6. Appendices

6.1 Server

Product Code: Dell PowerEdge R440 Rack Server

Note: Customized via Dell.com

Specifications:

Processor: Intel Xeon Silver 4216 2.1G, 16C/32T, 9.6GT/s, 22M Cache, Turbo, HT (100W) DDR4-2400 x 2

RAM: 32GB RDIMM, 2666MT/s, Dual Rank x 2 (Total 64GB)

Hard Drive: 1.92TB SSD SATA Read Intensive 6Gbps 512e 2.5in Hot-plug HYB CARR S4510 Drive, 3.5in 1 DWPD,3504 TBW x 1

Operating System: Windows Server® 2019 Datacenter Edition,16 CORE, FI, No Med, No CAL, Multi Language

Power Supply: Dual, Hot Plug, Redundant Power Supply (1+1), 550W

Server will be used for:

- File Sharing & Backups
- Providing authentication for a domain.
- Providing database services.
- Providing e-mail services with a mail server

6.2 Switches

6.2.1 Core Layer Switches

Product Code: Cisco WS-C3850-48T

Product Code Explanation

WS-C Cisco Catalyst Switch Series
3850 Series Number
48 48 Ports
T Data Only Ports

Product Overview

- Integrated wireless controller capability with:

  Up to 40G of wireless capacity per switch (48-port RJ45 models).

  Support for up to 100 access points and 2000 wireless clients on each switching entity (switch or stack).

- Five optional uplink modules with 4 x Gigabit Ethernet, 2 x 10 Gigabit Ethernet, 4 x 10 Gigabit Ethernet3, 8 x 10 Gigabit Ethernet4, or 2 x 40 Gigabit Ethernet QSFP+4 ports.

- Dual redundant, modular power supplies and three modular fans providing redundancy.

- Software support for IPv4 and IPv6 routing, multicast routing, modular Quality of Service (QoS), Flexible NetFlow (FNF), and enhanced security features.

Specifications:

Enclosure Type	1 RU
RAM	4 GB
Flash Memory	2 GB
Forwarding Performance	130.95 Mpps (Million Packets Per Second)
Installed Network SFP uplink module	C3850-NM-4-10G
Ports	48 x 10/100/1000
Feature Set	IP Base
Dimensions	44.5 cm x 44.5 cm x 4.45 cm
Power Supply	Dual redundant modular power supplies. (PWR-C1-350WAC)

6.2.2 Access Layer Switches

6.2.2.1 24 Port Switch

Product Code: Cisco WS - C2960L-24PS-LL

Product Code Explanation

WS-C	Cisco Catalyst Switch Series
2960L	Series Number
24	24 Ports
P	PoE available
S	SPF Module Slots Available
LL	LAN Base License

Product Overview

- Four fixed 1 Gigabit Ethernet Small Form-Factor Pluggable (SFP) uplinks.

- 24 Gigabit Ethernet data Ports with PoE+

- CLI and/or intuitive Web-UI manageability options.

- Device management support with:

    Over-the-air access via Bluetooth, Simple Network Management Protocol (SNMP), RJ-45 or USB console access
    Network management with Cisco Prime®, Cisco Network Plug and Play, and Cisco DNA Center

- Basic Layer 3 features with Static routing and Routing Information Protocol (RIP)
- Security with 802.1X support for connected devices, Switched Port Analyzer (SPAN), and Bridge Protocol Data Unit (BPDU) Guard

Specifications:

Enclosure Type	1 RU
CPU	ARMv7 800 MHz
RAM	512 MB
Flash Memory	265 MB
Forwarding Performance	64 Gbps
SFP uplink module	Build in 4 SFP Slots
Ports	24 x 10/100/1000
Feature Set	LAN Base
Unicast MAC addresses	16000
Dimensions	44.5 cm x 44.5 cm x 4.45 cm
Power Supply	Build in Power Supply
VLAN IDs available	4094
Maximum active VLANs	256
Maximum STP instances	64
Jumbo Ethernet frame	10,240 bytes

6.2.2.2 48 Port Switch

Product Code: Cisco WS - C2960L-48PS-LL

Product Code Explanation

|	
WS-C	Cisco Catalyst Switch Series
2960L	Series Number
48	48 Ports
P	PoE available
S	SPF Module Slots Available
LL	LAN Base License

Product Overview

- Four fixed 1 Gigabit Ethernet Small Form-Factor Pluggable (SFP) uplinks.

- 48 Gigabit Ethernet data Ports with PoE+

- CLI and/or intuitive Web-UI manageability options.

- Device management support with:

  > Over-the-air access via Bluetooth, Simple Network Management Protocol (SNMP), RJ-45 or USB console access
  > Network management with Cisco Prime®, Cisco Network Plug and Play, and Cisco DNA Center

- Basic Layer 3 features with Static routing and Routing Information Protocol (RIP)
- Security with 802.1X support for connected devices, Switched Port Analyzer (SPAN), and Bridge Protocol Data Unit (BPDU) Guard

Specifications:

Enclosure Type	1 RU
CPU	ARMv7 800 MHz
RAM	512 MB
Flash Memory	265 MB
Forwarding Performance	88 Gbps
SFP uplink module	Build in 4 SFP Slots
Ports	48 x 10/100/1000
Feature Set	LAN Base
Unicast MAC addresses	16000
Dimensions	44.5 cm x 44.5 cm x 4.45 cm
Power Supply	Build in Power Supply
VLAN IDs available	4094
Maximum active VLANs	256
Maximum STP instances	64
Jumbo Ethernet frame	10,240 bytes

6.3 Firewall
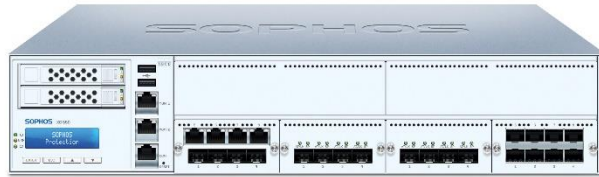
Product Code: Sophos XG 550 Rev.2

Product Code Explanation

Sophos XG   Sophos XG Firewall Series
550   Series Number
Rev.2   Hardware Revision Number 2

Product Overview

- Network Protection: All the protection you need to stop sophisticated attacks and advanced threats while providing secure network access to those you trust.

- Web Protection: Unmatched visibility and control over all your user's web and application activity.

- Email Protection: Consolidate your email protection with anti-spam, DLP, and encryption.

- Web Server Protection: Harden your web servers and business applications against hacking attempts while providing secure access.

Why we choose Sophos XG 550 Rev.2 firewall?

1. Number of Concurrent connections

Concurrent Connections refers to Maximum number of simultaneous TCP connections.
The typical Windows computer with a fairly normal selection of standard software (some Google apps, some Adobe products, Microsoft Office) will always have 10-15 connections going just for things like basic checking for updates, telemetry and data-syncing. This can peak briefly to as much as 50-100 connections after boot/login as all of the background applications do their startup checks.

Web-browsers typically will keep 3-5 connections open for each tab/window (even if it is not the active tab/window). This can easily ramp up to 15-20 if the tab runs an online app (Microsoft Office web-apps, Google Docs, SharePoint. etc.).

200 Connections on average (peaks up to 250-500)
Company has 1415 hosts including wireless network users.

Therefore,

Number of Concurrent connections = Number of Connections per host x Number of hosts

$$200 * 1500$$
$$\sim 300{,}000$$

Sophos XG 550 Supports up to **30,000,000** Concurrent connections.

2. Sophos Recommendation

Sophos XG Models by Recommended Number of Users			
1 to 10 Users	XG 85	200 to 300 Users	XG 230
10 to 25 Users	XG 105	300 to 500 Users	XG 310
25 to 35 Users	XG 115	500 to 750 Users	XG 430
35 to 50 Users	XG 125	750 to 1000 Users	XG 450
50 to 100 Users	XG 135	1000 to 2500 Users	XG 550
100 to 200 Users	XG 210	Over 2500 Users	XG 650 / XG 750

Sophos recommended XG 550 firewall for 1000 to 2500 users.

Specifications:

Enclosure Type	2 RU
Firewall throughput	65 Gbps
VPN throughput	8.4 Gbps
IPS throughput	17 Gbps
Antivirus throughput (proxy)	10 Gbps
New connections/sec	220,000
Concurrent connections	30,000,000
Ethernet interfaces (fixed)	8 x GbE copper 2 x 10 GbE SFP+r
Connectivity module	SFP/SFP+ Transceivers
I/O ports	2 x USB 3.0 (front)
	1 x Micro USB (front)
	1 x USB 3.0 (rear)
	1 x COM (RJ45) (front)
	1 x IPMI (front)
	1 x VGA (rear)
Power supply	2 x hot-swap internal auto-ranging 100-240VAC, 50-60 Hz PSU.
Dimensions	438 x 600 x 88 mm

6.4 IP Cameras

6.4.1 Indoor Camera

Product Code: Hikvision DS-2CD5185G0-IZS

Product Code Explanation

Hikvision DS-2	Hikvision DS-2 Series
C	Color
D	IP camera
5	Project Level
1	Dome/turret
8	8MP
5G0	Sensor or chipset information
-	
I	Supports IR
Z	Motorized varifocal lens
S	Audio/alarm I/O

Product Overview

- The Hikvision DS-2CD5185G0-IZS Indoor Varifocal Network Dome Camera provides high definition output. It supports H.265+ video compression, which assures savings in bandwidth and storage.

- The camera is equipped with a 2.8 mm to 12 mm motorized varifocal lens and offers an EXIR 2.0 IR range of up to 100 ft (30 m).

- Smart features such as line crossing, intrusion, scene change detection, and face recognition are also supported.

Specifications:

Image Sensor	1/1.8" progressive scan CMOS
Shutter Speed	1 s to 1/100,000 s
Day/Night	IR cut filter
Focal Length	2.8 mm to 12 mm
Aperture	ƒ/1.2
Focus	Auto, semi-auto, manual
FOV	V 2.8 mm to 12 mm, horizontal FOV 112.4° to 41°, vertical FOV 58.0° to 23°, diagonal FOV 137° to 47°
IR Range	Up to 100 ft (30 m)
Video Compression	Main stream: H.265+/H.265/H.264+/H.264
Video Bit Rate	32 Kbps to 16 Mbps
Maximum Resolution of Images	3840 x 2160
Supported Network Protocols	TCP/IP, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP, PPPoE, NTP, UPnP, SMTP, SNMP, IGMP, 802.1x, QoS, IPv6, UDP, Bonjour
Web Browser	IE8+, Mozilla Firefox 30.0+, Google Chrome 31.0+, Safari 8.0+; plug-in free live view supported
Simultaneous Live View	Up to 20 channels
Communication Interface	e 1-port RJ-45 10M/100M/1000M Ethernet port; 1 RS-485 interface (half duplex, HIKVISION, Pelco-P, Pelco-D, self-adaptive)
Power Supply	12 VDC ±20%, two-core terminal block; PoE (802.3at, class 4): 36 V to 57 V
Power Consumption and Current	12 VDC, 0.7 A, maximum 8 W; PoE (802.3at, 36 V to 57 V), 0.3 A to 0.2 A, maximum 9 W

6.4.1 Outdoor Camera

Product Code: Hikvision DS-2CD 2 6 85G0-IZS

Product Code Explanation

Hikvision DS-2	Hikvision DS-2 Series
C	Color
D	IP camera
2	Entry level
6	box/bullet/cube/covert
8	8MP
5G0	Sensor or chipset information
-	
I	Supports IR
Z	Motorized varifocal lens
S	Audio/alarm I/O

Product Overview

Designed for use in vandal-prone outdoor locations, the camera is housed in an IP67- and IK10-rated enclosure.

PoE technology simplifies installation by allowing you to run just one cable for both data and power.

A built-in microSD card slot for onboard storage of footage and audio in/out ports for two-way talk.

The camera is equipped with EXIR 2.0 IR LEDs with an effective range of up to 165', and uses an integrated IR cut filter to switch from color to B&W for day/night functionality.

Specifications:

Image Sensor	1/2" Progressive Scan CMOS
Shutter Speed	1/3 s to 1/100,000 s
Day/Night	IR cut filter
Focal Length	2.8 mm to 12 mm
Aperture	F1.4
Focus	Auto
FOV	Horizontal field of view: 112°to 46°
	Vertical field of view: 60°to 26°
	Diagonal field of view: 133°to 53°
IR Range	Up to 50 m
Video Compression	Main stream: H.265/H.264
	Sub stream: H.265/H.264/MJPEG
	Third stream: H.265/H.264
Video Bit Rate	32 Kbps to 16 Mbps
Maximum Resolution of Images	3840 x 2160
Supported Network Protocols	TCP/IP, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP, PPPoE, NTP, UPnP, SMTP, SNMP, IGMP, 802.1X, QoS, IPv6, UDP, Bonjour
Web Browser	IE8+, Mozilla Firefox 30.0+, Google Chrome 31.0+, Safari 8.0+; plug-in free live view supported
Simultaneous Live View	Up to 6 channels
Communication Interface	1 RJ45 10M/100M self-adaptive Ethernet port
Power Supply	12 VDC ± 25%
	PoE (802.3at, class 4)
Power Consumption and Current	12 VDC, 1.2A, max. 14.5W
	PoE: (802.3at, 42.5V to 57V), 0.5A to 0.3A, max. 18W

6.5 NVR

Product Code: Hikvision DS-9664NI-I8

Product Code Explanation

Hikvision DS	Hikvision General Products
96	Product Series
64	The number of IP channels (Number of Cameras Supported)
N	NVR
I	Stands for International Market
-	
I	Product Generation No.
8	The Number of HDDs.

Product Overview

▪ Adopt stream over TLS encryption technology (enhanced SDK service and RTP over HTTPS protocol) which provides more secure stream transmission service (max. 128 Mbps TLS stream outgoing bandwidth, when RAID is enabled, it will restrict TLS stream outgoing bandwidth to 64 Mbps).

▪ HDD hot swap with RAID0, RAID1, RAID5, RAID6 and RAID10 storage scheme configurable.

▪ Connectable to the third-party network cameras.

- Smart search for the selected area in the video; and smart playback to improve the playback efficiency.

Specifications:

IP video input	64 channels
Incoming bandwidth	320 Mbps
Remote connections	128
Recording resolution	12 MP/8 MP/6 MP/5 MP/4 MP/3 MP/1080p/UXGA/720p/VGA/4CIF/DCIF /2CIF/CIF/QCIF
VGA1 /HDMI1 output resolution	HDMI1: 4K (3840 × 2160)/60Hz, 4K (3840 × 2160)/30Hz, 2K (2560 × 1440)/60Hz, 1920 × 1080p/60Hz, 1600 × 1200/60Hz, 1280 × 1024/60Hz, 1280 × 720/60Hz, 1024 × 768/60Hz
Network protocols	TCP/IP, DHCP, Hik-Connect, DNS, DDNS, NTP, SADP, SMTP, NFS, iSCSI, UPnP™, HTTPS
Hard disk	8 SATA interfaces 1 eSATA interface
Capacity	Up to 10TB capacity for each HDD
Network interface	2, RJ-45 10/100/1000 Mbps self-adaptive Ethernet interface
Power supply	100 to 240 VAC, 50 to 60 Hz
Max. Power	200 W
Dimensions (W × D × H)	445 × 470 ×90 mm

6.6 Wireless LAN Controller

Product Code: Cisco AIR-CT3504-K9

Product Code Explanation

Cisco AIR	Cisco Aironet Series
CT	Controller
3504	Series Number
K9	Payload Cryptography (IPSec VPN, SSL VPN)

Product Overview

- The Cisco 3504 Wireless Controller with Cisco Multigigabit Ethernet technology is optimized for 802.11ac Wave 2 performance, high scale, and enhanced system uptime.

- Quiet operation, with a small form factor and compact design ideal for space-constrained deployments, providing flexibility without compromising on features.

- Intent-driven programmability and streaming telemetry.

- Integrated Cisco CleanAir® technology, providing the industry's only self-healing and self-optimizing wireless network.

- A simplified GUI wizard for quick setup and intuitive dashboards for monitoring and troubleshooting.

- Guest access and Bonjour and Chromecast services in centralized deployments

Specifications:

Wireless	IEEE 802.11a, 802.11b, 802.11g, 802.11d, WMM/802.11e, 802.11h, 802.11n, 802.11k, 802.11r, 802.11u, 802.11w, 802.11ac Wave 1 and Wave 2, Wi-Fi 6 (802.11ax)
Wired, switching, and routing	IEEE 802.3 10BASE-T, IEEE 802.3u 100BASE-TX specification, 1000BASE-T. 1000BASE-SX, 1000- BASE-LH, IEEE 802.1Q VLAN tagging, IEEE 802.1AX Link Aggregation
Security standards	Wi-Fi Protected Access (WPA) IEEE 802.11i (WPA2, RSN) MD5 Message-Digest Algorithm Transport Layer Security (TLS) Protocol Version 1.0 TLS Protocol Version 1.2 Encapsulating Security Payload (ESP) Triple Data Encryption Standard (3DES) Transform
Encryption	IPsec: DES-CBC, 3DES, AES-CBC Secure Sockets Layer (SSL) and TLS: RC4 128-bit and RSA 1024- and 2048-bit DTLS: AES-CBC
Authentication, Authorization, and Accounting (AAA)	IEEE 802.1X RADIUS Authentication RADIUS Accounting RADIUS Tunnel Accounting Dynamic Authorization Extensions to RADIUS TACACS support for management users
Management	Simple Network Management Protocol (SNMP) v1, v2c, v3 Telnet Trivial File Transfer Protocol (TFTP) HTTP Syslog
Management interfaces	Web-based: HTTP/HTTPS Command-line interface: Telnet, Secure Shell (SSH) Protocol, serial port
Interfaces and indicators	1x Multigigabit Ethernet interface (up to 5 Gigabit Ethernet) + 4x 1 Gigabit Ethernet interfaces (RJ-45) 1x service port: 1 Gigabit Ethernet port (RJ-45) 1x redundancy port: 1 Gigabit Ethernet port (RJ-45) 1x console port: Serial port (RJ-45) 1x console port: Serial port (mini-B USB)
Dimensions	1.73 x 9.5 x 8.5 in
Power adapter	Input power: 100 to 240 VAC; 50/60 Hz
Weight	4.4lbs

6.7 Wireless Access Point

Product Code: Cisco Aironet 1815i

Product Code Explanation

Aironet   Cisco Aironet Series wireless access point
1815   Series Number

Product Overview

- Ideal for small and medium-sized networks, the Cisco® Aironet® 1815i Access Point brings a full slate of Cisco high-performance functionality to the enterprise environment.

- The Cisco Aironet 1815i delivers industry-leading wireless performance with support for the latest Wi-Fi standard, IEEE's 802.11ac Wave 2 (Figure 1). It also meets the growing requirements of wireless networks by delivering a better user experience.

- The 1815i extends support to a new generation of Wi-Fi clients, such as smartphones, tablets, and high-performance laptops that have integrated 802.11ac Wave 1 or Wave 2 support.

- The 1815i delivers industry-leading performance for highly secure and reliable wireless connections and provides a robust mobility end-user experience.

Specifications:

CPU	710 MHz quad core
RAM	1 GB
Flash Memory	256 MB
Authentication and security	Advanced Encryption Standard (AES) for Wi-Fi Protected Access 3 (WPA3), WPA2, WPA 802.1X, RADIUS Authentication, Authorization, and Accounting (AAA)
Maximum clients	Maximum number of associated wireless clients: 200 per Wi-Fi radio, in total 400 clients per access point.
Data rates supported	802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b/g: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps
Interfaces	1 x 10/100/1000BASE-T autosensing (RJ-45), Power over Ethernet (PoE) Management console port (RJ-45)
Indicators	Status LED indicates boot loader status, association status, operating status, boot loader warnings, boot loader errors
Power draw	8.3W (maximum, on PoE)
Dimensions	150.8 x 150.8 x 33 mm

6.8 Rack Mount UPS

Product Code: APC Smart-UPS SRT 8000VA RM 208V IEC SRT8KRMXLT-IEC

Product Overview

- Periodic battery self-test ensures early detection of a battery that needs to be replaced.

- Warns when a battery is not available to provide backup power.

- Provides early-warning fault analysis ensuring proactive component replacement.

Specifications:

Rack Height	6 RU
Output Power Capacity	8000 Watts / 8000 VA
Nominal Output Voltage	208 v
Output Frequency	50/60Hz +/- 3 Hz
Waveform Type	Sine wave
Output Connections	(4) IEC 320 C19 (Battery Backup)
	(3) IEC Jumpers (Battery Backup)
	(6) IEC 320 C13 (Battery Backup)
	(1) Hard Wire 3-wire (2PH + G) (Battery Backup)
Battery Type	Sealed, maintenance-free, Valve Regulated Lead-Acid battery.
Typical recharge time	1.5 hour(s)
Net Weight	111.58 KG

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