

CorpsLON Challenges & Issues



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Some Big Picture Challenges and Issues

- Need to be familiar with and aware of Open systems challenges
- Contractors not necessarily familiar with LonWorks or CorpsLON
- Know what kinds of things to look for and how to avoid proprietary elements and implementations of LonWorks
- Planning is necessary
- Devil is in the Details



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Do you need “Open”?

- Will probably have higher first cost - but future benefits
- Example -- initially have stand-alone building with “no” intent to extend / integrate
 - hospital with own maintenance staff and no “plans” to integrate
 - Gets installed with proprietary controls
 - Hospital becomes the 400 lb. gorilla driving future base-wide decisions or hospital wants to do an expansion
- Beware short-term decisions with long-term impact

Planning is key!



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Controller Types:

ASC vs. AGC vs. GPPC

- Simple configuration to a specific application - generally fairly straightforward and intuitive
- LonMark certified
- LNS Plug-ins
 - Configuration through common Network Configuration Tool (NCT)
 - No proprietary tool required
- May not perform exact sequence
- Need to stock different controllers for different applications for spare parts



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Controller Types: ASC vs. AGC vs. GPPC

- Not (meaningfully) certified by LonMark
- Need for programming
 - Depending on vendor, may be easy or not
 - But probably not
 - Probably “housekeeping” details related to network communications and other controller overhead
 - Mistakes can impact whole network segment
 - Hard to debug / find mistakes
 - May be graphical, line-code, or some mix
- Need for special proprietary programming tool
- Can get exact sequence
- Can stock one part and use for multiple applications



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Controller Types: ASC vs. AGC vs. GPPC

- In-between ASC and GPPC
- Limited number of vendors (as of August 2008)
- LonMark certified (but not for your application)
- Configuration via LNS plug-in
 - No need for proprietary tool
 - Depending on vendor, may be easy or not
 - Probably easier than GPPC
 - Many details handled for you
 - Mistakes limited to “sequence doesn’t work”
 - Configuration **not** intuitive as with ASC
 - May need proprietary tool to access full features
- Can (probably) get exact sequence
- Can stock one part and use for multiple applications



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AGC vs. GPPC



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Sequence Implementation: Physical Hardware Constraints

- Controllers are certified by Functional Profile (FP), which describes network communications in support of a specific logical function
- Hardware devices may contain logic for multiple functional profiles
- “Traditional” AHU controller has the equivalent of many FPs:
 - Heating/Cooling Coil Control FP
 - MA with Economizer FP
 - RF Flow matching FP
 - Scheduling FP
- You can’t buy a “CorpsLON Return Fan VAV” controller



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FP/Hardware Limitations

- Three options:
 - Dumb-down the sequence
 - Get a programmable controller (GPPC or AGC)
 - Use multiple ASC
 - Distributed Control == Spreading a single sequence among multiple controllers.
- Example: VAV with Return Fan
 - Closest Certified device is 'Discharge Air Controller'. But it doesn't fit our communication needs (lack of SNVTs).
 - What solution to permit?
 - Simplify the sequence to use an existing certified 'Discharge Air Controller'
 - Keep the sequence and accept distributed control or programmable controllers



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Distributed Control (aka Node-Spray) -vs- Programmable Control

- Both have complexities, advantages, disadvantages
 - Node-Sprayed systems more difficult to decipher
 - ASC configuration more straight forward
 - ASC's required to have LNS 'plug-ins' (UFGS requirement)
 - Programmable controllers are not LonMark certified, but are acceptable as long as they meet UFGS requirements
 - GPPC programming can be complex / requires expertise
 - GPPCs require proprietary software programming tools



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Distributed Control vs. Programmable Controllers



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Network Media and Transceivers

- TP-1250 media is not recognized by any standards body ☹
- UFGS requires TP/FT-10 and/or Ethernet media
- CEA 852 vs. other approaches to Lon / IP
 - RNI (Remote Network Interface) ☹
 - Web servers ☹



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Functional Profile Elements

- Network Variables: SNVT, UNVT ☹
- Configuration Properties: SCPT, UCPT
- UNVT: User-defined Network Variable Type
 - Defined by device manufacturer (similar to SNVTs)
 - Non-standard communications (no one else may understand it) so it can close the system
 - **Not acceptable**
- UCPT: While proprietary, they are OK
 - If configured via plug-in or documented



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System Scheduler

- Scheduling of equipment via “System Scheduler” Sequence of Operation
 - Takes inputs from UMCS and determines outputs to equipment based on specified “priorities”
 - Includes default/backup schedule
- Not ‘off-the-shelf’. Must be programmed.
- Contractors/installers may not be familiar with this approach



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Supervisory Controllers: The Good

- Very common with vendors
 - Johnson Controls NAE
 - Tridium (and others) JACE (UNC, etc.)
 - Many others in BACnet and proprietary markets
- Provides
 - Scheduling
 - Logging (trending)
 - Alarming
 - May perform control sequences
 - May perform gateway functions and/or manage secondary network
 - May provide web interface to controls
 - Other supervisory interface functions



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Supervisory Controllers: The Bad and the Ugly

- Generally communicates via Closed protocol with UMCS
 - NOT via 709.1 or 852
 - Acts as a gateway, not a router
- Generally configured via non-standard / proprietary tools
 - NOT via SCPT, SNVT, or UCPT
- Generally requires use of same vendor's UMCS and/or tools
- Extends proprietary UMCS into every building
- Extends proprietary UMCS into control functionality
- Not specified in UFGS



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Building Management Interface (BMI)

- BMI should only be used in the absence of a UMCS as a “stop-gap”
- Provides
 - Web services (will serve up web pages)
 - Scheduling, Logging (trending), Alarming
 - Other supervisory interface functions
- Does not support Open (ANSI/CEA 709.1/852) communications over the base wide network (does not perform routing functions) ☹
- Not specified in UFGS



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Local Display Panel (LDP)

- Depending on vendor/model, features can include:
 - Real-time clock
 - Control/scheduling of heating, a/c, lighting ...
 - Load management
 - Local control/manual override (issue: access control/password protection)
 - Metering/alarms
- Configuration of functionality generally non-standard
 - May not use SCPT, SNVT, or UCPT
 - Vendor lock-in as with Supervisory Controllers
- Use/enforce UFGS requirements to perform the above functions



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Local Display Panel (LDP) Overrides and Integration Issues

- 709.1 does not have good override capability in the protocol
 - CorpsLON defines a method of implementing overrides
 - CorpsLON does NOT define priorities
 - If multiple senders override a point, the last one to “write” *WINS*
 - M&C server and LDPs can “fight”, resulting in confusion
- LDP “bindings” to points may not be done in a standard manner in LNS
 - Database merging at integration may break LDP bindings



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LDPs for viewing
LDPs for overrides
Extent of LDP use



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A Note on Packaged Controls

- Consider requiring packaged units to include factory installed LonMark certified controls and LNS plug-ins?
 - Think simple
 - Can avoid/limit problems with field installed controls
 - Will it limit packaged unit suppliers?
 - Need to define/consider controls contractor, System Integrator (SI) coordination and responsibilities



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Proprietary Databases

- Proprietary LonWorks
 - Some vendors use closed & proprietary databases/tools
 - These databases usually reside in field-level supervisory controllers. Results in 'lock-in' (down to the building level).
- LNS network management is open and non-proprietary



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HOA (Hand-Off-Auto) Switches

- Revised spec has designer options
- HOA's can be integral to controller or external
- Binary: Auto / On / Off
- Analog (two levels of functionality)
 - 3 position switch: Auto / 0% / 100%
 - 2 position switch: Auto / Adjustable 0% – 100%
 - With a pot for true hand adjustments
 - External HOAs must be this type
- Note: HOA can easily be abused – make sure O&M staff uses for troubleshooting, not to “fix” the problem



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HOA Switches



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Multiple LNS Databases

- LNS database can contain 32,000+ nodes
 - Practical limit dependent on M&C Software
 - Limit should be over 1,000 nodes
- M&C Software can access multiple LNS databases:
 - Practical limit dependent on M&C Software
 - Limit should be over 10
- For any reasonably-sized UMCS, M&C server will likely access multiple LNS databases
 - Note: We generally blur this distinction and talk about “the” LNS database when we often mean “the collection of LNS databases at the M&C server”



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Management of Multiple LNS Databases

- Integration of new buildings will require either:
 - New LNS database
 - Merge of building database into existing LNS database
- How to avoid finger pointing between installation / SI / building vendor over LNS database
 - Building vendor may “own” database through warranty
- How many LNS databases? Content of each?
 - Many small ones or several big ones?
 - Group buildings into distinct LNS databases by:
 - Location?
 - Function?
 - Vendor?
 - Support staff?



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LNS Database Management



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Network Configuration Tool (NCT)

- Network Configuration Tool (NCT) needed for troubleshooting
 - Exposes lots more information than M&C software (M&C points are limited by integration \$\$)
 - Can change things via SCPT/UCPT/SNVT (and LNS Plug-ins) that aren't exposed for overrides
- What machine(s) (where) is the NCT installed on?
 - On a single computer at the “front-end” – Can it be used from the field?
 - Can users ‘remote desktop’ into that server?
 - Can users get IP connections in the field?
 - In the field (laptop)



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Field NCT will likely require local LNS database

- Can NCT use “Master” UMCS/BAS database?
 - Danger of corrupting the master database for the whole BAS
 - May be DOIM/IT issues associated with access to LNS DB from a laptop in the building – May not be able to get IP connection
 - Performance seriously limits ability to use “master” LNS database from TP/FT-10 in the field
- NCT uses local database on that laptop
 - How to keep it consistent with master
 - How to port changes in local database back to master
 - Lots of work and chance for mistakes!



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Does O&M staff use NCT?

- Does staff have training to use properly?
- Use of NCT is *dangerous!*
- UMCS, LDP, and HOA as first-line troubleshooting
- Issues associated with use in the field – Further complicated by the possibility of multiple copies of NCT each accessing local LNS databases!
- Finger pointing possible between SI and O&M Staff



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Network Configuration Tool



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“Proprietary” BACnet

- BACnet (or Lon) devices can be made to interoperate: “Open”
- BACnet (or Lon) devices can be made to not interoperate: “Closed”
- BACnet has more options
- It is harder to force BACnet vendors to interoperate
- Many vendors will push Lon in the building, BACnet at the basewide level



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BACnet

- ANSI/CEA-709.1B (LonTalk) → The protocol
- LonWorks → the technology
- ANSI/ASHRAE 135 (BACnet) → the protocol
- ???????? → the technology
- Sometimes ??? = BACnet, but this is confusing.
- Spec for an Open LonWorks System = ...
 - “Specification for an Open System based on the BACnet protocol”
 - “Specification for an Open BACnet System”



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BACnet – Some Considerations

- No database standard available
 - Need vendor-specific (proprietary) configuration tools
 - May need multiple tools to replace one device
 - No “map” of the network; hard to decipher who talks to who
- Even within “standard” way of doing things there are options:
 - What do you schedule? Occupancy? Set Point?
 - What units do you use?
 - How do you look for alarms?



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BACnet “community” - Some Considerations -

- Seems less comfortable with System Integrator concept
- Fewer small/third party providers
- Less focus on device interchangeability, more focus on system interoperability
- Programmable controllers seem more prevalent



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BACnet – Bottom Line

- Could write a prescriptive specification for an “Open enough” system based on BACnet but:
 - Difficult – need to be very prescriptive
 - Still not integrated as tightly or as user friendly due to need for multiple network configuration tools
- The current Navy-only spec for BACnet is NOT a spec for an Open System
- BACnet is not “bad”, there just isn’t a spec available for a BACnet Open system and creating one is hard



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(according to Wikipedia...) **FUD**

Fear, uncertainty, and doubt (FUD) is a sales or marketing strategy of disseminating negative (and vague) information on a competitor's product. The term originated to describe disinformation tactics in the computer hardware industry and has since been used more broadly. FUD is a manifestation of the appeal to fear.



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BACnet – The FUD

- _____ is moving from LonWorks to BACnet:
 - No evidence of a migration away from LonWorks
 - Some/several vendors doing both
 - More than just the “big players” in the LonWorks arena – new, smaller manufacturers like Distech
- BACnet is cheaper
 - Really? Where’s the evidence?
 - Anecdotally this is not true, or BACnet is more
 - Need to compare total cost, not first cost
 - Need to compare Open to Open. (Proprietary systems usually have lower first cost)



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BACnet – The FUD

- BACnet does Scheduling, Alarming, Trending better:
 - Maybe slightly
 - Options in BACnet hurt this argument
 - LonWorks can meet Gov't needs fine – just do it as specified!
- LonTalk is designed for small data transfer and BACnet is better at the IP level – so you should translate to BACnet even if you used LonWorks in the building
 - BACnet may be better at large data transfers
 - We're controlling HVAC, not streaming video!
 - Why translate if we don't need to (and we don't)



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BACnet – The FUD

- BACnet was developed by ASHRAE and LonTalk was developed by a private company, so BACnet is more:
 - Open
 - Does “horse built by committee” mean anything?
 - Stable / standard
 - Why two incompatible BACnet/IP annexes?
- The origin is irrelevant. Look at the protocol as it is today and decide on that.



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BACnet – The FUD

- LonTalk is proprietary to Echelon because of the Neuron chip
 - It's an ANSI/CEA standard available to all
 - There are non-Neuron based implementations
 - Echelon doesn't manufacture the Neuron
 - Yes, Echelon manages NodeIDs and gets paid a small fee per device but this is miniscule. MAC addresses for Ethernet network cards are done similarly.



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BACnet® Testing Laboratories (BTL) Listed Devices

Manufacturer	Device						BACnet Devices
	(B-OWS)	(B-BC)	(B-AAC)	(B-ASC)	(B-SA)	(B-SS)	
ABB				√			1
Alerton		√	√	√			3
Automated Logic		√	√		√		22
Carel S.p.A.				√			2
Daikin Industries				√			2
Delta Controls		√	√	√			55
Honeywell International			√				13
Honeywell Korea				√	√		2
iControls				√			1
Johnson Controls, Inc.		√		√		√	8
KMC Controls			√	√			13
Lithonia Lighting				√			1
Phoenix Controls				√			1
Reliable Controls		√	√	√			11
Siemens		√	√	√			7
TAC		√	√	√			54
Teletrol					√		1
Viconics				√			3
TOTAL Devices:	0	39	68	58	8	1	200

BTL 'Listed' & LonMark 'Certified' Device Comparison								
Manufacturer						BACnet Devices	LonWorks Devices	
ABB						1	6	
Alerton						3	-	
Automated Logic						22	-	
Carel S.p.A.						2	1	
Daikin Industries						2	-	
Delta Controls						55	-	
Honeywell International						13	40	
Honeywell Korea						2	-	
iControls						1	-	
Johnson Controls, Inc.						8	33	
KMC Controls						13	-	
Lithonia Lighting						1	-	
Phoenix Controls						1	1	
Reliable Controls						11	-	
Siemens						7	88	
TAC						54	-	
Teletrol						1	-	
Viconics						3	2	
Continued...								

BTL Listed & LonMark Certified Device Comparison (Continued)								
Manufacturer						BACnet Devices	LonWorks Devices	
Circon						-	15	
Distech						-	18	
ESUSA						-	4	
McQuay						-	7	
Trane						-	22	
TAC/Invensys						-	6	
Others						-	215	
						200	458	




<http://www.bacnetinternational.org/btl/>
<http://www.LonMark.org/certifications/device%5Fcertification/product%5Fcatalog/>
as of: 6/25/2007



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LonWorks -vs- BACnet (as of 6/25/07)

- LonWorks
 - 458 LonMark Certified devices
 - 65 vendors
- BACnet
 - 200 BTL Listed devices
 - 18 vendors



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