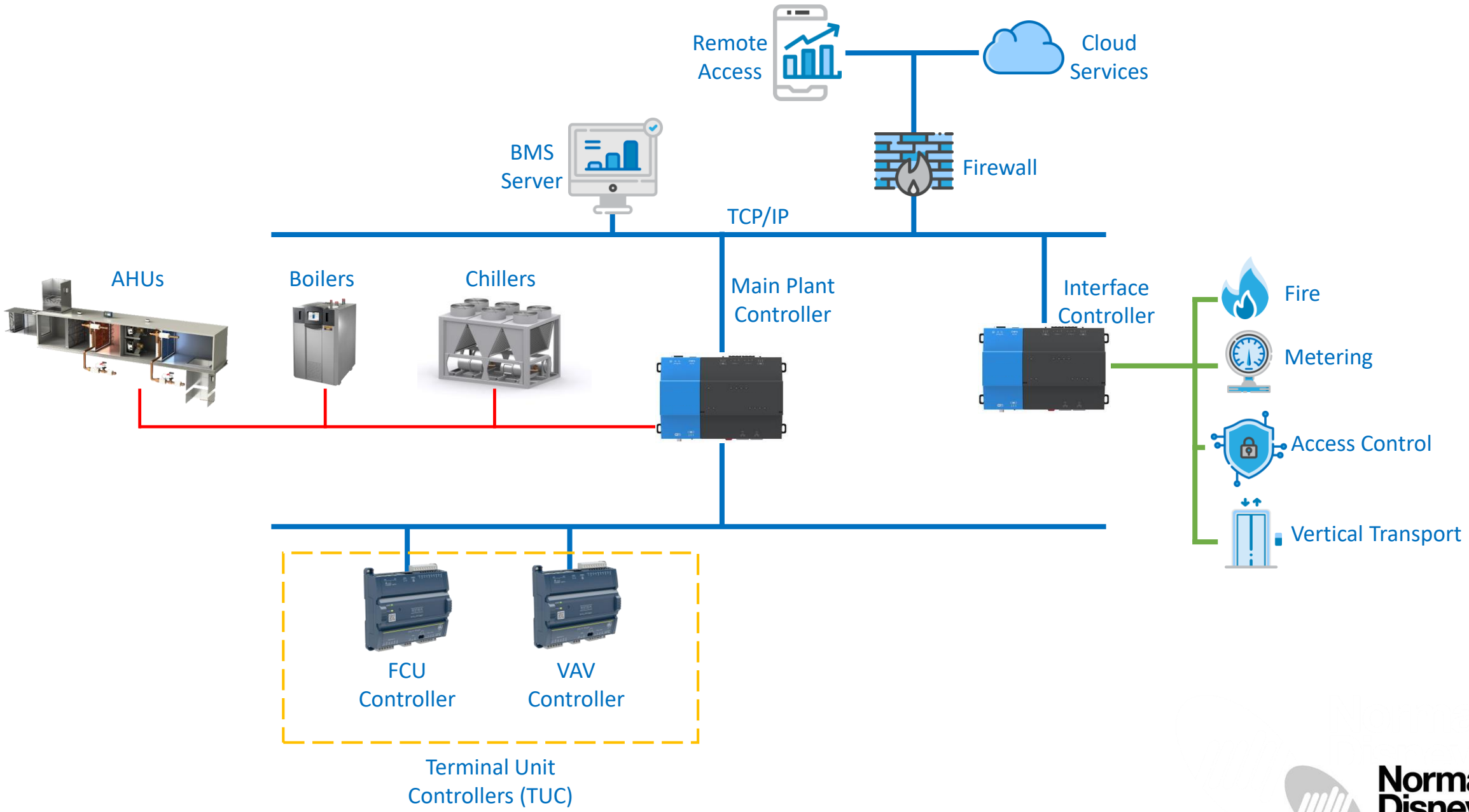
BUILDING MANAGEMENT SYSTEMS

AGENDA

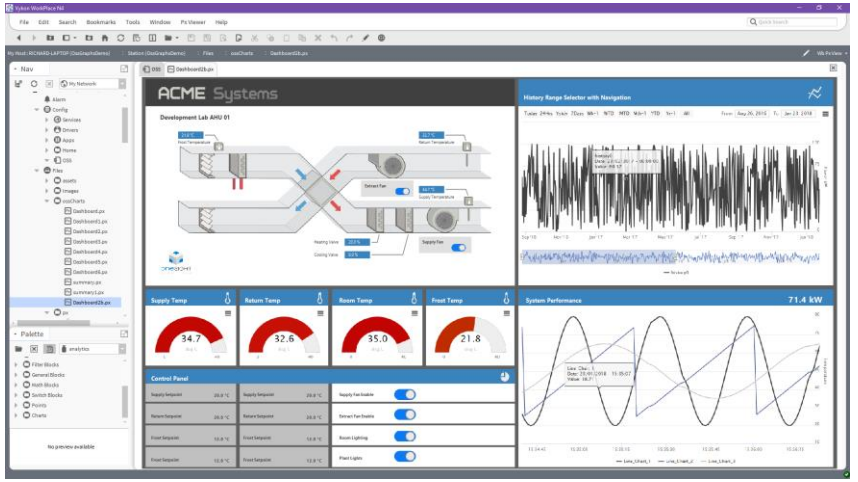
1. Introduction
2. BMS – What is it?
3. System Overview and Components
4. Why is it Important to Consultants?
5. The Future of BMS

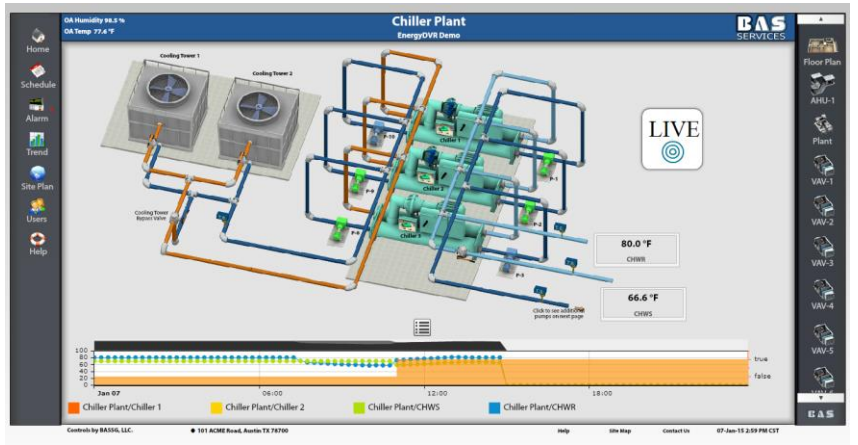


Norman Disney & Young

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

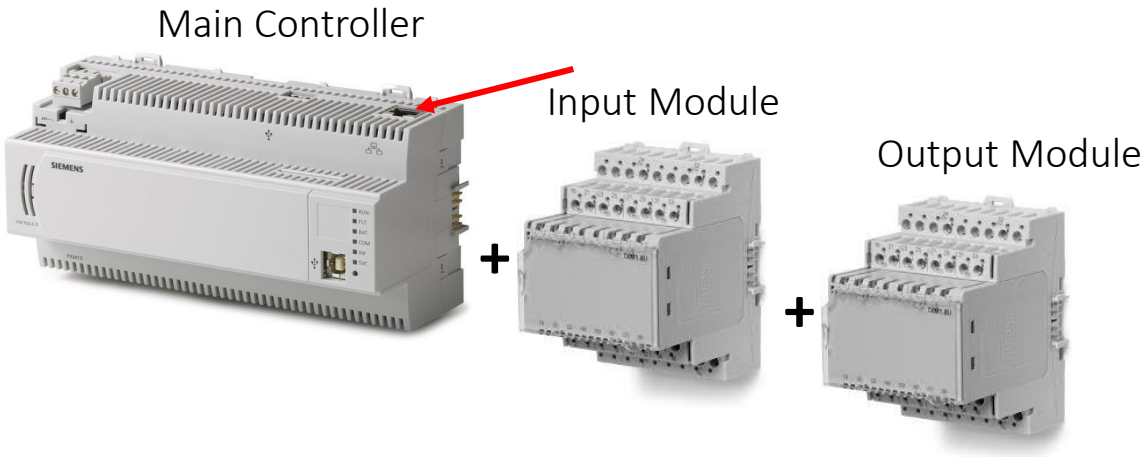


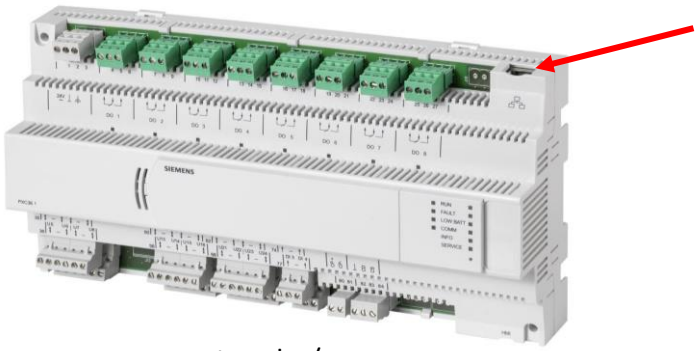


Norman Disney & Young

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



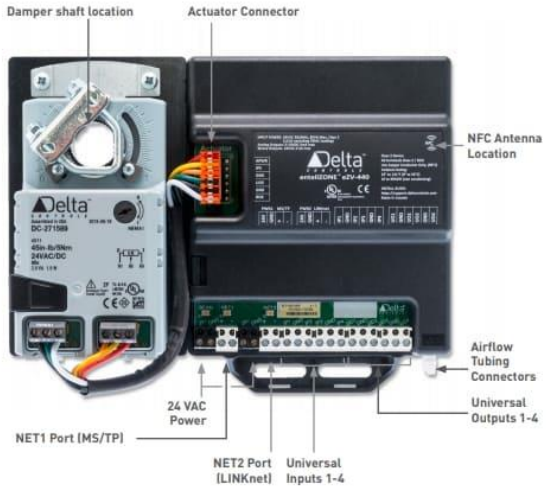


Fixed I/O

Norman Disney & Young

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

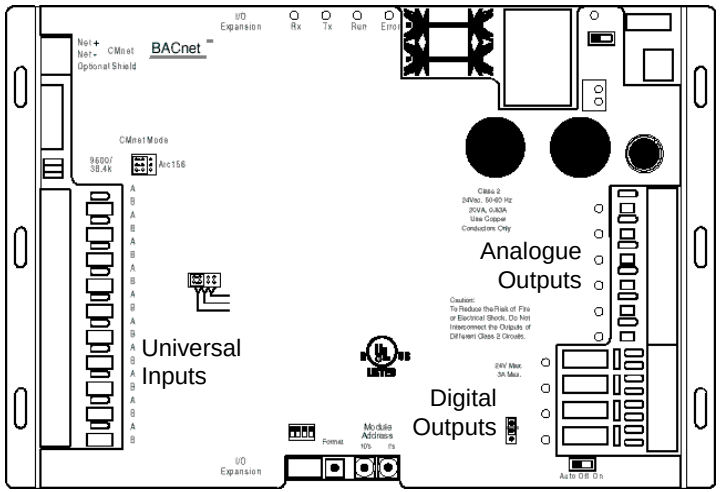


Norman Disney & Young

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)

Norman Disney & Young

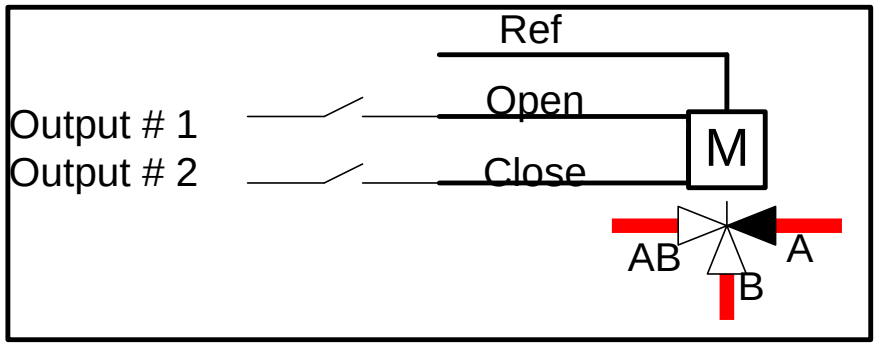
Inputs and Outputs

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

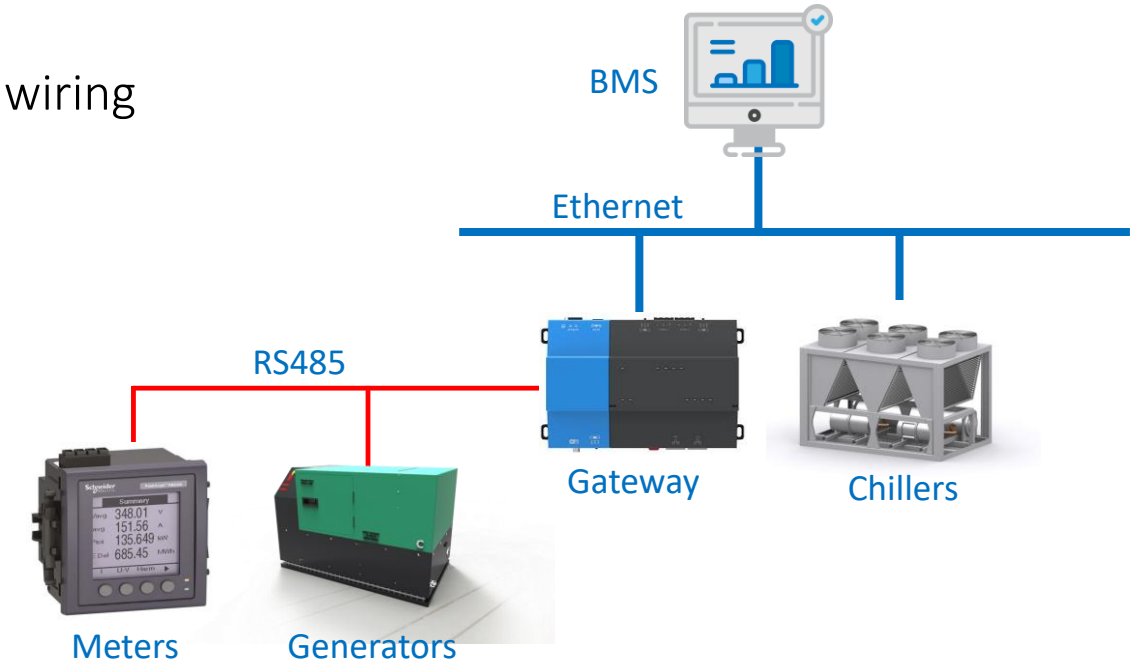
- Two output channels used to drive
- Actuator drive time known
- Will re-stroke occasionally for calibration



Norman Disney & Young

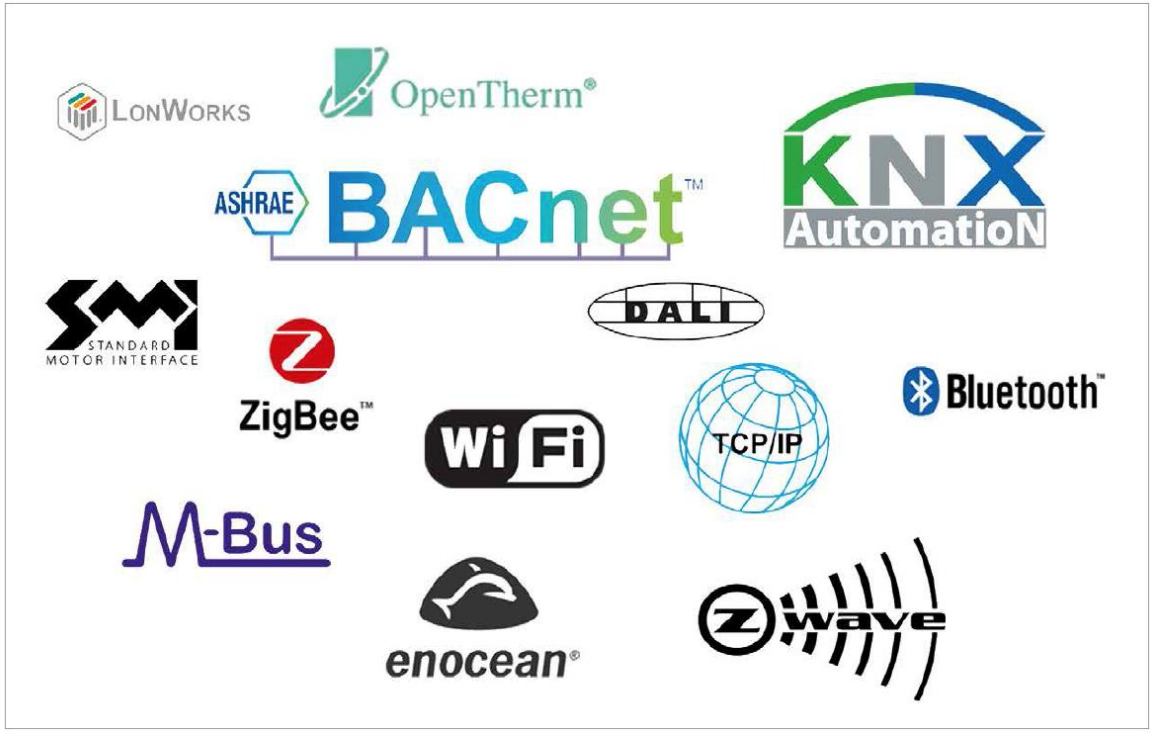
High Level Interface (HLI)

- 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

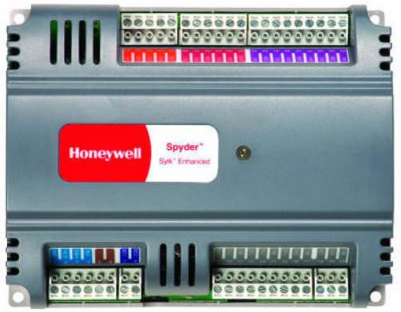


Norman Disney & Young

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

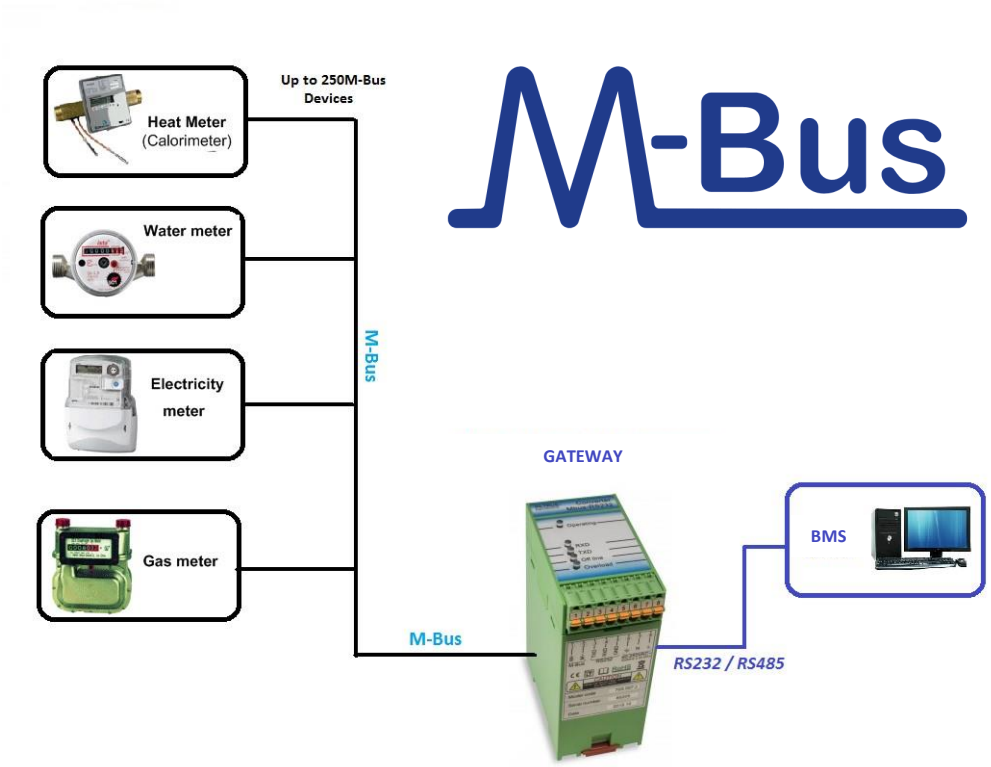
Modbus

- 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?

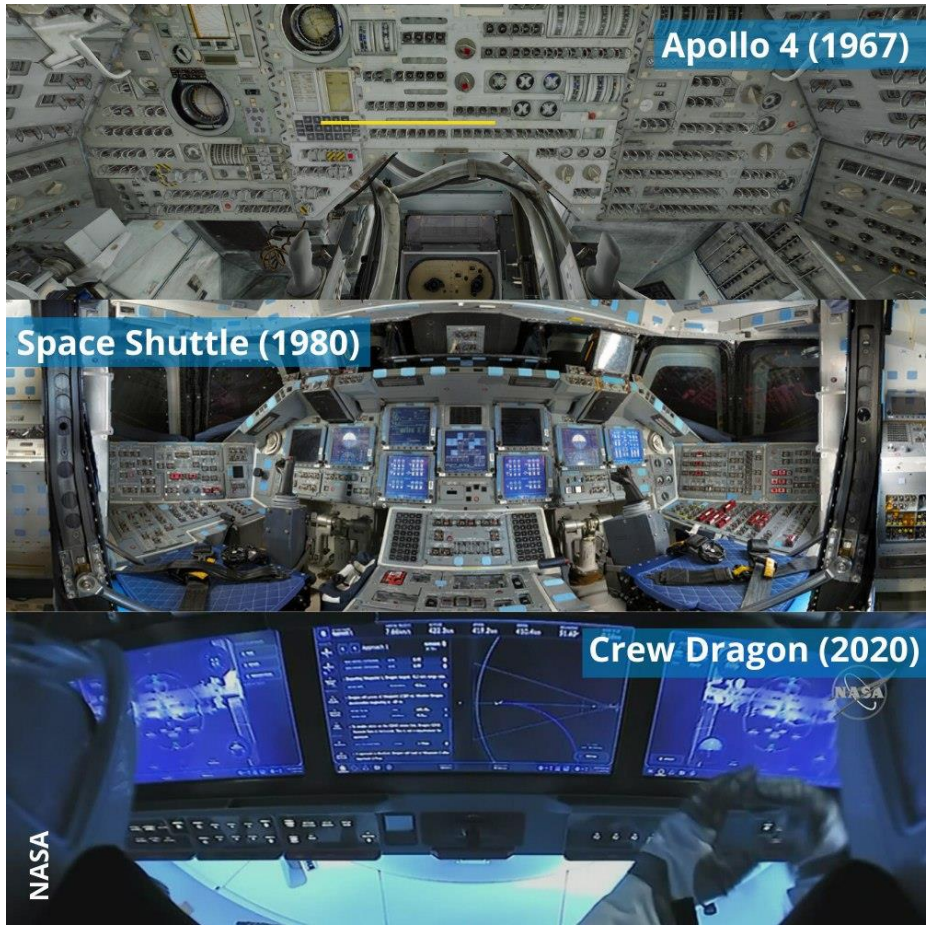
- We are the direct link to the **client**
- We are **responsible** for delivering an effective design
- We can **control** the design outcome
- BMS input early in design makes everyone's life **easier**
- The HVAC equipment can account for up to 80% of a buildings **energy** usage – important to manage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

Norman Disney & Young

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



Norman Disney & Young

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?

Norman Disney& Young

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

Norman Disney& Young

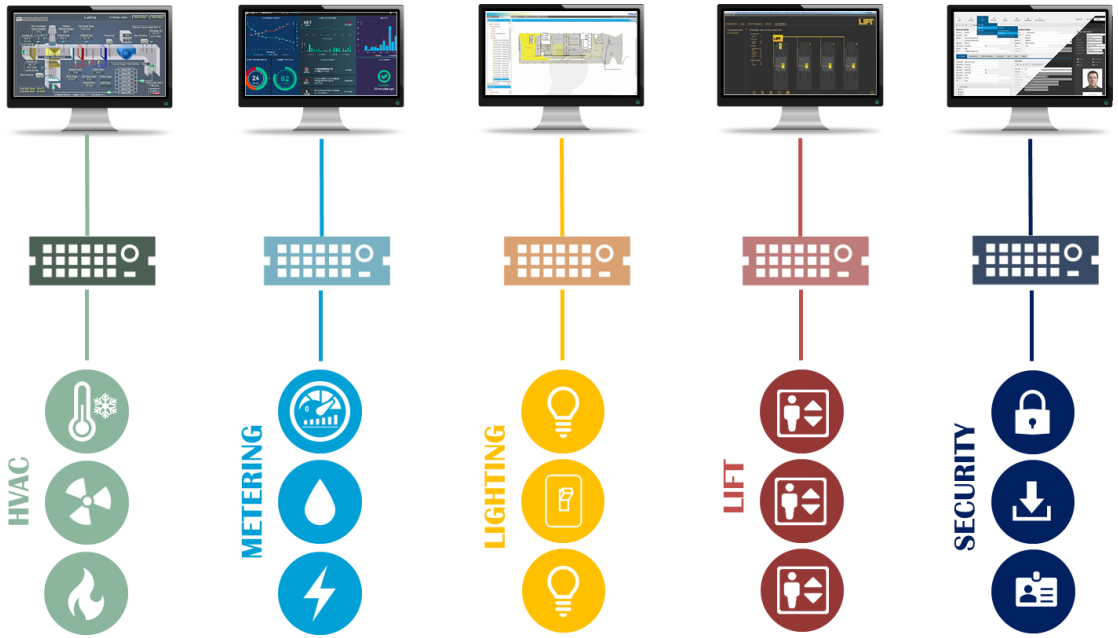
The Future of BMS

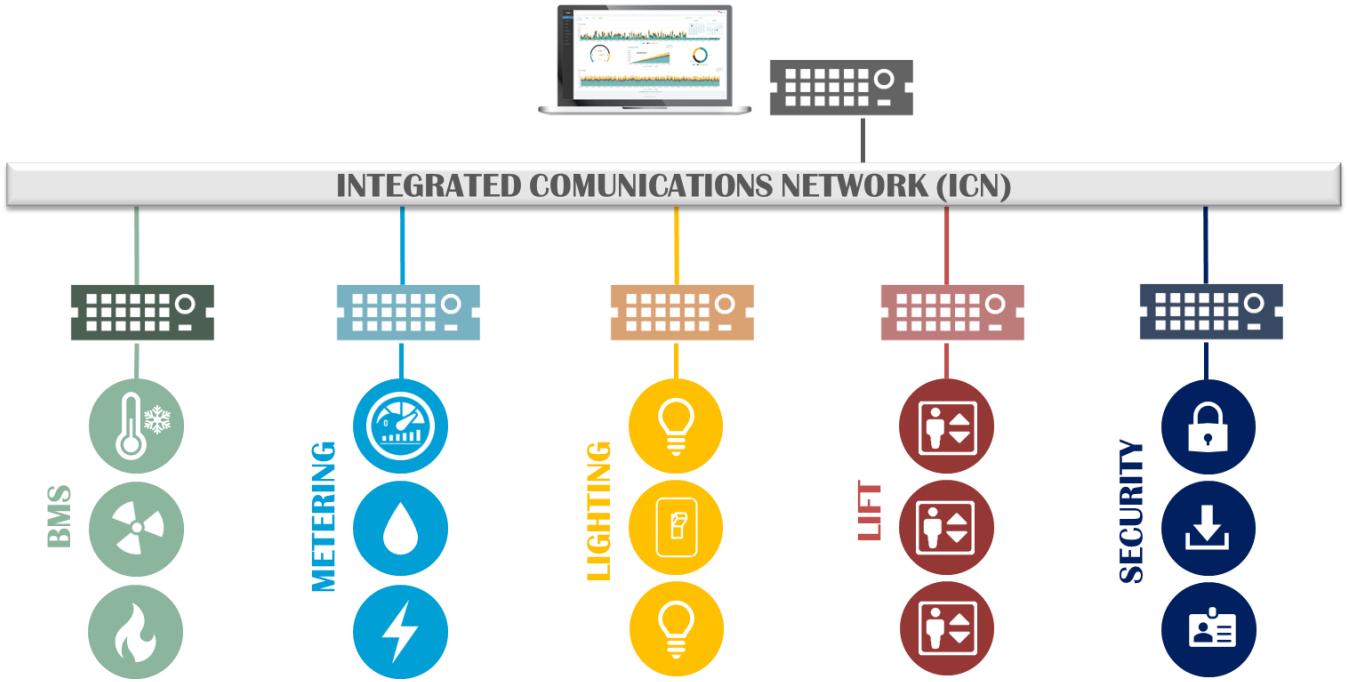
Norman Disney & Young
A TETRA TECH COMPANY

VERTICAL APPROACH

- Systems were designed in isolation
- Different infrastructures, interface etc
- The system vendors were proprietary of the network and the data

IN THE PAST





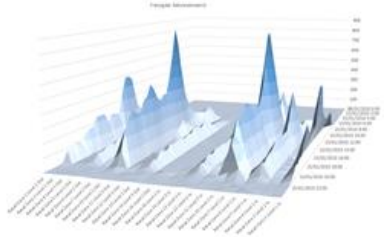
HORIZONTAL APPROACH

NOW

- 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

Presentation Layer





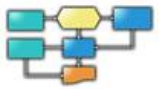



Application Layer


Business Logic


Data Consolidation


Analytics


Workflows


Web Services


Data Sharing

Data Layer


Warehousing

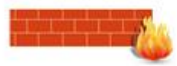

Management


Integrity


Live Data

Communications Layer

Network Layer



Process Layer

Electrical Meters	HVAC	Security	RTLS	Access Points	CCTV
Water Meters	Lifts	Plant & Equipment	Hydraulics	Smart Devices	People Counters
Gas Meters	Generators	Sensors	Electrical	BMS	Emergency Lighting
Thermal Meters	Movements	Occupancy	Lighting	Fire	Other...

Norman Disney & Young

THANK YOU
QUESTIONS?

c.kelly@ndy.com

CIBSE

Norman Disney & Young
A TETRA TECH COMPANY

Ciaran Kelly – Digital Market Sector Leader