

IS 6640-001

Networking and

Servers

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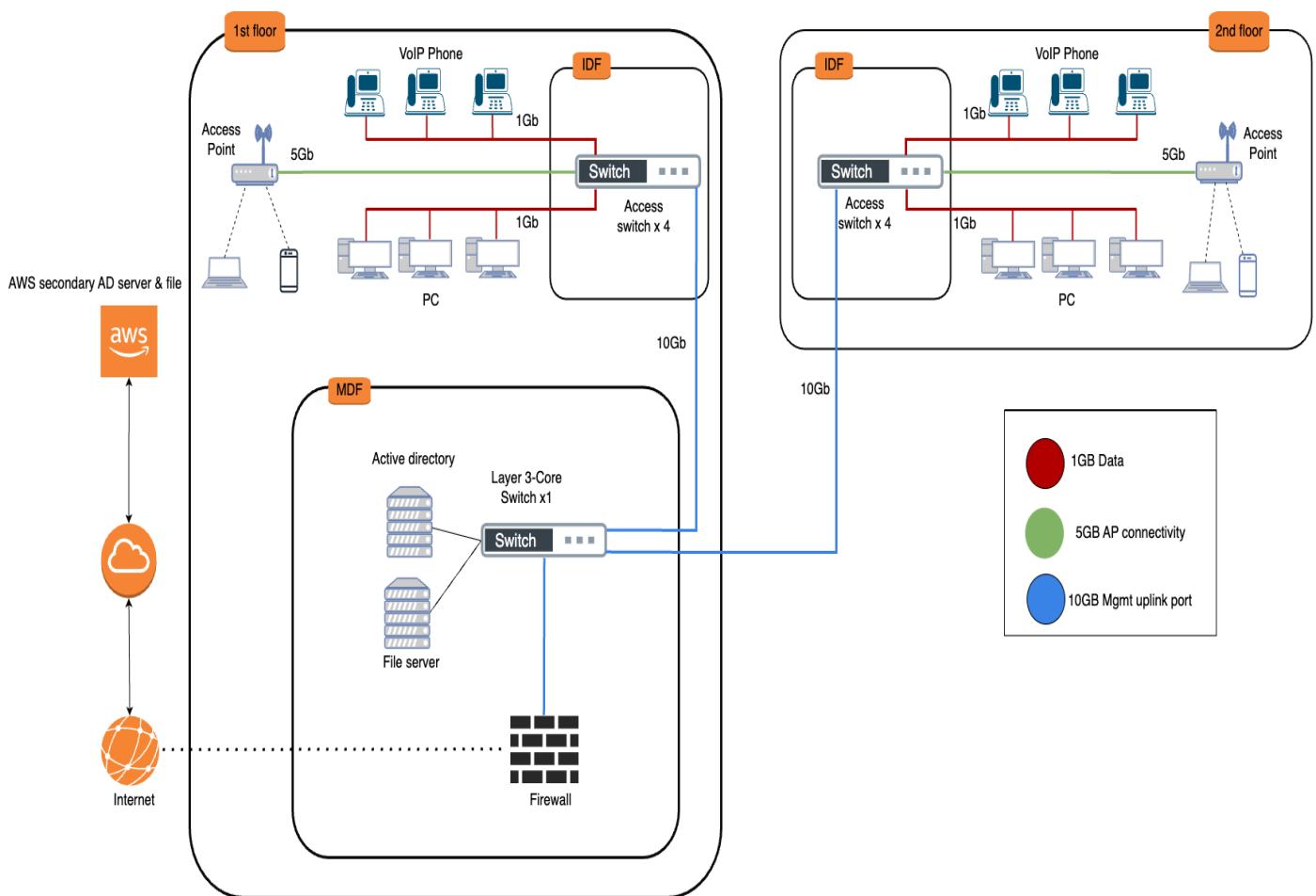
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Layer 1 Map



This is a network architecture diagram for two-story buildings. PCs, VoIP phones, and wireless access points are connected to Access Switches in their respective Intermediate Distribution Frames (IDFs) on both floors. The Main Distribution Frame (MDF) contains a Core Switch that connects to servers and a Router that connects to AWS and the Internet and is protected by a Firewall. For a medium to large organization, the configuration suggests effective connectivity, cloud integration, and security.

Layer 3

S.NO	Physical Location/devices	Logical VLAN	IP Address	Subnet Mask	IP Address Range
1	Management VLAN	VLAN 10	10.115.80.0/27	255.255.255.224	10.115.80.1 - 10.115.80.30
2	Server Network	VLAN 15	10.115.81.0/27	255.255.255.224	10.115.81.1 - 10.115.81.30
3	First Floor PCs	VLAN 20	10.115.82.0/26	255.255.255.192	10.115.82.1- 10.115.82.62
4	Second Floor PCs	VLAN 30	10.115.82.128/26	255.255.255.192	10.115.82.129 - 10.115.82.190
5	IP Phone Network	VLAN 40	10.115.84.0/24	255.255.255.0	10.115.84.1 - 10.115.84.254
6	Wi-Fi Network	VLAN 50	10.115.116.0/22	255.255.252.0	10.115.116.1 - 10.115.119.254

This is a network configuration with 6 VLANs. This configuration enables for traffic isolation between different types of network devices, which can improve security and performance. The server network, for example, is segregated from the other VLANs so that only authorized users can access the servers. The IP phone network is similarly segregated from the other VLANs, so that data traffic does not interfere with voice traffic.

A Wi-Fi network is also included in the network setup, allowing users to connect to the wireless network. Because the WiFi network is on a different VLAN than the other VLANs, unauthorized users cannot access the other VLANs via the Wi-Fi network.

Overall, this is a well-designed network configuration that delivers security, performance, and flexibility.

Wired Network BOM

Core Switch

The Cisco Catalyst C9300X-48HX-E switch is a suitable switch for the core network for WFG. It supports multi-gigabit Ethernet, PoE+ for powering devices like AP's and IP phones, and VLAN routing. This switch can connect to 48 edge devices. The switch also has 4x 10G uplink ports, which can support multi-gigabit speeds between the core switch and the edge switches. The switch supports advanced features such as Quality of Service (QoS) and SD-WAN for automation and enhanced network control to ensure network performance and reliability.

Switch	Make	Model	Description	Quantity	Price	Total Price
Core Switch	Cisco	C9300X-48HX-E	Catalyst 9300 48-port mGig PoE+, Network Essentials, C9300 Network Essentials, DNA Essentials, 48-Port Term Licenses, XE 17.9 UNIVERSAL, Power Cord for AC 1900W Power Supply for Cat9K	1	5651.32	5651.32
			Catalyst 9300 8 x 10G/ Network Module SFP+/SFP28	8	965.24	7721.92
			50CM Type 1 Stacking Cable	2	37.85	75.7
			Catalyst Stack Power Cable 30 CM	2	35.96	71.92
			10GBASE-SR SFP Module	8	390.57	3124.56
					Total	\$16645.42

Access Switch

The Cisco SG350X-48P switch is a suitable choice for meeting the LAN network needs of the client. The switch also meets the requirement for multi-gigabit uplinks to the core network with four 10 Gigabit Ethernet uplinks. The switch also supports advanced features such as Quality of Service (QoS) and Spanning Tree Protocol (STP) to ensure network performance and reliability. The Cisco SG350X-48P switch is a cost-effective solution that meets the hardware needs of the client for their access network.

Switch	Make	Model	Description	Quantity	Price	Total price
Access Switch	Cisco	SG350X-48P	48 port, 8 x 10 Gigabit SFP+, (PoE+)	8	\$3256.88	26055.04
			10GBASE-SR SFP Module	8	390.57	3124.56
						Total \$29179.6

Wireless BOM

The Aruba AP-535 switch is suitable access point for the WLAN requirement for WFG. It is high performance access point which supports Wi-fi 6 standards. This model supports both 2.5GHz and 5GHz frequency bands. It also has advanced security features with WPA3 encryption. This model support Dynamic Frequency Selection (DFS), allowing it to operate in additional frequency bands and reduce interference in crowded environments.

S.no	Make	SKU	Model	Unit	Price	Total
				price	price	price
1	HPE	JZ335A	Aruba AP-535 (JP) Unified AP	40	854.33	34173.2
2		R3J19A	AP-MNT-E Campus AP mount bracket type E: wall-box	40	30.45	1218
3		HG6E5E	HPE Foundation Care Exchange 1 Year (Mandatory)	40	75.66	3026.4
					Total	\$38417.6

Server BoM

Server BoM including two local servers (one for Active Directory/DNS/DHCP and one for a file server).

Category	Make & Model/Part	Description	Quantity	Unit Cost	Total Cost	Comment
Server Brand and Model	Dell PowerEdge R540 Server	Dell PowerEdge R540	1	\$6,556.99	\$6,556.99	
Processor		Dual Intel Xeon Silver 4110 Eight Core 2.1Ghz Processors				
RAM		128GB ECC DDR4 RAM (expandable)				
RAID		RAID 1 & 10				
Raid Controller		H730 1GB 12Gbps Raid Controller				
Memory		128GB of RAM				
Network Interface Card		Synology Dual-Port 10GbE SFP+ Network Interface Card	1	\$302.99	\$302.99	
Storage		Seagate Iron Wolf Pro ST4000NT001 - hard drive - 4 TB - SATA 6Gb/s	4	\$151.99	\$607.96	
Windows Server Licensing		Microsoft Windows Server 2019 Standard - license - 16 cores	1	\$921.99	\$921.99	
Client Access License		Microsoft Windows Server 2019 - license - 20 user CALs	10	\$964.99	\$9,650.00	
Total Price					\$18,039.93	Including Windows Server licensing

The BOM provides the components needed for a server setup. The Dell PowerEdge R540 Server is at the center of the infrastructure. This server is powered by 128 GB ECC DDR4 RAM, which provides effective multitasking. An H730 16GB 12Gbps Raid Controller has been picked for efficient storage management, ensuring fast data transfer and increased redundancy.

In summary, this BOM offers a thorough server configuration that strikes a balance between performance, storage, and connectivity.

Cloud BOM

The Cloud service we are going with is AWS. Amazon EC2, with the addition of Amazon's AD Connector, is suitable option for the client. Amazon EC2 can be used with various configurations of CPU, memory, storage, and networking capacity. It can also be scaled up and down depending on the future needs. In AWS there is a predefined template known as AMI. This will be useful while running an off-site copy of Active Directory database. Client is given with the plan to use this cloud server as a backup to the Active Directory database; the on-demand plan would be the best choice for the client per month. This is suggested to client as they do not actively use this server on daily basis. This is the monthly estimated cost average.

AWS Services: IAAS Approach

Service	Description	Quantity	Unit Price-Monthly	Total Cost
Amazon EC2	T2.medium(Windows server 2019)	2	65.89	131.78
Storage Root Volume	30GB	2	5.64	11.28
Data Transfer Amount	200 GB	1	0.10	0.1
Windows Server Licensing	EC2	2	133.00	266
Amazon AD services	Managed AD standard service	1	348.00	348
			Total	757.16

Summary BOM

Item	Quantity	Price	Total Price	On-Going Price
Core Switch	1	7080.94	16645.42	No
Access Switch	8	3647.45	29179.6	No
Aruba AP's	10	960.44	38417.6	No
Dell Server	1	6556.99	6556.99	No
NIC	1	302.99	302.99	No
Storage	4	\$151.99	607.96	No
Windows Server Licensing	1	921.99	921.99	No
CAL	10	964.99	9649.9	No
Amazon EC2 Services (Overall)	Monthly	552.63	757.16	Yes, Monthly
		Total	\$103039.41	

Summary

As per the requirements provided by Win Financial Group (WFG) to increase its employees to over 200 and to expand their business, we have provided a proposal with a list of deliverables and an estimated completion cost for WFG to successfully extend their infrastructure.

In the wired network, we have considered 1 core switch and 8 access switches having 48 ports distributed across the two floors in the building which can easily serve 100 workstations and 200 VoIP phones and for access points connectivity (40 AP's).

These access switches are connected to the core network via uplink ports using 10Gig SFP modules. We are procuring 16 SFP modules in total to accommodate 10Gig connectivity between Core and Access Switch. The first 4 access switches will be connected to the inbuilt uplink 4 modules. The other 4 access switches will be connected with SFP module and changing port configuration to 10Gig on both switches.

This core switch also serves as a link between the MDF and the IDF switches on each floor which also connects the VLANs present within the building. We have considered management Vlan 10 for management connectivity (IP for Core, Access, AP's, Servers will be configured from Mgmt Vlan 10).

The access points we considered are Aruba 535(Wi-fi 6) which support both 2.5GHz and 5 GHz. We considered 20 users per AP. Considering, there will not be any interference caused by these AP's. The reason for considering only 20 users per AP is there will be connection drop issues. As per Aruba standards and heat map generated by vendor it is recommended to have 20-30 users per AP.

Our recommendation for the AD and file server is as follows, the Dell PowerEdge R540 for the Active Directory/DNS/DHCP server and the file server. The choices were made best to meet the organization's present and future IT requirements. Below, we outlined these selections:

Hardware Performance: The Dell PowerEdge R540 was chosen for its robust dual Intel Xeon Scalable Processors and 128GB ECC DDR4 RAM. These components ensure efficient performance for handling Active Directory, DNS, and DHCP services while accommodating future growth.

Network Redundancy: The inclusion of Synology Dual-Port 10GbE SFP+ Network Interface Card provides network redundancy, enhancing reliability and ensuring high-speed connectivity.

Storage Configuration: 4x Enterprise-Grade HDDs (configured in RAID 10) offer a balance of performance and redundancy, supporting the storage needs for AD/DNS/DHCP services.

Licensing Compatibility: The recommended server models align with the requirements of Windows Server 2019 Standard and the necessary User/Device CALs. These selections were made with a focus on balancing performance, redundancy, scalability, and cost-effectiveness, ensuring that WFG's server infrastructure and we added integration with AWS to furnish WFG with a cloud infrastructure using the IaaS model considering Primary AD server is OnPrem and secondary/backup AD is on AWS. This AWS integration eliminates the need for configuring from scratch and offers future scalability.

Cost Overview: The devices we considered have a one-time cost of \$103039.41 and monthly AWS recurring cost would be \$757.16. Cisco will offer 36months free AMC renewal, Aruba offers 1-year free AMC and Dell's default contract offers 1 to 5 years. Contracts can be added based on SLA agreements with vendors.