

## Metasys system

The Metasys system is the industry-leading building automation system (BAS) and the foundation of modern building efficiency. It enhances occupant comfort, health, 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 hardware and software control components designed to work together as one cohesive system. A time-tested industry leader, the Metasys system has proven reliable for the most demanding customer scenarios.

## New features and enhancements at Metasys Release 13.0

Johnson Controls® is pleased to announce a new release of the Metasys system. Its substantial enhancements are designed to deliver better space utilization and planning, maximize operator efficiency, and enhance overall system performance and reliability.

Figure 1: Metasys Release 13.0



**Table 1: New features and enhancements**

<b>Features and enhancements</b>	<b>Description</b>
<b>Metasys server and software-based engine enhancements</b>	<ul style="list-style-type: none"> <li>• Provides supports for Windows® 11 Pro and Windows® 11 Enterprise versions 22H2, 21H2 (64-bit) and Windows® Server® 2022 (64-bit) operating systems.</li> <li>• Provides support for SQL Server® 2022 Express (64-bit).</li> <li>• Provides support for NAE85 and LCS85 products as either a Site Director or a child device.</li> </ul>
<b>Metasys User Interface (UI) enhancements</b>	<ul style="list-style-type: none"> <li>• A dynamically updating Alarm Notification Bar provides access to the top alarm event at all times.</li> <li>• Creation of trend study objects in the Network tree to help with troubleshooting.</li> <li>• User Account Report in Base Reports helps to identify dormant user accounts.</li> <li>• Logic Viewer and Editor Enhancements to improve productivity.</li> <li>• Direct access to training videos through the Take a Tour option in Metasys UI’s Help menu.</li> </ul>
<b>Enhancements to SNC and SNE network engine series</b>	<p>Metasys UI is now the primary interface on Site Director and child device engines. Provides similar functionality to Metasys UI already available on Metasys Servers including:</p> <ul style="list-style-type: none"> <li>• Metasys UI graphics</li> <li>• Access from browsers on desktop, tablet, and smartphone devices</li> <li>• Alarm Notification Bar</li> <li>• Network Tree or Custom Views Navigation</li> <li>• Schedule management</li> <li>• Advanced Search and Reporting, including Base Reports</li> <li>• System Activity for all alarms and audits</li> <li>• Logic Viewer and Editor</li> <li>• USB to Ethernet adapter provides a second IP port for SNE and SNC devices to support a secondary network of devices that communicate over BACnet/IP.</li> </ul>
<b>Enhancements to CV Series equipment controllers</b>	<p>CV Series equipment controllers now support additional preloaded applications in International System (SI) units to help speed the commissioning of VAV boxes.</p>

**Table 1: New features and enhancements**

Features and enhancements	Description
<b>Display enhancements</b>	<p>DLK and onboard displays now provide a new Live Trend feature to help with commissioning of Metasys SNC, CG, and CV series devices. Field technicians can now use live trending to plot in real-time, the present value of up to two untrended application points on a graphical trend chart.</p> <p>Additional enhancements to improve field productivity include:</p> <ul style="list-style-type: none"> <li>• A new trend table view to access trend data in a tabular format.</li> <li>• Additional controller attributes added in Controller Settings for more accessibility to controller information from the local display.</li> <li>• The alarm message text attribute is now viewable for Alarms, and new status messages to keep field technicians informed when a display is being provisioned.</li> </ul> <p>DLK displays now support plug and play functionality saving field technician's time by enabling the display to be functional out of the box with little to no user configuration required.</p> <p>The DLK display and SNC onboard display now have the availability to select between hardware and software points as the preferred view when working with a local application on SNC network controllers.</p>
<b>New router and gateway models to improve integration flexibility</b>	<ul style="list-style-type: none"> <li>• Johnson Controls BACnet/IP Router allows for the integration of a subnet of Metasys and third-party BACnet MS/TP devices.</li> <li>• Johnson Controls Modbus Gateway allows for the integration of a subnet of Modbus devices into a Metasys System.</li> </ul>

For more details about Release 13.0 features and enhancements, refer to *What's New at Metasys Release 13.0 (LIT-12014327)*.

## Features and benefits

### Operational savings

- Enhance productivity and effectiveness with the 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, present, and report building data in relevant and usable ways with Advanced Search and Reporting.
- Schedule the reporting of historical data, including alarm, audit, and trend data with the Scheduled Reports feature and Export Utility.
- Extend building management capability with wireless sensors and controllers.
- Integrate with other systems in your facilities using both industry standard communication protocols and REST-based APIs.
- Automate tasks for facility managers and staff.

- Increase effectiveness and lower operational costs with Alarm Management.
- Lower operational cost by correctly maintaining building systems guided by Fault Detection and Fault Triage.

## Energy savings

- Save energy using the Metasys scheduling and occupancy detection features to operate equipment only when needed.
- Achieve more energy savings by using additional features such as Trend Summaries and Demand Limiting/Load Rolling.
- Get top performance from your energy and central plant equipment with Central Plant Optimization (CPO).
- Seamlessly integrate with cloud-based applications for peak building performance.
- Use Interlocks to automatically coordinate control between equipment and systems.
- Reduce energy use by addressing common building system issues such as equipment running constantly, simultaneous heating and cooling, extreme setpoints, and others, as guided by Fault Detection and Fault Triage.

## 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.
- Compatibility with current operating system and platform technologies, including newer versions of Microsoft® operating systems, SQL Server® database system, and industry-leading web browsers.
- Secure, encrypted data exchange between your mail client and the Metasys server or network engine with a digital security certificate with HTTPS over a Transport Layer Security (TLS) 1.3 connection.
- A dashboard that informs and educates system administrators of user account and system information to understand and address potential cyber security concerns.
- Compliance with Federal Information Processing Standard Publication 140-2 (FIPS PUB 140-2), a United States government computer security standard used to approve cryptographic modules in software components.
- Compliance with BACnet/SC, a recent update to the BACnet interoperability standard aimed at improving cybersecurity and network infrastructure integrity.

## 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 granted access to the control system.
- Initiate a door-open command or trigger a security output point from a single seat operation through our improved unified user experience.
- Coordinate control with fire, security, lighting, and other non-HVAC building systems.
- Use available options to achieve UL/cUL 864 UUKL 10th Edition Smoke Control listing.

- Support your remote monitoring services.
- Support of Microsoft® Active Directory Federation Services (ADFS) with the opportunity for a single sign-on (SSO) experience and two-factor authentication (2FA).

## 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 equipment or spaces served by equipment, using the most effective diagnostics platform that leverages cohesive dashboards to point out root cause through graphics, trends, equipment activity, schedules, and more.
- Use Fault Detection and Fault Triage to investigate, manage, and solve building system faults that occur on your site.

## 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. For more details, see [Metasys system architecture](#).

## Distributed

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

The distributed Metasys components with their data sources and the equipment they control are connected by:

- direct wiring
- network wiring
- wireless networking

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

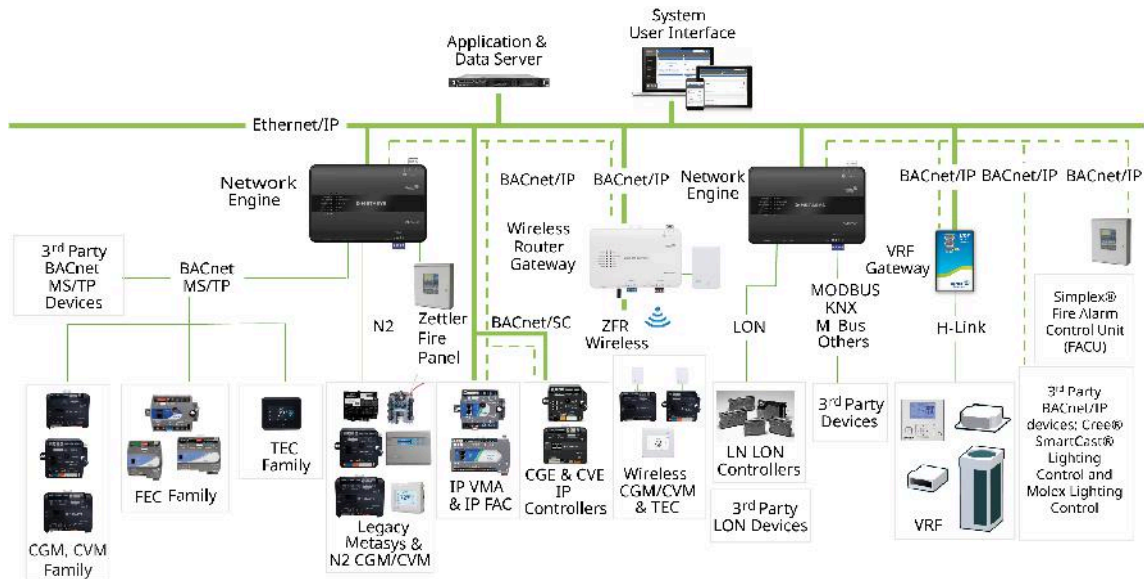
## Scalable

The Metasys system architecture is scalable. This means that you can add required components 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.

# Metasys system architecture

Figure 2: Metasys system architecture



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

## System attributes

### 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 equipment and systems using BACnet/SC, BACnet/IP, BACnet MS/TP, N2, LonTalk®, MODBUS, M-Bus, KNX, OPC UA and web services communication technology. The Metasys system supports BACnet Protocol Revision 18. 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/IP is also used to integrate SIMPLEX Fire Systems and lighting systems from preferred partners into the Metasys system.

LonWorks® controllers from Johnson Controls or LonMark® certified devices from other manufacturers can integrate into the Metasys system architecture. In a similar fashion, prior generations of N2-based Metasys components can integrate into the newer architecture, helping to modernize legacy Metasys installations. The Metasys system also communicates to third-party devices using MODBUS, KNX, and M-Bus integrations. Regardless of the protocols used, the data is available for display in the Metasys UI, for archiving in application servers, and for transmission to other devices on the IP network.

The Metasys system also supports:

- HTTPS with TLS 1.3 as the secure communication protocol between network engines, Application and Data Servers (ADS), Open Application Servers (OAS), 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 Wi-Fi (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 the SMP UI and Metasys UI login authentication purposes. Starting at Release 11.0, Active Directory includes Microsoft Active Directory Federation Services (ADFS) in addition to Active Directory LDAP authentication, with the ability to enforce two-factor authentication (2FA) when the ADFS Server is configured for 2FA.
  - ❗ **Note:** ADFS and AD/LDAP are not supported on SNx engines.
- The SQL database format, used by the Metasys server to store historical data, which facilitates the use of Microsoft SQL Server® software
- A growing suite of REST-compliant Application Programming Interfaces (APIs), including an API that enables reading, writing, and commanding of one or more Metasys objects/properties to provide a secure way to bi-directionally integrate with third-party applications.
- MQTT integration driver supports bidirectional communication between network engines and a generic MQTT broker to enable exchanging Metasys data with popular IoT platforms and applications.

## Secure

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

The Metasys system includes the following security features:

- Support for local, Active Directory LDAP, Active Directory Federated System, and Microsoft® Office 365 authentication.
- Obscures user names and passwords.
- Enforces strong passwords and password phrases.
- Provides an optional capability of sending its configured audit log entries and alarm (event) 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 the SMP. These reports can be scheduled on a daily basis. Dormant user account events are also included in the Audit Viewer and the Event Viewer.
- HTTPS with TLS 1.3 between Metasys components, including the Metasys Server, Metasys UI, System Configuration Tool (SCT), and network engines. This enhancement ensures the highest level of security to protect your building automation system from unauthorized users and computer hackers.
- Self-signed certificates are installed on supported products, with the option of configuring trusted certificates.
- Elliptic Curve Cryptography (ECC) certificates for BACnet/SC devices based on the BACnet Standard SSPC 135.
- One of three security shield icons are displayed in the SMP and SCT UIs to indicate the current level of a connection: trusted, self-signed, or untrusted.

- SCT 13.0 and later releases offer improved security by forcing users to change default passwords as part of the workflow when interacting with supervisory devices.
- Updated software licensing technology ensures only licensed, authorized, and released software is running on customer's networks.
- Users have to log on to SCT with a Metasys local or Active Directory user account.

## System components

A typical Metasys system architecture comprises three tiers of components:

- [Equipment Controllers](#)
- [Network Engines](#)
- [Metasys Server](#)

### 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.

Metasys equipment controllers include multiple families of controllers:

- FAC/FEC/VMA series equipment controllers, which were first introduced at MSEA Release 2.1, and have since been expanded and enhanced over several releases.
- CG/CV series equipment controllers, which were first introduced at Release 10.0, and succeed the FAC/FEC/VMA series ([CG series and CV series equipment controllers](#)).
- TEC3000 Thermostat controller family ([TEC3000 Networked Thermostat Controllers](#)).
- LN Series LonWorks® Controller family ([LN Series LonWorks Controllers](#)).

### Equipment controller families

The CG/CV series and FAC/FEC/VMA series equipment controller families share several similarities. Both families consist of fully programmable, high performance devices designed specifically for controlling a wide range of mechanical and electrical equipment found in commercial buildings. The CG/CV series controllers are modernized successors to the FAC/FEC/VMA series and include improvements intended to ease selection, configuration, commissioning, and servicing.

- CG/CV Equipment Controller Family:
  - General Purpose Application Controllers (CGMs and CGEs)
  - VAV Box Equipment Controllers (CVMs and CVEs)
  - Input/Output (I/O) Expansion Modules (XPMs)
- FEC Field Equipment Controller Family:
  - Advanced Application Field Equipment Controllers (FACs)
  - Field Equipment Controllers (FECs)
  - Variable Air Volume Modular Assemblies (VMAs)
  - Input/Output Modules (IOMs)

See [CG series and CV series equipment controllers](#) for more information about CGMs, CGEs, CVMs, CVEs, and XPMs.

See [Table 4](#) for a comparison of the FEC family controllers.

For further details about CGMs, CGEs, CVMs, CVEs, and XPMs, refer to the *Metasys CG, CV Equipment Controllers and XPM Expansion Modules Product Bulletin (LIT-12013105)*. For further details about FACs, FECs, VMAs, and IOMs, refer to the *Metasys System Field Equipment Controllers and Related Products Bulletin (LIT-12011042)*.



## Onboard inputs and outputs

Equipment controllers feature onboard inputs to receive information such as temperature, pressure, humidity, CO<sub>2</sub>, energy consumption, occupancy detection, and equipment status. Equipment controllers feature onboard outputs to control valve and damper actuators, sequence staged equipment, and turn equipment and lights on and off.

Equipment controller models are available with different I/O mixes, letting you select the most appropriate controller and I/O for the target equipment. Equipment controllers also offer universal inputs and configurable outputs, providing greater flexibility.

## Onboard control logic

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

- **State-Based Control Logic:** ensures the execution of only the specific control logic for any given state. 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.

## Controller Configuration Tool (CCT)

The Controller Configuration Tool (CCT) is the interface to the equipment controllers' 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:** programmers can choose from a list of application programs and select their specific control options by using a check-the-box interface.
- **Sideloop Wizard:** programmers can easily add additional custom control logic to the main control application by using a check-the-box interface.
- **Logic Interface:** programmers can 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.

**Note:** Field Controller Package files (MS-FCP-0) are sold separately and require a license.

## CWCVT Wireless MS/TP Converter

The Connected Workflow Application Wireless MS/TP Converter (CWCVT) is a communications converter that provides a temporary wireless connection between a host device and equipment controllers that support the BACnet® MS/TP protocol. The CWCVT is targeted for use by commissioning contractors and field technicians to help them quickly and efficiently perform commissioning and wiring validation functions for Metasys equipment controllers, TEC3000 Series Thermostats, and Smart Equipment Rooftop Units (RTUs). Through the CWCVT, the host device application can discover controllers connected to the MS/TP trunk, download applications, and commission the equipment. The CWCVT also supports a Wi-Fi wireless connection for Windows computers that run Johnson Controls BAS Tools such as the Controller Configuration Tool (CCT), System Configuration Tool (SCT), or Applications and Parameters Loading Tool (APLT).

## Networking protocols

The networking protocol options supported by the CG/CV and FEC equipment controller families include:

- **BACnet MS/TP:** Applies to installations where a high-speed, industry-standard, open communication protocol is preferred.

- **BACnet/SC:** Applies to installations where Ethernet cabling with improved cybersecurity and network infrastructure integrity is preferred. This communication protocol is available with the Metasys CVE, CGE, VMA1930, and FAC4911 controllers. Metasys supports the following networking topologies, each with their own cost and network resiliency characteristics:
  - Star
  - Daisy chain
  - Ring, using Media Redundancy Protocol (MRP) and selected Cisco® IE switches
- **BACnet/IP:** Applies to installations where Ethernet cabling with a high-speed, industry-standard open communication protocol is preferred. This communication protocol is available with the Metasys CVE, CGE, VMA1930, and FAC4911 controllers. Metasys supports the following IP networking topologies, each with their own cost and network resiliency characteristics:
  - Star
  - Daisy chain
  - Ring, using Media Redundancy Protocol (MRP) and selected Cisco® IE switches
- **Wireless ZFR:** Applies to installations where a less invasive, more flexible networking alternative to hard wiring is preferred or is more affordable.
- **N2:** Applies to legacy Metasys system installations that have equipment controllers added, where they can share the same N2 bus as legacy Metasys controllers, such as UNTs, VMA14xx, and DX-9100s.

#### Field Controller (FC) Bus

The CG/CV and FEC MS/TP family equipment 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 the equipment controllers.

#### Sensor/Actuator (SA) Bus

In addition to their onboard I/O interfaces, the CG, CV, and FEC family equipment controllers 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 Expansion Modules (XPMs and IOMs):** add additional input and output interfaces to an equipment controller to aid in operating large or complex equipment (such as central plants or large air handlers).
- **Network Sensors:** measure temperature, humidity, CO<sub>2</sub>, and occupancy, and transmit this information to the equipment 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 equipment controller over the SA Bus.

## CG series and CV series equipment controllers

The CG and CV series equipment controllers are a modernized equipment controller family that succeed the FEC/FAC/VMA series equipment controller family. This modernized family shares similar design details, including the following:

- Modernized packaging and styling
- Removable screw terminal blocks
- Decimal MS/TP address set with three rotary switches
- More memory and faster processor
- Background file transfer
- Improved SA Bus commissioning
- Models with BACnet MS/TP and N2 networking with auto-detect (CGM and CVM models)
- Models with BACnet/IP and BACnet/SC networking (CGE and CVE models)

**Note:** The CGE and CVE models can act as BACnet/SC nodes.

- Device Security (CGE and CVE models)
- FIPS 140-2 Level 1 Compliance using FIPS validated components (CGE and CVE models)
- Wireless ZFR Pro support
- CG series equipment controller models featuring an onboard display and keypad

The onboard display and keypad in the SNC and CG series models provide a local interface for users to perform the following tasks:

- Monitoring point values and status
- Viewing alarms and trends
- Overriding outputs
- Adjusting setpoints and parameters
- Live trending

These capabilities help end users and field technicians quickly troubleshoot issues and restore control, while being in close proximity to their associated mechanical equipment.

**Figure 3: CG series and CV series equipment controllers and XPM expansion modules**



The following tables outline the CG series and CV series controllers in more detail. The letter H in a model's product code number indicates that the controller model has an onboard display.

**Table 2: CG series and CV series controllers details**

	CGM04060-0	CGE04060-0	CGM09090-0 CGM09090-0H	CGE09090-0 CGE09090-0H	CVM03050-0	CVM03050-0P	CVE03050-0P
<b>Description</b>	General Purpose Application Controller				VAV Box Controller		
<b>Inputs and Outputs</b>	10 total: • 3 Universal Inputs (UIs) • 1 Binary Input (BI) • 4 Configurable Outputs (COs) • 2 Binary Outputs (BO)		18 total: • 7 UIs • 2 BIs • 4 COs • 3 BOs • 2 Analog Outputs (AOs)		8 total: • 3 UIs • 2 COs • 3 BOs • Integral actuator • Integral DPT	8 total: • 3 UIs • 2 COs • 3 BOs • Integral actuator • Integral DPT • Integral potentiometer to sense actual VAV box damper position	
<b>Communication Protocols</b>	• BACnet MS/TP • N2 (software switchable) • Zigbee for ZFR Pro Wireless Field Bus (add on modules)	• BACnet/IP • BACnet/SC	• BACnet MS/TP • N2 (software switchable) • Zigbee for ZFR Pro Wireless Field Bus (add on modules)	• BACnet/IP • BACnet/SC	• BACnet MS/TP • N2 (software switchable) • Zigbee for ZFR Pro Wireless Field Bus (add on modules)		• BACnet/IP • BACnet/SC
<b>Expandable through SA Bus</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Onboard real time clock</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Figure 4: Remote mountable display**



<b>Model number</b>	<b>M4-DLK0350-0</b>
<b>Description</b>	Remote mountable display/keypad
<b>Display details</b>	3.5-inch, 320 x 240 resolution, color display
<b>Keypad details</b>	Seven pushbuttons: <b>up, down, left, right, OK, menu, and back</b>
<b>Mounting style</b>	Panel and surface mountable and portable
<b>Power source</b>	Can be powered by controller over SA bus or powered externally using 12 VDC external power supply.

<b>Model number</b>	<b>M4-DLK0350-0</b>
<b>Compatibility</b>	Connects to and communicates on the SA bus of the following compatible devices: <ul style="list-style-type: none"> <li>• CG and CV series equipment controllers</li> <li>• FAC, FEC, and VMA series equipment controllers</li> <li>• SNC series network control engines</li> <li>• NCE series network control engines</li> </ul>
<b>Capabilities</b>	<ul style="list-style-type: none"> <li>• Monitoring point values and status</li> <li>• Viewing alarms and trends</li> <li>• Overriding outputs</li> <li>• Adjusting setpoints and parameters</li> </ul>
<b>Succeeds</b>	MS-DIS1710-0

The following figure and table outline the I/O expansion modules.

**Figure 5: Expansion I/O modules**



**Table 3: Expansion I/O modules**

Model number	M4-XPM04060-0	M4-XPM09090-0	M4-XPM18000-0
<b>Description</b>	Expansion I/O module		
<b>Inputs and Outputs</b>	10 total: <ul style="list-style-type: none"> <li>• 3 UIs</li> <li>• 1 BI</li> <li>• 4 COs</li> <li>• 2 BOs</li> </ul>	18 total: <ul style="list-style-type: none"> <li>• 7 UIs</li> <li>• 2 BIs</li> <li>• 4 COs</li> <li>• 3 BOs</li> <li>• 2 AOs</li> </ul>	18 BIs
<b>Field Bus Networking</b>	<ul style="list-style-type: none"> <li>• FC Bus (BACnet MS/TP)</li> <li>• SA Bus</li> </ul>		

## FEC comparison

**Table 4: Field Equipment Controller family comparison**

	Advanced Application Field Equipment Controllers (FACs)	Field Equipment Controllers (FECs)	Variable Air Volume Modular Assemblies (VMAs)
<b>Typical applications</b>	Controlling: <ul style="list-style-type: none"> <li>• Equipment that requires local scheduling, alarming, and trending</li> <li>• Air Handling Equipment</li> <li>• Central Plant Equipment</li> </ul>	Controlling: <ul style="list-style-type: none"> <li>• Rooftop Units</li> <li>• Heat Pumps</li> <li>• Unit Ventilators</li> <li>• Air Handling Equipment</li> <li>• Central Plant Equipment</li> <li>• Exhaust Fans</li> <li>• Supplemental Heating Equipment</li> </ul>	Controlling: <ul style="list-style-type: none"> <li>• Pressure independent VAV boxes</li> <li>• Pressure dependent VAV boxes</li> <li>• Zone Dampers</li> </ul>
<b>Onboard teal time clock</b>	Yes	No	Yes, only on VMA1930 model.
<b>Communication protocols</b>	<ul style="list-style-type: none"> <li>• BACnet MS/TP (B-AAC) or N2 (field switchable)</li> <li>• BACnet/SC (B-AAC) (model FAC4911 only)</li> <li>• BACnet/IP (B-AAC) (model FAC4911 only)</li> <li>• ZigBee Wireless (with an add-on module)</li> </ul>	<ul style="list-style-type: none"> <li>• BACnet MS/TP (B-ASC) or N2 (field switchable)</li> <li>• ZigBee Wireless (with an add-on module)</li> </ul>	<ul style="list-style-type: none"> <li>• BACnet MS/TP (B-ASC) or N2 (field switchable)</li> <li>• BACnet/SC (B-AAC) (model VMA1930 only)</li> <li>• BACnet/IP (B-AAC) (model VMA1930 only)</li> <li>• ZigBee Wireless (with an add-on module)</li> </ul>
<b>Expandable through SA Bus</b>	Yes	Yes	Yes

## TEC3000 Networked Thermostat Controllers

TEC3000 Networked Thermostat Controllers are specifically designed for controlling common commercial heating and cooling equipment. TEC3000s are packaged in enclosures that are designed for mounting on a wall in the controlled space.

**Figure 6: TEC3000 Color Series Thermostat**



The TEC3000 Color Series Thermostats 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

Single- or two-stage control of unitary rooftop units (RTUs):

- Single- or two-stage control of RTUs with economizers
- Up to three-stage control of heat pumps, (Two compressor stages) with or without economizer



① **Note:** Third stage is a supplemental heat stage and not a compressor like the first two stages.

TEC3600 models feature field-selectable BACnet MS/TP or N2 communication capabilities for integration into the Metasys system. New TEC3100 models are available that feature embedded wireless field bus capabilities for ZFR Pro wireless network integration into the Metasys system. All models include a USB port that allows simple backup and restore features, which enables rapid cloning of configuration between like units.

Some models have occupancy sensing capability built into the device. These thermostats help yield 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)

TEC3x3x models support Title 24 compliant Demand Controlled Ventilation (DCV) when driving an equipment with economizer and paired with a remote CO2 Sensor.

Some models support dehumidification on two-pipe fan coil units with reheat, and four-pipe fan coil units with or without reheat, or support dehumidification with staging equipment with external dehumidifiers configured over Auxiliary output terminal. When no heating is required, the thermostat controller monitors space humidity and activates dehumidification control as necessary. Heat and reheat are 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, refer to the *TEC3000 Color Series Thermostats Product Bulletin (LIT-12013193)*.

## LN Series LonWorks Controllers

The Metasys system LN Series controllers use the LonWorks 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 fully programmable to monitor, control, and integrate a wide variety of HVAC and other building equipment, such as rooftop units, fan coils, heat pumps, unit ventilators, VAV boxes, multistage air handling units, chillers, boilers, and refrigeration systems.

## Network engines

Metasys network engines provide network management and system-wide control coordination over one or more networks of equipment controllers, including the following:

- Metasys CG series, CV series, FAC, FEC, VMA, TEC, and LN series equipment controllers
- Metasys CGE, CVE, FAC, and VMA IP equipment controllers using several different topologies
- Legacy Metasys controllers, such as UNTs, VMA14xx, and DX-9100s
- Third-party devices

Metasys network engines may also be networked together for scaling up on large projects, and they may be networked with a Metasys Server for additional functionality and site unification.

From Release 12.0, the SNE, SNC, and NAE55xx-3 models can act as a Primary Hub, Failover Hub, or Node in the BACnet/SC network.

The Metasys system includes the following types of network engines:

- NxE series network engines, which were first introduced at MSEA Release 1.0 and have since been expanded and enhanced over several releases.

- SNx series network engines, which were first introduced at Release 10.1 and are intended to succeed the NxE series.

Refer to the *SNE/SNC Product Bulletin (LIT-12013296)* and the *Network Engines Product Bulletin (LIT-12012138)* for more information.

## SNE series network engines

The SNE series network engines are the most recent family of network engines in the Metasys building automation system portfolio.

**Figure 7: SNE series network engines**



The following table outlines the SNE models in more detail. The letter G in a model's product code indicates that the model is the Buy American version.

**Table 5: SNE series network engine details: SNE2200x, SNE1100x, SNE1050x, SNE110Lx**

Features	SNE2200x-0 SNE22002-0G <sup>1</sup>	SNE1100x-0	SNE1050x-0	SNE110Lx-0 <sup>2</sup>
<b>Communication interfaces</b>	<ul style="list-style-type: none"> <li>• 1 Ethernet port<sup>3</sup></li> <li>• 2 RS-485 ports</li> <li>• 2 USB ports<sup>4</sup></li> </ul>	<ul style="list-style-type: none"> <li>• 1 Ethernet port<sup>3</sup></li> <li>• 1 RS-485 port</li> <li>• 2 USB ports<sup>4</sup></li> </ul>		
<b>Maximum number of child engines when acting as a Site Director</b>	3	2	2	0
<b>Maximum allowed devices across all integrations. For example, MS/TP +IP. Includes VND integrations and devices brought in through routers.</b>	600	150	60	110
<b>BACnet/IP maximum trunks<sup>5</sup></b>	2	2	2	2
<b>BACnet/IP maximum devices per trunk</b>	200	100	50	10
<b>BACnet/SC maximum trunks<sup>6</sup></b>	1	1	1	1

**Table 5: SNE series network engine details: SNE2200x, SNE1100x, SNE1050x, SNE110Lx**

Features	SNE2200x-0 SNE22002-0G <sup>1</sup>	SNE1100x-0	SNE1050x-0	SNE110Lx-0 <sup>2</sup>
<b>BACnet/SC maximum devices per trunk<sup>7</sup></b>	150	100	50	10
<b>BACnet MS/TP maximum trunks</b>	2	1	1	1
<b>BACnet MS/TP maximum devices per trunk (Johnson Controls devices only)</b>  ① <b>Note:</b> A repeater is required if more than 50 Johnson Controls devices are on the same trunk.	100	100	50	100
<b>BACnet MS/TP maximum devices per trunk (with third party)</b>  ① <b>Note:</b> A repeater is required if more than 32 devices are on the same trunk and some are third party.	64	64	50	64
<b>N2 maximum trunks</b>	2	1	1	N/A
<b>Mapped N2 devices per trunk</b>  ① <b>Note:</b> A repeater is required if more than 50 devices are on the same trunk.	100	100	50	N/A
<b>LonWorks maximum trunks</b>	1	1	1	N/A
<b>LonWorks maximum devices</b>	255	127	60	N/A
<b>Remote Field Bus maximum trunks</b>	6	3	3	N/A

**Table 5: SNE series network engine details: SNE2200x, SNE1100x, SNE1050x, SNE110Lx**

Features	SNE2200x-0 SNE22002-0G <sup>1</sup>	SNE1100x-0	SNE1050x-0	SNE110Lx-0 <sup>2</sup>
Remote Field Bus maximum Johnson Controls Devices per bus	32	32	32	N/A
Remote Field Bus maximum devices per bus (with third-party devices)	16	16	16	N/A
Maximum objects in device <sup>8</sup>	5000	2500	2500	2500
Supported type of parent server	<ul style="list-style-type: none"> <li>• ADS</li> <li>• ADX</li> <li>• OAS</li> </ul>	<ul style="list-style-type: none"> <li>• ADS</li> <li>• ADX</li> <li>• ADS-Lite-E</li> <li>• OAS</li> </ul>	<ul style="list-style-type: none"> <li>• ADS</li> <li>• ADX</li> <li>• ADS-Lite-E</li> <li>• OAS</li> </ul>	ADS-Lite-A only
Supported integrations	<ul style="list-style-type: none"> <li>• BACnet/SC</li> <li>• BACnet/IP                             <ul style="list-style-type: none"> <li>- Simplex® Fire Alarm Control Unit (FACU)</li> <li>- Cree® SmartCast® Lighting Control</li> <li>- Molex® Lighting Control</li> </ul> </li> <li>• BACnet MS/TP Field Controller (FC) Bus</li> <li>• N2 Bus                             <ul style="list-style-type: none"> <li>① <b>Note:</b> The M4-SNE110Lx-0 model does not support the N2 Bus.</li> </ul> </li> <li>• LonWorks® (requires USB to LON adapter)                             <ul style="list-style-type: none"> <li>① <b>Note:</b> The M4-SNE110Lx-0 model does not support the LonWorks network interface.</li> </ul> </li> <li>• Modbus: Modbus TCP/IP on Ethernet and Modbus Remote Terminal Unit on RS-485</li> <li>• KNX IP</li> <li>• M-Bus</li> <li>• Tyco® C-CURE® 9000 and victor® Video Management</li> <li>• Zettler® Fire Panel with RS-232 adapter</li> <li>• OPC Unified Architecture (OPCUA/UA)</li> <li>• MQ Telemetry Transport (MQTT)</li> </ul>			
Operating system	Wind River® Linux LTS 19 (LTS=long-term support)			
Microprocessor	NXP i.MX6 DualLite processor			
Memory	Flash 2GB of DDR3 RAM and 16 GB of eMMC Flash			
User interface	Metasys UI			

<sup>1</sup> The letter G in a model's product code indicates that the model is the Buy American version.

<sup>2</sup> These models are intended for use with the ADS-Lite-A servers (only) in Australia, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore, Taiwan, Thailand, Vietnam, and select branches within regions of Africa and the Middle East.

<sup>3</sup> Second Ethernet port available with use of the ACC-USBETH-0 adapter.

<sup>4</sup> Only the supported USB integration adapters function with the SNE. Other integration adapters that are not supported cannot function with the SNE.

- 5 Two Ethernet device connections include one integral Ethernet port and the USB to Ethernet adapter, ACC-USBETH-0, as the second Ethernet port. The second BACnet/IP trunk is supported only at release 13.0 and later.
- 6 Direct Ethernet connection only. USB to Ethernet adapter does not support BACnet/SC at this time.
- 7 Multiple IP integrations can be on an engine, including BACnet/IP and BACnet/SC, but this is limited by the maximum devices that can be mapped to a trunk. The total number of BACnet/IP or BACnet/SC devices that you can map is 150. You cannot map 150 IP and 150 SC devices at the same time because they use the same BACnet Integration object.
- 8 Suggested object limit for performance considerations.

## NAE85 network engine

The NAE85 is a software-only Metasys network engine that runs on a Windows Server. The NAE85 provides most of the same functions and capabilities as the hardware network engine models, but with a much higher point capacity.

The NAE85 can supervise BACnet/IP-based or BACnet/SC-based devices directly, including the following:

- Metasys CGE and FAC4911 series general purpose application controllers
- Metasys CVE and VMA1930 series VAV box controllers

The NAE85 can integrate BACnet MS/TP devices using a BACnet MS/TP to IP router and the Remote Field Bus integration object, including the following:

- Metasys CGM series general purpose controllers
- Metasys CVM series VAV box controllers
- Metasys FEC, FAC, and VMA16/17/18 series field equipment controllers
- TEC series networked thermostats

The NAE85 also supports building-wide integrations using the following VND type integration drivers:

- C•CURE access control system
- victor video management system
- Zettler fire panel

The NAE85 also supports up to eight third-party integrations using the following integration drivers:

- BACnet, including Simplex Fire Alarm Control Unit (FACU)
- Modbus
- M-Bus
- KNX
- OPC UA

From Release 12.0, the NAE85 supports BACnet/SC and can act as a Primary Hub, Failover Hub, or Node in the BACnet/SC network topology. You need to purchase the M4-BACNETSC-0 add-on license to use BACnet/SC. For more information about BACnet/SC, refer to *BACnet/SC Workflow Technical Bulletin (LIT-12013959)*.

For more information about the NAE85 network engine, refer to the *NAE Catalog Page (LIT-1901148)*.

## SNC series network control engines

The Metasys SNC series network control engine is a hybrid offering that provides both supervisory and equipment control in a unified offering. They provide network management and system-wide control coordination over one or more networks of equipment controllers, including the following Metasys equipment controllers:

- CG series General Purpose Application Equipment Controllers
- CV series VAV Box Controllers
- FAC and FEC series Field Equipment Controllers
- VMA series VAV Box Controllers

- TEC series Terminal Equipment Controllers
- LN series Equipment Controllers
- Third-party equipment controllers

In addition to providing supervisory control capabilities, the SNC series network control engines also feature onboard input and output interfaces (I/O) and programmable logic to provide direct control over HVAC and other building system equipment.

**Figure 8: SNC series network control engines**



The following table outlines the SNC models in more detail. The letter G in a model's product code indicates that the model is the Buy American version.

**Table 6: SNC series Network Control Engines details**

Features	SNC2515x-0 SNC2515x-0H  SNC25152-0G <sup>1</sup> SNC25152-0HG <sup>1</sup>	SNC2515x-04 SNC2515x-04H	SNC1612x-0 SNC1612x-0H	SNC1612x-04 SNC1612x-04H
<b>Succeeds</b>	NCE25 Series	NCE25 Series	NCE25 Series	NCE25 Series
<b>Onboard inputs and outputs</b>	<ul style="list-style-type: none"> <li>• 40 total onboard I/O: 14 UI, 11 BI, 4 CO, 4 AO, 7 BO</li> <li>• Supports SA Bus expansion</li> </ul>		<ul style="list-style-type: none"> <li>• 28 total onboard I/O: 10 UI, 6 BI, 4 CO, 4 AO, 4 BO</li> <li>• Supports SA Bus expansion</li> </ul>	
<b>Communication interfaces</b>	<ul style="list-style-type: none"> <li>• <b>1 Ethernet port:</b> SNC25150-0, SNC25150-04, SNC16120-0, SNC16120-04, SNC25152-0, SNC25152-04, SNC25152-0H, SNC25152-04H, SNC16122-0, SNC16122-04, SNC16122-0H, and SNC16122-04H<sup>2</sup></li> <li>• <b>2 Ethernet ports:</b> SNC25151-0, SNC25151-0H, SNC25151-04, SNC25151-04H, SNC16121-0, SNC16121-0H, SNC16121-04, SNC16121-04H</li> <li>• 1 RS-485 port</li> <li>• 2 USB ports for connecting external integration adapters<sup>3</sup></li> </ul>			
<b>Maximum allowed devices across all integrations. For example, MS/TP +IP. Includes VND integrations and devices brought in through routers.</b>	96	4	60	4
<b>BACnet/IP maximum trunks<sup>4</sup></b>	2	2	2	2
<b>BACnet/IP maximum devices per trunk</b>	50	4	50	4



**Table 6: SNC series Network Control Engines details**

Features	SNC2515x-0 SNC2515x-0H  SNC25152-0G <sup>1</sup> SNC25152-0HG <sup>1</sup>	SNC2515x-04 SNC2515x-04H	SNC1612x-0 SNC1612x-0H	SNC1612x-04 SNC1612x-04H
BACnet/SC maximum trunks <sup>5</sup>	1	1	1	1
BACnet/SC maximum devices per trunk	50	4	50	4
BACnet MS/TP maximum trunks	1	1	1	1
BACnet MS/TP maximum devices per trunk (Johnson Controls devices only)	50	4	50	4
BACnet MS/TP maximum devices per trunk (with 3rd party)	50	4	50	4
N2 maximum trunks	1	1	1	1
Mapped N2 devices per trunk	50	4	50	4
LON maximum devices per trunk	64	4	60	4
LON maximum trunks	1	1	1	1
Remote Field Bus maximum trunks <sup>6</sup>	3	3	3	3
Remote Field Bus maximum Johnson Controls Devices per bus	32	4	32	4
Remote Field Bus maximum devices per bus (with 3rd party devices)	16	4	16	4
Maximum objects in device <sup>7</sup>	2500	2500	2500	2500
Supported type of parent server	<ul style="list-style-type: none"> <li>• ADS</li> <li>• ADX</li> <li>• ADS-Lite</li> <li>• OAS</li> </ul>			

**Table 6: SNC series Network Control Engines details**

Features	SNC2515x-0 SNC2515x-0H  SNC25152-0G <sup>1</sup> SNC25152-0HG <sup>1</sup>	SNC2515x-04 SNC2515x-04H	SNC1612x-0 SNC1612x-0H	SNC1612x-04 SNC1612x-04H
<b>Supported integration drivers</b>	<ul style="list-style-type: none"> <li>• BACnet/SC</li> <li>• BACnet/IP                             <ul style="list-style-type: none"> <li>- Simplex® Fire Alarm Control Unit (FACU)</li> <li>- Cree® SmartCast® Lighting Control</li> <li>- Molex® Lighting Control</li> </ul> </li> <li>• BACnet MS/TP</li> <li>• N2 Bus</li> <li>• LonWorks® with USB to LON adapter</li> <li>• Modbus: Modbus TCP/IP on Ethernet and Modbus Remote Terminal Unit on RS-485</li> <li>• KNX IP</li> <li>• M-Bus</li> <li>• Tyco® C•CURE® 9000 and victor® Video Management</li> <li>• Zettler® Fire Panel with USB to RS-232 adapter</li> <li>• OPC UA</li> <li>• MQ Telemetry Transport (MQTT)</li> </ul>			
<b>Operating System</b>	Wind River® Linux LTS 19 (LTS=long-term support)			
<b>Microprocessor</b>	NXP i.MX6 DualLite processor			
<b>Memory</b>	2 GB of DDR3 RAM and 16 GB of eMMC Flash			
<b>User Interface</b>	Metasys UI, starting at Release 13.0			

- 1 The letter G in a model's product code indicates that the model is the Buy American version.
- 2 Second Ethernet port available with use of the ACC-USBETH-0 adapter.
- 3 Only the supported USB integration adapters function with the SNC. Other integration adapters that are not supported cannot function with the SNC.
- 4 Two Ethernet device connections include one integral Ethernet port and the USB to Ethernet adapter, ACC-USBETH-0, as the second Ethernet port. The second BACnet/ IP trunk is supported only at release 13.0 and later.
- 5 Direct Ethernet connection only. USB to Ethernet adapter does not support BACnet/SC at this time.
- 6 The SNC requires Release 11.0 or higher to support the Remote Field Bus integration.
- 7 Suggested object limit for performance considerations.

**Note:** Servers must be equal to or at a higher Metasys Release than their child engines, including the SNCs.

## Network Engine features and integrations

### 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/SC:** for managing networks of Metasys IP-based devices, such as CGEs, CVEs, VMA1930, FAC4911, and third-party BACnet/SC devices with improved cybersecurity and network infrastructure integrity.

- **BACnet/IP:** for managing networks of Metasys IP-based devices, such as CGEs, CVEs, VMA1930, FAC4911, and third-party BACnet/IP devices.
- **BACnet MS/TP:** for managing networks of Metasys CGM, CVM, XPM, FAC, FEC, VMA, IOM, and TEC equipment controllers, non-Metasys BACnet MS/TP controllers, and third-party BACnet MS/TP devices.
- **Remote Field Bus:** for connecting remote BACnet MS/TP devices such as CGMs, CVMs, XPMs, FACs, FECs, VMA16s, IOMs, TEC3600 series thermostats, and other BACnet MS/TP field devices using a BACnet/IP to MS/TP router.
- **SIMPLEX® Fire System:** The SIMPLEX Fire System provides a BACnet/IP integration with the Metasys system to automate building conditions when triggered by a fire event.
- **Lighting systems integrations:** LED lighting and sensor networks from preferred partners – Cree® and Molex® – are tightly integrated with the Metasys system for coordinated lighting behavior to alert occupants to critical building scenarios like fire, intruder alert, lockdown and code blue events.
- **ZETTLER® Fire Panels:** Integrates data sourced from Zettler Fire Detection System into Metasys. This integration enables Metasys to serve as a secondary fire notification system that can alert more occupants in the event of a fire.
- **C-CURE 9000 Access Control and victor Video Management Systems:** Vendor (VND) integration drivers are added to the Metasys system to provide data from C-CURE 9000 Access Control and victor Video Management Systems from Tyco Security Products.
- **ZFR and ZFR Pro Wireless Field Bus:** for wirelessly managing networks of Metasys CGM, CVM, FEC family and TEC3000 equipment controllers.
- **N2:** for managing networks of legacy Metasys equipment controllers, such as UNTs, VMA14xx, 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, and third-party LonWorks devices.
- **MQTT integration driver:** for managing bidirectional communication between network engines and a generic MQTT broker, which enables the exchange of Metasys data with popular IoT platforms and applications.
- **Modbus:** for managing networks of third-party Modbus devices, such as energy meters and process controllers.
- **KNX (formerly EIB):** for managing networks of KNX devices, such as window blinds and shading controls, lights, and meters.
- **M-Bus (EN 13757-3):** for managing networks of M-Bus devices, such as heat meters.

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.

### Wireless Field Bus system

The Wireless Field Bus system provides a wireless platform across multiple levels of a Metasys building automation system (BAS), from network engines to equipment controllers and room sensors. Network engines require a Wireless Network Coordinator to interface to the wireless equipment controllers. Equipment controllers require only simple, add-on hardware to function wirelessly, and new models of TEC3100 network thermostats come with embedded wireless networking capabilities.

Wireless-enabled devices can coexist with hard-wired devices on the same Metasys network engine, providing a high degree of flexibility in installation design.

The Wireless Field Bus System provides a wireless alternative to hard-wired counterparts and facilitates easy initial location and relocation with minimal disruption to building occupants. The Wireless Field Bus System cost-effectively extends Metasys systems to applications where building

aesthetics (such as solid walls or ceilings, temporary walls, or decorative surfaces) normally hinder hardwiring.

For more information, refer to the *WRG1830/ZFR183x Pro Series Wireless Technical Bulletin (LIT-12013553)*.

### 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 any equipment or system integrated with Metasys to a preferred 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, 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 a Metasys 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 equipment or systems, 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 a Metasys Server 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 a Metasys Server.

## Metasys Server

The Metasys Server is an optional component that can be added to the Metasys system. The Server 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 UI, an intuitive user interface
- SMP user interface, which provides advanced operation and system navigation tree to show a hierarchical network view of the entire system for all connected devices

From Release 12.0, the ADS, ADX, and OAS support BACnet/SC and can act as a Primary Hub or Failover Hub in the BACnet/SC network topology. You need to purchase the M4-BACNETSC-0 add-on license to use BACnet/SC. For more information about BACnet/SC, refer to *BACnet/SC Workflow Technical Bulletin (LIT-12013959)*.

See [Server comparison](#) for a comparison of Metasys servers.

## Server comparison

The Metasys Server software family includes variants with different feature sets to meet a variety of different applications.

**Table 7: Metasys Server family comparison**

Feature	Application and Data Server (ADS)	Extended Application and Data Server (ADX)	Open Application Server (OAS)
<b>Host Platform</b>	Desktop computer platform: <ul style="list-style-type: none"> <li>Microsoft Windows® operating system</li> <li>Microsoft SQL Server Express database</li> <li>Open Database Connectivity (ODBC) compliant database package</li> </ul>	Server platform: <ul style="list-style-type: none"> <li>Microsoft® Windows Server® operating system</li> <li>Microsoft SQL Server database</li> </ul>	Turnkey and virtual desktop platform (virtual machine (VM)): <ul style="list-style-type: none"> <li>Microsoft Windows® operating system</li> <li>Microsoft SQL Server Express database</li> <li>Open Database Connectivity (ODBC) compliant database package</li> </ul> Virtual server platform (VM): <ul style="list-style-type: none"> <li>Microsoft® Windows Server® operating system</li> <li>Microsoft SQL Server database</li> </ul>
<b>Supported Simultaneous Users</b>	Up to 5 users	Up to 10, 25, 50, or 100 users (license specific)	Up to 5 users
<b>Network Engine Management</b>	Up to 14 engines	Up to 1,000 engines <i>ⓘ</i> <b>Note:</b> Support for engines varies depending on size of server hardware.	OASMIN: 0 engines OASSTD: up to 2 engines
<b>Direct BACnet Device Management</b>	No	No	Yes, BACnet/IP and BACnet/SC devices can be managed directly. BACnet MS/TP devices can be managed by using a BACnet/IP to MS/TP router. A maximum of 200 devices are supported.
<b>Archival of Historical Data</b>	Manual, scheduled, or automatic	Manual, scheduled, or automatic	<i>ⓘ</i> <b>Note:</b> You need to purchase the Metasys Historical Data add-on license to use this feature.
<b>User Interface</b>	Metasys UI SMP  <i>ⓘ</i> <b>Note:</b> SMP requires a license to operate and is for upgrading existing sites only. Only use to upgrade existing sites.	Metasys UI SMP  <i>ⓘ</i> <b>Note:</b> SMP requires a license to operate and is for upgrading existing sites only. Only use to upgrade existing sites.	Metasys UI SMP  <i>ⓘ</i> <b>Note:</b> SMP requires a license to operate and is for upgrading existing sites only. Only use to upgrade existing sites.
<b>Supports Export Utility</b>	Yes	Yes	No
<b>Supports Metasys Advanced Reporting</b>	No	Yes	No
<b>Supports Energy Essentials</b>	<i>ⓘ</i> <b>Note:</b> Energy Essentials is discontinued from Release 12.0.		
<b>Support for Split Configuration</b>	No	Yes	No



**Table 7: Metasys Server family comparison**

Feature	Application and Data Server (ADS)	Extended Application and Data Server (ADX)	Open Application Server (OAS)
<b>Supports Metasys for Validated Environments (MVE)</b>	No	Yes ⓘ <b>Note:</b> You need to purchase the MVE add-on license to use this feature. ⓘ <b>Note:</b> MVE is not available at Release 13.0. It is available at Release 12.0.50, and requires a Release 12.0.50 ADX and Release 12.0 validated engines.	No
<b>Five Years of Historical Data in Metasys UI</b>	Yes	Yes	Yes ⓘ <b>Note:</b> You need to purchase the Metasys Historical Data add-on license to use this feature.
<b>Supports Metasys Database Manager</b>	Yes	Yes	Yes
<b>Supports Fault Detection and Fault Triage features</b>	Yes	Yes	Yes ⓘ <b>Note:</b> At a minimum, you require 8GB of RAM and four virtual cores to support the Fault Detection and Fault Triage features on an OAS. ⓘ <b>Note:</b> You need to purchase the Fault Detection and Fault Triage add-on licenses to use these features.
<b>FIPS 140-2 Level 1 compliance using FIPS validated components</b>	Yes	Yes	Yes
<b>ADFS two-factor authentication</b>	Yes	Yes	Yes ⓘ <b>Note:</b> ADFS authentication is available to Metasys UI users, but is not available to Metasys SMP users. You need to purchase the ADFS add-on license to use this feature.
<b>Supports BACnet/SC</b>	Yes	Yes	Yes ⓘ <b>Note:</b> You need to purchase the M4-BACNETSC-0 add-on license for each Server to use BACnet/SC.

For more information, refer to the *Application and Data Server (ADS) and Extended Application and Data Server (ADX) Product Bulletin (LIT-1201525)* and to *Open Application Server (OAS) Product Bulletin (LIT-12013309)*.

## Server features

### FIPS 140-2 Level 1 compliance using FIPS validated components

FIPS 140-2 is a U.S. government cyber security standard that is used to approve cryptographic modules and algorithms used for encryption. From Release 11.0, FIPS 140-2 is available as a licensed add-on feature to the Metasys Server software products, including ADS, ADX, and OAS. This addition assures end customers that Metasys uses strong cyber security techniques to prevent unauthorized access to systems and data.

The following table provides more information about mixed site communication behaviors.

**Table 8: FIPS 140-2 impact on mixed site communication behaviors**

Communication behavior	Server Site Director and FIPS 140-2 status	
	Metasys Server at Release 12.0, and FIPS 140-2 is added.	Metasys Server at Release 12.0, but FIPS 140-2 is not added.
Can communicate with child network engines at Release 10.1 or earlier (FIPS 140-2 not available)	No	Yes
Can communicate with child network engines at Release 11.0 or 12.0 (FIPS 140-2 is default)	Yes	Yes

### Metasys Application Programming Interface (API)

Release 10.1 introduced a REST-compliant **Metasys Monitoring and Commanding Application Programming Interface (API)**. This API enables reading, writing, and commanding of Metasys objects or properties to provide a secure way to bi-directionally integrate with third-party applications. From Release 12.0, this API includes dynamic updating using Change of Value (COV) subscriptions. Dynamic updating eliminates the need for applications that are leveraging the Monitoring and Commanding API to constantly poll for data, which reduces cost and time on task.

- **Important:** Existing customers who want to upgrade their Metasys Server software and the Monitoring and Commanding API add-on need to purchase both the relevant -6 upgrade product code number for the Server software license upgrade and the M4-APIMOCMD-6 upgrade product code to upgrade the Monitoring and Commanding API. If existing customers do not purchase both upgrade product code numbers, the API is no longer functional. Customers who purchased the API upgrade at Release 12.0 need only upgrade their Server software license to use the API at Release 13.0.

### Site unification

Metasys network engines can network 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, you can add a Metasys Server as the Site Director to unify the system.

The Metasys Server 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; access remote sites over 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

A Metasys Server can be added to the Metasys system when the long-term historical data storage needs exceed the capacity of a network engine. The Metasys Server 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 [Server comparison](#) to understand the archiving capabilities of each Metasys Server type.

Metasys operators can view up to five years' worth of data within Metasys UI. This feature helps operators identify opportunities for system performance improvements and energy savings by providing year-over-year energy reporting.

- ⓘ **Note:** This feature requires the **Metasys Historical Data Add-on** license for an OAS, which needs to be purchased separately.

## Software licensing and software updates

From Release 10.0, updated licensing technology and software delivery are available. Updates include software downloads, comprehensive licensing and entitlement management, and 24-hour, self-service licensing over the Internet. These enhancements help streamline software management for field technicians and customers, and protect customers' buildings and networks from cyber security threats by preventing unlicensed, unauthorized use of Metasys software products.

From Release 11.0, Metasys UI administrator users receive notifications directly in the UI when licenses are expired, or when licenses are due to expire. Metasys UI administrator users also receive a software update notification when software updates are available. The software update notification feature identifies the latest software update for the Metasys server products, based on which one is installed with Metasys UI. For example, if your Metasys UI is installed with a Metasys OAS, you will see OAS update notifications only. Software Manager data is thereby displayed directly in the Metasys UI.

**Note:** Software update notifications are not available on MVE sites.

## 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.

**Note:** Metasys Export Utility is not supported for the Open Application Server (OAS).

## Advanced Reporting

The Metasys Advanced Reporting System is an optional feature of the ADX that provides historical and configuration data reporting capabilities separate from those available in the SMP.

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.

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.

For information about the reporting capabilities offered by the Metasys UI, see [Advanced Search and Reporting](#).

## 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.

**Note:** Energy Essentials is discontinued from Release 12.0.

## Metasys Database Management

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

- **Managing:** includes summarized information on methods for restoring Metasys system Metasys Server 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

### Metasys UI

The Metasys UI is an HTML5-compliant web interface that provides device-agnostic access to Metasys from smartphones, tablets, and computers. The Metasys UI is an intuitive interface that reduces learning time, maximizes productivity of operators, and provides a seamless user experience no matter what type of client device is used to access the system. The client device does not require any additional software installation—no Java™, Microsoft Silverlight®, Adobe®, Flash® or any other software from an online app store. The Metasys UI is included with SNE, SNC, NAE85, LCS85 series network engines, and any Metasys server: ADS, unified and split ADX, OAS, and ADS-Lite. You must license the server software to log on to the Metasys UI.

### Dashboards and widgets

A dashboard organizes data in the Metasys UI to help you see a complete picture of what is happening in a space, with a piece of equipment, or in a system such as a central plant. On each dashboard, widgets provide specific operator interaction features. You can customize dashboards to suit specific needs by allowing the selection of viewable widgets, widget order, and widget appearance, as well as assign by client device type.

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 Space Dashboard includes the following widgets:

- **Graphics** provide a visual representation of the selected space, which you can use to quickly check the status of that space, uncover unusual system conditions, make relational comparisons between nearby spaces at-a-glance, and issue commands to improve performance or restore order. The Graphics widget displays digital representations of equipment or systems, with graphical symbols and animations created using the Graphics Manager.
- **Equipment Serving Space** identifies the equipment serving the selected space and then provides details about that equipment, including other equipment or systems that may be affecting that piece of equipment.
- **Potential Problem Areas** provides a single display showing all items that are 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. You can use the Potential Problem Areas widget and Fault Detection as a daily punch list to manage buildings more efficiently.
  - ① **Note:** For an OAS, you require the **Metasys Potential Problem Areas** license to access Potential Problem Areas Points. You require the **Metasys Fault Detection** and the **Metasys Fault Triage** licenses to access both Fault Detection and Fault Triage. You can use Fault Detection without a Fault Triage license, but you require both licenses for Fault Detection and Fault Triage to use Fault Triage.
- **Equipment Summary** is a table view that lists all similar equipment that directly serves the selected space, and any downstream spaces. The Equipment Summary shows the most important information for each equipment and provides links to the equipment for even more detailed information. You can define which data to include in an Equipment Summary with the custom columns selection feature.

- **Schedule** widget lists all schedules affecting the selected space, and displays if the schedules are enabled or disabled. You can then select, view, and edit specific schedules associated with a space. The Schedule widget summarizes 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, use the bulk scheduling feature to add exceptions to several schedules at once and to assign weekly schedules in bulk.
- From Release 11.0, the Space Dashboard also supports the **Trend** widget. For details about the Trend widget see the section below.

The **Equipment Dashboard** provides a cohesive summary of a selected piece of equipment. The widgets shown in the Equipment Dashboard include the following:

- The **Graphics** widget enables users to view graphics associated with a piece of equipment or an Equipment Definition. The widget provides a visual representation of the monitored systems that enable you to check the status of equipment and recognize unusual system conditions. The widget displays digital representations of equipment or systems, with graphical symbols and animations created using the Graphics Manager.
- **Trend** widget is a chart that shows up to ten points of historical data for a single piece of equipment at the same time. Use this widget to view historical equipment data, compare performance changes over time, and easily create PDF or CSV reports. You can identify patterns in equipment operation, including performance outliers using an intuitive candlestick chart that displays min, max, and averages. From Release 11.0, you can also select a point without a trend extension, and see its real-time present value plotted on a Trend chart. This feature is called Live trending. In addition, the Trend feature is enhanced from Release 11.0 to include the ability to choose to view raw or aggregated data, regardless of duration. Furthermore, the sample limit is increased to 50,000 samples and the individual trend sample limit was removed. This provides you with more visibility into historical data.
- **Equipment Activity** enables you to view alarm activity, network controller offline events, user changes, and annotations made within a date range of up to one year within the last five years for the selected piece of equipment. This widget enables you to easily see and understand the correlation between disparate activities occurring within the system.
- **Equipment Relationships** identifies all relationships a piece of equipment has with other equipment, spaces, and network field controllers.
- **Equipment Data** lists all points and their real-time values for the selected piece of equipment, providing you with detailed information about the operational status of the equipment.
- **Schedule** widget lists all schedules affecting the selected equipment, and displays if the schedules are enabled or disabled. You can select, view, and edit specific schedules associated with a piece of equipment. The Schedule widget summarizes how a scheduling strategy affects the equipment 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 you to add exceptions to several schedules at once and to assign weekly schedules in bulk.

Additional Metasys UI features are available that are not specifically located in the Space or Equipment Dashboard, including:

- **Alarm Notification Bar** alerts you to the highest priority alarm that is pending your acknowledgment (requires acknowledgment, is not yet acknowledged, and you have permission to acknowledge it).

- **Alarm Manager** enables you to view and take action on Metasys system alarms. The Alarm Manager rolls up occurrences of alarms to help you prioritize the most important alarms and manage all occurrences of alarms in one operation. The Alarm Manager also displays an Alarm Summary that indicates how well the alarms are being managed. The Alarm Manager is accessible through the Metasys UI and full screen view, with a separate URL, well-suited for 24/7 operations centers. Spaces and equipment do not need to be configured for users to take advantage of the Alarm Manager. You can navigate directly from the Alarm Manager to the Building Network through a link, without having to manually search for it.
  - ① **Note:** Alarm Manager is only available for non-MVE servers and software-based engines. Use System Activity to manage alarms on MVE servers and on SNx engines.
- **Alarm Monitor** provides a similar view as the Alarm Manager, but does not require the user to log into the Metasys system. The Alarm Monitor is well-suited for the types of users who do not require or do not have authorization for full Metasys access, but who are responsible for viewing alarms from multiple integrated building systems. Spaces and equipment do not need to be configured for users to take advantage of the Alarm Monitor.
- **Custom Trend Viewer** is a chart showing up to ten points of historical data from multiple pieces of equipment at the same time. Use this widget to see and compare performance changes over time. You can identify patterns in equipment operation, including performance outliers using an intuitive candlestick chart that displays min, max, and averages. You can also view live trended points. These show the point's default value, such as, Present Value.
- With the **Trend Study Manager** feature, you can easily access custom trends configured in a previous Metasys UI session, and also view and manage space and equipment associations with all supported trend studies.
- **Cyber Health dashboard** provides a Metasys administrator with a centralized view of potential security-related issues or system issues which are detectable by a Metasys Server, but which may not surface as part of general system alarms. You can also see out-of-date software at one glance. The information is grouped into critical issues, potential risks, and informational items.
- **User Management** facilitates the creation and management of users and their roles, views, category-based permissions, and privileges. You can create and manage user details for Active Directory, and Metasys local users.
- **System Activity** provides a combined view of Audits and Alarms, as well as disparate views of Audits or Alarms for authorized users. Authorized users can filter, export, and act on Audits and Alarms.
- **Device Pairing** provides you with the ability to pair supported engines to the Metasys server for additional security.
- **BACnet/SC Management** enables you to manage BACnet Secure Connect (BACnet/SC) certificates. BACnet/SC is a secure, encrypted datalink layer that is specifically designed to meet the requirements, policies, and constraints of IP infrastructures.
- **Remote Notifications** enables you to configure the routing and filtering of event and audit messages directly in the Metasys UI for each server or engine, without the need to install software on client machines.
- **Fault Manager** enables you to view, enable, and disable all fault rules. You can also modify global attributes and export an archive of global attributes, exceptions, and activity logs. Alternatively, you can import an archive to restore data from a previously exported archive.

Certain widgets are connected with Advanced Search and Reporting, which you can use to quickly create even more powerful reports by leveraging the power of the dashboard with the Advanced Search feature. The widgets connected with Advanced Search include the Equipment Summary widget, Equipment Serving Space widget, Equipment Data widget, Graphics widget, and the Summary View widget. For more information, see [Advanced Search and Reporting](#).



## Building network

Metasys users with appropriate access can visualize the configuration of the Metasys network using the Building Network tree. Use Global status indicators to visually identify network and operational issues for any item in the Metasys network. You do not need to configure spaces and equipment to take advantage of the Building Network feature in Metasys UI.

Users can add, delete, and configure objects directly from the Building Network tree in Metasys UI. This reduces the need for Metasys operators to use a different UI to perform these configuration tasks.

Each item integrated into the Metasys system has a dashboard, where you can diagnose issues with the building network by viewing and editing detailed item information, as well as viewing historical trend data. The widgets shown in the Building Network dashboard include the following:

- **Detail** shows the current value and status of the item being viewed and allows the user to issue commands. The Detail widget contains the focus, diagnostic, and network views that you can use to view and edit detailed information for each item integrated into Metasys.
- **Summary** widget allows the user to quickly identify operational issues with the network item by displaying a tabular rollup of data under the current network item. For instance, a listing of data points' present value and status under a network field controller.
- **Relationships** enables the user to identify which equipment the network item serves.
- **Trend** widget is a chart showing up to ten points of historical data being collected on the Metasys network item at the same time. Use this widget to view historical data, compare changes over time, and easily create PDF or CSV reports. You can identify patterns including outliers, using the intuitive candlestick chart that displays min, max, and averages. View trended data points on up to three different charts at once. This helps you to visualize trended points of drastically different ranges by enabling them to be placed on separate charts.
- **Involvement** identifies what is currently attempting to control an object. The widget provides a visual depiction of what is involved with the object including what is serving it and what it is serving. The widget includes real-time values at every connection point in the involvement. The widget also distinguishes between operator commands and references; for example, logic connections. Involvement helps you to identify the root cause of system issues more quickly.

Some network dashboards, such as Schedules and Graphics, display the associated schedule summary or graphic widget, in addition to other widgets available in the Building Network dashboard.

## Intuitive navigation

The Metasys UI provides the following methods for operators to find information easily and quickly about their system:

- **Spaces Tree** is a set of links to each Space Dashboard. These links are intuitively organized by the site's physical hierarchy.
- **Building Network Tree** provides access to objects using an alternative navigation tree to the Spaces tree.
- **Bookmarking** provides a way for operators to quickly access favorite or most-frequently visited dashboards simply by bookmarking each location in the browser.
- **Search Bar** enables you to quickly access specific dashboards by entering the first few letters of the name of the space or equipment.
- **Views** enables you to select and use any of the user navigation trees that are assigned to you which may include **Tailored Summaries**. Tailored summaries display user-defined tables of system data.



## Fault Detection and Fault Triage

### Fault Detection

- Fault Detection is a licensed add-on feature to the Metasys Server software products, including ADS, ADX, ADS-Lite, and OAS.
  - ① **Note:** You require 16 GB of RAM and four virtual cores to support the Fault Detection and Fault Triage features on an OAS.
- This feature identifies building system-related faults and lists them in order of severity, whereby it leverages Johnson Controls-defined rules and a semantic data model to ease configuration.
- Fault Detection helps operators identify issues of building systems that are not operating correctly, prevent energy waste, and avoid comfort complaints.

### Fault Triage

- Fault Triage assists less experienced operators by guiding them to independently resolve issues. It is a licensed add-on feature to Fault Detection and the Metasys Server software products, including ADS, ADX, ADS-Lite, and OAS.
    - ① **Note:** You require 16 GB of RAM and four virtual cores to support the Fault Detection and Fault Triage features on an OAS.
  - Fault Triage improves the fault list order by adding fault duration and occurrence to the sorting logic, which improves driving the biggest problems to the top of the list.
  - Fault Triage leverages the Johnson Controls Field Support Knowledge Database to suggest possible causes, their likelihood, and appropriate corrective actions.
  - The feature captures corrective action activity that includes not tried, tried, and solved issues with the ability to add notes.
  - In addition, Fault Triage offers automatically generated, multi-stacked charting of fault data for each fault occurrence.
- ① **Note:** No significant feature additions were made to Fault Detection and Fault Triage at Release 13.0. The **Metasys Fault Detection** license and **Metasys Fault Triage** license remain at 11.x and continue to work at 13.x.

The functionalities of Fault Triage and Fault Detection are documented in detail in the *Potential Problem Areas widget* section of *Metasys UI Help (LIT-12011953)*.

### Advanced Search and Reporting

The Advanced Search and Reporting feature brings powerful insights to all Metasys users by providing an intuitive and easy method to gather and analyze data. You can quickly search for data across the Building Network tree, within navigation trees, or by spaces or equipment. Using a series of filters, that includes wildcards, you can refine your search results. For example, you can search for all zone temperature points in a specific space.

With the Advanced Search results, you can do the following:

- Create reports that shows historical activity, alarms, audits, and trend data based on a defined time range, or create reports that shows the present values of selected objects. This provides Metasys administrators with real-time information without requiring a log in.
- Export report data to CSV or PDF file formats on an ad hoc basis or by scheduling a report.
- Issue bulk commands to selected points and bulk modify multiple objects or multiple attributes on a single object.

- Schedule the email delivery of reports to up to 10 specified recipients. Report templates can be saved and be executed on-demand in the future.
  - Filter an Advanced Search to only include specific Equipment Definition short names.
  - Launch directly from certain widgets into a pre-populated Advanced Search. The filters are populated based on the equipment, space, and object information included in the widget. Users can launch Advanced Search from the following widgets:
    - Equipment summary widget
    - Equipment serving Space widget
    - Equipment data widget
    - Graphics widget
    - Summary view widget
- **Important:** You do not need to configure spaces and equipment for users to take advantage of the Advanced Search and Reporting feature. Advanced Search is available on computer and tablet platforms, but it is not available on phone platforms. Additionally, the Reporting, Bulk Commanding, and Bulk Modifying features of Advanced Search are not available on tablet or phone platforms.

From Release 12.0, you can use the Advanced Search and Reporting feature to run Base Reports. The reports on network items show you a snapshot view of the current exception situations and summary data in the entire site or selected engines of the site, and locate points that might need attention. The report on user accounts shows a snapshot view of current user information from the site director's security system.

The following reports are available:

- Alarm: Lists all network items with a non-Normal alarm state in the site or selected devices.
- Offline: Lists all network items whose offline state is True in the site or selected devices.
- Disabled: Lists all network items whose Enabled attribute value is set to False in the site or selected devices.
- Operator Override: Lists all network items currently being written to at a command priority value of **8**.
- Supervisory Override: Lists all network items whose Overridden attribute value is set to True. The meaning of Overridden is dependent on the integration and point type.
- Trouble: Lists all network items that have the Trouble attribute value set to True.
- Out of Service: Lists all network items that have the Out of Service attribute value set to True.
- User Account: Available for Administrators only. Lists all of the Metasys local and Active Directory user accounts with various details, including information to identify dormant user accounts. Applies to the site director only.

## User Management

The User Management feature facilitates the creation and management of users and their roles, category-based permissions, and privileges. Administrators can create and manage user details for Active Directory and Metasys local users. From Release 11.0, Active Directory includes Microsoft® Active Directory Federation Services (ADFS), including two-factor authentication (2FA) when the ADFS Server is configured for 2FA. This single sign-on solution helps prevent unauthorized access to Metasys, which, if not prevented, could result in data, financial, and reputational loss, system disruption, and other negative consequences.

## Space Authorization

Assign user access permissions to specific spaces and the equipment serving those spaces with Space Authorization. This allows for segmented user access by physical space within the building or campus.

## Remote Notifications

The Remote Notifications feature in the Metasys UI replaces the Server Destination Delivery Agents (DDAs) in the SMP. DDAs facilitate the routing of event and audit messages generated on the Metasys Server or engine.

With the Remote Notifications feature, you can configure the routing and filtering of event and audit messages directly in the Metasys UI for each Metasys Server or engine, without the need to install software on client machines.

- ① **Note:** From Metasys Release 10.1, management of Server DDAs is available with the Remote Notifications feature in Metasys UI only.

The main Remote Notification features are as follows

- **Space and Equipment filters:** Specify spaces and equipment to receive remote notifications, which improves the existing remote notification configuration workflow, as existing users are required to create numerous custom categories in order to achieve this level of functionality today.
- **Test email:** Send out a test email to confirm that the remote notifications are configured correctly and that recipients are able to receive them. This prevents missed notifications due to misconfiguration.
- **Alarm Escalation:** If an alarm has not been acknowledged or discarded by recipients in a specified period of time, an additional set of recipients will be notified.
  - ① **Note:** If the alarm clears before the specified period of time expires and without being acknowledged, the alarm escalation is still sent.

This provides Metasys administrators with a way to reduce the risk of operators missing critical alarms that could lead to compliance issues in critical spaces. This also ensures that alarm notifications reach the appropriate recipients, to prevent issues from becoming major breakdowns.

- **Send Announcement:** The Send Announcement feature provides the ability to send announcements to selected users. The announcement can be delivered by email, on a login banner, and on a home page banner. This feature enables information sharing and collaboration between multiple Metasys operators on a single site.

## Enhanced commanding

The Metasys UI includes the following features that enhance the practice of commanding or changing values, enabling operators to restore order quickly and efficiently and avoid unplanned rework.

- Use Timed Operator Commands to easily set time limits on the manual commands, such as issuing an override or taking a point out of service, to ensure the system reverts to automatic control. This can help reduce energy costs and reduce comfort complaints caused by the system staying in manual control for too long.
- The Annotations on Commands feature provides a means for operators to add a note when issuing a command, such as issuing an override or taking a point out of service. The note appears in the Equipment Activity widget and in System Activity for the command's audit to help operators trace system behavior back to manual commands and why they were issued. Administrators can choose to apply a setting to force users to add Annotations. This prevents confusion and clarifies understanding of why a Metasys operator made a change in the system.
- The commanding dialog view with integrated Priority Array identifies the current command priorities. This helps operators troubleshoot issues faster by making it easier for them to determine what command priority is currently active on a point object.

- Navigate directly from the Commanding Dialog to the Building Network through a link, without having to manually search the network tree after finding the root cause of an alarm or other issue.
- Metasys UI supports all existing SMP commands. Perform all SMP commands on objects that are supported in Metasys UI.

### User Views and Tailored Summaries

User Views are user-defined navigation trees that contain references to selected items found in the All Items navigation tree. You can create User Views to group commonly used items and graphics together. You can also assign User Views to user groups, such as building security and energy management.

Expanding the capability of User Views further, Tailored Summaries use table-based User Views to provide summary views of Metasys system items.

These summaries consist of sortable rows and columns tailored to contain information of your choosing. Tailored Summaries allow you to view, modify, and command large quantities of similar data in tabular format. Similar data, for example, may be all VAV boxes on a floor of a building, showing current temperatures, setpoints, flows, and minimum and maximum settings. Using this information, you can quickly analyze facility operation and troubleshoot for possible problems.

To help you get started with Tailored Summaries, a set of pre-built Summary Definitions can be imported into your site. These summary definitions fit into three categories: Configuration, Diagnostic, and Monitoring. The Device and Network Diagnostics definitions are intended for site administrators. The Mechanical Equipment definitions with links to graphics and Key Point definitions are useful for service professionals.

You can configure Tailored Summaries in SMP and SCT but not in Metasys UI or JCT.

### Metasys UI tools

Several tools are available to help you configure the Metasys UI. The System Configuration Tool (SCT) allows you to quickly define the spaces hierarchy, equipment definitions, and serving relationships. The Rapid Archive Creation streamlines the generation of the entire Metasys database for new or retrofit Metasys installations.

Metasys UI comes with an embedded graphics package to enable system designers to create the Graphics widgets using photo-realistic graphical representations of equipment and spaces. No separate software or license is required to use the Graphics Manager and Editor. An extensive library of graphic templates, symbols, and controls is provided with the Metasys UI, simplifying the task of graphic creation. Customized graphics symbols can be created using the Custom Behaviors feature. The following table summarizes some of the main Metasys UI graphics features.

**Table 9: Metasys UI Graphics features**

Feature	Description
Custom Symbols Library	Import and export custom symbols into the graphics palette with the Custom Symbols Library. Custom Symbol Libraries integrate seamlessly with the base graphics package.
Building Network Tree in Graphics Editor	Bind Network Tree items to graphics with the Building Network Tree binding option in the Graphics Editor.
Context-sensitive Binding Tree	The binding tree is context-sensitive, which ensures that the binding tree opens to the appropriate space or equipment when you launch the Graphics Editor from a particular space or equipment.
Path Tool Editing	Edit an existing path that was drawn with the drawing tool with the Path Tool editing feature.
Graphics Association Manager for Aliased Graphics	Bind graphics to an equipment definition with the Graphics Association Manager for Aliased Graphics feature, so that all equipment associated with that definition will be assigned the graphic automatically.

The Metasys UI also supports viewing of graphics that were created with an earlier version of Metasys graphics tools. Graphics+ graphics created with the Graphics+ Generation Tool (GGT) and standard graphics created with the User Graphics Tool (UGT) can be associated with spaces, equipment, and field controllers and be viewable in the Metasys UI without manual conversion.

The Johnson Controls System Configuration Tool (JCT), formerly called Metasys UI Offline, offers the ability to view how the Metasys UI looks in order to validate the UI's configuration. You can view the spaces and equipment configuration and view the graphics associated with the space and equipment. JCT leverages the SCT archives instead of the live site. JCT is automatically installed along with SCT.

## Site Management Portal (SMP)

The Site Management Portal (SMP) is the original web user interface introduced with Metasys and provided operators with access. SMP is nearing end-of-life and has been succeeded by the HTML5-compliant Metasys UI.

The SMP does not require any special workstation software, only a web browser and a Johnson Controls specific Java® plug-in. Authorized users simply log in to the network engine or Metasys Server using a web browser to access the SMP. 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 preferred.

- ⓘ **Note:** The Metasys server must be licensed in order to log on using SMP UI.
- ⓘ **Note:** From Metasys Release 12.0, SMP officially enters the end-of-support phase for Metasys Server software. From Release 12.0, SMP is a licensable feature and is only available to certain Metasys site types and restricted from others, as listed below:
  - Metasys UI now supports MVE.
  - SMP is available for new and existing Metasys Validated Environment (MVE) sites. For MVE sites, the SMP feature license does not need to be purchased separately as the SMP UI is included with the MVE license.
  - SMP is not available for new, non-MVE Metasys installations.
  - SMP is available for existing Metasys sites upgrading to 13.0. The SMP feature license must be purchased separately.

## System Configuration Tool (SCT)

SCT provides an offline mechanism for a project design engineer to configure the network engines and Metasys Server along with the Space and Equipment relationships for the Metasys UI. SCT can be integrated with the site to provide database loading and scheduled backups of the entire site. In addition to installing the SCT software, the SCT installer has been improved to install the required third-party software components, all with a single click of the mouse.

- ⓘ **Note:** SCT must be licensed in order to log in.
- ⓘ **Note:** Device Package files (MS-DP-0) are sold separately and require a separate license.

With **SCT Pro**, users can quickly and easily provision new, out-of-the-box Network Engines. Users can complete any of the following tasks:

- Provision a new Network Engine
- Upload and download a site
- Perform a backup of a site
- Schedule automatic recurring backups

- Restore a site from a backup
- Upgrade a device
- Discover devices on the same subnet as the SCT Pro server

SCT Pro is installed during the installation of SCT Release 13.0 and later. Users can launch the new HTML user interface from SCT or from a URL on any client device type (workstation, tablet, or phone).

The following table provides an overview of the SCT, Metasys Server, and NAE Update Tool releases:

**Table 10: Metasys Server, SCT, and NAE Update Tool releases**

Release Date	Metasys Server	SCT	NAE Update Tool
October 2015	Release 7.0	Release 7.0	Release 7.0
September 2016	Release 8.0	Release 11.0	Release 11.0
February 2017	Release 8.1	Release 11.1	Release 11.1
August 2017	Release 9.0	Release 12.0	Release 12.0
December 2018	Release 10.0	Release 13.0	Release 13.0
October 2019	Release 10.1	Release 13.2	Release 13.2
October 2020	Release 11.0	Release 14.0 <sup>1</sup>	The NAE Update Tool continues to be a component of the SCT install. However, we encourage you to use SCT Pro instead of the NAE Update Tool.
November 2020	Release 11.0	Release 14.1	
May 2021	Release 11.0	Release 13.3 and Release 14.2	
May 2022	Release 12.0	Release 15.0	
June 2023	Release 12.0.50	Release 15.0	
September 2023	Release 13.0	Release 16.0	

<sup>1</sup> SCT 14.0 was discontinued when SCT 14.1 was released.

For a list of updated features and benefits available at the latest SCT Release, refer to *System Configuration Tool Catalog Page (LIT-1900198)*.

## System configurations for special applications

### 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.

From Release 12.0, the LCS85 supports BACnet/SC and can act as a Primary Hub, Failover Hub, or Node in the BACnet/SC network topology. You need to purchase the M4-BACNETSC-0 add-on license to use BACnet/SC. For more information about BACnet/SC, refer to *BACnet/SC Workflow Technical Bulletin (LIT-12013959)*.

For more information about the LCS, refer to *LonWorks Control Server (LCS) 85 Product Bulletin (LIT-12011549)*.



## Metasys for Validated Environments (MVE)

Metasys for Validated Environments (MVE) on Metasys UI is the newest offering from Johnson Controls for facilities that require regulatory compliance for the Building Management Systems (BAS). 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.

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
- EU Annex 11 of the European Union Good Manufacturing Practice (EU GMP) regulations (European Medicines Agency [EMA] 2011)
- Agency regulations around the world that deal with electronic records and electronic signature requirements

The MVE feature operates on an ADX and communicates to validated Network Engine models.

- ① **Note:** MVE is not available at Release 13.0. It is available at Release 12.0.50, and requires a Release 12.0.50 ADX and Release 12.0 validated engines. Refer to *Metasys for Validated Environments, Extended Architecture Product Bulletin (LIT-12011326)* for further information about validated engines.
- ① **Note:** From Release 12.0.50, MVE capabilities are supported in Metasys UI, in addition to SMP. MVE also supports BACnet/IP or BACnet/SC devices.
- ① **Note:** You need to purchase an add-on license to use MVE on the ADX Server and you can use either Metasys UI or SMP for MVE.

## UL/864 Smoke Control Listed systems

The Metasys system at Release 8.1 can be configured to provide a UL/cUL 864 UUKL 10th Edition Smoke Control Listed system. The system integrates a fire alarm system, such as 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 MS/TP and legacy N2 Bus devices.

The Metasys Smoke Control System includes a set of UL/cUL 864 UUKL 10th 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. SMP is the supported UI in the 10th Edition Listing.

The UL/cUL 864 UUKL 10th Edition Smoke Control Listing at Release 8.1 includes the listing for the US and Canada at 10th Edition. The listing title is Metasys System UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System.

## Summary

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

## Related documentation

Refer to the following literature for technical specifications and information on operating and performance characteristics of the Metasys system.



**Table 11: Related documentation**

<b>For information about</b>	<b>Refer to document</b>
Metasys system overview	<i>Metasys System Configuration Guide (LIT-12011832)</i>
General Purpose Application Controllers (CGs), VAV Box Equipment Controllers (CVs), and I/O Expansion Modules (XPMs)	<i>Metasys CG, CV Equipment Controllers and XPM Expansion Modules Product Bulletin (LIT-12013105)</i>
Metasys system FEC family controllers and related products	<i>Metasys System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)</i>
Cisco® switch technology for Metasys network	<i>Cisco IE 2000 and IE 4010 Ethernet Switches for Metasys Networks Installation Instructions and Troubleshooting Guide (LIT-12013055)</i>
Controller Configuration Tool (CCT)	<i>Controller Configuration Tool (CCT) Catalog Page (LIT-1900386)</i>
LonWorks®-based products for integration into Metasys system	<i>LN Series Controllers Overview Product Bulletin (LIT-1201979)</i>
SNE Series Network Engines and SNC Series Network Control Engines	<i>SNE/SNC Product Bulletin (LIT-12013296)</i>
SNE Series Network Engines commissioning	<i>SNE Commissioning Guide (LIT-12013352)</i>
SNC Series Network Control Engines commissioning	<i>SNC Commissioning Guide (LIT-12013295)</i>
Network Engines	<i>Network Engines Product Bulletin (LIT-12012138)</i>
Network Engine commissioning for KNX vendor integration	<i>Network Engine Commissioning for KNX Vendor Integration Application Note (LIT-12013148)</i>
Network Engine commissioning for M-Bus vendor integration	<i>Network Engine Commissioning for M-Bus Vendor Integration Application Note (LIT-12013149)</i>
Network Engine commissioning for Modbus vendor integration	<i>Network Engine Commissioning for Modbus Vendor Integration Application Note (LIT-12013150)</i>
Network Engine commissioning for C-CURE 9000 Access Control and victor Video Management integration	<i>Network Engine Commissioning for C-CURE/victor Integration Application Note (LIT-12013151)</i>
Network Engine commissioning for Cree® Digital Lighting Systems Integration	<i>Metasys System Commissioning for Cree Digital Lighting Systems Integration(LIT-12013152)</i>
Network Engine commissioning for Molex® Digital Lighting Systems Integration	<i>Metasys System Commissioning for Molex Digital Lighting Systems Integration(LIT-12013153)</i>
Network Engine commissioning for Simplex® Fire System integration	<i>Network Engine Commissioning for Simplex Fire System Integration (LIT-12013060)</i>
Network Engine commissioning for Zettler® Fire Panel integration	<i>Network Engine Commissioning for Zettler MX Speak 6.0 Vendor Integration Application Note (LIT-12013269)</i>
Network engine commissioning for Message Queuing Telemetry Transport (MQTT) integration	<i>MQTT Client External Data Connector Network Engine Commissioning Guide (LIT-12013976) and Mass Changes Tool (MCT) Help (LIT-12013963)</i>
BACnet/SC workflow and use cases	<i>BACnet/SC Workflow Technical Bulletin (LIT-12013959)</i>

**Table 11: Related documentation**

For information about	Refer to document
Application and Data Server and Extended Application and Data Server	<i>Application and Data Server (ADS) and Extended Application and Data Server (ADX) Product Bulletin (LIT-1201525)</i>
Open Application Server	<i>Open Application Server (OAS) Product Bulletin (LIT-12013309)</i>
Metasys UI Help and overview	<i>Metasys UI Help (LIT-12011953)</i>
Export Utility	<i>Metasys Export Utility Product Bulletin (LIT-1201800)</i>
System Configuration Tool (SCT)	<i>System Configuration Tool Catalog Page (LIT-1900198)</i>
System Configuration Tool (SCT) Pro	<i>SCT Pro Help (LIT-12013035)</i>
LonWorks® Control Server (LCS) 85	<i>LCS85 Product Bulletin (LIT-12011549)</i>
Metasys for Validated Environments (MVE)	<i>Metasys for Validated Environments, Extended Architecture Product Bulletin (LIT-12011326)</i>
Metasys for Validated Environments on Metasys UI Product Bulletin	<i>Metasys for Validated Environments on Metasys UI Product Bulletin (LIT-12014261)</i>
Metasys Release 8.1 Smoke Control System	<i>Metasys System UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System Catalog Page (LIT-1901048)</i>
Commissioning a Metasys Release 8.1 Smoke Control System	<i>Metasys System UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System Technical Bulletin (LIT-12012487)</i>
Software licensing	<i>Software Manager Help (LIT-12012389)</i>
Metasys API	<a href="#">Metasys API documentation</a> : Includes a Quick Start Guide, REST API documentation, Frequently Asked Questions section, and Example Applications. <i>Metasys REST API Client for .NET and COM Developer Guide (LIT-12013522)</i>
ZFR Pro Wireless	<i>WRG1830/ZFR183x Pro Series Wireless Technical Bulletin (LIT-12013553)</i>

## Product warranty

This product is covered by a limited warranty, details of which can be found at [www.johnsoncontrols.com/buildingswarranty](http://www.johnsoncontrols.com/buildingswarranty).

## Software terms

Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable end-user license, open-source software information, and other terms set forth at [www.johnsoncontrols.com/techterms](http://www.johnsoncontrols.com/techterms). Your use of this product constitutes an agreement to such terms.

## Patents

Patents: <https://jciapat.com>

## Contact information

Contact your local Johnson Controls representative: [www.johnsoncontrols.com/locations](http://www.johnsoncontrols.com/locations)

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