



Introductions

- Randy Silva
- Employed at ICOM Mechanical for 16 years
- Started out as an apprentice 1987
- Worked in the field on all types of systems from small package to build up refrigeration systems and built up water systems
- Started working on controls in my second year in the apprentice.
- Had an aptitude for the engineering side of HVAC that ICOM owners noticed
- Was asked to work in the office as an engineer/project manager
- Currently designing control systems, clean rooms and some comfort HVAC applications with primary emphasis on troubleshooting design problems, and system commissioning
- Currently NEBB TAB certified and am the NEBB TAB supervisor at ICOM



Direct Digital Controls

- What I intend to cover.
 - We are going to cover direct digital controls the basics and how they have evolved to their current configurations.
 - How controls are applied in building systems.
 - The type of work I perform.
 - The type of work typically performed by field technicians.



Direct Digital Controls

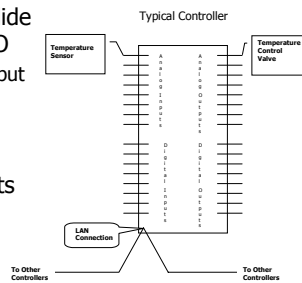
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| <ul style="list-style-type: none"> ■ Various Meanings <ul style="list-style-type: none"> ■ Originally controllers and devices communicated ■ Transition to common analog and digital signals ■ Now full circle to "Smart Devices" | <ul style="list-style-type: none"> ■ Digital means " On – Off " ■ Analog means infinite positions ■ Both terms apply to control systems but in different ways |
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Control "Systems" AKA BAS (Building Automation Systems)

- A control/BAS system is a collection of I/O with one common point of manipulation.
- Most manufactures use the buzz word (anachronism) HMI, which stands for Human Machine Interface. We (normal people) usually call it a computer.
- The I/O in today's world usually takes the form of distributed controllers.
 - Distributed controllers are controllers with limited I/O (at most 32 points) and small amounts of memory.
 - They are commonly applied to a single piece of equipment (like one air handler)

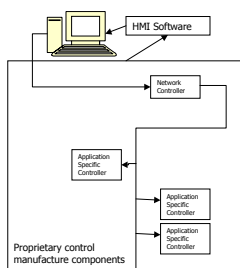
BAS "The Basics"

- In the previous slide we mentioned I/O
 - I/O stands for Input Output
- Virtually all controllers have inputs and outputs



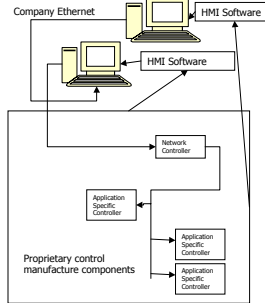
Traditional BAS Architecture

- The distributed controllers are then connected by a "LAN" so they can communicate back to the HMI.



Modified Traditional BAS Architecture

- Each manufacture in order to meet customer requests devised a way to add "connectivity" to their systems.
- Their software still needs to be on the external machines



Protocols

- Protocols are a way of transmitting data from one location to another.
- One protocol that most of you may have heard of is TCP/IP. The protocol of the internet. TCP/IP stands for Transmission Communication Protocol/Internet Protocol
- There are different protocols used in building automation control systems
 - Traditional BAS used proprietary protocols.
 - 2 new types are Bacnet and LONWorks

New BAS Protocols

- Bacnet
 - Conceived of by ASHRAE
 - Support largely for HVAC applications
 - Communication is almost one way.
 - No programming capabilities, just an information porthole
- LONWorks
 - Conceived of by the Echelon Corp.
 - Support for many platforms and growing
 - With cooperation from manufactures nearly a full featured interface
 - Programming can be done from the main HMI

Why not TCP/IP

- It would seem to most that if the TCP/IP protocol exists, and it supports multiple platforms, and data types, it would be a logical choice for BAS to use — why not?
- This is a debatable item, but in our opinion there are some flaws
 - TCP/IP is designed for the "Internet". There are complex needs for graphics and large data transfer.
 - BAS systems are sending and receiving small specialized types of data. The data is not something currently being passed through the WWW and TCP/IP would not be efficient at handling the data.
 - In short TCP/IP will need to evolve slightly to accommodate the needs of BAS, and the BAS vendors will have to drive that evolution.

Why not TCP/IP

- There are some other technical reasons for the slow adaptation of TCP/IP into the BAS world.
- Manufactures are slow to adapt the protocol for down stream devices because they would require more memory and processing capabilities that current hardware. That in turns means a cost increase and may position them at a market disadvantage.
- Their front ends would need to be capable of assigning IP addresses in order for mainstream IT departments to accept them.

Typical Design Architecture

- LONWorks Front End with a Variety of Controllers

