# O&M Guide to Building Monitoring and Controls Equipment Descriptions

## Table of Contents

# Building Monitoring and Control Systems (BMC) Descriptions

Note: These descriptions and definitions are provided to help clarify communications between O&Ms and the GSA IT community when describing faulty equipment as part of a troubleshooting effort or for any other purpose where clear nomenclature is required.
BMC systems are designed to operate building equipment or obtain data from the building equipment or environment, or both. BMC systems include their controllers, devices and sensors. Building Automation Systems are included within BMC Systems.

Other BMC Systems include utility or advanced metering, renewable energy systems, smart sensors, digital signage, irrigation control, lighting systems, network connected electric vehicle charging stations or any combination of foregoing. Refer to ADM 70021 - GSA Smart Buildings Directive for additional information on Smart Building requirements and system types.

# Building Automation Systems (BAS) (Figure 1 - Components of a BAS)

The typical BAS architecture is made of three key aspects:

1. IT Components (server, global controllers, IP edge devices)
2. Mechanical Devices/Controllers (serial devices)

3. Mechanical Equipment (chillers, boilers, VAV's, etc.)

# IT Components

## Server (Figure 1 - Components of a BAS)

The server is the host database storage point for the BAS. It acts as the centralized point for managing the data created by the sensors and mechanical equipment in the system. The server may also act as the central viewing point to monitor and control the system, hosting graphics or acting as a connection point to the global controller. Servers can have a 1 to 1 relationship with a building, or in most cases will have a one to many relationship, controlling/monitoring multiple buildings. If it is a regional or national server, Building IDs are not part of naming convention, as typically these servers and systems are expanded or edited over time.

## Global Controller (Figure 1 - Components of a BAS)

The global controller is the "brain" of the BAS.

As the technology in building automation systems has matured, the IT security requirements have increased to keep pace. Due to strict requirements and increased vulnerabilities related to the server and global controllers, BAS manufacturers have had to model their development and production after the IT model. This means the devices are patched and updated to keep up with the latest identified vulnerabilities.

One result of this change is that Global Network Controllers (GNC) require significantly more investment from manufacturers to support, and as such, older GNC's are not receiving this support. Because this support is critical for maintaining a secure network, the GSA must ensure that the GNC's on the network are supported and this can mean replacing the GNC's with newer, supported versions. As these replacements are software driven, PBS has identified this as BA61 IT-based work.

## Internet Protocol (IP) Edge Devices or Controller (Figure 1 - Components of a BAS)

The IP edge devices can make up the majority of the components of a BAS. These devices communicate over a twisted pair communication bus (IP or Ethernet) and connect to the mechanical equipment. These devices are physically connected to the valves, pumps, fans, dampers, and sensors that complete the space conditioning. IP edge devices also connect back directly to a GSA network switch and are not required to be connected to a Global Controller (ie. JACE). There can be as many as 70 to 100 edge devices per network switch so long as the Rapid Spanning Tree Protocol (RSTP) is utilized. These devices can be replaced without the need of replacing the mechanical equipment each device controls.

## Mechanical Equipment

There is a wide range of mechanical equipment that global controllers, IP edge devices, or serial devices can control. Some examples are listed below.

- Chillers
- Boilers
- AHU's
- VAV's
- Other (i.e. Cooling Towers, Heat Exchangers, Pumps, Chemical Feed Systems, Utility Feeds, Variable Frequency Drives, Snow Melt, Chemical Detection, Variable Refrigerant Flow, Heat Pumps, Generators, Uninterruptible Power Supplies, etc.)

## Mechanical Devices/Controllers (Serial Devices) (Figure 1 - Components of a BAS)

Serial Devices make up the majority of the components of a BAS. These devices communicate over a twisted pair communication bus (Figure 2 - Twisted Pair Communications Bus Visual/Example). Twisted pair does not communicate via IP or Ethernet to connect to the mechanical equipment. These devices are physically connected to the valves, pumps, fans, dampers, and sensors that complete the space conditioning. Serial devices connect back to a global controller and typically have 20 to 30 serial devices per serial wiring segment. Global controllers typically have up to 3 serial wiring segments connected, which allows them to consolidate and control between 60-100 serial devices simultaneously. These devices can be replaced without the need of replacing the mechanical equipment each device controls. There are many types of twisted pair communication (Figure 3 - Types of Twisted Pair Communications).

# Attachments

## Glossary

### Advanced Metering

Advanced Meters (or "smart meters") are devices that collect and transmit energy and water data in real-time. The granular data unlocks key operational insights and is a critical part of the energy program. The Advanced Metering Program is supported by two major applications: Power Monitoring Expert (Schneider Electric PME) and MUSE (IBM Envizi).

### GSALink

GSALink is GSA's Fault Detection & Diagnostics (FDD) Solution. GSALink continuously monitors building systems for losses in efficient operation and performance. When GSALink detects a loss in equipment performance or operations, it automatically, without human intervention, notifies the FM team via their work order management system. GSALink tracks the total estimated cost impact (TECI) of the loss in efficiency until the FM team resolves the underlying cause of the fault. TECI values are tailored to the equipment and the type of fault that is detected by GSAlink.

The GSALink III contract contains an optional CLIN that allows for regions to fund interactions to GSALink by coordinating through OFM Smart Buildings program. The regions and national program often refer to these as 'points' for integration to GSALink, as pricing is based on the number of points integrated to the system.

### Operational Excellence (OE)

Buildings are designed, then constructed, then operated. GSA's Public Buildings Service has well established programs for Design Excellence and Construction Excellence to promote the best possible design and construction, and has produced remarkable results. Operational Excellence (OE) follows as a natural complement to plan for operations. The Operational Excellence program promotes consistent interaction with design and construction. A network of Facilities Management experts and managers inject the long view at the most critical points of design review, and leverage consistent, thoughtful methodologies and information.

### National Computerized Maintenance & Management System (NCMMS)

The National Computerized Maintenance Management System (NCMMS) is a collaborative effort between Central Office FMSP, OCIO, FAS and all regions to deploy a single CMMS solution across our 11 regions. The National CMMS will maintain information about each building's maintenance operations to help us maintain our facilities effectively, by using

computers to plan and track: Building equipment inventories, Equipment maintenance schedules, Work orders and WO performance, and Service requests.

## National Digital Signage (NDS)

GSA has developed a National Digital Signage platform to provide building and project teams with an approved, easy to specify solution for digital signage needs. The system consists of a media player, a touchscreen monitor, a kiosk enclosure, and nationally supported software. OFM maintains the national license for the platform via the GSALink III contract. Regions coordinate with OFM to receive guidance on procuring the hardware and required coordination to set up new signage for owned federal buildings.

## Smart Sensors

The installation of Smart Sensors and integration to GSALink for analytics on sensor data will provide granular level data to shift operational actions from a building approach to a zone/space focus. This data will be used to adjust system operations, support portfolio planning, and enable other tenant-focused enhancements that improve building performance. GSALink continuously monitors building systems for losses in efficiency and performance, and has a new greenhouse gas (GHG) application to support reporting for the broader sustainability objectives.

Smart Sensors are generally used for monitoring only, but can be programmed to provide information that is used to control other components of the system. Example, occupancy sensor detects a room is empty, then the sequence of operations is updated to indicate to the system that it should be set to unoccupied mode.

## Securing Building Systems (SBS)

This is an annual allocation for PBS that is focused on modernizing building systems to secure cyber posture against vulnerabilities. This program is coordinated with GSA IT to ensure alignment on priority updates for the network connected building inventory.

## Unified User Interface (UUI)

This program initiative is focused on integration of systems, rather than building specific integrations. The main objective is to integrate siloed operational and record-keeping systems into one interface for a concise, streamlined experience to monitor building conditions, performance, and key metrics. The initial phase of integration will target integration of the following systems: Building Monitoring and Control Systems, NCMMS, GSALink, Smart Sensors, and Envizi. Based on data available from cross-walking these systems, the UUI is anticipated to focus on an initial subset of 150 buildings. This platform will provide real-time situational awareness for building operators and facility management to drive building efficiency, as shown on the IRA E&ST Smart Building overview.

## Regional Operations Center (ROC) - NCR Region Only

Regional Operation Centers (ROC) offer an environment where facility managers (FM's) can monitor and control day to day operations or emergencies remotely for multiple properties in a centralized location.

# Figures

## Figure 1 - Components of a BAS

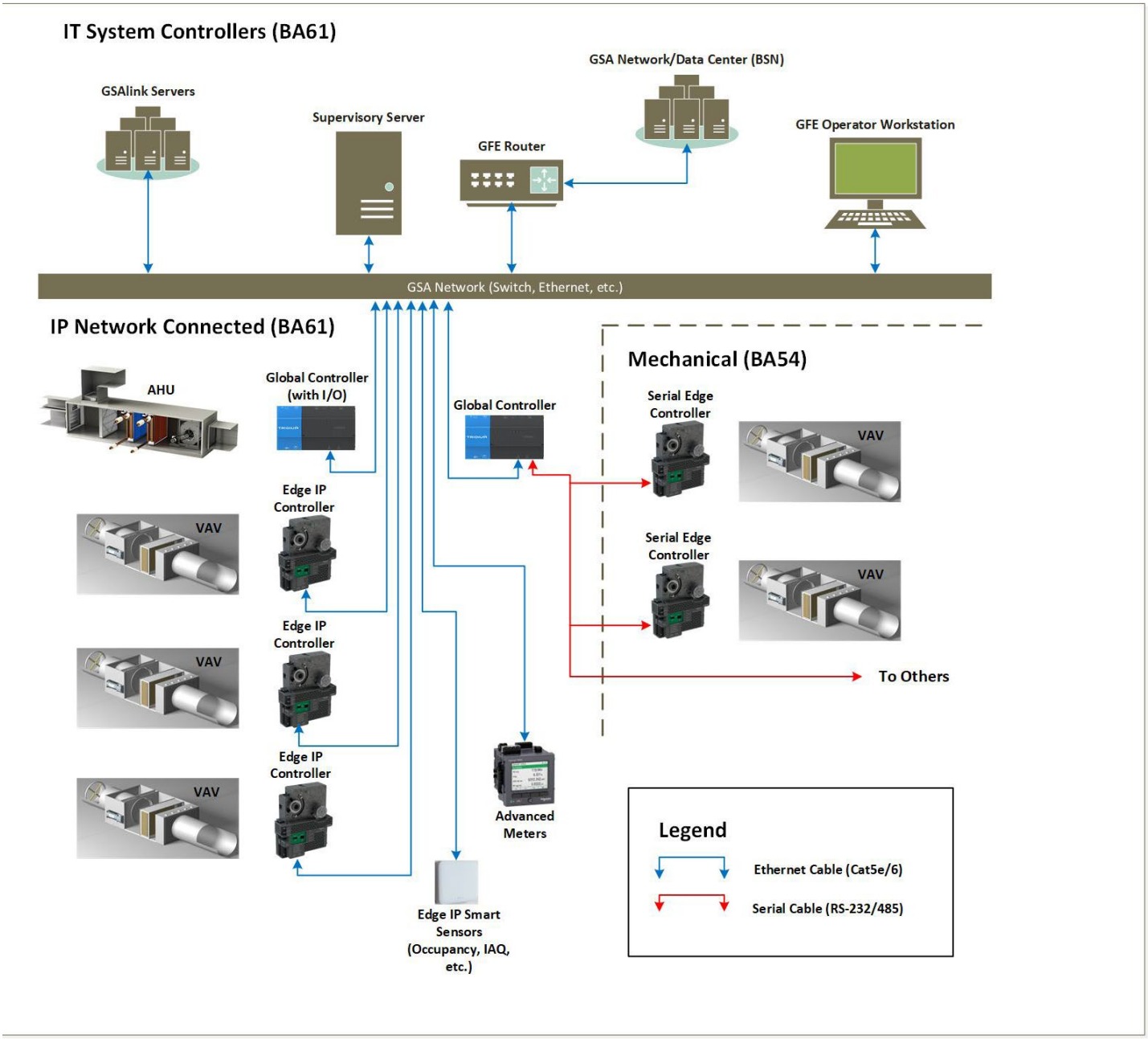

Figure 2 - Twisted Pair Communications Bus Visual/Example

Figure 3 - Types of Twisted Pair Communications

# Tables

## Table 1 - BAS Manufacturer Devices

| Manufacturer | Server Software* | Global Controllers* |
|---|---|---|
| Tridium | Niagara R2, AX, N4 | JACE |
| Johnson Controls Inc (JCI) | Metasys, Facility Explorer | NAE, NCE, NIE, SNE, FX |
| Siemens | Apogee Insight, Desigo CC, TALON | PXC, MEC, MBC, TC |
| Schneider Electric | I/NET Seven, Andover Continuum, TAC Vista, EcoStruxure | Xenta, bCX, ACX, NetController II, Automation Server (AS, AS-P, AS-B) |
| Honeywell | EBI, Comfort Point, WEBS | CP-IPC, CPO, WEBS |
| Alerton | Envision for BACtalk, Alerton Building Suite, Compass | BCM, VLX, ACM |
| Delta Controls | ORCAview, Entilweb | DSC, DAC, DCU |
| Automated Logic Controls (ALC) | WebCTRL | G5CE Optiflex (LGR replacement), LGR, ME812U-LGR, ME-LGR |

The table above is not all encompassing. Please ensure you're specifying the most recent version of the device that has been scanned and remediated by GSA IT.

Part Names previously mentioned are listed without part numbers. These part names are typically followed by a revision number (ie JACE 8000, PXC36-A, Metasys 11.03). These numbers indicated size, capacity or version of the software/device.