BUILDING MANAGEMENT SYSTEMS
AGENDA

1. Introduction
2. BMS – What is it?
3. System Overview and Components
4. Why is it Important to Consultants?
5. The Future of BMS
BMS Server

- Also referred to as the BMS Head End
- A Graphical User Interface (GUI) for monitoring and control of the BMS
- Displays live data from the field devices
- Allows user to adjust setpoints/schedules
- Can produce trends of historical data
- Displays alarms
- Licensed software so important to verify restrictions when reviewing tenders
Main Plant Controllers

- Often referred to as a Network Controller
- Can be modular or fixed Input/Output (I/O)
- Ethernet connectivity to BMS Network
- Software programmable
- Data can be shared between controllers
Terminal Unit Controllers

- Used for single plant operations such as:
  - Fan Coil units
  - Variable Air Volume boxes
  - Constant Air Volume boxes
  - Chilled Beams
- Limited flexibility as intended for single application
- Communicate over TCP/IP or RS485 network
- Can have integrated damper motors and pressure sensor for VAVs
- Mounted locally in the field with the plant controlled
**Inputs and Outputs**

### Inputs
- **AI** – Analog Input
  - Passive Resistance (Temp)
  - 0-10V (Temp/Hum/DP/Vel)
  - 4-20mA (Gas Det/Vel)
- **DI** – Digital Input (Volt Free)
  - Fan/Damper/Pump status
  - Pressure/Flow switch
  - Fire/Lift/Door status

### Outputs
- **AO** – Analog Output
  - 0-10V (VSD Speed/Valve/Damper)
- **DO** – Digital Output
  - VFC outputs (Fan/Pump enable)
  - Relay/Triac (Dampers/Valves/Heaters)
**Inputs and Outputs**

**Relay vs. Triac**

- Triacs have no moving parts
- Relays are electromechanical will ‘Click’ when energised
- Triacs have a long life cycle
- Relays have a finite number of operations
- Triacs are useful for Pulse Width Modulation (PWM)

**0-100% Actuator Operation with DO**

- Two output channels used to drive
- Actuator drive time known
- Will re-stroke occasionally for calibration
High Level Interface (HLI)

- Allows monitoring and control of third party devices
- Uses a communications open protocol instead of hard wiring
- Typical applications:
  - Chillers
  - Boilers
  - Generators
  - Terminal Unit Controllers
  - Energy and Utility Meters
  - Split unit interfaces
- Transmits data over ethernet or communications fieldbus
Communications Protocols

- Protocols are effectively communications languages
- The also require a transport medium e.g. ethernet
- Historically manufacturers used proprietary protocols
- Now mostly open protocols
- Open protocols are published to allow different manufacturers to communicate using the same language
Common Open Protocols

**BACnet**

- Developed by ASHRAE
- Most common open protocol for BMS
- Can be IP (ethernet) or MS/TP (RS485)
- Devices on the network can be auto-discovered
- If traffic is managed correctly, networks can be large
- Common Applications:
  - BMS Controllers
  - Chiller Interface
  - Split System Interfaces
Common Open Protocols

Modbus

- Can be TCP/IP (ethernet) or serial (RS232 or RS485)
- Maximum of 32 Devices per trunk
- No auto-discovery so point addresses must be known
- All device communication parameters need to match
- Not as ‘plug and play’ as BACnet devices
- Common applications:
  - Electricity metering
  - Variable speed drive control/monitoring
  - Fire & Security interfaces
Common Open Protocols

M-Bus

- Used almost exclusively for water and gas meters
- Far superior to pulse counting for metering
- Devices can be loop powered and battery backed up
- Addressing is best carried out before installation
- Also exist as wireless devices using radio frequencies
Common Open Protocols

DALI

- Used for lighting applications
- Can be luminaires or drivers (switches/sensors)
- Maximum of 64 addresses per gateway
- Can be easily grouped and configured into scenes
- Can be re-grouped if space use changes
- DALI2 now allows further data to be read from devices
Common Open Protocols

KNX

- Mainly for lighting applications
- KNX native switches/sensors/blind motors
- Can also be used for small scale HVAC applications
- Can be integrated with BMS using gateways
Why is it Important for Consultants – Where do we fit in?

- We are the direct link to the client
- We are responsible for delivering an effective design
- We can control the design outcome
- BMS input early in design makes everyone's life easier
- The HVAC equipment can account for up to 80% of a buildings energy usage – important to manage this well
Choosing a BMS Head End

Is it Easy to Use?
- Scheduling
- Web Based
- Built in Algorithms – easy to implement
- Easy to Program, powerful
- Intuitive Graphics
- Trending, Alarming
- Robust flexible architecture
- Open Protocol
- Reporting
Equipment Selection

- Is there a HLI option for the main plant – is it beneficial?
- Have I ensured the equipment selected has the right inputs/outputs
- Have I specified that third party interfaces must be open protocol (and defined the protocol)
- Is there a need for local control?
- Are there point or licensing restrictions?
**Metering**

- NABERSNZ/Greenstar driving necessity for accurate metering
- Unfortunately metering is always left until last
- Meters need to be in accessible locations
- Calibration needs to be carried out as part of DLP/Building Tuning
- This all needs to documented as par of O&M/Commissioning information
- Accurate and reliable metering enables effective energy management
The Future of BMS
- Systems were designed in isolation
- Different infrastructures, interface etc
- The system vendors were proprietary of the network and the data

**IN THE PAST**

**VERTICAL APPROACH**

- ICN allows communication between different systems, but systems still need server and software from the vendor.
- The different systems are not talking the same protocol
- More secure against Cyber attack

**HORIZONTAL APPROACH**
THANK YOU
QUESTIONS?
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