Metasys® System Product Bulletin

The *Metasys*® system is the industry leading Building Automation System and the foundation of modern building efficiency. It enhances occupant comfort, safety, security, and productivity, and it provides more system control and easier access to information than other Building Automation Systems. It is a complete family of systems and servers designed to work together as one cohesive system. A time-tested industry leader, it has proven reliable for the most demanding customer scenarios.

Metasys Release 8.0 provides exciting new features and capabilities that continue to position the *Metasys* system as the leading Building Automation System in the industry, including:
- the latest set of enhancements that consolidates existing *Metasys* user interface products into a single, simplified, and easy to learn interface that is accessible from smart phones, tablets, and computers
- an enhanced System Configuration Tool (SCT) that supports the efficient configuration of this powerful new user interface
- field productivity enhancements with the SCT
- updated and enhanced security provisions

Features and Benefits

Operational Savings
- Enhance productivity and effectiveness with the new simple and intuitive **user interface**.
- Access your *Metasys* system anytime, anywhere with **mobile device compatibility**.
- Enable quick decision-making with data displayed through **graphics**.
- Reduce programming, commissioning, and troubleshooting time with **Tailored Summaries**.
- Collect, summarize, and present building data in relevant and usable ways with **Advanced Reporting**.
- Schedule collection of historical data, including alarm, audit, and trend data with **Export Utility**.
- Extend building management capability with **wireless sensors and controllers**.
- Integrate with other systems in your facilities using popular **communication protocols**.
- Automate the tasks for facility managers and staff.
- Increase effectiveness and lower operational costs with **Alarm Management**.

Energy Savings
- Save energy using the *Metasys* **Scheduling and occupancy detection** features to operate equipment only when needed.
- Achieve more energy savings using additional features such as **Trend Summaries** and **Demand Limiting/Load Rolling**.
- Convert building data into energy spent. Measure and validate savings with **Energy Essentials**.
- Get top performance from your energy and central plant equipment with **Central Plant Optimization™ (CPO) 10**.
- Seamlessly integrate with cloud-based applications for peak building performance.
- Enhance productivity using Interlock objects to establish conditional control over one or more other objects. You can specify a set of conditional checks (using one or more points) for which a series of commands is used to control a collection of one or more other objects.

IT and Platform Security
- Utilization of **standard IT messaging** communication protocols to enable efficient transportation of massive amounts of data.
- Enhanced *Metasys* system security with **password management processes** to match best industry standard practices.
- Updated support for BACnet® protocol revision 12.
- Compatibility with **current operating system and platform technologies**, including newer versions of Microsoft operating systems, SQL Server, and Apple Safari web browser.
- Encrypted data exchange between your mail client and the *Metasys* server or supervisory engine with a digital security certificate through a **Secure Socket Layer (SSL) connection**.

Johnson Controls

Comfort and Security

- Monitor the HVAC, lighting, and security systems through a **unified user interface**.

- Alert the operators of facility problems by detecting problems before they become an issue.

- Perform a **pre-defined action** during an **alarm** event.

- Create **action interlocks** to occur within the *Metasys* system when access to the control system is granted.

- Initiate a **door-open command** or trigger a security output point from a **single seat operation** through our improved unified user experience.

- Integrate with your Fire and Security systems.

- Use available options to achieve **UL 864 Smoke Control listing**.

- Support your **remote monitoring services**.

Diagnostics

- Summarize **Potential Problem Areas** to see all items in alarm, warning, overridden, out of service, and offline within a space in the *Metasys* UI.

- Perform ad-hoc analysis on spaces served by equipment or equipment using the **Trend widget** and the Custom Trend Viewer in the *Metasys* UI.

Figure 1: *Metasys* System Architecture
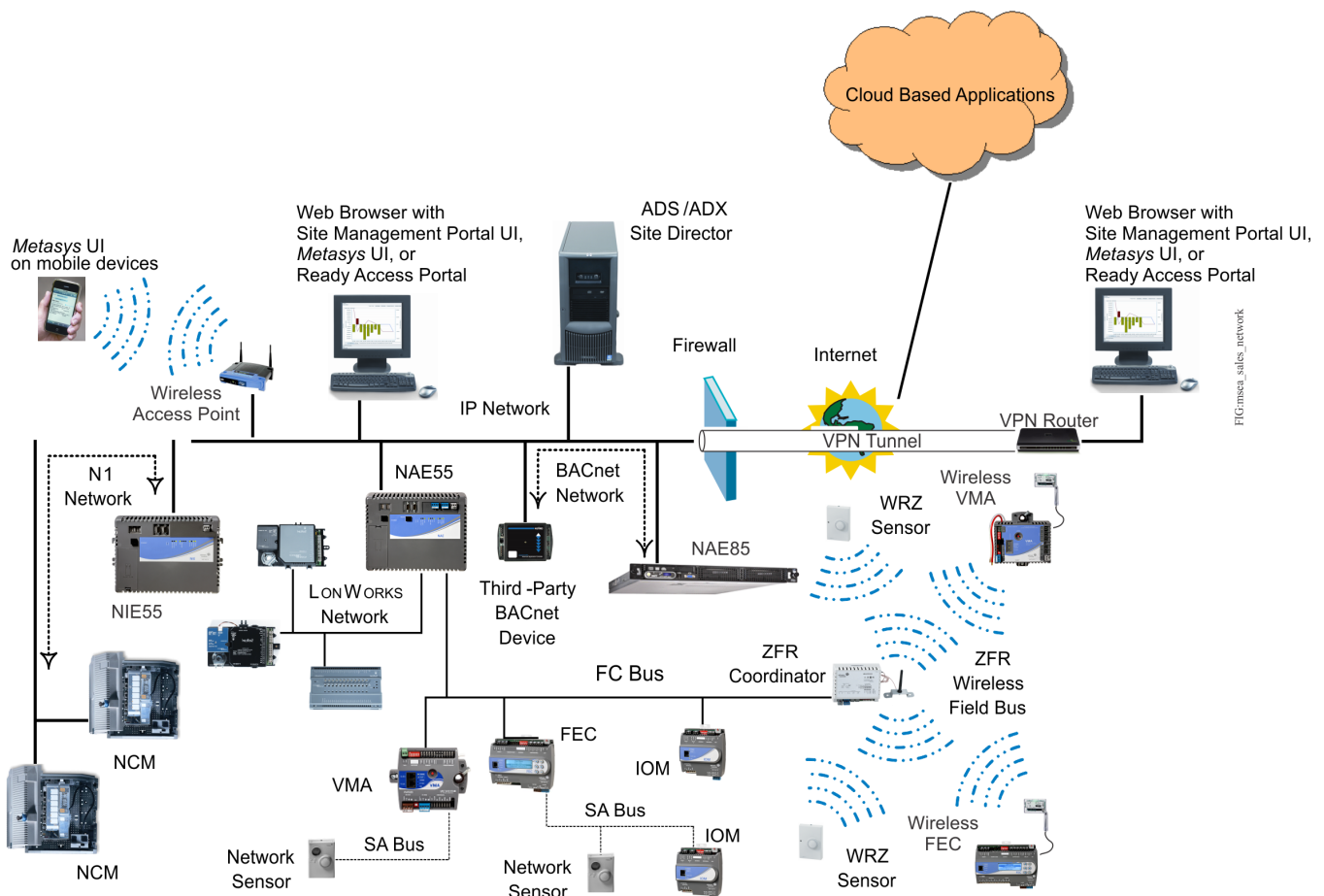
For more variations of the *Metasys* system architecture, refer to the *Metasys System Configuration Guide (LIT-12011832)*.

System Architecture

The *Metasys®* system comprises various hardware and software components that work closely together to provide coordinated control over a site's HVAC and other building systems.

Distributed

The *Metasys* system architecture is a distributed architecture, meaning that its components can be located as closely as possible to the equipment they are controlling, to provide optimum performance and reliability.

These distributed *Metasys* components along with their data sources and the equipment they control are connected together using:
- direct wiring
- network wiring
- wireless networking

The distributed *Metasys* components and various connection methods ensure system-wide data sharing, coordination, and remote access.

Scalable

The *Metasys* system architecture is scalable, meaning components can be added as needed to:
- control buildings and systems of varying complexity, size, and scope
- integrate third-party devices, to unify their operation with the *Metasys* system
- integrate earlier generations of *Metasys* components to modernize and unify their operation

Open

Because the *Metasys* system uses the standard data formats and communication protocols of the BAS and IT worlds, it is compatible with the networking infrastructure found in most buildings today. The *Metasys* system integrates building systems using BACnet, N2, LonTalk, MODBUS, M-Bus, KNX, and web services communication technology. At Release 8.0, the *Metasys* system now supports BACnet protocol revision 12. Johnson Controls® BACnet devices and third-party BACnet devices can be connected directly to the IP Ethernet network or to the MS/TP Field Bus. BACnet is also used to integrate the Johnson Controls P2000 Security Management System into the *Metasys* system. LONWORKS controllers from Johnson Controls or LONMARK® certified devices from other manufacturers can be integrated into the *Metasys* system architecture. In a similar fashion, the *Metasys* system connects to N2 and N1 protocol devices. The *Metasys* system also communicates to third-party devices using MODBUS, M-Bus, and KNX integrations. Regardless of the protocols used, the data is available for display in the *Metasys* user interface, for archiving in application servers, and for transmission to other devices on the IP network.

The *Metasys* system also supports:
- TCP/IP as the communication protocol between network engines, Application and Data Servers (ADSs), and web browsers
- Simple Network Management Protocol (SNMP) for alarm traps and object queries in the Management Information Base (MIB)
- Simple Network Time Protocol (SNTP) for network time synchronization
- Simple Mail Transfer Protocol (SMTP) for email message transfer
- Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) for device naming and dynamic network addressing
- Simple Object Access Protocol (SOAP) and XML, which transfer data between components of the system and make the data available to enterprise applications through the use of published web services
- Wireless communication standards, including Bluetooth® (used during commissioning), WiFi (used in network communication), and ZigBee® (for field controller and sensor mesh)
- The Microsoft® Active Directory® service, which provides a standard IT integration of the *Metasys* system into a customer's existing Active Directory service infrastructure for Site Management Portal (SMP) UI, *Metasys* UI, and Ready Access Portal login authentication purposes
  Note: The *Metasys* UI is not available on sites with network engine Site Directors.
- The SQL database format, used by the Application and Data Server (ADS) to store historical data, which allows use of Microsoft SQL Server® software

Secure

The *Metasys* system uses industry-standard system security and encoding protocols to protect against unauthorized access to data and control systems.

Release 8.0 includes the following security features:
- Supports three types of users: local users, Active Directory users, and RADIUS users.
- Obscures user names and passwords.
- Enforces strong passwords.
- Supports Remote Authentication Dial-In User Service (RADIUS) server. The RADIUS server authenticates your identity as an authorized user of the system. RADIUS implementation in the *Metasys* system adheres to the following Internet Remote Function Calls (RFCs):
  - RFC 2865 - Remote Authentication Dial In User Service (RADIUS)
  - RFC 2548 - Microsoft Vendor-specific RADIUS Attributes
  - RFC 2759 - Microsoft PPP CHAP Extensions, Version 2
- Provides the Syslog dynamic data access (DDA), an optional capability of sending its configured audit log entries and alarm notifications to an external, industry-standard Syslog server, conforming to Internet published RFC 3164.
- Provides Dormant account settings for users and reports. Dormant User Account Reports are available in SMP. Dormant user account events are also included in the Audit Viewer and the Event Viewer.

System Components

A typical *Metasys* system architecture comprises three tiers of components:
- Equipment Controllers
- Network Engines
- Application and Data Servers/Extended Application and Data Servers

Equipment Controllers

Metasys equipment controllers directly monitor and operate the HVAC and other building system equipment using onboard inputs and outputs and locally processed control logic.

Figure 2: Equipment Controllers in the System Architecture
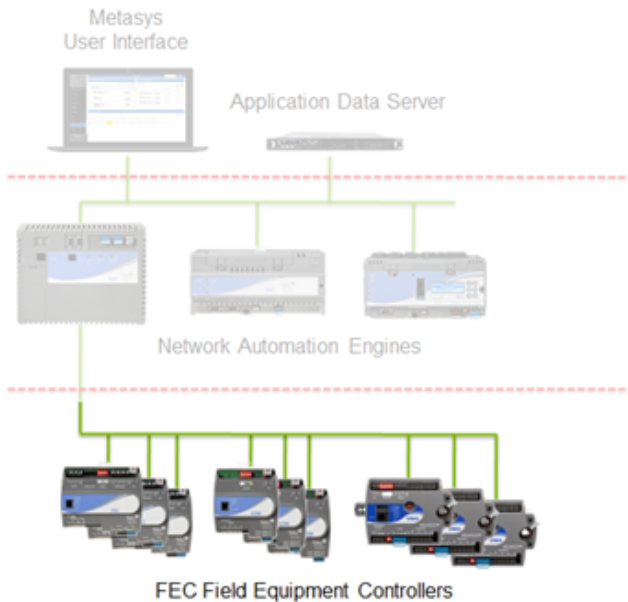
Metasys equipment controllers include three families of controllers:
- Field Equipment Controller (FEC) Family (*Figure 2*)
- TEC Thermostat Controller Family (*Figure 3*)
- LN Series LONWORKS® Controller Family

Field Equipment Controller (FEC) Family

The Field Equipment Controller (FEC) family of controllers is a line of fully programmable, high-performance devices designed specifically for controlling a wide range of mechanical and electrical equipment found in commercial buildings. For more information on FECs, refer to the *Metasys® System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)*.

The FEC family includes the following controller types:
- Field Equipment Controllers (FECs)
- Advanced Application Field Equipment Controllers (FACs)
- Variable Air Volume Modular Assemblies (VMAs)

See *Table 1* for a comparison of the controllers.

Onboard Inputs and Outputs

FECs feature onboard inputs to receive information such as temperature, pressure, humidity, CO_2, energy consumption, occupancy detection, and equipment status. FECs feature onboard outputs to control valve and damper actuators, sequence staged equipment, and turn equipment and lights on and off.

Different FEC models are available with different I/O mixes, letting you select the most appropriate controller and I/O for the target equipment. FECs also use configurable inputs and outputs, providing great flexibility.

Sensor/Actuator (SA) Bus

In addition to their onboard I/O interfaces, FECs feature a Sensor/Actuator (SA) Bus to gain additional input and output interfaces and to connect to networked end devices. SA Bus devices include:

- **Input/Output Modules (IOMs):** add additional input and output interfaces to an FEC family controller to aid in operating large or complex equipment (such as central plants or large air handlers).
- **Network Sensors (NSs):** measure temperature, humidity, CO_2, and occupancy, and transmit this information to the FEC family controller. Various mounting options are available, including wall-mountable and duct-mountable sensors.
- **Variable Speed Drives (VSDs):** control fan and pump speed, and can be controlled directly by the FEC family controller over the SA Bus.

Onboard Control Logic

The control logic in all FECs is fully programmable, making FECs well suited for controlling a wide variety of equipment. FECs feature advanced logic capabilities including:

- **State-Based Control Logic:** ensures that only the specified control logic for any given state is executed. State-based logic prevents energy-wasting control situations such as simultaneous heating and cooling.
- **Continuous Adaptive Control Algorithms:** provide better control over time by automatically adjusting

tuning parameters in response to seasonal and other load changes.

- **Chiller Plant Optimization 10:** selects the most efficient combination of chillers, pumps, heat exchangers, and cooling towers needed to match the building load, while observing all the timing delays needed for safe and stable operation.

The Controller Configuration Tool (CCT) is the interface to the FEC family controller's control logic, and provides visually intuitive screens for programming, simulating, and commissioning. CCT is well suited for programmers of any skill level and provides multiple programming interfaces, including:

- **System Selection Wizard:** allows programmers to choose from a list of application programs and to select their specific control options by using a check-the-box interface.
- **Sideloop Wizard:** enables programmers to easily add additional custom control logic to the main control application by using a check-the-box interface.
- **Logic Interface:** enables programmers to create unique, custom programs by selecting and connecting functional logic blocks. The Logic interface also allows programmers to add or modify the control logic of

applications created by the System Selection and Sideloop Wizards and also to view the logic and data flow for troubleshooting.

Field Controller (FC) Bus

FEC family controllers feature a Field Controller (FC) Bus to share information peer-to-peer and with other components of the *Metasys* system. The FC Bus also allows network engines to supervise FEC family controllers. The networking protocol options supported by the FEC control family include:

- **BACnet MS/TP:** applies to installations, where a high-speed, industry-standard, open communication protocol is preferred
- **ZigBee Wireless:** applies to installations where a less invasive, more flexible networking alternative to hardwiring is preferred or is more affordable
- **N2:** applies to legacy *Metasys* system installations that have FEC family controllers added, where they can share the same N2 bus as legacy *Metasys* controllers such as UNTs, VMAs, and DX-9100s

Note: FEC family controllers used for Smoke Control applications cannot be switched between MS/TP and N2 communication protocols in the field.

FEC Comparison

Table 1: Field Equipment Controller Comparison

	Field Equipment Controller (FECs)	Advanced Application Field Equipment Controller (FACs)	Variable Air Volume Modular Assemblies (VMAs)
Typical Application	Controlling: • Rooftop Units • Heat Pumps • Unit Ventilators • Air Handling Equipment • Central Plant Equipment • Exhaust Fans • Supplemental Heating Equipment	Controlling: • Equipment requiring local scheduling, alarming, and trending • Air Handling Equipment • Central Plant Equipment	Controlling VAV boxes
Processor	32-bit	32-bit	32-bit
Onboard Real Time Clock	No	Yes	No
Communication Protocol	• BACnet MS/TP (B-ASC) or N2 (field switchable) • ZigBee Wireless (via add-on module)	• BACnet MS/TP (B-AAC) or N2 (field switchable) • ZigBee Wireless (via add-on module)	• BACnet MS/TP (B-ASC) or N2 (field switchable) • ZigBee Wireless (via add-on module)
Expandable via SA Bus	Yes	Yes	Yes
Programmable Control Logic	Yes	Yes	Yes
Programming Tool	Controller Configuration Tool (CCT)	Controller Configuration Tool (CCT)	Controller Configuration Tool (CCT)

TEC3600 Networked Thermostat Controllers

TEC3600 Networked Thermostat Controllers are specifically designed for controlling common commercial heating and cooling equipment. TEC3600s are packaged in enclosures designed for mounting on a wall in the controlled space.

Figure 3: TEC3600 Networked Thermostat Controller

The TEC3600 Series Networked Thermostat Controllers are field-selectable BACnet®
Master-Slave/Token-Passing (MS/TP) or N2 networked devices that provide on/off, floating, and proportional control of:
- local hydronic reheat valves
- pressure-dependent VAV equipment with or without local reheat
- two- or four-pipe fan coils
- cabinet unit heaters
- other zoning equipment using an on/off, floating, or 0 to 10 VDC proportional control input

Models also provide single- or two-stage control of unitary rooftop units (RTUs) with or without economizers and heat pumps. The networked models feature a field-selectable Building Automation System (BAS) BACnet MS/TP or N2 communication capability that enables remote monitoring and programming for efficient space temperature control. All models include a USB port configuration that reduces installation time by allowing simple backup and restore features from a USB drive, which enables rapid cloning of configuration between like units.

Some models have occupancy sensing capability built into the device. These thermostat controllers maximize up to 30% energy savings in high-energy usage commercial buildings, such as schools and hotels, during occupied times by using additional standby setpoints.

All models feature an intuitive UI with backlit display that makes setup and operation quick and easy. Multiple fan configurations are supported for fan coil equipment types:
- single-speed
- multi-speed (two or three discrete speeds)
- variable-speed/EC motors (0 to 10 VDC control)

Some models support dehumidification on two-pipe fan coil units with reheat, and four-pipe fan coil units with or without reheat. When no heating is required, the thermostat controller monitors space humidity and activates dehumidification control as necessary. Heat and/or reheat is used as required to maintain the space temperature. For optimal dehumidification performance, use a fan coil unit that has a multi-speed or variable-speed fan (VSF).

For more information on TEC3600s, refer to the *TEC3000 Series Stand-Alone and Field Selectable BACnet MS/TP or N2 Networked Thermostat Controllers Product Bulletin (LIT-12011954)*.

LN Series LᴏɴWᴏʀᴋꜱ Controllers

The *Metasys* system LN Series controllers use the LᴏɴWᴏʀᴋꜱ communication protocol and can be programmed using any compliant software, such as LN Builder. The plug-in for these devices features a graphical control logic interface that is custom-made to suit various control requirements.

LN Series controllers are available either in fully programmable or LᴏɴMᴀʀᴋ® Profile-compliant configurable models. LN Series application-specific controllers let you control equipment such as rooftop units, fan coils, heat pumps, unit ventilators, VAV boxes, and other terminal units. LN Series programmable controllers apply to multistage air handling units, chillers, boilers, and refrigeration systems.

For more information, refer to the *LN Series Controllers Overview Product Bulletin (LIT-1201979)*.

Network Engines

Figure 4: Network Engines in the System Architecture

Metasys network engines provide network management and system-wide control coordination over one or more networks of equipment controllers, including *Metasys* FEC, TEC; and LN type equipment controllers; legacy *Metasys* controllers, such as UNTs, VMA14xx, and DX-9100s; and third-party equipment controllers.

Metasys network engines may also be networked together for scaling up on large projects, and they may be networked with an Application and Data Server (ADS) for additional functionality and site unification.
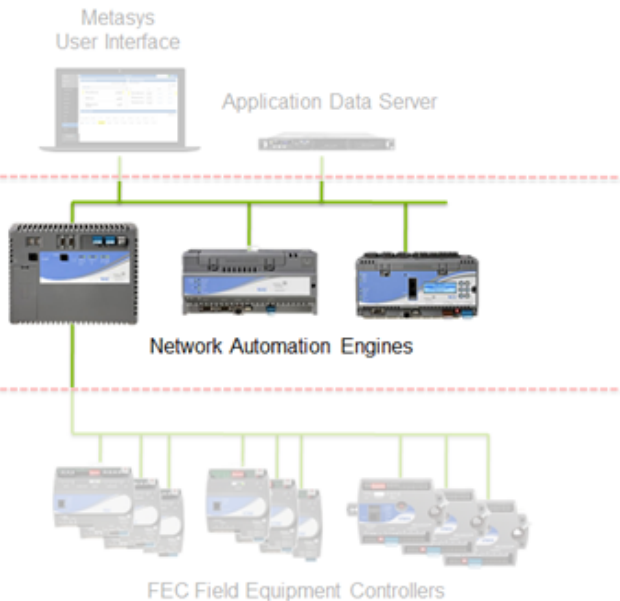
The *Metasys* system includes three types of Network Engines:

- Network Automation Engines (NAEs)
- Network Control Engines (NCEs)
- Network Integration Engines (NIEs)

See *Table 2* for a comparison of engines.

Network Engine Comparison

Table 2: Network Engine Comparison

	Network Automation Engine (NAE)	Network Control Engine (NCE)	Network Integration Engine (NIE55)	Network Integration Engines for Third-Party Integration (NIEx9)	Network Automation/Integration Engine (NAE85) and Network Integration Engine (NIE89) for Third-Party
Network Management Capabilities	Model-specific: • BACnet MS/TP • BACnet IP • N2 • LonWorks	Model-specific: • BACnet MS/TP • BACnet IP • N2 • LonWorks	Model-specific: • Legacy *Metasys* N1	Model-specific: • BACnet MS/TP • BACnet IP • N2 • LonWorks • Modbus RTU and TCP • KNX IP • M-Bus Serial and IP	NAE85: • BACnet IP (NAE85) • Legacy *Metasys* N1 (NIE85) NIE89: • Modbus IP • KNX IP • M-Bus IP • BACnet IP
Embedded Equipment Controller	No	Yes	No	Model-specific (only for NIE29)	No
System-Wide Control Capabilities	• Scheduling • Alarm and event management • Energy management • Data exchange • Historical data storage and management • Custom control logic	• Scheduling • Alarm and event management • Energy management • Data exchange • Historical data storage and management • Custom control logic	• Scheduling • Alarm and event management • Energy management • Data exchange • Historical data storage and management • Custom control logic	• Scheduling • Alarm and event management • Energy management • Data exchange • Historical data storage and management • Custom control logic	• Scheduling • Alarm and event management • Energy management • Data exchange • Historical data storage and management • Custom control logic
User Interface	Site Management Portal (SMP) Ready Access Portal	Site Management Portal (SMP) Ready Access Portal	Site Management Portal (SMP) Ready Access Portal	Site Management Portal (SMP) Ready Access Portal	Site Management Portal (SMP) Ready Access Portal
Programming Tool	System Configuration Tool (SCT)	System Configuration Tool (SCT) Controller Configuration Tool (CCT) for NCE25xx models	System Configuration Tool (SCT) (all NIEs)	System Configuration Tool (SCT) (all NIEs) Controller Configuration Tool (CCT) for NxE29xx models	System Configuration Tool (SCT) (all NxEs) SCT and NIEx9 Driver Manager tool (NIEx9s only)

Field Equipment Network Management and Integration

Metasys network engines provide network management over one or more networks of equipment controllers and other field devices. *Metasys* network engines feature several optional communication port and protocol selections for integrating not only *Metasys* equipment controllers, but also hundreds of types of non-*Metasys* devices and third-party devices typically found in commercial buildings.

- **BACnet MS/TP:** for managing networks of *Metasys* FEC and TEC equipment controllers, non-*Metasys* BACnet controllers, as well as third-party BACnet MS/TP devices.
- **BACnet/IP:** for managing networks of third-party BACnet/IP devices.
- **N2:** for managing networks of legacy *Metasys* equipment controllers, such as UNTs, VMA1400s, and DX-9100s and third-party N2 Open devices.
- **LONWORKS:** for managing networks of *Metasys* LN LONWORKS controllers, legacy LONWORKS equipment controllers, such as DX-9200s and TCUs, as well as third-party LONWORKS devices.
- **Modbus:** for managing networks of third-party Modbus devices, such as energy meters and process controllers.
- **M-Bus (EN 1434-3):** for managing networks of M-Bus devices, such as heat meters.
- **KNX (formerly EIB):** for managing networks of KNX devices, such as window blinds and shading controls, lights, and meters.
- **Legacy *Metasys* N1:** for managing legacy *Metasys* N1 devices (NCMs).

The *Metasys* network engine software normalizes data retrieved from these networked field devices into BACnet objects, so a common set of control processes and services can be applied to all devices in a unified manner.

Remote Field Bus Applications

The Remote Field Bus uses a BACnet IP to MS/TP Router to connect remote BACnet MS/TP devices, such as FACs, FECs, VMA16s, IOMs, TEC3600 Series thermostats, and other BACnet MS/TP field devices.

By leveraging the *Metasys* Remote Field Bus capability and installing the BACnet Router near the BACnet MS/TP devices, you can reduce system cost.

Applications for the Remote Field Bus include:
- Any intra-building, inter-building, or remote location that has IP network connections readily available
- Locations where it is cost prohibitive or difficult to run MS/TP wiring between devices and the network engine, due to distance, cost, accessibility, or customer factors
- Locations where field controllers are segregated from the network engines
- Intra-building applications that connect segregated locations within a building (for example, connecting penthouses to mechanical rooms)
- Remote buildings where an MS/TP bus is not already available, but an Ethernet BACnet/IP network is (for example, university or hospital campuses)
- Sites with a reliable network between buildings that do not need to have a separate network engine for the building (for example, school districts)

Note: The ZFR1800 Series Wireless Field Bus System is not supported on the Remote Field Bus.

For details on how to add a Remote Field bus, refer to the *MS/TP Field Bus Integration Object* section in *Metasys® SMP Help (LIT-1201793)*. For details on how to add a Remote Field Bus to a *Metasys* supervisory engine with an ODS, refer to the *ODS Commissioning Guide (LIT-12011944)*.

Automated System-Wide Control and Coordination

Metasys network engines provide automated system-wide control and coordination over multiple field devices under one or more field device networks. Some examples of the system-wide control coordination capabilities include:

- **Scheduling:** enables network engines to automatically command mechanical or electrical equipment to a desired operational state (such as On/Off, Occupied/Unoccupied, Economy/Comfort, or Heating/Cooling/Economizer/Auto) based on a user-defined schedule. Operating parameters can be set according to time of day, days of the week, holidays, or calendar dates.
- **Alarm and Event Management:** enables the network engines to generate alarms based on user-defined criteria; to send alarm and event messages to web browsers, pagers, email servers, Network Management Systems, and serial printers; and to store and view alarm and event logs on the network engine and transfer the data to an Application and Data Server.

- **Network-Wide System Interlocking:** enables network engines to collect data from field devices, make logical comparisons between the data, and issue relevant commands to other field controllers, anywhere on the network.

- **Transaction Recording:** audits and logs all user actions performed through the network engine. Operators can review these logs to understand what changes have been made to the system, who made them, and when.

- **Historical Data:** can be collected and stored by network engines for any monitored data point value based on user-defined intervals or on a change of value. Network engines can transfer the data logs to the Application and Data Server at defined intervals or when the network engine logs are full.

- **Totalization:** allows network engines to calculate rolling sums of any monitored data point value stream. Operators can use this information to monitor runtime information useful for service, maintenance, and early identification of building system problems.

- **Optimal Start:** enables network engines to automatically determine the best time to start heating and cooling systems to ensure that the facility is conditioned for occupancy. It adjusts to seasonal variations and reduces energy use.

- **Demand Limiting Load Rolling (DLLR):** enables network engines to monitor energy (electricity, gas, steam, or water) meters and automatically shed equipment loads according to user-defined levels. Demand Limiting helps manage utility demand charges, and Load Rolling controls equipment operating levels to reduce total energy consumption. Comfort overrides prioritize equipment shedding.

Scalable

Different network engine models are available, each with different field device capacities, so you can select the model that best meets the size, complexity, and scope of your specific project.

For projects that exceed the capacity of a single engine, *Metasys* network engines may be networked together, and they may be networked with an Application and Data Server/Extended Application and Data Server (ADS/ADX) for additional functionality and site unification. Also, a network engine, connected to a small number of other network engines, can act as a *Metasys* Site Director without the need for an ADS/ADX.

Application and Data Server and Extended Application and Data Server (ADS/ADX)

Figure 5: Servers in the System Architecture
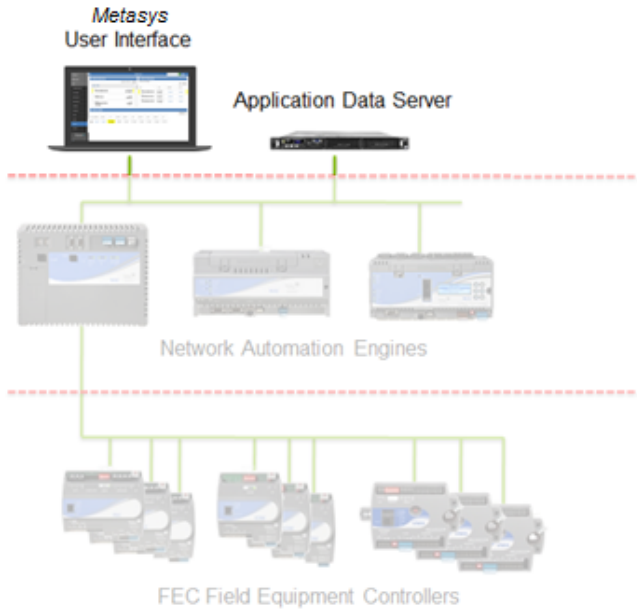
The Application and Data Server/Extended Application Data Server (ADS/ADX) is an optional component that can be added to the *Metasys* system. The ADS/ADX manages the collection and presentation of large amounts of trend data, event messages, operator transactions, and system configuration data, and provides one or more of the following:

- Site unification
- Long term, large scale storage of historical data
- Advanced reporting
- *Metasys* User Interface (UI), an end-user friendly user interface
- Site Management Portal user interface, which provides advanced operation and system navigation tree to show a hierarchal network view of the entire system for all connected devices

See *Table 3* for a comparison of *Metasys* servers.

Server Comparison

Table 3: Application and Data Server Family Comparison

Feature	Application and Data Server (ADS)	Extended Application and Data Server (ADX)
Host Platform	Desktop computer platform: • Microsoft Windows® operating system • Microsoft SQL Server Express database • Open Database Connectivity (ODBC) compliant database package	Server platform: • Microsoft® Windows Server® operating system • Microsoft SQL Server database
Supported Simultaneous Users	Up to 5 users	Up to 10, 25, 50, or 100 users (license specific)
Network Engine Management	Up to 14 engines	Up to 1,000 engines (support for engines varies depending on size of server hardware)
Archival of Historical Data	Manual, scheduled, or automatic	Manual, scheduled, or automatic
User Interface	*Metasys* UI Site Management Portal (SMP) Ready Access Portal	*Metasys* UI Site Management Portal (SMP) Ready Access Portal
Supports Export Utility	Yes	Yes
Supports *Metasys* Advanced Reporting	No	Yes
Supports Energy Essentials	No	Yes

Table 3: Application and Data Server Family Comparison

Feature	Application and Data Server (ADS)	Extended Application and Data Server (ADX)
Support for Split Configuration	No	Yes
Supports *Metasys* for Validated Environments (MVE)	No	Yes

For more information, refer to the *Application and Data Server (ADS) and Extended Application and Data Server (ADX) Product Bulletin (LIT-1201525)*.

Site Unification

Metasys network engines may be networked together for scaling up on large projects. When the number of Network Engines becomes larger than a single network engine can efficiently handle as the Site Director, an ADS/ADX may be added as the Site Director to unify the system.

The ADS/ADX connects to the network engines over the Ethernet IP network and coordinates access to the system for all users. You can use a VPN over a WAN for communication to devices in other buildings or on remote sites. You can also access remote sites via the Internet and an ISP, or by leased line or dial-up service using Remote Access Service (RAS) or the Point-to-Point Protocol (PPP).

Historical Data Storage and Management

An ADS/ADX can be added to the *Metasys* system when the long-term historical data storage needs exceed the capacity of a network engine. The ADS/ADX connects to the network engines over the Ethernet IP network and offers manual, scheduled, and automatic archiving of historical data, including trend data, event messages, operator transactions, and system configuration data. See *Table 3* to understand the archiving capabilities of each Application and Data Server type.

Metasys Export Utility

The *Metasys* Export Utility extracts historical trend, alarm, and audit data from the Network Engine or ADS/ADX. This data is then provided in several file formats, such as Microsoft Excel® spreadsheet (.xls) and Access database (.mdb). You can instantly extract the selected data or schedule an extraction at a convenient time or interval.

Advanced Reporting

The *Metasys* Advanced Reporting System is an optional feature of the Extended Application and Data Server (ADX) that provides historical and configuration data reporting capabilities separate from those available in the Site Management Portal.

Metasys Advanced Reporting System allows authorized users to run reports to review the configuration and performance of the *Metasys* system. Users can easily view these reports in a web browser.

Figure 6: *Metasys* Advanced Reporting System UI
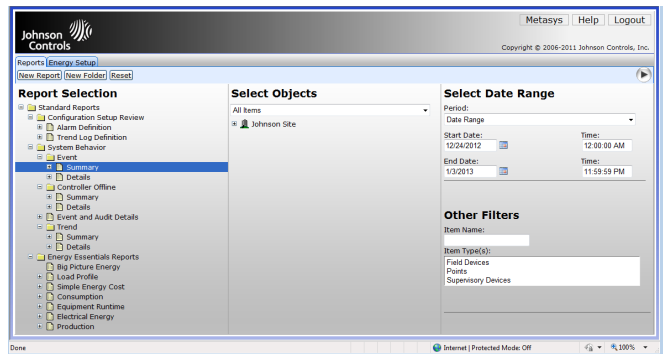
The following reports are available for the points included in the reporting system user views:

- Configuration Setup Review
- System Behavior
- Trend Report - statistical calculations and Mean Kinetic Temperature (MKT)
- Trend Detail Report - summary data

You can export a report and save it in a variety of formats, such as Microsoft Excel or PDF, for later use.

Energy Essentials

Energy Essentials is an add-on to the *Metasys* Advanced Reporting System and provides reports that transform stored energy data into meaningful information within the *Metasys* system. Energy Essentials offers the following seven reports:

- **Big Picture Energy:** a single high-level report that includes normalized source energy use.
- **Consumption:** similar to Big Picture Energy, a report that offers another level of detail on energy use in the default units of each energy type.
- **Electrical Energy:** a report focused on electrical energy information, including usage, peak demand, reactive power, and power factor.
- **Production:** a report focused on the energy that your site produces, including efficiency. For example, this report lets you see the true efficiency of your natural gas generator.
- **Simple Energy Cost:** a cost-based report, offering an easy-to-configure, high-level view of energy costs.
- **Load Profile:** a report focused on the daily demand profile, containing key information for developing strategies to minimize and defer peaks.
- **Equipment Runtime:** a report dedicated to the hours of runtime for equipment that typically represents a large percentage of overall usage. This report also includes the number of equipment starts for the reporting period.

Metasys Database Management

The *Metasys* Database Manager interacts with and monitors the trend, alarm (event), audit, and annotation databases on your ADS/ADX. It provides both managing and monitoring database functions, handled in two separate windows:

- **Managing**: includes summarized information on methods for restoring *Metasys* system ADS/ADX trend, alarm (event), audit, annotation, and reporting databases.
- **Monitoring**: continually reads database information and alerts you, using the taskbar icon, email, or both, based on user-configurable warning and alarm levels.

User Interface

Figure 7: *Metasys* UI

Metasys UI

The *Metasys* UI is HTML5-compliant and provides completely device-agnostic access from smart phones, tablets, and computers. You can access the *Metasys* UI from many types of client device at most screen sizes. No software installation is required on the client device—there is no need for Java, Microsoft Silverlight®, or Adobe® Flash®, and there is no software required from an online app store. The *Metasys* UI is included with any *Metasys* server Site Director: ADS, ADX (unified and split), and ADS-Lite.

Navigating by Spaces and Viewing Sites by Dashboards

The *Metasys* UI provides a simple location-based navigation approach to finding information, including the ability to search for any location by name and to bookmark a location in the browser. The result is an extremely powerful way to quickly get anywhere you need to go. Data in the *Metasys* UI is organized in a dashboard format, helping you see a complete picture of what's happening in a space, with a piece of equipment, or within a central plant.

The Space dashboard provides a cohesive summary of the selected space, including the equipment that serves the space and potential problem areas in the space. The Equipment dashboard provides a cohesive summary of a selected piece of equipment. Information displayed includes alarm history, user change history, historical trend information, and relationships with other equipment and spaces.

Searching by Spaces or Equipment

Search for the exact string that is contained in the space or equipment name. For example, if you search floor, the results include any space or equipment with the word floor contained in the name of any given space. Or, if you search fan, the results include any equipment with the word fan. You can also search words and phrases with varying case and obtain the same search results.

Viewing Graphics+ Graphics and Standard Graphics

View graphics associated with a space or a piece of equipment. Graphics provide a visual representation of the monitored systems that enable you to quickly check the status of spaces or equipment and recognize unusual system conditions. Graphics can be designed to allow the user to move through buildings, floors, and other areas, and to view building systems and control processes. Users can also easily find graphics associated with spaces and equipment by searching for the space or equipment.

Acting on Alarms

The Alarm panel (also known as Alarm Announcement), Alarm Manager, and the Alarm Monitor allow you to manage alarms throughout the *Metasys* system. The Alarm panel displays alarms that have occurred for points configured to equipment for the *Metasys* UI.

The Alarm Manager and Alarm Monitor display alarms in the *Metasys* system. Furthermore, the Alarm Manager allows you to
- bulk acknowledge or discard alarms
- view the spaces the alarms affect
- view alarms from associated mechanical systems for easy diagnostics

Learning About Equipment and Potential Problem Areas

The *Metasys* UI provides an intuitive display of the equipment that serves a space. The Equipment Summary widget displays a simple view of all equipment serving a space, which lets you view data one step at a time for better comparisons at the floor, building, and enterprise levels.

The Potential Problem Areas widget provides a single display showing all items in alarm, warning, overridden, out of service, and offline statuses within a space. This display also enables you to filter and view data that is important to you. Use the Potential Problem Areas widget as a daily punch list to manage buildings more efficiently. The Equipment Activity widget enables you to easily see and understand the correlation between disparate events within the system. With both widgets, you can easily view data to quickly get answers to questions, including:
- What happened to my chiller over the weekend?
- How long has the problem been occurring?
- What user changes were made in this time frame?

Viewing Trends through the Custom Trend Viewer and the Trend Widget

The Trend widget lets you perform ad-hoc analysis of any equipment situation for quick resolution of problems.

The Custom Trend Viewer allows you to view historical trend data on several pieces of equipment configured for the *Metasys* UI. The Trend widget allows you to view historical trend data on a single piece of equipment.

Commanding Simplification

The *Metasys* UI simplifies the routine practice of commanding or changing values, enabling you to restore order quickly and efficiently and avoid unplanned rework. The *Metasys* UI enables you to easily set time limits on user overrides to ensure the system restores an item to its previous value, which can help reduce energy costs. Also, the *Metasys* system gives you greater flexibility to take an item out of service. The *Metasys* UI automatically continually updates the data from the *Metasys* system on screen, even on mobile devices, so you do not have to worry about its accuracy.

At Release 8.0, the *Metasys* UI has an updated commanding dialog view makes changing point values easier.

Adding Annotations

Annotations can easily be added and viewed for alarms.

Managing Schedules

The Schedules widget allows the user to see a big picture view of all the schedules affecting a space or equipment. Edit and view schedules associated with a space or a piece of equipment. Schedules provide a visual representation of the monitored systems that enable you to quickly check. The Schedule widget provides a summary of how a space is affected by a scheduling strategy so that you can understand the complete picture. The Schedule widget also provides a way to view effective schedule information for a specific date in the future, so that you can ensure it is set up correctly. Furthermore, the bulk scheduling feature allows the user to add exceptions to several schedules at once and to assign weekly schedules in bulk.

Authorizing Users

With User Authorization within the *Metasys* UI, you can grant access to specific spaces and the equipment serving a space to a user. User Authorization allows user access to be segmented by physical space within the building or campus.

Metasys UI Offline

At Release 8.0, the *Metasys* offline is available. The *Metasys* UI offline provides the ability to view how the *Metasys* UI will look in order to validate the UI's configuration. You can view the spaces and equipment configuration and view Graphics+ graphics and standard graphics associated with the space and equipment. The *Metasys* UI offline leverages the SCT archives instead of the live site. The *Metasys* UI offline is installed separately from the *Metasys* Server and the SCT.

The *Metasys* UI offline has the following features:

- **Navigating by Spaces:** Validates the spaces configuration. Spaces help you organize the information displayed for the *Metasys* system into physical locations (a campus and buildings) and areas within those locations (floors, zones, and rooms).
- **Viewing Your Site by Dashboards:** Validates the spaces and equipment configuration. The Space dashboard provides a cohesive summary of the selected space, including the equipment that serves the space. The Equipment dashboard provides a cohesive summary of a selected piece of equipment.
- **Searching by Space and Equipment:** Search for the exact string that is contained in the space or equipment name. For example, if you search floor, the results include any space or equipment with the word floor contained in the name of any given space. Or, if you search fan, the results include any equipment with the word fan. You can also search words and phrases with varying case and obtain the same search results.
- **Viewing Point Information:** View a point's fully qualified reference (FQR).
- **Viewing Graphics+ Graphics and Standard Graphics:** View graphics associated with a space or a piece of equipment.

Building Control through Graphics

The evolution of the *Metasys* system has also spurred an evolution in graphic offerings as new software technologies have emerged. Building control through graphics is available from a standard graphic, an advanced graphic, or a Graphics+ graphic.

Standard Graphics is the default graphics package used to design equipment and floor plan graphics in a scalable, vector-based format. Standard graphics are created with the User Graphics Tool (UGT), which is embedded on both the SMP and SCT.

Advanced graphics are created with the Advanced Graphics Application. The AGA is an enhanced graphics creation package that provides dynamic graphic capabilities, such as animation, color changing, and flashing, for the *Metasys* system. The Graphics Example stencil component of the package contains pre-built dynamic symbols that shorten the time spent creating system graphics. Graphics created with the AGA appear directly in the *Metasys* system SMP UI with real-time controller field point data and allow building operators to command and update points.

Graphics+ graphics are designed with the Graphic Generation Tool (GGT). The GGT is a simple yet powerful diagraming tool that helps designers create compelling representations of their building equipment and floor plans and bind them to *Metasys* data objects. An extensive library of templates, symbols, and controls is provided with the GGT, simplifying the task of graphic creation. Once the images are saved to the system, the SMP UI, the *Metasys* UI, and the Ready Access Portal uses color and animation to effectively display the condition of monitored systems and provide the operator with methods of commanding and navigating the facility. In addition to the GGT, Graphics+ comes with the Graphics+ Viewer. The Graphics+ Viewer is integrated within the *Metasys* user interfaces (SMP, System Configuration Tool [SCT], *Metasys* UI, and Ready Access Portal), allowing users to show, command, or update in real time all the data linked objects that were created in the GGT.

New at Release 8.0, Graphics+ graphics and Standard graphics associated with spaces, equipment, and field controllers are viewable in the *Metasys* UI and *Metasys* UI Offline. Viewing Graphics+ graphics and Standard graphics is touch-optimized, supporting pinch to zoom and tapping to navigate and command.

Figure 8: Graphics+ Graphic in the *Metasys* UI

Figure 9: Site Management Portal UI
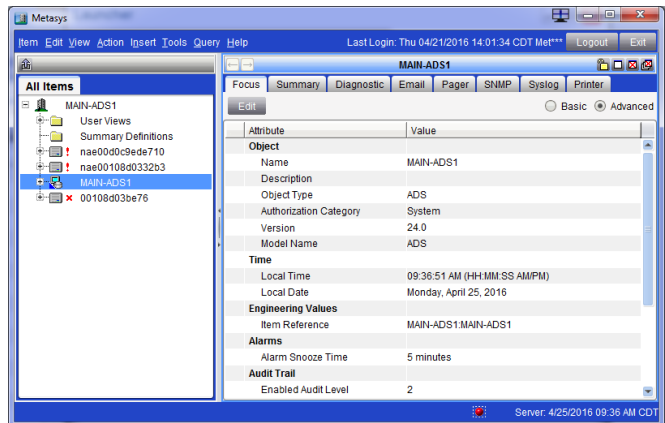
Site Management Portal (SMP)

Network engines and ADSs/ADXs include an embedded user interface called the Site Management Portal (SMP), which operators can access for system navigation and operation.

The SMP does not require any special workstation or client software—only a web browser and a Johnson Controls specific Johnson Controls proprietary Java® plug-in. Authorized users simply log in to the network engine or ADS/ADX using a web browser to access the Site Management Portal. This embedded user interface is ideal for smaller networks and remote locations where a dedicated computer platform to support a user interface is not required, and also for sites where a *Metasys* network view and advanced operations are desired.

Some of the key features of the SMP are:

- **System Security:** enables network engines to recognize users with valid user names and passwords at the Site Management Portal user interface. User access data is encrypted in transmission and in the Network Engine database. The system administrator manages user profiles, authorization levels, user names, passwords, and network engine data access privileges in each user account.
- **Standard system navigation tree:** shows a hierarchal network view of the entire system for all connected devices.
- **Monitoring and control:** works with all the mechanical and electrical systems in a typical building by collecting data from field devices. The required commands are then coordinated and sent to the controlled equipment at the required priority.
- **Global Search:** enables Site Management Portal operators to search the *Metasys* system and manage lists of objects, which can be used by other features for commanding, trending, reporting, and object selection.

- **Global Command:** allows Site Management Portal operators to send a single command to multiple objects and view a log of the command results.
- **Trend Studies:** show the historical data records of one or more data points in a single view for analyzing building system performance and quickly locating system problems.
- **Reports:** offer a snapshot view of the current exception situations and summary data in the entire site or in a selected area of the site, and enable you to locate points that need attention.

The SMP also provides online system configuration to efficiently streamline the process of setting up or reconfiguring one or more network engines, including:

- automatic discovery of field devices on a network engine's BACnet, LONWORKS, and N2 buses to accelerate the configuration process
- automatic discovery of *Metasys* N1 networks through NIEs
- simple creation of customized user navigation trees and powerful tabular summaries
- custom graphics configuration
- setting of user access rights and permissions
- point naming and setting of operating parameters
- alarm and event message routing
- graphical Logic Connector Tool (LCT) for custom programming
- downloading, uploading, and archiving network engine databases
- support of the configuration and commissioning tools for controllers on the N2 bus, BACnet MS/TP bus, and ZigBee wireless mesh network
- demand limiting and load rolling configurations

System Configuration Tool (SCT)

The System Configuration Tool (SCT) provides an offline mechanism for a project design engineer to configure the network engines and ADSs/ADXs along with the Space and Equipment relationships for the *Metasys* UI. The SCT can be integrated with the site to provide database loading and scheduled backups of the entire site.

System Configurations for Special Applications

Metasys Open Data Server

The *Metasys* ODS is a BACnet Testing Laboratories™ (BTL) Listed BACnet Operator Workstation with B-OWS profile. The ODS is intended for job sites that require a BACnet workstation. The ODS runs on either a Windows desktop or Windows Server operating system, and it supports up to 5 users connected to the SMP UI.

The ODS offers the flexibility to be configured in any of the following ways:

- The ODS in a **BACnet Workstation** configuration is an operator interface used for monitoring and operator actions. The ODS uses the BACnet protocol to communicate with networked BACnet devices. BACnet integration maps BACnet devices into the ODS. Network engines and FEC family devices are treated the same as all other BACnet devices.
- The ODS in a **Site Manager Workstation** configuration is similar to the ADS/ADX. The ODS uses web services to communicate with network engine supervisory devices. Other BACnet devices are mapped into the *Metasys* system through the network engine using BACnet integration. The ODS serves as the Site Director for up to 100 network engine supervisory devices.
- The ODS in a **Combined Workstation** configuration uses both BACnet Workstation and Site Manager Workstation at the same time. This configuration offers a good migration path from BACnet devices to a *Metasys* system.

LONWORKS Control Server (LCS)

The LCS85 is a high-capacity server that allows the integration of large LONWORKS network systems. The LCS85 uses an open-architecture flat LONWORKS system to monitor and supervise HVAC equipment, lighting, security, fire, and access control. The LCS85 supports a comprehensive set of supervisory features and functions for large facilities and technologically advanced buildings and complexes. When configured as the Site Director, the LCS85 can support up to four *Metasys* network engines.

A single LCS85 within a building provides monitoring and control, alarm and event management, data exchange, trending, energy management, scheduling, and data storage. For more information refer to *LONWORKS Control Server (LCS) 85 Product Bulletin (LIT-12011549)*.

Metasys for Validated Environments

Metasys for Validated Environments (MVE) is designed for facilities that require regulatory compliance for their environmental control systems. *Metasys* with MVE controls environmental conditions and audits user management for critical environments, such as hospitals, research facilities, food production centers, and other production environments where tight control is crucial to product success.

Metasys with MVE provides traceable electronic records, signatures, and time-stamped audit trails for facilities, helping customers comply with:

- Food and Drug Administration (FDA) Title 21, Code of Federal Regulations Part 11
- Annex 11 of the European Union Good Manufacturing Practice (EU GMP) regulations (European Medicines Agency [EMEA] 1998)
- Agency regulations around the world that deal with electronic records and electronic signature requirements

The MVE feature operates on an Extended Application and Data Server (ADX) and communicates to validated Network Engine models.

UL864 Smoke Listed Systems

The *Metasys* system at Release 5.2 can be configured to provide a UL864 Ninth Edition Smoke Control Listed system. The system integrates the Intelligent Fire Controller (IFC) fire alarm panel, the Firefighter's Smoke Control Station, and damper and fan control points throughout the facility using BACnet and LONWORKS devices.

The *Metasys* Smoke Control System includes a set of UL 864 Ninth Edition Smoke Control hardware components Listed for indoor, dry environments. The smoke control applications are targeted to be run in specific models (designated with a -U suffix) within the network engine and Field Equipment Controller (FEC) families. The Smoke Control UL 864 listing at Release 5.2 includes the listing for the US and Canada at Ninth Edition. The listing title is *Metasys* System UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System.

Summary

Today's *Metasys* system is our most advanced system ever. Johnson Controls, Inc. continuously strives to find new ways to make it work better, and to help you work smarter. We're constantly innovating to make sure our software, user interface, monitoring, and analytics are the best available.

Related Documentation

Refer to the following product bulletins listed in *Table 4* for technical specifications and information on operating and performance characteristics of the *Metasys* system.

Table 4: Related Documentation

For Information On	See Document
Application and Data Server and Extended Application and Data Server	*Application and Data Server (ADS) and Extended Application and Data Server (ADX) Product Bulletin (LIT-1201525)*
Controller Configuration Tool (CCT)	*Controller Configuration Tool (CCT) Catalog Page (LIT-1900386)*
Export Utility	*Metasys® Export Utility Product Bulletin (LIT-1201800)*
Graphic Generation Tool	*Graphics+ Product Bulletin (LIT-12011698)*
LONWORKS® Based Products for Integration into *Metasys* system	*LN Series Controllers Overview Product Bulletin (LIT-1201979)*
LONWORKS® Control Server (LCS) 85	*LCS85 Product Bulletin (LIT-12011549)*
***Metasys* for Validated Environments (MVE)**	*Metasys® for Validated Environments, Extended Architecture Product Bulletin (LIT-12011326)*
***Metasys* System Field Controllers and Related Products**	*Metasys® System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)*
***Metasys* System Overview**	*Metasys® System Configuration Guide (LIT-12011832)*
***Metasys* UI Help and Overview**	*Metasys® UI Help (LIT-12011953)*
Network Engines	*Network Engines Product Bulletin (LIT12012138)*
Network Automation Engine	*Network Automation Engine Product Bulletin (LIT-1201160)*
Network Control Engine	*Network Control Engine Product Bulletin (LIT-12011283)*
Network Integration Engine	*Network Integration Engine Product Bulletin (LIT-1201537)*
Network Integration Engine for Third-Party Integrations	*Network Integration Engine (NIEx9) for Third-Party Integrations Product Bulletin (LIT-12011923)*
Open Data Server	*Open Data Server Product Bulletin (LIT-12011943)*
System Configuration Tool (SCT)	*System Configuration Tool Catalog Page (LIT-1900198)*