Forescout OT Hardware Guidelines

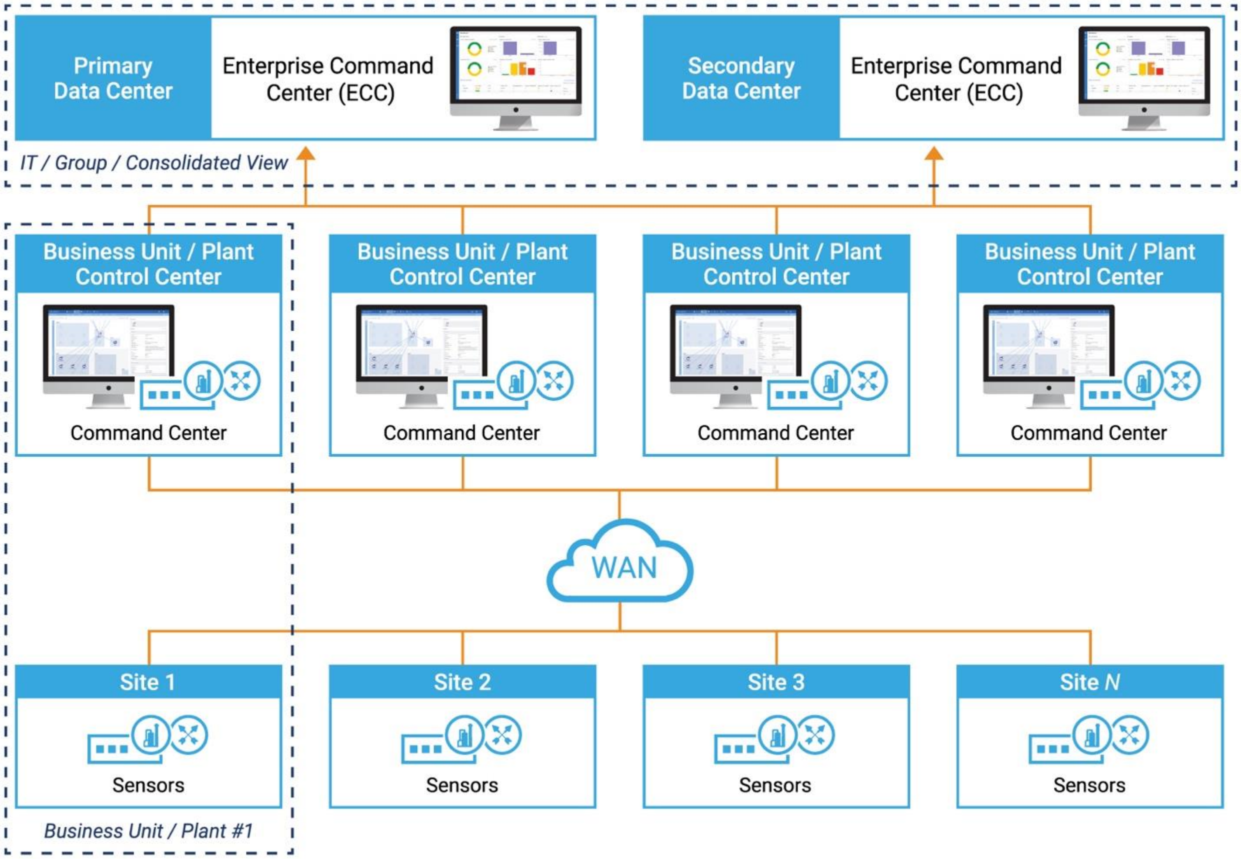
April, 2023

Document version 20230404.1

Introduction

Forescout eyeInspect offers a 3-tier architecture with Passive or Active Monitoring Sensors, Command Centers (CC), and Enterprise Command Centers (ECC) allowing for large deployments.

A basic deployment consists of a Command Center (CC) and one or more Sensors. A CC is commonly installed per site, plant, or business unit. An Enterprise Command Center (ECC) can be deployed to provide central or regional OT visibility and threat detection insights connecting to one or more Command Centers.


Primary Data Center
Enterprise Command Center (ECC)
Secondary Data Center
Enterprise Command Center (ECC)
IT / Group / Consolidated View
Business Unit / Plant Control Center
Command Center
Business Unit / Plant Control Center
Command Center
Business Unit / Plant Control Center
Command Center
Business Unit / Plant Control Center
Command Center
WAN
Site 1
Sensors
Site 2
Sensors
Site 3
Sensors
Site N
Sensors
Business Unit / Plant #1

Sensors monitor live network traffic via mirroring/SPAN port(s) or physical tap(s). Sensor density, placement, and form factor selection is very important. Your Forescout Systems Engineer can provide guidance for meeting the needs of your specific environment. The options you see in this document represent hardware options for Command Centers and Sensors. Some environments have adequate space, environmental controls, and rack availability for 1-3U rack server appliances. However, in many OT environments, this is not the case. The non-rack mount and ruggedized models shown in this guide provide solutions for harsh environments.

Sensor selection involves taking multiple variables into account, such as: physical space available, power supply limitations, required operating temperature range, endpoint session count, monitored traffic throughput needs, etc. Please consult with your Forescout account team for guidance to create an architecture best suited for your environment.

In this guideline, Reference models are hardware configurations that are qualified by Forescout for deploying eyeInspect Command Centers or Sensors. Reference models are a great option for customers requiring a hardware model that is not available among the Forescout branded options. Reference models can be ordered pre-installed with the eyeInspect software through Forescout, instead of sourcing it directly from different manufacturers. “(Reference model)” will be noted next to the Forescout Part Number. Please note the manufacturers of Reference models can change their product roadmap, alternate components, and warranty offerings at any time.

1.0 Enterprise Command Center

The ECC is an optional component for the eyeInspect Suite. It provides a high-level view of the status of the entire OT infrastructure and facilitates deployments in large, complex organizations with multiple chains of responsibility for the management of security information. The ECC can be installed on a physical or virtual appliance and the software is compiled for the x86-64 architecture.

Minimum Requirements	
Hardware / Hypervisor	19” rack server or minimum VMware ESXi 5
Processor	4-core (Intel®) CPU 64 bits ≥ 2.4GHz or better
Memory size	≥ 16-32 GB
Hard drive	≥ 250 GB thin provisioning
Network interface #1	Interface for Command Center communication, web application access and SSH access

2.0 Command Center

The Command Center is a web-based management interface that can be installed on a physical or virtual appliance, with its software being compiled for the x86-64 architecture. The CC is available in two license levels – eyeInspect (hereafter referred to as eyeInspect CC), and eyeSight (hereafter referred to as eyeSight CC). The eyeSight CC supports a subset of features as compared to the eyeInspect CC. The eyeSight CC supports asset inventory and OT vulnerabilities. The eyeInspect CC supports many additional features such as a Dashboard, Network Map, Network Analytics, Anomaly Detection, Event management, etc.

The protocols and amount of monitored traffic as well as the number of connected sensors can affect the performance requirements on the Command Center components. The following sections discuss the hardware requirements and tested systems.

2.1 eyeInspect Command Center Requirements

This section specifies the guidelines for the eyeInspect Command Center which can be deployed on a rack server or virtualized on VMware ESXi.

Alerts and network analytics data are stored in the CC. A larger disk allows storing the data for a longer period. Part of the network analytics data is loaded in memory. In addition, the number of sensors connected to the CC increase the memory and CPU requirements.

As minimum requirements for Hypervisor, CPU and storage, we suggest the following specification:

	Small deployment (up to 10 sensors)	Medium deployment (up to 20 sensors)	Large deployment (up to 200 sensors*)
Hardware / Hypervisor	19” rack server or minimum VMware ESXi 5		
Processor	8-core CPU 64bits	16-core CPU 64bits	32-core CPU 64bits ≥ 2.4GHz or better
Hard drive	500GB	1TB	>1TB
	(Based on data retention of 90 days)		
Network interface #1	Interface for sensor communication, web application access and SSH access		

*If sensor functionality is limited to device visibility (i.e. analytics and alerting are disabled), the large deployment specifications can support up to 400 sensors

For memory (RAM) guidelines, usage depends on several parameters. The most relevant are:

a) The number of Sensors connected to the Command Center.
b) The average of the observed network traffic throughput considering the contribution of each Sensor connected.
c) The amount of network hosts in the network.
d) Number of network events per second, such as: authentication/encryption events, file operations, name resolutions, potentially dangerous operations and traffic flow information.

However, parameters b), c), and d) above are not always known. The table below suggests the memory requirements based on the number of Sensors connected to the Commend Center and total network throughput (measured in terms of events per second received by the Command Center).

	Memory Requirement	Network Events per Second
Up to 10 Monitoring Sensors	64 GB	1200 network events/sec
Up to 20 Monitoring Sensors	128 GB	2400 network events/sec
Up to 200 Monitoring Sensors*	256 GB	4800 network events/sec

2.2 eyeSight Command Center Requirements

This section specifies the guidelines for the eyeSight Command Center deployed with Forescout eyeSight, which supports asset inventory and vulnerability discovery. The Command Center can be installed on a rack server or virtualized on VMware ESXi. As general guidelines we suggest the following specification*:

Minimum Requirements	
Hypervisor	minimum VMware ESXi 5
Processor	8-core (Intel®) CPU 64 bits ≥ 2.4GHz or better
Memory size	16-80 GB (see table below)
Hard drive	50 GB thin provisioning
Network interface #1	Interface for sensor communication, web application access and SSH access

The Command Center Memory usage in Forescout eyeSight depends on several parameters, the most relevant are:

a) The number of Monitoring Sensors connected to the Command Center
b) The average of the observed network traffic throughput taking into account the contribution of each sensor connected
c) The amount of network hosts in the network

However, parameters b) and c) are not always known. The table below suggests the memory requirement based on the number of Monitoring Sensors connected to the Command Center, assuming each sensor observes averages less than 100 Mbps network traffic as throughput:

	Memory Requirements	Peak Sensor Throughput
up to 20 Monitoring Sensors	16 GB	1 Gbps
up to 30 Monitoring Sensors	32 GB	
up to 50 Monitoring Sensors	64 GB	
up to 200 Monitoring Sensors*	96 GB	

Migration from eyeSight Command Center to eyeInspect Command Center Guidance

It is important to understand that an eyeSight CC can be upgraded to an eyeInspect CC. The eyeInspect CC requires more resources, as it offers the complete eyeInspect capabilities, including threat detection and visualizations. However, the process of upgrading the VM from the eyeSight CC resource requirements to eyeInspect CC resource requirements is not trivial (e.g., disk resizing). For this reason, whenever possible it is recommended to align to the eyeInspect CC resource requirements from the start (see table in Section 2.1 above) to be future proof for later expansions.

3.0 Sensors

Sensors are an essential component of an OT deployment. Monitoring Sensors passively monitor and analyze network traffic from a group of hosts. The analysis of that traffic provides the richness of data visualized in the CC. Active Sensors selectively query devices using techniques specifically built or tuned for OT environments, to enrich device visibility and compliance verification.

3.1 Passive Monitoring Sensor Requirements

Monitoring Sensors should be installed on dedicated hardware – either rack servers or industrial PCs depending on the deployment location and type of monitored environment – or virtualized on VMware ESXi.

All Monitoring Sensors require at least two network interfaces. One network interface is used to connect to the Command Center. The other interfaces are used to monitor the traffic.

As general guidelines we suggest the following technical specifications:

	Small deployment (up to 500 Mbps)	Medium deployment (~500-800 Mbps)	Large deployment (1 Gbps and above)
Deployment description	Deployments in small networks and/or harsh environments	Deployments in medium sized networks and harsh environments	Deployments in large networks and data center installations
Hardware Form factor	Short-depth rack server or Small size industrial PC / DIN-rail fitting	19” 1U rack server or Medium size industrial PC	19” 1U rack server
Example hardware model	Supermicro SME300	Forescout 4130	Forescout 5120, 5140 and 5160
Hypervisor	minimum VMware ESXi 5		
Processor	4-core (Intel) CPU 64 bits	6 or 8-core (Intel) CPU 64 bits	12-core or above (Intel) CPU 64 bits ≥ 2.4GHz
Memory size	4-16 GB	16-32 GB	64-256 GB
Memory type (physical deployment)	DDR4 2133MHz or better		
Hard drive	From 16 GB – In industrial PCs (wide-temperature) SSDs should be used.		

Network interface 1	Server management interface and connection to Command Center
Network interface 2+	Monitoring interface(s)

For virtualized deployments, the virtual network interface of the sensor may be attached to:

- A VMDirectPath I/O passthrough: this configuration is required when the traffic to be monitored enters the hypervisor from a physical network interface on the hypervisor server (for example, traffic mirrored from a physical network); this configuration bypasses the virtual switch and requires a physical NIC to be exclusively dedicated to the virtual machine running the Monitoring Sensor.
- A virtual-only virtual switch (i.e., not attached to any physical network interface): this configuration is supported only when all monitored traffic originates within the hypervisor network, and no traffic comes from the physical network interfaces.

Details for the former configuration can be found on the VMWare website.

3.2 Active Sensor Requirements

Active Sensors can be installed on dedicated hardware – either rack servers or industrial PCs depending on the deployment location and type of monitored environment – or virtualized on VMware ESXi.
The following are the minimum hardware requirements for Active Sensors; these requirements allow up to 50 concurrent active queries. Note that in case of bundled installations with Monitoring and Active Sensor on the same appliance, the Monitoring Sensor requirements indicated in the previous section will suffice to run both software components.

Processor	4-core (Intel) CPU 64 bits
Memory size	4 GB
Memory type (physical deployment)	Preferred DDR4-1866/2133
Hard drive	From 16 GB SSD
Network interface 1	Server management interface and connection to Command Center. The same interface can be used also to query network devices
Network interface 2	Optional separate network interface used to query network devices.

4.0 Forescout Appliances

These hardware models are branded and supported by Forescout and are provided with eyeInspect sensor software installed.

4.1 Rack server — Forescout® 5120, 5140, 5160

- Suitable for Monitoring Sensors deployed in data centers
- High-performance and expandable 1U rackmount
- Forescout ActiveCare maintenance and support available. More details: https://www.forescout.com/support-hub/customer-support/

Monitoring Sensor	
Forescout Part Number	FS-HW-5120-OT, FS-HW-5140-OT, FS-HW-5160-OT
Supported Throughput	FS 5120: up to 1.5 Gbps FS 5140: up to 2 Gbps FS 5160: up to 5 Gbps or up to 10 Gbps with maximum 5 Gbps per interface
Hard Drive	FS 5120, 5140: 3 HDD (RAID-1+HS) 600 GB FS 5160: 3 HDD (RAID-1+HS) 1.2 TB
Management Interface	1GB out of band management port
Copper Network Interfaces	4x 10/100/1000 Mbps Ethernet
SFP Network Interfaces	4x 1G/10G dual rate SR 2x Fiber SFPs included in base configuration
Power	Dual, Hot-plug, Redundant Power Supply, 750W – 100-240VAC Max power consumption: 847.27W
Operating Temperature	10°C to 35°C (50°F to 95°F)
Max. Heat Dissipation	2891 BTU/hr

4.2 Industrial PC — Forescout® 4130

- Recommended option for Monitoring Sensors deployed in harsh environments.
- Powerful and fanless industrial box PC with wide-range operating temperature and power input.
- Forescout ActiveCare maintenance and support available. More details: https://www.forescout.com/support-hub/customer-support/

Monitoring Sensor	
Forescout Part Number	FS-HW-4130-OT
Supported Throughput	Up to 800 Mbps
Processor	Gen 8 Intel® Core™ i5-8500T, 6C/6T CPU 64bit
Memory	32GB (2x16G) 2666MHz DDR4 SO-DIMM
Hard drive	512GB Solid State Drive SATA III
Management interface (built-in)	2 x 10/100/1000 Mbps Ethernet (i210-IT & i219-LM)
Monitoring interface (PCIe)	4 x 10/100/1000 Mbps Ethernet (i210-IT)
Power	Nominal input 24VDC. Power Supply: 100-240 VAC, up to 120W, 50~60Hz (AC/DC adapter included) Max power consumption: 52.8W
Dimensions	280 mm wide x 210 mm deep x 80.5 mm high 4.8 kg (10.58 lb)
Mounting Options	DIN Rail kit included (part number 8816K6719A0E), Wall mount kit (8816K6718A0E) available for purchase at: https://www.arrow.com/en/campaigns/forescout
Operating Temperature	-40°C to +50°C
Max Heat Dissipation	180.16 BTU/hr
Certifications	CE, FCC Class A, IP40, IEC 60068

4.3 Lightweight Sensor — Forescout® 2130

- Cost effective option for edge monitoring of networks with limited throughput
- Ruggedized box with wide-range operating temperature
- 3 Years Forescout Warranty included

Monitoring Sensor	
Forescout Part Number	FS-HW-2130
Supported Throughput	Up to 400 Mbps
Processor	Intel® Celeron® CPU J3455 1.50GHz, 4C/4T CPU 64-bit
Memory	4GB DDR3L-1866 SO-DIMM
Hard drive	16GB mSATA SSD
Network Interfaces	2 x 10/100/1000 Mbps Ethernet (i210-AT)
Serial Port	1 x DB9 **(disabled, not supported)**
Power	Nominal input 12-24VDC. Power Supply: 100-240 VAC, 50~60Hz (AC/DC adapter included) Power cord shipping with sensor is for North America only. Max power consumption: 11.68W
Dimensions	31 mm wide x 100 mm deep x 125 mm high 0.45 kg (0.99 lb)
Mounting Options	DIN Rail kit included (part number 822C5000040E), Wall mount kit (72742000500E) available for purchase at: https://www.arrow.com/en/campaigns/forescout
Operating Temperature	-40°C to +60°C
Max Heat Dissipation	39.85 BTU/hr
Certifications	UL, CB, RCM, VCCI, KCC, CE, FCC Class A, IP30, IEC 60068

5.0 Reference Models

These hardware models are certified and recommended by Forescout for use with eyeInspect software. They do not have Forescout branding, but they can be ordered pre-installed with the eyeInspect software through Forescout, instead of sourcing it directly from different manufacturers. Warranty and support for these models is provided by the manufacturer. **Please note that estimated lead-times on these appliances currently range from 12 to 16 weeks.**

5.1 Rack server — Dell® PowerEdge R640

- 1U rack server suitable for Command Center and Monitoring Sensors deployed in data centers
- High-performance and expandable
- Includes Dell® hardware warranty: Dell® ProSupport Next Business Day Onsite, 5 Years & Dell® ProSupport 7x24 Technical Support, 5 Years. More details: https://www.dell.com/support/contents/us/en/04/category/warranty.
- Gigabit Management Interface (built-in) and up to 12 network monitoring ports (Copper/Fiber)
- Dual, Hot-plug, Redundant Power Supply, 500-750W, Power input 100-240 VAC
- Max. Power Consumption 847.27W
- Max. Heat Dissipation 2891 BTU/hr
- Dell® iDRAC9 Enterprise included & Dell® ReadyRails^{TM} sliding rail kit included

Monitoring Sensor Model for Dell PowerEdge R640

Monitoring Sensor – 8 Network Monitoring Ports	
Forescout Part Number	SD-HW-S-FG8960 (Reference model)
Supported Throughput	Up to 5 Gbps or up to 10 Gbps with maximum 5 Gbps per interface
Processor	2x Intel Xeon® Gold 6254 3.1GHz, 18C/36T CPU 64bit
Memory	256GB DDR4 3200MHz
Hard drive	960GB SSD (8 drives)
Management interface	10 GB Network card (QLogic FastLinQ 41162 Dual Port 10GbE BASE-T)

Monitoring interface (PCIe)	4 Copper, 4 Fiber (Copper - 1x Broadcom 5719 Quad Port 1GbE BASE-T, Fiber – 1x QLogic FastLinQ 41164 Quad Port 10GbE SFP+; Transceivers not included)

Command Center Model for Dell PowerEdge R640

Command Center – Up to 200 Sensors* *if sensor functionality is limited to device visibility (i.e. analytics and alerting are disabled), the large deployment specifications can support up to 400 sensors	
Forescout Part Number	SD-HW-CC-FG8960 (Reference model)
Processor	2x Intel Xeon® Gold 6254 3.1GHz, 18C/36T CPU 64bit
Memory	256GB DDR4 3200MHz
Hard drive	4x 960GB SSD
Management interface	1/10 GB Network card (Broadcom 57416 Dual Port 10GbE BASE-T & 5720 Dual Port 1GbE BASE) built-in

5.2 Short-depth rack server — Supermicro SuperServer E300-9A-4CN10P

- Suitable for Monitoring Sensors deployed in small networks or networks with limited throughput
- Short-depth, 1U rack mountable (mounting kit included)
- IPMI OOB management (Out-Of-Band Intelligent Platform Management Interface)
- Manufacturer's warranty: 3 Years labor, 1 Year Parts, 1 Year Cross-ship. More details: https://www.supermicro.com/en/support/warranty

Monitoring Sensor	
Forescout Part Number	SD-HW-S-SME300 (Reference model; SMC PN: SYS-E300-9A4C10P-1-FT026)
Supported Throughput	Up to 300 Mbps
Processor	Intel® Atom® processor C3558, 2.2GHz, 4C/4T, CPU 64bit
Memory	8GB DDR4 2133MHz DIMM
Hard drive	240GB Solid State Drive
Management interface	1 GB Network card (Marvell® Alaska® 88E1543)
Monitoring interface (PCIe)	4 Copper (Intel® I350), 2 Fiber (Intel® I210)
Power	84W AC/DC power adapter included Max power consumption: 41W
Dimensions	254 mm wide x 43 mm high x 226 mm deep
Mounting Options	Rackmount kit included (MCP-290-30002-0B)
Max. Heat Dissipation	139.90 BTU/hr
Certifications	CE/FCC/UL/CB/BSMI/VCCI

5.3 Industrial PC — Schweitzer Engineering Laboratories® SEL-3355

- Suitable for Monitoring Sensors deployed in electric power substations - IEEE 1613 Compliant.
- Powerful and fanless industrial box PC with wide-range operating temperature and power input.
- SEL 10-Year Product Warranty + 5 years on NIC installed by Foxguard. More details: https://selinc.com/company/quality/

Monitoring Sensor	
Forescout Part Number	SD-HW-S-SL1480 (Reference model)
Supported Throughput	Up to 1 Gbps
Processor	Intel Xeon® E3-1505L 2.0G, 4C/8T CPU 64bit
Memory	16GB (1x16G) DDR4 2133MHz memory
Hard drive	480GB industrial multilevel cell (iMLC) SSD
Management interface (built-in)	Two 10/100/1000 Mbps Ethernet port connections on the rear panel support high-speed network connectivity and enable connections to independent networks or redundant paired network connections.
Monitoring interface (PCIe)	8x 10/100/1000 Mbps Ethernet (2x Intel i350)
Power	Single 160W High Voltage power supply included that supports either 125/250VDC or 120/220/240VAC. This appliance allows for a second power supply (not supplied by Forescout) which could be either an identical model to the above, or a 48VDC 160W Low Voltage model. Max. power consumption: 91.94W
Dimensions	3U 19” rack-mount chassis; 3U rack-mount panel included
Operating Temperature	–40°C to +60°C
Max. Heat Dissipation	313.72 BTU/hr
Certifications	IEEE 1613-2009 plus many other IEC, IEEE, FCC and CISPR – available upon request.

6.0 Network Infrastructure & Additional Hardware

The eyeInspect Monitoring Sensor software can be deployed on network infrastructure equipment (switches) listed in this section.

6.1. iS5 Raptor

The information below refers to the iS5 Raptor switch family. Information about network interfaces, dimensions, power requirements and certifications vary. eyeInspect sensor installed by iS5.

Monitoring Sensor	
Supported Throughput	150 Mbps
Processor	Intel E3940 4-core, 4-threads, 1.6 GHz
Memory	8GB LPDDDR4
Hard drive	512 GB, expandable to 2 TB, Industrial SATA III M.2 SSD
Management interface (built-in)	1 x 10/100/1000 Mbps ethernet
Monitoring interface (PCIe)	Can monitor all switch traffic, up to 24 ports total, 10/100 Mbps, 1/10 Gbps
Power	HV: 85 – 264 VAC or 88 – 300 VDC; MV: 36 – 72 VDC; LV: 10 – 36 VDC 2 supplies may be specified in most models for redundancy
Dimensions	iMX350 RAPTOR: 1U 19'' rack-mount chassis 403mm x 447 mm x 44mm iMR320 MicroRAPTOR: DIN rail mount 183mm x 83mm x 203mm iMR350 MicroRAPTOR: 1U 19" rack-mount chassis 403mm x 447mm x 44mm
Operating Temperature	-40 to +75 degrees Celsius
Certifications	IEC 61850-3, IEEE 1613, KEMA Gold certified

6.2 Ruggedcom 15xx Series with APE 1808

The information below refers to the APE 1808 module. Information about network interfaces, dimensions, power requirements and certifications vary depending on the hosting 15xx Series model.

Monitoring Sensor	
Forescout Part Number	N/A
Supported Throughput	150 Mbps
Processor	Intel Atom x5-E3940, 4 cores, x86_64, 1.6 GHz (Burst 1.8 GHz), 2 MB L2 cache, Intel VT-x and VT-d
Memory	8 GB DDR3 with ECC
Hard drive	80 GB eMMC
Operating Temperature	-40 to +75 degrees Celsius

6.3 Cisco Catalyst 9300 Series

The information below refers to the Cisco 9300 switch family. Information about network interfaces, dimensions, power requirements and certifications vary. Additional Cisco licensing and hardware is needed to run applications(details available)

Monitoring Sensor	
Forescout Part Number	N/A
Supported Throughput	180 Mbps
Processor	x86 CPU (resources automatically allocated to deployed containers)
Memory	8-GB memory
Hard drive	16 GB of flash and external USB 3.0 SSD pluggable storage slot to host containers