

LISTEN.
THINK.
SOLVE.®

Industrial Automation Ethernet Usage

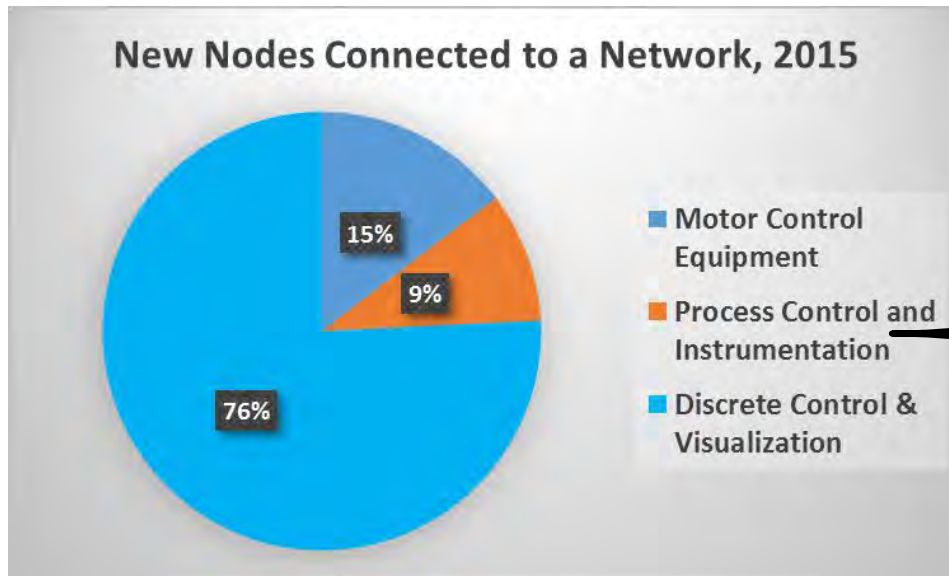
David Brandt



PUBLIC INFORMATION

Industrial Automation Characteristics

- A large portion of the *Discrete Control & Visualization* and associated *Motor Control Equipment* is concentrated in machines and is of relatively short distance (40m) and benefits from high performance (100Mb/s -> 1Gb/s)
- Certain important *Process Control and Instrumentation* applications require very long distances (1000m) and have relatively low performance requirements



Source: IHS, The World Market for Industrial Ethernet & Fieldbus Technologies – 2013 Edition

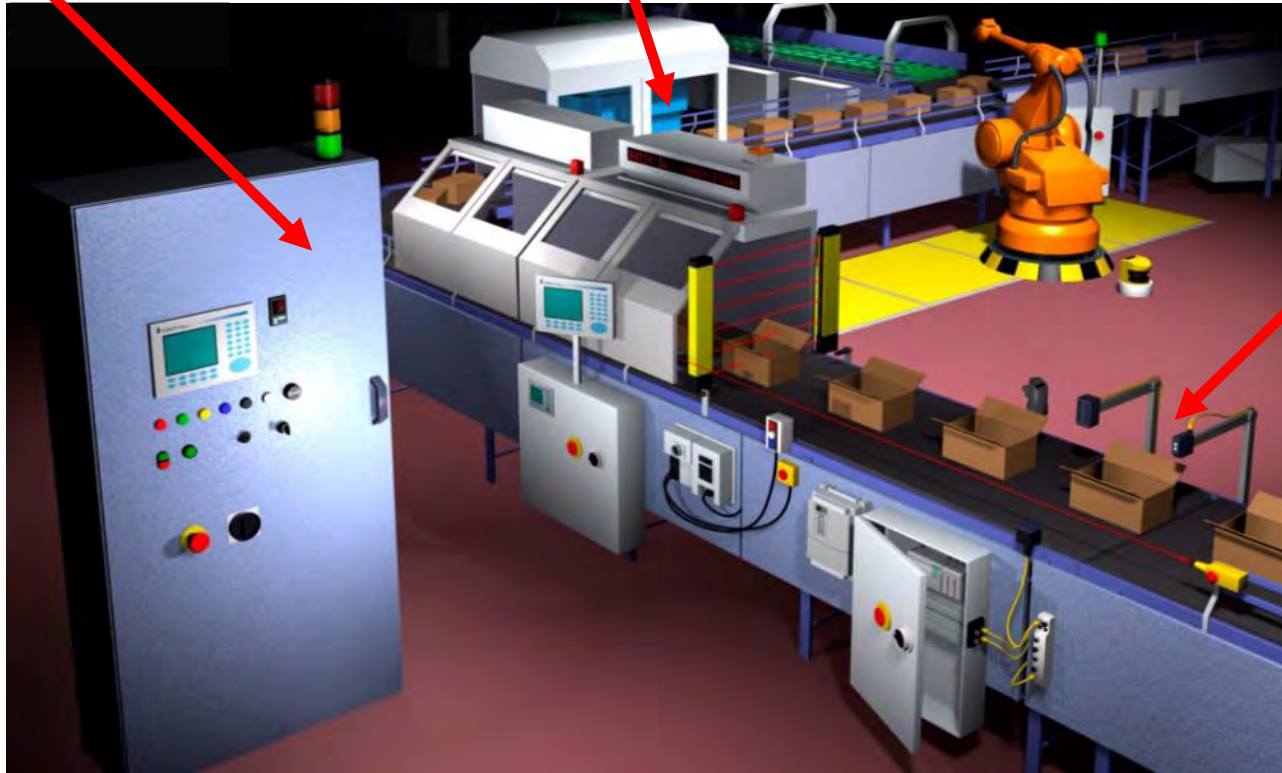


Factory Automation Modules

**Rockwell
Automation**

Control
Cabinets

Work cells



Conveyors

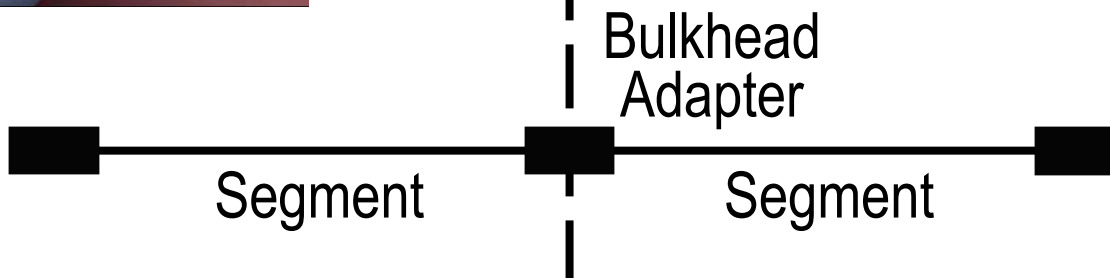


In-cabinet cabling relationship to On-machine cabling

In-cabinet
IP20
RJ45 Ethernet

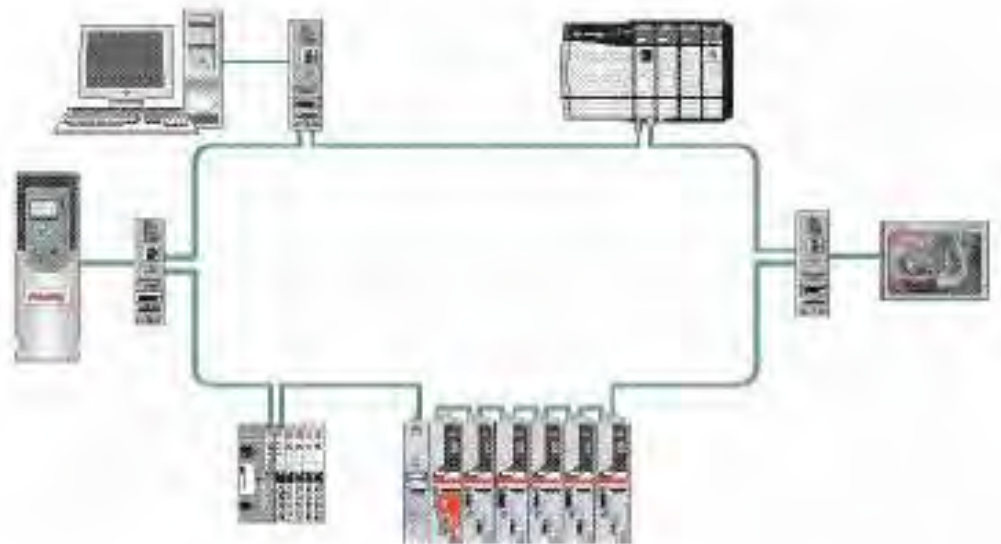


On-machine
IP67
M12 Ethernet



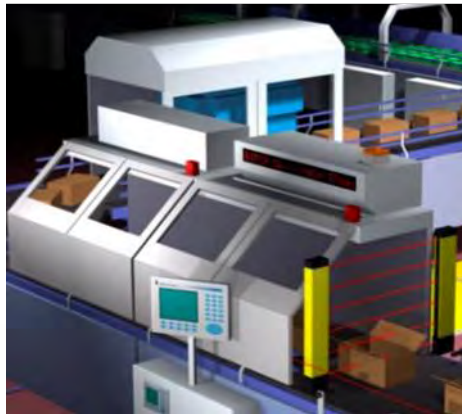


- Dense node packing
- Very short segments
- Linear or Ring configuration of dual-port nodes
 - Cable lengths rarely $> 15\text{m}$



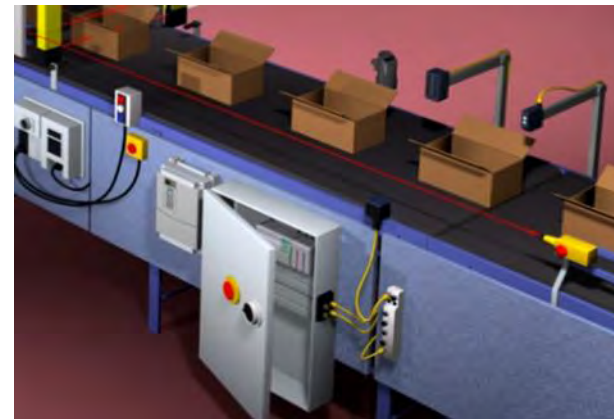
Work Cells

- Nodes spread to best physical position
- Somewhat bigger than the product
 - i.e., an Automobile
- Linear or Ring configuration of dual-port nodes
 - Cable lengths rarely > 40m



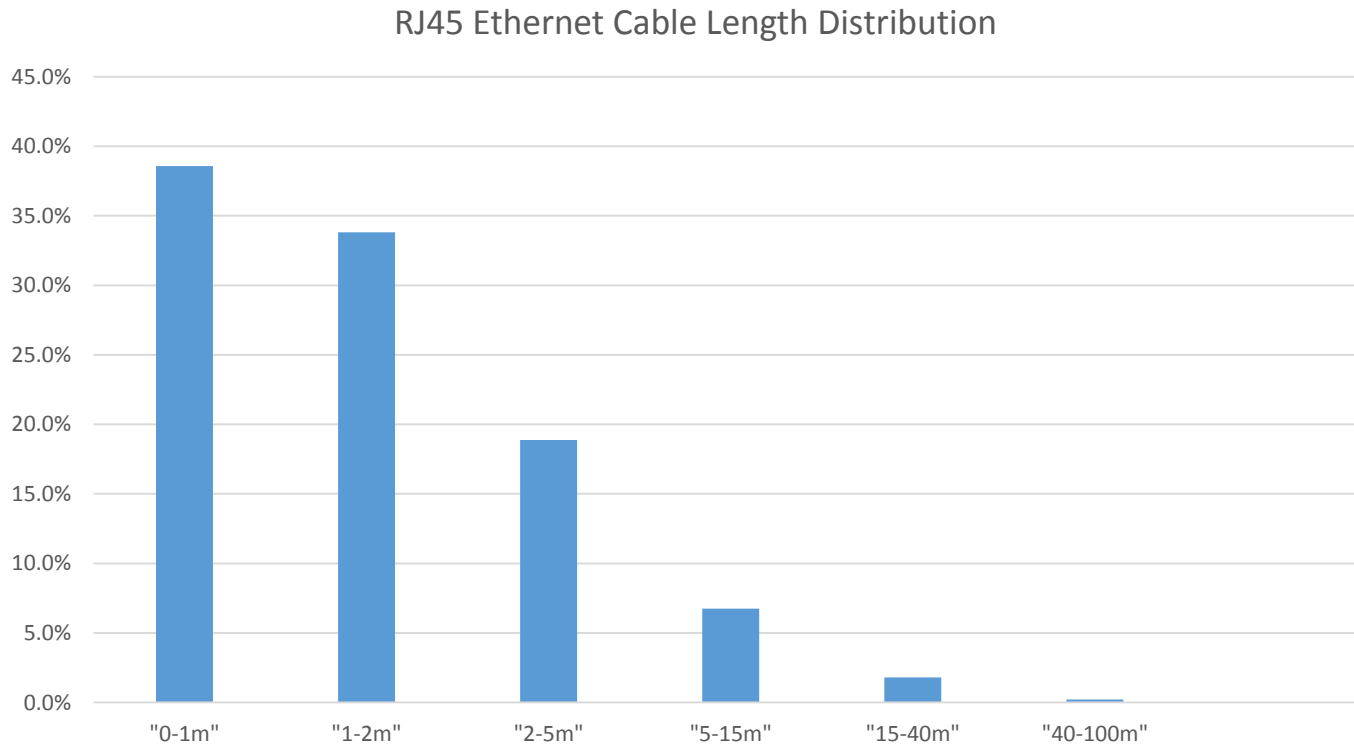
Conveyors

- Nodes distributed along length
- Often modular
 - i.e., 3m sections
- Linear or Ring configuration of dual-port nodes



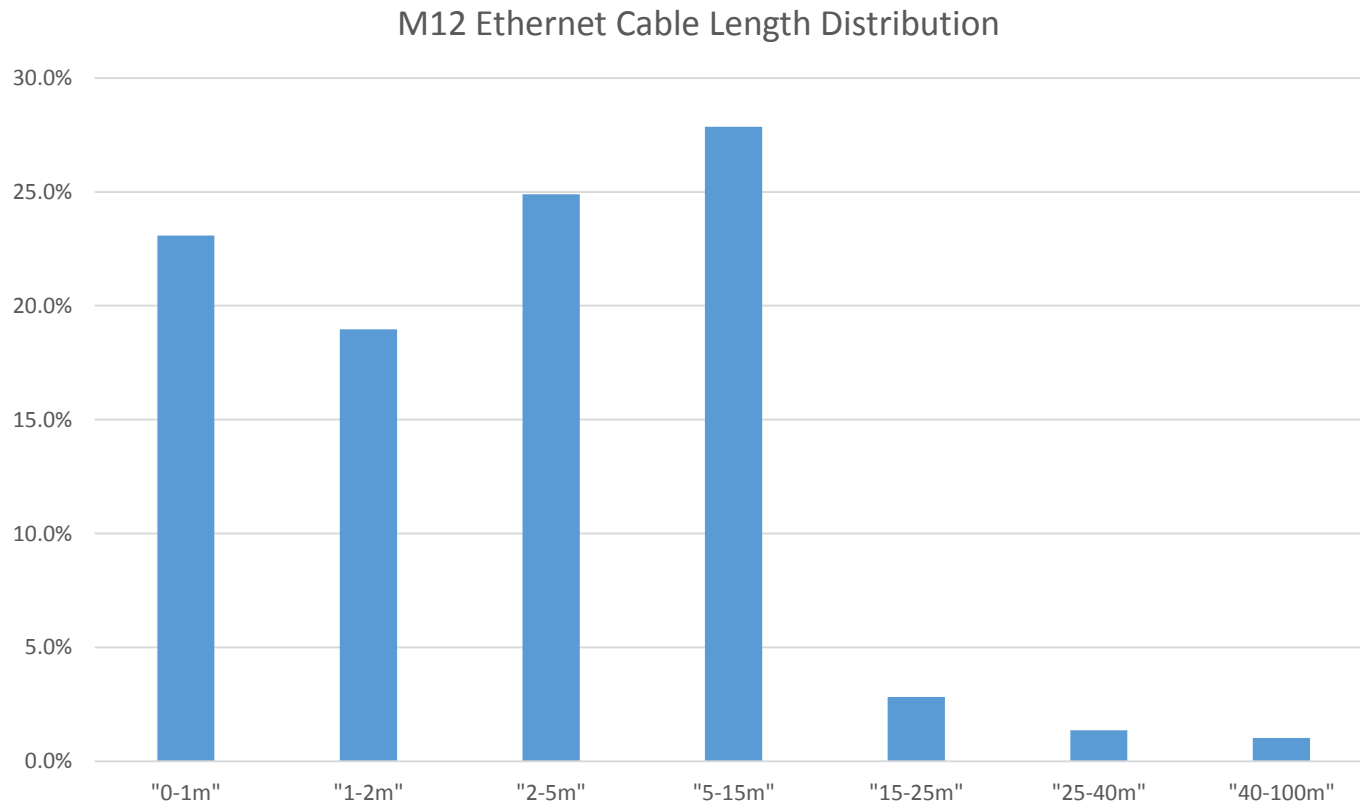
RJ45 cable length distribution estimate (pre-made, single vendor)

- Most RJ45 is in-cabinet
- The bulk is less than 15m



M12 cable length distribution estimate (pre-made, single vendor)

- All M12 is on-machine
- The bulk is less than 25m



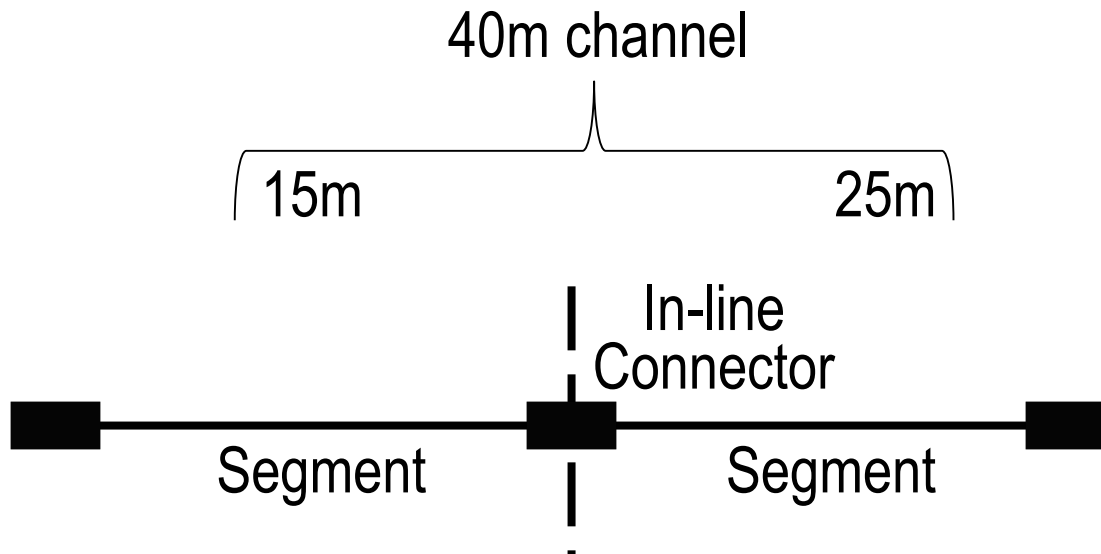
Useful minimum distance for Factory Automation

Rockwell
Automation

In-cabinet



On-machine



Process Automation “Skids”

- Many Process Automation skids are reasonably small
- On-machine requirements apply



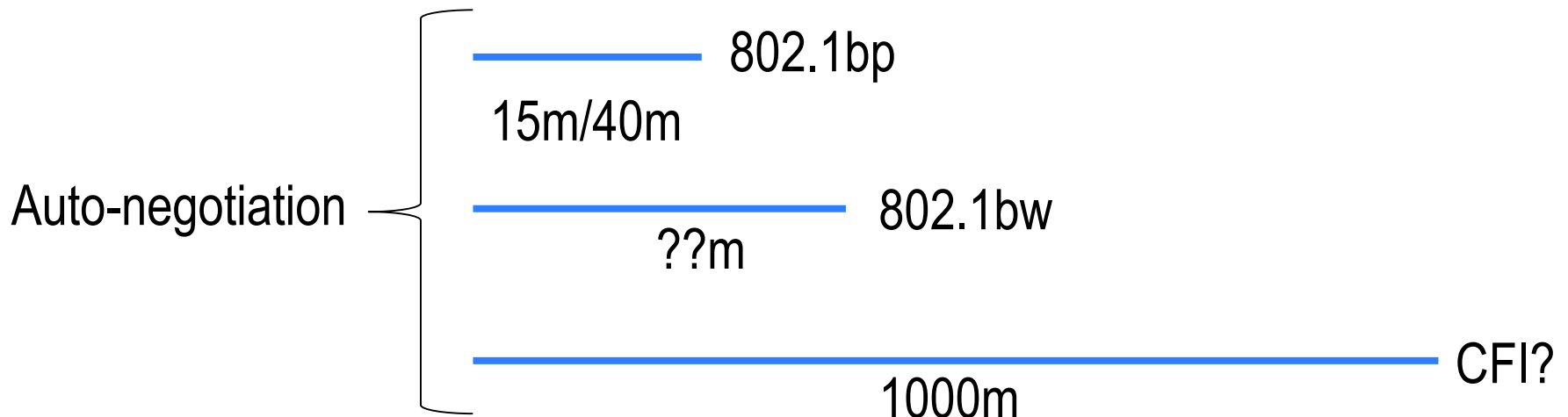
Large Process Automation Applications

- Nodes spread over large site
- Star topologies
- Legacy cable runs
 - 1000m
 - 4-20mA -> Fieldbus -> Ethernet?



Additional application coverage via hybrid systems

- Selectively extend distance with reduced rate for greater application coverage
- Minimize media converters



- Industrial Automation nodes require power
- Various applications will benefit from two strategies
 - 1 pair Ethernet within a “harness” that includes power
 - 24VDC is common
 - 1 pair Ethernet + PoDL



TR42.9 motion to adopt 1000BASE-T1

- Telecommunications Industry Association (TIA)
 - Industrial Telecommunications Infrastructure

- Motion [passed]: Add to February agenda as new business the following:
- Create a new project request for an addendum to ANSI/TIA-1005-A-2012 to add;
 - **1G industrial cabling for one pair Type B (40 meters) (1000BASE-T1) for E2 and E3 environments,**
 - 1G industrial cabling for four pair (100 meters) (1000BASE-T) for E2 and E3 environments.



Conclusions

- Major segments within Industrial Automation will benefit from the 40m optional channel length
 - Factory Automation
 - In-cabinet
 - On-machine
 - Process Automation
 - Skids
- An important portion of Process Automation applications are not met except with much greater length
 - A CFI is likely for an additional 1-pair Ethernet to meet these application needs
- Auto-negotiation extends the benefits of the individual 1-pair standards

