



Building Automation, Energy Management and Reporting System

Guide Specification Proton

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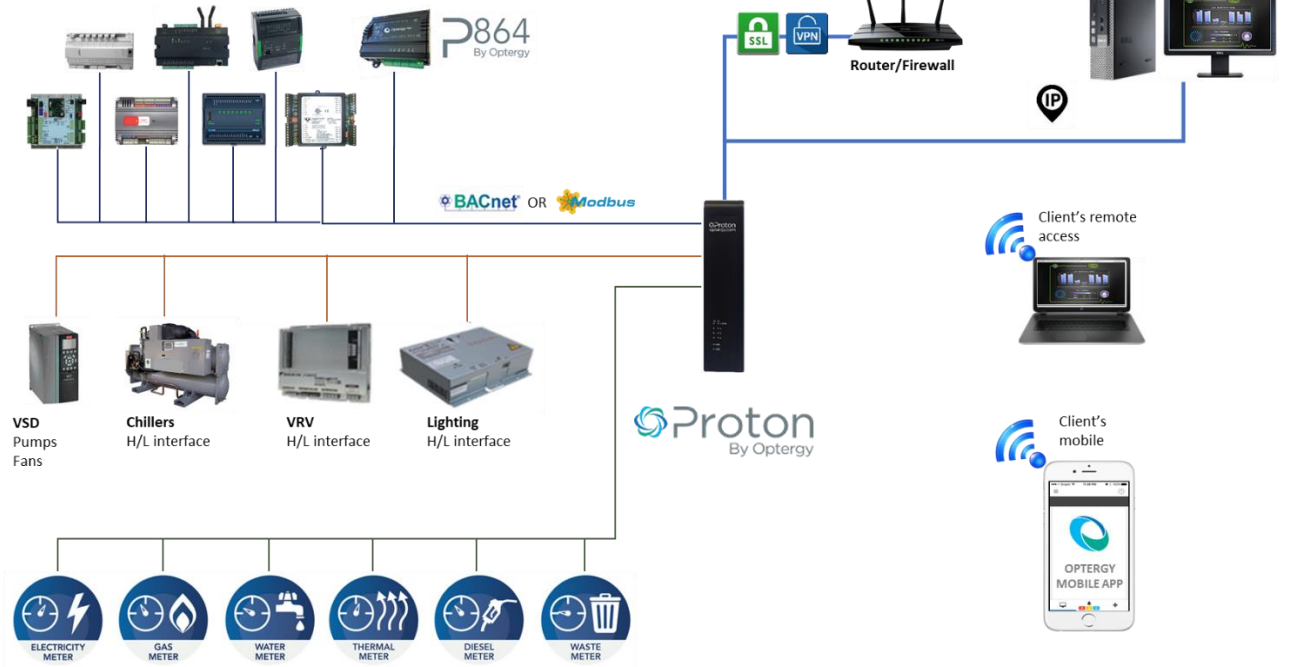
1. GENERAL REQUIREMENTS



Proton Building Supervisor Controller

BACnet Direct Digital Controllers

- Control & Monitor Plant, Chillers, Pumps, CT, etc.
- Controller interfacing : DI/DO/AI/AO



PROTON NETWORK EXAMPLE

The software shall provide the means to interface with the building automation field controllers and energy monitoring devices.

The software shall comply with the following requirements:

- Provide access to all functionality via a standard web browser over the internet
- Utilize a PostgreSQL database
- English language support with context sensitive help
- Factory provided e-learning (online training course)
- The communication protocols supported at a minimum shall be:
 - BACnet MSTP
 - BACnet IP
 - Modbus RTU
 - Modbus TCP/IP
- System shall reside on a LAN or WAN
- Users shall connect to using an on-board VPN (virtual private network) when using an internet connection to the system
- System shall require username or password authentication and can automatically manage the authorization or expiration of users
- Software shall support user and group authentication with the ability to restrict users or groups to only the actions an administrator allows
- The software will allow for custom graphics to be displayed complete with animations and the ability to view data in real-time
- Configurable automated system backup and/or on-demand
- Configurable file transfer using FTP or SFTP (file transfer protocol and secure file transfer protocol)
- Automated remote file transfer
- Report and trend log export to PDF (graphical) or CSV
- Communication with uninterruptable power supplies in order to perform orderly shutdown of operating system. Compliance of this will be via NUT (Network UPS Tools) <http://www.networkupstools.org>
- The software will have the ability to be pre-engineered and configured prior to set up and on site commissioning
- Software shall be easily identifiable via version number
- All software updates shall be made free and available for the period of the warranty/defects and liability period
- Will support an Application Program Interface (API) for third party integration trend logs, energy logs, users and groups
- The software shall be able to log maintenance requests
- The software shall have a companion mobile app for IOS and Android devices

2. LICENSING

- A license file page shall allow license files to be installed and show what functionality the current license enables
- System Hardware Key
 - The software shall generate a unique key for the hardware on which it is installed
 - The System Hardware Key shall be checked against license files on installation to ensure only a license file for the unique machine is being installed
- From the license page the user shall be able to download a copy of their license in xml. format
- If there have been any previous licenses installed the software shall display a drop-down box. This box shall allow to select any previous license files to view and re-install if required. When re-installing a previous license the currently installed license shall become part of the previous license list and be available for re-installation in the future
- The software base licensing shall be a once off purchase and be perpetual with no subscription or annual fees
- The software shall have free regular updates including new features, improvements and fixes
- The software shall be upgradeable incrementally with additional features
- The software shall have the ability to remotely upload and download the license file through a web based GUI
- The software shall be licensed by “devices” and not “points”
- Each device shall be counted as 1 device irrespective of how many points are integrated from that device. Devices shall include the follow:
 - Programmable Logic Controllers (PLC’s)
 - Physical meters
 - Electrical
 - Gas
 - Water
 - Thermal (chilled and hot)
 - Diesel
 - Virtual meters
 - Aggregate meters
 - Apportion meters
 - Calculation meters
 - Manual meters
 - Forecast meters
- End of line sensors and actuators which are physically wired into binary inputs/outputs or analog inputs/outputs shall not be included in device count. Any device that communicates through BACnet or Modbus shall be included in device count

3. SYSTEM STATUS

- The software shall display through the GUI the following information at a minimum:
 - Software, webserver and Java versions
 - Hardware specifications including CPU and RAM
 - list of the partitions, size, space used, space available and percentage of the disk space used
 - The CPU (central processing unit) shall show the utilization of this system. As the load on this system increases so will CPU utilisation
 - Memory showing the amount of RAM that is currently being used
 - Network RX showing the amount of network data the system is receiving measured in Kilobytes Per Second
 - Network TX showing the amount of network data the system is transmitting measured in Kilobytes Per Second
 - Locally Hosted BACnet Objects
 - The counts of schedules, trendlogs, and alarms in the system
 - Current Devices Count
 - The total count of physical devices, meters, and unique unit virtual points in this system
 - Number of Hosted Alarms
 - Hosted on Analog Input 2400
 - Number Active Acknowledged Alarms
 - Hosted on Analog Input 2401
 - Number Active Unacknowledged Alarms
 - Hosted Analog Input 2402
 - Number of Events Today
 - Hosted on Analog Input 2403
 - Number of Events Yesterday
 - Hosted on Analog Input 2404

3.1. Portal Status Report

- The portal status report shall allow for portal status information to be emailed to particular users on a regular basis
- The software shall allow the user to select the pieces of information that are to be included in the status report:
 - Disk Space – shall detail the storage capacity for each disk partition
 - High Level Activity List - shall provide a brief summary of the number of distinct user interactions
 - Frozen Emails – shall provide a list of frozen email jobs that have been unable to be sent
 - Raised BACnet Alarms – shall provide a list of all the BACnet alarms that have been raised during the specified time period
 - Raised Meter Alarms - shall provide a list of all the meter alarms that have been raised during the specified time period
 - Meter Status – shall provide a brief summary of each selected meter

3.2. System Maintenance

- The system maintenance page shall provide features for maintaining performance and operation including at a minimum:
- Optimise Database:
 - This feature shall optimise the statistics in the database, and can help improve on database performance
- Rebuild Database:
 - Shall reset the database to factory settings for the currently installed version, including trendlog and energy log data. When performing this action, the option shall also be provided to clear the user activity log
- Factory Reset
 - With the exception of the network settings, everything thing is deleted or reset to factory defaults (for the currently installed version). Specifically, it shall:
 - Clear all data in the database, including trendlog and energy log data
 - Delete all display files, user images, spectrum overlays, software updates, scrolling displays, log files, temporary files
 - Reset all system configuration settings, except for network settings
 - Remove all log files produced by the software

4. BUILDING AUTOMATION

4.1. Web-based Access

- The software shall be accessible via a web browser and be located on a local area network, a wide area network or the internet.
- The software shall allow an unlimited number of users to be assigned within the system.
- The software shall allow an unlimited number of concurrent web requests subject only to network bandwidth and hardware resources.
- No software plugins shall be required to be installed on the web browser used for access.
- The web presentation shall include a dynamic graphical user interface (GUI) with access to all historical data.
- All graphic displays and programing tools shall be built in allowing local and remote engineering and commissioning using a standard web browser through single sign on.
- Control programming shall be viewed and made live on demand using a standard web browser.

4.2. System Navigation

- The software shall allow navigation via PC input device such as a mouse or touch screen.
- System menus are configured based on user, role and permission.
- The system shall have a search field to quickly filter and navigate menu options.
- The system shall have bookmarks to quickly navigate to any Optergy display or internet available web page.
- The system shall be able to embed web page links or images into custom displays using common URL links.

4.3. Contact Management

- The software shall have a simple and easy way to manage clients, owners, and other relevant contacts pertinent to the system. The 'Contact Management' page shall be a central place to view and keep track of all contacts configured in the software
- All currently available contacts recorded in the system shall be shown in a main table. This main table shall store the following information at a minimum:
 - First Name
 - Last Name
 - Email Address Required
 - Company
 - Phone Number
 - Mobile Number

4.4. User Authentication and Permissions

- Each user shall have a password and user authentication shall be enforced on log-on to the software.
- Users shall be able to be assigned to one or more permission groups which define access permissions.
- A user shall have defined access to each point and be able to specify read, write and modify levels where a data point is accessible.
- A permission group shall define access to display and the ability to add or modify users.
- The software shall have the capability to assign password change permissions and expiry date on a per-user basis.
- The user will be logged out automatically if there has been no activity after a predefined period of time.

4.5. Security

- The system shall support remote connectivity via a free openVPN connection.
- The software shall produce a client.ovpn certificate for authentication.
- Users shall connect to the system using an on-board VPN when connecting via the internet.
- The software shall regenerate the client.ovpn certificate every time the Public IP, Ports, or Protocol in the VPN Configuration is changed.

4.6. Data Storage

- Data shall be stored in an SQL compliant database adhering to as a minimum ANSI-SQL 92/99 standard.
- Data retrieval and archiving shall be an automatic function within the software and easily selectable and extracted via the user interface.
- Provide hard disk storage for minimum of 5 year's storage of trend log data and energy data including other meter parameters.
- Provide software database to create and maintain all meter data and parameters as BACnet objects. These BACnet objects shall be accessible from any BACnet system.
- The system shall include at a minimum a 120GB Solid State Hard Drive for long term data storage.

4.7. Alarm, Event and Trend Log Notification

- The software shall be able to receive BACnet alarm and event notifications and store these in the database in a BACnet format. This shall include the priority assigned to the notification.
- Where the notification is a trend log buffer-full notification, the software shall be able to read that trend log buffer from the BACnet system and store it in the database in BACnet format.

4.8. Alarms

- The software shall have the ability to create and edit BACnet alarms.
- The software shall allow users to view and respond to alarms.
- Users shall be able to view a list of all alarms, with the ability to acknowledge and or clear.
- Alarm escalation shall occur after a user configurable time period.
- Alarms summary shall be viewable on a summary toolbar.
- Alarm summary page shall have quick links to a custom graphic display.
- Alarms shall be made available on a companion mobile app for IOS or Android.
- Meter alarms shall be configurable, viewed and acknowledged through the user interface.
- Meter alarms shall be configurable with the following criteria at a minimum:
 - Grouped by user, group or meter.
 - Notifications shall be emailed or SMS (Short Messaging Service) messaged.
 - Meter status:
 - Offline.
 - Online.
 - Meter parameter:
 - Consumption changes.
 - Instantaneous changes.
 - Time of day consumption.
 - Day of week and time delay.
- The system shall be capable of “alarm reporting” in report format (PDF) and searchable by the following criteria:
 - Date.
 - Message text.
 - Acknowledgment state.
 - Alarm state.
 - BACnet alarms:
 - Device.
 - Object type.
 - Object instance.
 - Meter alarms:
 - Meter.
 - Meter alarm type.
 - Meter alarm parameter type.

4.9. SMS Alarming

- The software shall allow the transmission of alarms via GSM network in the form of SMS. The communication via SMS shall be two way communication and will be capable of receiving acknowledgements via SMS.

4.10. Alarm Escalation

- The software shall allow the ability to receive acknowledgments of alarms, if alarms are not acknowledged the software shall have the ability retransmit alarms to the any number of predetermined recipients after a user defined time period has elapsed. A minimum of 12 escalation levels shall be supported.

4.11. Trend logs

- The software shall have the ability to create and edit trend logs, including BACnet compliant trend logs, this includes trend intervals and number of stored trend logs before archiving.
- The software shall also allow users to view trend logs in graphical form. Trend graphs can be modified to view multiple trends on one graph. The time period of the graph shall be adjustable.
- Trend views are trend logs with contextual information which can be saved as a snapshot in time. The software shall allow trend views to be saved and updated at a future point in time.
- The software shall allow for the following Graph Options:
 - Title: Title of graph that appears at the top of the page.
 - Show time period: This option determines if the graph time period will be displayed as a sub-heading e.g. 01/01/2013 12:00 AM - 07/01/2013 12:00 AM.
 - Shared Y-Axis on each point: Allow all trends displayed on graph to share the same Y axis, instead of having individual.
 - Y Axis size: The software shall automatically determine the minimum and maximum Y axis value so as to display the graph at the highest resolution. Users shall have the ability to set a minimum and maximum Y axis if they choose.
 - Zoom: The software shall allow users to select an area, zoom in on trend views and back out again.

4.12. BACnet Data Access

- The software shall be able to access BACnet data points in attached BACnet building automation controllers. If the BACnet point is writeable, then the software shall support writing user-entered data to the BACnet point.

4.13. Schedules & Calendars

- The software shall have the ability to create and edit BACnet schedules. These shall include standard weekly schedules, and special event schedules.
- The software shall also support calendars. Multiple schedules can be linked to a calendar. The calendar may have entered items like public holidays or special events that will override standard schedule entries.

4.14. Touch Screen, Kiosk and Scrolling Display Support

- The software shall support foyer display, kiosk and touch-screen systems which can be used for passive or interactive communications with specific building users, such as tenants, or the general public.
- The software and hardware shall support connecting a monitor, keyboard and mouse for the purpose of using the combined hardware and software as a user interface to the system for monitoring, engineering and control of the system.
- The software shall support scrolling displays being a list of accessible URLs which are displayed in order for a predetermined time similar to a slide show. The software shall support an unrestricted number of scrolling displays on a per-user basis.

- The software display source shall support:
 - Custom URL's
 - Custom Displays
 - Meter Displays
 - Bookmarks
 - Dashboards
 - Utility Reports
 - Embedded Video (e.g. Vimeo)
- The scrolling display support menu shall support manually navigating the displays, pausing and pinning the control menu.
- The end user shall have the ability to create scrolling displays, edit the content, and set the timing and order.
- Any content in the system shall be able to be used as a scrolling display.
- The system shall be capable of supporting video output using HDMI or Display Port and VGA.

4.15. Weather Station

- The software shall be capable of communicating with a physical weather station. The weather data shall be made available via BACnet so as to be shared with other building services.

4.16. Online Weather Information and Weather Forecast

- The software shall allow the retrieval of online local weather data and weather forecast data. The weather data shall be made available via BACnet so as to be shared with other building services or used in the control programming.

4.17. Visualization and Custom Displays

- The software shall allow for the creation of custom graphics either within the web browser or offline with a graphics tool.
- Standard image file types that are visible on a standard web browser will be supported, such as JPG, PNG and GIF.
- The software shall also support animated graphics (GIF), e.g. indicate a fan that is in operation.
- The software shall allow live trend graphs & live reports to be embedded into custom display pages.
- Any custom display created can be selected as the home page for any user or group.
- Custom display pages shall display links to other pages, for example to navigate to floors, zones or various equipment pages. The display pages shall allow for live point data to be viewed or written to. The point data shall allow engineering units to be displayed.
- Points where applicable, shall allow direct access to trends, alarms and schedules.

4.18. Graphics Library

- The software shall come with a graphical library of images for HVAC equipment. This shall, include graphics such as Chillers, Boilers, Air Handlers, Fan Coil Units and VAVs, and shall have incorporated applicable graphics such as fans, coils, dampers and pumps.

4.19. Automatic Software Backup

- The software shall allow for automatic backups to be created.
- The software shall back up the following at minimum:
 - Database/configuration, display files, images and documentation.
 - Control programming
 - Schedules

- Alarms
- BACnet trend logs
- Energy logs
- License

4.20. System Restore

- In the event of a hardware failure or damage, system backups shall be used to restore the system back to the state at the time of backup.

4.21. FTP / SFTP Remote Archiving

- The software shall allow auto and manual backups to be configured to be sent to a remote server, using either FTP or SFTP protocols.

4.22. User Activity

- The software shall allow for user activity reports detailing all the user activities within. User reports will be filtered according to user, date and different user activities.

4.23. Time

- System time shall be based on system location settings and will automatically update for daylight savings based on the locale.

4.24. Optimum Start/Stop

- Optimum Start mode offers an intelligent and adaptive algorithm to control warmup and cool down operations for a zone.
- Optimum Start mode shall respond to environmental and historical conditions dynamically.
- Users can enable (or disable) Optimum Start mode when warmup and cooling operations to intelligently adapt to changing conditions.
- The software shall enable a minimum of 10 Optimum Start Points.

4.25. Mobile Application

- The mobile application shall run on current versions of IOS or Android platforms.
- Updates shall be made to the application via normal IOS or Android updates.
- The system shall connect via a built-in Application Program Interface (API) to a mobile application that is dedicated for use with the building automation and energy management system.
- A feedback mechanism shall be made available to the end user.
- The mobile application shall use a dedicated Icon to start the application.
- Notifications shall be displayed on the Icon badge.
- Notifications shall generate audible alerts, that can be suppressed as desired by the user.
- Notifications shall generate when the Notices are sent or Alarms are generated.
- The mobile application shall not use a browser to navigate the system, it shall be a purpose-built companion application.
- The application shall use the same user/group permission structure.
- The application shall use the same password and authentication method.
- The system shall make use of the fingerprint authentication on devices.
- The number of users shall not be restricted.
- The users shall have the ability to change between sites without restriction.
- The users can add a site to the mobile app and preconfigured containers shall be accessible.
- Reports and graphs shall feature a zoom capability to increase the size to full screen.

- Reports and graphs shall allow the user to pinch zoom an area of the graph.
- Reports and graphs shall display a tool tip when an area is touched this includes:
 - Date
 - Time
 - Dataset name
 - Units
 - Values
- The mobile application configuration shall be part of the web based system and support containers that can be customized per user or per group. These include:
 - Alarms
 - Energy Reports
 - Trend logs
 - BACnet points
- The Mobile Application Management shall be a selectable permission
- The Mobile Application shall support at a minimum the following Facility Management capabilities:
 - Site information and contact details including a map.
 - Unrestricted number of sites supported.
 - Alarm notifications (unacknowledged, acknowledged, return to normal).
- Dashboard view of the system which includes unrestricted number of:
 - Energy reports
 - Trend log data
 - Live BACnet points (read and writeable from App)
 - Weather data
 - Weather forecast
- The mobile application shall support the following Tenant or Building Occupant capabilities:
 - Site information and contact details including a map.
 - Dashboard view of the system which includes unrestricted number:
 - Energy reports
 - Live BACnet points (read and writeable from App)
 - Weather data
 - Weather forecast
 - After hours' override (on demand or scheduled).
 - Tickets (mechanism for users to notify facility of problem condition.
 - Notices (messaging from facility management to some or all users).

4.26. Commissioning Tools

- The software shall have tools to aid in the commissioning and interrogation of the attached network devices.
 - Modbus Client: Allows for low level troubleshooting of Modbus hardware. It will allow for testing whether or not the software can communicate to a Modbus device, and determine parameter registers.
 - BACnet Read Property: Allows the properties of a BACnet device to be read. The results can optionally be exported to a CSV or PDF files.
 - BACnet Diagnostic Templates: these allow for monitoring points before a custom display has been created

- Network Ping Utility: A low-level network diagnostic tool which is useful for checking if an IP address is currently reachable. Failures can indicate the remote device being off, there is misconfigured network settings somewhere, cables are loose, there is an equipment failure, and network or routing faults.
- Documentation and References: this is a repository for documents such as Operation and maintenance manuals, equipment manuals and other project related documents such as plans and drawings. Items loaded here can be recalled on demand.

5. ENERGY MANAGEMENT

5.1. Metering Information

- The software shall retrieve at a minimum from each meter the Kilowatts (KW) and Kilowatt hours (KWh). This data is retrieved as it occurs for presentation, analysis, trending and reporting via the software package.

5.2. Meter Data Acquisition

- The software shall connect to electricity, water, gas and fluid energy meters via BACnet or MODBUS.
- The software shall also connect to pulse output meters using BACnet or Modbus.

5.3. Manual Data Input

- The software shall support CSV upload.
- The software shall support manual data entry.

5.4. Virtual/Calculation Meters

- The software shall allow the creation of calculation meters based on physical meters or other calculation meters.
- The software shall allow the following types of meters to be created:
 - Physical Meters: Adding of multiple physical meters.
 - Forecast Meter: The software shall allow for user defined forecast data to be entered. This will allow a forecasted value to be tracked against the actual for comparison.
 - Manual Meter: The software shall allow for manual entry of meter data, for example a meter that is created using data received from only monthly utility bills, which must be manually entered.
 - Calculation Meter:
 - Aggregate: An aggregate meter is the sum of all associated meters.
 - Custom: Custom calculation meters require the calculation expression or equation to be defined. Available calculation operators are +, -, *, /, ().
 - Portion: A portion meter is configurable to a specified percentage of a given parent meter.
 - Remainder: A remainder meter is the remainder of a parent meter minus its child meters.

5.5. Data Retrieval

- The software shall permit users to drill down to/from sub-meters to a selected meter following physical hierarchy or aggregate meter hierarchy.

5.6. Meter Condition Alarming

- The software shall allow for the configuration of alarms for a meter, and also enable notifications and emails to alert users of alarm events associated with given meter.
- Alarm Conditions to include:
 - Configuration Changed
 - Meter Online
 - Meter Offline
 - Condition Alarming based on settings such as:
 - Instantaneous maximum and minimum values
 - Consumption over interval

- Consumption over time
- Tolerance Levels
- The software shall allow the ability to specify the delay period of alarms.

5.7. Tariff Descriptions

- The software shall be capable of maintaining a detailed description of a tariff including, but not limited to, volume charges, demand charges, metering and supply charges and government levies and charges. These charges shall be able to be based on volume blocks, time of use, seasonal rates, peak and off-peak and other charging regimes in common use.
- Each meter shall be able to have an associated tariff which allows a utility bill to be created for that meter. This bill can be used to compare actual utility bills or to generate invoices for tenants for metered services.
- The software shall maintain in the database records of invoices sent and be able to generate a per-tenant statement of charges made.

5.8. Demand Limiting / Load Shedding

- The software shall support demand limiting / load shedding to ensure that electrical maximum demand is not exceeded.
- The software shall write to MODBUS or BACnet, in either binary or analog.
- Delay timers will be used to set the time before an event is triggered and before an event is returned to normal.
- The user shall be able to create a hierarchy of loads to be shed in a prescribed manner.
- The software shall provide a minimum of 10 demand limiting points.

5.9. Meter Commissioning

- The software shall allow commissioning actions to be entered and maintain a record of each commissioning activity. The Commissioning activities that shall be stored as a minimum are:
 - Comment:
 - Name/Initials:

6. REPORTING

6.1. Analysis

- The software shall at a minimum report on:
 - Hourly consumption.
 - Daily consumption.
 - Weekly consumption.
 - Monthly consumption.
 - Yearly consumption.
- Aggregate of multiple meters or meter parameters.
- Benchmarking
- Normalization (Square meters and number of people)
- Comparison between meters, buildings, time periods across all or some of the meters and buildings.
- Reporting (in tabular, graphical – charts & line graphs) for water, gas and electrical utilities.

6.2. Energy Trend logs

- Energy Breakdowns (gas and electric) as total energy usage
- Electricity breakdown into costs sections defined by the user.
- Breakdown of each meter as total energy.
- Power Factor
- Demand (kW)
- Real Time (kWh)
- Voltage
- Amps
- Upload energy data from external sources (.CSV).

6.3. Reports General

- The software shall support the generation of reports including text and charts. These shall be generated either as HTML displays than can also be generated as a PDF document. The generation of downloadable underlying data in the form of CSV files shall be provided where possible.
- The user shall also have the ability to email reports to other users on demand, or have the ability to create an automatic email. For example, a monthly report will be automatically emailed on the first day of the new month for the previous month.
- Custom reports that are created will also have the ability to be saved to a reports library and will be generated using the same time period as the original. For example, if report is created for the current week, then the following week when the report is run it will be for that current week.

6.4. Reports Library

- The software shall support preconfigured reports & shall be able to be generated as required and, to allow these to access the expected time periods, terms such as “yesterday”, “last week”, “last 3 quarters” and “last season” shall be supported.
- The software shall provide reports which show comparisons across multiple meters or across multiple time periods.

6.5. Custom Reports Generation

- The software shall support the creation of custom reports.
- The user shall have the ability to customize the report by selecting chart type, report type, utility type, and time period.

6.5.1. Chart Type

- Bar Chart
- Line Chart
- Scatter Chart
- Area Chart
- Pie Chart
- Ring Chart
- Tabular List

6.5.2. Report type

- Consumption/Generation
- Demand
- Greenhouse Gas (GHG) Emissions
- Degree Days
- Occupancy Analysis
- Trend log Comparison
- Tariff Costs

6.5.3. Utility Type

- Electricity
 - Active
 - Apparent
 - Reactive
- Water
- Gas
- Diesel
- Waste

Note: For the same utility type, multiple utility consumption sources will be supported. For example, multiple electricity active energy sources can be selected such as, Lighting, Mechanical general power. And all will be visible on the same report.

6.5.4. Time Period

- The time period that the utility report shall support: current or previous period, and the periods can include daily, weekly, monthly, yearly, as well as custom periods: before x date, after x date, between x and y dates .
- The software will also support comparisons of previous period.
Example: Compare with previous years(s).
- Comparison of a selected period with the same period previous years. For Example, if this month is chosen and this option is selected, the graph will display this month and the same month in the previous year. The number of previous years to be included will be selectable.

6.6. Reports Customization

- Target: The software shall allow the report to have lines inserted at fixed points. The lines selection will allow for dashed or solid lines, the line color will be selectable. Multiple lines will be supported per report.
- Range: The software shall allow the report to have budget or forecast bands to be displayed in the reports. The band color will be selectable. Multiple bands will be supported per report.
- Units: The software shall allow the user to customize the units shown in the report. For example, display GWh instead of kWh.
- Legend: The software shall allow for the graph legend to be hidden or its location to be specified.
- Colors: The software shall allow for the customization of graph colors, such as headings, legend, and axis'.
- Title: The software shall allow the report and graph headings to be altered and customized.
- Text Style: The software shall allow for the customization of report and graph text size and styles.
- Label: The software shall allow for the customization of graph label positions.
- Chart Axes: The software shall allow for the domain and range axes on the chart to be enabled or disabled.
- Custom Reports Library: The software shall allow for custom reports to be saved in a library that can be generated on demand, while retaining all the custom feature that were selected when it was created.

6.7. Auto emailing of reports at set frequency

- The software shall allow for saved reports to be automatically emailed at a user defined frequency to any user with email credentials.

6.8. Point Override Activity Report

- The software shall provide the ability to run a report on the points that have been overridden.
- Reports can be filtered using any of the following criteria.
 - User
 - BACnet Device
 - BACnet Object
 - BACnet Object Instance
 - Property
 - Array Index
 - Result (Success/Failure/Both)

6.9. Object List Report

- The software shall provide the ability to run an object list report on BACnet devices that are save on the software.
- Reports can be filtered using any of the following criteria.
 - Object Types
 - Analog input
 - Analog Output
 - Analog Value
 - Binary Input
 - Binary Output

- Binary Value
- Multistate Input
- Multistate Output
- Multistate Value
- Calendar
- Event Enrolment
- Schedule
- Trend Log
- Notification Class
- Additional Properties:
 - Description
 - Present Value
- Group By:
 - Device object
 - Object Type User
- BACnet Device Properties

6.10. Afterhours Summary Report

- The software shall provide the ability to produce a report of the afterhours requests for each building tenant.
- The software shall record and report at a minimum:
 - Floor
 - Suit
 - Zone
 - Event start
 - Event end
 - Actual duration
 - Tenant

7. HARDWARE AND SOFTWARE

- The software hardware shall be designed for installation in non-controlled spaces and use the following hardware specification:
 - Temperature -10°C to 60° C or 14°F to 140°F)
 - Relative Humidity 5% ~ 95% (Non-condensing)
 - Vibration IEC 60068-2-64, 0.5Grms, Random 5 ~500 Hz, 40 Mins/Axis
- All connectivity to the software hardware shall be through IP (TCP or UDP) and shall not require a keyboard and display to allow the platform to be installed in inaccessible areas such as a corporate server room.
- All software updates and changes to the software shall be capable of being performed remotely using the network.
- The solid state disk (SSD) shall be at least 120 Gigabyte capacity for application software and data storage.

- The software shall have a minimum of 4 Gigabyte RAM to ensure that sufficient application memory and data cache space is available to prevent the need for paging and swapping.
- The software shall have a CPU with performance at least equal to that of a 2Gh Intel Quad Core Processor to ensure that large numbers of users and intensive database queries can be supported with execution speeds not compromised by CPU execution speed limits.

8. COMMUNICATIONS

8.1. BACnet MS/TP

- The system shall support:
 - 4 x RS-485 communication ports that can be configured for BACnet MS/TP.
 - Ports that can be enabled or disabled in software.
 - Operate in accordance with BACnet MS/TP protocol rev 14.
 - Each port can have adjustable baud rates (9.6k, 19.2k, 38.4k, 76.8k and 115k).
 - Use on board diagnostic tools for setup and troubleshooting.

8.2. BACnet IP and Routing

- The system shall support:
 - BACnet MS/TP to BACnet IP routing.
 - Support BBMD with unrestricted number of BDT table entries.
 - Operate in accordance with BACnet protocol rev 14.
 - Support a configurable IP network.
 - Support a configurable IP and MSTP network number
 - Use on board diagnostic tools for setup and troubleshooting.

8.3. Modbus RTU

- The system shall support:
 - 4 x RS-485 communication ports that can be configured for Modbus RTU.
 - Enabled or disabled in software.
 - Operate in accordance with Modbus RTU.
 - Can have adjustable baud rates (9.6k, 19.2k, 38.4k, 76.8k, 115k).
 - Use on board diagnostic tools for setup and troubleshooting.

8.4. Modbus TCP/IP

- The system shall support:
 - Enabled or disabled in software
 - Configurable Modbus Port (default 502)
 - Configurable Modbus configuration (timeout, delay, retries, keep alive)
 - Configurable Modbus gateway to BACnet
 - Use on board diagnostic tools for setup and troubleshooting.

9. ENGINEERING TOOLS

9.1. Programming Logic-Direct Digital Control (DDC)

- The software shall support real time operating programming that:
 - Uses predefined logic blocks that have specific functions, those blocks are executed based on fixed values or values coming from other BACnet points.
 - Logic functions shall include at a minimum the following functionality:
 - AND Gate
 - OR Gate
 - Single Shot
 - Delay on Make
 - Delay on Break
 - Exclusive OR Gate
 - Latch Gate
 - Comparator / Hysteresis
 - Increment/Decrement
 - Transfer Data
 - Gated Transfer
 - Subtraction
 - Addition
 - Multiplication
 - Division
 - Within
 - Switch
 - High / Low Limiter
 - Runtime
 - Linear Converter
 - Two Input Linear Converter
 - High Selector
 - Low Selector
 - Input
 - Output
 - Comment
 - PID Controller
 - Allows the user to create custom function blocks that can have their own executable code.
 - Custom blocks shall be importable and exportable for re-use.
 - Operate in HTML5 environment using a common web browsers with no plugins needed to operate, configure, view live data, and publish the programming code.
 - The programming environment shall support four distinct environments in the web interface:
 - Toolbox (holds all the logic blocks).
 - The Workspace (the area where the program elements are added).
 - Logic Block Properties (permits user to adjust logic block configuration).

- Toolbar workspace tools (to manage viewing and file management properties).
- The software shall have the ability to create and store multiple work spaces with the ability to link programming across workspaces.
- The software shall permit the users to view the program elements live data both in the web user interface within the programming tool in the browser.
- The software shall permit inserting a live programming workspace into custom display.
- The software shall support using subroutine programming which is used to run the same programming across multiple devices.
- The software shall support self-programming “validation” which can be run prior to publishing to check and advise of errors that need fixing before publishing.
- The software shall support a file repository that can hold multiple files available from the web user interface or via remote file sharing (if enabled)
- The files can be edited live on any device and exported to be used in another like device
- The access to Control Programming shall be controlled by user and group permission
- The manufacturer shall provide online help to assist using the system, and provide regular updates as new features, enhancements or fixes are made available
- The manufacturer shall provide DDC programming content using online eLearning training to train users how to use the programming tool. The subjects covered shall include:
 - Introduction and Basics
 - Workspace and Function Blocks
 - Create and Publish
 - Subroutines
- The manufacturer shall provide detailed browser based online Help that can be used to inform users how to use the programming tool. The help shall be updated with each update and shall be exportable to use as an operator’s manual
- The Programming (DDC) online help content shall include:
 - DDC Introduction
 - DDC Environment
 - Workspace Menu and Canvas
 - Logic Blocks (functional description)
 - Null Values Interpretations

9.2. Display Tool

- The software shall come with a built-in display creation and editing tool operating in HTML5 using common web browsers with no plugins needed to operate.
- The tool shall allow users to create displays, device templates and object templates.
 - Displays – single display page
 - Device templates – repeatable display, increments by device number
 - Object templates – repeatable display defining Binary or Analog object properties
- The software shall be compatible with .jpg, .gif, .png image files.
- Displays shall be saved in .xml format.
- The tool shall have the following toolbar features to create display pages:

- Point permission defaults:
 - View level default
 - Write level default (binary)
 - Write level default (analog)
 - Write level default (other)
- Common configuration editor for:
 - Visual properties
 - Display properties
- Live text configuration:
 - BACnet properties
 - Device instance
 - Object types
 - Object instance
 - Property
 - Array index
 - Right click menu
 - Refresh
 - Change value
 - Live trends
 - Add Trend log
 - Alarms
 - View change activity
 - Device properties
- Boolean properties configuration:
 - BACnet properties
 - Device instance
 - Object types
 - Object instance
 - Property
 - Array index
 - Right click menu
 - Refresh
 - Change value
 - Live trends
 - Add Trend log
 - Alarms
 - View change activity
 - Device properties
- Range float properties configuration
 - BACnet properties
 - Device instance
 - Object types
 - Object instance
 - Property
 - Array index
 - Right click menu

- Refresh
 - Change value
 - Live trends
 - Add Trend log
 - Alarms
 - View change activity
 - Device properties
- Range Elements:
 - Low
 - High
 - Image
 - Text
- Button properties configuration:
 - Text
 - Font size
 - Font
 - URL
 - Location
 - Size
 - Layer
- Check box properties configuration:
 - BACnet properties
 - Device instance
 - Object types
 - Object instance
 - Property
 - Array index
 - Right click menu
 - Refresh
 - Change value
 - Live trends
 - Add Trend log
 - Alarms
 - View change activity
 - Device properties
- Image properties configuration:
 - File path OR URL
 - Image click – link URL
 - Location
 - Size
 - Layer
- Group box properties:
 - Text
 - Font size
 - Font
 - Location

- Size
- Layer
- HTML properties configuration:
 - URL link
 - Allow scrolling on image size
- Spectrum overlay configuration:
 - BACnet properties
 - Device instance
 - Object types
 - Object instance
 - Property
 - Array index
 - Full color spectrum
 - Stepped spectrum
 - Delta from-
 - Midpoint
 - Set point – BACnet point link
 - Dead band
 - Occupied space – BACnet point link
- Dial properties configuration
 - BACnet properties
 - Device instance
 - Object types
 - Object instance
 - Property
 - Array index
 - Scale factor
 - Face text
 - Face units
 - Face range
 - Colored dial bands
- Select-box configuration (drop down menu)
 - Select meter type
 - Quick link to meter display pages
 - Live trend-log display configuration
 - Up to 5 BACnet points
 - Location
 - Size
 - Layer
- Alignment tool to:
 - Align left
 - Align right
 - Align centre
 - Align top
 - Align bottom

- Align middle
- Repeat tool to:
 - Replicate any selected item
 - Number of copies to make
 - Spacing
- Increment by:
 - Device number
 - Object instance
 - Array index
 - Text item

10. FACILITY MANAGEMENT

10.1. Afterhours Billing

- The software shall provide the ability to produce bills (invoices) for payment by tenants for requested afterhours usage.
- Each tenancy afterhours bill (invoice) shall contain at a minimum the following information:
 - Ability for biller to insert company logo
 - Tenant name and address details
 - Tax invoice number
 - Date of issue
 - Total amount payable
 - Payment due date
 - Total amount payable after due date
 - Invoice charges breakdown
 - Sequence number
 - Floor
 - Suit
 - AC Zone
 - Event start
 - Event end
 - Actual duration
 - Billable duration
 - Chargeable rate per hour
 - Chargeable amount per instance
 - Applicable surcharges
 - Total charges
 - Total before GST.
 - GST.
 - Instructions on how to pay bill (invoice)

10.2. Utility Billing

- The software shall provide the ability to produce bills (invoices) for payment by tenants for utilities usage.
- The software shall record and show a summary of previously produced bills (invoices) and allow users to download for viewing or re-distribution at a later date.
- The software shall provide the ability to produce bills (invoices) for the following utility types:

- Electricity
- Gas
- Water
- Thermal Energy
 - Chilled Water
 - Heating Hot Water
- Each tenancy afterhours bill (invoice) shall contain at a minimum the following information:
 - Ability for biller to insert company logo
 - Tenant name and address details
 - Tax invoice number
 - Date of issue
 - Total amount payable
 - Payment due date
 - Total amount payable after due date
 - Meter Summary
 - Meter Description
 - Days covered by bill (invoice)
 - Previous reading
 - Current reading
 - Usage between previous and current reading
 - Summary bar chart showing previous 12months consumption
 - Average usage per day
 - Average usage for same time last year
 - Time of use charge details including:
 - Off-peak
 - Peak
 - Shoulder
 - Peak demand
 - Time on/off
 - Rate applicable
 - Usage during period
 - Charges applicable
 - Additional fees and charges
 - Service charge
 - Processing charge
 - Total usage and supply charges
 - Total before GST.
 - GST.
 - Instructions on how to pay bill (invoice)

11. LANGUAGE TRANSLATION

- The software shall provide the ability to translate the web presentation of the menu items and help content into the language used by the browser.
- The software shall support at a minimum the following languages: English, French, Spanish, Chinese, Greek, Arabic, Portuguese, Romanian, Filipino, Malay, Thai, Hindi, Vietnamese, Japanese, and Korean.
- The software shall be able to update to include additional languages as software updates occur.
- The user can switch their browser language on demand, and when doing so the content shall change automatically with no need to restart the system.
- The software will provide a language translation tool to Find and Replace any word or phrase used in the system.
- The translated content can be uploaded for immediate use.
- The translated content can be exported in a binary file that can be used in another installation.
- The language shall be displayed in the user interface using the appropriate character encoding determined by the browser configuration.
- The default language is English.
- A reset to default language shall be provided.