SPMD Usecase:
Retrofitting buildings with building automation

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Background

- Adesto acquired Echelon in 2018
- Echelon was a pioneer in protocols and devices for industrial automation and specifically in building automation

- The two leading building automation protocols:
  - Echelon's LONWORKS which was standardized by several organizations including ISO/IEC and ANSI
    - The PHY used for communications over twisted pair is called Free Topology (FT)
  - A competing Fieldbus protocol which is called BACnet MS/TP
    - The PHY used for communications over twisted pair is an RS485 transceiver

Constraints

- When a building is retrofitted with a new building automation hardware, it is quite common to replace the devices but to <u>keep the wires unchanged</u>

- The existing wires were typically used for either RS485 or FT communications

- The key characteristics of these protocols is shown in the following table:

PHY	Max Number of Nodes	Stub Length	Max Bus Length (m)
FT	64	Unlimited	2700
RS-485	~32-64	<<10m	1050

Proposed SPMD Compromise

- We won't define a 10Mb/s standard with >1Km range
- An alternative is shorter segments with nodes serving as Two Port MAC Relays (TPMRs)
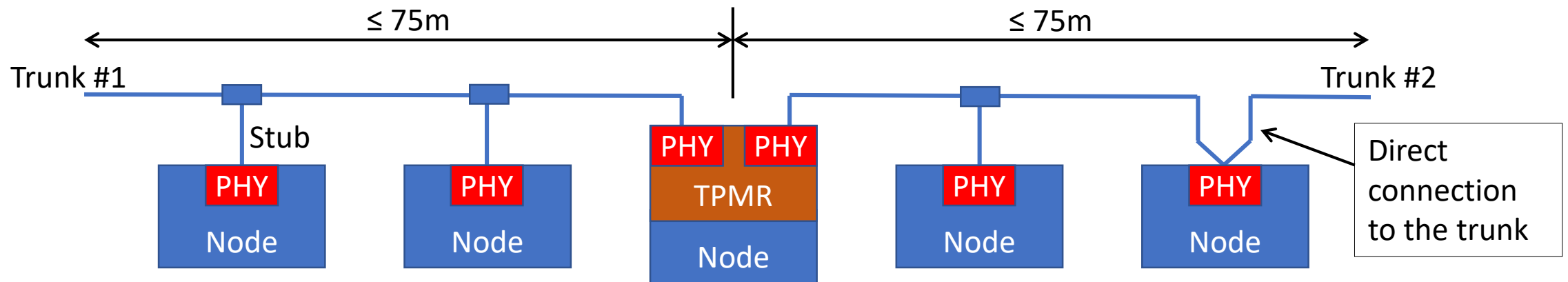
- The cost of nodes with a relay function will be higher
- Existing wire stubs may still pose an issue

Use case: Retrofitting buildings with building automation

Item	Min Value	Desired value	Extra information
Supported nodes on one mixing segment	Up to 32	Up to 64	
Minimum supported cable length	75m	>> 75m	
Acceptable cable gauges	16 through 24AWG	16 through 24AWG	
Required power for a node	?	?	
60V voltage OK?	?	?	
Required initial power allocation	?	?	
Interoperability level for the application	engineered	plug & play	
Pass through or T connection	T-connection (1m)	T-connection (>>1m)	
Hotpluggability	?	?	
Possible market size	> 10s of million devices annually		

Item	Description
Supported nodes on one mixing segment	Indicate the numbers of nodes on a single mixing segment. The minimum reflects the number of nodes needed for the usecase to make sense. The desired value represents a natural fit for the application. Both numbers could be the same.
Minimum supported cable length	Is the length you need between the two furthest nodes on the mixing segment.
Acceptable cable gauges	What cable gauges can be accepted for the application (consider cost, size, bend radius, …)
Required power for a node	How much power is needed in the node to run the application. This is the power level as measured at the connector of the device. Note that there may be a rectifier or other elements that cause some loss (2% to 5% typical).
60V voltage OK ?	Is it acceptable for the input voltage to be up to 60V ? If not, what is the reason ?
Required initial power allocation	Because this is a bus powered system, a node needs to be permitted to draw some amount of power after being plugged in. This power is used to communicate with the PSE about the power requirements. The system should be able to operate it's PHY with this power. How much power do you foresee to need for this. This is different from the "Required power for a node" which is about the complete power need of the device.
Interoperability level for the application	Choose between "plug&play" or "engineered" system. Plug & play means that a compliant device works when connected to a network of other compliant devices. There is no need for configuration or to verify if devices will be compatible or not. Engineered system means that you will use the standard within your own products or that the end user can determine which devices will work in the system.
Pass through or T connection	See slide 4-6 of http://grouper.ieee.org/groups/802/3/SPMD/public/sep19/spmd_cjones_01_0919.pdf If the application cannot be equipped with two connectors, select T connection. If it must be possible to live connect a new node without disconnecting other nodes, also select T connection.
Hotpluggability	Should it be supported to connect new devices while the bus is powered and guaranteed that this does not cause devices to be interrupted (eg. Reboot, lose long stretches of data). If not required, select no.
Possible market size	Potential market expressed in number of nodes. Do not express this in currency of any kind due to IEEE SA rules.

Thank You