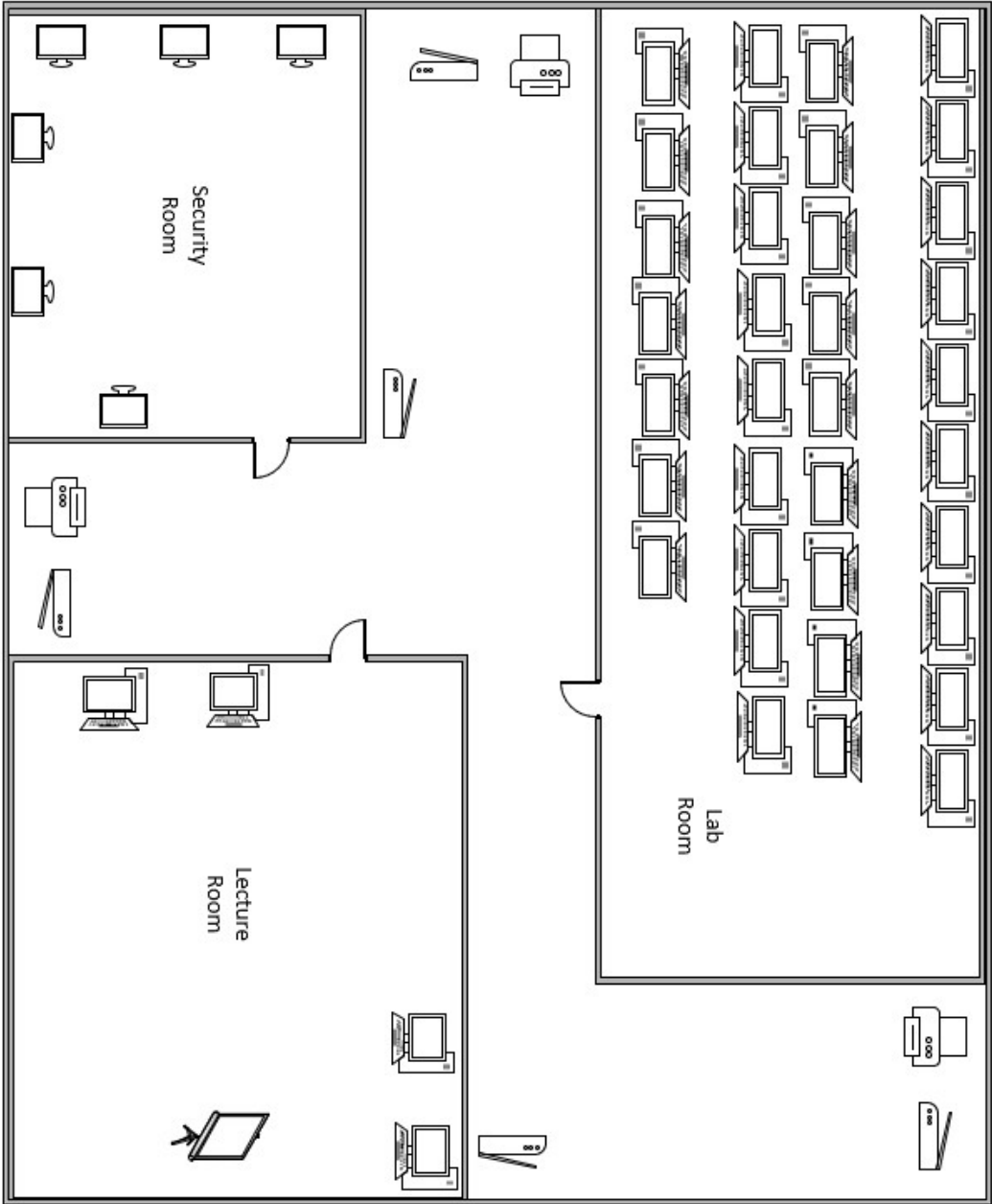
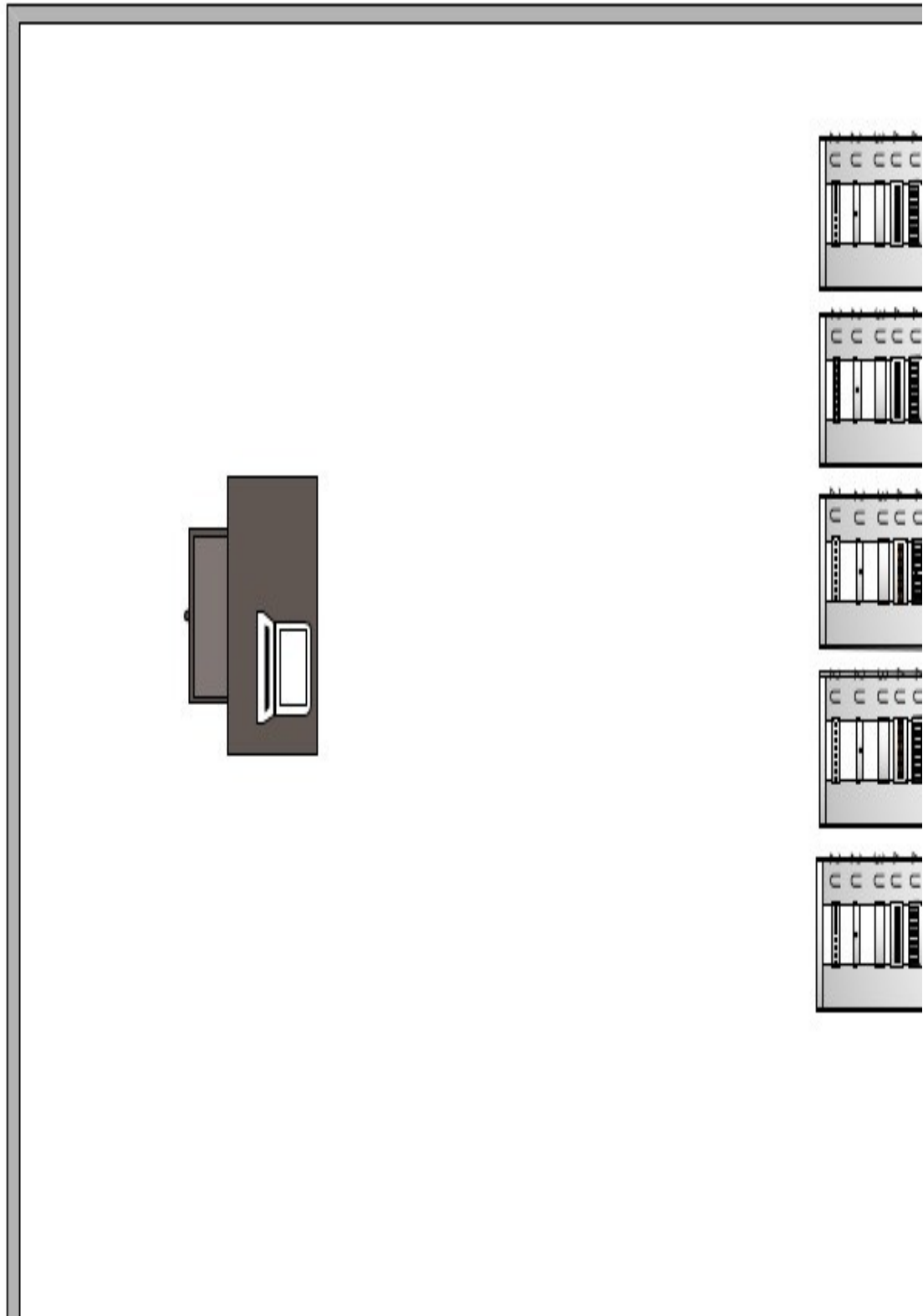


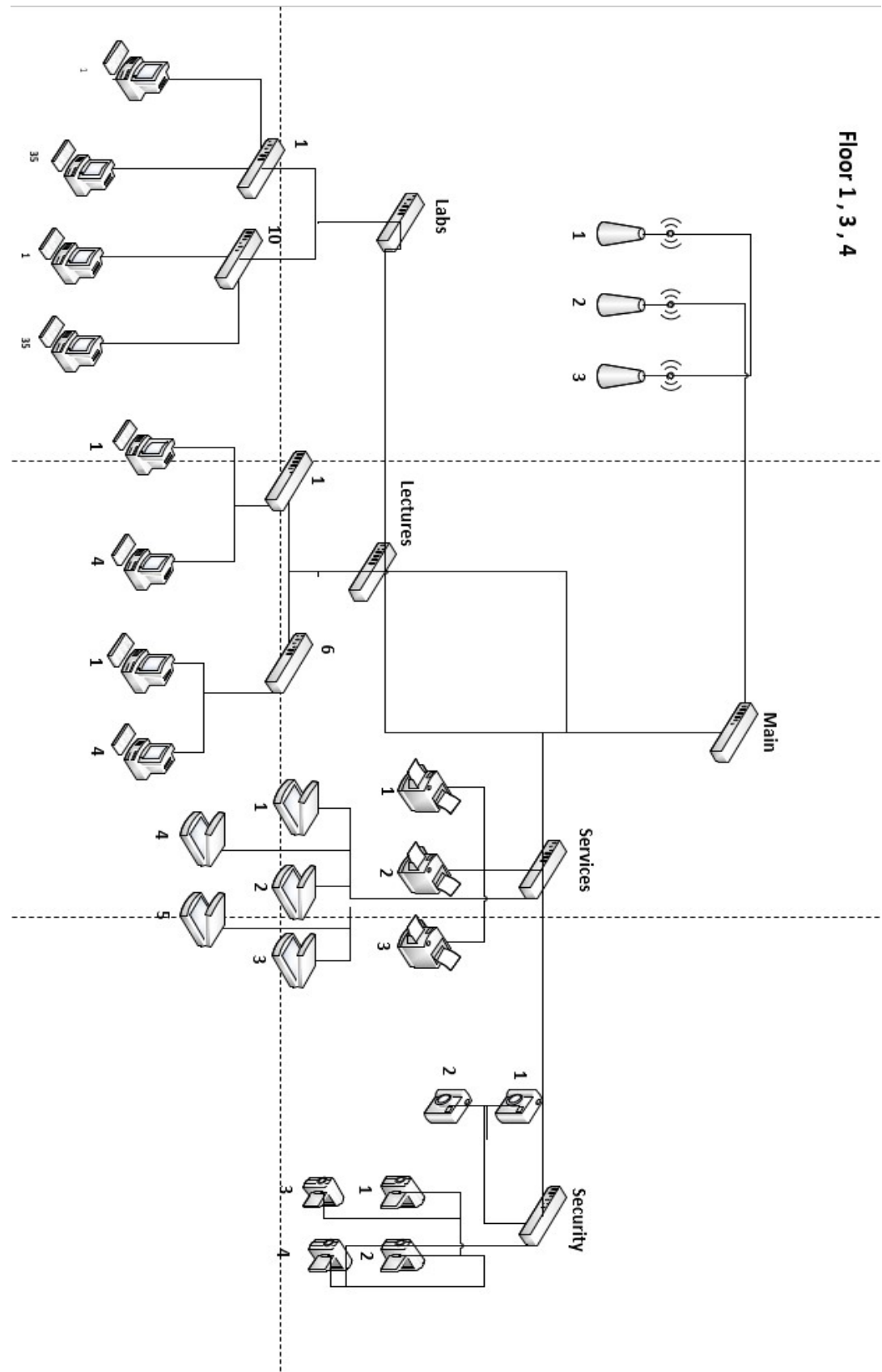
Rooms Prototype



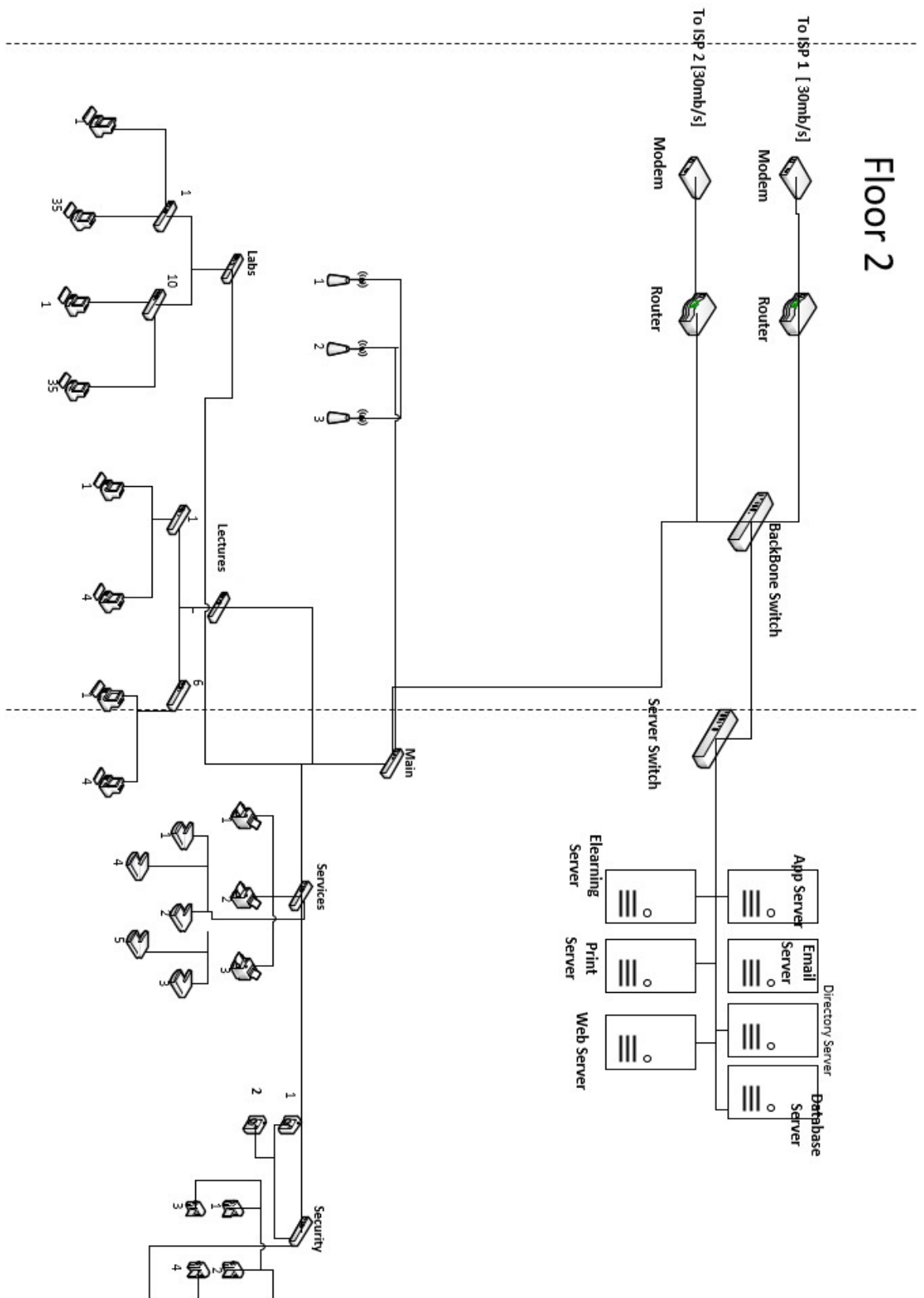
Server Room Prototype:



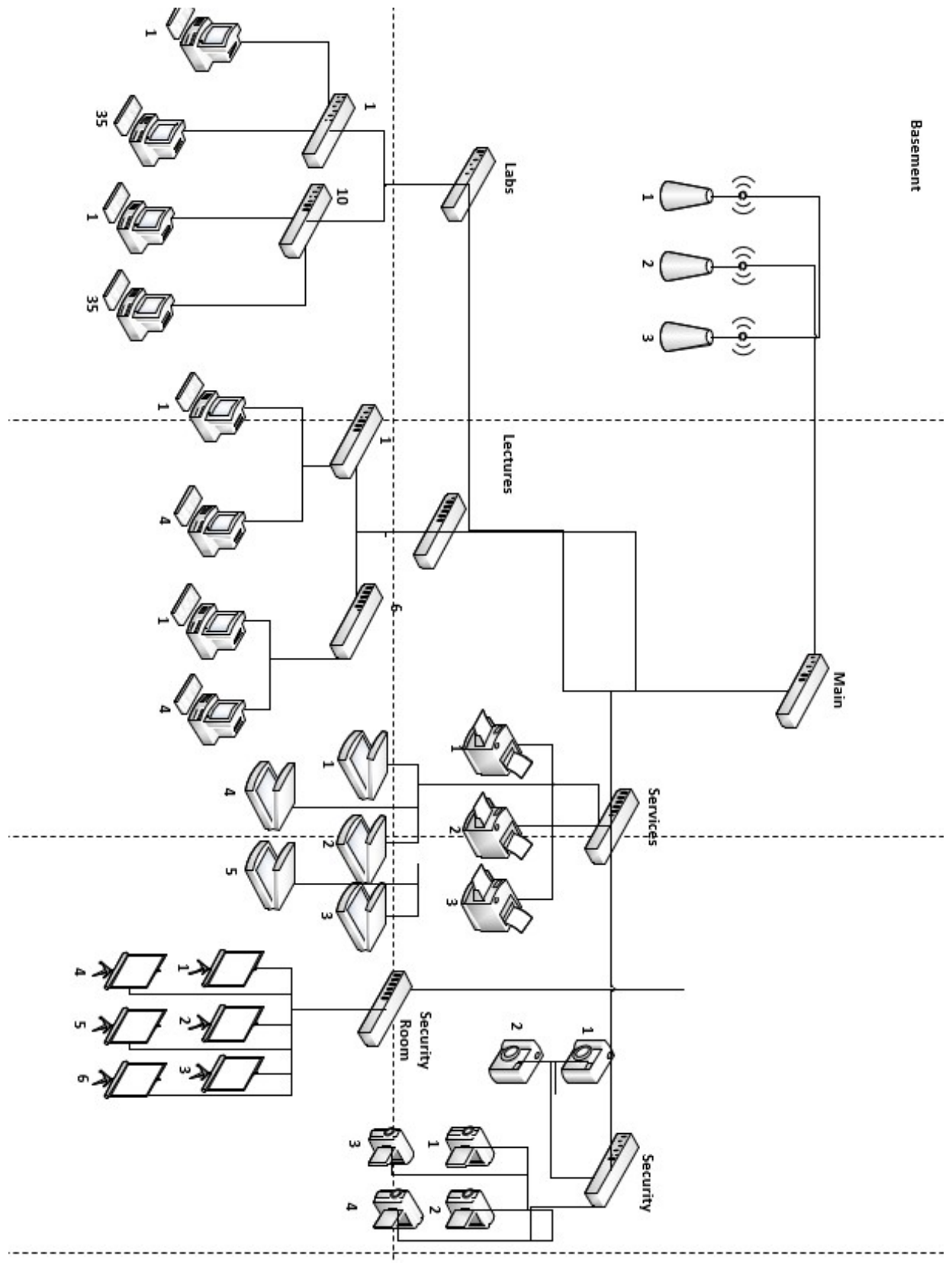
Floor 1 – 3 – 4 Physical Design



Floor 2 Physical Design



Basement



Backbone Switch: Cisco Catalyst 6506-E switch



- It contains 13 slots, 1G, 10G, 40G ports, and forwarding capacity up to 720 Mpps.
- Allows flexibility and room for future growth.
- Scales the system capacity for future needs.
- Increases resiliency to protect against backplane control channel failures.
- Allows ease of access to ports and cables.
- 6509-V-E has front-to-back air flow to support hot aisle or cold aisle designs.

Main Switches used for each floor: Cisco 3850 Series Switch.

- Bandwidth of 480 Gbps copper and fiber
- Uplinks 4x1G, 2x10G, 4x10G (all models)
- Wireless lan Controller
- Application visibility across wired and wireless
- enabling fast service creation, and providing complete
- visibility into the wired and wireless access networks

Room Switches: Cisco 3850 Series Switch

- Bandwidth of 480 Gbps copper and fiber
- Uplinks 4x1G, 2x10G, 4x10G (all models)
- Wireless lan Controller
- Application visibility across wired and wireless
- enabling fast service creation, and providing complete
- visibility into the wired and wireless access networks

Security rooms switch: Cisco Catalyst Digital Building Series Switch



- 8 fast Ethernet ports and 2 gigabit copper uplink ports, with line-rate forwarding performance
- Universal Power over Ethernet (Cisco UPOE) and Power over Ethernet Plus (PoE+) support with up to 480W of power budget
- Support for Layer 2 features, optimized for robust connectivity to lighting and other building IoT devices
- Silent operation due to fan-less design, which enhances reliability
- Enhanced Limited Lifetime Warranty (E-LLW)
- The switch allows for hassle free upgrades, maintenance, and troubleshooting for lighting and other building networks using over-the-air software change. This is enhanced with the easy offline firmware and configuration upgrades with an SD card using an intuitive mobile app interface
- The switch is Cisco DNA-ready, and can be used as part of the APIC-EM solution for automated switch deployments. It also supports Network Plug-n-Play (PnP), a secure, scalable solution that accelerates network device deployments by automating the installation/configuration of Cisco IOS® Software, enhancing productivity and user experience, and reducing costs and downtime

Switches for Printers and Scanners: 2960x switch



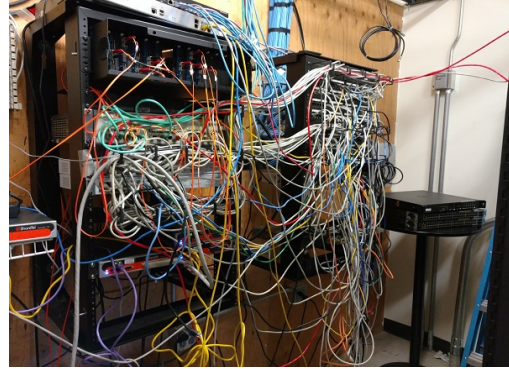
- 48 port
- 4 fixed 1 Gigabit Ethernet Small Form-Factor Pluggable (SFP) uplinks or 2 fixed 10 Gigabit Ethernet SFP+ uplinks
- PoE+ support with a power budget of up to 740W and Perpetual PoE
- Cisco IOS LAN Base[1] or LAN Lite[1] and Cisco IOS IP Lite[2]
- Device management with web UI, over-the-air access via Bluetooth, Command-Line Interface (CLI), Simple Network Management Protocol (SNMP), and RJ-45 or USB console access
- Network management with Cisco Prime®, Cisco Network Plug and Play, and Cisco DNA Center
- Stacking with Flex Stack-Plus and Flex Stack-Extended
- Layer 3 features with routed access (Open Shortest Path First [OSPF]), static routing, and Routing Information Protocol (RIP)
- Security with 802.1X, Serial Port Analyzer (SPAN) and Bridge Protocol Data Unit (BPDU) Guard
- Reliability with higher Mean Time Between Failures (MTBF) and Enhanced Limited Lifetime Warranty (E-LLW)

Routers: Cisco 4321 Integrated Services Router



- 50 MBPS to 100 MBPS system throughput
- 2 WAN/LAN ports
- 1 SFP port
- Multi-core CPU
- High security
- Best quality voice
- Intelligent WAN
- CISCO iOS firewall
- CISCO Scan Safe connector
- IPS support
- SSL VPN
- IPsec VPNs
- Group encrypted tunnel-less VPN
- Version 2.0 Secure shell protocol

Racks:



Rack cables management is important for future issues, the picture at the right it will be difficult to check for the cables and which port have the problem to be solved. So, if the cables have been managed from the beginning it will give benefits as:

- **Reduces Cable Clutter** – Cluttered cables can make it difficult to reach into the servers, routers, switches, or other devices that need work. It can also make it difficult to install or remove hardware since the cables can get in the way.
- **Hides Cable Slack** – Keeping any extra cable slack hidden away helps your datacenter look much more professional. It also reduces the risk of a cable accidentally getting pulled or damaged when working in the area.
- **Professional Look** – If you need to give customers or potential employees a tour of the data center, you don't want it to look like a child ran your cabling. A patch cable organizer gives every rack a clean and professional look.
- **Easier Cable Tracing** – If you suspect a cable has gone bad, tracing it out will be much easier when you have every cable carefully ran through the organizer.
- **Bend Radius Compliance** – Patch cabling is not meant to bend at sharp angles. Using this device will help encourage a safer bend radius so your cables don't pinch or crack.
- **Improved Air Flow** – Keeping the cables properly organized will help ensure the airflow within the rack is even and unobstructed. This can help protect the equipment temperature within the datacenter.

Planning Effective Power and Data Cable Management in IT Racks

Step 1: Plan. Planning is the first step for power and data cable management in IT racks, and when done properly, it facilitates all the steps below. A professional cabling contractor with detailed *statement of work (SOW)* is normally recommended to complete the entire project.

Step 2: Determine the routes for power and data cables. First, determine if the power and data cabling will enter from the top or bottom of the rack. Next, determine the routes to separate power and data cables, copper data cables and fiber, which can prevent erratic or error-prone data transfers.

Step 3: Identify cables. Good cable identification and administration is an investment in infrastructure. Implement best practices like using colored cables combined with labeling cables can ensure cable identification.

Step 4: Route and retain cables. Cables must be protected at points where they might rub or meet sharp edges or heated areas. Cable management accessories like “waterfall”, flexible cable tie, and cable management arms can be used to route and retain cables.

Step 5: Secure cables and connectors. Cables and connectors should be secured to prevent excessive movement and to provide strain relief of critical points.

Step 6: Avoid thermal issues. Ensure the airflow path is clear of obstructions. If airflow is restricted, component temperatures can rise. Sustained higher temperatures can shorten devices’ expected lifespan and cause unexpected failures resulting in unscheduled system downtime.

Step 7: Document and maintain organization. Documenting the complete infrastructure including diagrams, cable types, patching information, and cable counts is important for future cable management. IT leaders must lead the way to organization by committing to constructing standard procedures and verifying that they are carried out.



Server Room:

You can avoid problems that can come with a new server room. A server room all of the following design aspects added to allow technical equipment to operate properly:

Precise Environmental Control – A server room should have sensors throughout the area that measure both temperature and humidity. The environmental control systems should also be able to keep the entire room at the desired levels.

Airflow Planning – Servers and other computer equipment generate a lot of heat. A good airflow plan helps to avoid ‘hot spots’ and eliminates heat from the area so it doesn’t cause damage.

Fire Suppression System – If a fire occurs, you don’t want to have to spray a server room with water. The water would damage all the equipment, resulting in a huge disaster. There are quite a few options for this type of system including Intergern systems, Novec systems, and FM-200 systems. These are all designed to extinguish fires while keeping computer equipment safe.

Cable Management Solutions – Server rooms can end up with miles of cables. Designing the room to allow cables to properly run through the ceiling, or under the floor, helps avoid huge messes.

Redundant Power Sources – Having redundant power sources is important not only to ensure the equipment always remains up and running, but also to avoid power surges that could damage the servers and other items in the room.

Physical Security – Server rooms house thousands, or even millions, of dollars worth of equipment. In addition, the stored data in these rooms can be invaluable. Having the necessary physical security in place to keep it safe is essential.

DMARK Location – Server rooms typically have multiple data circuits coming in, often from multiple different telephone companies. Having one location (the DMARK point) where the telco’s responsibility ends and passes off to the business is important.

1 passive requirements

1-

cable length= (no. Of nodes*average length of a link
+length of uplinks)/305=
= $1935 \times 965 + 975 + 970 + 968$ / 305 =
24603.0491803 = 24603 Reels.

2.

no. of Rj45 face plate= no. Of nodes = 1935 face
plates.

3.

no. of drop cable = no. Of nodes = 1935 face drop
cables (3m)

4.

no. of patch cards = 1935 patch cable. (1m)

5.

patch panel
No. Of ports: 48 each 5.
No of ports: 24 each 1.

6.

duct length= cable length/3 = $24603 \times 305 / 3 = 2501305$.

7.

pvc = length of uplinks = $975 + 970 + 968 = 2913$.

8.

rack size: 48 U: each 2
-One for servers and server switch.
-one for BB switch, routers, modems.
Size :9 U: Each 5
One for each floor

1 - Passive elements

S. N	Item	Description	Unit	Qty.
1-1 Copper Requirements				
1	UTP Cable		meter	2460
2	RJ45 Face Plate		each	193
3	Drop Cable (PC)	3 [m]	each	193
4	Patch Cord (panel)	1 [m]	each	193
5	Patch Panel	No. of ports:48....	each	5
		No. of ports:24.....	each	1
		No. of ports:	each	

1-2 Fiber Requirements (Approximately)

1-2 Fiber Requirements				
6	Indoor Fiber Cable		meter	266
7	Outdoor Fiber Cable		meter	500
8	Fiber Face Plate		each	1000
9	Drop cable (for the server.)	3 [m]	each	700
10	Patch cable (for the panel.)	1 [m]	each	500
11	Patch Panel	No. of ports:48.....	each	5
		No. of ports:24.....	each	1
		No. of ports:	each	

1-3 Racks				
12	Rack	Size: 42 U:	each	2
		Size: 12 U:	each	5
		Size: U:	each	

1-3 Racks

1-4 Trunks (Approximately)

1-4 Trunk				
13	Ducts	size:20X20cm	meter	100
		size 200X200 cm	meter	1000
		size 1000X1000 cm	meter	5000
14	Trays	Size: 100	meter	4000
15	PVC	Size: 2913. Specs: 200	meter	3000

1-5 Electricity

16	Circuit Breaker	16 [A]	each	200
		32 [A]	each	400
		64 [A]	each	600
17	Enclosures		each	100
18	Cables	Size : 1000 [mm]	m	5000
		Size : 3000 [mm]	m	300
		Size : 4000 [mm]	m	250
19	Data Earthing			600
20	Electricity Earthing			50

1-5 Electricity (Approximately)

2- Active Elements: Switches, Routers, Security

S. N	Item	Description	Unit	Qty.
1	Access/Edge Switch	24 port	each	3
2	Distribution Switch	24 port	each	5
3	Backbone Switch	24 port	each	2
4	Router		each	3
5	Modem		each	3
6	Fire wall		each	3

3- Connectivity

<u>S. N</u>	<u>Item</u>	<u>Unit</u>	<u>Quantity</u>
1	Internet connectivity from ISP 1	Each	1 30 mb/s
2	Internet connectivity from ISP 2	Each	1 30 mb/s

Reference List:

Lin, P. (2015, November 10). Seven Steps to Achieve Effective Power and Data Cable Management in IT Racks. Retrieved from <https://blog.se.com/datacenter/2015/11/02/seven-steps-to-achieve-effective-power-and-data-cable-management-in-it-racks/>

Mitchell, J. (2020, March 9). 6 Benefits of a Patch Cable Organizer. Retrieved from <https://www.racksolutions.com/news/data-center-trends/patch-cable-organizer/>