COMMATUBE

CS625 TERM PROJECT

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Contents

Area 1: A definition of an Organization

Commatube allows the comments of the video to be displayed while the associated video segment is playing. This allows comments to respond directly to events occurring in the video and in sync with the viewer in order to create a sense of a shared watching experience.

the commatube service will cover but not limit to theaters, plazas, as well as create its own style of entertainment. Also, commatube will do the big data, aiming to produce better user experience of its own users or make better co-operation with other companies.

For the employees, we have front-end and back-end engineers, UX designers, Production Manage team, content manage team, iOS/android dev team, accountant, copywriter, data analyst, social media manage team, customer support.

For the customer, generally it's anyone that using video services. Clients can be uploaders and co-operate companies.

The high end level items will include database, which is mongoDB.

The main campus of will be in Los Angeles, California.

Physical Infrastructure

STATE	AMOUNT OF CAMPUS	AMOUNT OF BUILDINGS
CALIFORNIA	2	4
TEXAS	1	2
NEW YORK	1	1
ILLINOIS	1	1
FLORIDA	1	1
PENNSYLVANIA	1	2
WASHINGTON	1	1

Table1.1: distribution of campus and buildings

Except for the main campus in Santa Monica, which has three buildings, the rest of the campus will only have one building. So there are total of 12 buildings.
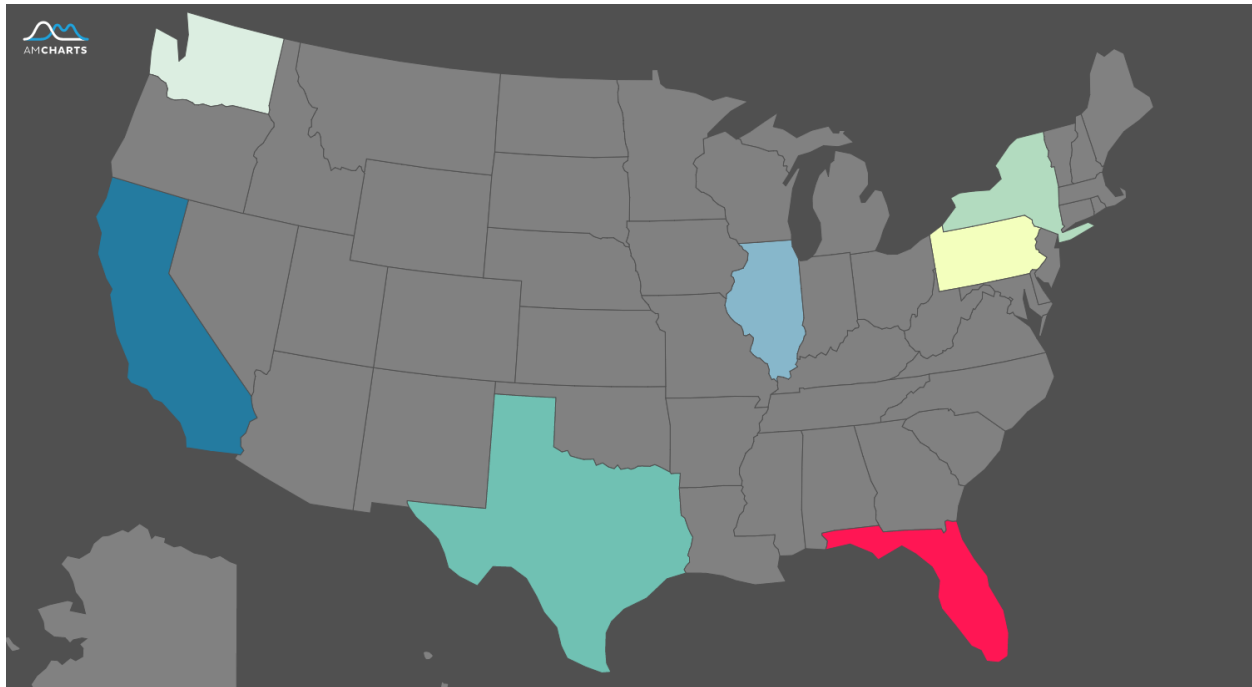
Figure 1.1: Visualization of each campus on a US map

The highlighted area is where commatube distributed.

The farthest distance is from New York to California, which is about 2,441 miles (3928 km).

The closest distance is from Santa Monica, California to Pasadena, California, which is about 20 miles (32 km).

Main Campus

There are three building on the main campus in Santa Monica, two buildings are on the same side of the street, while the other one is on the other side.
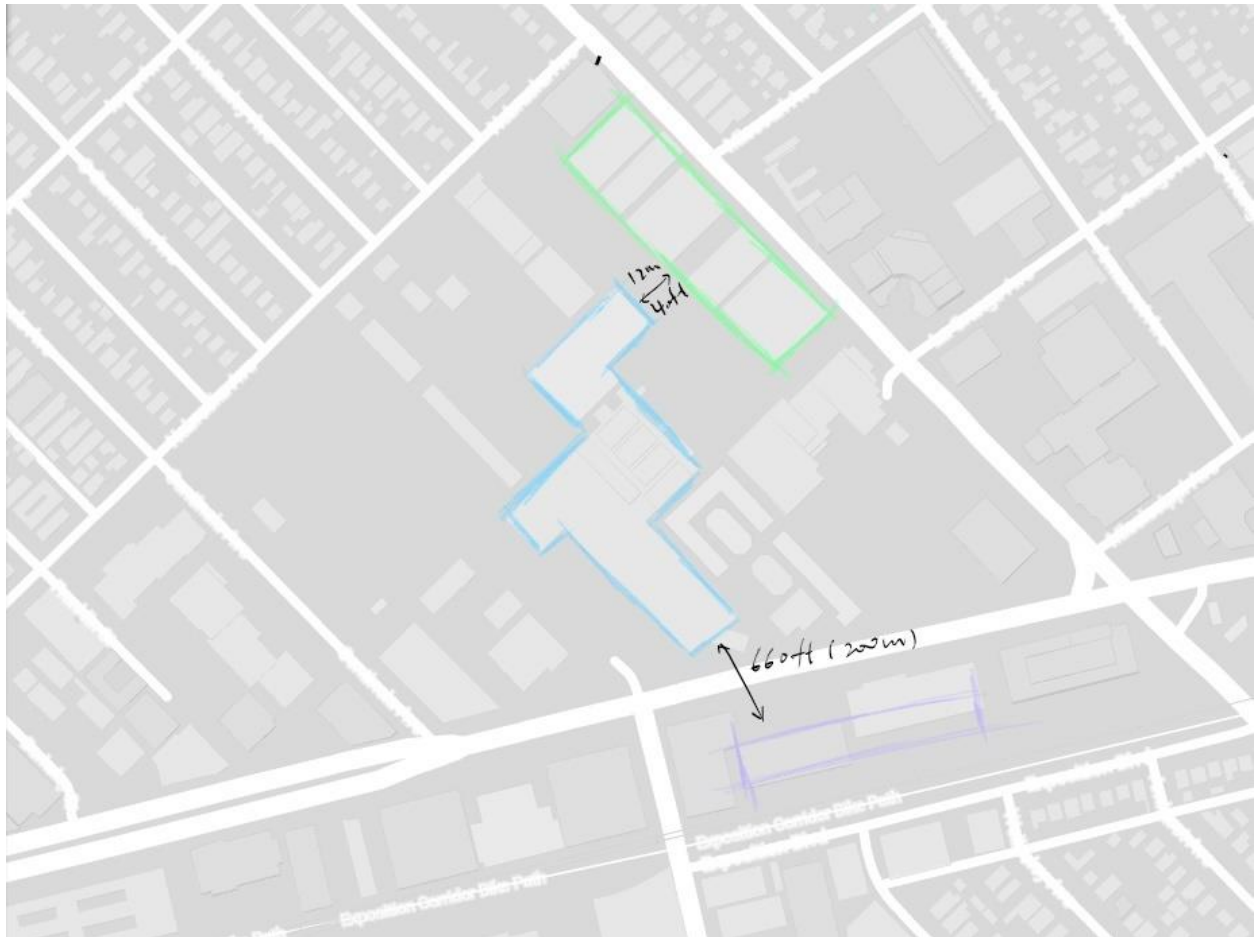
Figure 1.2: Distribution of main campus buildings in Santa Monica

The farthest distance is about 660 ft. (200 m), and the closest distance is about 40 ft. (12 m)

The main building, in the color of blue, has two levels. The side building, in the color of green, also has two levels.

Here are the detailed floor plans of the main building, the width and length is listed on the plan. It is in a 1:10 scale. Each side length of the building is display on the floor plan.

29'2"

Office area

Office area

13'2"

20'9"

13'4"

Coffee & drinks

Up

1st floor

26'8"

Lobby

2'11"

Welcome
Entrance

Front Desk

32'1"

18'8"

Exhibition Hall

8'

40'

Free Public area

29'4"

15'

Figure 1.3: first floor plan of the main building

29'2"

Office area

Office area

13'4"

20'9"

2nd floor

26'8"

12'11"

Conference Rooms

office area

18'8"

32'1"

8'

40'

29'4"

Public area

15'

Figure 1.4: Second floor plan of main building

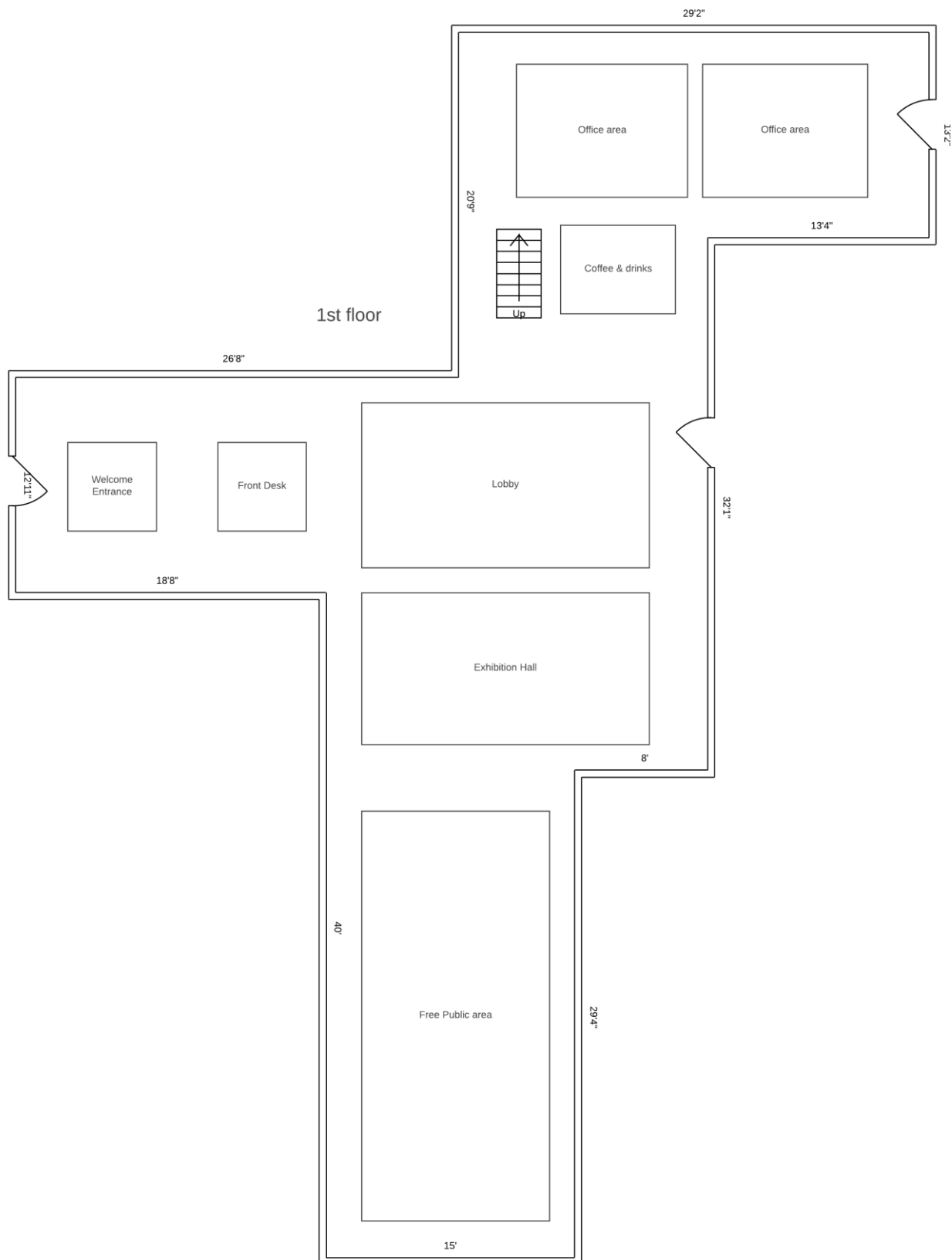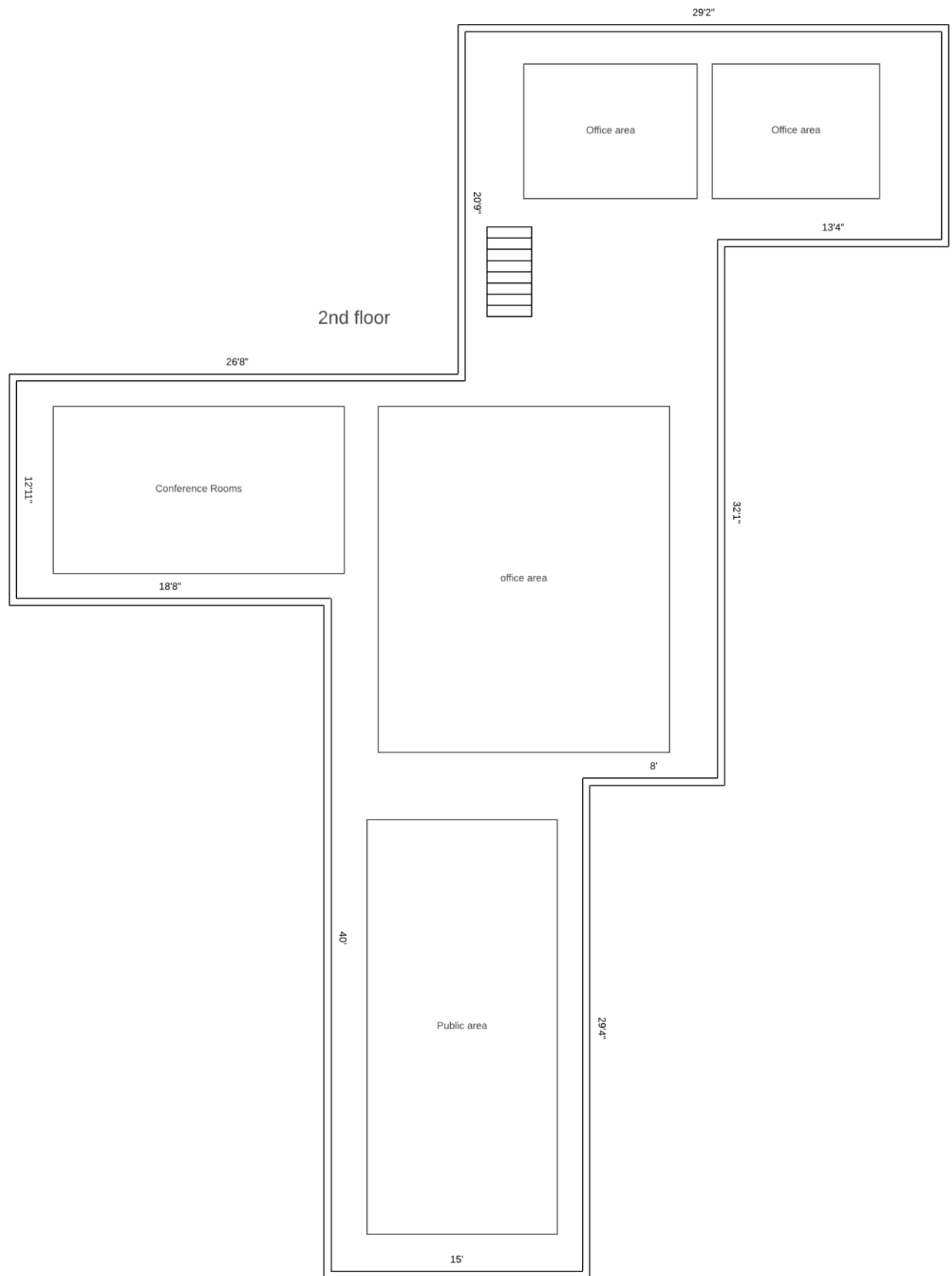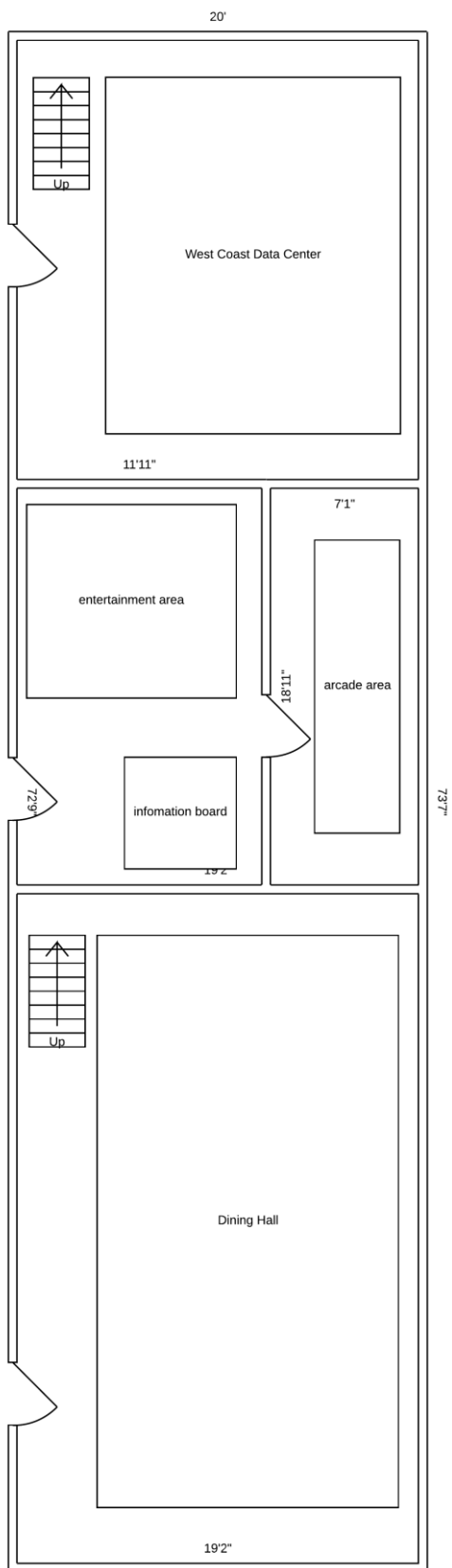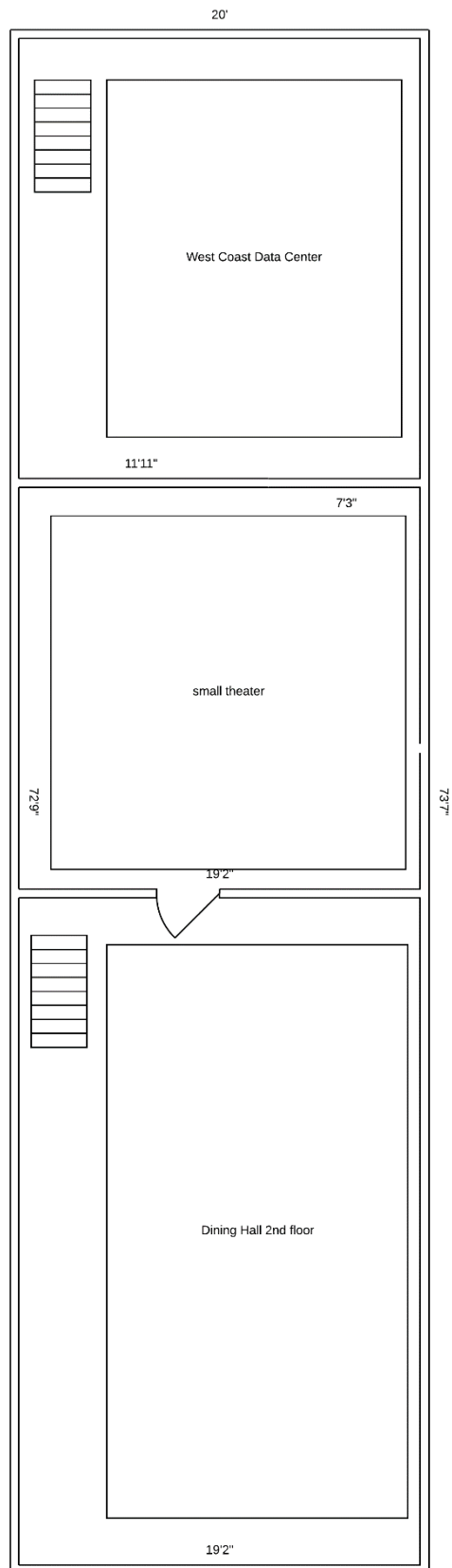*Figure 1.6: First floor plan of side building*

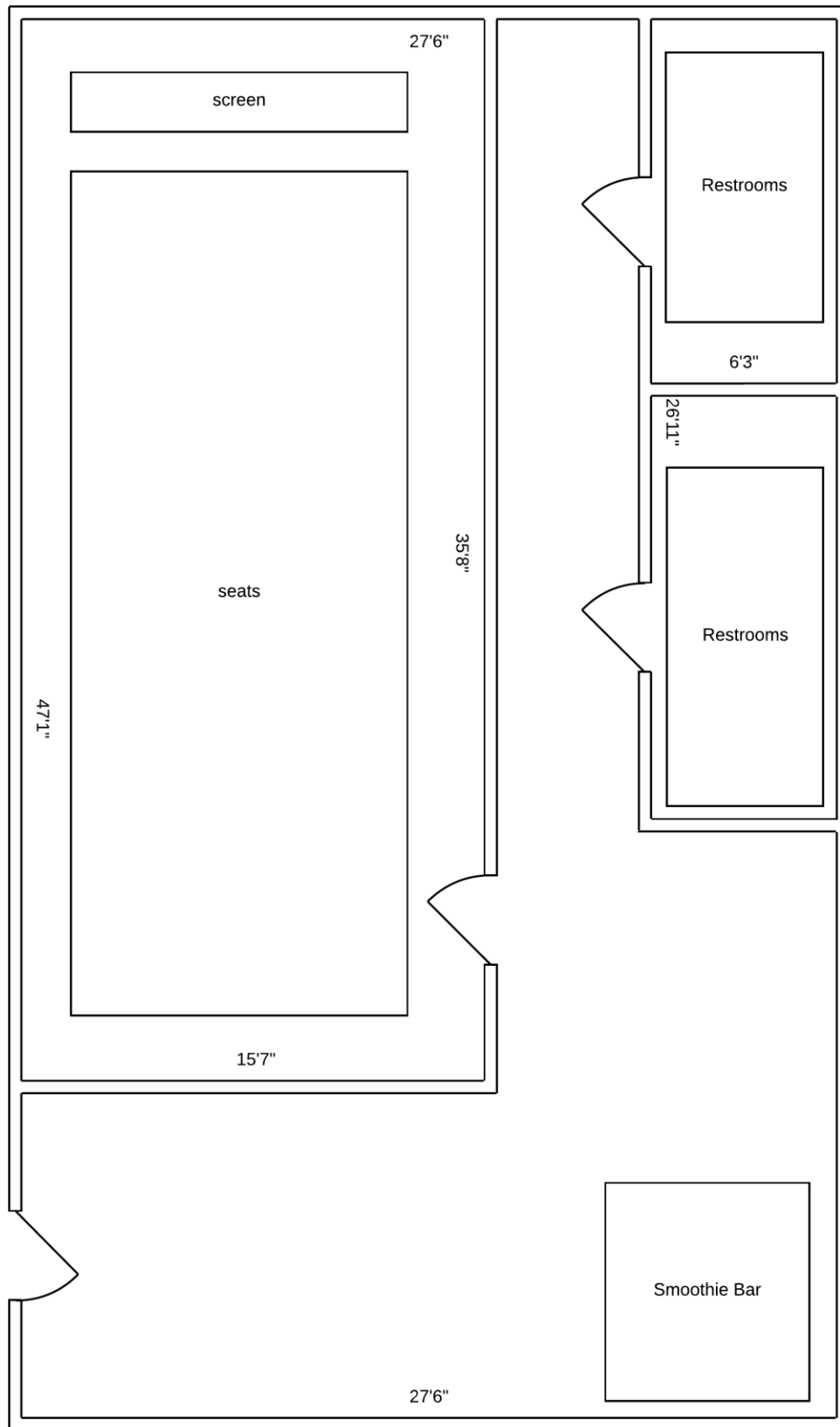*Figure 1.7: Second floor plan of side building*

Figure 1.8: floor plan of the building across the street

Area 2: Application requirements

User Uploading System

This system enables the users to upload videos to the website, it works like the way of YouTube. We make it an *n-tier Architecture*. User will use their personal computers to upload videos to commatube, commatube will provide the corresponding web pages for the uploading process. Once user finished uploading, the server will start the video compressing process and store it to the cloud storage in our datacenter in Texas.

Streaming System

This system enables the streaming function of commatube. User can now be Live on commatube; it works like the way of Twitch.tv. We also make It an *n-tier Architecture*. Commatube will still provide users with corresponding functions and applications to support user streaming, which include pc & smart phone streaming tools and software.

Visitor Check-in System

This system is a *two-tier Architecture*. There will be a visitor check-in process at front desk. With the user interface on a tablet, and connect directly to the local database.

Email System

Since commatube is using G Suite as its main email function, which is cloud based. It's also an *n-tier Architecture* for the email system. And the service will be provided by Google.

Company Collaboration System

Commatube is using Slack as team collaboration and services, which is also a cloud based *n-tier Architecture*. There is slack apps and web applications provided by Slack Technologies, Inc.

Video Conferencing System

Cisco Unified Communications, as well as Skype Business, provide best support of Commatube's VoIP System. Each establishes a *three-tier Architecture* video conferencing system.

File Sharing System

Enable employees to share data locally, which is a *three-tier Architecture*.

Software Update System

This system is to make sure each device has the same version of software, to provide best compatibility for employees works and antivirus support. This system is an *n-tier Architecture*.

Entertainment System

Commatube provide its employees with best working experience, so we also have entertainment area, which includes but not limit to console/pc video games and movies. The entertainment system is based on *n-tier Architecture*.

Systems	Estimate Sharing Bandwidth
User Uploading System	6Gbps
Streaming System	6Gbps

Visitor Check-in System	10Mbps
Email System	50Mbps
Company Collaboration System	1Gbps
Video Conferencing System	1Gbps
File Sharing System	1Gbps
Software Update System	300Mbps
Entertainment System	2Gbps

Table2.1: Bandwidth table

Since we have the datacenters in the location of Los Angeles, and we are providing video and streaming services, so we have 12Gbps for user uploading and streaming system. With an estimate of 300 employees in commatube at LA, we give 50Mbps for the email and 300Mbps for software update. For company collaboration, video conferencing and file sharing, we give each 1Gbps to ensure best work experience. And for the entertainment, we have a bandwidth of 2Gbps. This is for HD videos, or low gaming latency. So, a total bandwidth of 18Gbps will be use in the Santa Monica campus.

On average, each client will get a network speed around 50Mbps, and also scalable up to 300Mbps depends on the amount of online devices. Most of the employees' device will only be online during their work hours.

Area 3: Local Area Network Design

The LAN design of main building and side building will be provided here. Each switch in the diagram is 24-port 100Base-T Switch. For wired connection, CAT6a cable will be used, and CAT6 cable for connecting wireless AP, which both support up to 10Gbps network speed.
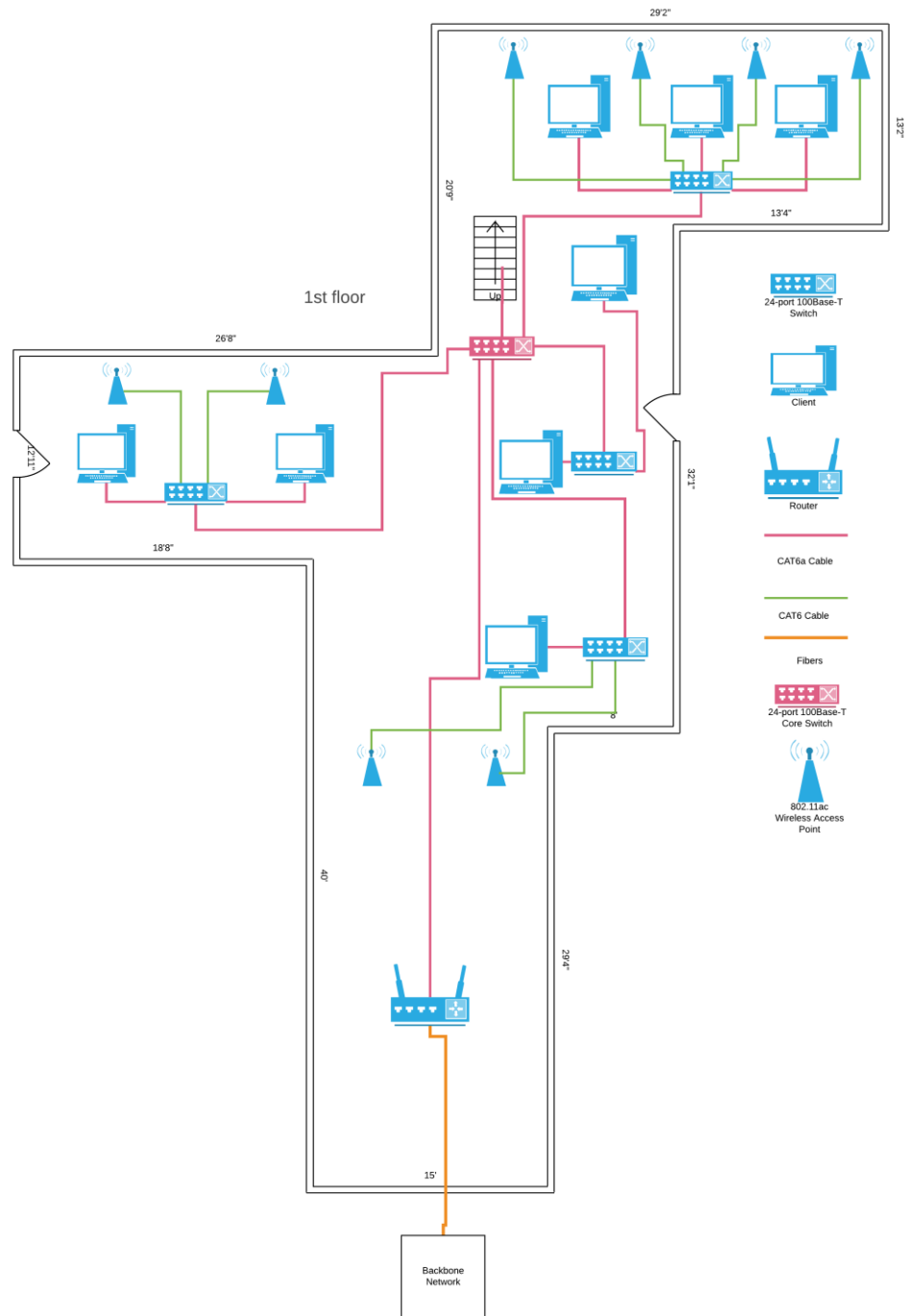
Figure 3.1: Conceptual LAN of first floor of the main building

There's a core switch on the first floor of the building, and a router connect to the backbone network using optical fiber. The CAT6a cable is enough for the office daily routing wired network traffic. And CAT6 for connecting the wireless AP.
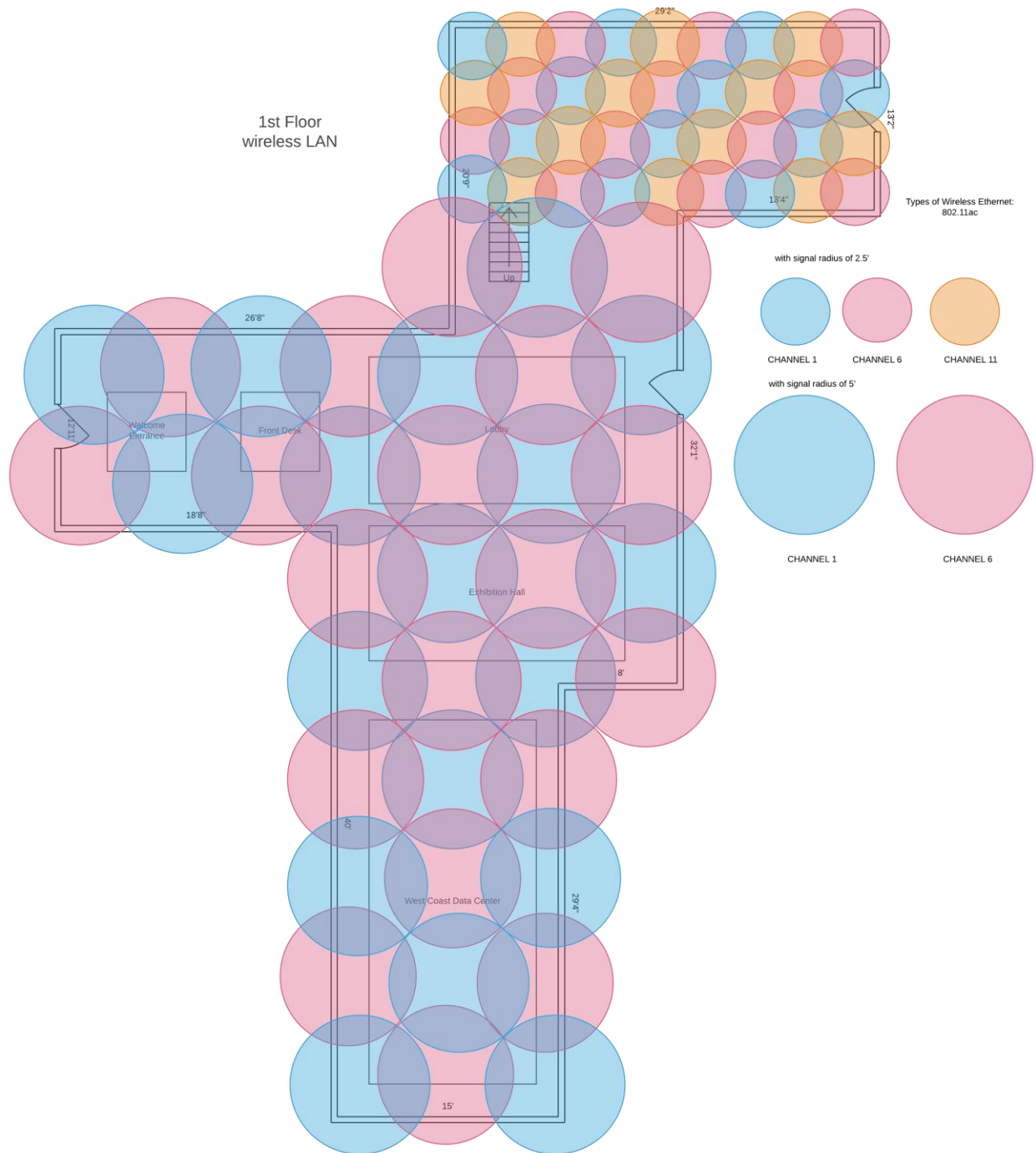
Figure 3.2: Wi-Fi Signal distribution of first floor of main building

Each building in commatube will be fully covered by Wi-Fi, in order to provide best convenience for our employees. Strong Wi-Fi signal will be available at the office area, and medium Wi-Fi signal for the rest area. Each Wireless AP will have a signal radius of 2''5' in the office area, and 5'' for the rest area.

29'2"

13'2"

2nd floor

20'9"

13'4"

24-port 100Base-T Switch

26'8"

12'11"

Client

18'8"

Router

32'1"

CAT6a Cable

Switch

CAT6 Cable

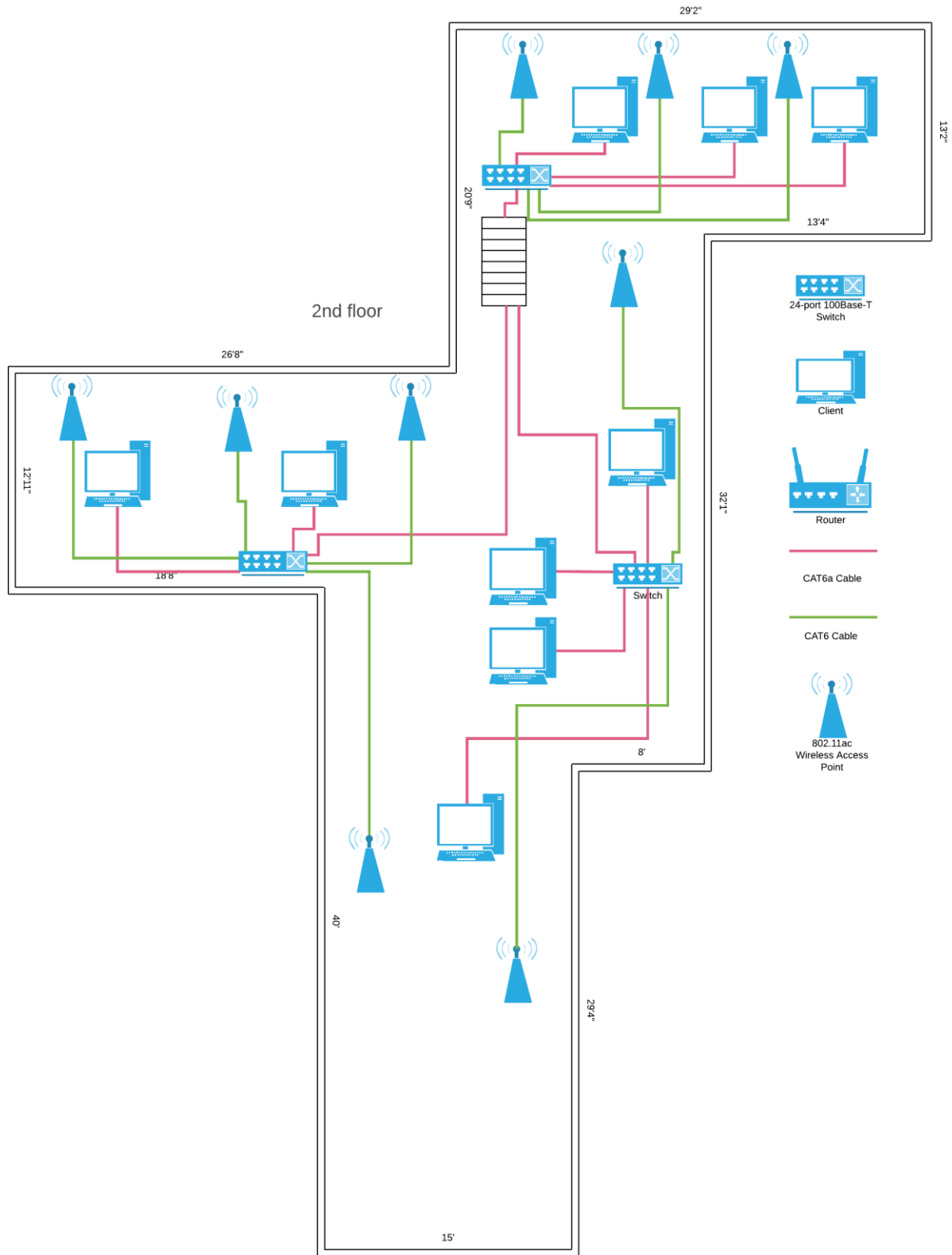802.11ac
Wireless Access
Point

8'

40'

29'4"

15'

Figure 3.3: Conceptual LAN of second floor of the main building

The switches on the second floor will connect to the core switch. All the standard remains the same.

2nd Floor
wireless LAN

Types of Wireless Ethernet:
802.11ac

with signal radius of 2.5'

CHANNEL 1   CHANNEL 6   CHANNEL 11

with signal radius of 5'

CHANNEL 1   CHANNEL 6   CHANNEL 11

West Coast Data Centre
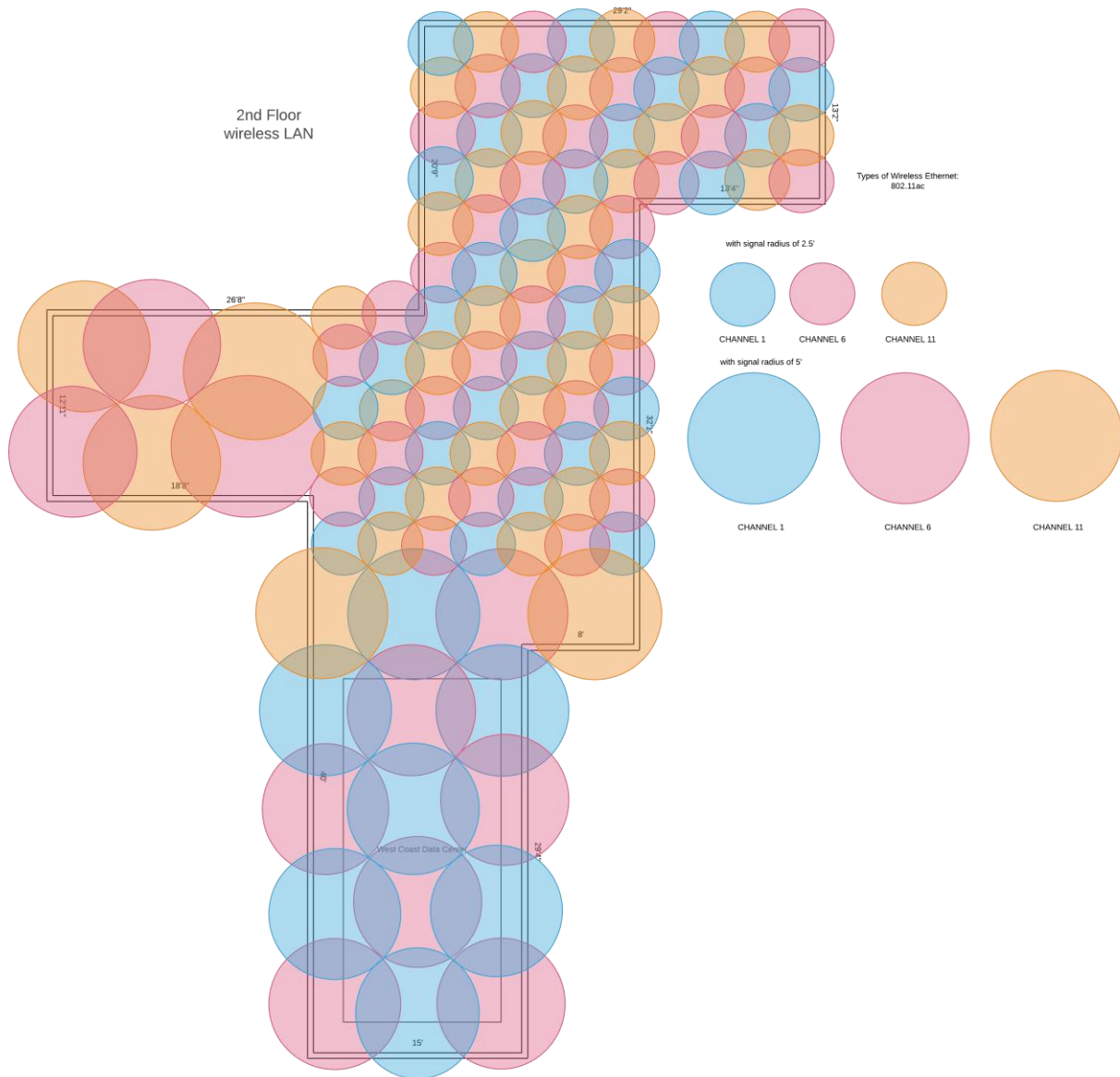
Figure 3.4: Wi-Fi Signal distribution of second floor of main building

The wired LAN is of second floor is very similar to the first floor. The difference is that all the switches in second floor is connected to the core switch on the first floor. And same reason for the Wi-Fi signal distribution as mentioned before.
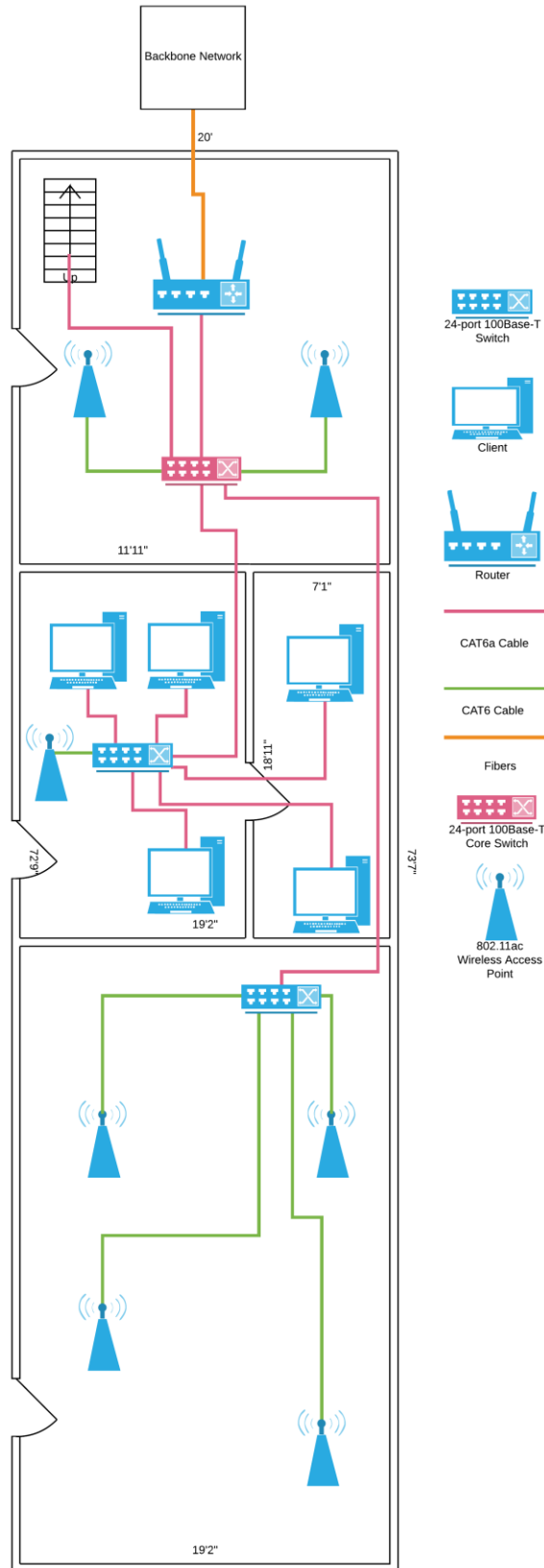
Figure 3.5: Conceptual LAN of 1st floor side building
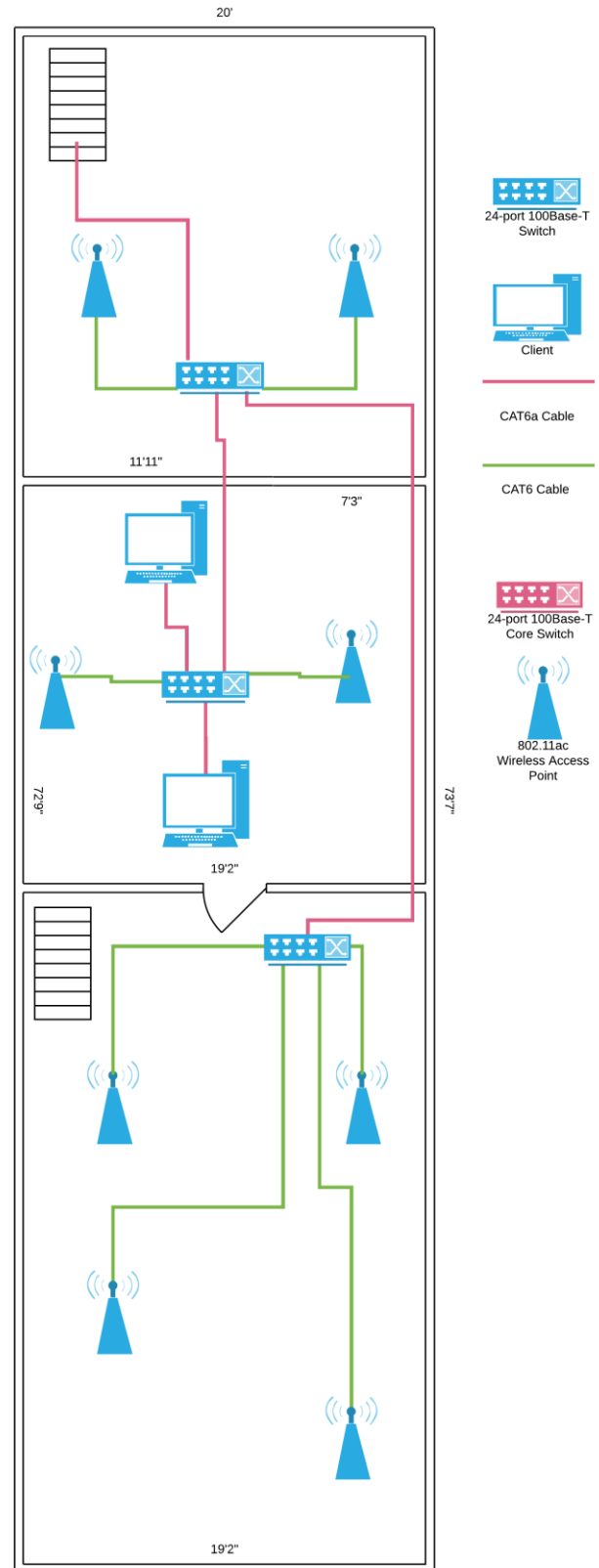
Figure 3.6: Conceptual LAN of 2nd floor side building
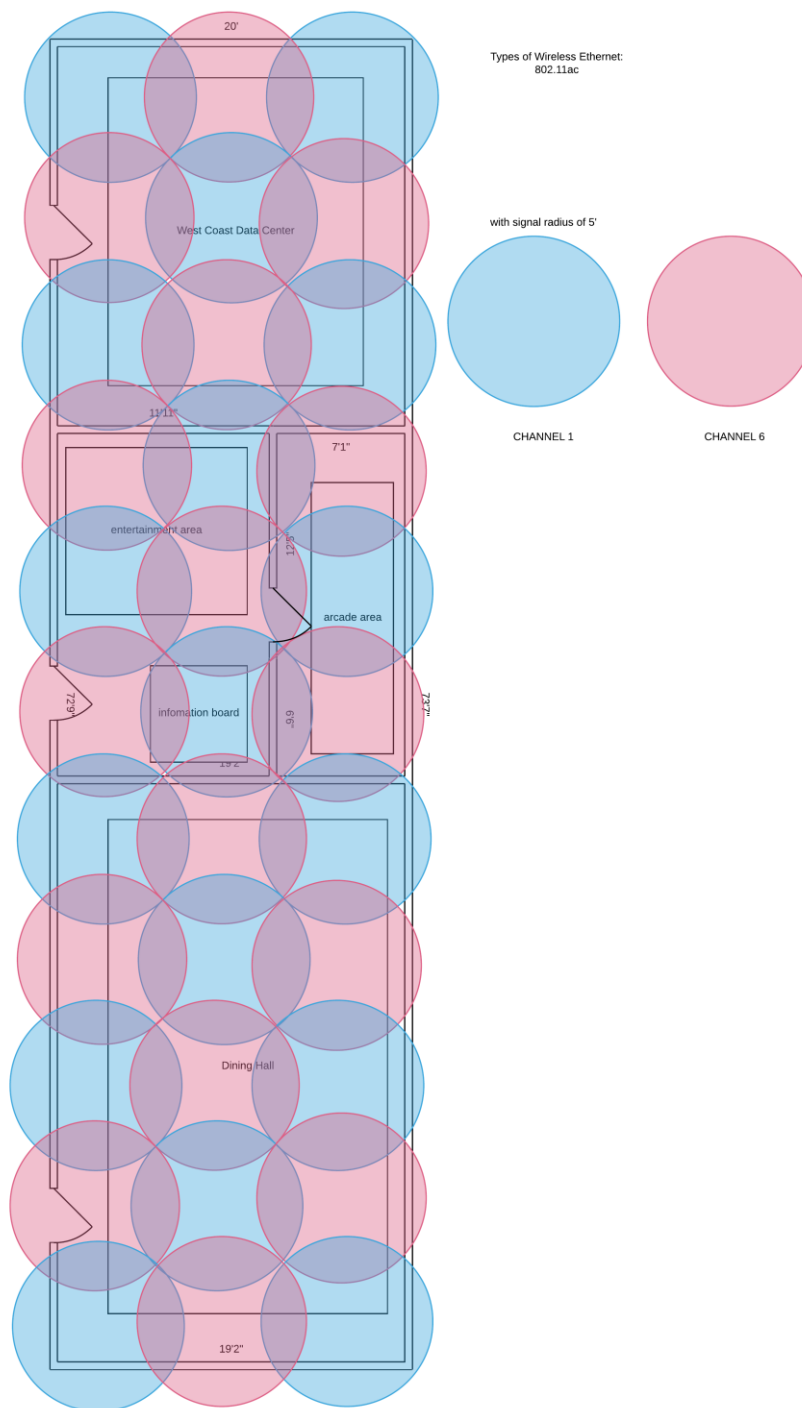
Figure 3.7: Wi-Fi Signal distribution of side building

For the side building, it is a little bit different from the main building, but the standard is the same. We have the router and core switch where data center locates. There will be no client in the dining hall, but we will have wireless AP there. And also we don't need intense Wi-Fi signal here, so each AP has a signal of 5'' radius. Both floors have the same distribution of wireless AP.

Area 4: Local Backbone Network Design

Figure 4.1: Conceptual Local Backbone Network

The Local Backbone Network is using the ring topology. CAT6a cable is using to connect between the main building and the side building because they are the closest buildings to each other and is fulfilled the requirement for using CAT6a cable. The rest of the building connection is based on optical fibers. Side building has the core router that connect to WAN Backbone Network.

Area 4-1: WAN Backbone Network Design
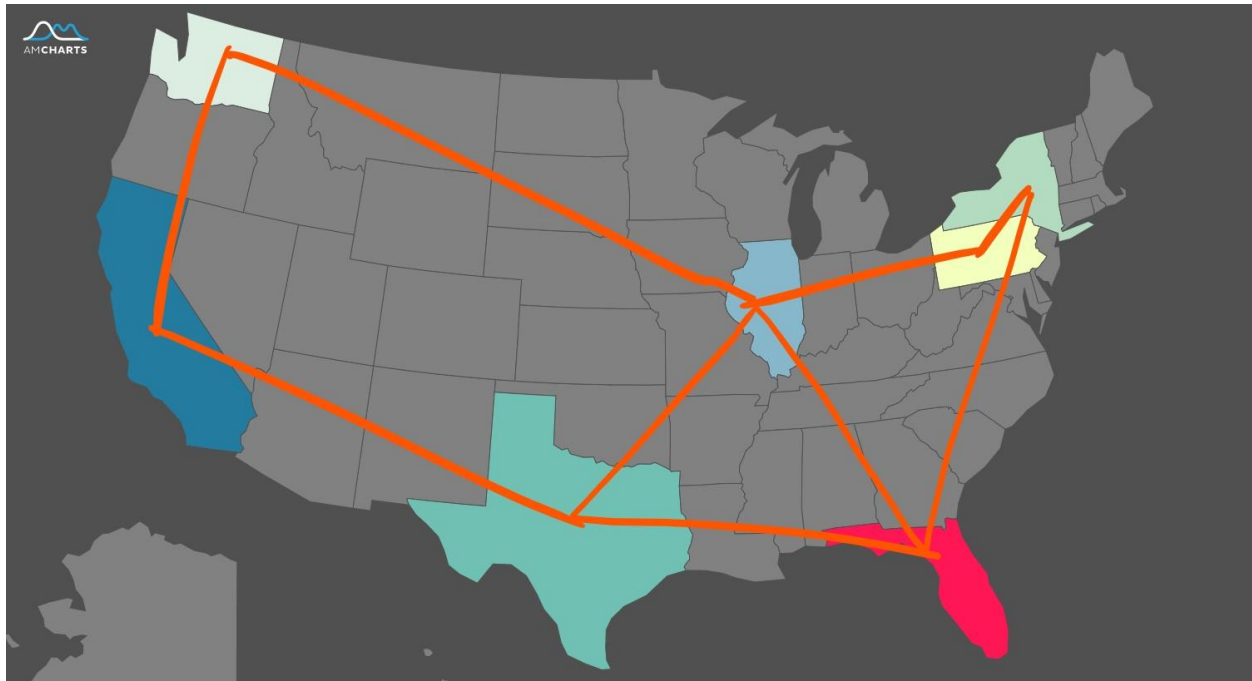
Figure 4.2: WAN Backbone Design
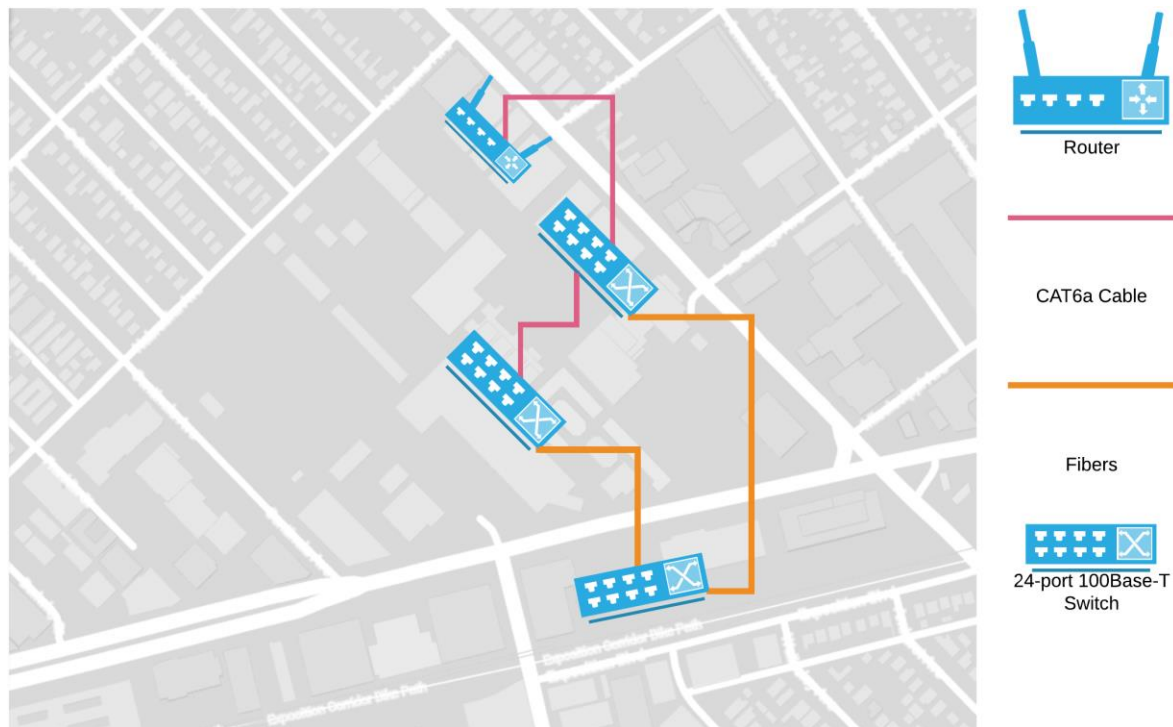
The WAN Backbone will use partial mesh topology. We have datacenters on west coast in LA, central in TX, and east coast in PA. The ISP is different in each state, depends on each situation, but mainly US Verizon and AT&T.

Area 5: Network Security and Management

Security

Asset	Importance	Most Important Security Requirement	Description	Security Tech
Customer database	High	Confidentiality	This database include all customers' records, personal information and credit card info.	All the Customer info in our mongoDB is encrypted.
Web server	High	Availability	Since we are doing video sharing platform, we need to make sure sever will be available 24/7.	DDoS protection service will be provided by Cloudflare. Also, commatube have three different data centers and servers in west, central, and east of US.
Financial records	High	Confidentiality	These records are used by the C-level executives	Anything that related to financial will be handle by third party ADP.

			and also by the VP of operations.	
Mail Server	Medium	Integrity	This is used by employees for internal communication. It is very important that no one intercepts this communication as sensitive information is shared via email.	G Suite powered by Google will be used for the e-mail services.
Employees' computers	low	availability	Each employee is assigned to a cubical that has a desktop computer in it. Employees provide customer service and support for our Web site using these computers.	Each desktop and laptop has it's unique BIOS password and users need to change that password each month.

Table 5.1: Brief sum up of security issues

Asset	Customer database		
Asset Importance	High		
Threat	Theft of information		
Description	An external hacker or a disgruntled current or former employee can gain unauthorized access to the client data and distribute it to a third party.		
Likelihood	Medium (2)		
Impact on	Confidentiality		
Impact Area	Priority	Impact	Score
Financial	High(3)	Medium(2)	6
Productivity	Medium(2)	High(3)	6
Reputation	High(3)	High(3)	9
Legal	Medium(2)	Medium(2)	4
		Impact Score	25
Risk score(Likelihood × Impact Score)	50		
Adequacy of Existing Controls	Medium		
Risk Control Strategy	Mitigate		
Risk Mitigation Controls			
Encryption	The database mongoDB is encrypted		
Firewall	A firewall is installed on the router in front of the database to prevent unauthorized access.		

Personnel Policy	All employees have their log-in credentials removed within 24 hours of their resignation or termination.
Automatic screen lock	Each employee's computer will lock if the computer hasn't been used for five minutes so that if an employee leaves his or her desk without logging off, someone else cannot gain unauthorized access to the employee's computer.

Table 5.2: Details of analyzing customer database

Asset	Web Server		
Asset Importance	High		
Threat	Overload or server down		
Description	Server may be flooded due to suddenly increased traffic or DDoS.		
Likelihood	Medium (2)		
Impact on	Confidentiality		
Impact Area	Priority	Impact	Score
Financial	Medium(2)	Medium(2)	4
Productivity	High(3)	High(3)	9
Reputation	High(3)	High(3)	9
Legal	Medium(2)	Medium(2)	4
		Impact Score	25
Risk score(Likelihood × Impact Score)	50		
Adequacy of Existing Controls	Medium		
Risk Control Strategy	Mitigate		
Risk Mitigation Controls	Description		
bandwidth	The bandwidth of server will be increased; scalable		
Servers	More powerful servers will be added as well as datacenters to balance the traffic. There's always backup servers for backup plan.		

Table 5.3: Details of analyzing web server

Management

Five common network issues

1. Managing Network Traffic
   Since commatube is an online video sharing platform, it is important to ensure that when a request arrives at the server farm, it is immediately forwarded to a server that is not busy. Therefore, we need a load balancer acts as a traffic manager at the front of the server farm. In addition, with policy-based management, the network manager uses special software to set priority policies for network traffic that take effect when the network becomes busy.
2. Reducing Network Traffic
   The Content Delivery strategy will be used here to reduce the network traffic. Google cloud CDN will be used here for delivery content to our potential users
3. VoIP quality
   VoIP may experience sound quality issue. An increasing in UDP traffic service can avoid this issue
4. Virtual Servers Monitoring

Besides physical servers and datacenters, commatube also have virtual servers. Since those servers is from third party and they are not in our sight, we need to play attention on the CPU and Memory use. Increasing the ongoing capabilities.

5. Climate Control
High temperature, humidity, even sunlight could damage the equipment. Keep an eye on the monitoring cooling equipment and other environmental values.

Personnel and Positions

There are four levels of network personnel in commatube.

1. First Line Support. Sometimes a reboot of the device is able to solve the network problem, so the reboot process goes into this category. Although this category is never associated with real problem solving, it is still an essential position for quick trouble shooting.
2. The Network Technician. For this level, staff begins to look for the problems, but besides replace the device, s/he can't do anything. So, they often contact with the staff next level to get the problem solved.
3. The Network Analyst/Engineer. Expert staff will be available in this level. They gather data from many resources and probably prepare for a permanent solution.
4. The Architect. This is the highest staff level. They are responsible for the problem that cannot be solved by analysts, like redesigns and expansions.

Managed devices

1. Managed Switches

   Managed switches give more control over LAN traffic and offer advanced features to control that traffic. The managed switches at the campus are using Simple Network Management Protocol, for monitoring the devices on the network. Since SNMP queries can determine the health of the status of a particular device, IT managers can monitor the performance of the network and quickly detect and repair network problems without having to physically interact with the switch.

2. Load Balancer or Virtual Server

   To reduce the server pressure, commatube is using google cloud load balancing. It distributes client requests or network load efficiently across multiple servers across the US. Also, it ensures high availability and reliability by sending requests only to servers that are online. Through these mechanics, user will have much better user experience.

3. Content Delivery

   To ensure that we provide user with best service, a content delivery network is implemented, which is also provided by google cloud. After using CDN, user will lower latency and higher speed for using commatube. Since speed matters for an online service company, ensuring a consistent experience for all users is important.

Other requirements

1. Perform Regular Check

Commatube should perform a device health check twice a year to ensure the devices are in normal functions.
2. Setup Alerting
Commatube is not a company that have people work for 24/7, therefore we need setup alerting or warning on any necessary device or traffic.
3. Limit Budget
Limited resource has been put on the network maintenance. Department or managers should use those budget wisely and create priority on the network devices.

Overall Organization

To sum up, the ISP of Commatube can be Verizon or AT&T. Cisco's products will be generally used in Commatube, which including its switches, routers, wireless AP, Unified Communications, etc.. CAT6 and CAT6a cable will be used in the building, and fibers will be used to connect local backbone and WAN backbone network. A bandwidth of 18Gbps will be used in Santa Monica campus. In addition, commatube is also support sustainability and using environmental friendly products.

Reference

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