# HVAC Controls Open Protocol & Architecture: Facts & Fiction

*A description of the primary components of an HVAC DDC controls system, a discussion of what constitutes "open protocol and architecture" and information to help you ask the right questions when considering different systems.*

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HVAC Controls Open Protocol & Architecture: Facts & Fiction

Meet the Presenters

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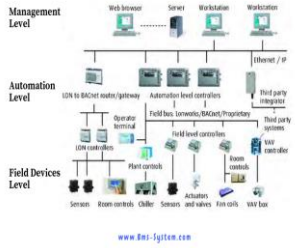
HVAC Controls Architecture

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HVAC Controls Architecture

Field Device Level

- Sensors, T-stats, etc
- Dampers, Control Valves, etc
- Equipment
  - AHUs
  - Boilers
  - Chillers
  - VAVs

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HVAC Controls Architecture

Automation Level - Controllers

- Every piece of equipment requires a controller
- Packaged vs DDC
- Configurable vs programmable
  - Comparable to photography
- Basically, a mini-computer

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HVAC Controls Architecture

Automation Level - Controllers

- Software added by the manufacturer
- Requires licensing – varies by manufacturer
- Points are limited
- Programmed to utilize a protocol

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HVAC Controls Architecture

Automation Level – Points

- A command or information sent or received by a controller
  - Physical measurement or a calculated value
  - Inputs & outputs – they are relative to the controller
- Two types of points
  - Digital/binary = 2-position (i.e., start/stop)
  - Analog = modulating (i.e., temp, humidity, heating coil valve, supply air fan)
- D/I, D/O, A/I, A/O

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HVAC Controls Architecture

Automation Level – Points

- Know your points!
- Create a points list to share with contractors & engineers
- NOTE: Few engineers provide a points list in specifications
- Points determine the size & quantity of controllers

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HVAC Controls Architecture

Automation Level – Protocol

- Technically, a set of rules to follow, or format, to send and receive points between devices
- Basically, the "language" controllers talk
- The only ASHRAE-approved "open" protocol is BACnet
- Other protocols considered "open" are LonWorks & Modbus.

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HVAC Controls Architecture

Automation Level - Protocol

BACnet-LonWorks-Modbus comparison

https://www.setra.com/blog/what-is-the-difference-between-bacnet-modbus-and-lonworks

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Automation Level – Protocol

- BACnet is a robust translator
- More manufacturers are using BACnet
- Controls manufacturers who used to use a protocol now use BACnet
- Not all who claim be "open" exclusively use BACnet
- Controllers may use multiple protocols
  - Field-level controller may talk BACnet to devices or packaged controllers but a proprietary protocol with other field controllers and/or the "head-end"

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Management Level

- What the user sees and interacts with - typically referred to as the user interface or "head end"
- Also refers to the platform (i.e., Niagara, Desigo, FX, Metasys, Tracer)
  - Think of it as being similar to Excel
- NOTE: May be at the controller level or on a field control panel w/ access to a browser
- May only have limited control of equipment points
  - Read only, read/write, write a limited value

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HVAC Controls Architecture

AND there's one more level…

The Enterprise Level

- Above the Management Level
- The Internet of Things (IoT)
- Where HVAC Controls integrate with other systems (Fire, Security, Lighting, etc)
- Where HVAC Controls connects to 3rd party data sources such as National Weather Service

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HVAC Controls Architecture

The JACE – Savior of the world?

- Acronym for Java Application Control Engine
  - ➢NOTE: Java support is an issue for existing JACEs
- An automation-level mechanism allowing connectivity to multiple controllers
- Requires communication cards or software add-ons to "speak" with controllers
  - ➢NOTE: A 3rd party "aftermarket" product may be required

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HVAC Controls Architecture

The JACE – continued

- Comes in 1 size, physically, but each is expandable to accommodate multiple devices
- Hardware is manufactured by a Honeywell-owned firm
- Software is the Niagara platform – by the same firm
- Available to other manufacturers

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So, what makes HVAC Controls "open"?

- BACnet Protocol?
- Accessible Architecture?
- Competition?
- Low cost?

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Facts to Consider

- HVAC DDC Controls require software
- Software requires updates
- Updates = subscription fees
- Working on software requires tools & training (owner and/or contractors must pay for software tools and training employees to work with them)
- It's an "IT Thing"

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Facts to Consider

- JACES won't necessarily make your HVAC Controls "open" (depending on how you define "open")
- A proprietary protocol doesn't necessarily mean its "closed"
- The devil is in the details (that is… the program).
  - ➢Who can access it?
  - ➢Who can make changes?
  - ➢Who do you want to access it?

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Facts to Consider

- Adding a new control manufacturer won't necessarily eliminate an existing controls manufacturer and/or contractor
- Adding a new system won't be able to fix programming issues with the existing controls
- Review the specs for your next project – will it unnecessarily add another "player"?

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Other Considerations

- Remote access/how do you want to access it
- Data security
- Integration:
  - Fire Systems
  - Security Systems
  - Lighting/Blinds
  - Peak Demand Limiting
  - Energy Management

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Controls Contractors

- Personnel required to create & maintain a controls system
  - Application Engineers
  - Graphic Designers
  - Installers
  - Programmers
  - 24/7 Call center
  - Professional Engineers
  - Project Managers
- What are their credentials – training and manufacturers certified to work on?

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- How long have they been in business?
- Will the firm be around in 10 years? 5 years?
- Graphics: who builds them, what do they look like, are they interactive?
- See their systems yourself
- Get references

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- What is the protocol used between ALL devices?
- Integration with other systems
- Subscription fees (when do you "pay the piper"?)
- Can the owner train it's employees to service the system?

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Questions?

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