Industrial Network Infrastructure Future
Your Future Business Foundation

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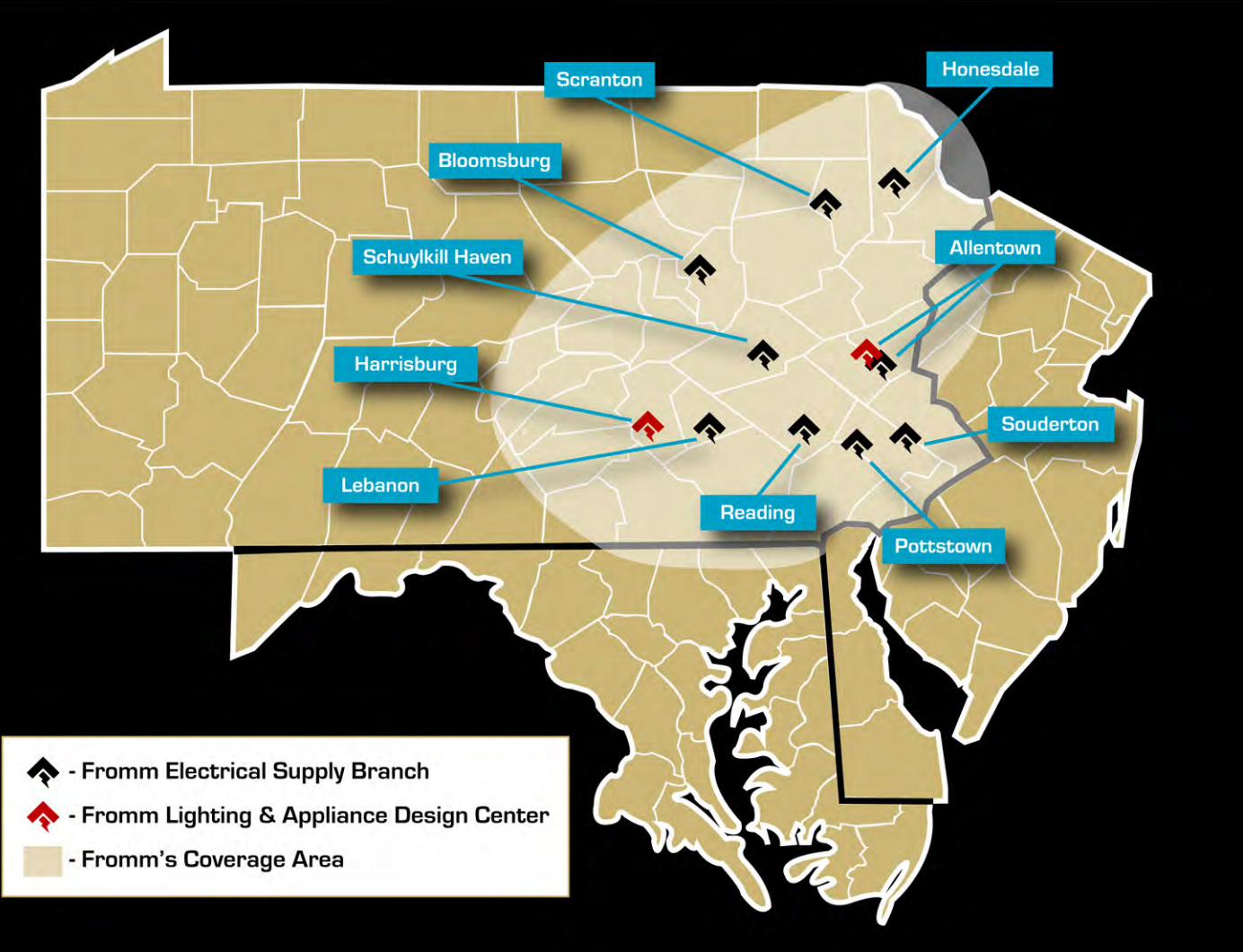IFMA Meeting June 11st, 2020

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FROMM'S FOUNDATION

- Fromm is an independent electrical distributor in its 3rd generation of family ownership; headquartered in Reading, PA and servicing the Mid-Atlantic.

- Fromm has been distributing products and services in the Lehigh Valley Facilities Managers Association's operational footprint for nearly a century.

FROMM'S DISTRIBUTION FOOTPRINT

Scranton
Honesdale
Bloomsburg
Allentown
Schuylkill Haven
Harrisburg
Souderton
Lebanon
Reading
Pottstown

- Fromm Electrical Supply Branch
- Fromm Lighting & Appliance Design Center
- Fromm's Coverage Area

FROMM

Fromm is a leading supplier of industrial services

- **Arc Flash:** Fromm's team can help you eliminate the risk of arc flash events, stay in compliance with national and local standards, and keep your workers safe.

- **Asset Performance Management:** Fromm conducts an analysis of your facility's assets and helps you implement a proactive asset maintenance strategy to improve the efficiency and performance of you assets.

- **Control Panel Assembly:** Decrease labor costs by allowing Fromm to drill, tap, mount, and install hardware on your control panels before shipping them to your facility.

- **Energy Efficiency:** Our specialists will perform an energy efficiency audit at your facility then provide you with a summary of recommendations on lowering your energy consumption and costs. Our experts will also help you apply for utility rebates for quicker payback on your investment.

- **Inventory Management:** Reduce inventory costs and eliminate stockouts by letting Fromm partner with your to manage your storeroom inventory.

FROMM

# Fromm is a leading supplier of industrial services, continued

- **Lighting Design:** Fromm's team of experts can advise you on both lighting output and lighting design features. They can help you manage your lighting design projects and control costs.

- **Power System Design:** Fromm's team assess your power systems and help you develop a plan to make sure they're running reliably and cost-efficiently.

- **Power System Studies:** Improve your power system performance by letting Fromm perform studies and audits tailored to your needs, including power quality and reliability and energy management.

- **Thermal Audit:** Eliminate downtime due to part failure. Our team will conduct a thermal audit of your electrical enclosures, helping you prevent electrical overheating.

- **Jobsite Material Kitting:** Reduce labor costs by allowing Fromm to assemble and pre-package rough-in and finishing materials for your project, which are then delivered and organized where you need them on your jobsite.

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Importance of Industrial Networks

- Control and communicate the status of your profit-making assets

- Impacts workforce productivity significantly

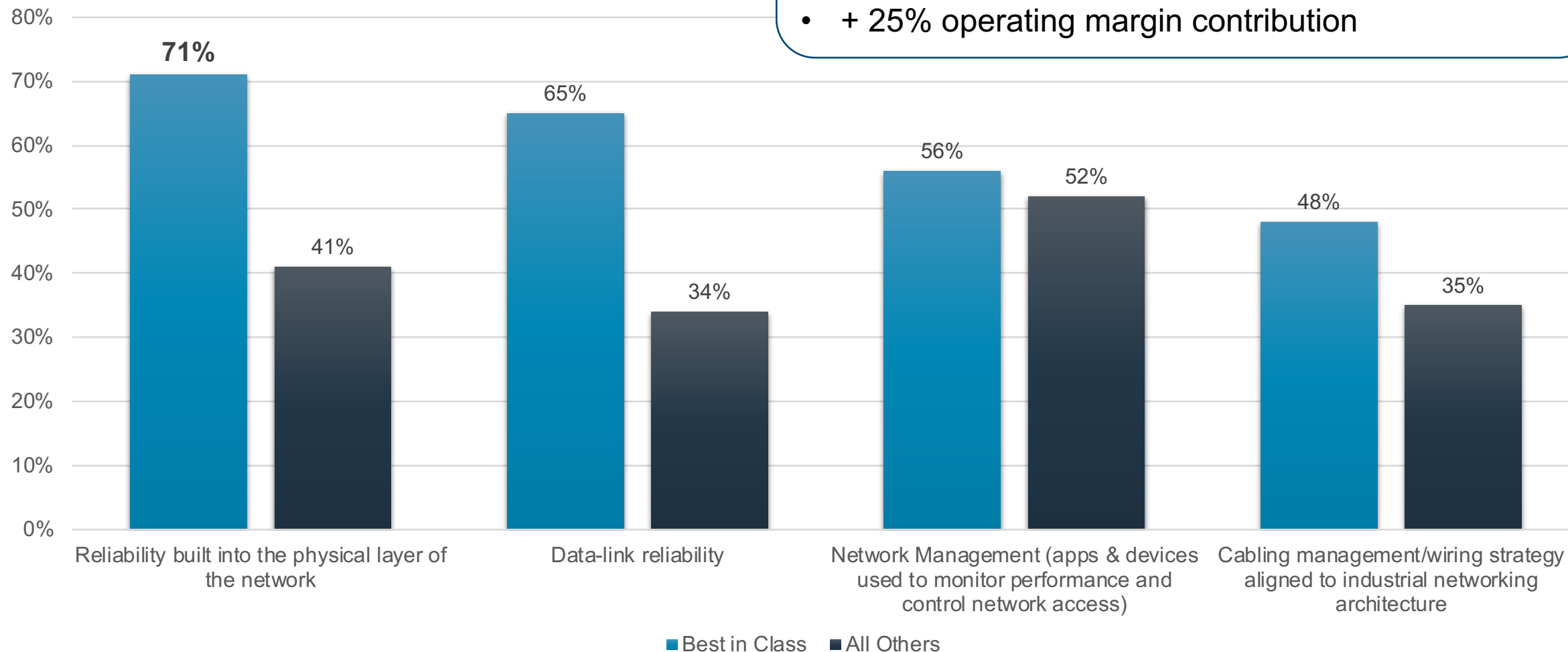- Outages and slowdowns are extremely visible and readily monetized
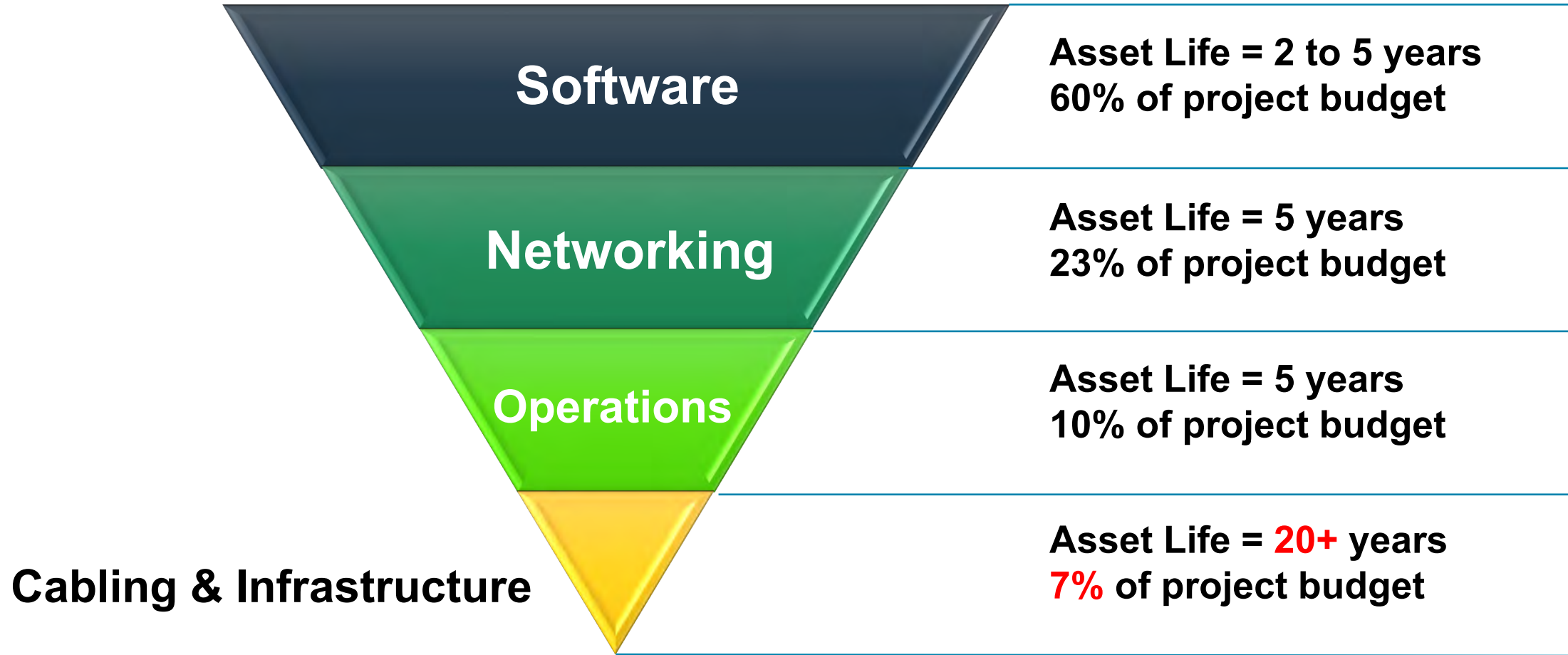
Best In Class Networks

- 8 hours downtime (99.91% uptime)
- 11% reduced TCO (Total Cost of Ownership) for industrial network
- 90% OEE (Overall Equipment Effectiveness)
- + 25% operating margin contribution

Bar chart legend: ■ Best in Class ■ All Others

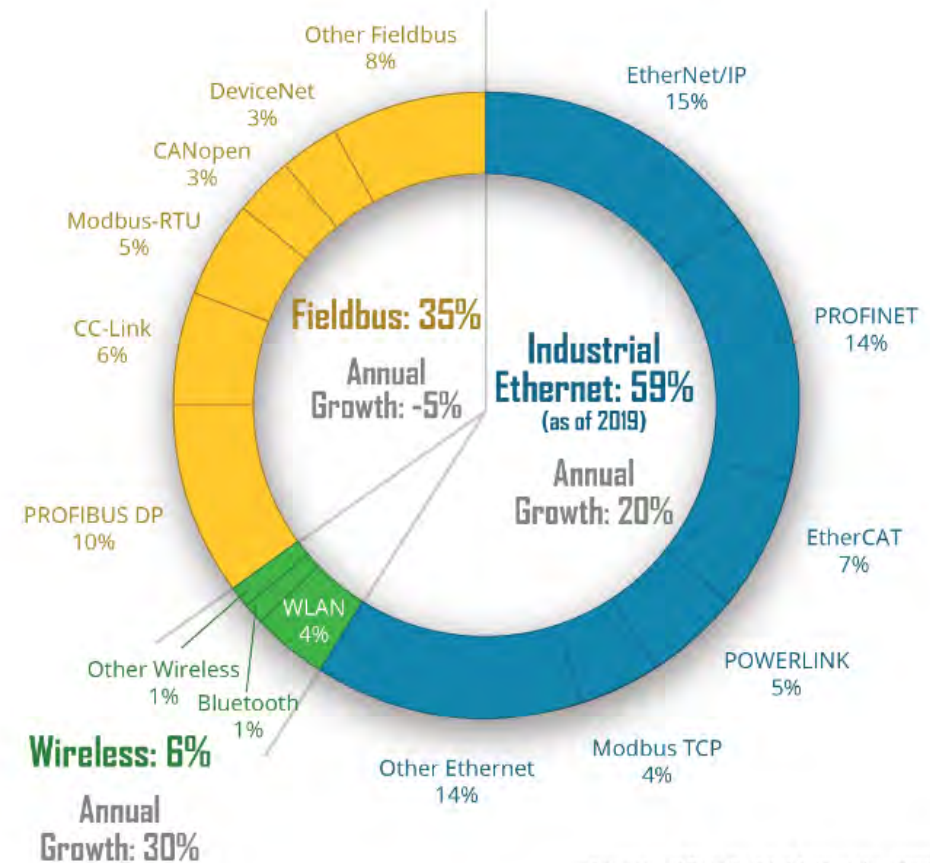| Category	Best in Class	All Others
Reliability built into the physical layer of the network	71%	41%
Data-link reliability	65%	34%
Network Management (apps & devices used to monitor performance and control network access)	56%	52%
Cabling management/wiring strategy aligned to industrial networking architecture	48%	35%

Where do I start?

- Network assessment and documentation

- Mitigation plan for impending problems

- Network M&O strategy

- Future looking plans for your current network; i.e. *legacy protocol migration*

Network Planning & Management

- **Legacy Protocol Migration**
  - Key output of the site assessment
  - Your industrial network is *not* all the same age
  - Some elements need to retire

- **Industrial Network Refresh Rate**
  - Like the human portions of the business, you need to do some succession planning.

Other Fieldbus 8%
DeviceNet 3%
CANopen 3%
Modbus-RTU 5%
CC-Link 6%
PROFIBUS DP 10%
Other Wireless 1%
Bluetooth 1%
WLAN 4%
Fieldbus: 35% Annual Growth: -5%
Industrial Ethernet: 59% (as of 2019) Annual Growth: 20%
EtherNet/IP 15%
PROFINET 14%
EtherCAT 7%
POWERLINK 5%
Modbus TCP 4%
Other Ethernet 14%
Wireless: 6% Annual Growth: 30%

Source: HMS Industrial Networks, 2019

CPwE – Converged Plantwide Ethernet

- **TESTED AND VALIDATED REFERENCE ARCHITECTURES**

- A collection of use case driven reference architectures

- Designed to be robust and scalable

- Created by Cisco and Rockwell Automation 10 years ago

- Panduit has been an active contributor for > 2 years now

CPwE Network Building Blocks
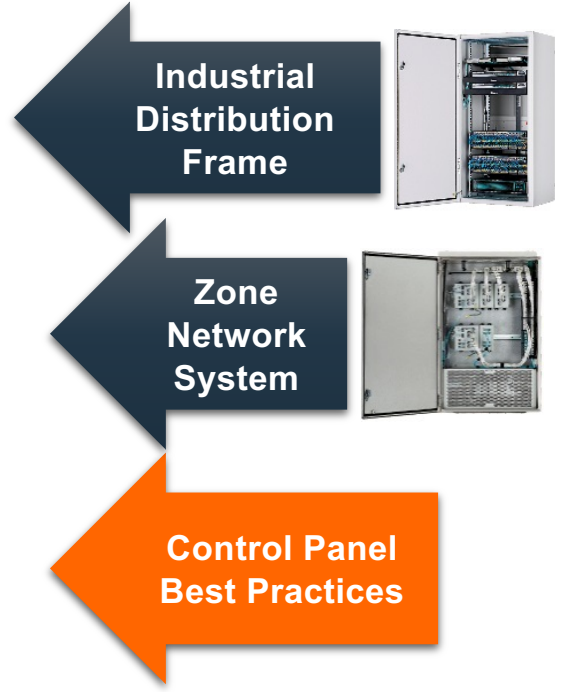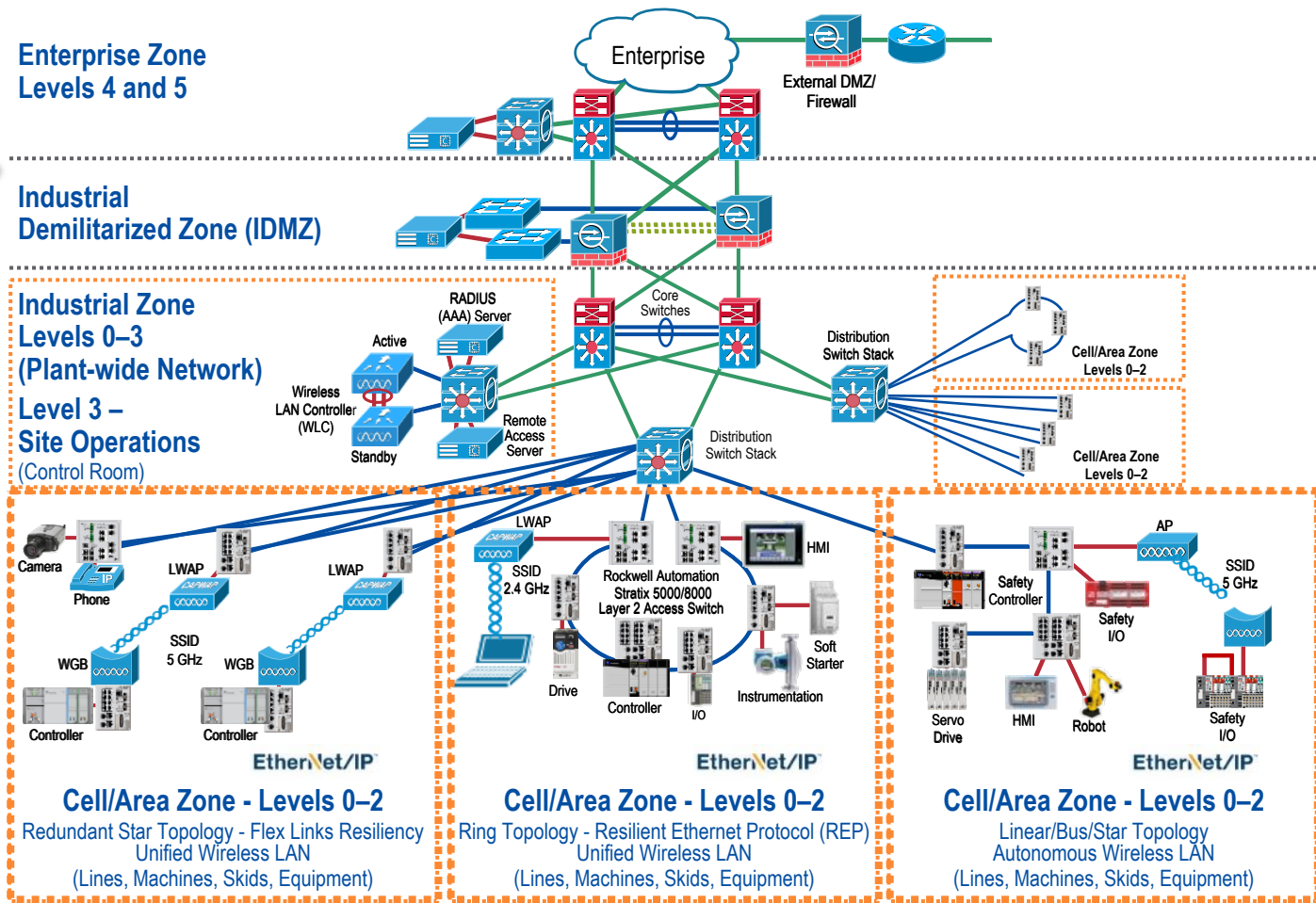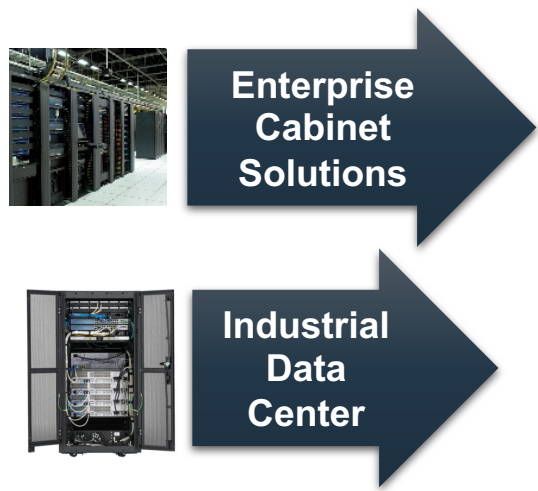
Network Management Tools

- Functional Needs
  - Documentation of current state of network
  - Monitor network readiness
  - Gauge network performance
  - Find faults or misconfigurations
  - Uncover network traffic problems
  - All through a common view, aka "Single Pane of Glass"

NMS Feature Set

	BASELINE FEATURE SET	IDEAL FEATURE SET
Automatic Topology Map of Field Devices	X	X
Vendor Neutral Diagnostics	X	X
Live Health Monitor for Field Devices	X	X
Live Event Logs	X	X
Graphical Bandwidth Analysis	X	X
Key Performance Indicator (KPI) Reporting	X	X
Activity Monitoring Dashboard		X
Remote Assessment of Plant Network		X
Supervisory Function for Global Plant Visibility		X

Continuing Education …

- Think of it as being *better informed* …

- Necessary investment as your network evolves

- Considerable benefits to all team members that touch your network

- Cisco Certifications
  – CCENT
  – CCNA
  – CCIE

Network Infrastructure Lifecycle

Assess

- Accurate documentation of current network
- Agile & scalable via structured cabling techniques
- Remember, 20 to 25 year lifespan

Design

- Reference architecture based
- Scalable designs to grow with business
- Validated network building blocks to reduce risk

Deploy

- Network Management Software is essential
- Monitor metrics like bandwidth, BER, traffic
- Stay current on new technology

Maintain

- Expert help using secure remote access techniques
- Use NMS output to plan and avoid traffic issues
- Plan to migrate legacy protocols to Ethernet

Future Planning Considerations

New Technologies to Monitor

Power over Ethernet

- Delivers DC power along the same conductors that carry Ethernet traffic

- Network switch negotiates with end device to automatically provide the right power

- Created to enable VOIP telephony to succeed

- Not a new idea but there is an enabling IEEE standard

- Industrial Network Impact?
  - DC control power infrastructure will evolve
  - End device power and control simplified
  - Troubleshooting simplified

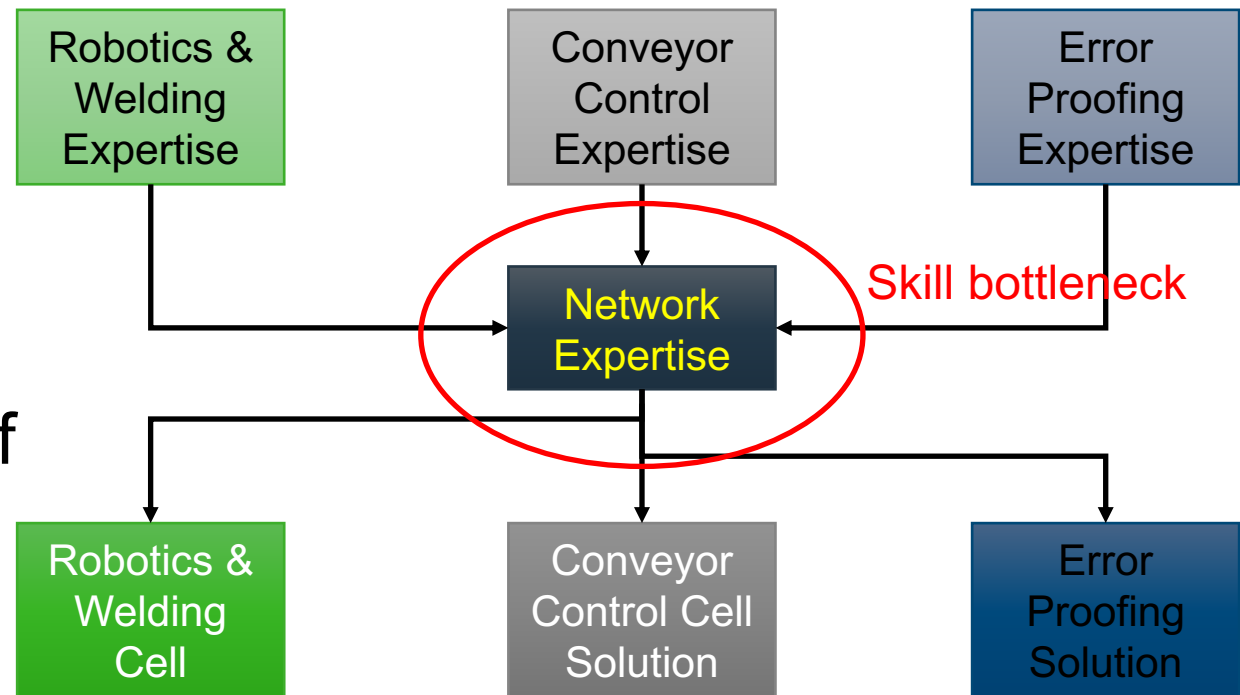| Property	PoE IEEE 802.3af	PoE+ IEEE 802.3at	4PPoE IEEE 802.3bt	PoE++ IEEE 802.3bt
PSE Power	15.4W	30.0W	60W	100W
PD Power	12.95W	25.5W	51W	71W
Power Management	Power class levels, negotiated at initial connection or 0.1W steps negotiated continuously			

Single Pair Ethernet

- What is it?
  - Ethernet transmission over a twisted pair at distances up to 1000 meters with optional power delivery

- Where is it needed?
  - Automotive – on vehicle applications like telematics and real time diagnostics
  - Industrial – connectivity at the network edge
  - Digital Building – possible applications due to similarity to some legacy Industrial protocols (still being evaluated)

- Media
  - Industrial – 18AWG shielded twisted pair
    - IP-67 and IP-20 connectors
  - Automotive – 18 AWG twisted but not always shielded
    - Proprietary automotive industry connectors

- Status
  - In task group IEEE 802.3cg, specified in February 2020

TSN – Time Sensitive Networking

- IEEE802.1 suite of standards

- 3 basic "tools" in the suite
  - Time Synchronization
  - Scheduling & Traffic Shaping
  - Select Communication Paths, Path Reservations and Fault Tolerance

- Enhances communication by adding mechanisms to ensure timely delivery with soft and hard real-time requirements.

- IEEE802.1 started for professional audio/visual needs

- Future application benefits for:
  - Industrial control
  - Automotive
  - Industrial Internet of Things

- Key elements to monitor
 - IEEE802.1
  - AVnu Alliance

Software Defined Networking

- **Software-defined networking** (**SDN**) is an approach to networking that allows network services to be managed through abstraction of lower level functionality

- What to monitor:
  – ODVA and IEEE
  – Progressive network equipment manufacturers

Robotics & Welding Expertise

Conveyor Control Expertise

Error Proofing Expertise

Network Expertise

Skill bottleneck

Robotics & Welding Cell Solution

Conveyor Control Cell Solution

Error Proofing Solution

Resources

- CPwE Information –
  www.panduit.com/cpwe
- White Papers –
  www.panduit.com/industrialwhitepapers
- Case Studies –
  www.panduit.com/industrialcasestudies
- Popular Configuration Drawings –
  www.panduit.com/pcds
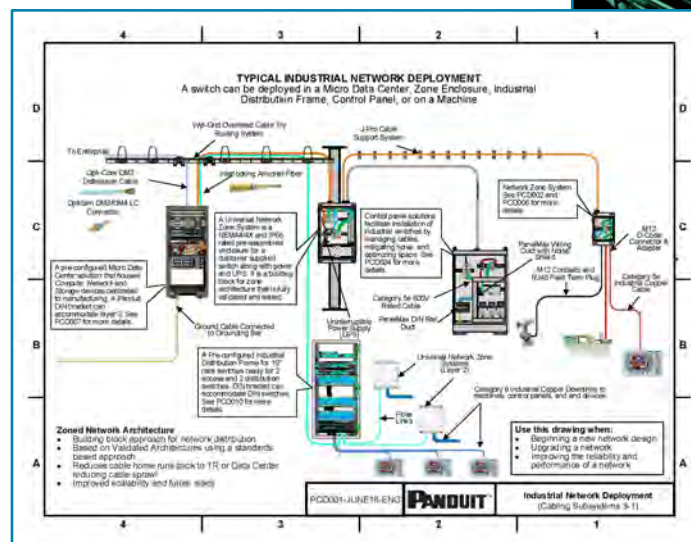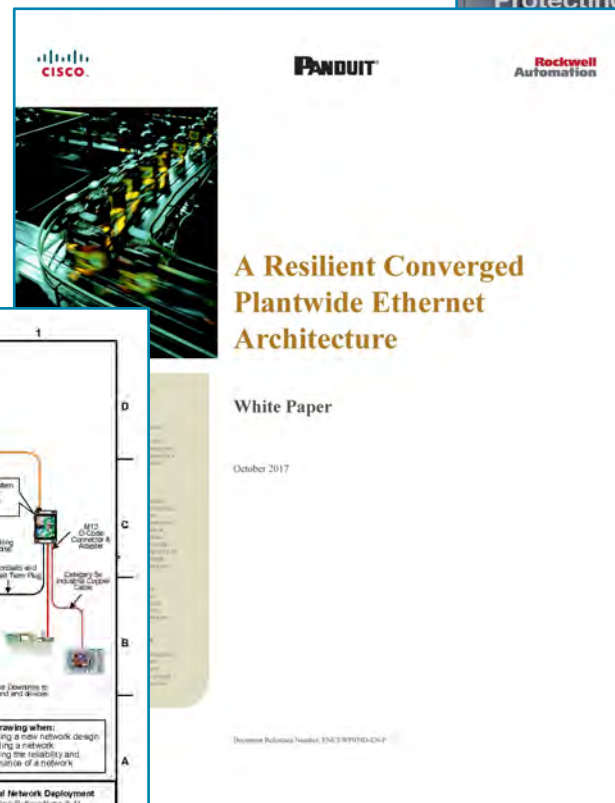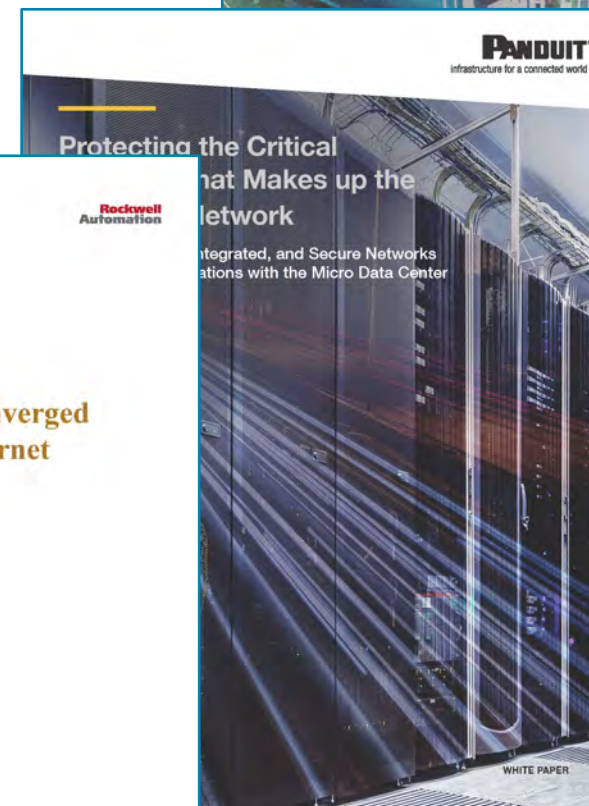
Fromm & Panduit

- Fromm has been a proud partner of Panduit's for several decades, so our sales team knows Panduit's product line and which products will work with your project.

- Together, Fromm and Panduit are capable of providing expertise on network assessment, documentation, and management.

- Our team of experts will work with you to:

  - Enhance network security
  - Document your network design and implementation plan
  - Assist with network upgrades
  - Help you develop a strong foundation for the connected enterprise

FROMM

Thank you!!

Stay healthy and safe – together we will get through this!

Jason Campbell - Panduit
Lou Fromm - Fromm Electric