10th Floor Financial Department Telecommunications Room Plan

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Mr. Headings

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Introduction

The following document's objective is to help provide a comprehensive plan to build a dedicated local area network telecommunication room on the 10th floor and connect it back to the data center on the second floor of the organization's building. Some objectives of this document are to make a secure, dependable, redundant, and fast network. This is important for a financial network as you are dealing with money and a compromise in the network or failure can result in companywide economic loss.

This document will contain two solutions for ethernet switching equipment. The two ethernet switching vendor solutions we will compare are Cisco and HP. Also provided in this document is a diagram of the interconnection for the switching stacking solution. We have also included our opinion on which solution is more advantageous for the company. This document also addresses what rack and fiber patch panel we recommend for the network. Along with a power plan to make sure power is supplied constantly guaranteeing a good uptime. All solutions made meet the requirements set by the IT manager.

The requirements are at least 250 Gb Ethernet ports provided by fully managed, stackable, rack mount Layer 2 switches to support edge connections. Fifty of these ports must provide PoE. There must be at least 100 Gb Ethernet ports to support data center equipment. These should be provided by managed, stackable, rack-mount Layer 3 switches. There must be (2) 10Gb fiber ports in the switching equipment to allow this telecommunication room to connect to the 10Gb fiber switches about one hundred yards away in the central data center on floor two. A fiber patch panel and associated fiber patch cables must be provided – otherwise, the fiber between floor two and floor ten is already present, terminated, and ready to plug into your fiber

patch panel. Three nineteen," four post equipment racks will have to be provided. rack-mountable UPS equipment that can provide power protection to all the ethernet switches, and five 350-watt servers, and still have at least 40% capacity remaining. Specification must be provided for the quantity and type of AC circuits and receptacles that electricians will be directed to provide in the telecommunications room. If any one of the above items is a single point of failure that could cause extended network outage time, spare parts or additional capacities should be purchased and kept on site.

Cisco Switching Solution

Edge Switch (Option 1)

Model name: Catalyst 9300L Series

Model number: C9300L-48P-4G-E

Spare Parts: (Price)

Fan: FAN-T2: 160

Cisco SFP-10G-SR 10GBASE-SR SFP Module: 50

Quantity: five

Stacking Solution: Stack Wise 320 Stacking Cables included

Price: Individual: 4,000, Total: 20,160

Description: The Cisco Catalyst 9300L Series is a switch designed for network settings, like data centers, enterprise campuses, and branch offices. It offers scalability, high-performance advanced security features, and quality of service (QoS) to meet the demands of networks. These switches are known for using power efficiently. Provide redundancy and high availability with hot-swappable components and stacking capabilities. They operate on the Cisco IOS XE operating system, which supports a wide range of networking needs and is compatible with software-defined networking (SDN) to enhance network management and layer three switching. PoE is also supported over all ports, so you can power devices via the ethernet cord. Supports port speeds of over 1 Gbps over ethernet and speeds of 10Gbps over fiber. There are forty-eight copper ports and four fiber ports on each switch.

Edge Switch (Option 2)

Model name: Catalyst 9300LM Series

Model number: C9300LM-48U-4Y

Spare Parts: (Price)

Fan: FAN-T2: 160

Cisco SFP-10G-SR 10GBASE-SR SFP Module: 50

Quantity: five

Stacking Solution: Stack wise 320 Stacking Cables included

Price: Individual: 10,000, Total: 50,160

Description: The Cisco Catalyst 9300LM Series is a switch designed for network environments, such as data centers, enterprise campuses, and branch offices. It offers scalability, high-performance advanced security features, and quality of service (QoS) to meet the demands of networks. These switches are recognized for their power usage. Provide redundancy and high availability through hot-swappable components and stacking capabilities. The Catalyst 9300LM Series operates on the Cisco IOS XE operating system, which supports a range of networking requirements and is compatible with software-defined networking (SDN) for improved network management. Additionally, all ports support PoE allowing devices to be powered through the Ethernet cable. The switches can get port speeds exceeding 1 Gbps over Ethernet. Speeds up to 10 Gbps, over fiber connections.

Data Center (Option 1)

Model name: Catalyst 9500 series switches

Model number: C9500X-60L4D

Quantity:

(2) C9500X-60L4D

Stacking Solutions: Stack Wise Virtual

Price:

C9500X-60L4D: 45,000

Spare Parts: (Price)

C9K-PWR-650WAC-R/2 650W AC Power Supply: 1,514

C9500-ACC-KIT-19I= Accessory kit for Catalyst 9500 Series - 19" rack: 30

Cisco SFP-10G-SR 10GBASE-SR SFP Module: 50

C9K-T1-FANTRAY Catalyst 9500 fan tray: 750

Total Price: 92,294

Description: The Cisco Catalyst 9500X Se-ries is a powerful, expandable, and secure switch made for data centers. It provides level three routing and security options like MACsec encryption, NBAR, and Trust Sec. This Catalyst 9500X Series can also oversee a wide range of

QoS features and allows SDN compatibility. Every port back PoE. Fiber port speeds can reach a whopping four hundred Gbps. The C9500X-60L4D has sixty copper ports, each with 50 Gbps speeds, and four fiber ports for every switch.

Data Center (Option 2)

Model names: Catalyst 9500 series

Model numbers: C9500-48Y4C

Quantity: (3)

Stacking Solutions: Stack Wise Virtual

Price: Individual:16,000

Spare Parts: (Price)

C9K-PWR-650WAC-R/2 650W AC Power Supply: 1,514

C9500-ACC-KIT-19I= Accessory kit for Catalyst 9500 Series - 19" rack: 30

Cisco SFP-10G-SR 10GBASE-SR SFP Module: 50

C9K-T1-FANTRAY Catalyst 9500 fan tray: 750

Total Price: 50,294

Description: The Cisco Catalyst 9500 Se-ries is a powerful, expandable, and secure switch made for data ce-nters. It provides level three routing and Security options like MACsec encryption, NBAR, and Trust Sec. This Catalyst 9500 Series can also oversee a wide range of QoS features and allows SDN compatibility. Every port supports PoE. Fiber port speeds can reach one hundred Gbps. The C9500-48Y4C has forty-eight copper ports, each with 25 Gbps speeds, and four fiber ports for every switch.

HP Switch Solution

Edge Switches (Option 1)

Model name: 6300M 48x 1G PoE / 4x SFP56

Model number: JL661A

Spare Parts: (Price)

HPE Aruba X372 - power supply - hot-plug / redundant - 1050 Watt: 1,020

HPE Aruba - SFP+ transceiver module - 10 GigE: 106

Quantity: four

Stacking Solution: The deterministic method Stacking Cables included

Individual Price: 6,500

Total Price: 27,026

Description: The Aruba 6300M 48x 1G PoE / 4x SFP56 (JL661A) is a powerful, expandable, and secure switch made to be a hybrid switch that can be used in data centers or edge switches. It provides Layer 3 routing and security options such as MACsec encryption. The 6300M can also oversee a wide range of QoS features and allows SDN compatibility. Every port supports PoE, and fiber port speeds can reach 50 Gbps. The JL661A has forty-eight copper ports with 1 Gbps speed and 4 SFP56 ports.

Edge Switches (Option 2)

Model name: 2930M 48G 1-slot 48 Port Switch

Model number: JL321A

Spare Parts: (Price)

HPE Aruba X372 - power supply - hot-plug / redundant - 1050 Watt: 1,020

HPE Aruba - SFP+ transceiver module - 10 GigE: 106

Quantity: five

Stacking Solution: The deterministic method Stacking Cables included

Individual Price: 2,000

Total Price: 11,126

Description: The Aruba 2930M 48G 1-slot 48 Port Switch is an effective, low-cost, and easily manageable switch for small and medium businesses, department workplaces, and part networks. It provides Layer 3 routing and plenty of safety features, inclusive of MACsec encryption. The 2930M additionally helps PoE+ on all 48 ports. The copper port supports speeds of 1 Gbps and the two fiber ports help accelerate to 10 Gbps.

Data Center (Option 1)

Model name: 6300M 48x 1G PoE / 4x SFP56

Model number: JL661A

Spare Parts: (Price)

HPE Aruba X372 - power supply - hot-plug / redundant - 1050 Watt: 1,020

HPE Aruba - SFP+ transceiver module - 10 GigE: 106

Quantity: two

Stacking Solution: The deterministic method Stacking Cables included

Individual Price: 6,500

Total Price: 14,126

Description: The Aruba 6300M 48x 1G PoE / 4x SFP56 (JL661A) is a powerful, expandable, and secure switch made to be a hybrid switch that can be used in data centers or

edge switches. It provides Layer 3 routing and security options such as MACsec encryption. The 6300M can also oversee a wide range of QoS features and allows SDN compatibility. Every port supports PoE, and fiber port speeds can reach 50 Gbps. The JL661A has forty-eight copper ports with 1 Gbps speed and 4 SFP56 ports.

Data Center (Option 2)

Model names: Aruba 3810M 48G 1U 48-Ports 1-Slot Switch

Model numbers: JL072A

Spare Parts: (Price)

HPE Aruba X372 - power supply - hot-plug / redundant - 1050 Watt: 1,020

HPE Aruba - SFP+ transceiver module - 10 GigE: 106

Quantity: three

Stacking Solutions: resilient Stacking Cables included

Individual price: 4,000

Total price: 13,126

Description: The Aruba 3810M 48G 48-ports 1-slot switch offers surprisingly superior performance, scalable, and security characteristics such as MACsec encryption. Often used in environments like enterprise networks, branch offices, data centers, and many other purposes. It has all these features like 48 Gigabit Ethernet ports, support for PoE+, layer 3 routing, resilient stacking technology, 40Gbps speeds for ethernet, and ease of management with Aruba Airwave.

Fiber Term, Equip Racks & More

As far as what switching solution to use it makes sense to use Cisco. This is because the rest of the network equipment in the company is Cisco, and we think it would be good to keep the network equipment to one vendor instead of making a multi-vendor environment because management and costs of a single security vendor strategy can minimize equipment management and costs. Cisco also has more security options than HP.

The best Cisco solution is Edge switch solution option one and data center switch solution option two. Which is five C9300L-48P-4G-E and three C9500-48Y4C. The reason

behind this is that this solution can achieve all the same features as the other options while saving the most amount of money. All the switches also happen to support layer three capabilities because layer two switches that meet all requirements of this are ruffly the same price in most cases. Layer three capabilities are nice to have on the edge switches as if we decide to implement VLANs it will allow for faster inter-VLAN routing.
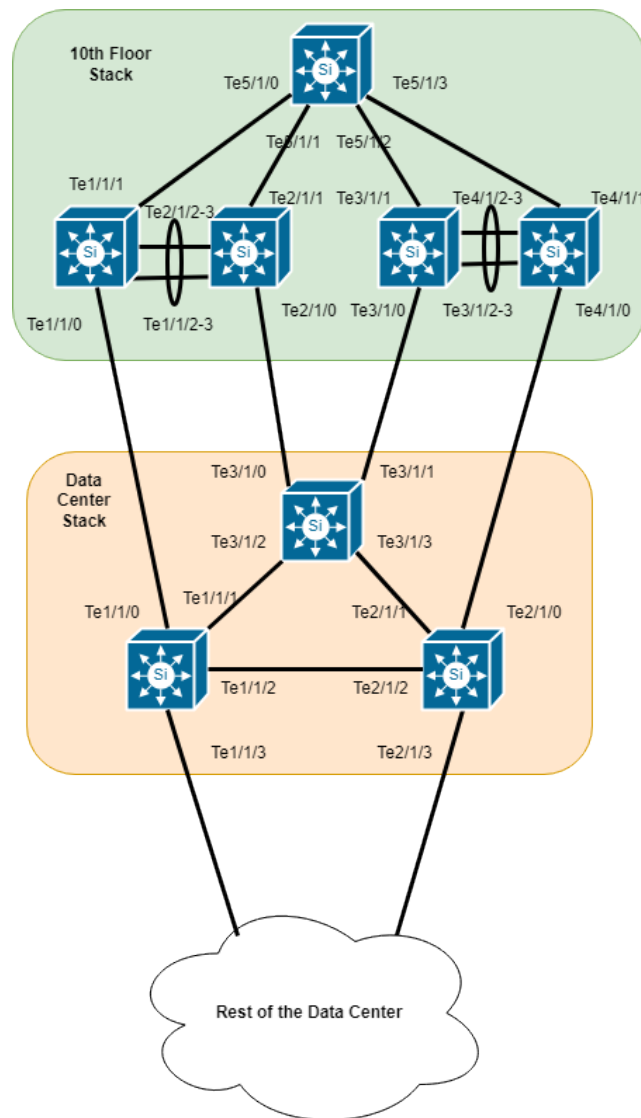

This is our diagram for the switching solution and how we would stack the switches. We built this diagram to provide maximum speed and redundancy. As there are multiple paths to

each switch all over fiber connections. We also used LACP (Link Aggregation Control Protocol) in certain areas of the 10th floor to provide more reductant and bandwidth to the switches. Then the links that will be used for connecting client devices will use the gigabit ethernet ports. We also stacked all the edge switches together to make one logical switch and did the same for the data center switches.

We should back up the running configuration of all the switches to a TFTP or FTP server so that when we need to replace a switch, we can download the configuration from the server. The actual stacking is a bit different for each floor. On the 10th floor, it will be using Stack wise 320 meaning the switches will have to be stacked in the order they are in the diagram and linked up together by the stack cables that will go on the back of the switch like in the picture below. The cables for reference are about three feet in length.

Stackwise-1T/480/320
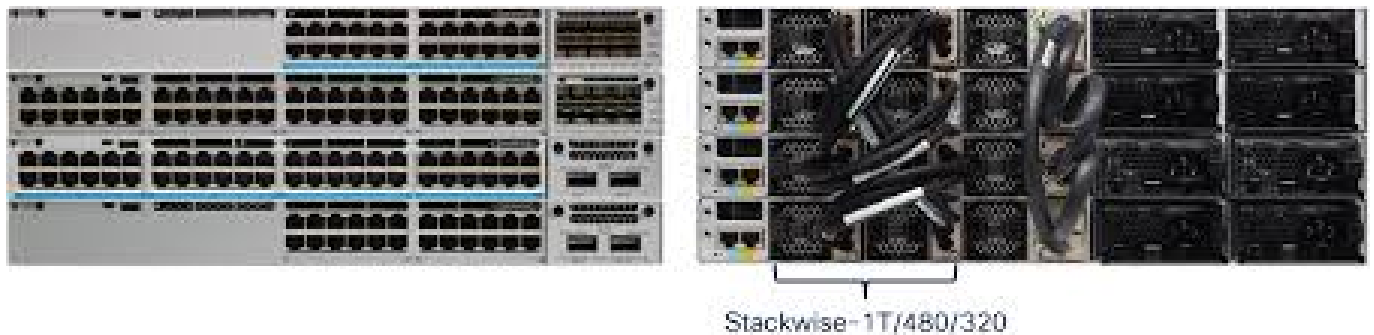
We also need a place to terminate the fiber cables. We recommend buying 2 FHU 1U 19" Fiber Adapter Panel, 48 Fibers OM4 Multimode, 24 x LC UPC Duplex (Aqua) Adapter. This supports multi-mode fiber which is meant for long distances like up to the 10th floor. You can estimate it to be around one hundred feet. Multimode fiber can carry a signal up to 1804 feet. We also suggest Beyond Tech LC to LC Fiber Patch Cable Multimode 3ft patch cables. They work with the recommended patch panel and are cheap for fiber, sitting at around ten dollars per cable.
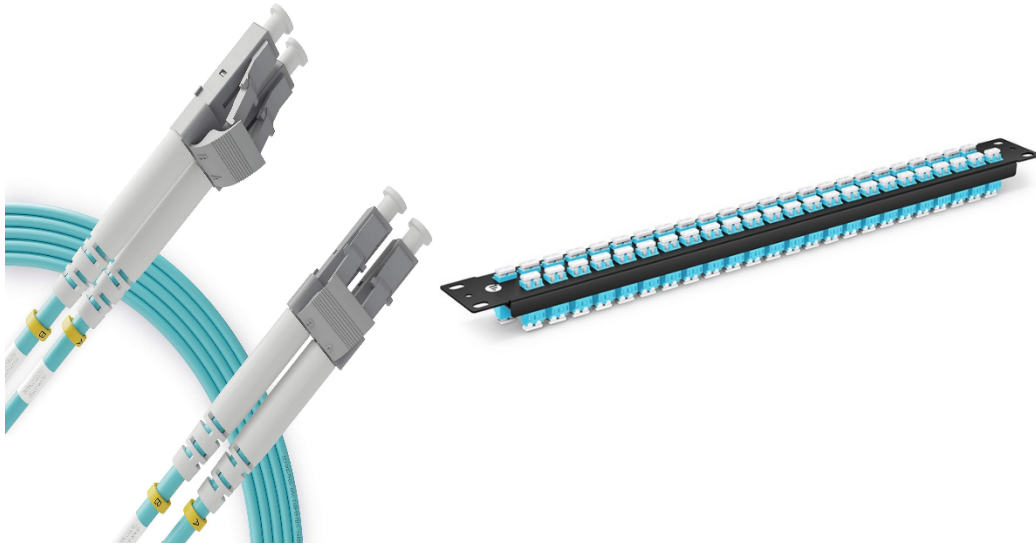
We suggest buying three Raising Electronics Server Rack 4 Post Open Rack Frame Rack Enclosure 19 Inch 42U. We suggest this because it is a very efficient use of money as the cost of one rack is only $ 220.30. It also meets all requirements having a nineteen" frame to fit all equipment and giving lots of extra room left over to help be able to scale the network within short notice.

Power

Power Plan

Equipment	Watts
Edge Switches	5,500
Data Center Switches	4,500
Switches Total	10,000
Servers Total	1,750
Total	11,750
Total + 40% Capacity	16,450

The UPS we recommend to power all this equipment is seven V7 Uninterruptible Power Supplies 3000VA UPS Rack Mount 2U LCD (UPS1RM2U3000-1N). We recommend this UPS because it has more than enough power to power all the equipment with 45% capacity remaining. It is also a rack-mountable device. It cost $5142.69. It also lasts for 20 mins once the power goes out. To supply all the power to all these UPS's we will need 7 AC three-phase connections that supply 120 VAC.

In conclusion, we recommend getting five C9300L-48P-4G-E, three C9500-48Y4C plus spare parts, two FHU 1U 19' Fiber Adapter Panels, 24 Beyond Tech LC to LC Fiber multimode 3ft patch cables, Three Raising Electronics Server Rack 4 Post Open Rack Frame Rack Enclosure 19 Inch 42U, and seven V7 Uninterruptible Power Supplies 3000VA UPS Rack Mount 2U LCD (UPS1RM2U3000-1N). The total cost for this will be excluding labor to install equipment and the electrician to install AC connections is $76,557.59.

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