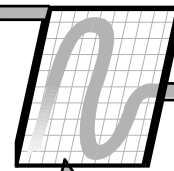


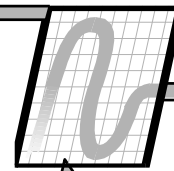
System Architecture For ANSI 709.1 (LON) Systems

Is Lon “Open”?



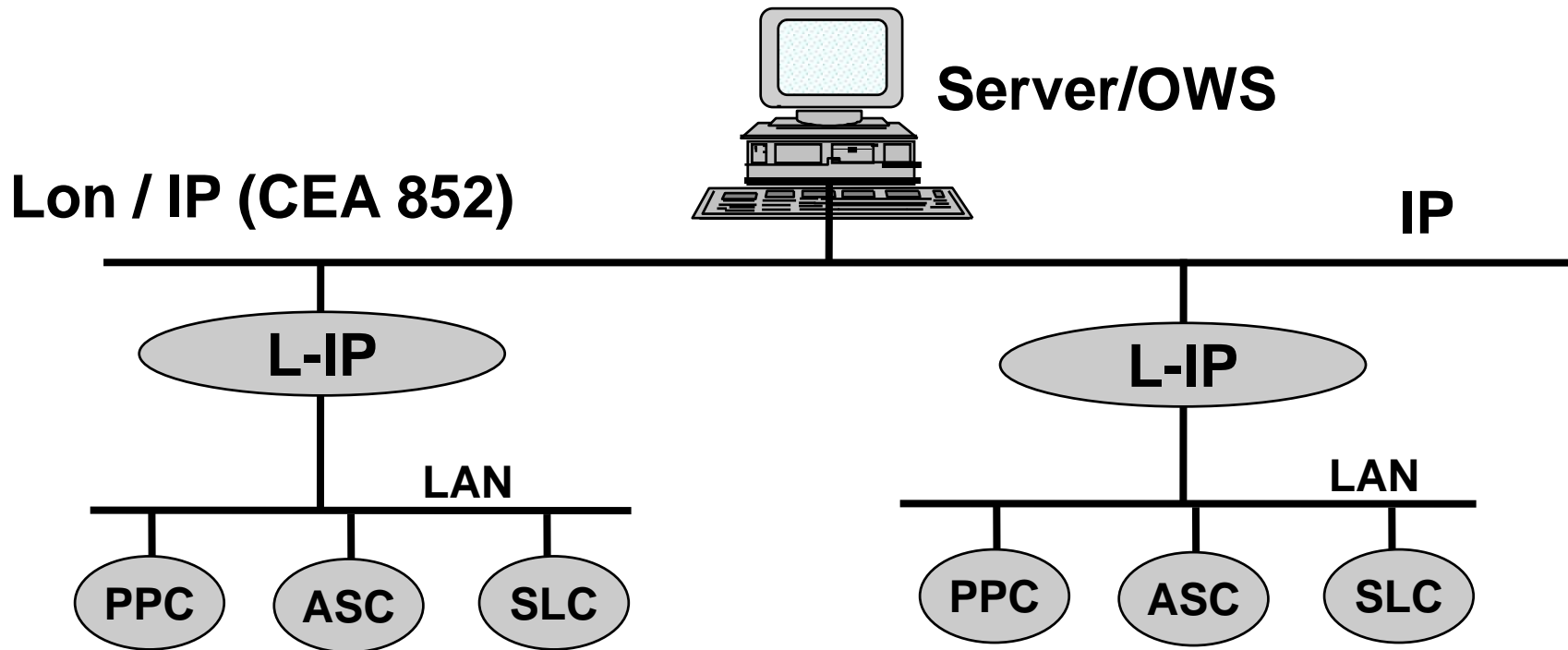
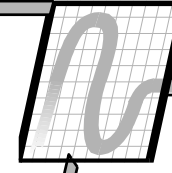
- Can it be worked on by multiple vendors?
 - Is it widely supported – a “de-facto” standard?
 - Is it supported by multiple local vendors?
 - *...by local vendors’ (PLURAL) “A-Teams”?*
- As a practical matter, probably **NOT**.
 - In the US, local support for Lon is very sketchy
 - You will likely find **at most** one competent Lon vendor in your area.
- Your first question should be:
 - “Who are the good vendors in my area?”

Objectives



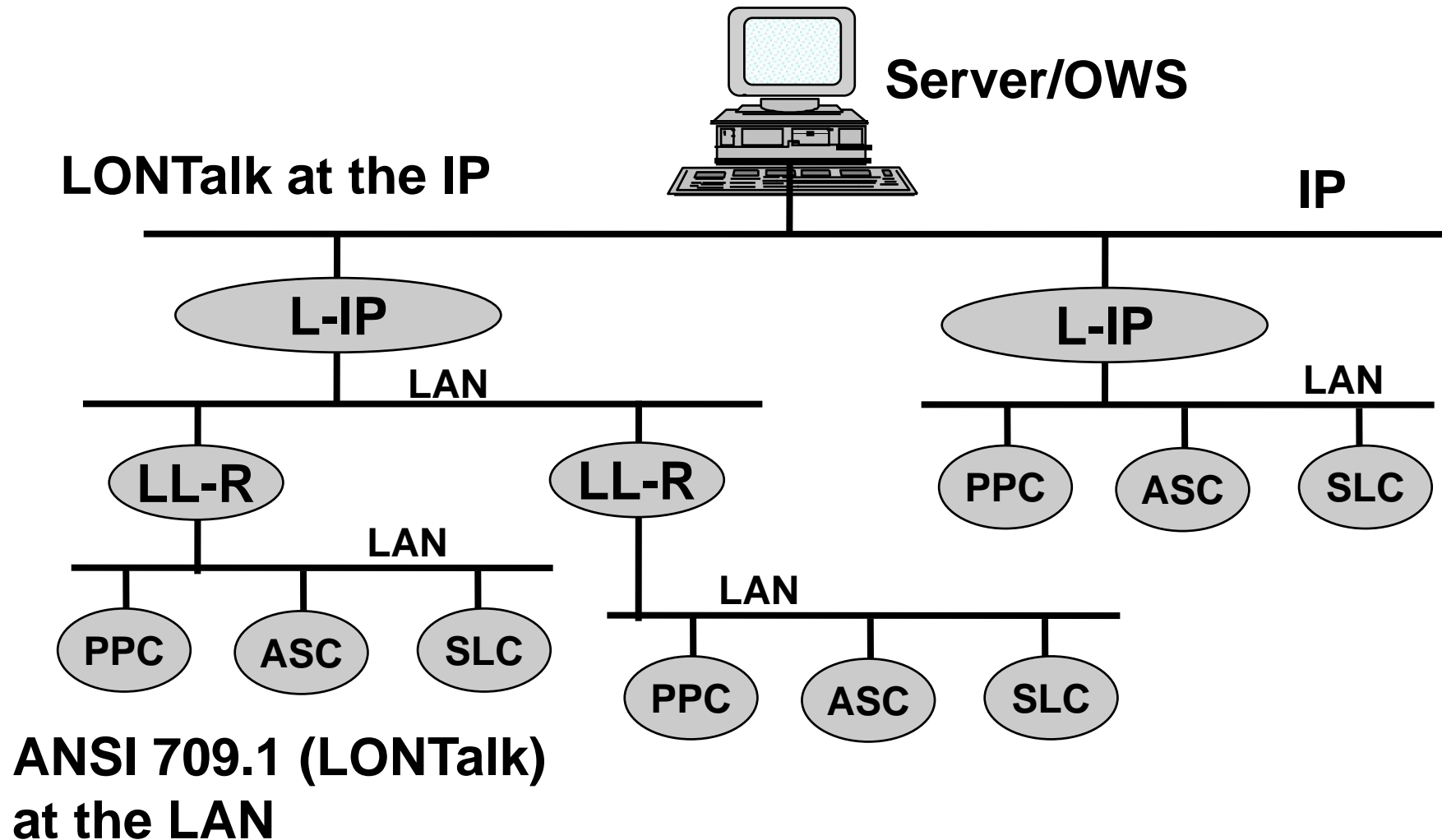
- Describe the unique characteristics of system architectures that apply to LON systems.
- Describe the basics of a LonWorks system:
 - Unified network management
 - SNVTs and SCPTs
 - Functional Profiles
- Describe the key issues in developing an Open System specification based on LonWorks

Simple LON Architecture

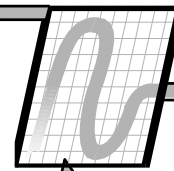


**ANSI 709.1 (LONTalk)
at the LAN**

Complex LON Architecture

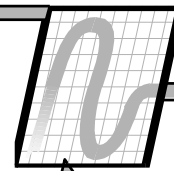


Terminology



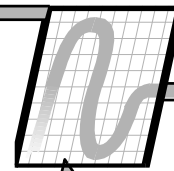
- L-IP: LON to IP (CEA 852) Router
- LL-R: LON to LON Router
- PPC: Programmable Process Controller
- SLC: Supervisory Logic Controller
- ASC: Application Specific Controller
- AGC: Application Generic Controller
- Really, it's ANSI 709.1, not "LON"
 - ANSI 709.1 is **NOT** proprietary
 - ANSI 709.1 does **NOT** require Neuron chip

LON LAN



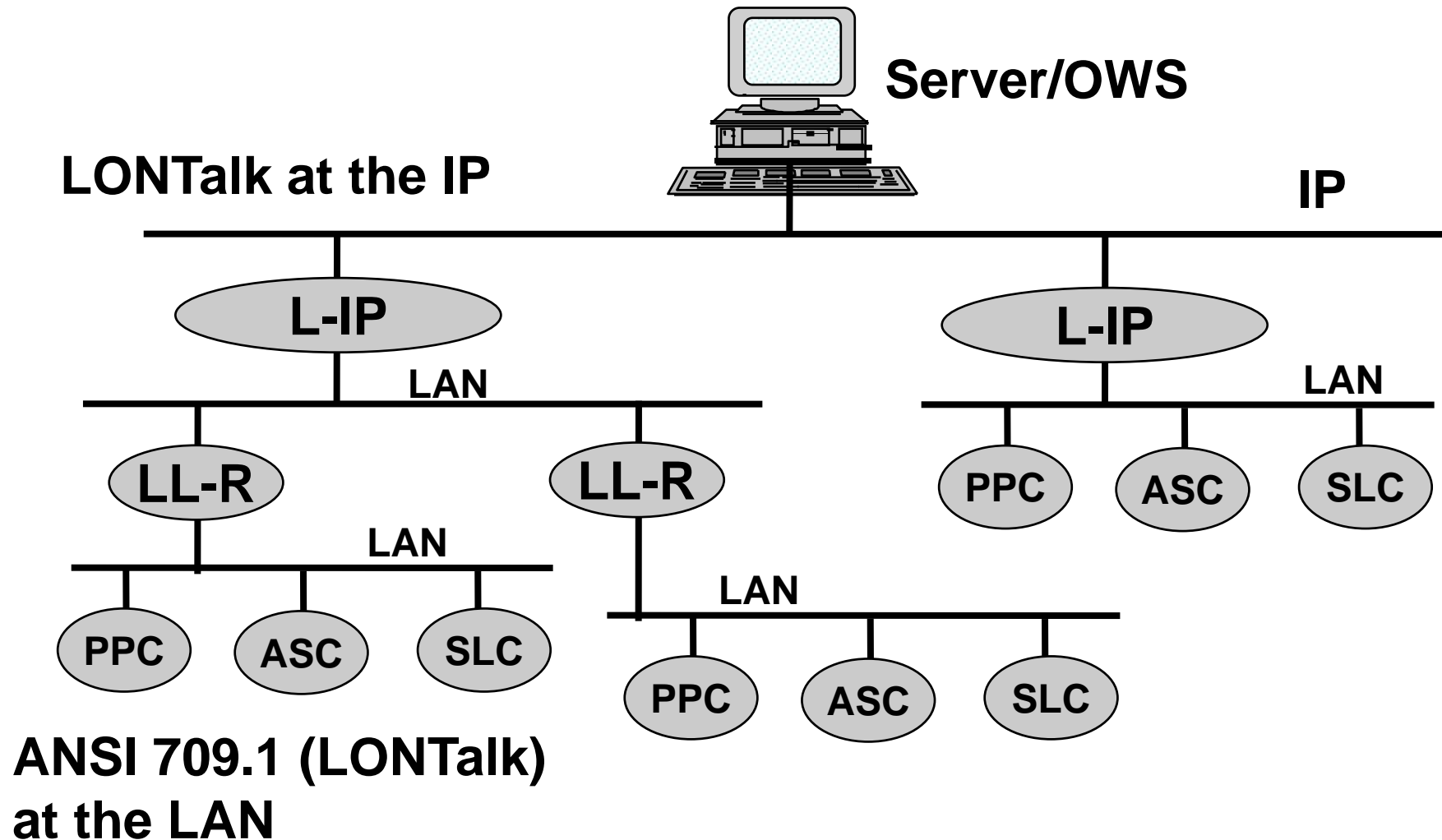
- Everything is peer-to-peer.
- Suitable for Primary controllers
- By far most common media is TP/FT-10 (ANSI)
 - 78 kbps
 - Supports routers and repeaters
- TP/XF-1250 media (not an ANSI standard)
 - 1250 kbps
 - Not many devices, mainly for backbone traffic
- CEA-852 (Lon over IP “media”) (CEA standard)
 - Almost no devices, mainly for backbone traffic

LON LAN



- Use of CEA-852 (Lon / IP) is preferred to XF-1250 unless you have problems with the IT staff
- Lon-to-Lon routers can subdivide the TP/FT-10 bus for bandwidth savings, e.g. placing an AHU controller on a separate network with its VAV boxes.
- Allows you to place a lot of devices under a TP/FT-10 (or TP/XF-1250) backbone... but:
 - Don't put too much under a single Lon-IP router.
 - May create bottleneck for getting data to front end.

Complex LON Architecture

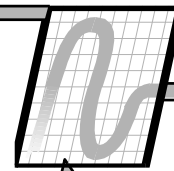


LON Network Management Tool



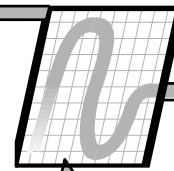
- Lon has de-facto standard(s) for network management
- Connections between Vendor A's controller and Vendor B's controller can be established using Vendor C's tool.
- Two most common standards are LNS and Tridium Niagara. Many vendors make LNS-based network management tools
- This does not include device programming!
 - But may include device *configuration*

Lon Mark SNVT

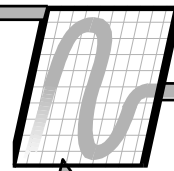


- SNVT: Standard Network Variable Type
 - defines a data format on the network.
 - A device that has a SNVT output on the network can be read by another device that has a corresponding SNVT input.
 - Over 250 SNVT types
 - SNVT_temp_p SNVT_flow
 - SNVT_pressure SNVT_occupancy
 - Generally want to require their use.
- (Lon Mark is the trade organization: vendors, A&E's installers, end users)

Functional Profiles



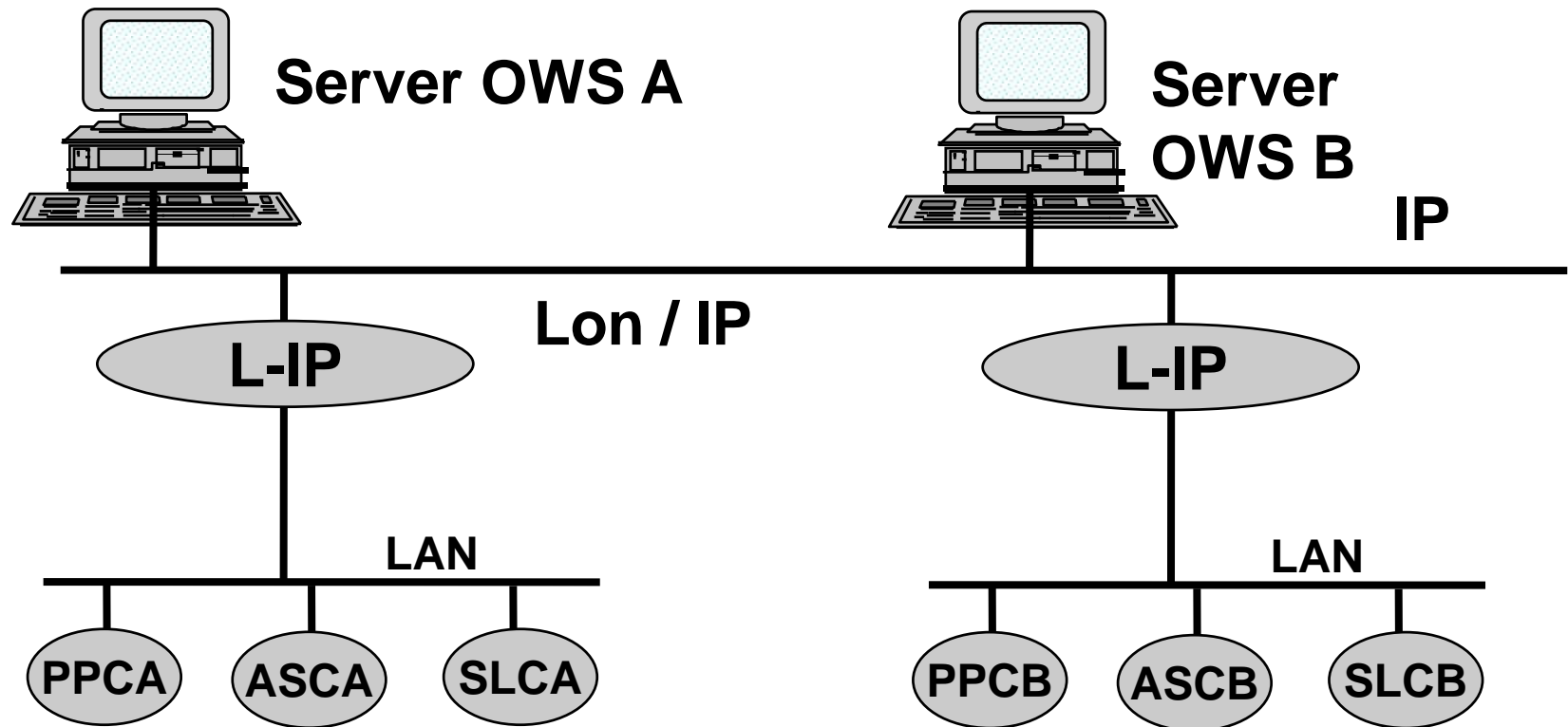
- Lon Mark defines standard applications
- Roughly 15 - 20 HVAC (many more non-HVAC)
 - VAV box controller
 - Schedule functional profile
 - Thermostat
- Functional Profiles define required and optional input and output SNVTs. Also define required and optional configuration properties
 - But has too few required SNVTs (many are optional)
- Lon Mark certifies ASCs to specific Functional Profiles.
- Generally, want to require for ASCs



Key Interoperability Issues

- If we mix multiple vendors into a single overall system, just what interoperability can we expect?
 - Data flow from one system to another?
 - Time Schedules?
 - Trend log retrieval?
 - Alarm message generation?
 - Alarm acknowledgement?
 - Adjustment of parameters?

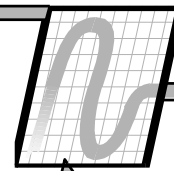
Multi-Vendor Lon System



Note: L-IP are vendor-neutral, 3rd party devices.

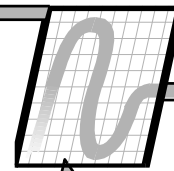
Note: May seldom need OWS B

Some Questions



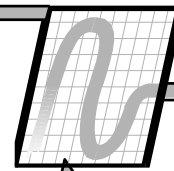
- Can data flow from Controllers-A to Controllers-B? Vice versa?
- What is the relationship between OWS A and Controllers-B? Vice versa?

Lon Data exchange



- Both controllers should use the same SNVTs
- Provide a list of required SNVT types; e.g. require SNVT_temp_p for temperature
 - Programmable controllers can be programmed to use the required SNVT type
 - ASCs use whatever SNVT type was set at the factory
 - but will generally use the “correct” type
 - LonMark certification requires specific SNVT types, but doesn’t cover all network I/O
- This is an easy requirement to meet
 - Type translators exist if you can’t avoid a mis-match

Higher Order Functions



- Vendor A's scheduler can likely schedule Vendor B's devices
- Vendor A's front end may be able to set up Vendor B's scheduler.
- Trend logs may reside in PPC or SLC.
- Trend log creation, modification, and upload is probably proprietary.
- Alarm message generation is in the PPCs and SLCs. Transmission of the message to the front end may be proprietary.
 - PPC Alarm Message is Vendor A
 - OWS must be Vendor A

Common device configuration



- SCPTs: Standard Configuration Property Type
 - Like SNVTs, but for device configuration
- Lon Mark defines hundreds of these
- Example: SCPTSetPoints

Occupied Heating

Occupied Cooling

Standby Heating

Standby Cooling

Unoccupied Heating

Unoccupied Cooling

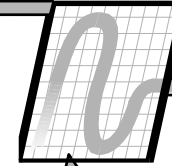
- Use of these allows standard tools for device configuration

Common device configuration



- Assuming:
 - ASC (Application Specific Controllers)
 - LNS (A de-facto network database standard)
- Many vendors provide a “LNS-plugin” that provides a device-specific GUI that runs within a standard 3rd party network management tool
- Can provide a common tool for multi-vendor device configuration
 - Reduces the burden of learning multiple tools
- NOT for programming

Configuration via LNS plugin



Johnson Controls TEC2200 Staged Series Configure

JOHNSON CONTROLS

HVT_ROOFTOP

Johnson Controls TEC2200 Staged (RoHS) (8000115500040412)

Heating - Cooling | Hardware | General | Network | Contact | About

Heating

Setpoints

Occupied: 68.0 °F

Unoccupied: 65.0 °F

Maximum limit: 90.0 °F

OA Temperature Lockout: 120.0 °F

Cycles per hour: 4

Cooling

Setpoints

Occupied: 72.0 °F

Unoccupied: 76.0 °F

Minimum limit: 54.0 °F

OA Temperature Lockout: -40.0 °F

Cycles per hour: 4

Heating cooling minimum setpoint deadband: 2 °F

Plug-In Display Units: ☐ Metric ☒ Imperial

Refresh All Cancel Apply Exit

Lnfg Online LCS_3/LCS_3/B4213 Bench/JCI TEC2203-3

JCI Rooftop Unit

Configuration Screen For Honeywell VAV W7751F

PID Configuration Input Misc Parameters Control Parameters Wiring Flow Pickup Table

Cooling Setpoints

Occupied: 23 Deg C

Standby: 25 Deg C

Unoccupied: 28 Deg C

Flow Setpoints

Maximum: 1696 m³/h

Minimum: 335 m³/h

Max Reheat: 508 m³/h

Standby: 166 m³/h

Heating Setpoints

Occupied: 21 Deg C

Standby: 19 Deg C

Unoccupied: 16 Deg C

Duct Area

Area: 0.0504 m²

Dia: CustomArea

Wall Module Setpoint Limits

Low Lim: 12.8 Deg C High Lim: 29.44 Deg C

Special SI Units

☐ Asia Flow Units

SETPOINTS: Unocc Heat < Stdby Heat < Occ.Heat < Occ.Cool < Stdby Cool < Unocc Cool

FLOW SETPOINTS: Minimum < Max. Reheat < Maximum

VAV2 PLUGIN VERSION 4.3.2

OK Cancel Apply Help

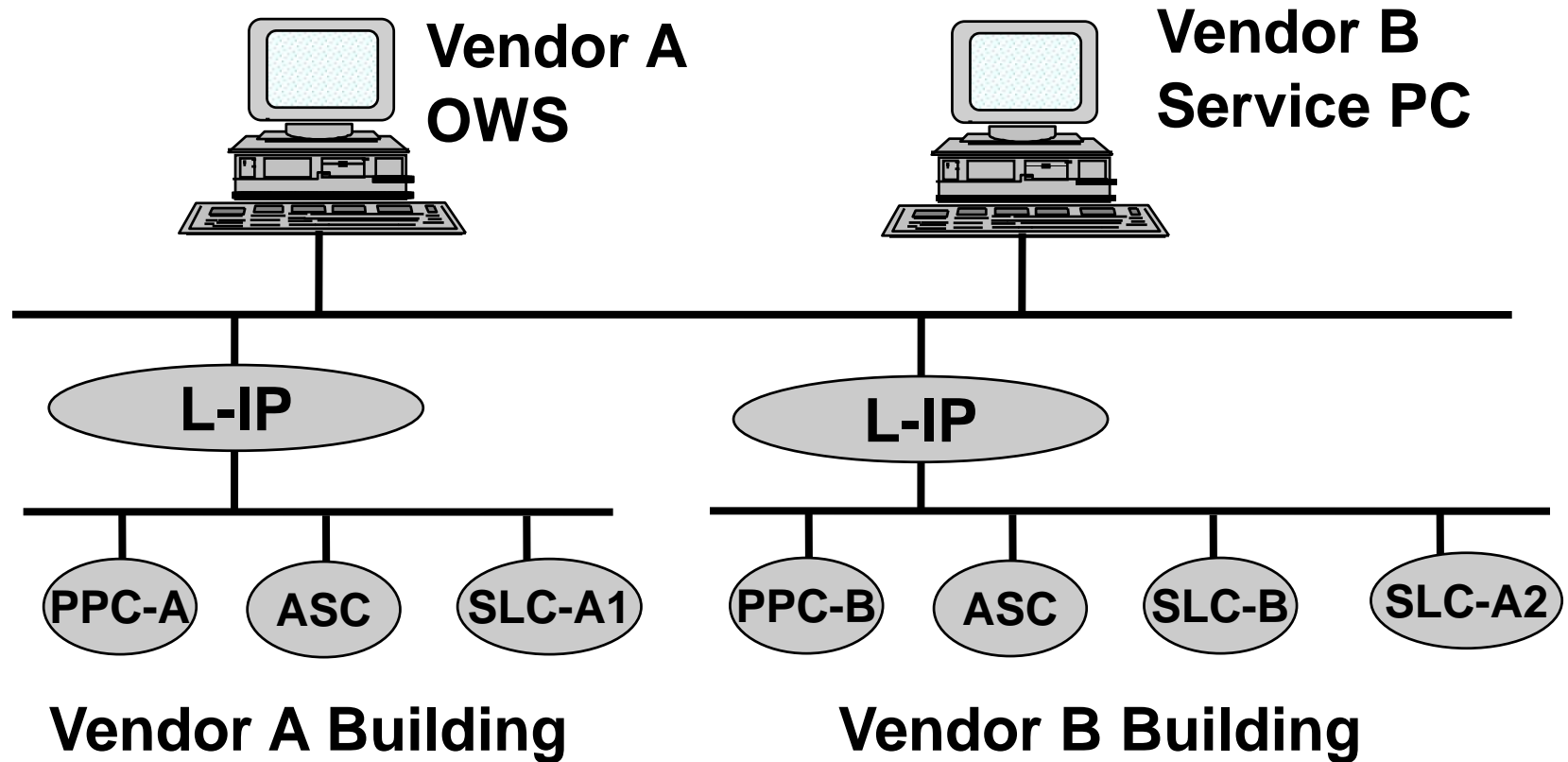
Honeywell VAV Controller

Two All Lon Vendors

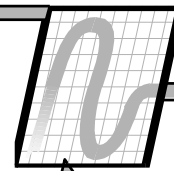


- Vendor A is the lead OWS.
- Vendor A has the network management tool
 - But it could be Vendor B's tool (or 3rd party)
 - This includes ASC configuration for both/all vendors (assuming LNS plugins)
- Vendor B has one or more buildings.
- Vendor B still needs software for programming programmable devices.
- Vendor B may need software for alarming and trending tasks.

Architecture

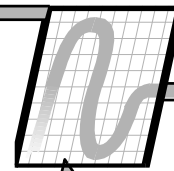


Two All Lon Vendors



- PPC-A: Programmable process controller belonging to vendor A. Must be programmed by Vendor A's application programming tool.
- ASC: LonMark certified application specific controller. Any vendor, but most likely belong to the vendor that controls the building.
- Use of LNS plugin allows configuration from any vendor's LNS-based network management tool.

Two All Lon Vendors



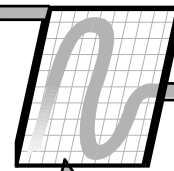
- SLC-A1: Vendor A's SLC. Supervisory logic, scheduling, trend logging and alarm handling.
- SLC-A2: Vendor A's SLC installed in a vendor B building. Executes scheduling, logging and alarm handling. Does not execute supervisory logic.
 - There are ways to avoid this, but they are clunky or result in reduced functionality
- SLC-B: Vendor B SLC. Executes supervisory logic only. Probably does not execute scheduling, trend logging or alarm handling.

Other Issues with Lon



- Management of the network database
- Data flow across IT subnets
- Clear definition of functionality from Vendor A's OWS to Vendor B's devices with respect to configuration.
- Ongoing development of functional profiles

Summary



- Multi-vendor installations, whether based on LonWorks or BACnet bring to the table a need to design and specify at a much deeper level than with single vendor solutions.
- You need to jump in with both feet or stay out of the water!