

Information Technology System Planning Guide

EcoStruxure Building Management



Commitment to IT-friendly and secure solutions

Schneider Electric views the deployment, monitoring, and security of the devices and software that comprise a Building Management System as essential to the goal of achieving optimal efficiency for a building. As a result, Schneider Electric is committed to providing an IT-friendly and secure solution.

Scope

This guide is designed for IT professionals who need to review the system design and provide support for the system installation.

EcoStruxure Building Operation Cybersecurity Features

The cybersecurity features of the EcoStruxure Building Operation software are constantly being enhanced. The following list of cybersecurity features indicates the version of the EcoStruxure Building Operation software each feature was introduced in.

Identification and Authentication

All human users are uniquely identified

- Admin logon password management (v1.3)

Imported User Accounts are disabled by default (v1.7)

Certificate functionality for - HTTPS connections

- Self-signed certificates
- Default certificates (v1.4)
- Certificate Authority certificates (v1.6)

Password policies can be enforced (v1.6)

- Days until password expires
- Minimum number of characters
- Minimum number of lowercase characters
- Minimum number of numeric characters
- Minimum number of special characters
- Number of consecutive unique passwords before reuse
- No more than three repeating identical characters

SSH connection control (v1.6)

- Disabled after failed logon attempts
- Time-out for admin free connection re-enabling
- Rate limiting to protect against brute force attacks

SSH device fingerprint authentication (v1.9)

Password policies are secure by default:

- Factory settings (v1.7):
 - Days until password expires: Enabled: 90 days
 - Minimum number of characters: 8
 - Minimum number of lowercase characters: 1
 - Minimum number of numeric characters: 1
 - Minimum number of special characters: 1
 - Number of consecutive unique passwords before reuse: 6
 - Do not allow more than three repeating identical characters: Enabled
- Force Admin password change (v1.7)
- Password blacklist (non editable) (v1.7):
 - 123
 - admin
 - Admin
 - admin1
 - Admin1
 - Admin1!

Information Technology System Planning Guide

EcoStruxure Building Management

- password
- Password
- PaSsWoRd
- Password1!

Active Directory/Windows Logon support is available for both Workstation and WebStation (v1.5)

Enterprise Server Run-As-Service selectable user account (v1.5)

Secure flag for cookies in WebStation is enabled when using HTTPs (v2.0)

Authorization

Custom logon banners can be enabled to communicate usage policies to operators

- Non-SSH connections (v1.5)
- SSH connections (v1.6)

Role-based access control (permissions)

- Object level security

Confidentiality

Encrypted transmission of data:

- HTTPS using TLS 1.0 (v1.2)
- HTTPS using TLS 1.1, TLS 1.2 (v1.9)
- EWS Encrypted Logon (v1.5)
- Disable use of MD5 configuration option (v1.6)
- SNMPv3 support, SNMPv1 and v2 removed (v1.5)
- SmartX server: SSHv2, SSHv1 removed (v1.5)
- Redirect web clients to HTTPS configuration option (v1.6)
- SMTPS secure email notification support (v1.8)

Clickjacking protection options (v1.9)

Password data is obscured from view

Passwords are stored and transmitted securely

CA certificate central log storage (v1.6)

Basic secure key management

Basic data at rest protection (v1.4)

Integrity

Auto logoff (v1.5)

Audit log with system-wide synchronized timestamps

Activity logs provide non-repudiation

SmartX server Boot Loader U-Boot disabled (v1.5)

SmartX server Boot restricted to a single boot location (v1.5)

SHA2-256 Hash algorithm support (v1.9)

WebStation: HTML5 Graphics and Trend viewing support, removal of JAVA (v1.7)

Basic protection of audit information

Basic protection against program and data at rest modification

Basic protection for input validation

Basic protection for secure and effective error messages

Restricted data flow

Basic capabilities for network segmentation

Basic options for enabling/disabling ports

- Disable HTTP (HTTPS only) configuration option (v1.5)
- Disable SmartX AS-P and AS-B server USB ports configuration option (v2.0)
- Disable SmartX server SSH port 22 configuration option (v2.0)

World-writable programs or scripts removed (v1.6)

EcoStruxure Web Services server interface is disabled by default on EcoStruxure BMS servers (v2.0)

Timely response to events

Audit log access

SIEM Support: Remote system logging option (v1.6)

Web server access logging configuration option (v1.6)

Resource availability

System backup, recovery and reconstitution

Information Technology System Planning Guide

EcoStruxure Building Management

Access to network and security configuration settings

IT Overview

Best practice LAN architecture

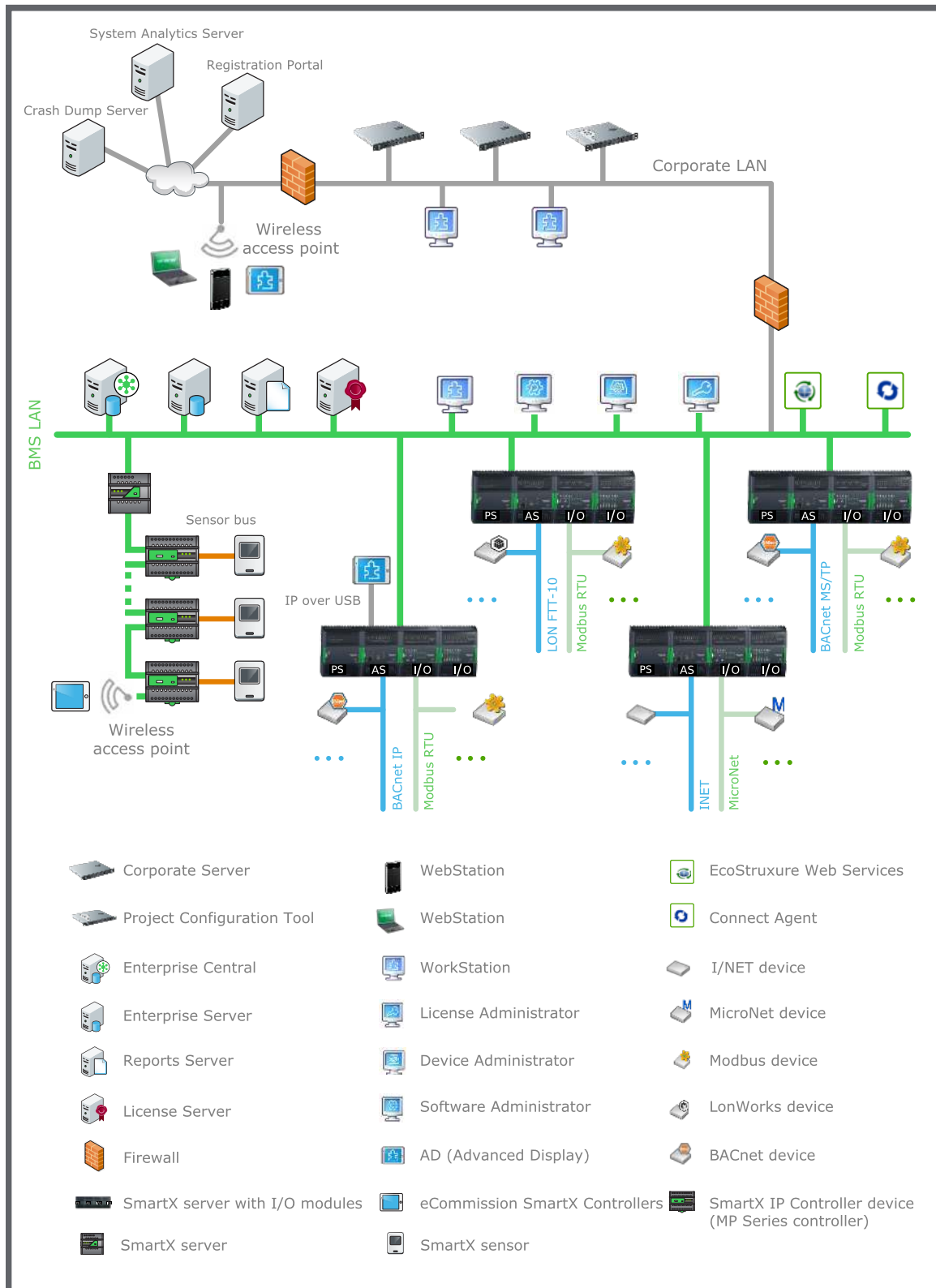
Servers should be protected against cybersecurity threats by using standard IT hardening methods, such as a firewall and port filtering. The servers in the EcoStruxure BMS have several internal cybersecurity

features. However, a defense-in-depth approach is recommended, particularly when Internet connectivity is required. Direct Internet connectivity is not supported.

The figure below shows the best practice architecture for the implementation of a Building Management System LAN connected to a Corporate LAN. The primary feature is the presence of the segregation firewall that effectively decouples the two networks.

Information Technology System Planning Guide

EcoStruxure Building Management



IT architecture implementation example

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EcoStruxure Building Management

On the Corporate LAN side, there may be many EcoStruxure Building Operation WorkStations. They are used to program and manage the Building Management System equipment.

Mobile and wireless devices are becoming as prevalent in the Building Management System world as they are in the corporate world. Building management professionals require secure and easy access to the Building Management System. The IT professional should plan on providing a pathway from the wireless system to the Building Management System firewall.

On the Building Management System side, a wide range of IP devices are operational 24/7/365:

- EcoStruxure Building Operation WorkStations
- EcoStruxure BMS servers that are software applications (Enterprise Central, Enterprise Server, License Server, and Reports Server)
- SmartX servers (Automation Server, SmartX AS-P servers, and SmartX AS-B servers): These EcoStruxure BMS servers are hardware devices and use TCP/IP for their main communications and additionally support a wide array of open and proprietary serial bus protocols.
- SmartX IP Controller devices:
 - MP Series controllers (MP-C and MP-V): These are IP-based field controllers, which are connected to a SmartX AS-P or AS-B server or an Enterprise Server using various network topologies such as star, daisy-chain, or RSTP.
 - IP-IO modules: These are IP-based I/O extension modules, which are connected to an MP Series controller, a SmartX AS-P or AS-B server, or an Enterprise Server using various network topologies such as star, daisy-chain, or RSTP.

During normal operation, only a very limited amount of well-defined data needs to pass through the firewall, which ensures a simplified configuration of the segregation firewall.

Types of traffic

In general, communication passing through the segregation firewall is associated with the following functions:

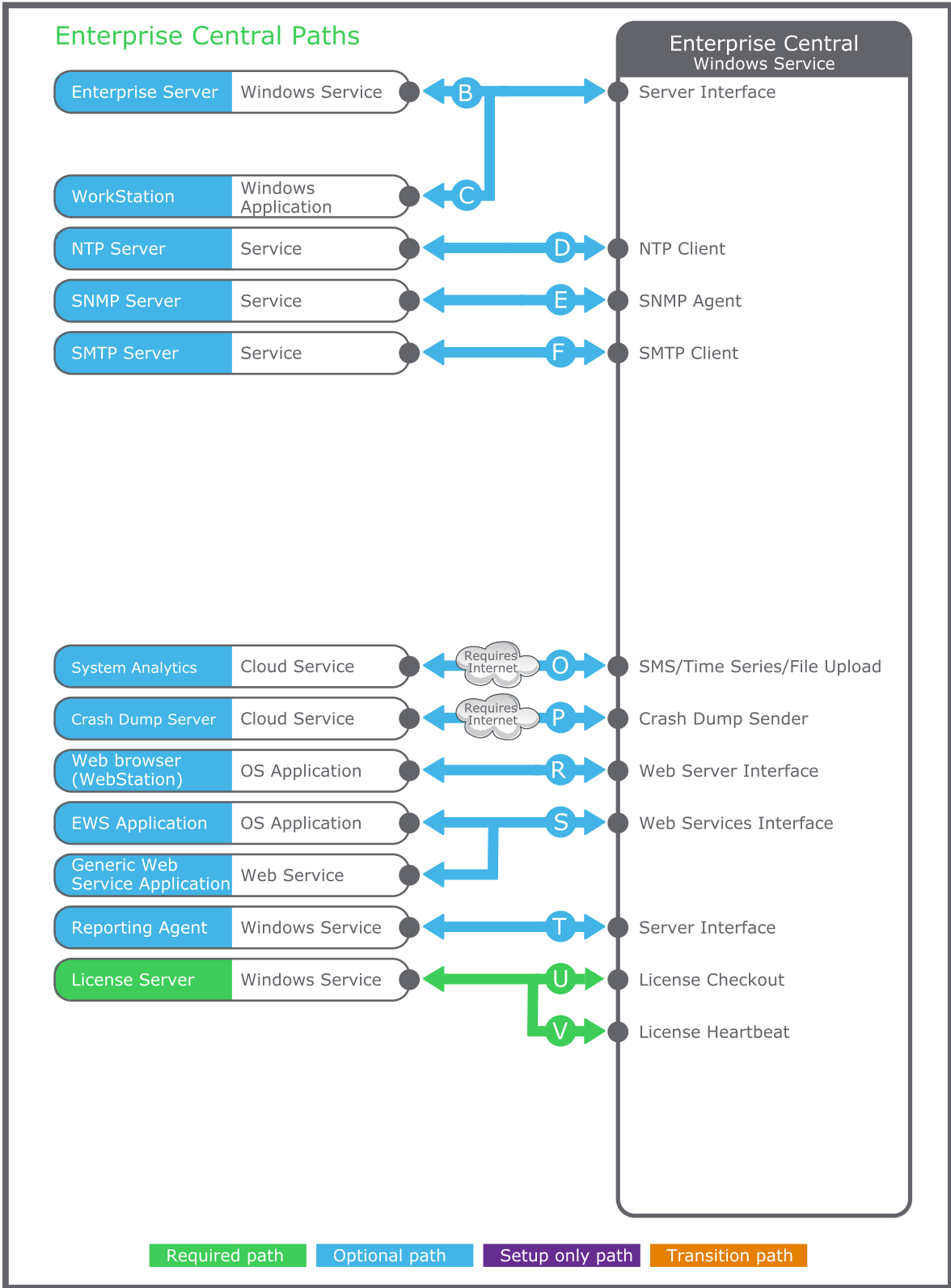
- HTTPS: This protocol is used for Building Management System engineering and monitoring, reports, web services, and EcoStruxure Web Services.
EcoStruxure Web Services is a Schneider Electric web services standard used for integration between systems. In certain scenarios, the EcoStruxure Web Services traffic remains on the Building Management System LAN, and in other scenarios, the traffic could traverse public networks. As such, the firewall needs to be configured according to each use case.
- SSH: This protocol is used for EcoStruxure Building Operation software upgrade operations on SmartX servers. The need to have this port open depends on network use policy.
- SNMPv3: This protocol is used to monitor servers within an EcoStruxure BMS using standard SNMP Managers supporting SNMP version 3 authentication. The protocol can also be used by the EcoStruxure BMS to send trap notifications to an SNMP management console.
- SMTPS: This protocol is used to send secure email messages.

Open port on segregation firewall

The active communication paths should first be identified between network segments. Refer to the Communication Paths figure for the respective IP device to determine the paths that will be active to support the targeted system design. Then refer to the Network Ports table for the respective IP device to identify the network ports each path will require. All of the required ports should be configured for both inbound and outbound communication.

Information Technology System Planning Guide

EcoStruxure Building Management



Enterprise Central – Communication paths

Information Technology System Planning Guide

EcoStruxure Building Management

Enterprise Central – Network Ports

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
B ^a (option 1)	Server to server comm.	IT	CSP (Config.)	4444 (TCP)	Yes	if option 1	Persistent	No	-
B ^a (option 2)	Server to server comm.	IT	HTTPS (Config.)	443 (TCP)	Yes	if option 2	Persistent	No	-
C ^a (option 1)	Client to server comm.	IT	HTTP (Config.)	80 (TCP)	Yes	Yes	On demand	No	-
C ^a (option 2)	Client to server comm.	IT	HTTPS (Config.)	443 (TCP)	Yes	-	On demand	No	-
D	Time synch.	IT	NTP (Disabled)	123 (UDP)	-	Yes	Persistent	No	-
E	Network mgmt	IT	SNMPv3 (Disabled)	161/162 (UDP)	-	Yes	Persistent	No	-
F (option 1)	Email	IT	SMTP (Disabled)	25 (TCP)	-	Yes	Persistent	No	-
F (option 2)	Email	IT	SMTSPS (Disabled)	587 (TCP)	Yes	Yes	Persistent	No	-
O	System analytics	IT	HTTPS (Enabled)	443 (TCP)	-	Yes	Persistent	Yes	-
P	Crash dumps	IT	SFTP (Enabled)	22 (TCP)	Yes	Yes	On demand	Yes	-
R (option 1)	Client to server comm.	IT	HTTP (Enabled)	80 (TCP)	Yes	Yes ^b	On demand	No	Redirect to HTTPS
R (option 2)	Client to server comm.	IT	HTTPS (Enabled)	443 (TCP)	Yes	Yes ^b	On demand	No	-
S (option 1)	Client to server comm.	IT	HTTP (Disabled)	80 (TCP)	Yes	Yes	On demand	No	Redirect to HTTPS
S (option 2)	Client to server comm.	IT	HTTPS (Disabled)	443 (TCP)	Yes	Yes	On demand	No	-
T (option 1)	Historical data collection	IT	HTTP (Config.)	80 (TCP)	Yes	Yes	Persistent	No	-
T (option 2)	Historical data collection	IT	HTTPS (Config.)	443 (TCP)	Yes	-	Persistent	No	-
U	License checkout	Propriet.	FLEXnet (Enabled)	27000-27009 (TCP)	Yes	No	Persistent	No	-

Information Technology System Planning Guide

EcoStruxure Building Management

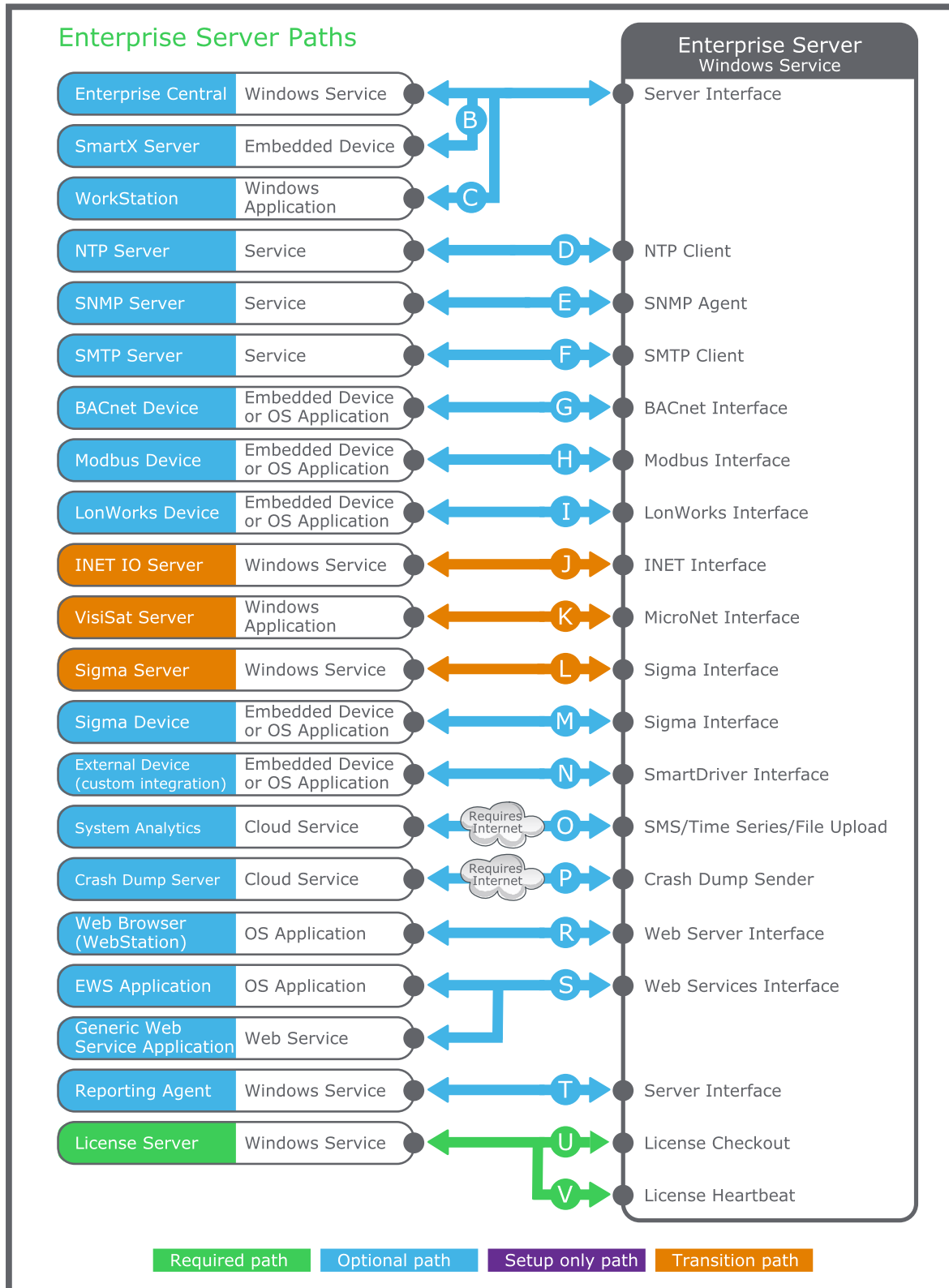
Continued

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
V	License heartbeat	Propriet.	FLEXnet (Enabled)	Random (TCP) ^c	Yes	No	Persistent	No	-

- a) This communication path uses dynamic port assignment. The port assignment is controlled by the operating system (Windows). The allowable range for the port assignment is configurable from Windows. The default dynamic port range depends on the operating system. For the EcoStruxure Building Operation software supported Windows versions, the default port range is 49152 to 65535.
- b) Not for WebStation.
- c) Flexera does not specify a port for the vendor daemon. If the port has not been specified, the port will be chosen at random by the operating system at runtime. It is completely random and depends upon what (non-restricted) ports are available at the time the operating system assigns it. This port may be configured manually to align with local policies and standard network management practices.

Information Technology System Planning Guide

EcoStruxure Building Management



Enterprise Server – Communication paths

Information Technology System Planning Guide

EcoStruxure Building Management

Enterprise Server – Network Ports

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
B ^a (option 1)	Server to server comm.	IT	CSP (Config.)	4444 (TCP)	Yes	if option 1	Persistent	No	-
B ^a (option 2)	Server to server comm.	IT	HTTPS (Config.)	443 (TCP)	Yes	if option 2	Persistent	No	-
C ^a (option 1)	Client to server comm.	IT	HTTP (Config.)	80 (TCP)	Yes	Yes	On demand	No	-
C ^a (option 2)	Client to server comm.	IT	HTTPS (Config.)	443 (TCP)	Yes	-	On demand	No	-
D	Time synch.	IT	NTP (Disabled)	123 (UDP)	-	Yes	Persistent	No	-
E	Network mgmt	IT	SNMPv3 (Disabled)	161/162 (UDP)	-	Yes	Persistent	No	-
F (option 1)	Email	IT	SMTP (Disabled)	25 (TCP)	-	Yes	Persistent	No	-
F (option 2)	Email	IT	SMTSPS (Disabled)	587 (TCP)	Yes	Yes	Persistent	No	-
G	BACnet integr.	BMS open protocol	BACnet/ IP (Disabled)	47808 / 33487 (UDP)	Yes	Yes	Persistent	No	-
H	Modbus integr.	BMS open protocol	Modbus TCP (Disabled)	502 (TCP)	-	Yes	Persistent	No	-
I	LonWorks integr.	BMS open protocol	LonWorks IP (Disabled)	1628 (UDP)	-	Yes	Persistent	No	-
J	Transition	BMS propriet.	I/NET (Disabled)	50069 ^b / 49152 ^c (UDP)	Yes, from 49152 to 65535	Yes	Persistent	No	-
K	Transition	BMS propriet.	MicroNet (Disabled)	7001 (TCP)	-	Yes	Persistent	No	-
L	Sigma integr. ^d (data importer)	BMS open protocol	Sigma (Enabled)	8080 ^e (TCP)	Yes	No	On demand	No	-
M	Sigma integr. ^b	BMS propriet.	Sigma (Enabled)	49152 ^f (UDP)	No	No	Persistent	No	-
N	Integr.	Driver depend.	Driver depend. (Disabled)	Driver depend.	Driver depend.	Yes	Persistent	No	-

Information Technology System Planning Guide

EcoStruxure Building Management

Continued

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
O	System analytics	IT	HTTPS (Enabled)	443 (TCP)	–	Yes	Persistent	Yes	-
P	Crash dumps	IT	SFTP (Enabled)	22 (TCP)	Yes	Yes	On demand	Yes	-
R (option 1)	Client to server comm.	IT	HTTP (Enabled)	80 (TCP)	Yes	Yes ^g	On demand	No	Redirect to HTTPS
R (option 2)	Client to server comm.	IT	HTTPS (Enabled)	443 (TCP)	Yes	Yes ^d	On demand	No	-
S (option 1)	Client to server comm.	IT	HTTP (Disabled)	80 (TCP)	Yes	Yes	On demand	No	Redirect to HTTPS
S (option 2)	Client to server comm.	IT	HTTPS (Disabled)	443 (TCP)	Yes	Yes	On demand	No	-
T (option 1)	Historical data collection	IT	HTTP (Config.)	80 (TCP)	Yes	Yes	Persistent	No	-
T (option 2)	Historical data collection	IT	HTTPS (Config.)	443 (TCP)	Yes	-	Persistent	No	-
U	License checkout	Propriet.	FLEXnet (Enabled)	27000-27009 (TCP)	Yes	No	Persistent	No	-
V	License heartbeat	Propriet.	FLEXnet (Enabled)	Random (TCP) ^h	Yes	No	Persistent	No	-

a) This communication path uses dynamic port assignment. The port assignment is controlled by the operating system (Windows). The allowable range for the port assignment is configurable from Windows. The default dynamic port range depends on the operating system. For the EcoStruxure Building Operation software supported Windows versions, the default port range is 49152 to 65535.

b) Default to 50069 for unencrypted communication.

c) Default to 49152 for encrypted communication.

d) For the engineering of Sigma, the Sigma software client(s) use TCP port 3614 to communicate with the Sigma server.

e) The EcoStruxure Building Operation data importer uses TCP port 8080 to import Sigma data from the Sigma server to the EcoStruxure Building Operation database.

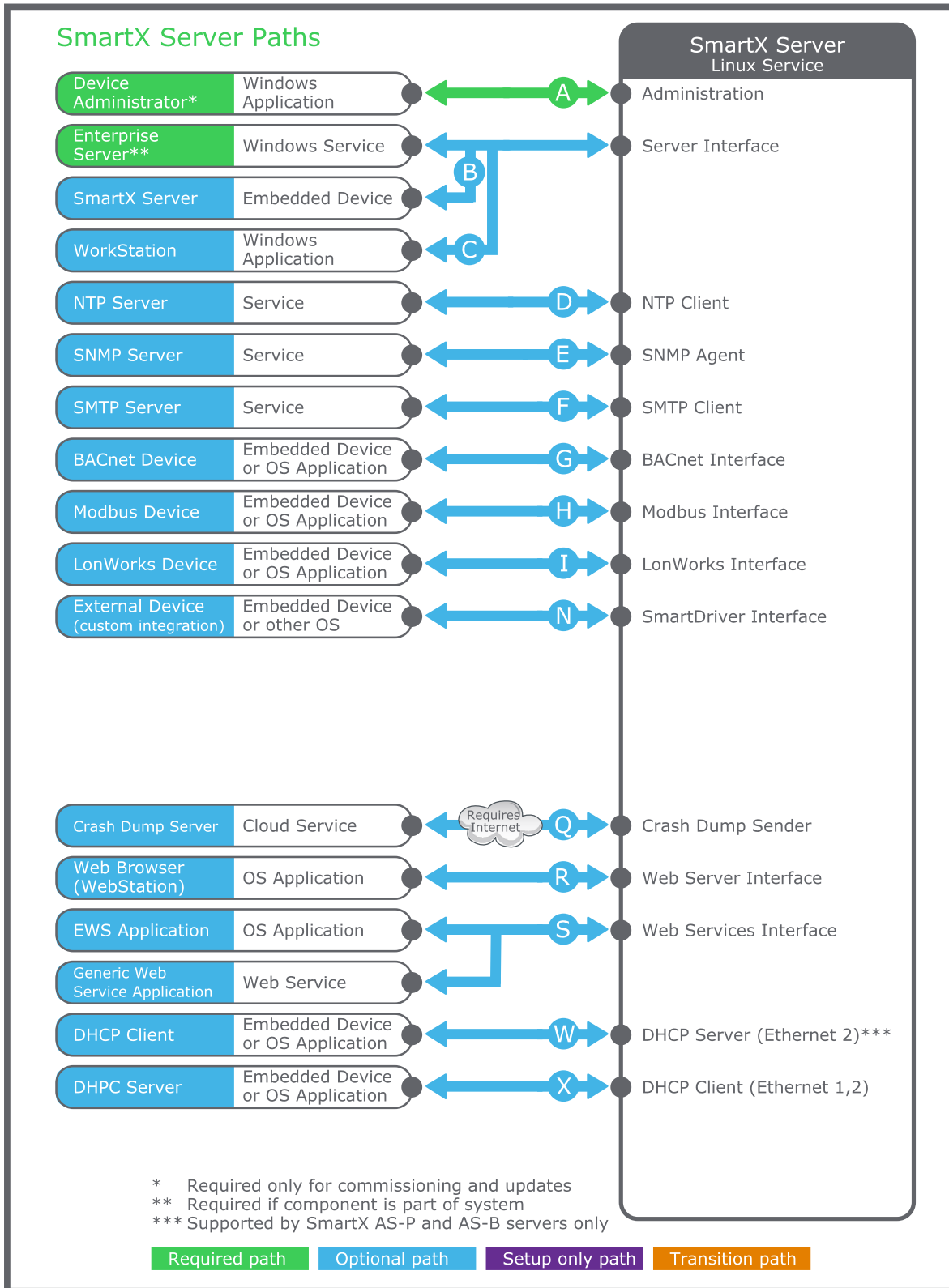
f) Enterprise Server uses UDP port 41952 to communicate with the Sigma Universal Network Controllers (UNCs) and Integration Controllers (ICs) on the Sigma network.

g) Not for WebStation.

h) Flexera does not specify a port for the vendor daemon. If the port has not been specified, the port will be chosen at random by the operating system at runtime. It is completely random and depends upon what (non-restricted) ports are available at the time the operating system assigns it. This port may be configured manually to align with local policies and standard network management practices.

Information Technology System Planning Guide

EcoStruxure Building Management



SmartX server – Communication paths

Information Technology System Planning Guide

EcoStruxure Building Management

SmartX Server – Network Ports

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
A	Administration	Propriet.	SSH (Enabled)	22 (TCP)	Yes	Yes	Config. only	No	-
B ^a (option 1)	Server to server comm.	IT	CSP (Config.)	4444 (TCP)	Yes	if option 1	Persistent	No	-
B ^a (option 2)	Server to server comm.	IT	HTTPS (Config.)	443 (TCP)	Yes	if option 2	Persistent	No	-
C ^a (option 1)	Client to server comm.	IT	HTTP (Config.)	80 (TCP)	Yes	Yes	On demand	No	-
C ^a (option 2)	Client to server comm.	IT	HTTPS (Config.)	443 (TCP)	Yes	-	On demand	No	-
D	Time synch.	IT	NTP (Disabled)	123 (UDP)	-	Yes	Persistent	No	-
E	Network mgmt	IT	SNMPv3 (Disabled)	161/162 (UDP)	-	Yes	Persistent	No	-
F (option 1)	Email	IT	SMTP (Disabled)	25 (TCP)	-	Yes	Persistent	No	-
F (option 2)	Email	IT	SMTPS (Disabled)	587 (TCP)	Yes	Yes	Persistent	No	-
G	BACnet integr.	BMS open protocol	BACnet/ IP (Disabled)	47808 / 33487 (UDP)	Yes	Yes	Persistent	No	-
H	Modbus integr.	BMS open protocol	Modbus TCP (Disabled)	502 (TCP)	-	Yes	Persistent	No	-
I	LonWorks integr.	BMS open protocol	LonWorks IP (Disabled)	1628 (UDP)	-	Yes	Persistent	No	-
N	Integr.	Driver depend.	Driver depend. (Disabled)	Driver depend.	Driver depend.	Yes	Persistent	No	-
Q	Crash dumps	IT	HTTPS (Enabled)	443 (TCP)	Yes	Yes	On demand	Yes	-
R (option 1)	Client to server comm.	IT	HTTP (Enabled)	80 (TCP)	Yes	Yes ^b	On demand	No	Redirect to HTTPS
R (option 2)	Client to server comm.	IT	HTTPS (Enabled)	443 (TCP)	Yes	Yes ^b	On demand	No	-
S (option 1)	Client to server comm.	IT	HTTP (Disabled)	80 (TCP)	Yes	Yes	On demand	No	Redirect to HTTPS

Information Technology System Planning Guide

EcoStruxure Building Management

Continued

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
S (option 2)	Client to server comm.	IT	HTTPS (Disabled)	443 (TCP)	Yes	Yes	On demand	No	-
W ^c	DHCP	IT	DHCP (Disabled)	67 (UDP)	-	Yes	Persistent	No	-
X	DHCP	IT	DHCP (Enabled)	68 (UDP)	-	Yes	On demand	No	-

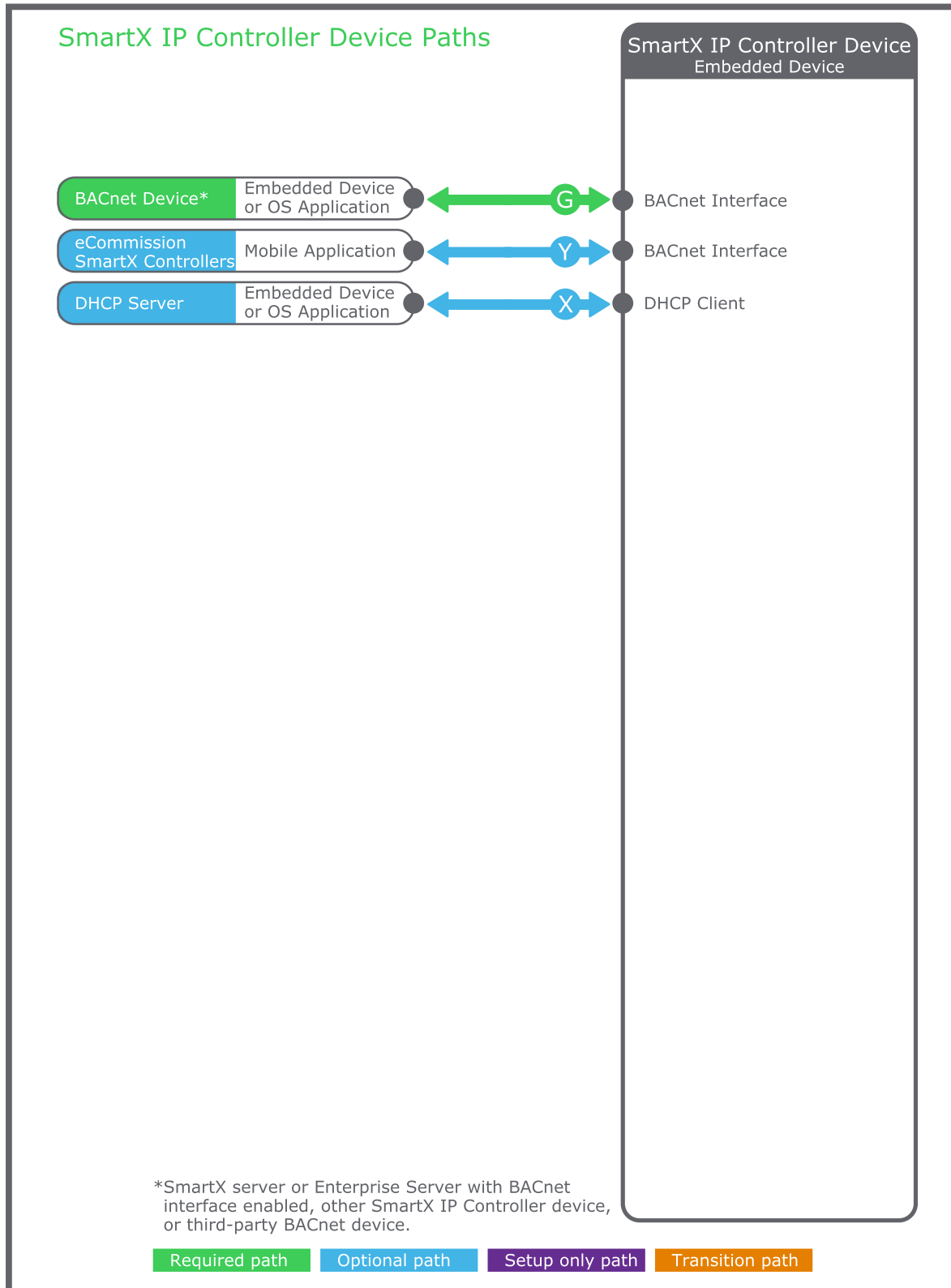
a) This communication path uses dynamic port assignment. The port assignment is controlled by the operating system (Linux). The allowable range for the port assignment is not configurable. The default dynamic port range depends on the operating system. For SmartX servers (Linux), the default port range is 32768 to 61000.

b) Not for WebStation.

c) Supported by SmartX AS-P and AS-B servers only.

Information Technology System Planning Guide

EcoStruxure Building Management



SmartX IP Controller device – Communication paths

Information Technology System Planning Guide

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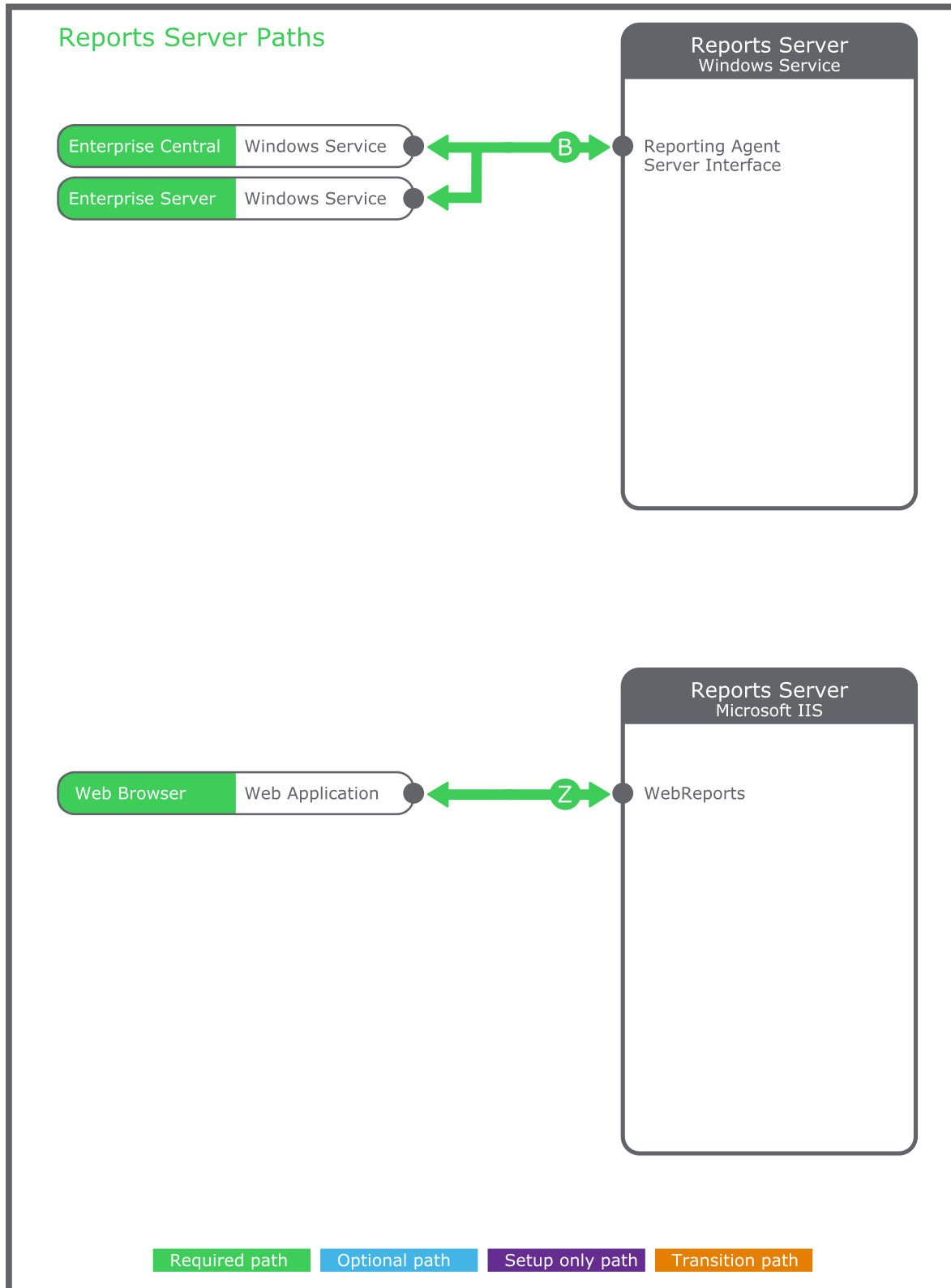
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SmartX IP Controller Device – Network Ports

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
G	BACnet integr.	BMS open protocol	BACnet/ IP (Disabled)	47808 / 33487 (UDP)	Yes	Yes	Persistent	No	-
Y	BACnet integr.	BMS open protocol	BACnet/ IP (Disabled)	47808 / 33487 (UDP)	Yes	Yes	Persistent	No	-
X	DHCP	IT	DHCP (Enabled)	68 (UDP)	-	Yes	On demand	No	-

Information Technology System Planning Guide

EcoStruxure Building Management



Reports Server – Communication paths

Information Technology System Planning Guide

EcoStruxure Building Management

Information Technology System Planning Guide

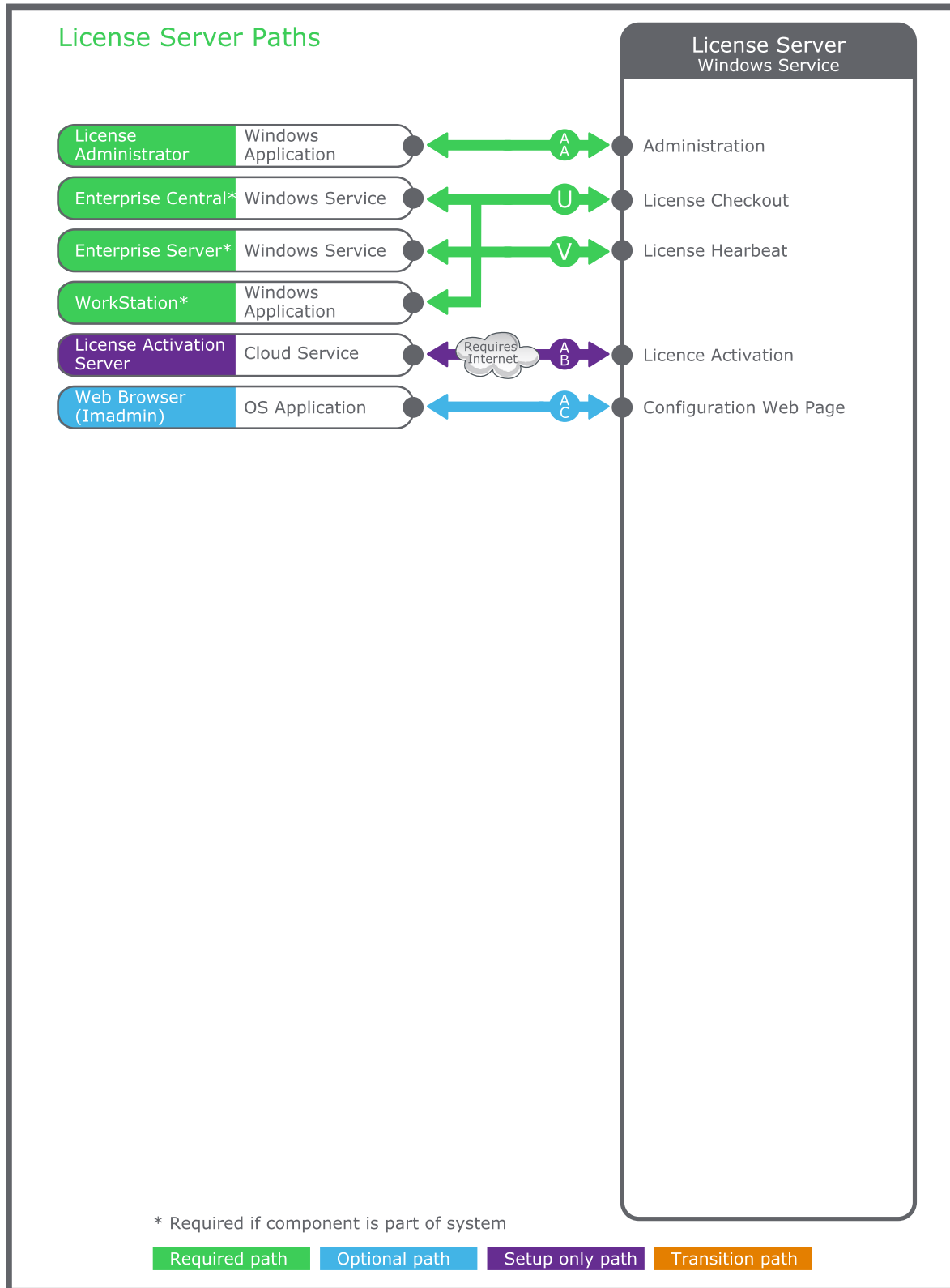
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Reports Server – Network Ports

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
B (option 1)	Server to server comm.	IT	CSP (Config.)	4444 (TCP)	Yes	if option 1	Persistent	No	-
B (option 2)	Server to server comm.	IT	HTTPS (Config.)	443 (TCP)	Yes	if option 2	Persistent	No	-
Z	Client to server comm.	IT	HTTP (Config.)	80 (TCP)	Yes	Yes	On demand	No	-

Information Technology System Planning Guide

EcoStruxure Building Management



License Server – Communication paths

Information Technology System Planning Guide

EcoStruxure Building Management

License Server – Network Ports

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
U	License checkout	Propriet.	FLEXnet (Enabled)	27000-27009 (TCP)	Yes	No	Persistent	No	-
V	License heartbeat	Propriet.	FLEXnet (Enabled)	Random (TCP) ^a	Yes	No	Persistent	No	-
AA	Administration	Propriet.	FLEXnet (Enabled)	27000-27009 (TCP)	Yes	No	On demand	No	-
AB	License activation	Propriet.	FLEXnet publishers (Enabled)	Random (TCP)	Yes	No	Setup only	No ^b	-
AC (option 1)	Configuration	IT	HTTP (Enabled)	8888 ^c (TCP)	Yes ^d	No	On demand	No ^e	-
AC (option 2)	Configuration	IT	HTTPS (Disabled)	Not set (TCP)	Yes	Yes	On demand	No ^e	-

a) Flexera does not specify a port for the vendor daemon. If the port has not been specified, the port will be chosen at random by the operating system at runtime. It is completely random and depends upon what (non-restricted) ports are available at the time the operating system assigns it. This port may be configured manually to align with local policies and standard network management practices.

b) Optional file-based activation.

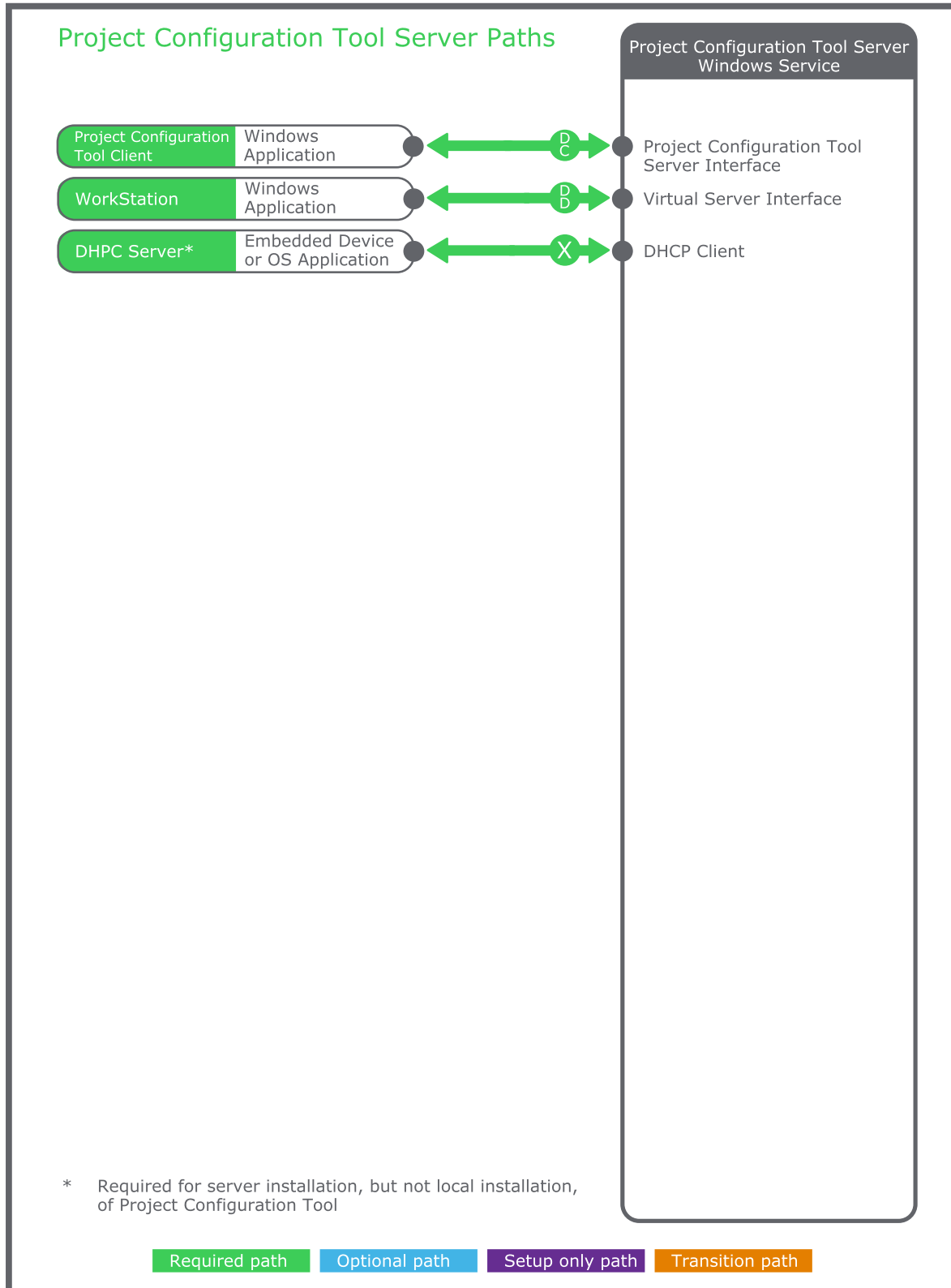
c) This is the port that a network scanner picks up when the Admin page starts up.

d) Can be redirected to HTTPS.

e) An Internet connection is not needed when you run the license server web application on the same computer as the licenser server.

Information Technology System Planning Guide

EcoStruxure Building Management



Project Configuration Tool server – Communication paths

Information Technology System Planning Guide

EcoStruxure Building Management

Project Configuration Tool Server – Network Ports

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
DC	Client to server comm. ^a	IT	Thrift (Config.)	9091 (TCP)	Yes ^b	No	On demand	-	-
DD	Client to server comm. ^c	IT	HTTPS (Config.)	49152-65535 (TCP)	No	No	On demand	-	-
X	DHCP ^d	IT	DHCP (Enabled)	68 (UDP)	No	No	On demand	-	-

a) Communication between Project Configuration Tool client and server.

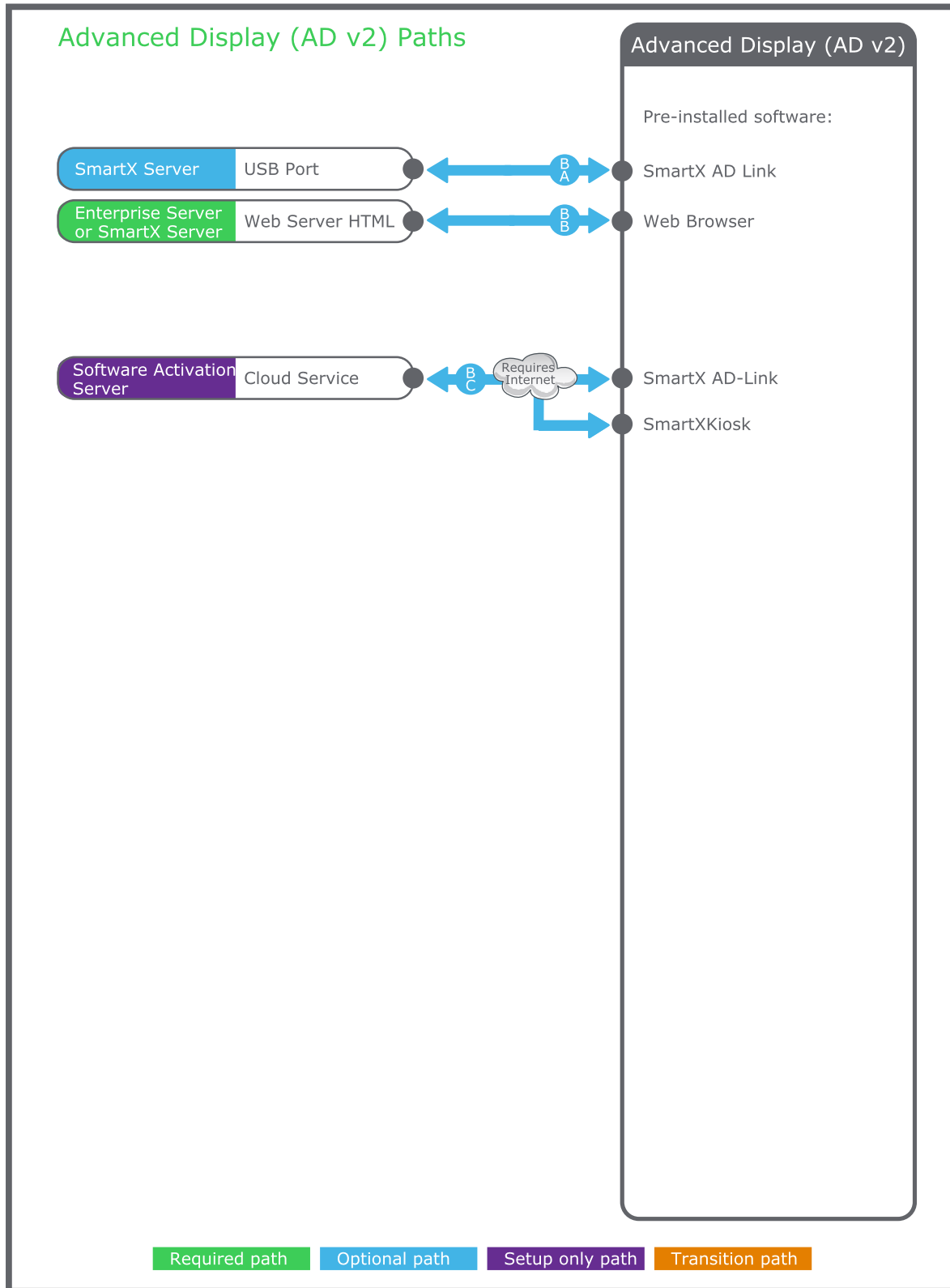
b) The port can only be configured during installation.

c) Communication between WorkStation and virtual server.

d) This communication path applies only to a server installation, not a local installation of the Project Configuration Tool. The Project Configuration Tool server asks the DHCP server for IP addresses to Project Configuration Tool projects when projects are opened.

Information Technology System Planning Guide

EcoStruxure Building Management



Advanced Display (AD) – Communication paths

Information Technology System Planning Guide

EcoStruxure Building Management

Advanced Display (AD) – Network Ports

Path	Function	Connection Type	Protocol (Default State)	Default Port (TCP or UDP)	Configurable Port	Can Be Disabled	Usage when Enabled	Internet Needed	Optional Settings
BA	Data exchange	Propriet.	AD Link (Disabled)	N/A	N/A	Yes	Persistent	No	-
BB	Data exchange	Propriet.	HTTP (Enabled)	80 (TCP)	Yes	Yes	Persistent	No	-
BC	Mobile enrollment	Propriet.	HTTPS (Enabled)	443 (TCP)	No	No	Persistent	No	-

Software Activation Servers for the SmartX AD-Link and SmartXKiosk Software

Americas	China	Asia, Africa, Europe and all other regions
gslb.secb2b.com	china-gslb.secb2b.com.cn	gslb.secb2b.com
us-prod-klm.secb2b.com	china-klm.secb2b.com.cn	eu-prod-klm.secb2b.com
us-elm.secb2b.com	china-elm.secb2b.com.cn	eu-elm.secb2b.com

Windows services

Windows Services

Application	Windows Service	Startup Type	Recovery	Log On As Default
Enterprise Central	Building Operation x.y Enterprise Central	Automatic	Run a Program	Local System
Enterprise Central ^a	Building Operation x.y Connect Agent	Automatic	Restart the service	Local System
Enterprise Server	Building Operation x.y Enterprise Server	Automatic	Run a Program	Local System
Enterprise Server ^b	Building Operation x.y Connect Agent	Automatic	Restart the service	Local System
License Administrator ^c	Building Operation x.y License Server	Automatic	Restart the service	Local System
Project Configuration Tool	Project Configuration Tool Modules Service	Automatic	Restart the service	Local System
WebReports	Building Operation x.y WebReports Agent	Automatic	Restart the service	Local System

a) The Enterprise Central installation file includes the Connect Agent.

b) The Enterprise Server installation file includes the Connect Agent.

c) The License Administrator installation file includes two components: License Administrator and License Server. You can select to install both components or one of them. Only the License Server has a Windows service.

Information Technology System Planning Guide

EcoStruxure Building Management

Bandwidth requirements

As in all instances of planning, more is generally better. Although the current SmartX servers are limited to 100 Mbps, a single installation may contain many SmartX servers each with a significant number of field devices resulting in substantial data traffic. Insufficient bandwidth may affect the overall performance of the building.

EcoStruxure BMS LAN descriptions

SmartX servers, Enterprise Server, and Enterprise Central

The SmartX servers are hardware devices with embedded Linux operating systems whereas the Enterprise Server and Enterprise Central are software applications that are installed on a PC. These EcoStruxure BMS servers are multi-function IP addressable devices that can provide the following functions:

Server Functions

Function	SmartX Servers	Enterprise Server	Enterprise Central
Server (for data exchange) – a server for open and proprietary protocols	Yes	Yes	Yes
Server (for clients) – a web server and server for application-based user interfaces	Yes	Yes	Yes

Router Functions

Function	SmartX Servers	Enterprise Server	Enterprise Central
IP Networks – a router for LON IP, BACnet/IP, Modbus TCP, Web Services, proprietary networks	Yes	Yes	Yes ^a
Private RS-485 Networks – a router for BACnet MS/TP, LON, Modbus RTU, proprietary networks	Yes	No	No
Private FT-10a Networks – a router for LON TP networks	Yes	Yes ^b	No

a) Enterprise Central includes only a router for Web Services.

b) With optional adaptor

Information Technology System Planning Guide

EcoStruxure Building Management

Gateway Functions

Function	SmartX Servers	Enterprise Server	Enterprise Central
Gateway – a gateway for open and proprietary building automation protocols	Yes	Yes	No

Clients

The SmartX servers, Enterprise Server, and Enterprise Central support the following clients:

- WorkStation: An application-based Microsoft Windows client.
- WebStation: A browser-based client.

The SmartX IP Controller devices support the following clients:

- eCommission SmartX Controllers: A mobile application designed for local configuration, field deployment, and commissioning of SmartX IP Controller devices.

AD

AD is a touch screen device that can be locked to an application such as the preinstalled web browser running WebStation. The preinstalled SmartXKiosk app prevents the user from closing the selected application, or switching to another application. AD is connected to the EcoStruxure BMS using the USB ports on AD and a SmartX server. The preinstalled SmartX AD-Link app enables IP communication over USB.

Reports Server

The Reports Server is used to gather data from the Building Management System and generate reports. The Reports Server requires the following Microsoft applications:

- ASP.NET
- Internet Information Services (IIS)
- SQL Server
- SQL Server Reporting Services

For more information on supported versions, see the EcoStruxure BMS requirements.

Project Configuration Tool

Project Configuration Tool is an off-site engineering platform for the EcoStruxure BMS. The Project Configuration Tool simulates all functions of the Enterprise Central, Enterprise Server, and SmartX servers virtually before deployment.

Project Configuration Tool is a suite of three software programs: server, client, and WorkStation. The Project Configuration Tool server provides an environment within which all virtual EcoStruxure BMS servers of the project can run while being engineered. The Project Configuration Tool client provides an intuitive user interface for project management. WorkStation is a full-featured user interface for configuration of EcoStruxure BMS servers.

EcoStruxure Building Operation Software OS user requirements

To install and use the EcoStruxure Building Operation software, users must have the following credentials:

- All software requires the installing user to have administrative privileges on the PC onto which the installation is to take place.
- Enterprise Central, Enterprise Server, and License Server are installed as services and require a user with administrative privileges to start and stop the services.
- The PC running the Enterprise Central, Enterprise Server service or License Server service needs to be running under an administrative user's account.
- Use of the Software Administrator or License Administrator requires that the user have administrative privileges.
- Operation of WorkStation, Device Administrator, and WebReports requires normal user privileges.

EcoStruxure BMS requirements

WorkStation includes Graphics Editor, Script Editor, Function Block Editor, and WorkPlace Tech Editor.

Information Technology System Planning Guide

EcoStruxure Building Management

WorkStation

Hardware and software requirements	Supported versions
Processor	Minimum: Intel Core i5 @ 2.0 GHz or equivalent Recommended: Intel Core i5 @ 3.0 GHz or better
Memory	Minimum: 4 GB Recommended: 8 GB or higher
Hard disk space	Minimum: 20 GB
Operating systems	Microsoft Windows 7 (64-bit) Microsoft Windows 8.1 (64-bit) Microsoft Windows 10 (64-bit) Microsoft Windows Server 2008 R2 (64-bit) Microsoft Windows Server 2012 (64-bit) Microsoft Windows Server 2012 R2 (64-bit) Microsoft Windows Server 2016
Visio versions (WorkPlace Tech Editor)	Microsoft Office Visio 2016 (32-bit) Microsoft Office Visio 2013 (32-bit) Microsoft Office Visio 2010 SP1 (32-bit)
Required additional software	Microsoft .NET Framework 4.5 or 4.6 Microsoft .NET Framework 3.5 SP1 (WorkPlace Tech Editor)

The following Microsoft Windows 7 editions are supported: Professional, Enterprise, and Ultimate.

The following Microsoft Windows 8.1 editions are supported: Pro, Pro N, Enterprise, and Enterprise N.

The following Microsoft Windows 10 editions are supported: Pro and Enterprise.

The following Microsoft Windows Server 2008 R2 editions are supported: Standard, Web, Enterprise, Datacenter, and Itanium.

The following Microsoft Windows Server 2012 and Microsoft Windows Server 2012 R2 editions are supported: Datacenter, Standard, Essentials, and Foundation.

The following Microsoft Windows Server 2016 editions are supported: Datacenter, Standard, and Essentials.

WebStation

Software requirements (web browsers)	Supported versions
Windows PCs	Google Chrome Mozilla Firefox Microsoft Edge Microsoft Internet Explorer 11
Mac OS computers	Safari
Linux computers	Google Chrome
Android tablets and smartphones	Google Chrome

Information Technology System Planning Guide

EcoStruxure Building Management

Continued

Software requirements (web browsers)	Supported versions
iOS tablets and smartphones	Safari Google Chrome

Enterprise Central

Hardware and software requirements	Supported versions
Processor	Minimum: Intel Core i5 @ 3.0 GHz or equivalent Recommended: Intel Core i5 @ 4.0 GHz or better
Memory	Minimum: 6 GB Recommended: 12 GB or higher
Storage capacity	Minimum: 1 TB Recommended: 4 TB
Storage device	Recommended: Enterprise Solid State Drive (SSD) An Enterprise SSD is recommended to maintain the necessary speed and stability. The database and the binaries should both be installed on the Enterprise SSD.
Operating systems	Microsoft Windows 8.1 (64-bit) Microsoft Windows 10 (64-bit) Microsoft Windows Server 2008 R2 (64-bit) Microsoft Windows Server 2012 (64-bit) Microsoft Windows Server 2012 R2 (64-bit) Microsoft Windows Server 2016
Required additional software	Microsoft .NET Framework 4.5 or 4.6

Processor power, memory, and storage capacity should be scaled upwards to accommodate targeted system size as impacted by the total quantity of Enterprise Servers, SmartX servers, and expected historical archiving. Enterprise Central is tested on a server with an 8-core 3.6 GHz processor, a 16 GB of memory, and a storage capacity of 4 TB.

The following Microsoft Windows 8.1 editions are supported: Pro, Pro N, Enterprise, and Enterprise N.

The following Microsoft Windows 10 editions are supported: Pro and Enterprise.

The following Microsoft Windows Server 2008 R2 editions are supported: Standard, Web, Enterprise, Datacenter, and Itanium.

The following Microsoft Windows Server 2012 and Microsoft Windows Server 2012 R2 editions are supported: Datacenter, Standard, Essentials, and Foundation.

The following Microsoft Windows Server 2016 editions are supported: Datacenter, Standard, and Essentials.

Information Technology System Planning Guide

EcoStruxure Building Management

Enterprise Server

Hardware and software requirements	Supported versions
Processor	Minimum: Intel Core i5 @ 2.0 GHz or equivalent Recommended: Intel Core i5 @ 3.0 GHz or better
Memory	Minimum: 4 GB Recommended: 8 GB or higher
Storage capacity	Minimum: 100 GB Recommended: 1 TB
Storage device	Recommended: Enterprise Solid State Drive (SSD) An Enterprise SSD is recommended to maintain the necessary speed and stability. The database and the binaries should both be installed on the Enterprise SSD.
Operating systems	Microsoft Windows 7 (64-bit) Microsoft Windows 8.1 (64-bit) Microsoft Windows 10 (64-bit) Microsoft Windows Server 2008 R2 (64-bit) Microsoft Windows Server 2012 (64-bit) Microsoft Windows Server 2012 R2 (64-bit) Microsoft Windows Server 2016
Required additional software	Microsoft .NET Framework 4.5 or 4.6

Processor power, memory, and storage capacity should be scaled upwards to accommodate targeted system size as impacted by the total quantity of SmartX servers and expected historical archiving. Enterprise Server is tested on many different servers with varying configurations. The typical configuration is an 8-core 3.6 GHz processor, a 32 GB of memory, and a storage capacity of 1 TB.

The following Microsoft Windows 7 editions are supported: Professional, Enterprise, and Ultimate.

The following Microsoft Windows 8.1 editions are supported: Pro, Pro N, Enterprise, and Enterprise N.

The following Microsoft Windows 10 editions are supported: Pro and Enterprise.

The following Microsoft Windows Server 2008 R2 editions are supported: Standard, Web, Enterprise, Datacenter, and Itanium.

The following Microsoft Windows Server 2012 and Microsoft Windows Server 2012 R2 editions are supported: Datacenter, Standard, Essentials, and Foundation.

The following Microsoft Windows Server 2016 editions are supported: Datacenter, Standard, and Essentials.

Information Technology System Planning Guide

EcoStruxure Building Management

Project Configuration Tool

Hardware and software requirements	Supported versions
Processor	<p>Standalone solution:</p> <p>Minimum: Intel Core i5-3340M @ 2.70 GHz</p> <p>Recommended: Intel Core i7-4800MQ @ 2.70 GHz or higher</p> <p>Server:</p> <p>Minimum: Intel Core i7-4800MQ @ 2.70 GHz</p> <p>Recommended: Intel Core i7-3930K @ 3.20 GHz or higher</p> <p>Client:</p> <p>Minimum: Intel Core i5-3340M @ 2.70 GHz</p> <p>Recommended: Intel Core i7-4800MQ @ 2.70 GHz or higher</p>
Memory	<p>Standalone solution:</p> <p>Minimum: 8 GB</p> <p>Recommended: 16 GB or higher</p> <p>Server:</p> <p>Minimum: 32 GB</p> <p>Recommended: 64 GB or higher</p> <p>Client:</p> <p>Minimum: 4 GB</p> <p>Recommended: 8 GB or higher</p>
Hard disk space	<p>Standalone solution:</p> <p>Minimum: 50 GB</p> <p>Server:</p> <p>Minimum: 200 GB</p> <p>Recommended: 1 TB or higher</p> <p>Client:</p> <p>Minimum: 1 GB</p>
Required BIOS configuration	<p>Standalone solution and Server:</p> <p>Intel VT-x or AMD-V virtualization support enabled</p>

Information Technology System Planning Guide

EcoStruxure Building Management

Continued

Hardware and software requirements	Supported versions
Operating systems	Microsoft Windows 7 (64-bit) Microsoft Windows 8.1 (64-bit) Microsoft Windows 10 (64-bit) Microsoft Windows Server 2008 R2 (64-bit) Microsoft Windows Server 2012 R2 (64-bit) Microsoft Windows Server 2016
Oracle VirtualBox	version 5.2.44
Required additional software	Microsoft .NET Framework 4.5 or 4.6

Processor power, memory, and storage capacity should be scaled upwards to accommodate targeted system size as impacted by the total quantity of EcoStruxure BMS projects. The Project Configuration Tool is tested on a server with an 8-core 3.6 GHz processor, 32 GB of memory, and storage capacity of 1 TB.

The PCT service and Oracle VirtualBox are installed on the C drive (C:) and require approximately 2 GB of storage space even if the database and program are installed on another drive.

The following Microsoft Windows 7 editions are supported: Professional, Enterprise, and Ultimate.

The following Microsoft Windows 8.1 editions are supported: Pro, Pro N, Enterprise, and Enterprise N.

The following Microsoft Windows 10 editions are supported: Pro and Enterprise.

The following Microsoft Windows Server 2008 R2 editions are supported: Standard, Web, Enterprise, Datacenter, and Itanium.

The following Microsoft Windows Server 2012 R2 editions are supported: Datacenter, Standard, Essentials, and Foundation.

The following Microsoft Windows Server 2016 editions are supported: Datacenter, Standard, and Essentials.

Reports Server

Hardware and software requirements	Supported versions
Processor	Minimum: Intel Core i5 @ 2.0 GHz or equivalent Recommended: Intel Core i5 @ 3.0 GHz or better
Memory	Minimum: 4 GB Recommended: 8 GB or higher
Hard disk space	Minimum: 20 GB
Operating systems	Microsoft Windows 7 (64-bit) Microsoft Windows 8.1 (64-bit) Microsoft Windows 10 (64-bit) Microsoft Windows Server 2008 R2 (64-bit) Microsoft Windows Server 2012 (64-bit) Microsoft Windows Server 2012 R2 (64-bit) Microsoft Windows Server 2016

Information Technology System Planning Guide

EcoStruxure Building Management

Continued

Hardware and software requirements	Supported versions
SQL versions	Microsoft SQL Server 2008 R2 (64-bit) SP2 or SP3 Microsoft SQL Server 2012 (64 bit)* Microsoft SQL Server 2014 (64-bit), SP1 and SP2 Microsoft SQL Server 2016 (64-bit) SP1
Required additional software	Microsoft .NET Framework 4.5.2 or 4.6

* Microsoft SQL Server 2012 SP1, SP2, SP3, or SP4 is required if the operating system Windows Server 2012 R2 is used

The following Microsoft Windows 7 edition is supported: Professional.

The following Microsoft Windows 8.1 editions are supported: Pro and Enterprise.

The following Microsoft Windows 10 editions are supported: Pro and Enterprise.

The following Microsoft Windows Server 2008 R2 editions are supported: Standard, Web, Enterprise, Datacenter, and Itanium.

The following Microsoft Windows Server 2012 edition is supported: Standard.

The following Microsoft Windows Server 2012 R2 editions are supported: Datacenter and Standard.

The following Microsoft Windows Server 2016 editions are supported: Datacenter, Standard, and Essentials.

The following Microsoft SQL Server 2008 R2 and Microsoft SQL Server 2012 editions are supported: Standard and Express with Advanced Services.

The following Microsoft SQL Server 2014 and Microsoft SQL Server 2016 editions are supported: Enterprise, Standard, and Express with Advanced Services.

For more information on hardware and software requirements for installing SQL Server 2008 R2, see [https://msdn.microsoft.com/en-us/library/ms143506\(v=sql.105\)](https://msdn.microsoft.com/en-us/library/ms143506(v=sql.105)).

For more information on hardware and software requirements for installing SQL Server 2012, see [https://msdn.microsoft.com/en-us/library/ms143506\(v=sql.110\).aspx/html](https://msdn.microsoft.com/en-us/library/ms143506(v=sql.110).aspx/html).

For more information on hardware and software requirements for installing SQL Server 2014, see [https://msdn.microsoft.com/en-us/library/ms143506\(v=sql.120\).aspx](https://msdn.microsoft.com/en-us/library/ms143506(v=sql.120).aspx).

For more information on hardware and software requirements for installing SQL Server 2016, see <https://docs.microsoft.com/en-us/sql/sql-server/install/hardware-and-software-requirements-for-installing-sql-server>.

Information Technology System Planning Guide

EcoStruxure Building Management

WebReports

Software requirements	Supported versions
Web browsers	Microsoft Internet Explorer 11 Mozilla Firefox Google Chrome

eCommission SmartX Controllers

Hardware and software requirements	Supported versions
Hardware	Android phones and tablets Apple iPhones and iPads PCs, laptops, and tablets running Microsoft Windows 10
Operating systems	Android 6.0 and 6.0.1 (Marshmallow) Android 7.0 and 7.1 (Nougat) Android 8.0 (Oreo) Apple iOS 11.2 Microsoft Windows 10 (64-bit)
EcoStruxure BMS servers	EcoStruxure Building Operation software version 2.0