Planning your building controls and Building Energy Management System (BEMS)

Integration of controls

1. Considerations for Integration

The most efficient BCS/BEMS is one where all aspects of control are closely integrated with one another and decisions are made based on interactions between sub-systems, e.g. heating interlocked with cooling, or ventilation and shading initiated by lighting control system occupancy sensors. It is important that the equipment selected should provide the correct physical interface(s) and support open protocols to facilitate integration between systems and sub-systems.
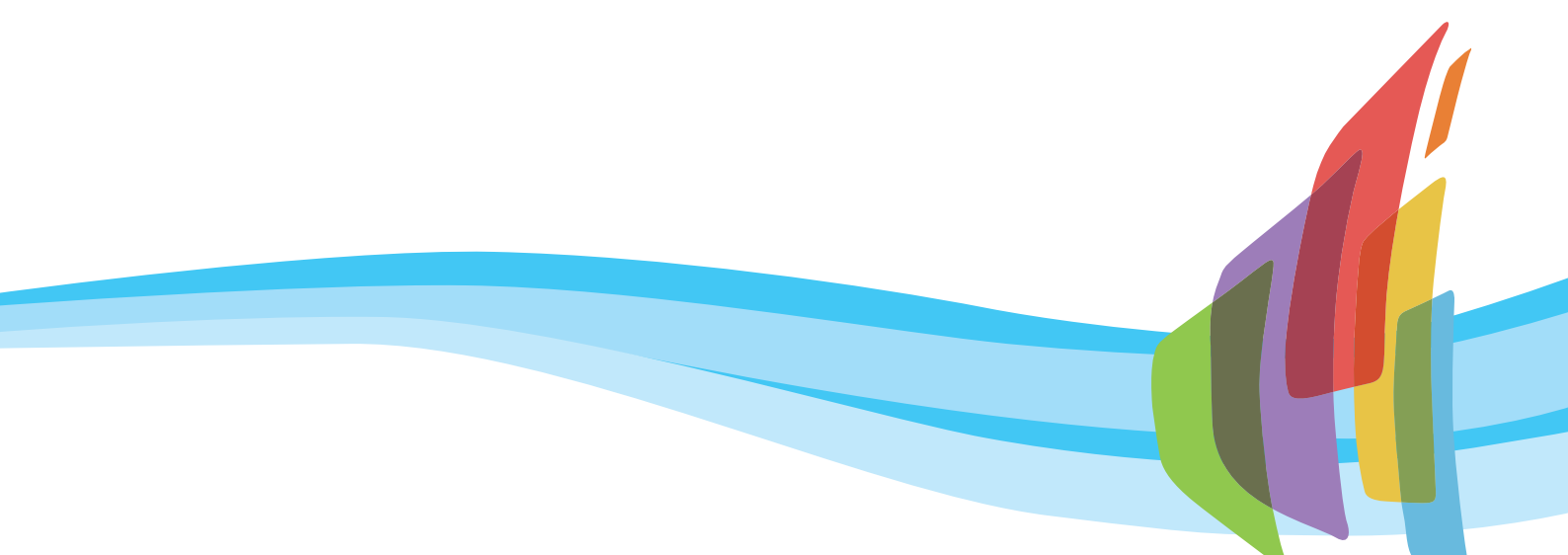
- Are there any areas that should be isolated from integration, e.g. operating theatres, laboratories, computer equipment rooms?
- If retrofitting, is the legacy equipment worth keeping? (or is it beneficial to replace it as part of a new, integrated system?)
- Is the system going to be installed as separate "vertical functions" (e.g., lighting, BMS, energy monitoring) or will it be room-focussed where all functions required are integrated as a single system within that space?
- Demand-based control at room level is proven to provide the highest level of occupant comfort, delivered in the most energy-efficient way.
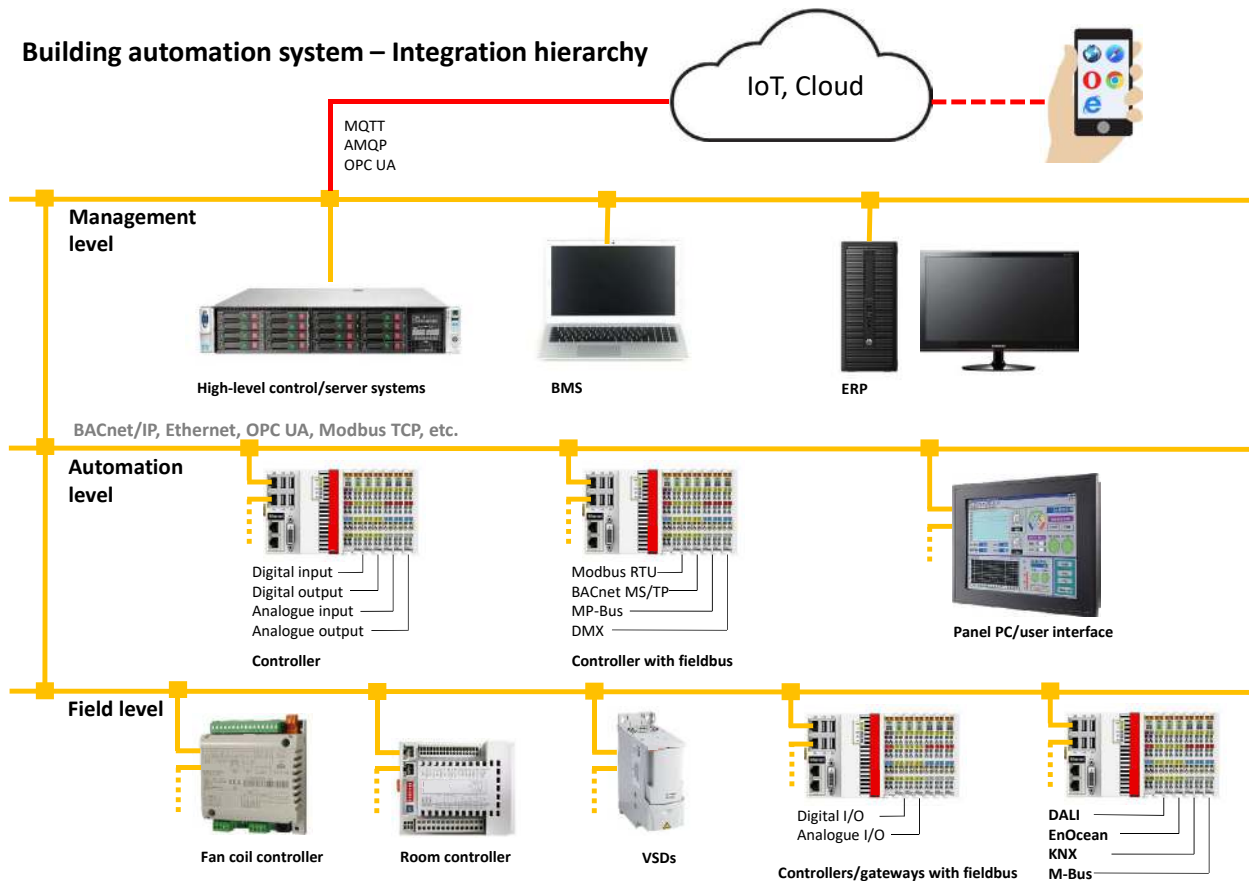
2. Communications

- Does any legacy equipment have the facility to communicate or is this available as an add-on? (e.g., BACnet or Modbus interface)
- Can all systems or controllers communicate on the same physical network or fieldbus?
- Does the building have existing network or fieldbus infrastructure (e.g., cable, switches, routers) that could be used?
- Does a single, integrated network provide the required level of resilience in the event of a failure?
- Do all systems need to communicate to an (existing) head-end/visualisation system and does this system dictate the connection methods that must be used?

3. Interfaces

- Selected equipment should include a physical interface to allow it to be connected to other systems, typically "serial" (e.g. RS232 or RS422/485) or Ethernet
- The interface should support an open protocol such as BACnet, KNX or Modbus

Building automation system – Integration hierarchy

IoT, Cloud

MQTT
AMQP
OPC UA

Management level

High-level control/server systems

BMS

ERP

BACnet/IP, Ethernet, OPC UA, Modbus TCP, etc.

Automation level

Digital input
Digital output
Analogue input
Analogue output

Controller

Modbus RTU
BACnet MS/TP
MP-Bus
DMX

Controller with fieldbus

Panel PC/user interface

Field level

Fan coil controller

Room controller

VSDs

Digital I/O
Analogue I/O

Controllers/gateways with fieldbus

DALI
EnOcean
KNX
M-Bus

4. Data Flow

- Do you know which systems/controllers require data from their peers?
- Will the peers communicate directly with each other or is a supervisory system required to facilitate this?
- How will you make this data available and how will you use it to optimise operations?
- Is this data required externally, e.g., to facilities management or energy managers?
- Is the data required to be stored and, if so, where and how?
- Can the BEMS user interface (HMI, head-end etc) access the variables and set points of all the components within the integrated system?

5. Maintenance and Asset Management

- Can you minimise maintenance and administration effort by leveraging integration with existing IT systems and infrastructure?
- How does the system report its own faults and handle failures?
- A BCS/BEMS lifespan will be considerably less than the building itself; can it be designed to be continuously improved and replaced/upgraded with minimal disruption and integrated with new or emerging technologies?
- Is data from the system required to be integrated into a CAFM package for maintenance?
- Would the visibility of all building data afforded by a completely integrated control system benefit a pro-active predictive maintenance or energy management plan?