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The Architectural Guidelines provide the recommended EcoStruxure BMS design limits for common applications. These are the configurations that have been tested and supported by Schneider Electric. In many cases, it is technically possible to exceed the recommended system design limits or create architectures outside the guidance provided in this document. In other cases, environmental factors such as network traffic and radio interference may reduce the stated limits of these guidelines. However, deviations from these guidelines may result in performance related issues or product failures.

An EcoStruxure BMS has few hardcoded limitations. Therefore, most of the recommendations are based on tests and software design.

Terminology

The table below lists the terms used in this document to represent different groups of EcoStruxure BMS software and hardware products.

Term	Groups of EcoStruxure BMS software and hardware products
EcoStruxure BMS servers	Enterprise Central, Enterprise Server, AS-P servers, AS-B servers, and Edge Server[a]
Automation servers	AS-P servers, AS-B servers, and Edge Server[a]
BACnet/IP controllers	SpaceLogic MP and RP controllers
BACnet MS/TP controllers	EasyLogic MP and RP controllers[b]
SpaceLogic BACnet/IP devices	SpaceLogic MP and RP controllers, and IP-IO modules[c]
EasyLogic BACnet MS/TP devices[b]	EasyLogic MP and RP controllers, and RP-IO modules[d]
MP controllers	MP-C: SpaceLogic MP-C Pro and EasyLogic MP-C controllers[e] MP-V: SpaceLogic MP-V Pro controllers[f]
RP controllers	RP-C: SpaceLogic RP-C Advanced, RP-C Pro, RP-C Pro Plus, and EasyLogic RP-C controllers[g] RP-V: SpaceLogic RP-V Advanced and EasyLogic RP-V controllers[h]
RP controller expansion modules	DALI light, 0-10V light, SMI blind, blind, relay, sensor, and Zigbee modules[i]

a) Edge Server is an EcoStruxure BMS server with the same role as an automation server, but is software only.
b) EasyLogic devices (controllers and I/O expansion modules) only support BACnet MS/TP communication. EasyLogic devices have "-M" in their product name.
c) IP-IO: IP-IO-DI10, -UIO10, and -UIO5DOFA4.
d) RP-IO: RP-IO-12A-M and -16E-M.
e) MP-C Pro: MP-C-15A, -18A, -18B, -24A, and -36A. EasyLogic MP-C: MP-C-24A-M and -36A-M.
f) MP-V Pro: MP-V-7A and -9A.
g) RP-C Advanced: RP-C-12A-F-24V, -12B-F-24V, -12C-F-24V, and -16A-F-230V. RP-C Pro: RP-C-16B-F-24V and -16B-F-230V. RP-C Pro Plus: RP-C-16C-F-230V. EasyLogic RP-C: RP-C-12A-M-24V, -12B-M-24V, and -16A-M-24V.
h) RP-V Advanced: RP-V-4A and RP-V-5A. EasyLogic RP-V: RP-V-5C-M.

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i) DALI: RP-C-EXT-DALI-M-PD and RP-C-EXT-DALI. 0-10V: RP-C-EXT-0-10V-4-PD and RP-C-EXT-0-10V-4. SMI: RP-C-EXT-BL-SMI-4-HV-PD and RP-C-EXT-BL-SMI-2-LV-PD. Blind: RP-C-EXT-BL-4-HV-PD and RP-C-EXT-BL-2-LV-PD. Relay: RP-C-EXT-REL-4 and CRS-HH-REL-10. Sensor: RP-C-EXT-MS-BLE (Multi-sensor) and RP-C-EXT-IS-BLE (Insight-Sensor). Zigbee: RP-C-EXT-ZB-DALI and RP-C-EXT-ZB-0-10V.

Architectural summary

The strategy for the recommendations provided in the following tables is to allow the system to support any realistic combination within the recommended limits without negative effect on the total performance.

System limits

The following tables show the recommended limits.

Architecture – Enterprise Central systems

Function	Enterprise Central	Enterprise Servers	Automation servers per Enterprise Server	Automation servers in total per system	Comment
Number of servers	1	50	250	2,500	See the “Architectural design considerations” section. One Project Configuration Tool per system. Enterprise Central should not be installed on the same PC as any Enterprise Server.

Architecture – Enterprise Server Only systems

Function	Enterprise Central	Enterprise Servers	Automation servers per Enterprise Server	Automation servers in total per system	Comment
Number of servers	-	1	250	250	See the “Architectural design considerations” section. One Project Configuration Tool per system.

Number of concurrent client connections

Function	Enterprise Server or Enterprise Central[a]	Automation server	Comment
Operator			
WebStation	100[bc]	5[b]	-
WorkStation	10[bc]	5[b]	-
Engineering			

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Function	Enterprise Server or Enterprise Central[a]	Automation server	Comment
WorkStation	2	1	Consumes operator connections Maximum 10 concurrent WorkStation engineering clients in total per system

a) Enterprise Central is intended as a supervisory aggregator.
b) To allow the maximum number of WebStation or WorkStation connections, the CPU load shall not exceed 40% when no user is logged in.
c) An Enterprise Server or Enterprise Central supports up to 100 WebStation clients, or 10 WorkStation clients, or 90 WebStation clients plus 10 WorkStation clients.

Number of hosted devices

Function	Enterprise Central	Enterprise Server	AS-P / Edge Server	AS-B server	Comment
Maximum number of devices per server	50[a]	600[bc]	300[d]	50[e]	Total number of devices on all interfaces and ports, such as BACnet, LON, and Modbus

a) Enterprise Central can only host Enterprise Servers.
b) The maximum number for Enterprise Server includes automation server count.
c) The maximum number for Enterprise Server does not include field devices hosted by each automation server.
d) An AS-P server may support either an Infinet network or a BACnet MS/TP network, but not both.
e) AS-B servers with “L” in the product model name do not support hosting of devices.

Open protocol limits

The following tables show the recommended limits.

Number of hosted BACnet devices

Function	Enterprise Server[a]	AS-P server	AS-B server[b]	Edge Server	Comment
Maximum number of SpaceLogic BACnet/IP devices per private IP fieldbus	-	200[c]	50[c]	-	See footnotes: [defgh]
Maximum number of SpaceLogic BACnet/IP devices on either a private IP fieldbus and/or site IP network	600[c]	200[c]	50[c]	200[c]	See footnotes: [defgh]
Maximum number of SpaceLogic BACnet/IP devices per daisy-chain sub network	50[c]	50[c]	50[c]	50[c]	See footnotes: [f]
Maximum number of SpaceLogic BACnet/IP devices per RSTP sub network	39[c]	39[c]	39[c]	39[c]	See footnotes: [fhi]

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Function	Enterprise Server[a]	AS-P server	AS-B server[b]	Edge Server	Comment
Maximum number of MP/RP controllers per BACnet MS/TP network	-	50	50	-	See footnotes: [jk]
Maximum number of BACnet MS/TP devices per BACnet MS/TP network when the devices are a mix of MP/RP controllers and b3 or MNB BACnet devices	-	50	50	-	See footnotes: [jkl]
Maximum number of BACnet MS/TP devices per BACnet MS/TP network	-	127[m]	50	-	See footnotes: [jk]
Maximum number of BACnet MS/TP networks per server	-	2[n]	1	-	
Maximum total number of hosted BACnet MS/TP and/or BACnet/IP devices per server	600	254[o]	50	254	See footnotes: [defhk]

a) Enterprise Server load testing for SpaceLogic BACnet/IP devices was done in a virtual machine environment running Windows Server 2012 with 2.8 GHz dual-socket quad-core CPUs (8 virtual processors), 32 GB RAM, and a 1 terabyte 10,000 rpm hard drive.
b) AS-B servers of hardware version 9.07 and later are required to host SpaceLogic BACnet/IP devices. AS-B servers with "L" in the product model name do not support hosting of BACnet devices, BACnet objects, BBMD, or foreign devices.
c) For information on the recommended limits for SpaceLogic RP controllers with RP controller expansion modules, see Table: Number of hosted SpaceLogic RP controllers with RP controller expansion modules.
d) Automation server examples: Maximum 50 devices per IP daisy-chain sub network x 4 daisy-chain sub networks = 200 devices. Maximum 39 devices per RSTP sub network x 5 RSTP sub networks = 195 devices. Maximum 127 devices per MS/TP network x 2 MS/TP networks = 254 devices.
e) This includes virtual BACnet devices (that is, a BACnet gateway presenting 20 ZigBee devices as BACnet devices counts as 21 – one for the gateway and 20 for the ZigBee devices). No hard-coded limit, so maximum is equal to the number of devices the EcoStruxure BMS server supports.
f) SpaceLogic BACnet/IP devices support star, daisy-chain, and RSTP network topologies, which can be connected to an automation server at either the site network or private IP fieldbus level.
g) The AS-P (hardware version 0.62 and later) and AS-B servers have two Ethernet ports, which can be configured with two IP addresses to allow separate connections to both the site network and a private IP fieldbus. The private IP fieldbus can be configured with an own optional DHCP server which is limited to a Class C IP network with the address range 10.110.210.0/24 and a maximum of 254 usable addresses. For more information, see section "Use of second Ethernet port on AS-P or AS-B servers".
h) These numbers are the results of tests that were focused on determining the SpaceLogic BACnet/IP device maximum counts and were performed with only SpaceLogic BACnet/IP devices hosted by servers and no other loads. Each SpaceLogic BACnet/IP device had a standard application load of 481 objects and approximately 500 kilobytes of free object system memory.
i) The RSTP protocol supports a maximum of 40 devices. At least one external managed switch is required to serve as a root to connect a maximum of 39 SpaceLogic BACnet/IP devices to either the site network or private IP fieldbus.
j) MS/TP field buses will perform better with an RS-485 repeater (such as the B-LINK). This may become necessary with some devices and networks greater than 32 nodes.
k) The following SpaceLogic MP and RP controllers can be configured to use BACnet MS/TP, instead of BACnet/IP, for communication with the AS-P or AS-B server: RP-C Advanced (hardware version 10 and later), RP-C Pro, RP-C Pro Plus, RP-V Advanced, and MP-V Pro. EasyLogic RP-C, RP-V and MP-C only support BACnet MS/TP communications. The BACnet MS/TP support for RP-C Advanced, RP-C Pro, RP-V Advanced, and MP-V Pro requires EcoStruxure Building Operation version 4.0.2 or later. EasyLogic RP-V requires EcoStruxure Building Operation version 4.0.3 or later. RP-C Pro Plus and EasyLogic RP-C and MP-C require EcoStruxure Building Operation version 5.0.1 or later.
l) Mixing RP-C Pro Plus controllers with MNB BACnet devices (devices with an RS-485 isolated interface) on a BACnet MS/TP network is not supported.
m) When using both LonWorks and BACnet MS/TP networks on the automation server, the network with more than 10 devices connected is considered to be the main network. The other network then supports up to 10 devices. The main network will support the number of devices specified in the table for the used protocol. For example, if the automation server has 64 LonWorks devices connected to it, the BACnet MS/TP network can support 10 devices.
n) An AS-P server may support either an Infinet network or a BACnet MS/TP network, but not both.
o) When the hosted BACnet MS/TP devices include MP/RP controllers, the maximum total number of hosted BACnet MS/TP devices per AS-P server is 100.

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Number of hosted SpaceLogic RP controllers with RP controller expansion modules

Function	Enterprise Server	AS-P / Edge Server	AS-B server	Comment
Maximum number of SpaceLogic RP controllers with RP controller expansion modules per private IP fieldbus and/or site IP network	256	64	16	See footnotes: [ab]
Maximum number of SpaceLogic RP controllers with RP controller expansion modules per daisy-chain sub network	50	50	16	See footnotes: [a]
Maximum number of SpaceLogic RP controllers with RP controller expansion modules per RSTP sub network	39	39	16	See footnotes: [ac]

a) SpaceLogic RP controllers (BACnet/IP controllers) support star, daisy-chain, and RSTP network topologies, which can be connected to an automation server at either the site network or private IP fieldbus level.
b) The AS-P server (hardware version 0.62 and later) has two Ethernet ports, which can be configured with two IP addresses to allow separate connections to both the site network and a private IP fieldbus. The private IP fieldbus can be configured with an own optional DHCP server which is limited to a Class C IP network with the address range 10.110.210.0/24 and a maximum of 254 usable addresses. For more information, see section “Use of second Ethernet port on AS-P or AS-B servers”.
c) The RSTP protocol supports a maximum of 40 devices. At least one external managed switch is required to serve as a root to connect a maximum of 39 SpaceLogic RP controllers to either the site network or private IP fieldbus.

IP-IO and RP-IO module limits

Function	Automation server	MP / RP controller	Comment
Maximum number of IP-IO or RP-IO modules per server or controller[a]	See Table: Number of hosted BACnet devices	3	-

a) IP-IO and RP-IO modules are used by and provide I/O expansion for MP and RP controllers, but it is always the automation server that hosts the I/O expansion modules.

BACnet Secure Connect (BACnet/SC) hub function limits

Function	Enterprise Server	AS-P / Edge Server	AS-B server	Comment
Maximum number BACnet/SC connections per server	1000	300	50	See footnotes: [ab]

a) Enabling BACnet/SC hub has minimal impact on system memory usage. BACnet/SC hub support requires EcoStruxure Building Operation version 4.0.3 or later.
b) Load testing of an AS-P BACnet/SC hub showed that the more traffic a hub relays, the more CPU load and packet latency. Test results showed that an AS-P hub that relayed 1200 packets per second reached a CPU load of 70% and an average packet response time of 16 milliseconds. Based on the test results, it can be extrapolated that to stay below a CPU load of 70%: A system with 120 BACnet/SC nodes can handle 5 requests/responses per second per node. A system with 300 BACnet/SC nodes can handle 2 requests/responses per second per node.

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Other BACnet limits

Function	Enterprise Server	AS-P / Edge Server	AS-B server	Comment
Maximum number of BACnet objects per server[a]	See table below[b]	See table below[b]	See table below[bc]	-
Maximum number of BBMD per server	Not restricted	Not restricted	Not restricted[c]	-
Maximum number of foreign devices per server	600[d]	254[d]	50[cd]	-

a) The maximum number of BACnet objects per server is the upper limit for the number of objects in the Application folder of the BACnet Interface that are owned and used by the EcoStruxure BMS server. This number excludes hosted BACnet objects (for example, SpaceLogic BACnet/IP devices). The number of hosted BACnet objects count toward the maximum number of objects per server, see Table: Objects. The number of BACnet objects can be found using the Search view in WorkStation. For BACnet objects, in the Include types box, enter “BACnet Object”. For hosted BACnet objects, in the Include types box, enter “BACnet Object (Generic)”. You can select and sort on the Type column to view each type.
b) The number varies depending on the BACnet object types used. See Table: Maximum number of BACnet objects per type.
c) AS-B servers with “L” in the product model name do not support hosting of BACnet devices, BACnet objects, BBMD, or foreign devices.
d) No hard-coded limit, so maximum is equal to the number of devices the EcoStruxure BMS server supports.

Maximum number of BACnet objects per type

BACnet object type	Persistent memory per object	Maximum number of objects[a]
Analog value	1440	4094
Digital value	1440	4094
Multistate value	1440	4094
Event enrollment	896	6580
Analog input	160	36849
Digital input	640	9212
Multistate input	160	36849
Analog output	1440	4094
Digital output	2000	2948
Multistate output	1520	3879
Loop	0	Unlimited
Schedule	256	23031
Trend log	176	33499
Notification class	0	Unlimited
Calendar	0	Unlimited
COV subscription	64	92123

a) The maximum number of BACnet objects per type depends on how much memory other functionality has allocated. You can check how much persistent memory is used here: /System/Modules/PersistentMemoryManager/MemoryInfo

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LonWorks

Function	Enterprise Server	AS-P server[a]	AS-B / Edge Server	Comment
Maximum number of NVs on local node	4096	4096	-	-
Maximum number of LonWorks networks	5	1	-	One local node on the Enterprise Server
Maximum number of Xenta[b] and LonWorks devices per server[cd]	600[e]	200[f]	-	No MNL devices allowed
Maximum number of Xenta 400 I/O modules per server[g]	-	20	-	-
Maximum number of MNL devices per server[cd]	600[e]	127[f]	-	No Xenta or LonWorks devices allowed
Total number of MNL devices and LonWorks devices per server[cd]	600[e]	127[f]	-	When Xenta and/or LonWorks devices are present

a) AS-P servers with "NL" in the product model name do not support LonWorks.
b) Xenta 280/300/401 needs to be of version 3.4 and later. For version 3.8 and higher, the performance of reading multiple values from the same Xenta 280/300/401 device is significantly improved.
c) LonWorks networks with long wires and high node counts can experience communication issues. The use of a LonWorks router (such as the Loytec L-Switch) is the best solution for resolving wire length and node count related issues on LonWorks networks. A LonWorks repeater (such as the Xenta Repeater) installed near the automation server (in addition to the LonWorks routers added for standard network design reasons) can also improve performance.
d) If the device count exceeds 64 nodes, LonWorks field buses require a LonWorks switch because of electrical limitations of the FTT-10 bus.
e) This is the maximum number of devices that has been tested by Schneider Electric. In many cases, it is possible to exceed this limit provided that the bandwidth usage on the LonWorks network does not exceed 70%.
f) When using both LonWorks and BACnet MS/TP networks on the automation server, the network with more than 10 devices connected is considered to be the main network. The other network then supports up to 10 devices. The main network will support the number of devices specified in the table for the used protocol. For example, if the automation server has 64 LonWorks devices connected to it, the BACnet MS/TP network can support 10 devices.
g) The purpose of the Xenta 400 I/O module communication is to make it possible to retain the Xenta 400 I/O modules when converting Xenta 700 or Xenta 401 to an AS-P server.

Modbus

Function	Enterprise Server	AS-P server	AS-B server	Edge Server	Comment
Maximum number of RTU server devices	124	124	50[a]	-	Maximum 62 devices per COM port x 2 ports = 124 More than 31 devices per COM port requires a repeater Enterprise Server: Requires 2 serial ports to be available
Maximum number of TCP server devices	247	247	50[a]	247	-
Maximum number of TCP gateways	100	100	100[a]	100	-

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Function	Enterprise Server	AS-P server	AS-B server	Edge Server	Comment
Maximum number of concurrent TCP client connections when acting as TCP server	2	2	2[a]	1	-
Maximum number of RTU clients when acting as a serial server	2	2	2[a]	-	Maximum 1 RTU client per COM port x 2 ports = 2 Enterprise Server: Requires 2 serial ports to be available
Maximum number of Modbus objects per server	10,000[b]	10,000[b]	2,000[ab]	10,000[b]	Total number of objects for TCP (including gateways) and serial

a) AS-B servers with "L" in the product model name do not support Modbus.
b) Use Modbus groups as much as possible to maximize use of available bandwidth.

Integration protocols

The following tables show the recommended limits or results from performance measurements.

SmartDrivers

Function	Enterprise Server	AS-P server	AS-B server	Edge Server	Comment
Maximum number of SmartDrivers	2[a]	2[a]	-	2[a]	-
Supported communication ports	IP, RS-232[b]	IP, RS-485[b]	-	IP	-

a) Maximum CPU usage shall not exceed 60% with driver running.
b) See Driver documentation for the list of communication ports supported by that specific driver.

Web Services – Consume

Function	Enterprise Central	Enterprise Server	Automation server	Comment
Maximum number of connections	5	5	5	Web services and EcoStruxure Web Services
Maximum number of actively consumed values by the server	10,000	10,000	2,000	Speed of data collection path will slow down data updates

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Web Services – Serve

Function	Enterprise Central	Enterprise Server	Automation server	Comment
Maximum numbers of connections	5	5	1	Only EcoStruxure Web Services
Maximum number of actively served values by the server	10,000	10,000	2,000	-

MQTT – Effect of the Number of Data Points on the CPU Load

Data Transfer	Baseline CPU Load 4%	Baseline CPU Load 40%	Comment
Interval: 1,000 values every 10 seconds	+2%[a]	+4%[a]	-
Event driven: 100 values per second	+7%[a]	+8%[a]	-

a) The measured increase in CPU load is based on measurements performed on an AS-P server that transfers data to an MQTT broker. The measurement results are not significantly affected by how many data groups or MQTT client objects the data traffic is distributed on.

Schneider Electric protocol limits

The following tables show the recommended limits.

Infinet

Function	Enterprise Server	AS-P server[a]	AS-B / Edge Server	Comment
Maximum number of Infinet devices	-	127, Com A 127, Com B	-	-
Maximum number of objects per device	-	Limited by device memory	-	-

a) An AS-P server may support either an Infinet network or a BACnet MS/TP network, but not both.

Object limits

The following tables show the recommended limits.

Objects

Function	Enterprise Central	Enterprise Server	AS-P / Edge Server	AS-B server	Comment
Maximum number of objects per server	23,855,000	23,855,000	452,000	238,000	-

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Server alarms

Function	Enterprise Central	Enterprise Server	Automation server	Comment
Maximum number of active alarms	10,000	10,000	1,000	-
Maximum number of alarms displayed in WorkStation	10,000	10,000	1,000	-
Maximum number of alarms displayed in WebStation	10,000	10,000	1,000	-

Server events

Function	Enterprise Central	Enterprise Server	Automation server	Comment
Maximum number of events	50,000,000[a]	5,000,000[a]	10,000[a]	-
Maximum number of events displayed in WorkStation	100,000	100,000	10,000	-
Maximum number of events displayed in WebStation	100,000	100,000	10,000	-

a) This limit is valid for the historical database of the EcoStruxure BMS server. With an external log storage, the maximum number can be increased. For more information, see the “Historical data storage considerations” section.

Server trend logs

Function	Enterprise Central	Enterprise Server	AS-P / Edge Server	AS-B server	Comment
Maximum number of internal trend logs[a]	2,000	2,000	3,000	1,000	The AS-P server is tested with trend logs configured for 5-minute intervals and 96 records each.
Maximum number of extended trend logs[ab]	25,000	25,000	1,500	1,500	-
Maximum number of records per internal trend log[a]	100,000[c]	100,000[c]	100,000[c]	100,000[c]	-
Maximum number of records per internal BACnet trend log[a]	100,000	100,000	1,000	1,000	Runtime access to all BACnet trend logs is from RAM and copied from the SQL database at startup. The Enterprise Server may require additional RAM to support the specified limit.
Maximum number of records per extended trend log[ab]	600,000	600,000	600,000	600,000	-

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Function	Enterprise Central	Enterprise Server	AS-P / Edge Server	AS-B server	Comment
Number of records per implicit log[ad]	-	-	500	500	Built-in logs for all Central IO module I/O points; not changeable
Maximum number of trend log records per server[a]	2.5 billion[c]	2.5 billion[c]	10 million[c]	10 million[c]	-

a) Trend log limits based on configurations with 5 minute (or larger) record intervals.
b) With an external log storage, extended trend logs are not needed for the following trend log types: change of value trend logs, interval trend logs, manual trend logs, and variable triggered trend logs. For more information, see the "Historical data storage considerations" section.
c) This limit is valid for the historical database of the EcoStruxure BMS server. With an external log storage, the maximum number can be increased. For more information, see the "Historical data storage considerations" section.
d) Implicit log performance is impacted by the COV increment value. For more information, see the "Central IO modules" section.

Architectural design considerations

Distributed architecture

The Enterprise Server is capable of handling IP integration via BACnet, LON, Modbus, and EcoStruxure Web Services. However, it is recommended to distribute the hosting of IP devices and systems with an automation server that is located physically near or has a logical relationship with the applications managed by that automation server. In most cases, distributing IP connections among automation servers will improve performance and reliability. If an application requires a more central connection point, the Enterprise Server may still host that IP device or system.

Distribution also includes the decision on where to place certain types of objects. To improve bandwidth usage, fault tolerance, and response time, consider placing control objects (such as programs and time schedules) and monitoring objects (such as trend logs and alarms) as near as possible to the objects they are controlling or monitoring. This replacement reduces the number of inter-server bindings and improves the performance of the system.

Cybersecurity

When designing solution architectures for a project, the level of required cybersecurity measures should be taken into account. While performance results may be impacted depending on the hardening method used (such as enabling encryption), it is the general recommendation to secure all IP level devices, data, and connection paths regardless of any explicitly stated customer requirement. Most interfaces and connection paths can be configured to provide a level of protection directly within the software, server, or controller. When an additional level of protection is required, external hardening methods should be employed.

Servers should be protected against cybersecurity threats by using standard IT hardening methods, such as a firewall and port filtering. The servers in the EcoStruxure BMS have several internal cybersecurity features. However, a defense-in-depth approach is recommended, particularly when Internet connectivity is required. Direct Internet connectivity is not supported.

If a solution architecture has strong performance requirements, it is recommended to isolate any unsecure portions of the network through other methods, such as firewalls.

Server to server communications

All new installations must use TCP or HTTPS because the HTTP communication option was removed in 1.5. The TCP server to server communication protocol performance has been enhanced and does not utilize the clustering method associated with the HTTPS connectivity mode. When the system can be secure through alternate methods, the best performance can be achieved by using the TCP protocol option for server to server communications. If encryption is required, use HTTPS.

When using TCP, the following sections "Enterprise Server to automation server communication when using HTTPS" and "Automation server to automation server communication when using HTTPS" can be disregarded.

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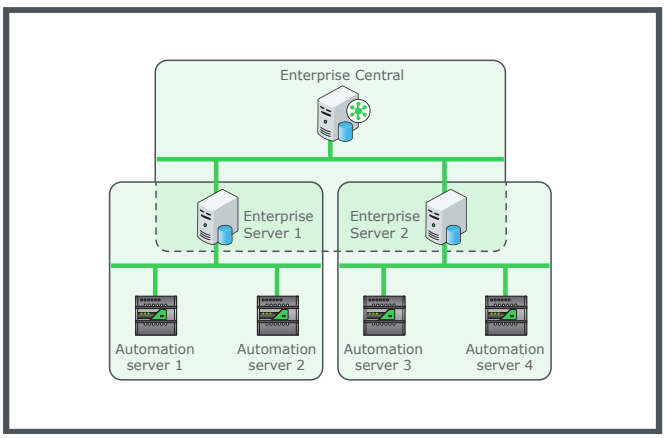
When the HTTPS server to server communication protocols are used, you need to look at the communication load and intensity between the automation servers, and between the automation servers and the Enterprise Server. This needs to be done to be able to scale the number of automation servers you can have in a system without having a negative impact on the performance.

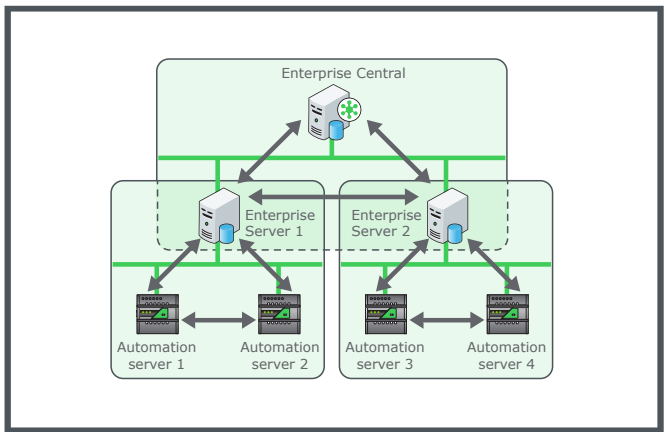
Enterprise Central to Enterprise Server to automation server communication

Use the figure below as a basis for the discussion of server-to-server-to-server communication in the fully populated EcoStruxure BMS architecture. The previous discussions on HTTPS and TCP are appropriate for the Enterprise Server and automation servers. The Enterprise Central supports 10 Enterprise Server systems, so there is no need for clustering for the Enterprise Central to Enterprise Server communication as described below for the automation servers.



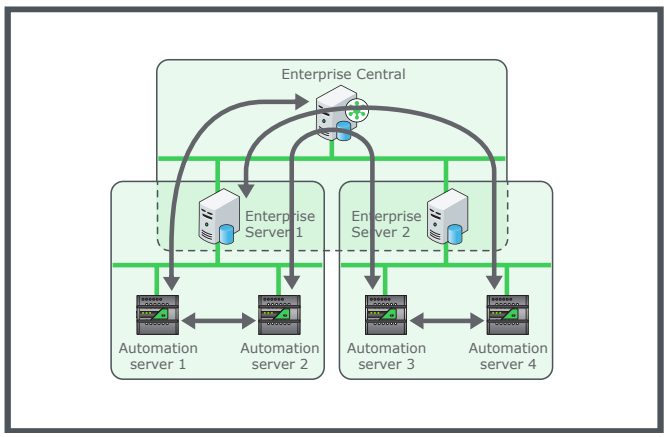
Enterprise Central with two Enterprise Server systems

All servers can communicate directly to each other within a system. In the figure below, Automation server 1 subscribes to values in Automation server 2 and Enterprise Server 1 directly. Enterprise Server 1 subscribes directly to Automation server 1, Automation server 2, Enterprise Server 2, and Enterprise Central.



All servers can communicate directly to each other within a system

Communication between systems can also go through the Enterprise Central and any Enterprise Servers along the way. In the figure below, Enterprise Central talks to Automation server 1 through Enterprise Server 1. Enterprise Server 1 talks to Automation server 4 through Enterprise Central, which in turn talks through Enterprise Server 2. Automation server 2 talks to Automation server 3 through Enterprise Server 1, which in turn talks through Enterprise Central and Enterprise Server 2.



Communication between systems can also go through the Enterprise Server and any Enterprise Servers along the way

The primary purpose of Enterprise Central is to act as an aggregating operational window for two types of systems:

- Distributed systems that are under the same operational organization
- Very large systems that require a quantity of automation servers that would exceed the capacity of a single Enterprise Server

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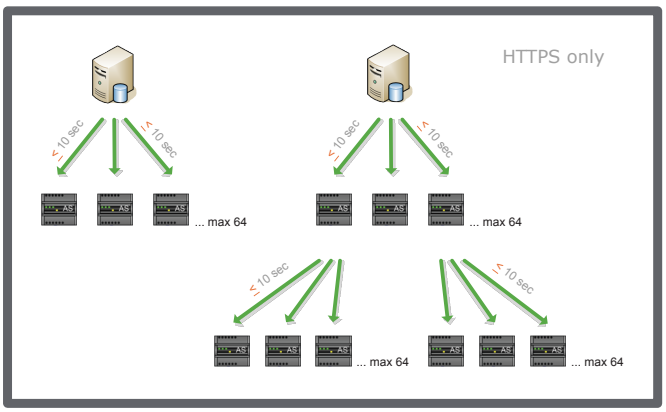
Two automation servers that need to communicate with one another need to be under the same Enterprise Server.

Enterprise Server to automation server communication when using HTTPS

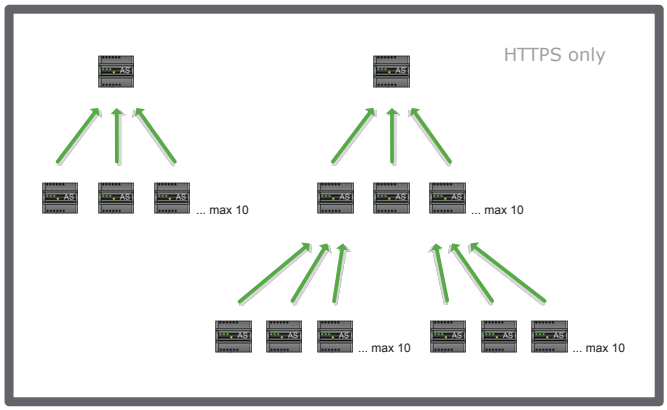
The Enterprise Server can send out values to a maximum of 64 automation servers if the update frequency is 10 seconds or less. If more than 64 automation servers are needed, the recommendation is to send the values via other automation servers in a two-step approach. If the transfer interval is greater than 10 seconds, there is no limitation on how many automation servers the Enterprise Server can communicate with. This is called clustering.



Enterprise Server sending values

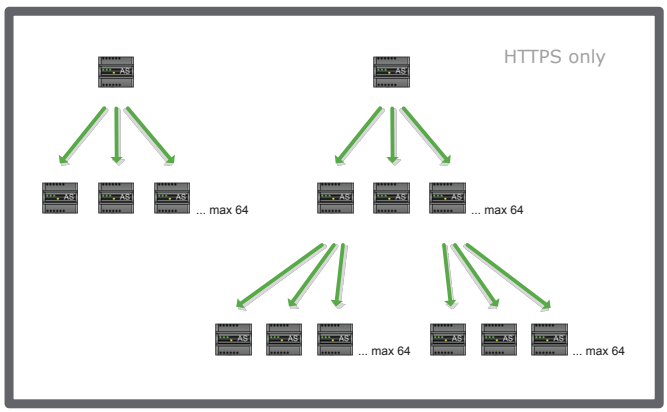
Automation server to automation server communication when using HTTPS

An automation server should be limited to receive values from 10 other automation servers. This is an important limitation and exceeding it will have significant negative impact on the performance and the general behavior of the system. If values need to be received from more than 10 automation servers, the recommendation is to send the value via other automation servers in a two-step approach. This is called clustering.



Automation server receiving values

An automation server should be limited to send values to 64 other automation servers. If values need to be sent out to more than 64 automation servers, the recommendation is to send the value via other automation servers in a two-step approach.



Automation server sending values

Use of second Ethernet port on AS-P or AS-B servers

The two Ethernet ports are connected to a built-in Ethernet switch, which can be configured in three different modes: switching enabled, second port disabled, or dual IP networks. One port should be connected to the site network. When switching between the two ports is enabled, the other port can be used to connect computers running WorkStation or WebStation, Modbus TCP units, or BACnet/IP devices such as SpaceLogic BACnet/IP devices, but not another EcoStruxure BMS server. To limit access to the system, you can disconnect the second port. When the switch is configured in dual IP mode, you can connect a separate a private IP fieldbus of SpaceLogic BACnet/IP devices to the second port. The AS-P or AS-B server

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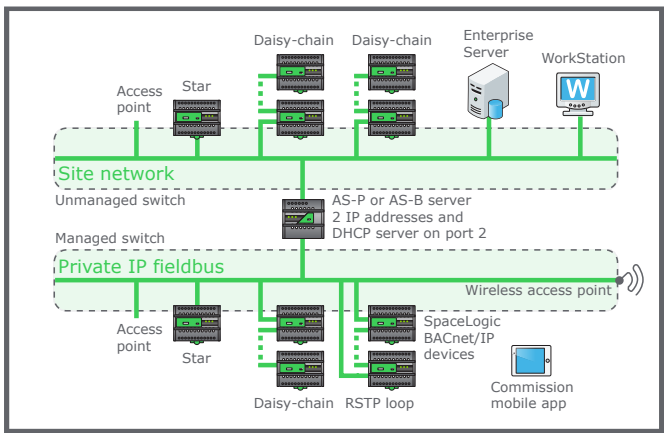
has the ability to act as a DHCP server on this network. You can lock the DHCP network and only allow current DHCP clients to communicate with the AS-P or AS-B server.

Use of second Ethernet port on SpaceLogic BACnet/IP devices

The two Ethernet ports are connected to a built-in Ethernet switch. One port can be connected to either the site network or a private IP fieldbus beneath an AS-P or AS-B server. The second port can be enabled for daisy-chaining of SpaceLogic BACnet/IP devices. The SpaceLogic BACnet/IP devices can be connected in three different network topologies: star, daisy-chain, and RSTP ring. RSTP rings require the use of an external managed switch with IEEE 802.1W or IEEE 802.1Q-2014 support. Finally, the second Ethernet port can be disabled in star and at the end of daisy-chain topologies to limit system access. When the SpaceLogic BACnet/IP device's second Ethernet port is not used by the SpaceLogic BACnet/IP device network, you can connect the EcoStruxure Building Commission mobile application using that port without disruption or additional hardware.



Use of second Ethernet port on SpaceLogic BACnet/IP devices

IP version considerations

System with dual IP architecture

EcoStruxure Building Operation software version 5.0.1 and later supports IPv6 for:

- Server-to-server communications between the following:
  - EcoStruxure BMS servers (Enterprise Central, Enterprise Server, and automation servers)
  - License Server and EcoStruxure BMS servers (Enterprise Central and Enterprise Server)
- Client-to-server communications between clients (WorkStation, WebStation, and Device Administrator) and EcoStruxure BMS servers

EcoStruxure Building Operation software version 5.0.1 and later supports a dual IP architecture using both IPv4 and IPv6. Consider the following before using IPv6 for the IP architecture of the EcoStruxure BMS:

- EcoStruxure BMS servers provide IPv6 addressing support for both static and SLAAC (Stateless Address Auto-configuration).
- SpaceLogic BACnet/IP devices only support IPv4.
- To support IPv6 in a multi-version EcoStruxure BMS that includes versions earlier than version 5.0.1, DNS servers are required with both IPv4 and IPv6 entries for each EcoStruxure BMS server.

For information on which communication paths support IPv6 and/or IPv4, see the IT System Planning Guide.

Historical data storage considerations

Historical data such as trend logs and events are stored in the EcoStruxure Building Operation database, which resides in the EcoStruxure BMS servers. Extended trend logs can be used to store larger amount of trend log records on Enterprise Servers and Enterprise Central. If even higher storage capacity is required, an external log storage is required.

An external log storage can be used for the following reasons:

- Increase database size (and make it depend only on the storage capacity of the chosen storage device)
- Provide access to the EcoStruxure Building Operation historical data from other systems
- Exclude extended trend logs for the following trend log types:
  - Change of value trend logs
  - Interval trend logs
  - Manual trend logs
  - Variable triggered trend logs
- Reduce backup and system upgrade time

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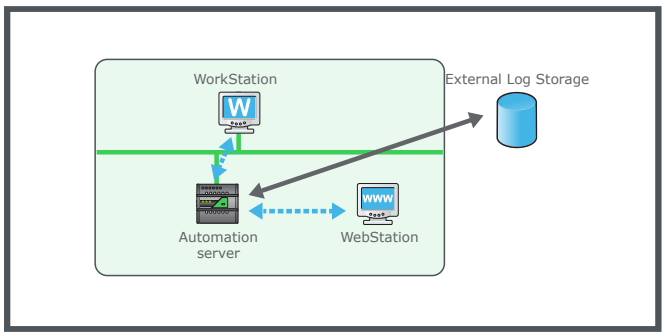
The EcoStruxure Building Operation software supports an open SQL database solution for external storage of historical data based on PostgreSQL with TimescaleDB as well as a solution based on Microsoft SQL Server.

The following sections provide examples that can be used as a basis for discussions on how an external log storage can be used for different EcoStruxure BMS architectures.

An external log storage for a standalone automation server

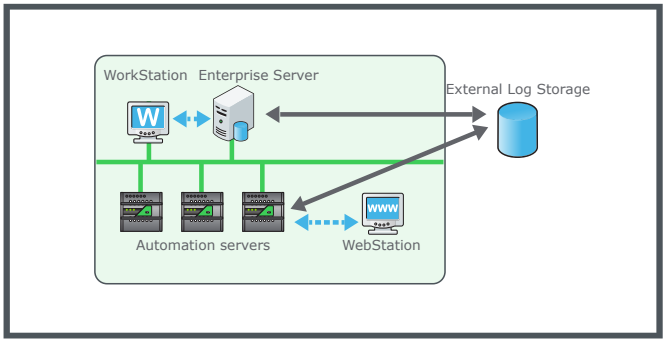
A standalone automation server can be configured to store historical data in an external log storage. All historical data is available through WorkStation and WebStation. With the introduction of the external log storage, there is no longer any great need to store extended trend logs on the automation server.



An external log storage used for a standalone automation server

One external log storage for an Enterprise Server and several automation servers

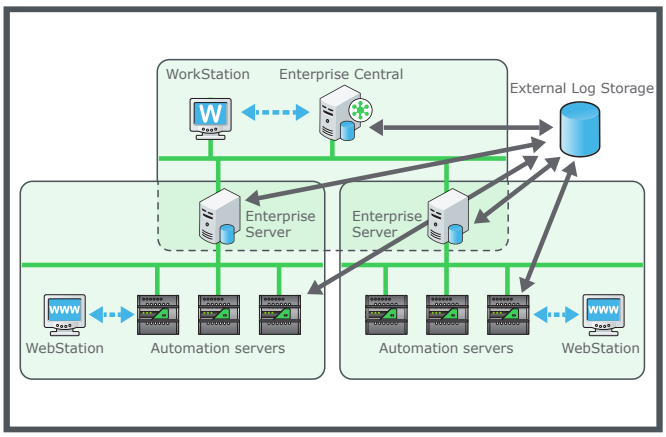
For an EcoStruxure BMS consisting of an Enterprise Server and several automation servers, all servers can be configured to store historical data in one external log storage. All historical data is available through WorkStation and WebStation. With the introduction of the external log storage, there is no longer any great need to store extended trend logs on the Enterprise Server.



An external log storage used for an EcoStruxure BMS consisting of an Enterprise Server and several automation servers

One external log storage for an Enterprise Central, two Enterprise Servers, and several automation servers

For an EcoStruxure BMS consisting of an Enterprise Central, two Enterprise Servers, and several automation servers, all servers can be configured to store historical data in one external log storage. All historical data is available through WorkStation and WebStation. With the introduction of the external log storage, there is no longer any great need to store extended trend logs on the Enterprise Central and Enterprise Servers.



One external log storage used for an EcoStruxure BMS consisting of an Enterprise Central, two Enterprise Servers, and several automation servers

Two external log storages for an Enterprise Central, two Enterprise Servers, and several automation servers

For an EcoStruxure BMS consisting of an Enterprise Central, two Enterprise Servers, and several automation servers, all servers can also be configured to store historical data in two different external log storages. All historical data is available through WorkStation and

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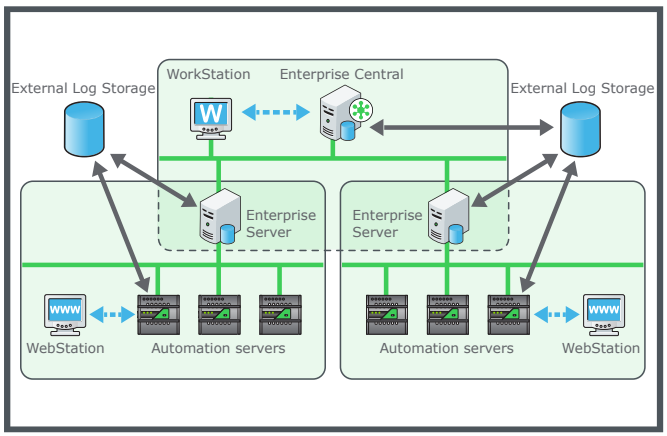
WebStation. With the introduction of the external log storage, there is no longer any great need to store extended trend logs on the Enterprise Central and Enterprise Servers.



Two external log storages used for an EcoStruxure BMS consisting of an Enterprise Central, two Enterprise Servers, and several automation servers

Semantic data storage considerations

The EcoStruxure Building Operation software supports a database solution for external storage of semantic information.

The semantic information is a contextual representation of a building that follows the Brick Schema. It includes representation of building assets such as points, locations, and equipment.

The semantic information is configured in WorkStation, and the information is available in WorkStation and WebStation. The information is also available through EcoStruxure Web Services.

All EcoStruxure BMS servers can communicate with the external semantic data storage. The database solution is based on Ontotext's GraphDB™, a semantic graph database that supports external access through SPARQL and encrypted communication.

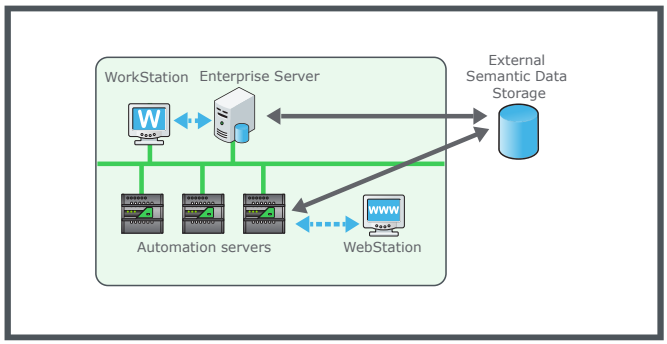
The EcoStruxure Building Operation software supports one semantic data storage per EcoStruxure BMS.

The built-in version of the semantic graph database supports queries using two CPU cores. For larger systems and sites, it is recommended to purchase a license for additional CPU cores to minimize the query response time. For more information on licenses, see the Enterprise Central and Enterprise Server Specification Sheets.

The following sections provide examples that can be used as a basis for discussions on how an external semantic data storage can be used for different EcoStruxure BMS architectures.

One external semantic data storage for an Enterprise Server and several automation servers

For an EcoStruxure BMS consisting of an Enterprise Server and several automation servers, all servers can be configured to store semantic information in one external semantic data storage.



An external semantic data storage used for an EcoStruxure BMS consisting of an Enterprise Server and several automation servers

The semantic data storage is installed as part of the Enterprise Server installer. The semantic data storage can be installed either on the same computer as Enterprise Server or on a separate computer.

One external semantic data storage for an Enterprise Central, two Enterprise Servers, and several automation servers

For an EcoStruxure BMS consisting of an Enterprise Central, two Enterprise Servers, and several automation servers, all servers can be configured to store semantic information in one external semantic data storage.

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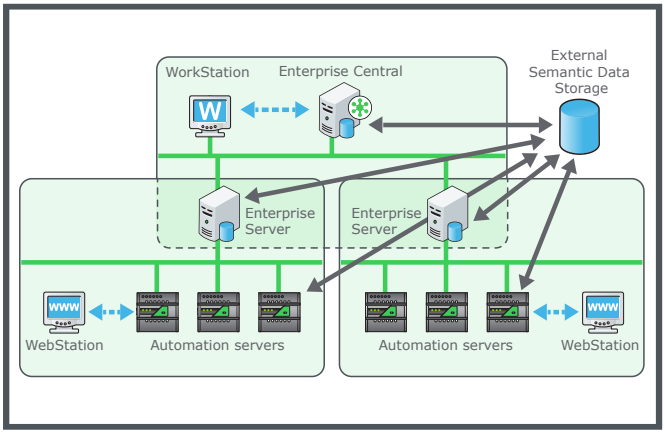

An external semantic data storage used for an EcoStruxure BMS consisting of an Enterprise Central, two Enterprise Servers, and several automation servers

The semantic data storage is installed as part of the Enterprise Server or Enterprise Central installer. The semantic data storage can be installed either on the same computer as one Enterprise Server or Enterprise Central or on a separate computer.

Load design considerations

Enterprise Server communication load

The total communication load on the Enterprise Server must be considered. This includes events, extended trend logs, and alarms. In systems with significant communication load, the following recommendations exist:

- The performance of the PC is important. Use solid-state drive, in combination with significant RAM memory size and CPU performance.
- Install the Enterprise Server on a solid-state drive and the Enterprise Server database to a second disk (RAID).
- The size of the database impacts backup and upgrade time. Limit the total size of the historical database by limiting the size and quantity of the extended trend logs.
- Don't schedule all the reports to be generated at the same time.

WorkStation load considerations

For systems that have a high frequency of events, it is recommended that the WorkStation Event Views not be included in workspaces as performance and/or responsiveness of other functions may be affected. If performance is not satisfactory, try excluding Event Views from used workspaces and instead create filtered Event View objects that can be temporarily opened when events need to be reviewed.

Load measurements

There are two server properties that are relevant for understanding the load on the automation server:

- System memory usage (%)
- CPU usage (%)

The System memory usage (%) property measures the current RAM memory usage. The system memory usage should never exceed 80%. No peaks should be seen above this limit.

The CPU usage (%) property measures the current CPU load in the automation server. The CPU usage should stay below 60%. It is normal that the CPU usage peaks at 100% on occasion when lower priority activities are performed. This peak does not affect the overall performance.

These two properties are the key measurement points when monitoring the load of the automation server. They always need to be considered, especially when getting close to (or exceeding) the defined limits. The properties are trend logged and can be plotted in a standard trend chart. These properties are not available for the Enterprise Server because Windows Task Manager can be used instead.

Concurrent users

User type definitions:

- An operator views and monitors the system and can make changes to the system, such as create trend logs, alarms, schedules, users, and perform some object property changes.
- An engineer also makes other changes to the system that are typically not supported by WebStation, such as create and change Graphics, Function Block, and Script objects; create devices; import and export; and backup and restore.

The EcoStruxure BMS server accepts one change at a time and queues up concurrent changes. Changes made by an operator are quickly handled by the EcoStruxure BMS server and no noticeable delay

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occurs when the changes queue up. Some of the engineering changes might take a longer time. Changes made during that time are handled by the server when the engineering change is finished.

References between automation servers

There are two main things to consider when optimizing the automation server to automation server communication:

- Minimizing the quantity of references between the automation servers.
- Minimizing the transfer interval intensity of the references between the automation servers.

Avoid using alarms and trend logs to monitor values outside of the automation server where the alarm or the trend log resides to minimize the quantity of references.

Recommendations on how to minimize the transfer interval intensity:

The transfer interval for an automation server to automation server variable should be kept to the longest possible time.

The transfer interval when a Function Block or Script program input gets a value from another automation server equals the program cycle time. The transfer intervals for these values are in many cases unnecessarily short. Create a server value so you can change the transfer interval manually for a program input:

- Create a server value on the automation server where the program resides.
- Bind the server value to read the value from the other automation server.
- Configure the transfer interval.
- Bind the server value to the program input.

If short update intervals are required, monitor the CPU and system memory usage of the automation server where the value resides. For more information, see the *Bindings Overview* topic on WebHelp.

I/O and field bus design considerations

Central IO modules

The I/O bus supports 32 devices. This limit is determined by the terminal base hardware and cannot be extended. Out of the 32 addressable slots, the first slot is used for the PS-24V power supply, the second slot for the automation server, and the remaining slots are used for the Central IO modules and if needed, additional PS-24V power supplies.

Implicit logs will record based upon a fixed COV increment. The default value of “0” should be changed to best reflect the characteristics of the sensing device and the intended application. When the COV increment is set to 0, the Central IO module will report the Value at its maximum resolution (every change regardless of how small or how frequent). For many sensing environments, a change is measured so frequently that reporting every change will require a significant amount of CPU bandwidth to process. Correctly setting the COV threshold values can help reduce high CPU utilization and slow system response conditions.

All field buses

Use caution when using the change of value trend log type to monitor a value outside of the automation server where the trend log resides. This setting can create large amounts for network traffic if the thresholds are not well tuned or the monitored value exceeds the threshold frequently.

If possible, avoid having the automation server poll values for alarms or trend logs from devices on a field bus. Instead, use the capabilities of the field bus protocol to transfer the value to the automation server where the alarm or trend log resides.

BACnet

To limit unnecessary communication, create BACnet objects in locations that will minimize the use of external references. Minimize external data exchanges by setting less frequent polling rates of larger COV thresholds. In most applications, COV communication can produce more efficient communication provided the threshold value is optimally tuned. For values that change frequently over a wide range, a polled data delivery mechanism maybe more efficient than COV.

LonWorks

A LonWorks device template can in rare cases include thousands of objects. When using these device templates, there is a risk that the number of objects the automation server database can support is exceeded.

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For more information on the maximum number of objects per automation server database, see Table: Objects. You can see the number of objects the database contains in the Tree size property of the System/Modules/RuntimeDBManager/RtDb Object Tree object (you have to log off and log on to get the count updated). A trend log with thousands of records is counted as only one object.

To limit unnecessary communication, bind variables in the LonWorks devices to objects created in the local node when the variables need to be monitored for alarm or trend logging. Use alarms and trend logs in the EcoStruxure BMS server to monitor the variables. There is no need to bind Xenta 280/300/401 variables to the local node, because a special event-driven protocol is used for these devices.

Modbus

Multi-read is supported, but not multi-write.

To maximize the available bandwidth, use Modbus groups.

To be able to use the maximum number of Modbus RTU devices when the automation server is the RTU client, both COM ports must be used for Modbus. If one of these ports is used for BACnet MS/TP, the supported number is limited to half.

Modbus only allows you to poll values, so alarms monitoring Modbus values consume bandwidth and will at some point affect the network performance. To avoid this, create a server value so you can manually change the transfer interval for an alarm:

- Create a server value on the automation server where the alarm resides.
- Bind the server value to read the value from the Modbus device.
- Configure the transfer interval.
- Bind the server value to the alarm.

Infinet

To optimize data exchange with Infinet devices, it is important to reduce the amount of polled data. Whenever possible, change of value (COV) data exchanges should be established. Objects tagged for export will utilize COV subscriptions. Whether or not an object is tagged for export will depend on the type of binding or reference that is established for objects within Infinet devices (or certain objects types within the Application folder of the Infinet interface).

If the binding or reference is not tagged for export, the following poll reduction techniques can be used:

- Close inactive Watch windows, List views, and graphics that contain polled values from Infinet devices.
- Use Infinet specific graphic components that support adjustable polling rates.
- Adjust polling rates for Script program bindings and Infinet specific graphic components to the slowest acceptable value for the application.
- Create references in the Infinet device to Infinet value objects in the AS-P server to take advantage of the better performance offered by the IE table.

For more details regarding Infinet device data exchange, see the Technical Reference Guide.

Other design considerations

Backup operations

Back up the system when users are not interacting with the servers or the system. In larger systems, the scheduled backups of the automation servers are recommended to be split over time.

Web services

The RESTful API based Web services function is only supported by the SpaceLogic RP controllers.

The Web services function is disabled by default. When enabled, it requires approximately 200 kB of the RP application memory.

EcoStruxure Building Commission

The EcoStruxure Building Commission mobile application is designed as a client for the SpaceLogic BACnet/IP or EasyLogic BACnet MS/TP device for use only during the commissioning phase.

The EcoStruxure Building Commission mobile application has the following limits:

- One instance of Building Commission can connect to multiple SpaceLogic BACnet/IP or EasyLogic BACnet MS/TP devices via IP connection.

  Users can perform device restart and download firmware to multiple SpaceLogic BACnet/IP or EasyLogic BACnet MS/TP devices at a time. All other features will only be available when connected to a single device at a time.

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- One SpaceLogic MP or RP controller or EasyLogic RP controller per Bluetooth session: The mobile application can only connect to a single SpaceLogic MP or RP controller or EasyLogic RP controller at a time via SpaceLogic Bluetooth Adapter.

SpaceLogic Sensors

The maximum number of SpaceLogic Sensor devices that can be connected to the sensor bus of an MP or RP controller varies depending on the model and hardware version of the controller.

SpaceLogic RP-V Advanced, RP-C Pro, RP-C Pro Plus, and RP-C Advanced controllers of hardware version 10 and later, and EasyLogic RP-V and RP-C controllers support the connection of up to four SpaceLogic Sensor devices, regardless of the sensor model and the combination of cover and sensor base type.

- Blank covers: Up to four sensors of any combination of sensor base types
- 3-button and touchscreen covers: Up to four sensors of any combination of sensor base types
- SpaceLogic LCD temperature sensors: Up to four sensors are supported

SpaceLogic MP controllers and RP-C Advanced controllers of hardware version 9 and earlier support the connection of up to four SpaceLogic Sensor devices. This maximum number varies depending on the power consumption of the selected sensor model and the combination of cover and sensor base type. To summarize the power conditions, the following key SpaceLogic Sensor combinations are supported:

- Blank covers: Up to four sensors of any combination of sensor base types
- 3-button and touchscreen covers:
  - Up to two sensor bases with CO_2 option
  - Up to four sensor bases without CO_2 option
- SpaceLogic LCD temperature sensors: Up to four sensors are supported

For more information, see the SpaceLogic Sensors - SXWS Sensors for MP and RP IP Controllers - Specification Sheet.

RP Controller Expansion Modules

The restrictions listed below only apply to Connected Room Solutions for Buildings. For Connected Room Solutions for Hotels, it is recommended to use the RP-C Pro controller. For additional information on what restrictions apply to Connected Room Solutions for Hotels, see the supplementary document Architecture Guidelines – Hotel Application.

The RP-C Pro and RP-C Pro Plus controller room bus supports up to nine connected RP controller expansion modules with the following restrictions:

- Maximum of two DALI light modules
- Maximum of two SMI blind modules
- Maximum of seven Multi-sensor or Insight-Sensor devices

The RP-C Advanced controller room bus supports up to six connected RP controller expansion modules with the following restrictions:

- Maximum of two DALI light modules
- Maximum of two SMI blind modules
- Maximum of four Multi-sensor or Insight-Sensor devices

The RP-V Advanced controller room bus supports up to four connected RP controller expansion modules with the following restrictions:

- Maximum of one DALI light module
- Maximum of one SMI blind module
- Maximum of two Multi-sensor or Insight-Sensor devices

Modbus devices and registers connected to a SpaceLogic MP controller

The maximum number of Modbus devices that can be connected to an MP controller depends on the number of Modbus registers.

The maximum number of Modbus registers that can be connected to and managed by an MP controller depends on the communication capacity of the controller's Modbus network.

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The MP controller Modbus network supports up to 20 connected Modbus devices with the following restrictions:

- Maximum of 1,000 Modbus registers per network

64-bit Modbus registers are supported, which can be used in energy metering.

Modbus devices and registers connected to an RP controller

The restrictions listed below only apply to Connected Room Solutions for Buildings. For Connected Room Solutions for Hotels, it is recommended to use the RP-C Pro controller. For additional information on what restrictions apply to Connected Room Solutions for Hotels, see the supplementary document Architecture Guidelines – Hotel Application.

The maximum number of Modbus devices that can be connected to an RP controller depends on the type of Modbus device and the number of Modbus registers.

The maximum number of Modbus registers that can be connected to and managed by an RP controller depends on the communication capacity of the controller's Modbus network.

The RP-C Pro and RP-C Pro Plus controller Modbus network supports up to 20 connected Modbus devices with the following restrictions:

- Maximum of one KNX Modbus gateway (RP-C-EXT-KNX)
- Maximum of 1,000 Modbus registers per network

The RP-C Advanced and RP-V Advanced controller Modbus network supports up to 10 connected Modbus devices with the following restrictions:

- Maximum of one KNX Modbus gateway (RP-C-EXT-KNX)
- Maximum of 250 Modbus registers per network

The EasyLogic RP controller Modbus network supports up to 10 connected Modbus devices with the following restrictions:

- No KNX Modbus gateway (RP-C-EXT-KNX)
- Maximum of 250 Modbus registers per network

64-bit Modbus registers are supported, which can be used in energy metering. This applies to all models of RP controllers.

KNX devices and datapoints connected to a SpaceLogic RP controller

The restrictions listed below only apply to Connected Room Solutions for Buildings. For Connected Room Solutions for Hotels, it is recommended to use the RP-C Pro controller. For additional information on what restrictions apply to Connected Room Solutions for Hotels, see the supplementary document Architecture Guidelines – Hotel Application.

The maximum number of KNX devices and datapoints (channels) that can be connected to and managed by an RP controller through a KNX Modbus gateway (RP-C-EXT-KNX) depends on the KNX system, the KNX bus power supply, and the number of KNX group addresses.

The following limits apply:

- Maximum of 250 KNX datapoints
- Maximum of 10 KNX devices

Zigbee devices connected to a SpaceLogic RP controller

The maximum number of Zigbee devices that can be connected wirelessly to a SpaceLogic RP controller equipped with Wireless Adapter - Advanced depends on the type of Zigbee device and the radio bandwidth usage of the Zigbee device.

The RP controller supports up to 30 Zigbee wireless devices with the following restrictions:

- Maximum of four Schneider Electric SE8000 or VT8000 room controllers
- Maximum of 20 Zigbee end devices (ZEDs) paired with the RP controller
- Maximum of one ASSA ABLOY VingCard electronic lock

For information on the supported wireless devices, see the Wireless Adapter - Advanced Specification Sheet.

Zigbee devices connected to an AS-P or AS-B server

The maximum number of Zigbee devices that can be connected wirelessly to an automation server equipped with Wireless Adapter - Advanced depends on the type of Zigbee device and the radio bandwidth usage of the Zigbee device.

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The automation server supports up to 164 Zigbee wireless devices with the following restrictions:

- Maximum of 64 Zigbee routers (ZRs) and Zigbee end devices (ZEDs)
- Maximum of 100 Zigbee Green Power devices (ZGPDs)
- Maximum of 20 Zigbee end devices (ZEDs) paired with the automation server

For information on the supported wireless devices, see the Wireless Adapter - Advanced Specification Sheet.

EcoStruxure Building Engage

The EcoStruxure Building Engage mobile application enables occupants to adjust the room temperature, fan speed, window blinds and shades, and lighting in office areas and meeting rooms.

The Engage mobile application has the following limits:

- One connection per SpaceLogic RP controller: Only one mobile application can connect to a SpaceLogic RP controller at a time.
- No limit per network segment: There is no limit on the number of mobile applications that can be used on a network segment.

RP Controller Expansion Remote Control

The RP controller expansion remote control (RP-C-RC-BLE) enables occupants of office buildings to control the comfort level of their space. The remote control provides immediate access to controls for lights, blinds, temperature setpoint, and fan speed. The remote control also allows the user to select from a pre-defined set of scenes.

The remote control has the following limits:

- Up to 4 groups of lights and 12 groups of blinds are handled separately

Project Configuration Tool

Each virtual EcoStruxure BMS server requires approximately 150 to 200 MB allocated project memory. To start a virtual EcoStruxure BMS server, Project Configuration Tool requires that at least 25 percent free project memory is available.

Project Configuration Tool has the following recommended limits:

- Maximum number of virtual EcoStruxure BMS servers created simultaneously: 20
- Maximum number of virtual EcoStruxure BMS servers deployed in one command: 10

MP and RP controller considerations

Free object system memory

Free object system memory is shared between objects and data according to the controller application. There are no specific limits on the number of objects and trend logs that can be created.

The RP controller has about 50 percent of the free object system memory of the MP controller. To reuse large MP controller applications in the RP controller, the trend log buffer size and other objects may need to be adjusted.

When configuring the EcoStruxure BMS, it is recommended to balance the controller application to optimize the use of free object system memory. For more information, see the *Free Object System Memory Utilization in BACnet Controllers and IO Modules* topic on WebHelp.

System upgrade considerations

System with multi-version automation servers

The EcoStruxure Building Operation software version 3.2 and later supports communication with Enterprise Servers running version 3.1 and later and with automation servers running version 3.0 and later (version 3.0.4 and later is recommended). When upgrading the EcoStruxure BMS from version 3.0, 3.1, or later to version 3.2 and later, you can upgrade some Enterprise Servers to version 3.2 and later and let other Enterprise Servers stay at version 3.1 (or later), and you can upgrade some automation servers to version 3.2 and later and let other automation servers stay at version 3.0, 3.1, or later. The Enterprise Central and WorkStation software must be upgraded to version 3.2 and later. Version 3.2 and later does not support copy and paste of objects between Enterprise Servers of different versions or between automation servers of different versions.

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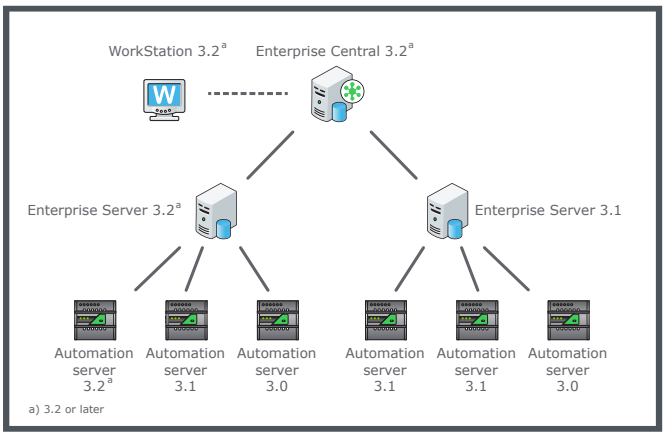

System upgraded to version 3.2 or later with one Enterprise Server still at version 3.1 and some automation servers still at version 3.0 and 3.1

System memory usage

Before upgrading from an earlier version of the EcoStruxure Building Operation software to version 5.0, it is important to assess the current level of system memory usage as version 5.0 requires more memory. The system memory usage limits below are only indicative and will vary depending on the system configuration and the use of field devices. If the system memory usage exceeds these limits, you need to make engineering adjustments to reduce the memory usage.

System memory usage limits for an upgrade to version 5.0

EcoStruxure Building Operation software version	System memory usage limit
1.5[a]	50%
1.6[a]	50%
1.7[a]	55%
1.8[a]	60%
1.9[a]	65%
2.0[a]	70%
3.0[a]	70%
3.1[a]	70%
3.2	70%
3.3[a]	70%
4.0	70%

a) Direct upgrade to version 5.0 is not supported. For more information, see the EcoStruxure Building Operation - System Upgrade Reference Guide.

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