06 – Building Management Systems

Version	Date	Authors	Summary of Changes
1.0	2012		New document
2.0	05 February 2016	Rajeel Naicker	General Revision
2.1	16 June 2016	Rajeel Naicker	Control types defined
2.2	15 January 2024	Rajeel Naicker	General Revision

Introduction

06.01 The Campus and Buildings Requirements Manual (the CBRM, the Requirements or the Manual) documents the minimum design and construction requirements for new, refurbishment or repurposed building works, landscapes and engineering/infrastructure projects on buildings, facilities and campuses of the Australian National University (the ANU or the University). The Requirements are prepared for the direction of a Consultant, Designer or Project Manager in the preparation of project specific documentation and in the delivery of project works.

06.02 Notwithstanding any Consultants particular discipline or area of responsibility, each Consultant and/or designer shall consider the document in its entirety. The complete CBRM consists of the following Sections which may be referred to within this Section:

Campus and Building Requirements Manual	
Section 01	General Requirements
Section 02	Architectural Requirements
Section 03	Roads, Car Parking & Civil Works
Section 04	Soft Landscaping
Section 05	Roofing, Roof Fabric & Roof Safety
Section 06	Building Management Systems
Section 07	Electrical Services
Section 08	Fire Protection Systems
Section 09	Hydraulic Systems
Section 10	Mechanical Services
Section 11	Lifts, Cranes & Vertical Transportation Systems
Section 12	Security, CCTV & Access Control
Section 13	PV Systems

06.03 The ANU currently has four major types of Building Management System (BMS) on the Acton Campus. The current BMS controls and monitors heating, cooling and ventilation in administration and critical laboratory environments. In addition, routing of critical laboratory alarms is facilitated through the BMS. The BMS also controls street and certain cark park lighting.

06.04 The University aims to reduce Campus facility operating costs and recurrent capital expenditure. Over time the ANU will progressively mitigate and/or eliminate risks associated with past traditional building services, strategies and systems and the lack of full integration capability.

06.05 ANU will move from a traditional BMS setup towards an Open System integration. The term Open System refers to integrating multiple services to the Integration Platform then to one

uniform front end, refer Figure.01. The base building BMS controls or DDC will utilise BACnet protocol to communicate via the University's WAN to its respective servers and the integration platform.

06.06 The University is aware of multiple vendors providing BACnet control systems but requires systems installed that are consistent and common to extant systems and components. These systems will provide maintenance staff, building managers and laboratory managers visibility to their building systems to assist in building management and energy usage monitoring.

06.07 Currently, ANU Facilities & Services accepts the only proprietary controllers with full capability to comply with the requirements listed in this section.

06.08 Automated Logic and StruxureWare controls are the two permissible control types on campus. Any deviation from these manufacturers requires formal approval from ANU Facilities & Services Division.

06.09 Airmaster, Automated Logic and Schneider Electric are the approved BMS contractors. Any deviation from these contractors requires formal approval from ANU Facilities & Services Division.

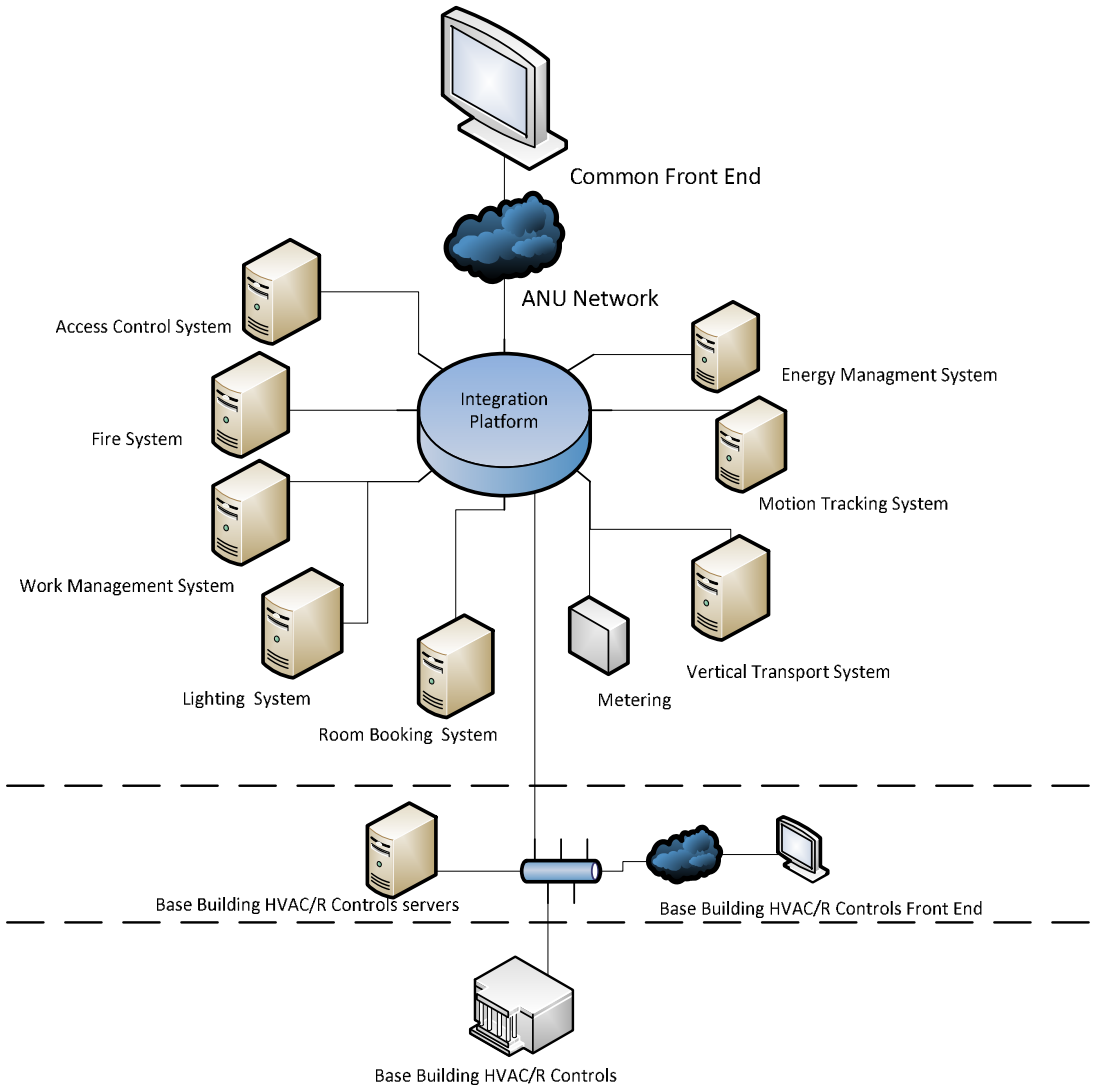

Figure.01

Main Server

06.010 Main Server refers to an enterprise application that will communicate with the Master and Field Controllers. Enterprise applications must run on a virtual server.

1. Graphics
   a. All graphics on the Main Server must be presented in HTML5 format only;
   b. All graphics must be viewed via the major web browsers
      To view graphics additions software or plugin must not be used.
   c. Should support animation;
   d. Should have all features listed under Master Controller;
   e. ANU Power Users should be able to fully edit graphics;
   f. Graphics should be vector based (optional);
   g. Graphics should be responsive to suit screen;
   h. graphics should be in HTML5 format;

i. ANU Power Users should be able to control all points on graphics via web access; and
j. Multi-layer graphics.

2. Code: All code should be written in block format only. Users should be able to modify and troubleshoot all code from Field and Master Controllers from the Main Server.
3. Time Schedule: All Time Schedules are to be presented in Microsoft Outlook Calendar format or horizontal/vertical bar format. Adding exception Time Schedules must not exceed four clicks. Time Schedules should be written and held in local Field Controllers .
4. Firmware: Users must have the ability to push firmware updates to the Master Controller via the Main Server.
5. User Access:
   a. Users must be able to access the Main Server graphics by entering one IP address on an internet browser.
   b. Multiple users must be able to access the Main Server graphics at once. 50 users should be able to access the graphics at once.
   c. Roaming PCs with client software to access Main Server graphics is not permitted.
6. Security: Power Users must be able to block certain users from viewing certain buildings and commanding certain points.
7. Licensing: ANU must be informed about all license costs prior to system installation. Enterprise licenses shall not be on any external hardware, USB Dongle for example.
8. Trending logs- Trend logs must be captured in an SQL database.
9. Time sync –via the ANU NTP server.

Master Controller or Main Plant Controller

06.011 Master Controller refers to the controller that connects to the Campus WAN to communicate to the Main Server.

06.012 Master Controllers should have the ability to be a Complete Stand Alone Controller. Complete Stand Alone Controllers should have the following features:

1. Web Access: Users should be able access the controller by entering an IP address on any Internet Browser in the ANU local network. This feature is to be used ONLY if connection to Main Server is lost.
2. Graphics
   a. All graphics related to the controller should be stored in the Master Controller;
      To view graphics additions software or plugin must not be used.
   b. graphics must be visible via web access;
   c. graphics should be vector based (optional);
   d. graphics must automatically scale to suit screen;
   e. graphics must be in HTML5 format;
   f. users must be able to control all points on graphics via web access; and
   g. multi-layer graphics.
3. Code: All code should be written in block format only. Script code is not permitted.

4. **Time Schedule:** Users must have the ability to change schedules via web access and add time exception. Time Schedules must be written and held in local Field Controllers in BACnet schedule format.
5. **Alarms:** controller must have the ability to send email alarms (SMTP) without relying on the Main Server or a third party software.Refer to BMS Alarms section of this document. Refer to Section.12 Security, CCTV & Access Control.
6. **Security:** Automatic log off option and HTTPS option during web access.
7. **Trend Logs:** User should have the ability to view and export trend logs via web access. The preferred format is CSV.
8. **Native Protocols:** BACnet/IP, Modbus TCP, Webservices (optional).
   a. Gateways and extra-low voltage (ELV) devices must comply with ISO/IEC 14908.4.
9. **Time Sync:** via Main Server or the University's NTP Servers.
10. **BACnet:** Controllers must be BACnet Testing Laboratories (BTL) approved.
11. BACnet Points: Must have Priority Array to which the users can write to.

06.013 Projects should include a double data point per master controller. A minimum of one master controller should be considered in each MSSB to reduce the extent of local LAN cabling required.

Field Controller or Application Controller

06.014 Field Controller are controllers that connect to the Master Controller and other Field Controllers via a local LAN.

1. **Code:** All code should be written in block format **only**. Users should be able to upload modify and troubleshoot all code from the Main Server.
2. **Exposed Points:** Controllers should have the ability to expose all BACnet points.
3. **One Master Point of Control:** There should be one point in the Field Controller that controls the whole plant. For example the Time Schedule point in the controller should turn off the fans and drive all valves and loops to zero. There should be **only one** master room temperature set point.
4. **Native Protocols** – BACnet/IP, Modbus TCP. Webservices (optional on approval).
   a. Gateways and ELV devices must comply with ISO/IEC 14908.4.

Naming Format	Campus(Acton)_Building Number(BLD)_Level_Plant_Point Example: Acton_Bld 124_level01_FCU_FanEnable
BACnet ID/Device ID / Instance Number	Contact the Principal's Representative (the Principal or the Principal's Project Manager) for more information.

External Lighting

External lighting shall be controlled via the BMS. Refer to the electrical section for further details.

Design Stage

06.015 Provide the following document to the University's Controls Engineer for approval before implementation

a. Functional Description: This should be provided in PDF and editable Word Document formats.
b. BMS LAN Schematic
c. Folder Structure of the BMS Database.
d. Controller Selection List.

Hand over Documents

06.016 Provide the following document to the University's Controls Engineer via Email

a. BMS LAN Schematic: This should have the final IP and controller addresses and Master Controller Location.
b. Functional Description: This should be provided in PDF and editable Word Document formats.
c. Alarm list: More information in the Alarms section of this document.

Hardware Labels

06.017 All hardware connected to the BMS controller must be labelled using acrylic labels (Traffolyte Labels). All Master and Field Controllers must have IP addresses , BACnet Numbers or MAC addresses

Wireless Hardware

06.018 Wireless hardware to be used as a last resort. University's Controls Engineer must provide approval to use any wireless Master or Field Controllers or any hardware that will communicate with the Master or Field Controllers.

Cable and Field Hardware Labelling

06.019 Cable labels should follow the following naming convention:

Naming Convention: McFcPtPn

MasterController_FieldController_Point Type_Point number

Example: 0102BI03

01	Address for the Master Controller
02	Address for the controllers on the Rs485 LAN (local to the master controller)
BI	Binary input or output. (BI,BO,AI,AO,UI,UO)
03	Point number on controller number 02.

06.020 This naming convention should be consistent from controller to field hardware. Cable number should also be placed on the field hardware with hardware name. Example Room temperature sensor should have labels “Room temp 01 “ and “0102BI03 “ on the face plate and sensor cable should have label “0102BI03”.

06.021 If points are wired directly to master controller then field controller address will be 00

BMS ALARMS

06.022 SMTP HOST: This information will be provided by the Universitys BMS/Controls Section

06.023 Port Number: This information will be provided by the Universitys BMS/Controls Section

06.024 Email Sending Address: This information will be provided by the Universitys BMS/Controls Section.

06.025 Alarm Template: Must be as shown below

06.026 Before enabling Alarms: Provide the University with a spreadsheet of all alarms withthe following columns.

a. Point Name.(This will be the controls point that will be going in to alarm)
b. Alarm Description (Description that a lay-person can understand)
c. Delay (in Seconds) before alarm is executed

The University will review this spreadsheet with the client and update the spreadsheet with messages associated with every alarm. Once the spreadsheet is amended and returned to the contractor then only can the alarms be enabled.

Alarms: BMS Alarm Template

- Items in red should be changed to suit.
- Items after // should be removed.
- Emails should be brief and to the point. DO NOT USE POINT NAMES FOR ALARM DESCRIPTION. For example, do not use ANU_L1_SFTYSHWER_FLT for Level 1 Safety Shower Fault.

Email header	To: *bmsalarms@anu.edu.au or other email address* Cc: *Building manager or other email address* Subject: ****CRITICAL ALARM**** or General Alarm (do not change format in Subject line)
Email body	******NO ACTION REQUIRED******NO ACTION REQUIRED****** Building Name : xxxxxxxxx Building Number : xxxxxxxxx Issue: *Enter alarm description* // Example: Safety Shower level 1 activated. Please perform following action DURING HOURS Mon-Fri: 0900-1700 ***DO NOT LEAVE MESSAGES, ROTATE THROUGH PHONE NUMBERS UNTIL SOMEONE ANSWERS*** FIRST CALL: phone number (Person's name and title) SECOND CALL: phone number (Person's name and title) THIRD CALL: phone number (Person's name and title) AFTER HOURS Mon - Fri: 1700-0900, weekends and public holidays ***DO NOT LEAVE MESSAGES, ROTATE THROUGH PHONE NUMBERS UNTIL SOMEONE ANSWERS*** FIRST CALL: phone number (Person's name and title) SECOND CALL: phone number (Person's name and title) THIRD CALL: phone number (Person's name and title)