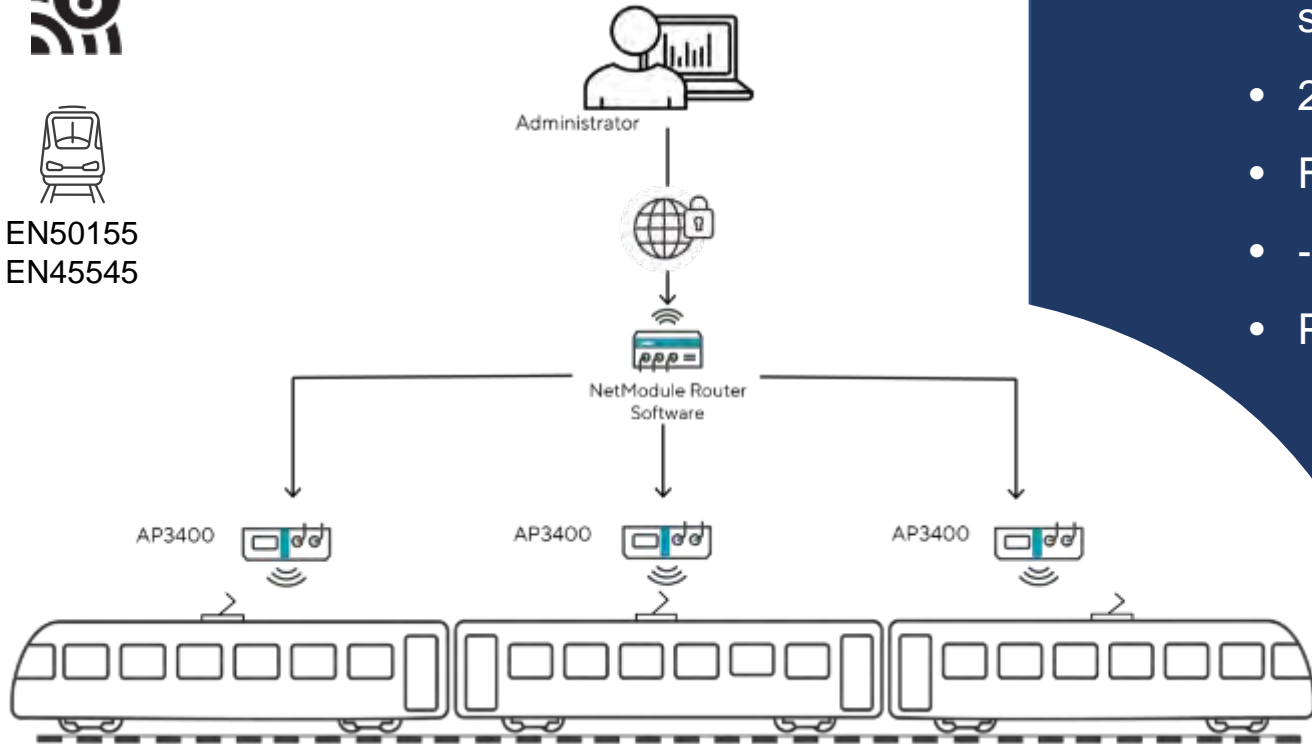
Compact Dual Band Wi-Fi 6 2x2 MU-MIMO Access Point

- Runs two Access Points concurrently in 2.4/5GHz over the same antennas
- 2x 2.5 Gigabit Ethernet
- Fully manageable from NB3800 Webinterface
- -40...+70°C, -40...+158°F
- Powered only by PoE+ (IEEE802.3at)

[Datasheet](#)



EN50155
EN45545

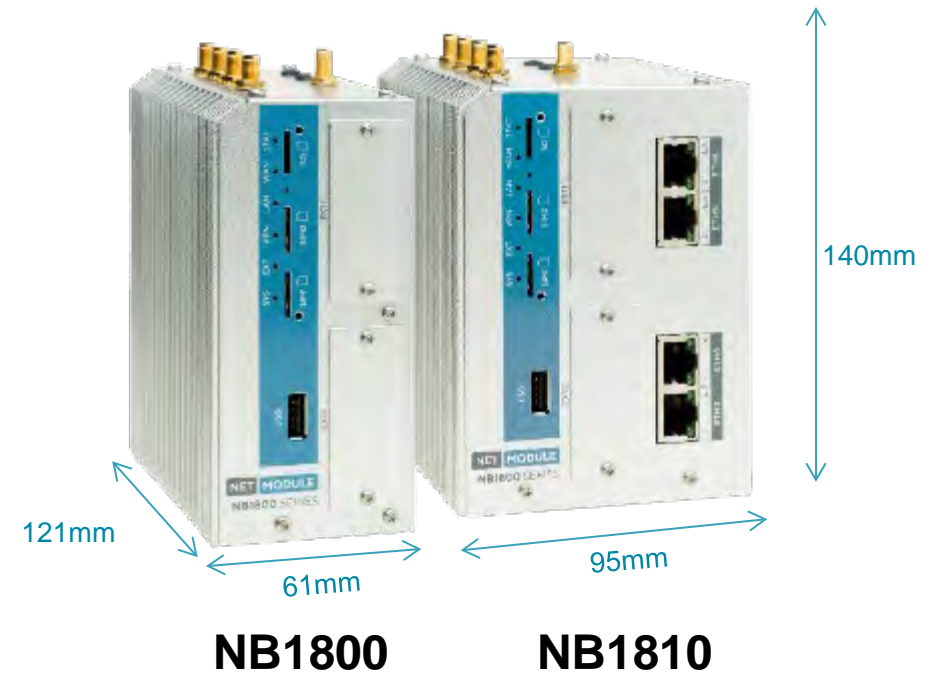


NB1800 Industrial Gateway

High-performance DIN-Rail router with LTE, WiFi, Gigabit Ethernet with PoE+, SFP, GNSS

- 2x LTE, 2x micro-SIM – 5G since Q3/22
- 1x Dual Band Wi-Fi 5 in AP or client mode
- NB1800 - 2x Gigabit Ethernet, 1x SFP (fiber-optic or other)
- NB1810 - 5x Gigabit Ethernet with 4x PoE+, 1x SFP/Gigabit Ethernet combo
- SD Card Slot
- Operating environment: -40 °C/-40 °F to +70 °C/+158 °F
- Input voltage: 12 VDC to 48 VDC

[Datasheet](#)



Q3/22



NB2800 Vehicle Gateway Family



NB2800

NB2810



UN ECE-R10
UN ECE R118

ITxPT compliant wireless router series with multiple LTE, WiFi, Gigabit Ethernet, GNSS

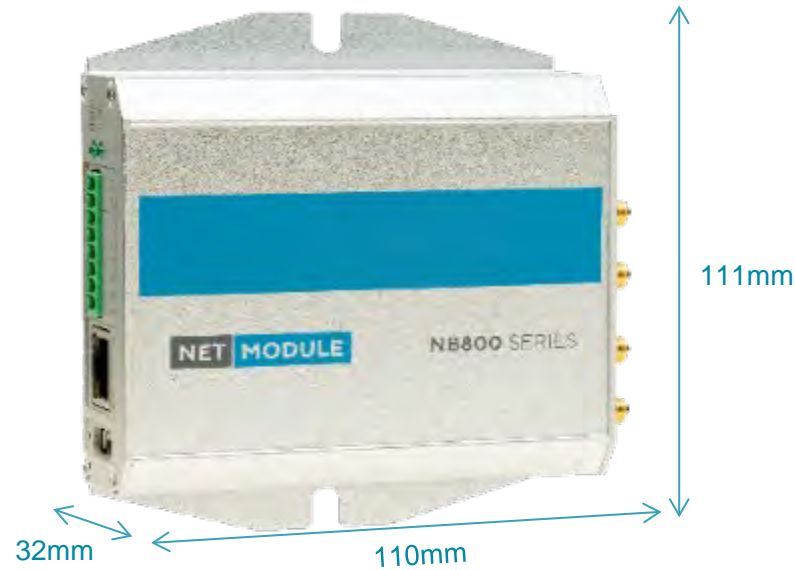
- 4x LTE, 4x micro-SIM, 5G since Q3/22
- 1x Dual Band Wi-Fi 5 in AP or client mode
- 2x Gigabit Ethernet (RJ45 or M12)
- 2x extension for additional interfaces such as RS-232, RS-485, digital I/O, IBIS, CAN, audio
- Up to 1 TB SSD storage expansion
- Operating environment: -25 °C/-40 °F to +70 °C/+158 °F, IP40
- Input voltage: 12 VDC to 48 VDC with Ignition Sense

[Datasheet](#)



NB800 Compact Family

The “fits-in-every-corner” router with LTE, WiFi, Bluetooth Low Energy, Ethernet, GNSS

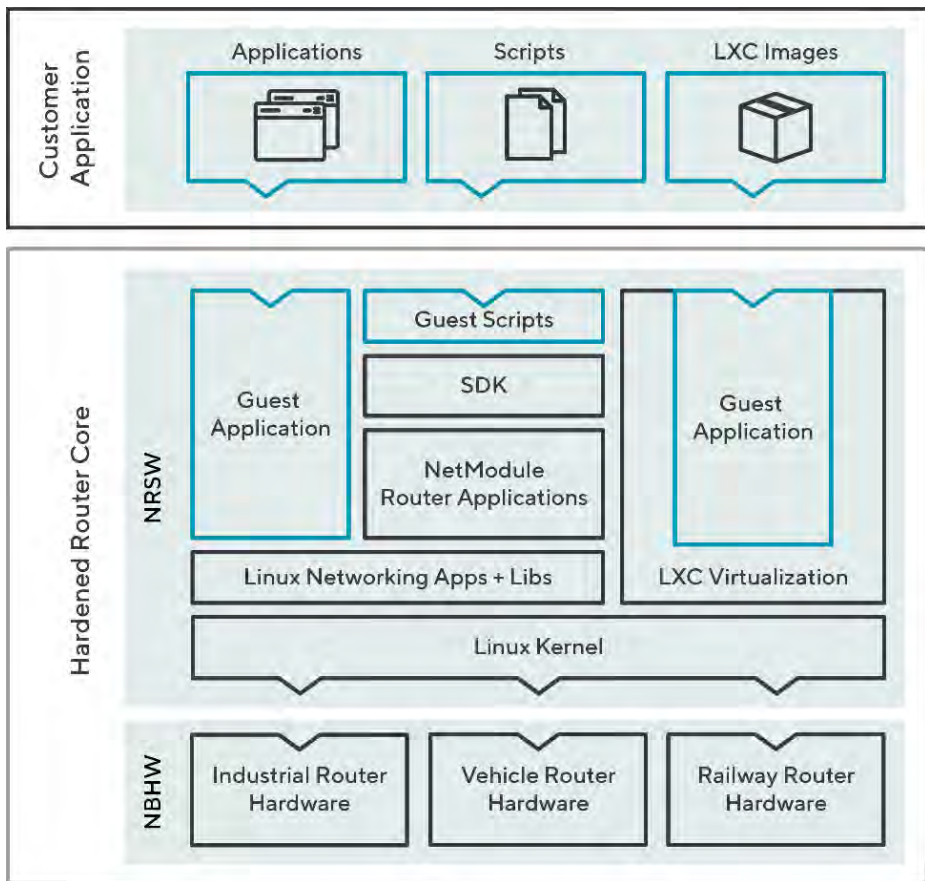
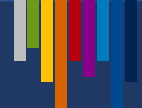


- 1x LTE, 2x mini-SIM
- 1x Dual Band Wi-Fi 4 and BLE
- 1x Fast Ethernet
- 1x shield extension for RS-232, RS-485, digital I/O, CAN
- Operating environment: -40 °C/-40 °F to +70 °C/+158 °F
- Input voltage: 12 VDC to 24 VDC



UN ECE-R10
UN ECE R118
optional

[Datasheet](#)

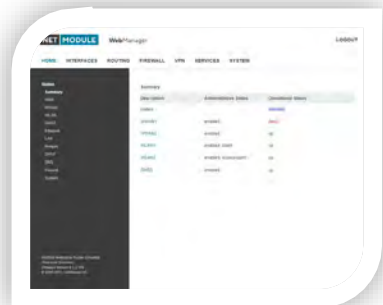


NRSW Netmodule Router Software

Firmware that drives all products with an intuitive user interface. Train on one product and be enabled to operate all of them. Highlights include:

- Cellular: Multi-SIM, Multi-APN, eSIM, VoLTE, SIP Gateway
- Routing: Link prioritization, aggregation and load balancing
- WiFi: WPA3, Fast Roaming (11r), 8 SSIDs, Bridging
- Routing: Mobile-IP, OSPF, BGP, RSTP, VRRP
- VPN: OpenVPN, IPSec, PPTP, GRE
- Firewall: Stateful, connection tracking, NAT, NAPT, masquerade

Customers and Partners can easily extend the functionality via SDK, Scripts and Containers!



Webinterface Simulator

Easily demo the webinterface to customers and partners. Look&Feel at its finest:

simulator.netmodule.com

[Datasheet](#)



Antennas and Accessories

To complement our range of industrial wireless routers, we also supply the antennas to suit your application.

- Antennas with transportation approvals
 - Bus/Tram: E-Mark, R118 Fire Safety
 - Train: EN50155, EN45545 Fire Safety
- MIMO and multi-technology antennas:
 - Cellular: 2G, 3G, 4G (LTE), 5G
 - WiFi: 2.4GHz, 5GHz
 - Positioning: GPS, Galileo, Glonass, BeiDou, active
- Kits, Power Supplies, Connectors, SFPs



[Datasheet](#)

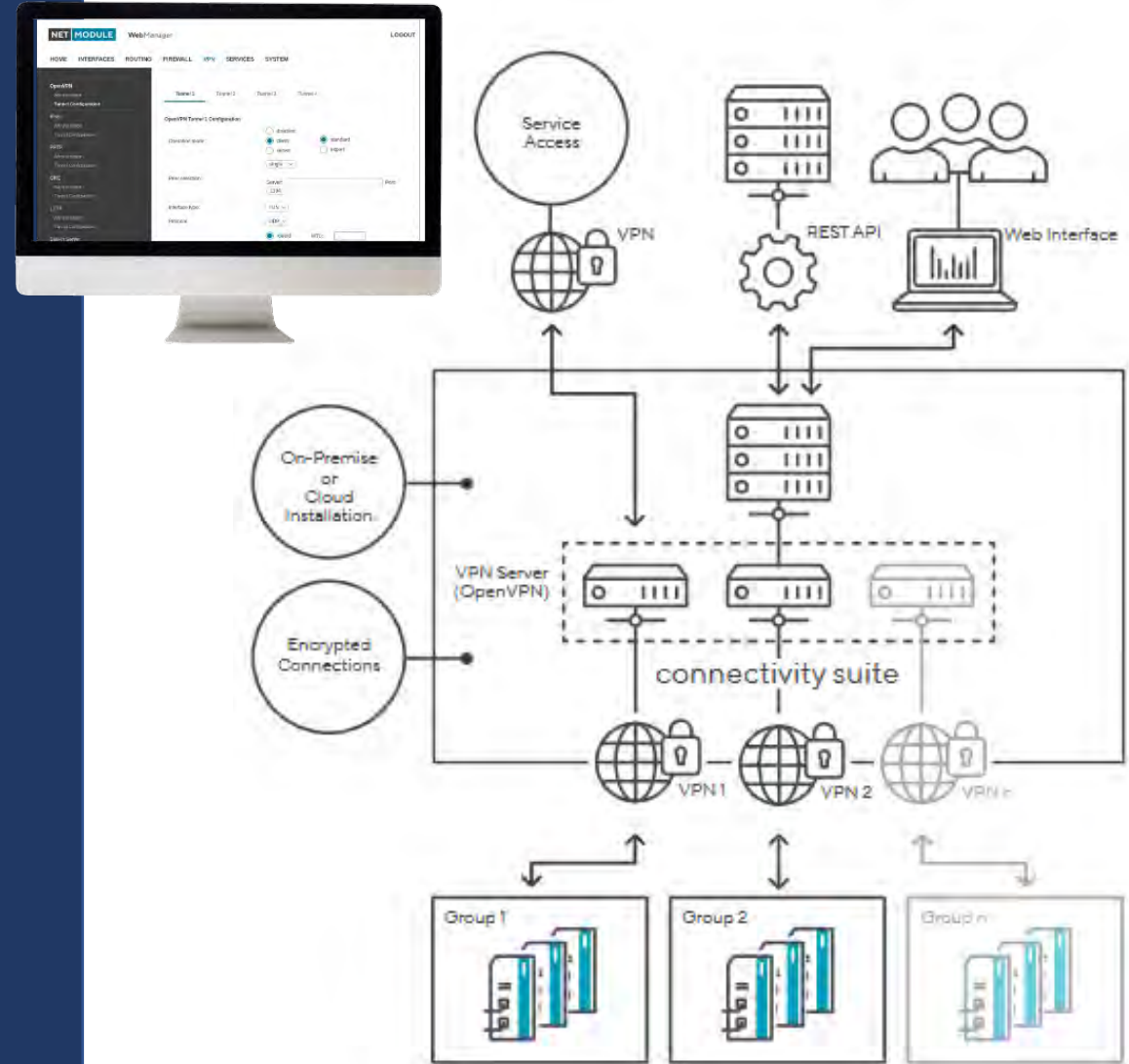


Connectivity Suite

Software solution to manage and monitor the gateways from your control room and connect to all remote networks on demand.

- On-premise or cloud based
- End-to-end security without complexity
- Advanced access control for monitoring and management
- Automated and scheduled firmware and configuration updates
- Easy asset management

[Datasheet](#)





Firewalls & Cybersecurity

Firewalls and Deep Packet Inspection

Unmanaged DIN Rail Mount Switches

MS20, MS30, MSP30, MSP32

RSR20, RSR30

19" Rack Mount Switches

SPIDE
Cost-of-
unmanag
• SPID
• SPID
with
• SPID
• SPID
• SPID
• SPID
• SPID

RS2, F
Feature
switche
port 1v
approv
• RS2
• RS20
• RS30
are Gigabit

EAGLE40-03



- 3x 1 Gig RJ45 (option for one to be SFP)
- Redundant 24 - 48V power, -40°C to +70°C
- Intel Atom E3825 @ 1.33GHz
- HiSecOS with IDS, SPI, and DPI capabilities
- Firewall Learning Mode for rule configuration
- IPSec VPN for secure data encryption
- Dynamic-routing support with OSPF VRRP
- ISA-12.12.-01Class 1 Div. 2 – Haz. Loc, ATEX-95 Category 3G (Zone 2)

Managed DIN Rail Mount Switches

GECK
Lite ma
• GECK

RSB20
Fast Et
with ba
• RSB2

RS20,
Fully co
switche
feature

• RS20
24 or
• RS30
two
• RS40
• RS22
28 ports, four of which are PoE
• RS32 10, 18, or 26 ports, four of which are PoE and two are Gigabit

EAGLE40-07



- 5x 1Gig RJ45 + 2x Gig SFP
- Redundant 24 - 48V power, -40°C to +70°C
- Intel Atom E3950 @ 1.6GHz
- HiSecOS with IDS, SPI, and DPI capabilities
- Firewall Learning Mode for rule configuration
- IPSec VPN for secure data encryption
- Dynamic-routing support with OSPF VRRP
- Added substation approvals EN 61850-3, IEEE 1613

factor pluggable (SFP) ports

IPSE/7, from 8 up to 28 ports
M12 D-code; several options available:
multi- or singlemode fiber ports, Power

which are Gigabit
• MAR1120, up to 20 ports on rear of switch
• MAR1130, up to 24 ports on rear of switch,

• MACH104 – All eligible, 4 RJ45/SFP combi
ports, 16 RJ45 PoE+ ports (optional with
2 XFP 10G uplink ports)

and EESX20 and EESX30
• EES Development Kit

Security, Firewall and VPN Appliance

EAGLE/Tofino Xenon

Network segmentation,
VPN and deep packet
inspection.



- Tofino Xenon: Industrial firewall with Stateful Packet Inspection (SPI) and optional Deep Packet Inspection (DPI) for bridged communication.
- EAGLE20-0400 and EAGLE30-0402: Multi-port Stateful Packet Inspection (SPI) firewalls optional Deep Packet Inspection (DPI) in convection-cooled metal DIN Rail housings which support 6 LAN ports – two of which are Gigabit and two SHDSL ports
- EAGLE One: Industrial firewall providing Stateful Packet Inspection (SPI) for bridged or routed communication combined with a unique Firewall Learning Mode and comprehensive Network Address Translation (NAT) techniques.

Industrial Wireless LAN



BAT Access Points/Clients

- OpenBAT Rugged wireless LAN access point and/or client for use in industrial environments.
- BAT450-F wireless LAN access point
- Wireless Local Area Network (WLAN) Controllers
- BAT-C Wireless LAN Access Client
- Extensive antenna and accessory offering

Serial to Ethernet Media Converters

IOLAN DS/SDS

End devices with a serial interface can be easily and reliably connected to Ethernet networks.



Hardened Fiber Transceivers/Modems

FiberINTERFACES

Extending the reach of copper for serial and fieldbus protocols via fiber.



Industrial-strength Patch Panel

MIPP

- Single Modules:
6 x SC Duplex, 6x LC Duplex, 12x LC Duplex, 4 x RJ45 Keystone Jack unshielded or shielded
- Double Modules:
12 x SC Duplex and 12 x LC Duplex
- Accessories: Pigtails



Secure Remote Access Solution

Secure Remote Access Solution

A simple and secure way to provide remote network access and diagnostics through a three-component system:

- GateManager
- SiteManager
- LinkManager



Network Management Software

Industrial HiVision

Network visualization and configuration software with integrated OPC server.

- Optimized for Hirschmann devices
- Integration of third-party devices
- Enhanced Auto-Topology Discovery
- MultiConfig™ for simultaneous configuration of multiple devices
- Security Status Visualization



Industrial Ethernet Media Cord Sets

Ethernet Cord Sets

- Hardened pre-terminated and factory tested cordsets
- RJ45-RJ45, RJ45-M12, M12-M12
- Unshielded and Shielded Versions
- PVC, TPE and TPE High-Flex Cat 5e UTP
- 17 lengths - from 0.3 to 50 meters
- M12 bulkhead termination also available



Belden IAF-240 | Product Overview

- **Physical Attributes**
 - Ports: 4 x GbE RJ45 ports
 - Dimensions: 48 x 137 x 105 mm (W x H x D)
 - Operating Voltage: Dual 12 - 24 V DC
 - Power Consumption: 2.5 - 12 W
 - Operating Temperature: -40 - +70 °C
 - Protection Class: IP30
 - Housing Material: Aluminum
- **Computing Resources**
 - CPU: NXP i.MX 8M Mini ARMv8 64-bit Cortex-A53 @ 1.6 GHz (quad core)
 - Memory: LPDDR4 4 GB
 - Storage: 64 GB eMMC
- **Industry Approvals**
 - CE, FCC
 - UL 61010
 - ANSI/UL 121201 Class 1 Div. 2 – Haz. Loc, ATEX-114 Category 3G (Zone 2)
- **Software Features – See Previous Slide**



Belden IAF-240 | Product Overview

1

Remote Access

Access your Firewall Web GUI, Console and a number of tools right through the Firewall Management Portal. The Belden Firewall utilizes a reverse connector via a HTTPS connection.

2

Device Management

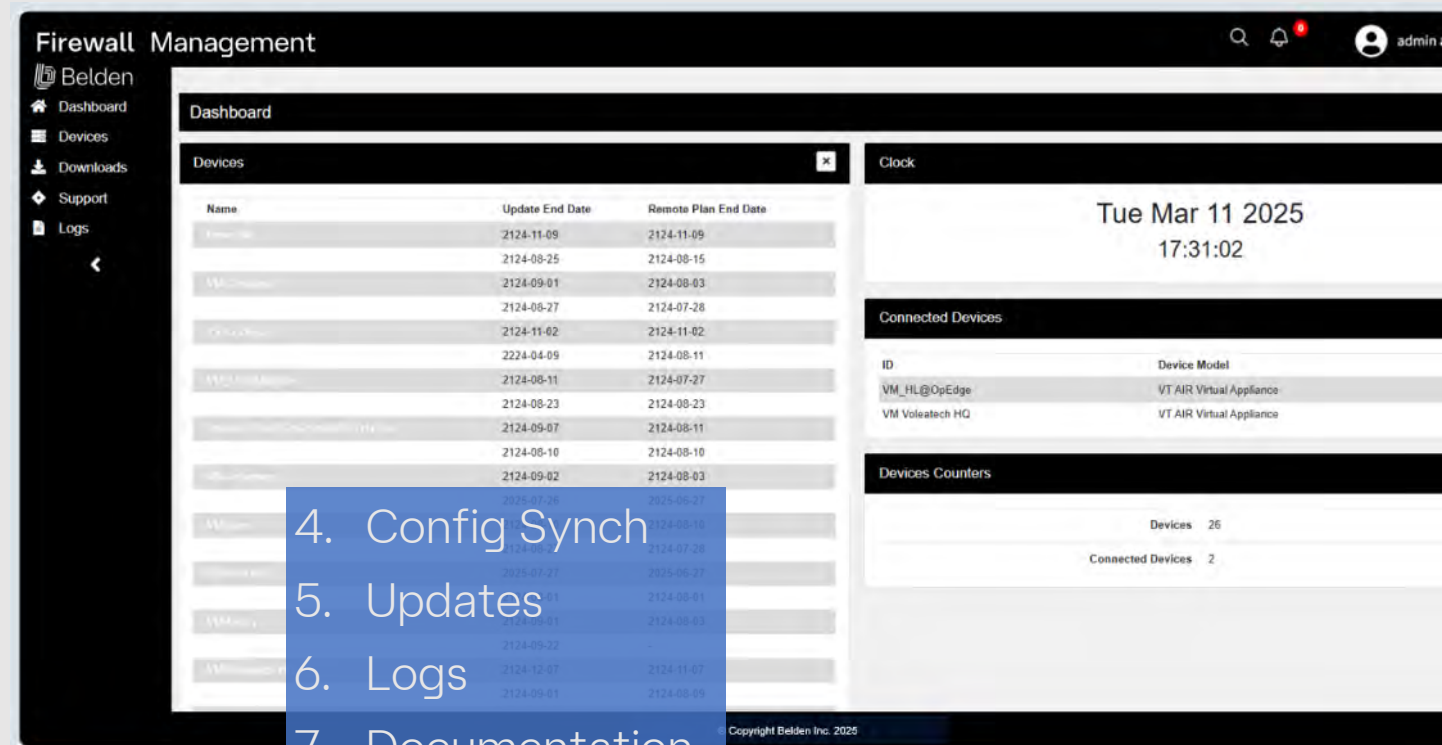
See all your devices in one place. Each Firewall needs to be registered under your account.

Create automated encrypted nightly backups of your device.

3

Configuration Templates

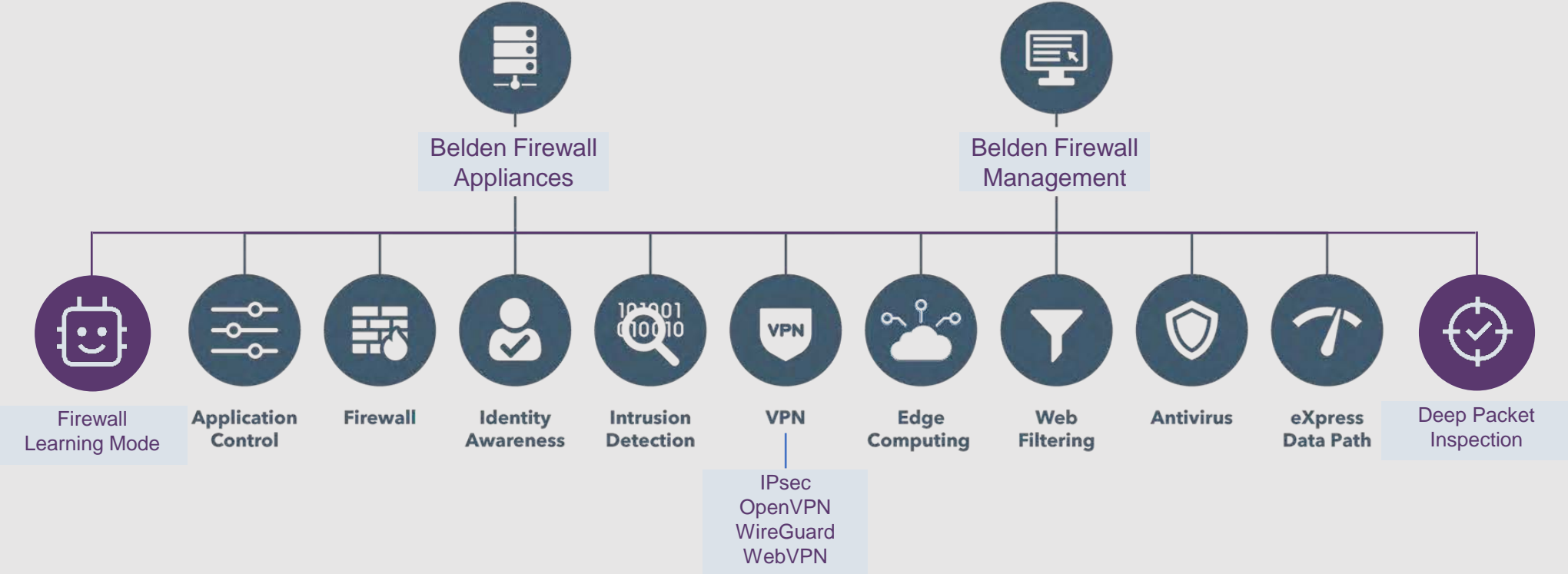
Create Configuration Templates that can be stacked and assigned to Devices or Device Groups. Allows for global settings being deployed to multiple devices and central management.



Belden Firewall Portfolio

Next-Generation Firewalls (3rd Gen)

These are the building blocks (features) of the Belden next-generation firewall (NGFW) product offering (Belden OS)



- New Business- & Licensing Model
 - Subscriptions-based
 - 3 Editions of Next-Gen Firewall Software Stack Licensing

- Edition 1 Firewall | **ESSENTIAL** // comes w/ subscription for 3 years
w/ Firewall, w/ VPN, w/ EDGE, w/ XDP Offloader
w/o Anti-Malware, w/o Web Filtering, w/o High Availability, w/o DPI
w/o WAF, w/ 802.1x Authentication, w/o IDS/IPS, w/o Dynamic Routing

Firewall Management
Software not included

- Edition 2 Firewall | **ADVANCED** // comes w/ subscription for 3 years
w/ Firewall, w/ VPN, w/ EDGE, w/ XDP Offloader
w/ Anti-Malware, w/ Web Filtering, w/ High Availability, w/ DPI
w/o WAF, w/ 802.1x Authentication, w/o IDS/IPS, w/o Dynamic Routing

Firewall Management
Software not included

- Edition 3 Firewall | **PRO** // comes w/ subscription for 3 years
w/ Firewall, w/ VPN, w/ EDGE, w/ XDP Offloader
w/ Anti-Malware, w/ Web Filtering, w/ High Availability, w/ DPI
w/ WAF, w/ 802.1x Authentication, w/ IDS/IPS (ET Open), w/ Dynamic Routing (OSPF, BGP)

Firewall Management
Software not included

Onboard Rail Firewalling & IDS

- **Ethernet Ports** – 6 x 2.5-Gigabit Ethernet X-coded M12
- **CPU** – Intel® Core™ Apollo Lake-I x7-E3950 @ 1.6 GHz
- **Memory** – 8GB DDR3
- **Storage** – 64GB SSD
- **Operating Temperature** – -40°C to +70°C
- **Railway Certifications** – EN 50155, EN 50121-4, EN 45545, EMV06 ("DB - Deutsche Bahn")
- **Safety Certifications** – IEC 62368-2, UL 61010, EN 61131



“The EAGLE40-6M is a next-generation firewall designed for railway rolling stock that provides real-time traffic monitoring and deep packet inspection with vertical-specific certifications.”

Onboard Rail Firewalling & IDS



SECURITY

Firewall Learning Mode (FLM)

- Software function that automatically creates filtering rules based on monitoring network traffic

Industrial Deep Package Inspection (DPI)

- Protocol-specific enforcer modules (Modbus TCP, OPC, EtherNet/IP, DNP3, IEC104, and AMP) that analyze each packet's data payload in detail (industrial protocol layers, including commands, services, objects, function codes, and process values) instead of focusing only on the packet header to discover and block cyber threats

MANAGEMENT

Static Multicast Routing

- The ability to route multicast traffic that is manually configured and limited to designated receivers, which can help conserve network bandwidth

VLAN Routing

- The ability to enable communication between different virtual local area networks (VLANs) within a network, which is facilitated using the Open Shortest Path First (OSPF) routing protocol

Virtual Router Redundancy Protocol (VRRP)

- This function establishes redundancy in a network through the creation of a virtual router that can act as a backup if the primary router fails

Support for Intrusion Detection Systems (IDS)

- An integrated Docker runtime enables the deployment of a sensor/probe for a rolling stock security platform, which enables asset management and threat detection capabilities on the firewall



Network Access Control (NAC)

Zero Trust Network Access Control (NAC) cybersecurity software

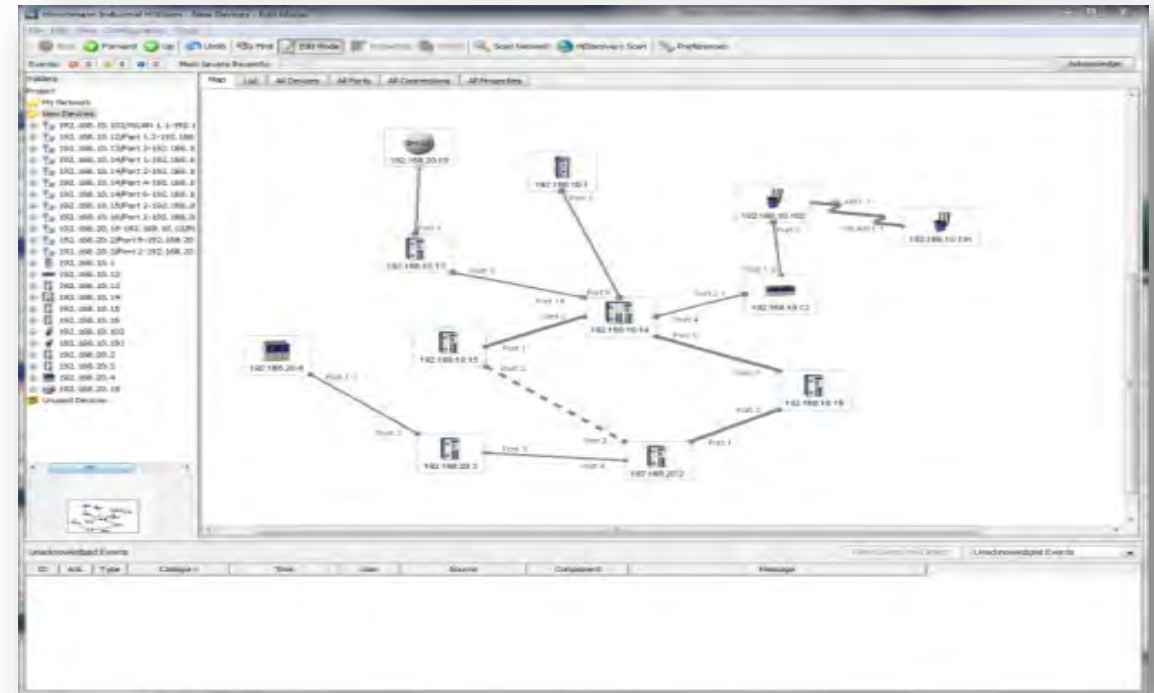
- Network asset discovery/inventory, graphical reporting, topology
- Provides full vendor-agnostic control over all network devices for segmentation and isolation of unidentified connections or compromised systems (disable port, assign to Guest VLAN, etc.)
- Third-party integrations using the open REST API for Asset Management, CMDB and other solutions



Network Management Software/Solutions (NMS)

Industrial HiVision NMS

- SNMP-based graphical NMS
- Topology discovery “draws” network
- Traps provide push alarms to NMS
- Rapid deployment with multi-device configuration
- Event log and handling
- Asset management
- EtherNet/IP aware, aids discovery
- Client / Server
- Integrated OPC server
- Flexible node-based licensing



Industrial HiVision NMS

The screenshot displays the Industrial HiVision NMS software interface. The main window shows a network map of an industrial site with various areas labeled: Camp Area 1, Camp Area 2, Explosives Magazine, Tailing dam, Auxiliary Area, Processing Area, and Crushing station. The map includes a satellite-style background and network connections between devices. A left sidebar lists 'New Devices' with their IP addresses and port configurations. The top menu bar includes 'File', 'Edit', 'View', 'Configuration', and 'Tools'. The bottom status bar shows 'Unacknowledged Events' and a table with columns for ID, Ack., Type, Category, Time, User, Source, Component, and Message.

Unacknowledged Events

ID	Ack.	Type	Category	Time	User	Source	Component	Message
----	------	------	----------	------	------	--------	-----------	---------

Industrial HiVision NMS

The screenshot displays the HiVision NMS interface. The main window shows a topographic map of an industrial site with several key areas labeled: Camp Area 1, Camp Area 2, Explosives Magazine, Tailing dam, Auxiliary Area, Crushing station, and Processing Area. A network topology is overlaid on the map, showing various ports and IP addresses (e.g., 192.168.10.19, 192.168.10.12, 192.168.10.10, 192.168.10.15, 192.168.10.14, 192.168.10.11, 192.168.10.13, 192.168.10.16, 192.168.10.17, 192.168.10.18, 192.168.10.19, 192.168.10.20, 192.168.10.21, 192.168.10.22, 192.168.10.23, 192.168.10.24, 192.168.10.25). A red dashed line highlights a specific path or connection in the network.

At the bottom of the interface, there is an 'Unacknowledged Events' table with the following data:

ID	Act.	Type	Category	Time	User	Source	Component	Message
2021		SNMP Trap		4/2/12 2:09:16 PM	SVEN_B54208	192.168.20.2	Port 1Link	Link is Down
2020		Status Warning		4/2/12 2:09:16 PM	SVEN_B54208	192.168.20.2	Port 2Link	Status Equipment Error (Link-Down)
2019		SNMP Trap		4/2/12 2:09:16 PM	SVEN_B54208	192.168.20.2	Port 1Link	Link is Down
2018		Status Warning		4/2/12 2:09:16 PM	SVEN_B54208	192.168.10.18	Port 2Link	Status Equipment Error (Link-Down)
2017		SNMP Trap		4/2/12 2:09:16 PM	SVEN_B54208	192.168.10.16	Port 2Link	Link is Down
2016		SNMP Trap		4/2/12 2:09:16 PM	SVEN_B54208	192.168.20.2	Redundancy Manager	HSPER-Ring Status Changed
2015		SNMP Trap		4/2/12 2:09:16 PM	SVEN_B54208	192.168.20.2	Redundancy Manager	HSPER-Ring Status Changed

Industrial HiVision NMS

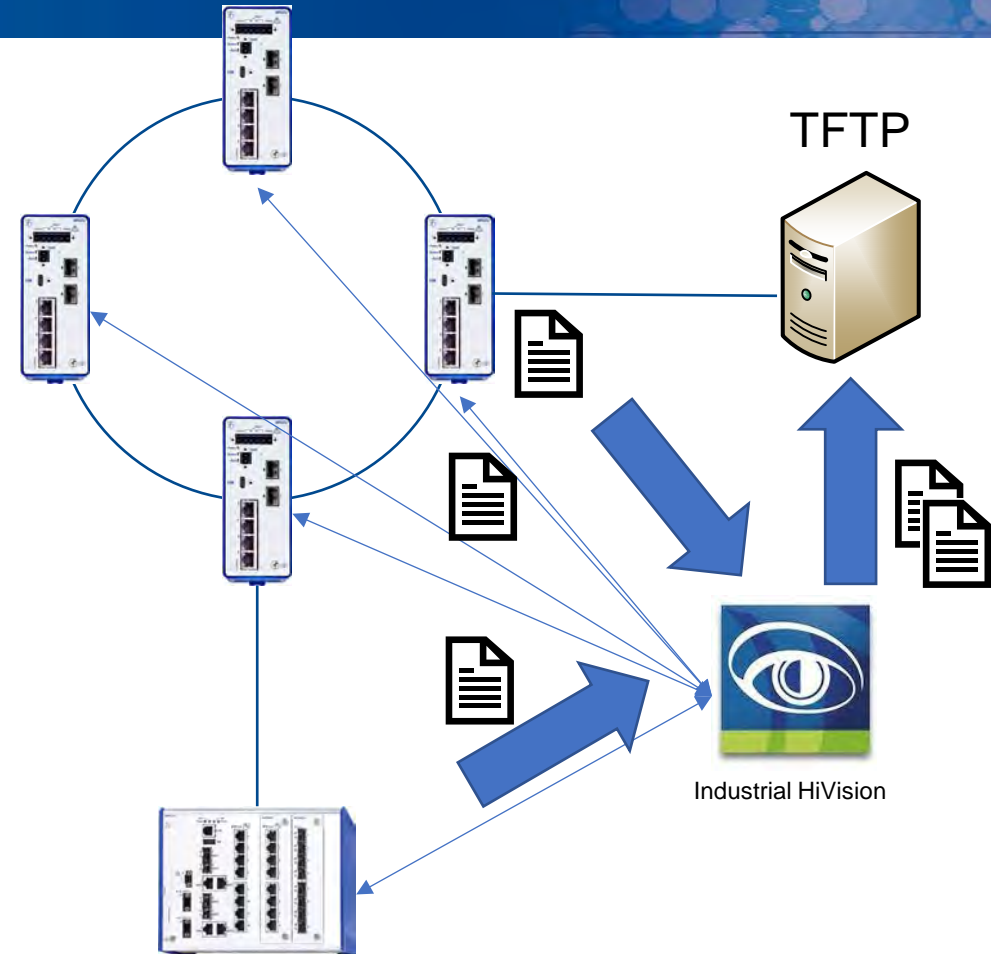
The screenshot displays the HiVision NMS interface in 'Edit Mode'. The main window shows a topographic map of an industrial site with several key areas labeled: 'Camp Area 1', 'Camp Area 2', 'Explosives Magazine', 'Crushing station', 'Processing Area', 'Auxiliary Area', and 'Tailing dam'. A network topology is overlaid on the map, with nodes representing devices and lines representing connections. Specific IP addresses are visible on the map, such as 192.168.10.19, 192.168.10.13, 192.168.10.12, 192.168.10.14, 192.168.10.15, 192.168.10.16, 192.168.10.10, 192.168.10.11, 192.168.10.12, 192.168.10.13, 192.168.10.14, 192.168.10.15, 192.168.10.16, 192.168.20.2, 192.168.20.3, 192.168.20.4, 192.168.20.5, 192.168.20.6, 192.168.20.7, 192.168.20.8, 192.168.20.9, 192.168.20.10, 192.168.20.11, 192.168.20.12, 192.168.20.13, 192.168.20.14, 192.168.20.15, 192.168.20.16, 192.168.20.17, 192.168.20.18, 192.168.20.19, 192.168.20.20, 192.168.20.21, 192.168.20.22, 192.168.20.23, 192.168.20.24, 192.168.20.25, 192.168.20.26, 192.168.20.27, 192.168.20.28, 192.168.20.29, 192.168.20.30, 192.168.20.31, 192.168.20.32, 192.168.20.33, 192.168.20.34, 192.168.20.35, 192.168.20.36, 192.168.20.37, 192.168.20.38, 192.168.20.39, 192.168.20.40, 192.168.20.41, 192.168.20.42, 192.168.20.43, 192.168.20.44, 192.168.20.45, 192.168.20.46, 192.168.20.47, 192.168.20.48, 192.168.20.49, 192.168.20.50.

The left-hand pane shows a tree view of 'New Devices' with a list of IP addresses and their corresponding ports. The bottom pane displays a table of 'Unacknowledged Events'.

ID	Ack.	Type	Category	Time	User	Source	Component	Message
2036	<input type="checkbox"/>	SNMP Trap		4/2/12 2:39:13 PM	SVEN_B64208	192.168.20.2	Redundancy Manager	HPER-Ring Status Changed
2035	<input type="checkbox"/>	SNMP Trap		4/2/12 2:39:13 PM	SVEN_B64208	192.168.20.2	Redundancy Manager	HPER-Ring Status Changed
2034	<input type="checkbox"/>	SNMP Trap		4/2/12 2:39:13 PM	SVEN_B64208	192.168.20.2	Port 1Link	Link is Up
2033	<input type="checkbox"/>	Status Better		4/2/12 2:39:13 PM	SVEN_B64208	192.168.20.2	Port 1Link	Status Improvement: OK (Link-Up)
2032	<input type="checkbox"/>	SNMP Trap		4/2/12 2:39:13 PM	SVEN_B64208	192.168.20.2	Port 1Link	Link is Up
2031	<input type="checkbox"/>	Status Better		4/2/12 2:39:13 PM	SVEN_B64208	192.168.10.16	Port 2Link	Status Improvement: OK (Link-Up)
2030	<input type="checkbox"/>	SNMP Trap		4/2/12 2:39:13 PM	SVEN_B64208	192.168.10.16	Port 2Link	Link is Up
2029	<input type="checkbox"/>	Status Worse		4/2/12 2:09:40 PM	SVEN_B64208	192.168.10.16	Port 2Link	Status Improvement: Error (Link-Down)

Zero Touch Device Replacement (1/3)

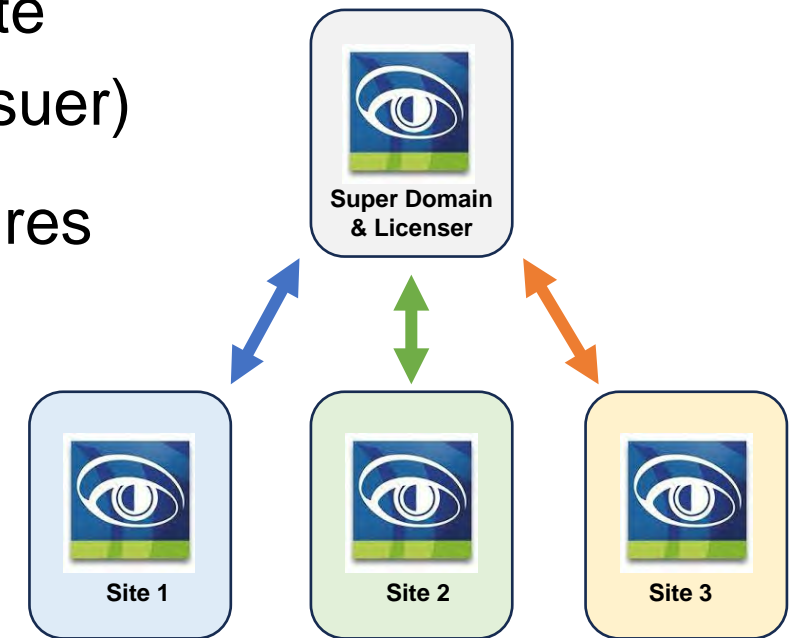
1. Collect configurations from devices
2. Save configurations to TFTP server
3. Configure “DHCP server per port” on all capable Hirschmann devices
4. Configure switches to send configuration changes to TFTP server
5. Replace device 1:1
6. Neighbor device tells new device where to find the configuration
7. New device retrieves configuration from TFTP



Topology Concepts to Consider

Hierarchical topology and management

- Remote sites have own installation, monitored at site and in NOC (which is Super Domain and license issuer)
- Licensing option to have NOC lease licenses (requires VPN/similar, max 48 hr link loss)
- Licensing model
 - Perpetual, binary (32, 64, 128, ...)
 - 16 nodes – free (stand-alone use)
 - 32, 64, etc. – paid-for perpetual license





Industrial Connectivity and Ethernet-based Active I/O

History of Connectivity (+IO Modules) Innovation



1967
First valve connector worldwide invented

1989
Worldwide first passive IP67 distribution box

1998
M8 Quick connection technology „MiniQuick“

2003
M12 Ethernet connector

2021
Industry 4.0 ready with e.g. OPC UA (LioN-X)

2023
M8 Single Pair Ethernet

1981
M12 connector „The Lumberg Connector“

1990
First IP67 fieldbus module

2000
Modular IP67 fieldbus station

2005
Ethernet fiberoptic connector for the industry micro FX

2016
Industry's first universal I/O Lion-P

2024
M12 Push Pull – 70% faster installation
CLICK!



State of the Art Connectivity Solutions for Industrial Applications



Experience the power of Industry 4.0 with the industries most popular connectivity solutions from:



and



available in space-saving designs for various applications and offer technical expertise for each environment.



Power



Valve



Sensor/
Actuator



Data



State of the Art Connectivity Solutions for Industrial Applications



Power



 **HIRSCHMANN**
A BELDEN BRAND

Valve



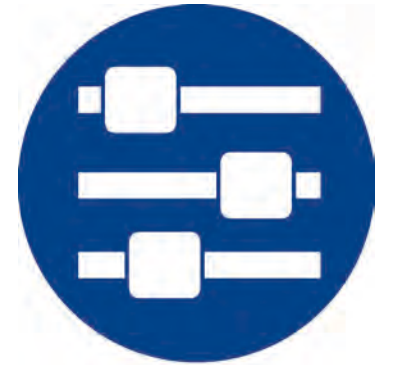
 **HIRSCHMANN**
A BELDEN BRAND

Sensor/Actuator

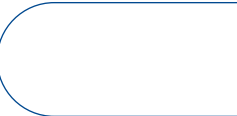


 **lumbergautomation**
A BELDEN BRAND

Data



 **lumbergautomation**
A BELDEN BRAND



State of the Art Connectivity Solutions for Industrial Applications



Power Connectors



Broad variety of power supply connectors for:

- Machine Building
- Mobile machinery
- Logistics
- Smart Building



Valve Connectors



Valve connectors for hydraulic, pneumatic and electro-magnetic actuators & sensors:

- Mobile Equipment
- Machine Building
- Transportation



Sensor/Actuator Connectors



The industry proven standard to connect sensors and actuators:

- Automotive
- Machine Building
- Food & Beverage
- Material Handling

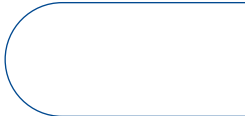


Data Connectors



Reliable communication between I/O modules and sensors & actuators:

- Automotive
- Machine Building
- Food & Beverage



State of the Art Connectivity Solutions for Industrial Applications



Power Connectors



Broad variety of power supply connectors:

- M12 Power
- G/GO Series
- CA/CM Series
- 7/8" Series
- ST Series
- M23 Series
- Mini Power



Valve Connectors



Valve connectors for hydraulic, pneumatic and electro-magnetic actuators & sensors:

- Type A
- Type B
- Type C
- Accessories



Sensor/Actuator Connectors



The industry proven standard to connect sensors and actuators:

- M8 Series
- M12 Series
- M8 5 pole B-coded
- WashDown Series
- T-Splitters & Adapters



Data Connectors



Reliable communication between I/O modules and sensors & actuators:

- Fieldbus Connectors
- Fast Ethernet Connectors
- Gigabit Ethernet Connectors
- Hybrid Connectors
- Data Connectors for Railway Applications



LioN-X Digital I/O Modules



LioN-X Digital 8DI/8DO without galvanic isolation



Scheduled Release: February 2023

Key Features:

- Output current up to 2A per port
- Better product availability than LioN-P

Supported Protocols:



LioN-X Digital 16DI/16DIO

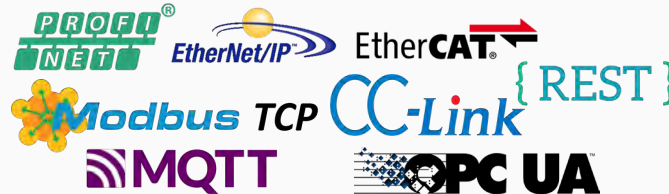


Scheduled Release: March 2023

Key Features:

- Output current up to 2A per port
- Multiprotocol capable
- Embedded IODDinterpreter for future LioN Management Suite (LMS) support

Supported Protocols:



LioN-X Digital 8DI/8DO with galvanic isolation



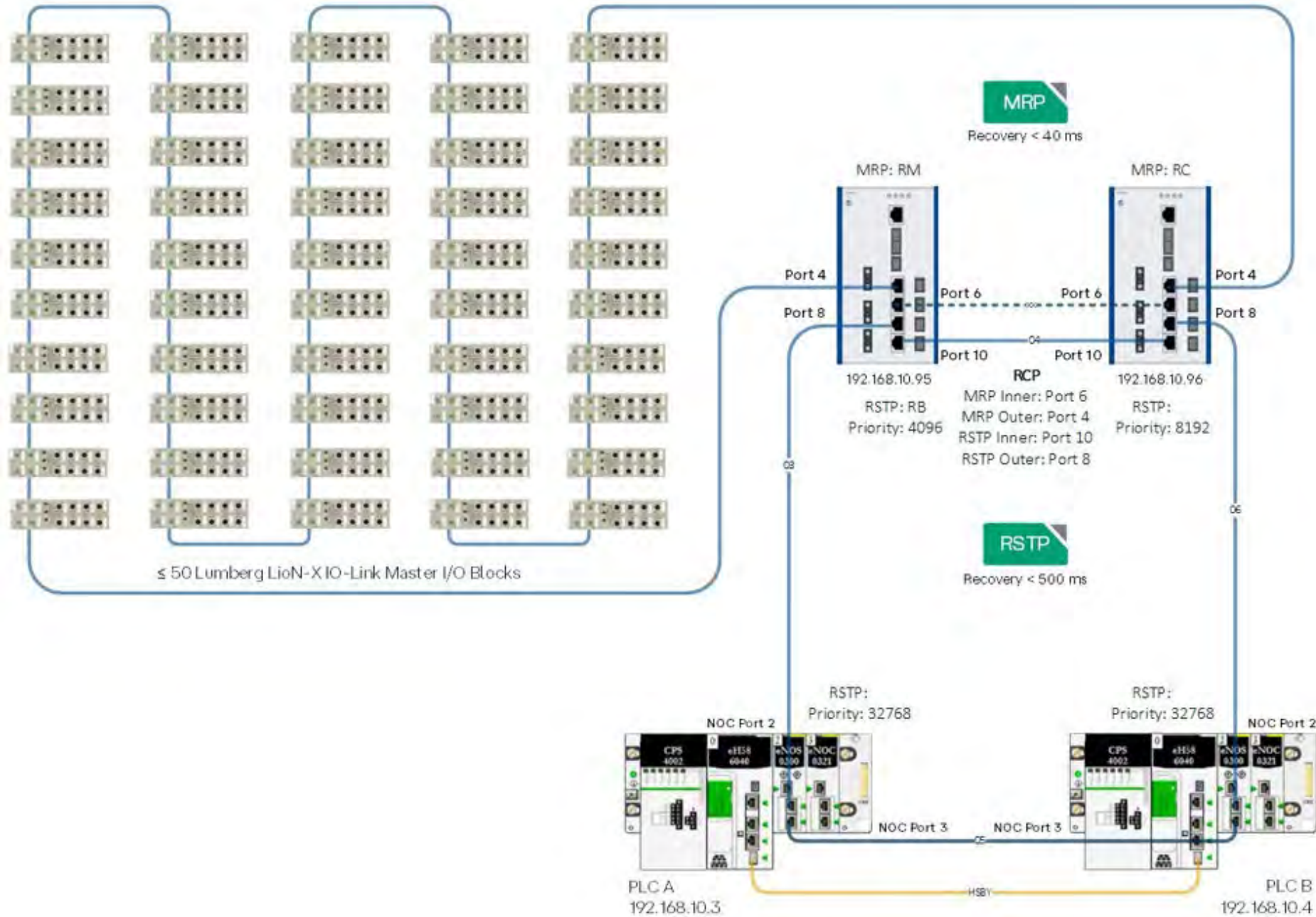
Scheduled Release: May 2023

Key Features:

- Output current up to 2A per port
- 8DI/8DO with galvanic isolation

Supported Protocols:







LioN-Safety IO PROFI-safe



Scheduled Release: December 2023

Key Features:

- Made for harsh environments (-40°C to +70°C and IP67/IP69K)
- Depending on Variant with 8 Safe ports or 6 Safe Ports + 2 IO-Link Master Ports (Class A)

Certifications:



LioN-Safety IO CIP Safety



Scheduled Release: Mid of 2024

Key Features:

- Made for harsh environments (-40°C...+70°C and IP67/IP69K)
- Depending on Variant with 8 Safe ports or 6 Safe Ports + 2 IO-Link Master Ports (Class A)

Certifications:





LioN-H (Prototype)



Concept Study

Description:

2-port SPE IO-Link Master (10BASE-T1L) with M12-L coded connectors.

Supported Protocols (currently):



LioN-X https



Scheduled Release: September 2023

Description:

LioN-X with additional https security. Based on a request by GM.



Supported Protocols (currently):



Redesign of the IO Link Hubs



Work in Progress

Analog Converter



Work in Progress

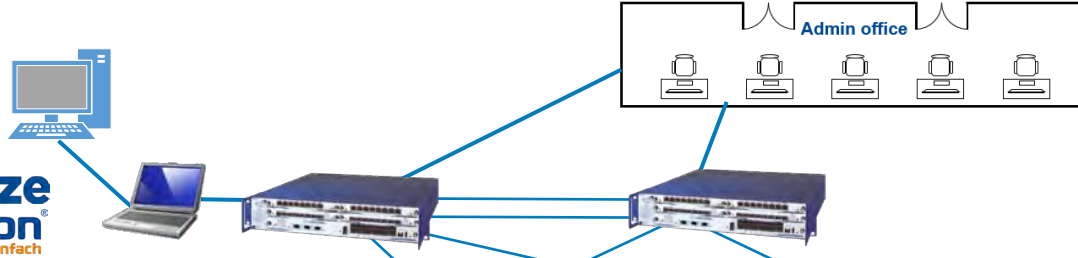


Typical Manufacturing Footprint

Onsite Backbone Network

Solution Elements

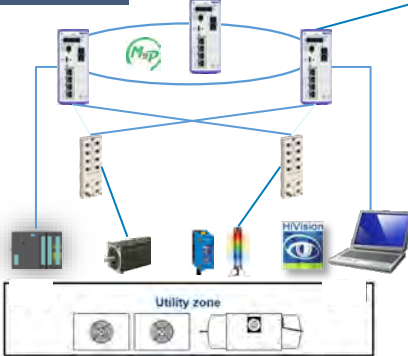
IT / OT Connection



OT Connection

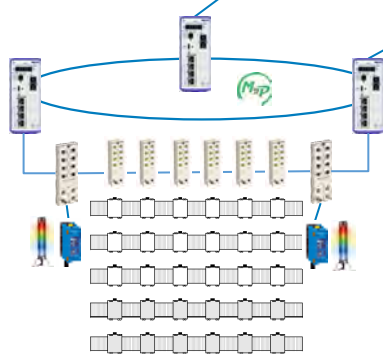


Sensor Data



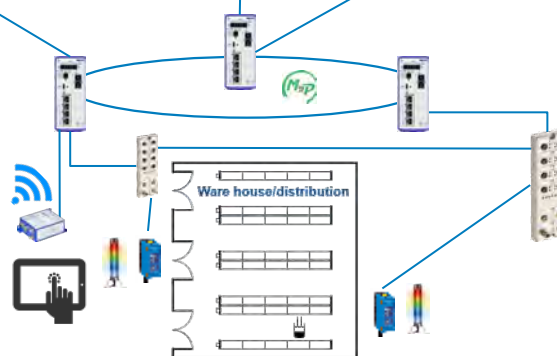
1 x Common Area	4 - 6 Sensor / Asset
30 - 40 asset	2 - 5 PLCs

Utility Zone



4 - 6 Prod. lines	4 - 6 sensor / asset
6 - 8 Asset / Line	1 PLC / Asset

Production Lines



1 x Common Area	2 - 3 Assets / Line
4 - 6 Storage Lines	4 - 6 sensor / asset

Warehouse / Distribution

Plant Floor and Assets

Remote management and data solutions



Onsite Backbone Network

Data Orchestration & Mgmt.

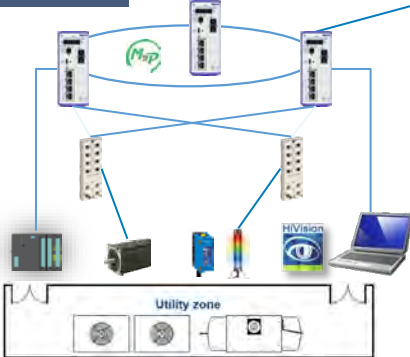
Solution Elements

IT / OT Connection



OT Connection

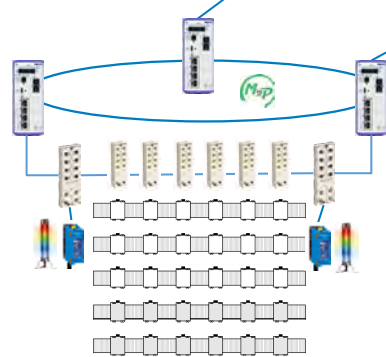
Sensor Data



1 x Common Area
30 - 40 asset

4 - 6 Sensor / Asset
2 - 5 PLCs

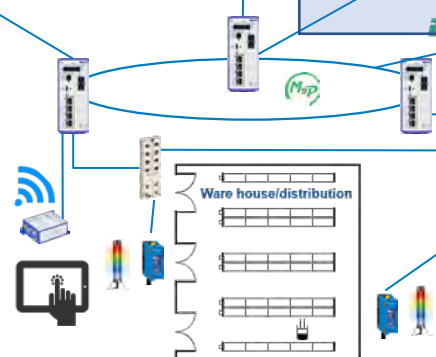
Utility Zone



4 - 6 Prod. lines
6 - 8 Asset / Line

4 - 6 sensor / asset
1 PLC / Asset

Production Lines

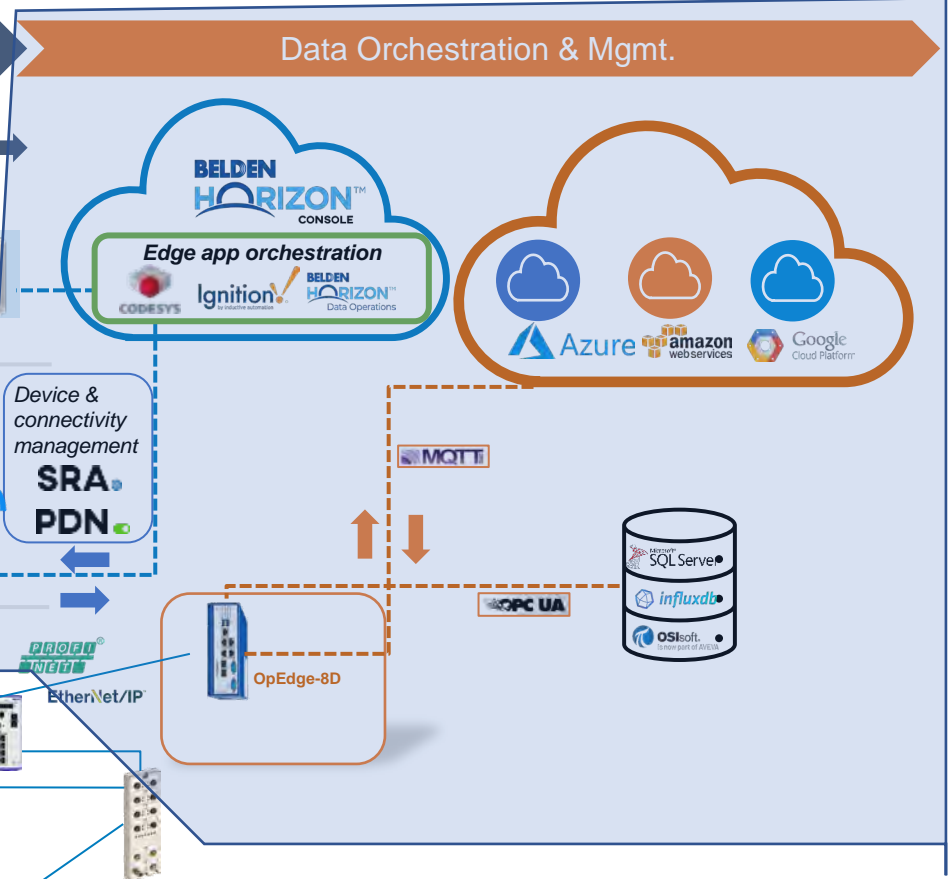


1 x Common Area
4 - 6 Storage Lines

2 - 3 Assets / Line
4 - 6 sensor / asset

Warehouse / Distribution

Plant Floor and Assets



Remote management and data solutions

Onsite Backbone Network

Data Orchestration & Mgmt.

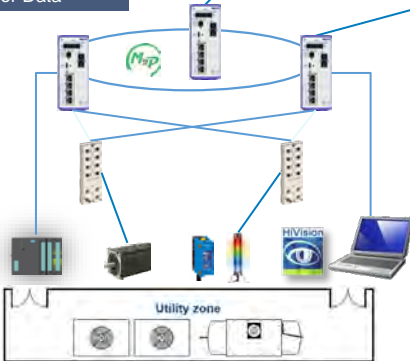
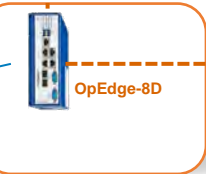
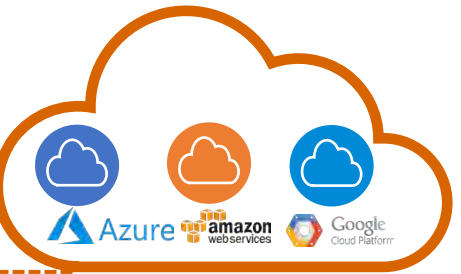
Solution Elements

IT / OT Connection



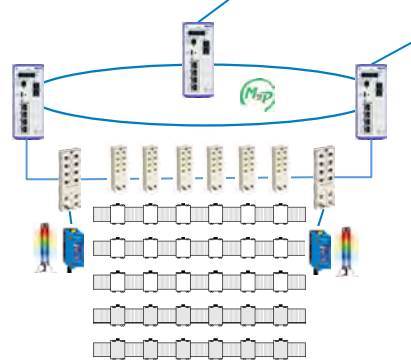
OT Connection

Sensor Data



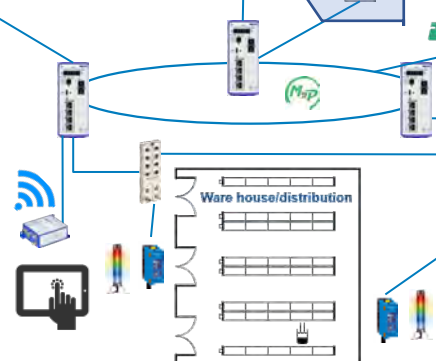
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2 - 5 PLCs

Utility Zone



4 - 6 Prod. lines
6 - 8 Asset / Line
4 - 6 sensor / asset
1 PLC / Asset

Production Lines



1 x Common Area
4 - 6 Storage Lines
2 - 3 Assets / Line
4 - 6 sensor / asset

Warehouse / Distribution

Plant Floor and Assets



Overview of ProSoft Technology

- Providing high-quality industrial connectivity and communication products since 1988
 - Acquired by Belden in 2014
- Partners with Rockwell Automation®, Schneider Electric®, and major industrial automation associations
- Global organization with broad industry experience and deep domain knowledge in key industries
- Your first step to IIoT connectivity starts with ProSoft!



ProSoft Product Families

In-Chassis PLC Modules

- 62% of Revenue
- Exclusive to RA or Schneider Channels



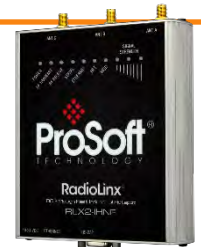
Industrial Protocol Gateways

- 26% of Revenue
- 5-10% SOM / 15%+ Growth



Wireless LAN

- 10% of Revenue
- Focused on Mobile Automation / AGV Applications



Remote Connectivity

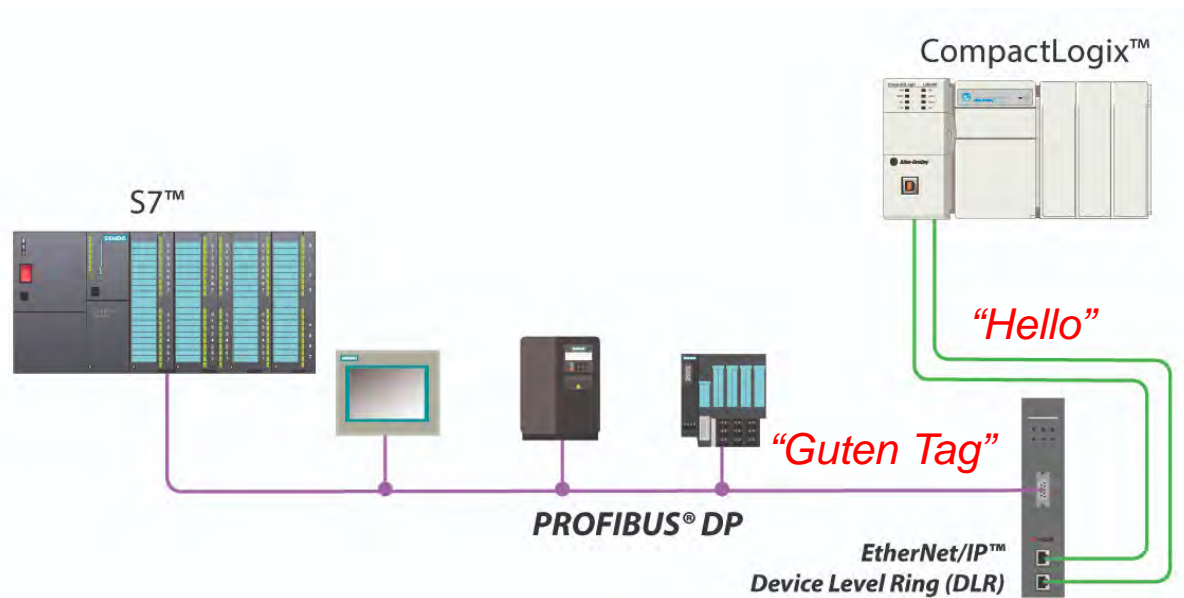
- ~2% Revenue
- 20%+ Growth



Industrial Protocol Gateways & In-Chassis Modules

Customer Problem: Connect critical real-time data between dissimilar control equipment

Competition: HMS, Moxa, Advantech, Red Lion, others



Belden Advantage:

- Superior tech support reduces engineering cost & risk
- 160+ protocol combinations to connect almost anything



MVI56E & 69E



PLX51



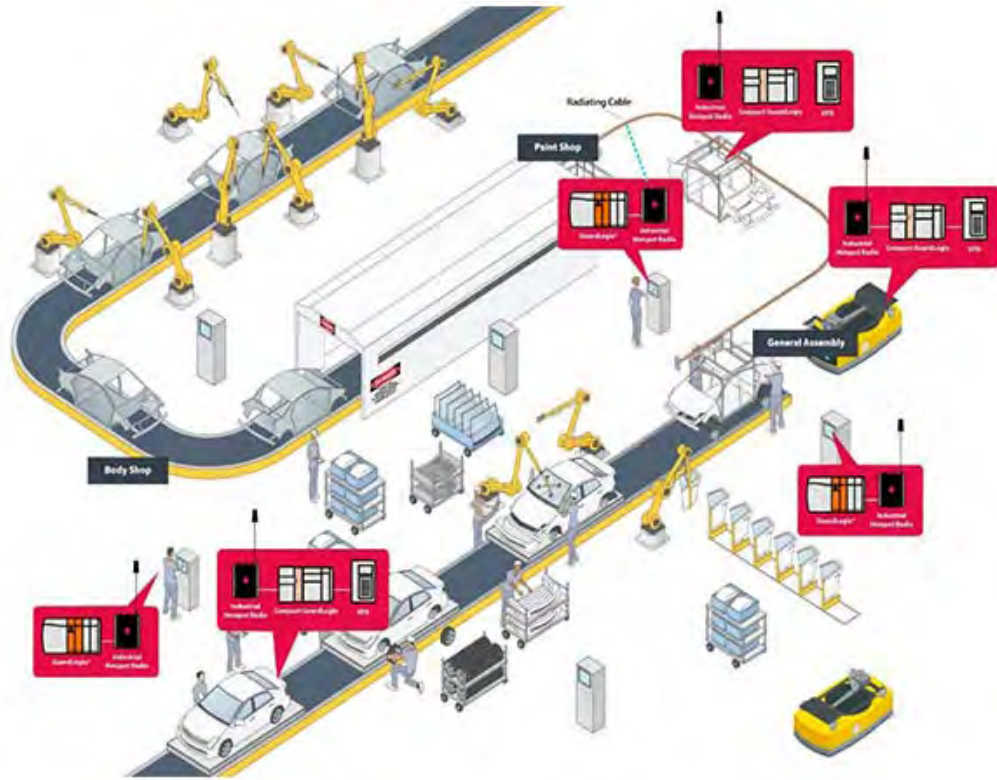
PLX30



PLX80

High Performance Wireless LAN for Industrial

Customer Problem: Achieve high uptime and operational flexibility for conveyance systems in automotive manufacturing



Competition: Siemens, FluidMesh (Cisco), Moxa, HMS, Phoenix Contact, and others

Belden Advantage:

- Hitless roaming enables reliable I/O communication (including ProfiSAFE and CIP Safety)
- Single channel operation more acceptable to IT departments
- Wireless solutions services for antenna, cable, and application integration support



Radiating Cable

RLX2

Antennas

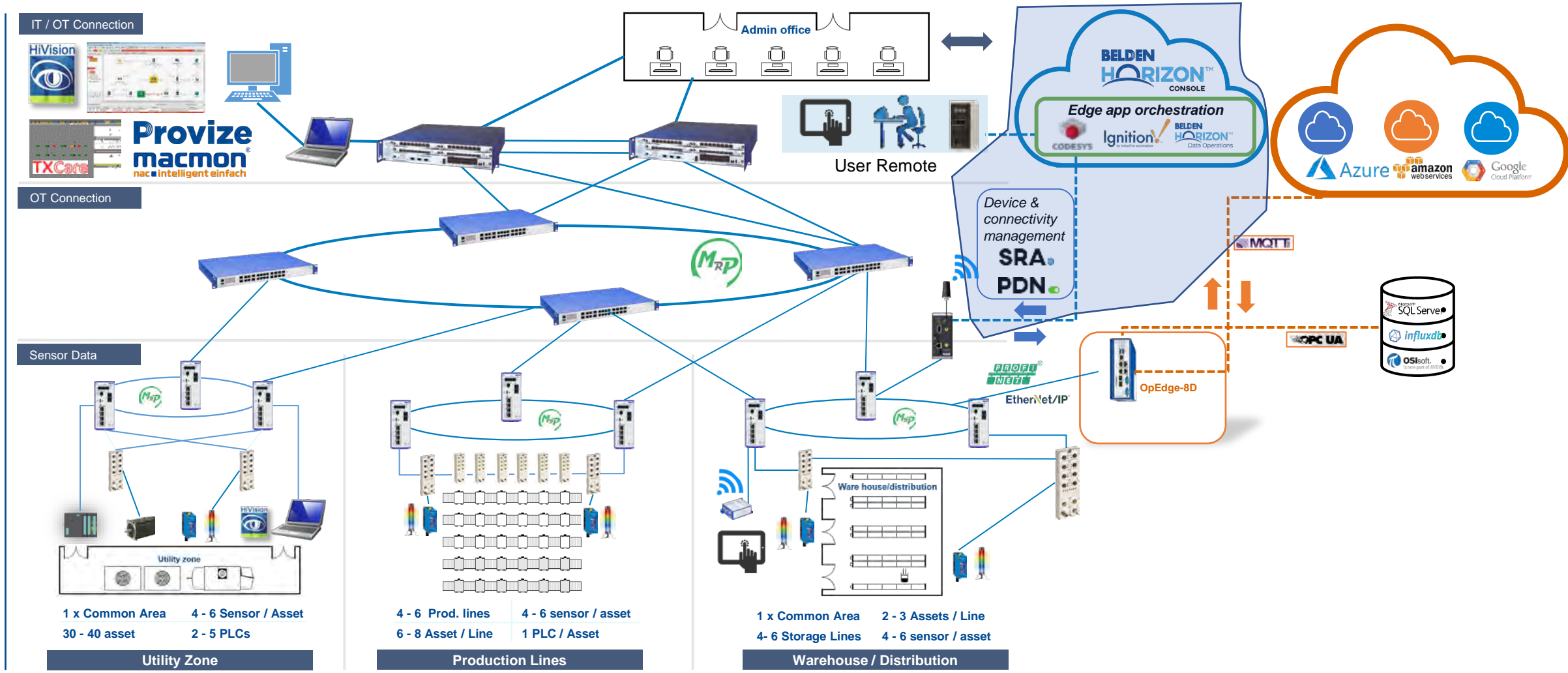
Remote management and data solutions



Onsite Backbone Network

Data Orchestration & Mgmt.

Solution Elements



Plant Floor and Assets

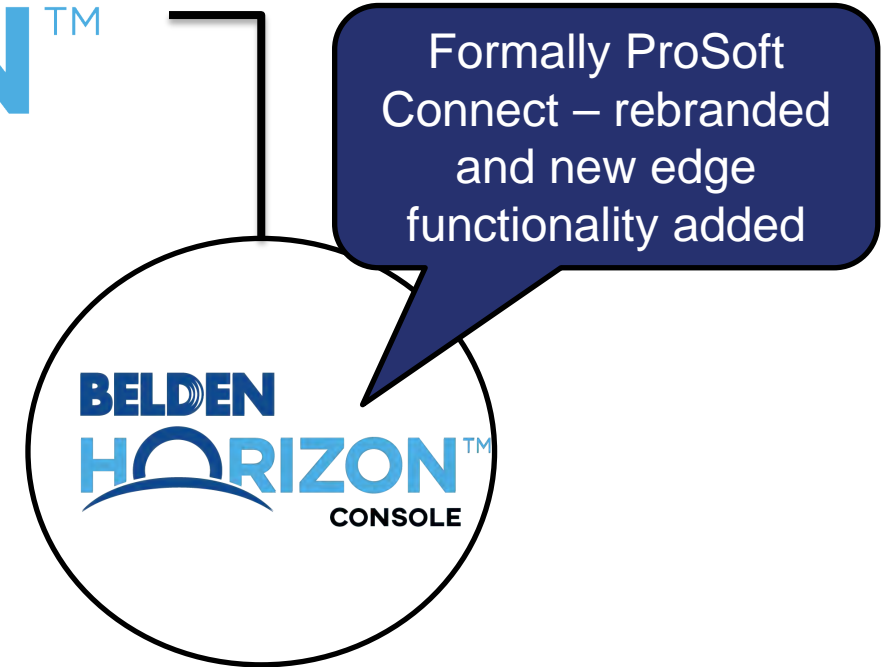
Belden Horizon™ Portfolio



*Global brand describing
Belden-branded software*

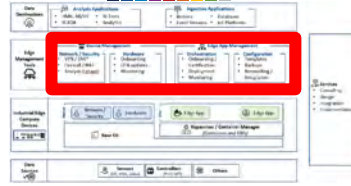


Software deployed via containers and/or virtual machines that, in the case of the former, may be hosted within the application repository in the Belden Horizon Console, but no further integration with the platform is performed



The user interface through which services are deployed that are either native to or integrated with the Belden Horizon platform

Belden Horizon Overview



- Core platform on top of which new services are developed
- Core platform services include AAA, persistence, common UI / UX framework, microservice architecture, etc.

Services built on top of the Belden Horizon Console



View, configure, and update all the nodes in a network



Onboard, deploy, and manage edge applications across fleet of devices



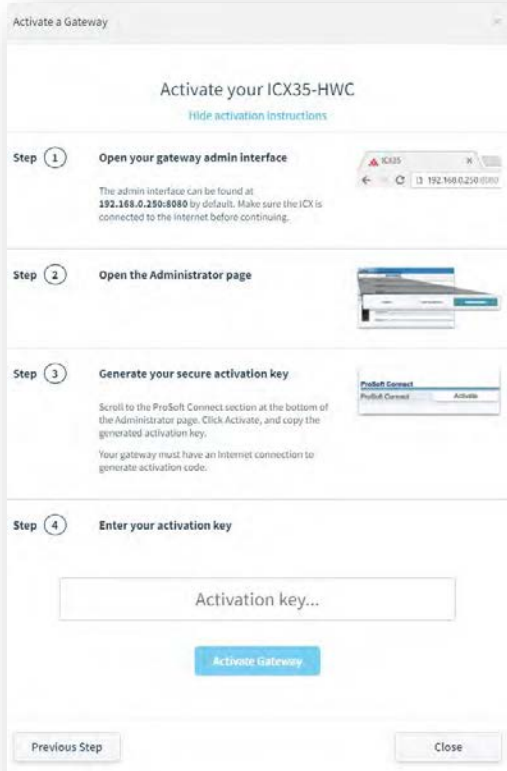
Securely access remote assets on OT networks on-demand

Future services...

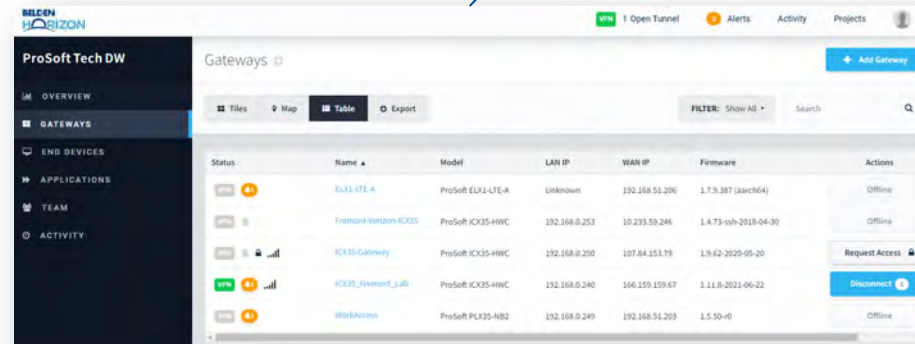


Securely access remote assets on OT networks permanently

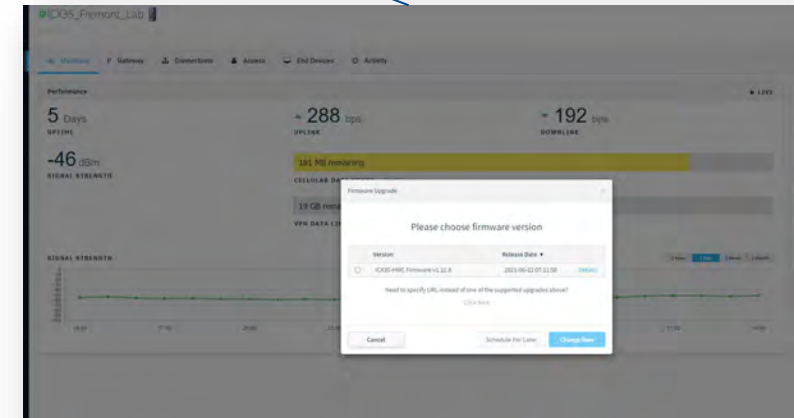
Device onboarding, monitoring, and OTA updates



Device onboarding



Device monitoring

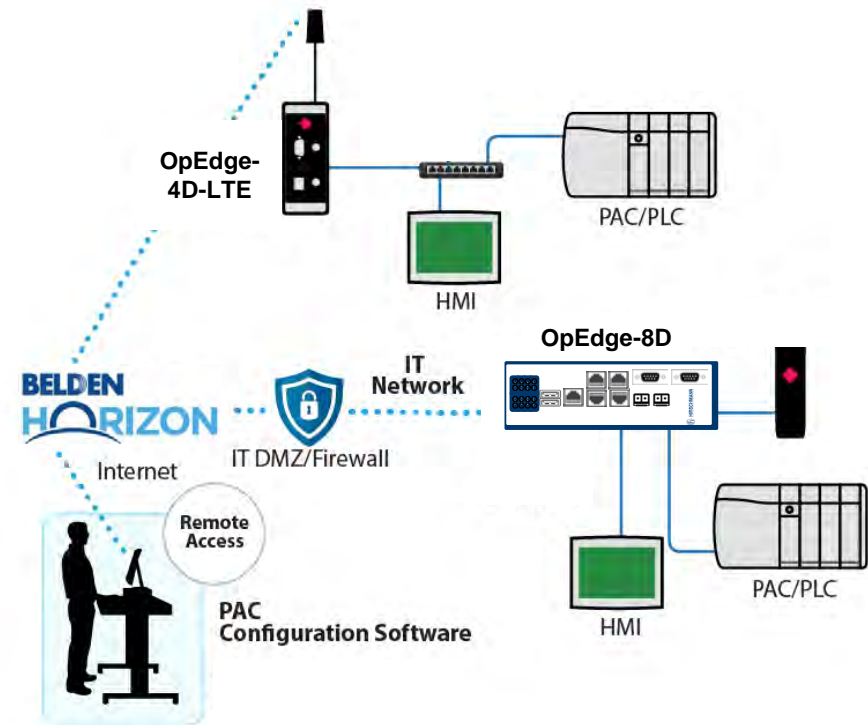
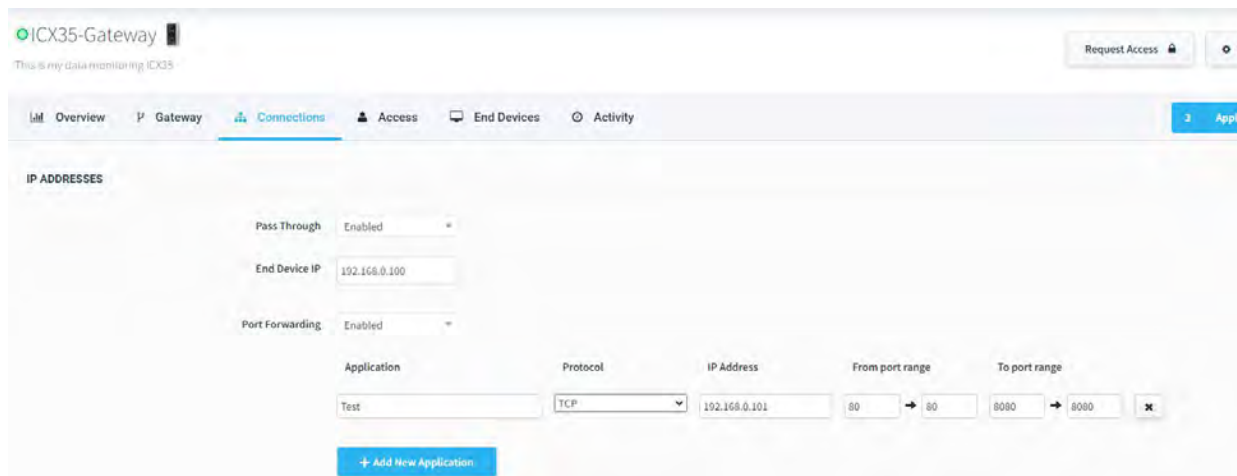


OTA device updates

Secure Remote Access (SRA) to PLCs and end devices



- Secure remote access (SRA) enables users to access end devices connected to gateway
- Service is provided free of charge* for OpEdge gateway users

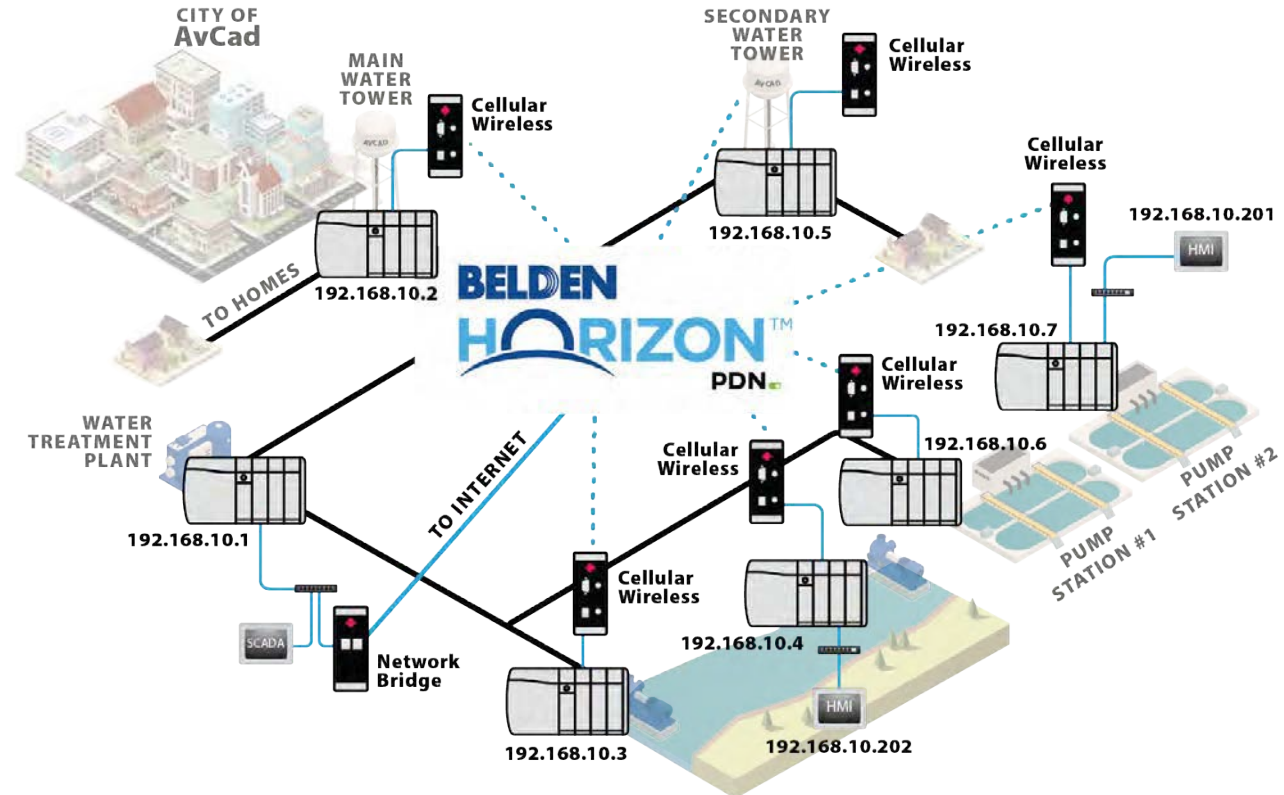


* Free tier is limited to a certain amount of data transfer / year

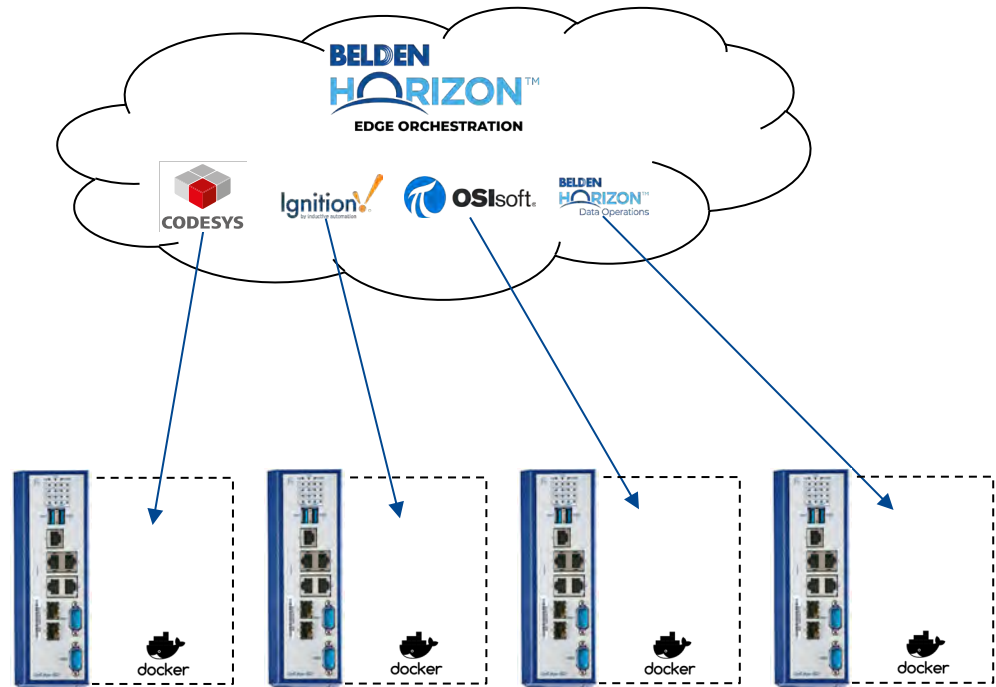
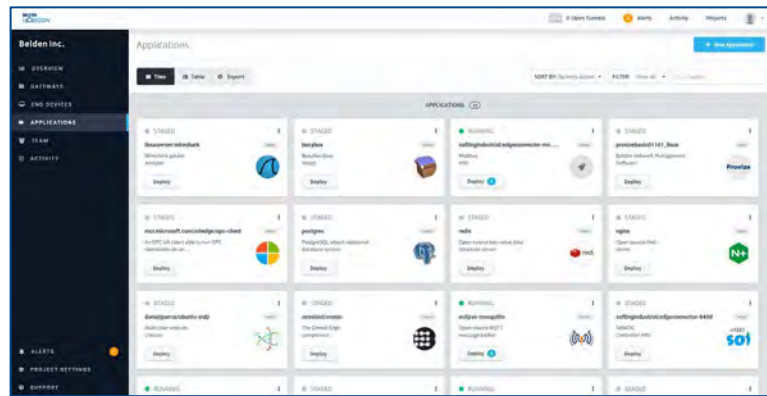
Persistent Data Network (PDN) for secure networks between sites



- ❖ PDN = Persistent Data Network
- ❖ PDN is the easiest way to set up a secure network between remote sites
- ❖ Security at multiple levels
- ❖ ProSoft managed service allows customers to focus on automation and control
- ❖ No local software installation or licensing
- ❖ Comprehensive audit trail for forensic review
- ❖ Increased bandwidth allows customers to bring back more data, more frequently
- ❖ High availability and reliability








Edge Orchestration



Deploy and orchestrate containerized edge applications on at s





Belden Horizon Console Compatible Devices

Device	Device Manager	Secure Remote Access (SRA)	Persistent Data Network (PDN)	Edge Applications	Available for sale ¹
 ICX35-HWC	✓	✓	✓	✗	Today
 PLX35-NB2	✓	✓	✓	✗	Today
 OpEdge-8D	✓	✓	✓	✓	Today
 OpEdge-4D	✓	✓	✓	✓ ²	1H 2024
 OpEdge-4D-LTE	✓	✓	✓	✓ ²	1H 2024



Comparing OpEdge Gateways – Using OpEdge-8D

	OpEdge-8D 	OpEdge-4D 
CPU	Intel Atom E3950 @ 1.6 GHz	NXP™ i.MX8M Mini Quad Core 1.6GHz ARM® Cortex™-A53
Memory	8GB DDR3L	4GB DDR4
Storage	64GB SSD storage (48.5GB shared between VMs and Containers)	64GB eMMC (17GB user available for containers)
Fiber Ports	2	0
RJ45 Ports	5 (GbE)	4 (GbE)
Serial Ports	2 (RS-232)	1 (RS-232/485)
Temperature Rating	-40°C to 70°C	-40°C to 70°C
Approvals	CE, RoHS, REACH, FCC, UL, 62368-1, IEC 61850-3, IEEE 1613, IP40	CE, FCC, RoHS, REACH, UL, IEEE 1613, ATEX, C1D2, DNV
Cellular	No	Pend
Containers	Yes (x86)	Yes (ARM)
Virtual Machines	Yes	No
Availability	Today	Early 2024

Reasons for Selecting the OpEdge-8D

- **Resource-intensive use cases** – additional memory (8GB) and storage (48.5 GB accessible) is available to allow for the deployment of more apps or those that have more cumbersome computing requirements
- **Support for virtual machines** – the x86 CPU allows for the user to leverage the capability of the hypervisor built into the OS for running virtual machines
- **Greater number of connected devices** – the additional GbE ports allow for additional connectivity to the edge gateway
- **Support for fiber connections** – the SFP slots in the OpEdge-8D offers the customer fiber connectivity
- **Energy use cases** – the device has substation approvals for the energy sector



Comparing OpEdge Gateways – Using OpEdge-4D

OpEdge-8D



OpEdge-4D (LTE)



CPU	Intel Atom E3950 @ 1.6 GHz	NXP™ i.MX8M Mini Quad Core 1.6GHz ARM® Cortex™-A53
Memory	8GB DDR3L	4GB DDR4
Storage	64GB SSD storage (48.5GB shared between VMs and Containers)	64GB eMMC (17GB user available for containers)
Fiber Ports	2	0
RJ45 Ports	5 (GbE)	4 (GbE)
Serial Ports	2 (RS-232)	1 (RS-232/485)
Temperature Rating	-40°C to 70°C	-40°C to 70°C
Approvals	CE, RoHS, REACH, FCC, UL, 62368-1, IEC 61850-3, IEEE 1613, IP40	CE, FCC, RoHS, REACH, UL, IEEE 1613, ATEX, C1D2, DNV
Cellular	No	Yes (4D-LTE only)
Containers	Yes (x86)	Yes (ARM)
Virtual Machines	Yes	No
Availability	Today	Early 2024

Reasons for Selecting the OpEdge-4D

- **Lower cost and lower power consumption** – the use of an ARM CPU results in a more cost competitive device with lower power requirements
- **Hazardous location approvals** – the OpEdge-4D has ATEX and C1D2 approvals which makes it a great option for process industries
- **Maritime industry approvals** – the OpEdge-4D has a DNV approval for marine applications
- **Application deployment via containers** – for use cases that only require the use of Docker containers, the OpEdge-4D will often be the best option for the customer

Three Industrial Edge Use Cases

Onsite Backbone Network

Remote Management

Data Orchestration & Mgmt.

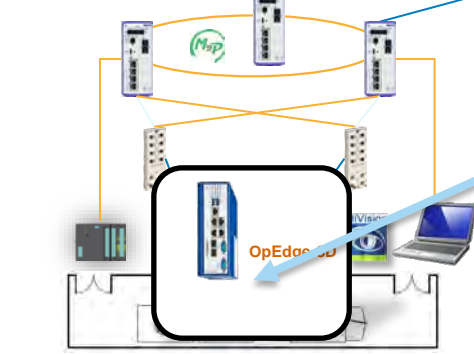
Solution Elements

IT / OT Connection



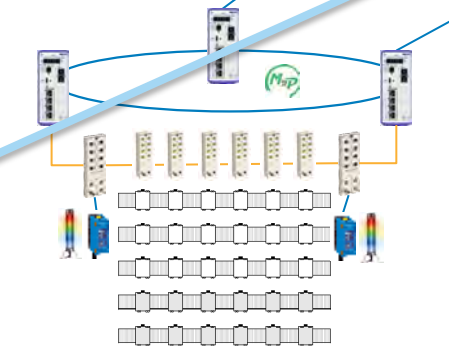
OT Connection

Sensor Data



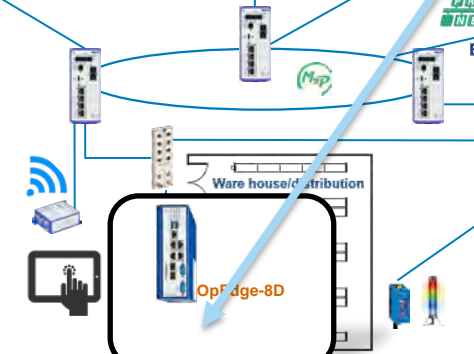
1 x Common Area
30 - 40 asset
4 - 6 Sensor / Asset
2 - 5 PLCs

Utility Zone



4 - 6 Prod. lines
6 - 8 Asset / Line
4 - 6 sensor / asset
1 PLC / Asset

Production Lines



1 x Common Area
4 - 6 Storage Lines
2 - 3 Assets / Line
4 - 6 sensor / asset

Warehouse / Distribution

Plant Floor and Assets



Device & connectivity management
SRA
PDN



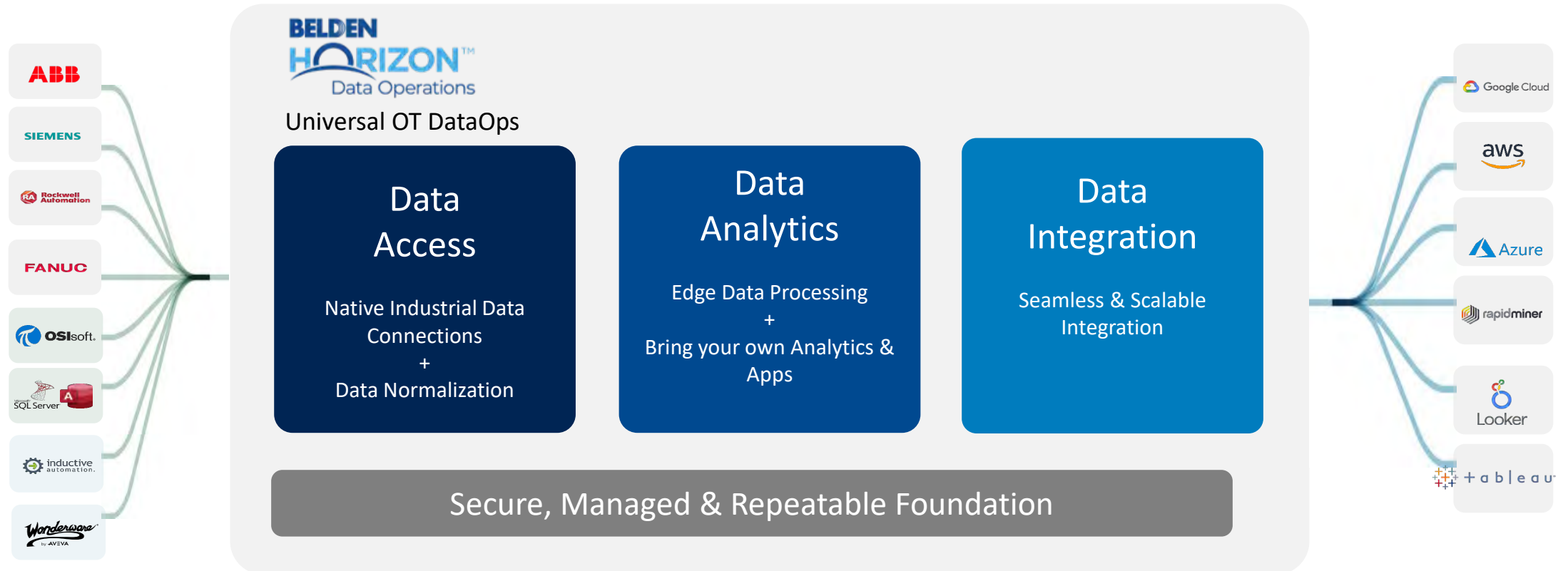
MQTT

OPC UA





Protocol Conversion: Belden Horizon Data Operations



✓ Highest # of Industrial Protocols in the world
Connects to 275+ Protocols & 10s of thousands of Assets

✓ Well Integrated
Edge Native Deployments, Clouds, Data Lakes , ML Studios

✓ Frictionless Experience
Best in class for UX, Security , Business models



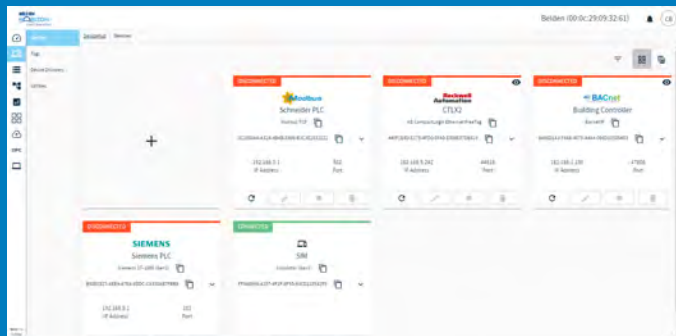
What does BHDO do for its users?

Device Connectivity

Ships with hundreds of OT device drivers

With 250+ pre-built drivers, Belden can connect to any machine or industrial system out-of-the-box. Collected data is structured and stored, and ready for use by edge and enterprise applications

- ✔ Connect any asset – PLC, CNC, SCADA, MES, Historian
- ✔ Pre-loaded drivers, no programming required
- ✔ Normalize hundreds of custom data points.

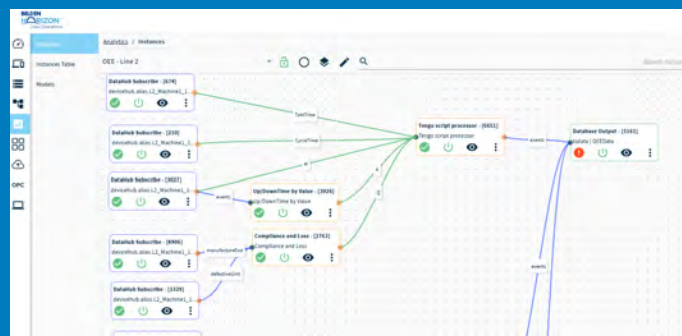


Analyze Data

Pre-built machine analytics and visualizations

With pre-built KPIs and an easy-to-use dashboard builder, customers can quickly create data visualizations and analytics for machine downtime, condition monitoring, OEE and more.

- ✔ Analyze data at the edge for instant value
- ✔ Pre-built analytics dramatically reduce setup time
- ✔ Drag and drop KPIs to build custom dashboards



Share Data

Integration with cloud and enterprise systems

Immediately feed ready-to-use machine data to any cloud or enterprise system to achieve a complete edge-to-cloud data picture for OT, IT and Data Science teams.

- ✔ Normalized data can be used by any application
- ✔ Simple drag-and-drop editor to send data anywhere
- ✔ 20+ pre-built connectors to cloud and enterprise systems



Latest edition to Belden family: CloudRail



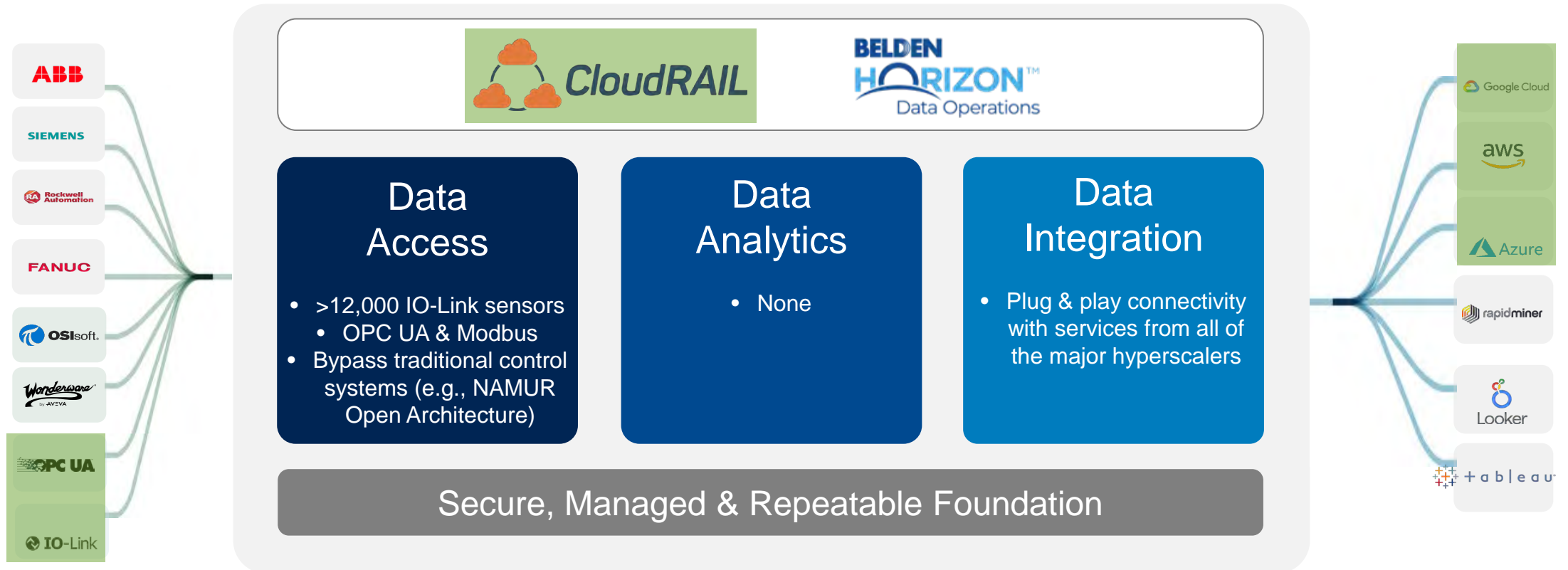
Seamlessly connects sensor data to cloud services in one step

- Hardware or Docker app can read sensor data using OPC UA, IO-Link, and Modbus
- Connects data to AWS, Microsoft Azure, MQTT, SAP, etc.
- Hardware
 - CloudRail.Box device has hardened ARM Quad Core processor with 1 Gig RAM and 4 Gig flash memory – ideal for gathering data and simple batching
 - CloudRail.Box Max device increases processing and capabilities with Intel Quad Core, 8 Gig RAM, 256 Gig SSD, and optional LTE/5G – features make this unit ideal for edge computing

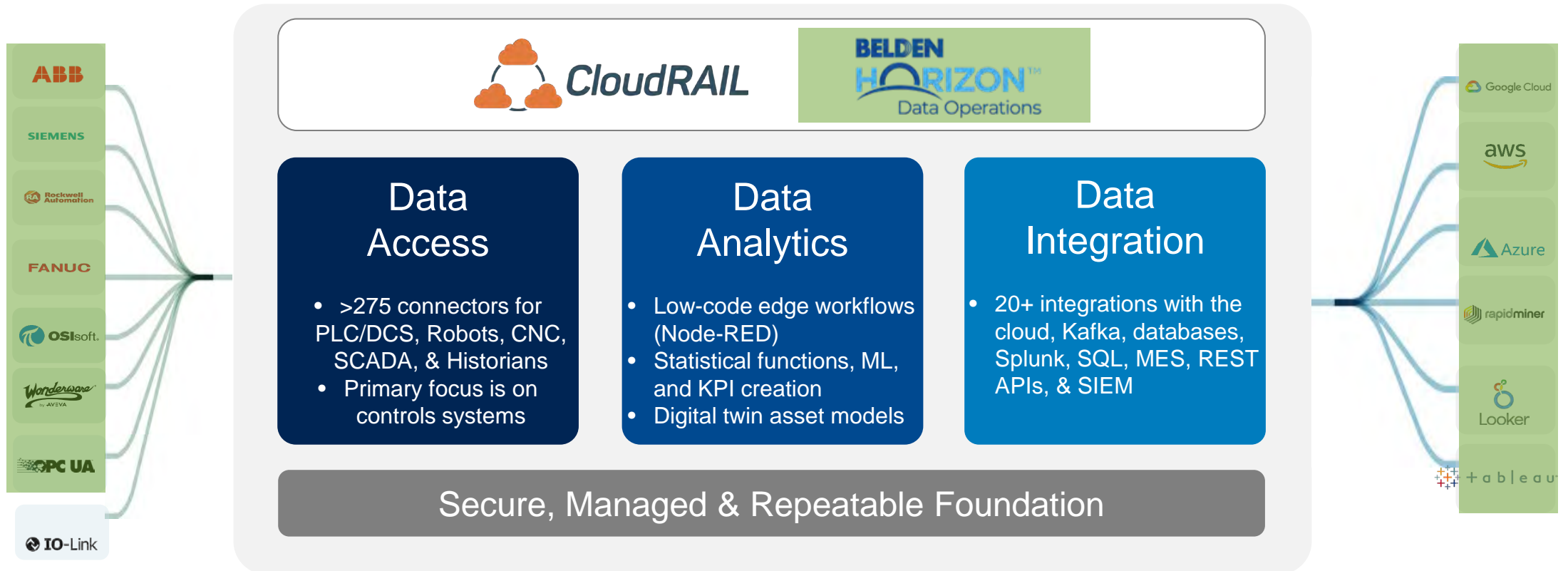




When should *CloudRail* be used?



When should **BHDO** be used?





Copper and Fiber Media for Industrial Applications

Industrial Fiber Optic Cable

Take Your Network Farther, Faster



HAZARD MATCHED DESIGNS – LSZH, NFPA 130 / 502 Compliant

Durable, flexible glass rated for use across oil & gas, offshore & shipboard, transportation, factory automation and mining applications



LONGER RUNS, LOWER SIGNAL LOSS

Allow multi-mile distances with fewer repeater and infrastructure costs while adding 10 times more bandwidth



BUILT-IN NETWORK SECURITY

Signals cannot be 'tapped' like copper and are immune to electrical noise and radio interference common in harsh applications



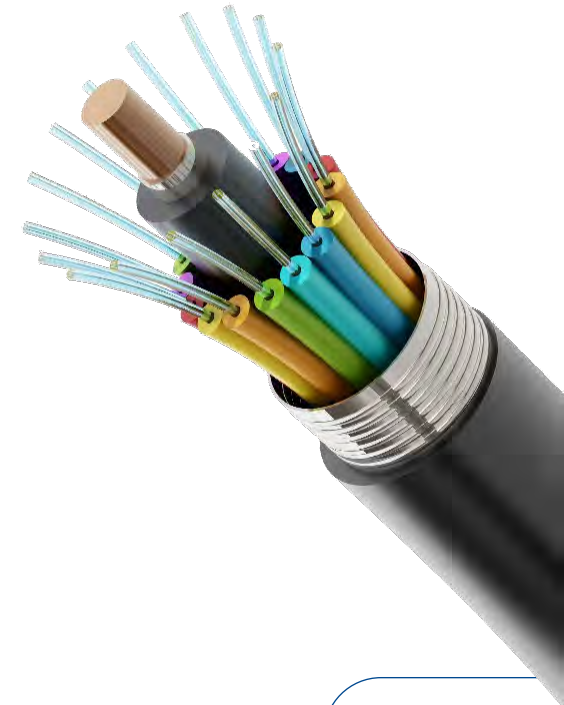
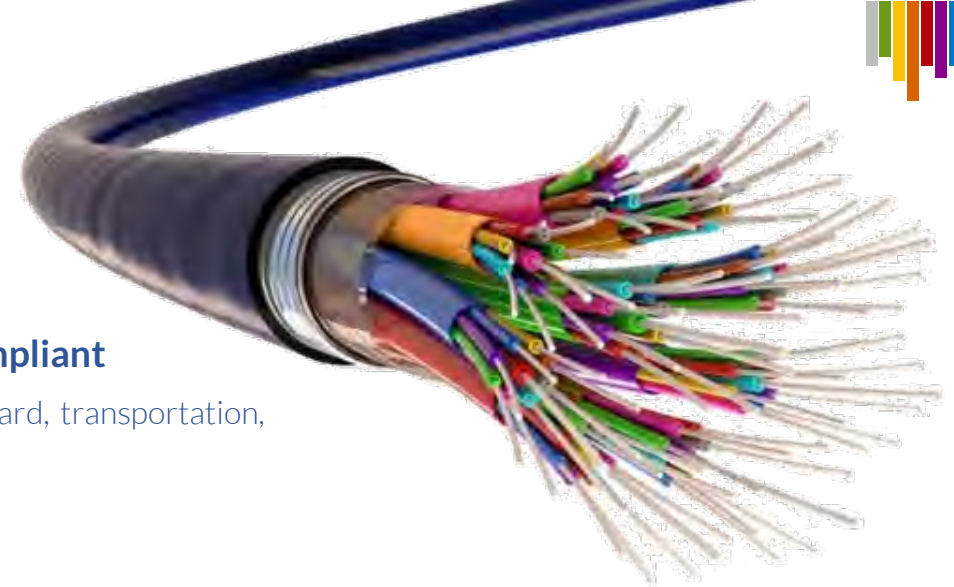
IMPROVED PHYSICAL SAFETY

Eliminate sparks, short circuits, lightning strike surges, ground loops, and shock hazards to protect operators and installers



DECREASED COST, SIZE, AND WEIGHT

Require less duct space, weigh 10-15x less, and cost less than copper cable equivalents



Modular Industrial Patch Panel

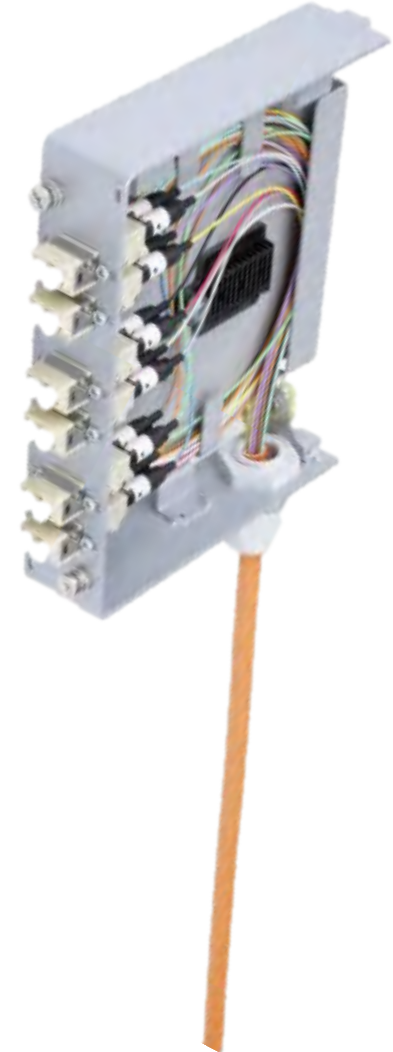
Patch Panel Connections, Secure and Compact



Modular Industrial Patch Panel

Patch Panel Connections, Secure and Compact

- Configurable, 1-6 modules wide
- DIN rail or panel mount
- RJ45 punch-down or couplers
- Multimode or singlemode fiber – ST, SC, LC
- Pre-polished fiber pigtailed available for fusion splicing
- Modules can be flipped 180 degrees for top/bottom cable entry
- Future expansion should be accounted for with blank panel



Industrial Ethernet Cable

Same Network, Tough Environment



UNIVERSAL PROTOCOL

Modernize industrial control systems and integrate IT & OT with common technology while reducing design, deployment, infrastructure, and maintenance costs



RUGGED DESIGN - LSZH, NFPA 130 / 502 Compliant

Keep mission critical operations running despite harsh operating conditions - shock, vibration, flex, extreme temperature, water, chemicals, UV, noise, and more



INSTALLABLE PERFORMANCE™

Achieve maximum uptime with built-in signal protection provided by Belden's patented bonded pair design, minimizing the cost of downtime and maintenance



PRE-CONNECTORIZED FIT

Simplify installation to I/O devices, switches, and sensors using industry standard RJ45, M8, or M12 connectivity



PoE, TSN, AND SDN COMPATIBLE

Leverage improvements from the larger IT community for performance, bandwidth, standardization, security, and industry-specific value-add capabilities



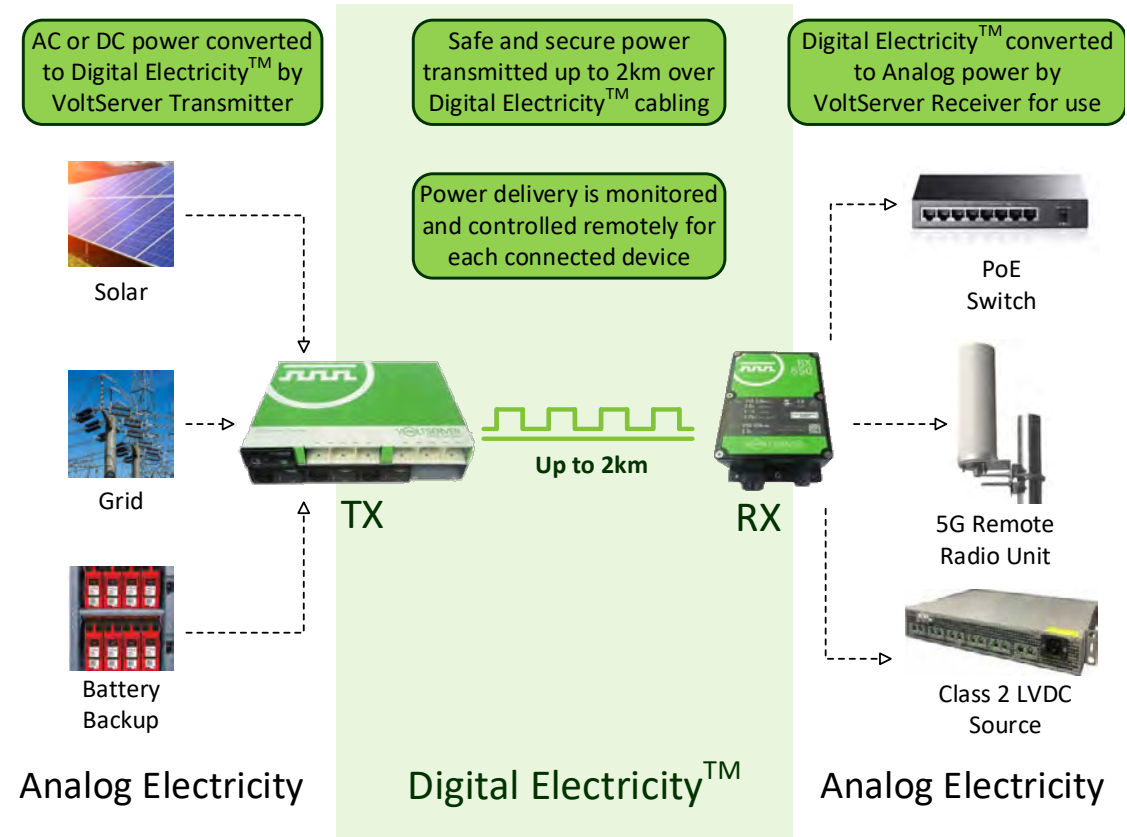
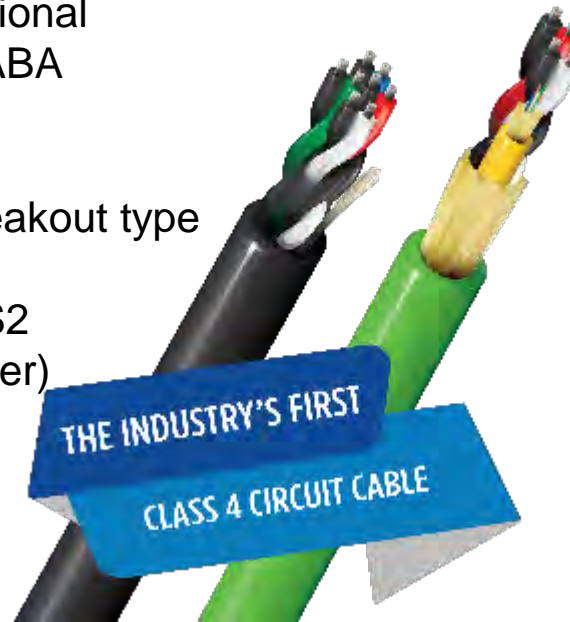
FMPS Cable – Fault Managed Power Systems

Class 4 (CL4) FMPS Digital-Electricity Cabling



Versatile Solution

- Copper only or Copper/Fiber Hybrid
- Indoor and Indoor/Outdoor Variants
 - Plenum & Riser ratings
 - CL4 rated
 - LSZH NFPA130 available
- Copper options
 - 12 – 18 AWG
 - 2 – 8 or more Pairs
 - Foil Shielding Optional
 - Copper-only is BABA
- Fiber Options
 - Distribution or Breakout type
 - 2 – 12 Fibers
 - OM3, OM4, or OS2
 - Hybrid (copper/fiber) is not BABA



Safe Delivery
Significant Power
Significant Distance
Smaller Conductors
Speedy Deployment





FMPS Cable – Copper-only Offering

Class 4 (CL4) FMPS Digital-Electricity Cabling

Digital Electricity™ Copper Cables (Power Transmission)

Building a SmartPart Number

Please select from options below to build your SmartPart number.

DE	I	P	16	8	U		
Fixed Letter Series	Application	Rating/Type	AWG		Pair Count'	Shielding	
DE	Indoor	I Indoor	14	14	2 Pairs	2 Unshielded	U
	Indoor/Outdoor	D Plenum P	16	16	4 Pairs	4 Foil Shield	F
	Waterblocked-Indoor/Outdoor	W Indoor/Outdoor or Waterblocked	18	18	8 Pairs	8	
		N General Purpose/ Wet Locations					

Example:

DEIP168U - Indoor, Plenum CL4P-rated, 16 AWG, 8 Stranded Tinned-Copper Pairs, Unshielded, 2000 Ft Reel, Apple Green Jacket

DEDN148U - Indoor/Outdoor, CL4-rated, Sun Res, Wet Locations, 14 AWG, 8 Stranded Tinned-Copper Pairs, Unshielded, 2000 Ft Reel, Black Jacket

DEWN164U - Indoor/Outdoor with waterblocking tape, CM, CL4-rated, Sun Res, Wet Locations, 16AWG, 4 Stranded Tinned-Copper Pairs, Unshielded, 2000 FT Reel, Black Jacket

Belden weblink to datasheets & more



FMPS Cable – Hybrid Copper/Fiber Offering

Class 4 (CL4) FMPS Digital-Electricity Cabling

Hybrid Digital Electricity™ Cables (Power and Data Transmission)

Building a *SmartPart* Number

DH		I		P		16		2		U		4		B		02		C	
FX Fiber Cable	Location	Rating/Type		Copper Type		Pair Count		Shielding		Fiber Type		Family		Fiber Count		Sub-Unit Type/ Configuration			
Hybrid DE	Indoor	I	Plenum	P	16 AWG	16	2 Pairs	2	Unshielded	U	OM3	3	Breakout	B	2 Fibers	02	Breakout		
	Waterblocked-Indoor/Outdoor	W	LSZH CMR-OF/FT4-STI	L	18 AWG	18	4 Pairs	4			OM4	4	Distribution	D	4 Fibers	04	2.0 mm Sub (1F x 900 μm)**		
							8 Pairs	8			OS2 (G.657A1)	5			6 Fibers	06	3.0 mm Sub (1F x 900 μm)		
															12 Fibers	12	Distribution: Utilized		
																	1 Fiber Distribution Tube (900 μm)		

Example:

DHIP162U4B02C - Indoor, 16 AWG, 2 Stranded Tinned-Copper Pairs, OM4, Breakout, 2 Fiber Strands, 3.0 mm Subunit, Unshielded, Plenum CL4P-OF Rated, Apple Green Jacket

DHIP182USD06J - Indoor, 18 AWG, 2 Stranded Tinned-Copper Pairs, OS2, Distribution, 6 Fiber Strands, 1 fiber distribution tube, Unshielded, Plenum CL4P-OF Rated, Apple Green Jacket

* Plenum default jacket color is Apple Green. Waterblocked-Indoor/Outdoor default jacket color is black. Length specified at the time of order.

* LSZH cable is compliant to NFPA130 rating

** 2 mm Breakout Plenum Class 4 offering coming soon

Belden weblink to datasheets & more

Industrial Patch Cables

Patch Fiber Connections, Secure and Compact

- Broad selection of industrial, pre-terminated Cat 5e Ethernet cordsets
- RJ45/M12 D-code, single-ended or double-ended, in any connector style mix
- Shielded or unshielded
- Varying lengths - from 0.3 to 80 meters
- M12 bulkhead termination also available
- PVC, TPE, High-flex TPE and LSZH cables
- 600V AWM-rated available
- 600V tray-rated available

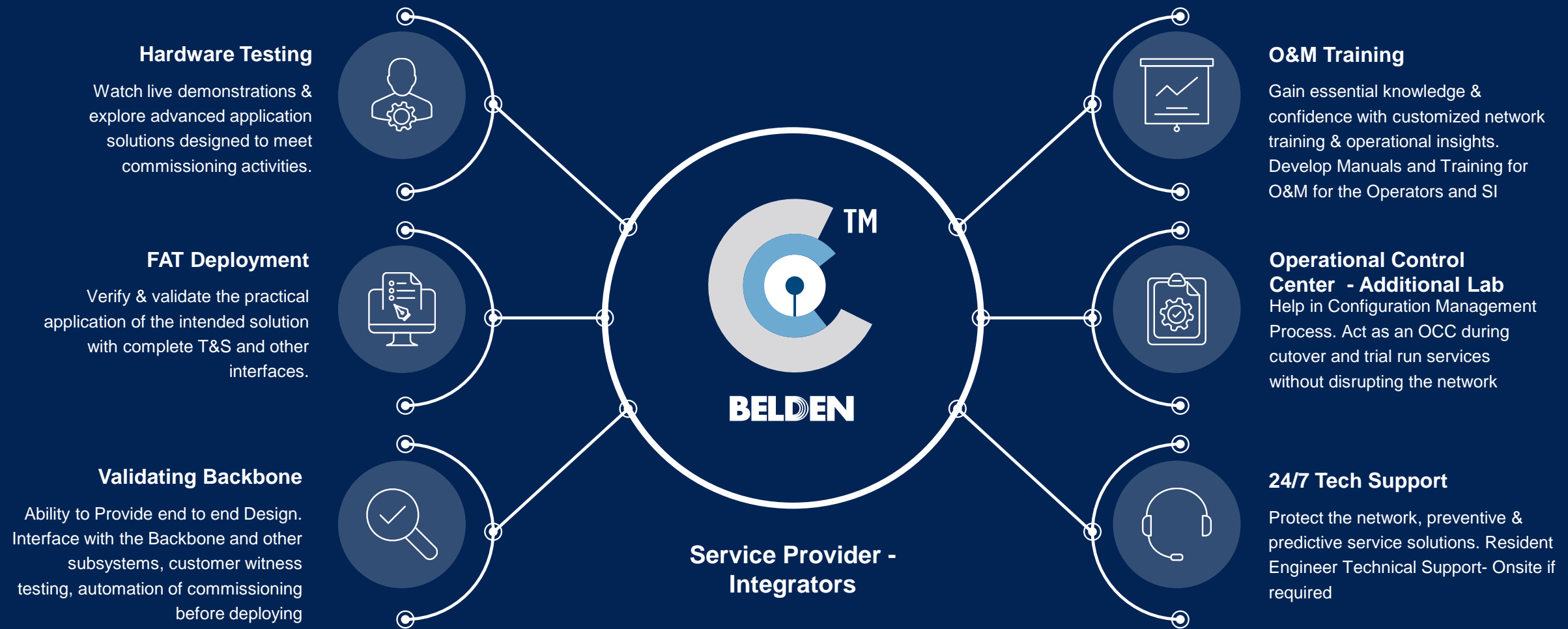




Professional Services



Professional Services, Operations and Maintenance





Global Teams



Solution Architect

Network architecture experts. Experience in designing pre-bundled, ready-to-sell solutions.



Digital Automation Consultant

Industry expert with in-depth process and workflow knowledge. Experience in executing process audits, Gemba walks, Ind. 4.0 transition.



Project Manager

Support the customer from the PO, through the commissioning, to the implementation of our solutions in their plants.



Solution Enablement

Team focused in providing supports to Sales & CIC to showcase our capabilities and our solution expertise in the most meaningful and engaging way to the customers.



Regional Teams



Solution Consultant

Application expert with deep technical knowledge per vertical. Experience in conducting industrial network audits and positioning solutions.



Solution Engineer

Network experts with deep products knowledge. Experience in conducting trainings, testing, commissioning networks, and post sales assistance.

CIC Locations | Regional Solution Hubs of Belden



Santa Clara



Chicago



Stuttgart



Bangalore



Shanghai



Global Presence, Local Expertise & Support

- **Validation Lab:** to validate the solutions created for each customer
- **The Cube:** to empower visitors to self-discover the faces of Belden's success
- **Digital Solution Room:** to make the most of the online experience
- **Training Room:** to have hands-on training session with technical experts
- **Innovation Discovery Wall:** to empower visitors to choose and explore relevant products and solutions.
- **PoC Room:** to explore online and onsite our offering
- **Sales Collaborative Area:** to offer a working space for sales directly in the CIC
- **Townhall:** to engage and interact in the best way with our customers



Time for

— Q&A