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Build LAN Project Connor Horning

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Project Summary

With the new building being purchased and now used as a warehouse, the financial department has moved into floor 10. Since floor 10 used to be the warehouse, there was no need for a telecommunications room there. This project aims to implement a telecommunication room on floor 10 so that the financial department is able to have access to the company's networking resources.

Project Description

To fulfill this project, the telecommunications room will need at least 250 Gb ports with at least 50 ports being PoE, spread over rack mountable layer 2 switches to support edge connections. There will also need to be at least 100 Gb ethernet ports that will be used to support data center equipment. These switches will need at least two 10 Gb fiber ports to be able to connect to the central data center on floor 2. There will need to be a fiber patch panel and fiber patch cables to be able to connect the switches. All of these switches will be placed on three 19", four post equipment racks. There will need to be a UPS in the mix as well. The UPS should be able to cover all of the switches, five servers, and still have at least 40% capacity remaining. With all this equipment, there will need to be more AC circuits installed on floor 10. Lastly, there should be spare parts in case of emergency. With all of this equipment, the telecommunications room on floor 10 should be up and running.

Network Installation Process

Phase 1: Information Gathering

Phase one will include gathering information about the area, how much space this telecommunications room will require, all the devices and equipment that will need to be purchased for the room, and how much cable will be needed to run all the way down to floor two where the main distribution frame is. All this should take about two days maximum.

Phase 2: Selection and Design

Phase two will include selecting devices and equipment that will be used for either the Cisco implementation or the HP implementation. The equipment will be ordered and should come in before the start of phase three. The design of the telecommunications closet will also happen during this phase. This room will have to be built on to floor ten so it can be secure and only accessible to the IT staff. If the equipment was out in the open, anyone would be able to get to it and mess with it so it is imperative that it is secure. This should take a maximum of three days.

Phase 3: Implementation

Phase three begins the implementation phase. This phase includes setting up the racks and racking all the equipment. This also will include setting up the walls for the room. There will be a key card reader in front of the door where only authorized employees are able to access the room. This will be one of the longer phases as before the equipment can be installed, the room needs to be built. It should take a maximum of fourteen days.

Phase 4: Operation

Phase four starts the operation process. This includes configuring all the equipment, running the cable down to floor two to the main distribution frame, connecting all the equipment, and installing any extra AC outlets if need be. This is the longest of all the phases as it is expected to take a maximum of eighteen days.

Phase 5: Review and Evaluation

Phase five is the final phase. This phase includes making sure all the equipment is configured and there is a connection from point a to point b. There will also be verification that the equipment is connected down to the main distribution frame on floor two and that it can also connect all the way up to floor ten. This will include any troubleshooting that may happen along the way. This phase is expected to be a maximum of seven days.

Option 1: Cisco Solution (Preferred)

Edge Switches

Cisco Catalyst 9300-48P-A

Quantity: 7

Individual Price: \$4,810 Total Price: \$28,571.40

The Cisco Catalyst 9300-48P-A switch is a fully managed layer 3 switch. It has 48 PoE+ ethernet ports. It has four SFP ports (10Gb) for fiber-optic connection. It also has three stacking ports in the back to help with stacking all of these switches. The PoE budget is 437 watts. It has two power supply slots but has a 715 watt power supply installed by default. It supports StackWise-480 and Stack Power. The stacking bandwidth is 480 Gbps. It has modular uplink ports.

Total MAC Addresses: 32,000 Total IPv4 Routes: 32,000 IPv6 Routing Entries: 16,000 Multicast Routing Scale: 8,000 QoS Scale: 5,120 ACL Scale: 5,120 Packet Buffer per SKU: 16 MB DRAM: 8 GB Flash: 16 GB VLAN IDs: 4094



Data Center Switches

Cisco Business CBS350-48T-4X Part Number: 8MZ935

Quantity: 4

Individual Price: \$1,203.21 Total Cost: \$3,609.63

This switch has 48 ports each so in order to get 100 total ports, we would need three of these. All 48 ports are PoE+. It is also rack mountable and supports stacking. It has four SFP ports for fiber-optic connection. It is a layer 3 switch. It draws 51 watts max. Its AC input power is 100 to 240 VAC. Its MTBF is 1,452,667 hours. It is 1 RU.

Switching Capacity: 176 Gbps Forwarding Rate: 130.94 Mpps Total MAC addresses: 16,000 VLAN IDs: 4094 512 MB of memory 256 MB of flash



SFP Modules

3KM SC Connector SFP Module (2 pack) Quantity: 18 Individual Price: \$18.00 Total Cost: \$324

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These modules will be inserted into the SFP ports on the switches to provide the switches with fiber optics. These will meet the requirements for fiber optics on the switches.

Fiber Patch Cables

Quantity: 25 Individual: \$8.49 Total: \$212.25

Fiber Patch Panel

Ultra Spec Cables 24 Port SC Fiber Patch Panel Multimode Individual Price: \$87.49 Quantity: 4 Individual Price: \$59.99 Total price: \$239.96 Compatible with 19" racks 24 patch panel ports



Copper Patch Panel

TRENDnet 48-Port Cat6 Unshielded Patch Panel TC-P48C6 Individual Price: \$70.14 Total Price: \$701.40



Racks

Quest FR1924-28-02 adjustable steel floor rack SKU: FR1924-28-02 Quantity: 3 Individual price: \$395.84 Total Price: \$1,187.52 28U Adjustable depth from 24" to 36"



UPS Equipment

CyberPower Smart App Sinewave PR3000RTXL2UN Part Number: 5656044 3000 Watt / 3000 VA Quantity: 4 Individual Price: \$1,630.95 Total Price: \$4,892.85 2U AC 100-120 Volts 9 output connectors Active PFC 3 hour recharge time 4 batteries at 9 Ah each 1.7 minutes at full load, 7 minutes at half load



AC Power

We need 5 120V 20 Amp AC Circuits and receptacles for each circuit.

8,670 watts / 1680 watts (70%) = 4.66 (Round to 5)

There will be 1 by each rack and the other two will be at both ends of the far end racks.



Spare Parts

1 Cisco Catalyst 9300-48P-A (\$4,810) 1 CyberPower Smart App Sinewave PR3000RTXL2UN (\$1,630.95) 1 Cisco Business CBS350-48T-4X (\$1,203) 1 Fiber Patch Panel (\$87.49) 1 pack of CAT6 cable (\$132.98) 7 SC Fiber Patch Cables (\$36.47) 1 Copper Patch Panel (\$70.14) Total Cost of Spare Parts: \$7,971.03

Price Breakdown

Cisco Solution Total Price: \$50,830.71

Option 2: HP Solution

Edge Switches

HPE Aruba 2530-48G-PoE+

Quantity: 7 Individual Price: \$2,655.74 Total Price: \$18,590.18

This switch is fully managed, layer 2, with PoE+ support. It also includes enhanced security access, IPv6 support, and energy efficiency. It

has 48 RJ-45 PoE+ ports and four fixed gigabit ethernet SFP ports. It allows up to 16 switches for stacking.



1U in height 128 MB in flash 256 DDR3 DIMM 3 MB dynamically allocated 441 Watts Switching Capacity: 104 Gbps MAC address table size: 16,000 entries

Data Center Switches

HPE Aruba 6300F 48-Port Quantity: 4 Individual Price: \$4,706.62 Total Price: \$18,826.48 Part Number: JL667A

48 gigabit ethernet ports. It also has 4 SFP ports. Its switching capacity is 494 Gbps. It is capable of supporting ten switches per stack. It draws 740 Watts with full PoE capability.



8 GBytes of DDR4 32 GBytes eMMC 8 MB Shared Packet Buffer Memory 1U in height 20,480 IPv4 Addresses 5,120 IPv6 Addresses 20,480 MAC Addresses

SFP Modules

3KM SC Connector SFP Module (2 pack) Quantity: 18 Individual Price: \$18.00 Total Cost: \$324

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These modules will be inserted into the SFP ports on the switches to provide the switches with fiber optics. These will meet the requirements for fiber optics on the switches.

Fiber Patch Cables

Quantity: 25 Individual: \$8.49 Total: \$212.25

Fiber Patch Panel

Ultra Spec Cables 24 Port SC Fiber Patch Panel Multimode Individual Price: \$87.49 Quantity: 4 Individual Price: \$59.99 Total price: \$239.96 Compatible with 19" racks 24 patch panel ports



Copper Patch Panel

TRENDnet 48-Port Cat6 Unshielded Patch Panel TC-P48C6 Individual Price: \$70.14 Total Price: \$701.40



Racks

Quest FR1924-28-02 adjustable steel floor rack SKU: FR1924-28-02 Quantity: 3 Individual price: \$395.84 Total Price: \$1,187.52 28U Adjustable depth from 24" to 36"



UPS Equipment

Tripp Lite UPS Smart 5000VA 3750W Rackmount Part#: SMART5000TEL3U

> Quantity: 4 Individual Price: \$3,557.52 Total Price: \$14,230.08 3U Height 120V outlets 5 208V connectors 16 minute runtime half load

8.5 minute runtime full load



AC Power

We need 6 120V 20 Amp AC Circuits and receptacles for each circuit.

9,262 watts / 1680 watts (70%) = 5.51 (Round to 6)

There will be 2 by each rack.



Spare Parts

1 HPE Aruba 2530-48G-PoE+ (\$2,655.74) 1 HPE Aruba 6300F 48-Port (\$4,706.62) 1 Tripp Lite UPS (\$3,557.52) 1 Fiber Patch Panel (\$59.99) 1 pack of CAT6 cable (\$132.98)

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7 SC Fiber Patch Cables (\$59.43) 1 Copper Patch Panel (\$70.14) Total Cost of Spare Parts: \$11,242.42

Price Breakdown

Total Cost of HP solution: \$53,789.97

HP Solution

Network Design Overview



With the three racks, three of the servers will be in the middle rack with the others split between the other two. On each rack we have two copper patch panels, one fiber patch panel, two edge switches, and one data center switch. The servers are connected to the data center switches and the data center switches are connected to the fiber optics that lead down to the main datacenter. The edge switches are connected to the copper patch panels which lead out to the financial department office where it leads to the wall jacks by each desk. The heaviest devices are on the bottom so it keeps the racks more stable and won't cause any issues with the racks falling down due to too much weight on top. Not pictured are the 3 UPS systems. These will be below the servers at the bottom. One per rack.

Conclusion

Given the two solutions, the one that would be best would be the Cisco solution. The central data center on floor two has two cisco routers so I prefer going with the Cisco solution. To keep it the same brand of equipment which has the same command set. This will make it easier to manage. If the HP solution was chosen, it would still be compatible with the Cisco routers on floor two. The Cisco solution is also about \$3,000 cheaper than the HP solution as well. The Cisco solution draws less power than the HP solution. It just seems to be better in most aspects of this new telecommunications room on the tenth floor.