DDC Basics

Introduction

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Agenda

- Control Basics
- Communication Fundamentals
- Protocols
- Integration
- The future of BAS
- Questions | Discussion

Control Basics

- What is BAS?

Control Basics

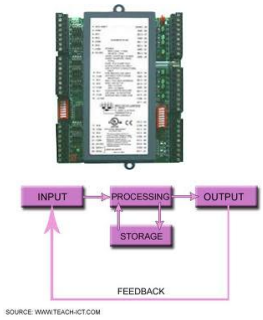
- ACS, DDC, BAS, BMS, EMS, FMS, …..
- Building Automation System:
  - A network of integrated computer components that automatically control a wide range of building operations such as HVAC and lighting.

History

- History of Building Controls
  - 1950's - Basic Pneumatics
  - 1960's - Advanced Pneumatics (Receiver/Controller)
  - 1970's - Basic Central Control (DDC)
  - 1980's - Distributed Logic Controllers (DDC)
  - 1990's - Open Protocols (BACnet, Lon)
  - 2000's - Web Based Controls, Wireless

Controllers

- Controllers
  - Freely Programmable
  - Application Specific
- Functions
  - Input Data (Inputs)
  - Process Input (Controller)
  - Generate Output (Outputs)
  - Communicate to other Controllers



Inputs

- Analog Inputs (AI)
  - Bring an analog signal into the controller
  - Temperature (Thermistor, RTD)
  - Humidity | Pressure – (0-10 VDC, 4-20 ma)

- Binary or Digital Inputs (BI or DI)
  - Read a Binary signal
  - Contacts | Current Switch | Pressure Switch

Outputs

- Analog Outputs (AO)
  - Generate a modulating signal out of the controller
  - Valves | Actuators | Speed Control (VFD)
  - 0-10 VDC | 4-20 ma

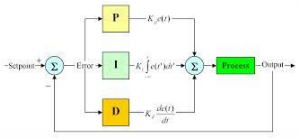
- Binary or Digital Output (BO or DO)
  - Enable/Disable a device or piece of equipment
  - Relays | Two position Actuators

PID Loops

- PID Loops
  - Proportional
    - The proportional term produces an output value that is proportional to the current error value…
  - Integral
    - The contribution from the integral term is proportional to both the magnitude of the error and the duration of the error…
  - Derivative
    - The derivative of the process error is calculated by determining the slope of the error over time…

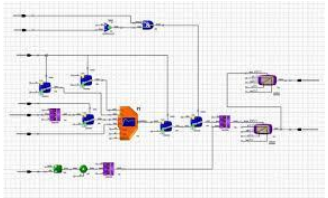
PID Loops

- PID Loops
  - Proportional
    - 10 deg P means 1 deg error = 10% movement
  - Integral
    - Continuously adjusts for error
  - Derivative
    - For don't use
    - Adjust for how fast you are moving towards or away from set point



Control Basics

- Control Languages
  - Graphical Based
    - Function Blocks
    - Similar to pneumatic devices
  - Text Based
    - "If then do this……"
    - Similar to Basic programming

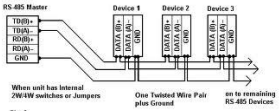


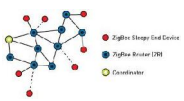
Gateways

- Gateways
  - Convert one protocol to another
    - Pro's
      - Lower cost
    - Con's
      - Single point of failure
      - Functionality
      - Less information

Communication

- Communication of BAS Systems
  - Ethernet - Hard Wired
  - Ethernet - Wireless
  - RS-485 (2 wire serial comm)
  - Wireless - Zigbee Mesh





Protocols

- Protocols
  - Language for a controller
  - Proprietary
  - Open
    - BACnet (ASHRAE)
    - Lon (Echelon)
    - Modbus (Modicon)
    - XML

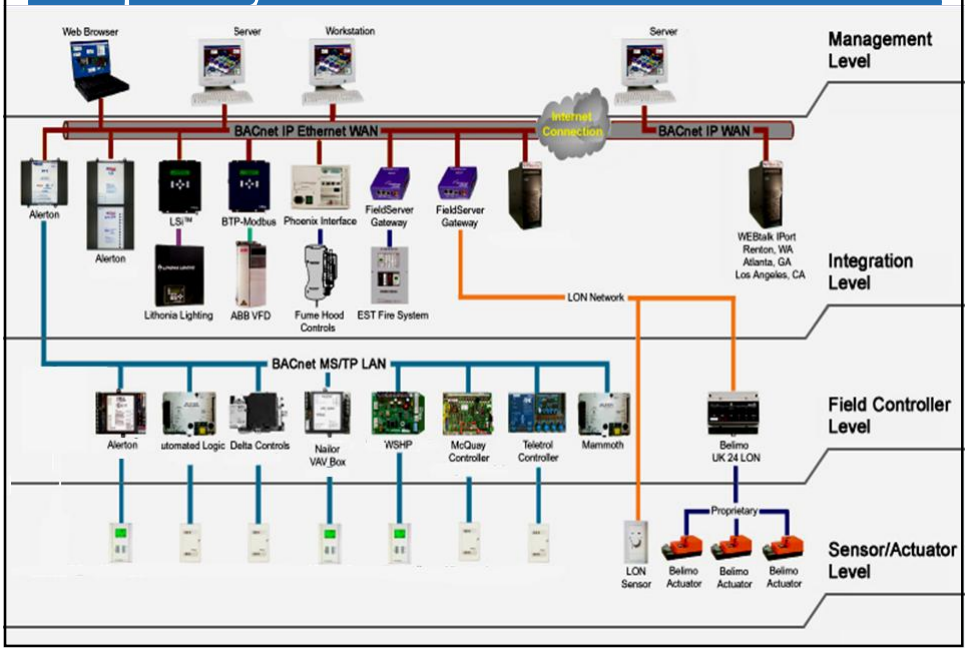
Protocols

- Why BACnet?
  - Kind of like pneumatics
  - Has what an owner wants in a BAS
    - Alarming
    - Trending
    - Scheduling
  - Ethernet Routing
  - Self Discovery
  - Not a panacea
    - Different programming types
    - Not everyone does it the same…

BACnet Vendors

AutomatedLogic Corporation, Alerton, Carrier, Delta Controls, Honeywell, Notifier by Honeywell, EMCtrl, Phoenix Controls, Schneider Electric, Siemens, Tridium, Trend, Airtek, American Auto-Matrix, Control Solutions Inc. Minnesota, Distech Controls, Ebtron, I-Controls, Johnson Controls, KMC Controls, Reliable Controls, Samsung SDS, Philips teletrol, Viconics, ABB, Belimo, Blueridge Technologies, Carel, cimetrics, Contemporary Controls, Daikin, Danfoss, FieldServer Technologies, Greystone Accuracy by Design, ITT, Kele, Lithonia Lighting, McQuay International, Mitsubishi Electric Changes for the Better, Nara, neptronic, Opera gas sensors, Samsung Heavy Industries, Trane, Veris Industries, WattStopper, azbil Yamatake Corporation, Yaskawa The Drive for Quality, DEOS control systems, kieback&peter, PUVA The art of having control, Samson, Sauter Creating Sustainable Environments, BCI, Building Technology Systems Ltd., Control Technologies Putting You in Control

Open System Architecture



Integration

- What is it…
  - Integration (from the Latin integer, meaning whole or entire) generally means combining parts so that they work together or form a whole…
  - Two or more different manufacturers devices talk to each other…

Integration

- Pro's
  - Can lower cost… competition
  - Potentially options available
  - New devices/systems being added daily
- Con's
  - You get what you get – application specific
  - Additional field coordination
  - Not everybody does BACnet the same

The future of BAS

- Energy Awareness
  - Energy Analytics
  - Metering (Sub-metering)
  - Dashboards
- Continuous Commissioning/Fault Detection
  - 24/7 intelligence watching equipment
  - Finding the energy wasters $$$
- Connectivity to everything

Questions?

Thank you for your time!