Apollo Residence
Network Design
Team 12

List of Items to Purchase

Floor 1

Description	Unit Cost	Number Used	Cost
Ethernet 10/100/1000 Base-T 24 (Wired)	200	1	200
UTP Cat 5e	50	1	50
WAP with POE	100	1	100
UTP Cat 5e	50	1	50
Upgrade switch to POE	75	2	150
Ethernet 10/100/1000 Base-T 24 (Switch)	200	1	200
Ethernet 10/100/1000 Base-T 8 port router	150	1	150
Total			**$900**

Floor 2

Description	Unit Cost	Number Used	Cost
Ethernet 10/100/1000 Base-T 24 (Wired)	200	0	0
UTP Cat 5e	50	1	50
WAP with POE	100	5	500
UTP Cat 5e	50	6	300
Total			**$850**

Floor 3-8

Description	Unit Cost	Number Used	Cost
Ethernet 10/100/1000 Base-T 24 (Wired)	200	18	3600
UTP Cat 5e	50	330	16500
WAP with POE	100	24	2400
UTP Cat 5e	50	24	1200
Upgrade switch to POE	75	6	450
Total			**$24,150**

Network Management

Product	Unit Cost	Number Used	Total Cost
Add SNMP to any device	$200	1	$200
SNMP Device Management Software	$2,000	1	$2,000
Bandwidth Shaper (runs at 1 Gbps)	$1,000	1	$1,000
Cache Engine (runs at 1 Gbps)	$1,000	1	$1,000
Total			**$4,200**

Total Cost for Building **$30,100**

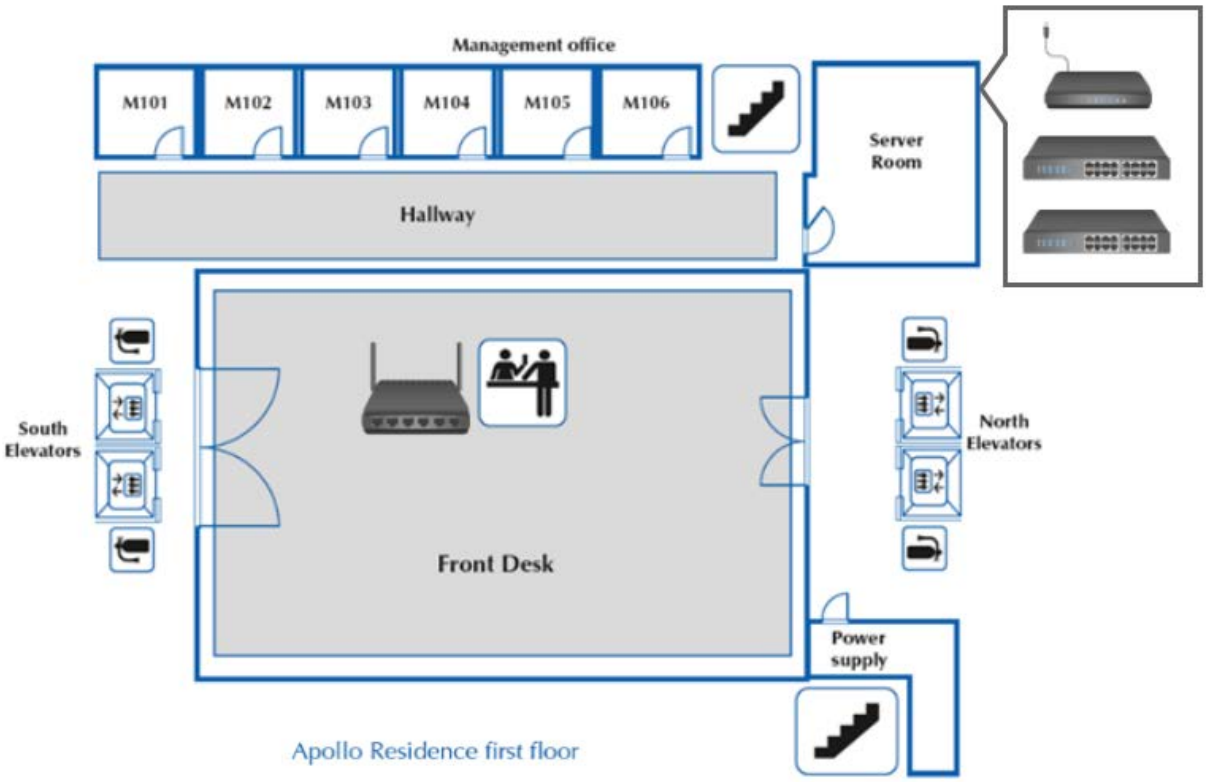
Floor 1

Logical Design

Wired LAN 1

WiFi 1 (WiFi will also reach down from the second floor)

Backbone 1 (located in 1st floor server room)



Wireless Access Point

Switch

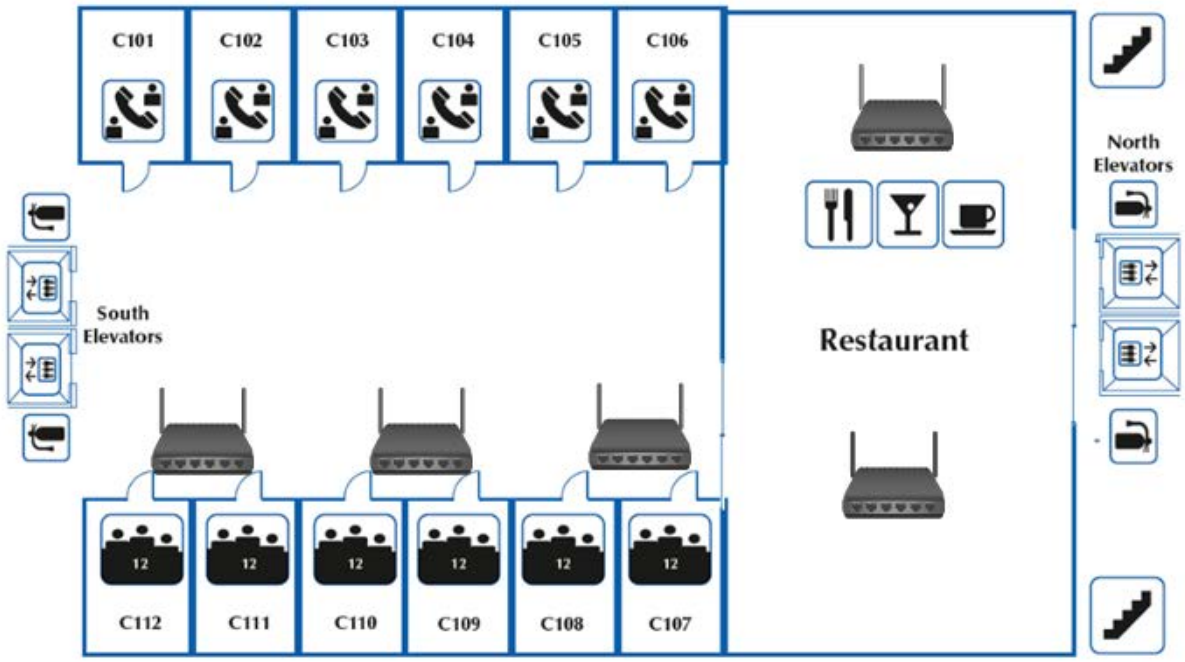
Router

Floor one has one WAP with POE for the front desk area. Floor one also shares the WAPs from floor two because we expect that during some time period, the WAP of floor two's restaurant and office may not experience heavy traffic. The server room contains the backbone switch of the building that connects the building to the rest of the world, as well as one switch that serves both the first and second floors.

Floor 2

Logical Design

WiFi 5



Apollo Residence second floor

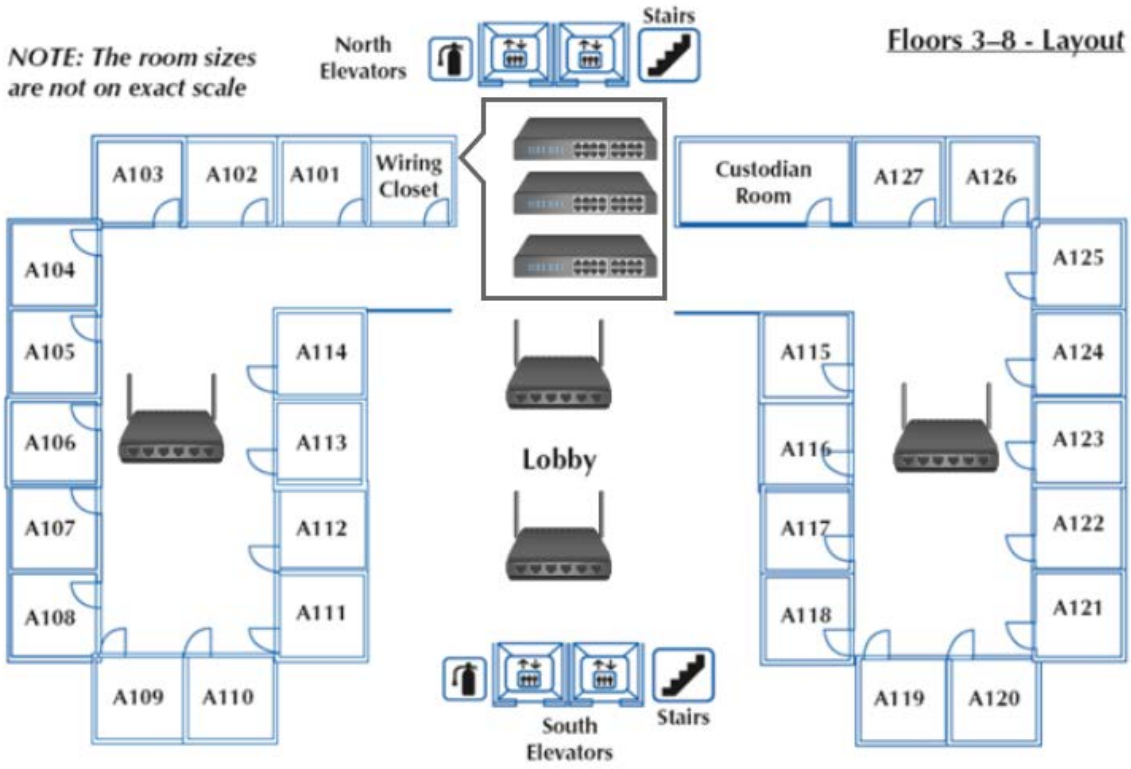
Floor 2 contains numerous conference rooms for meetings and a restaurant that is open to the public. To accommodate the multitude of users who will use WiFi in the restaurant and in the conference rooms, we have five WAPs all with POE. Having this amount of WAPs will allow those on this floor to use the wireless internet with fast speed no matter where they are or who they are with. Most of the WAPs will be located in the section of the floor with conference rooms because the staff will need quick internet speed during their meetings to avoid delays, which could cause lost business. The WAPs and cables used to connect them will be connected to and shared with the switch on the first floor.

Floors 3-8

Logical Design

Wired LAN 18 (3 for each floor*6 floors)

WiFi 24 (4 for each floor* 6 floors)



On floors 3-8, each floor has 27 two-bedroom apartments, thus there will be at least 52 wired connections. We choose three 24-port Ethernet switches for each floor. This will allow plenty of ports for the needed wired connections as well as room for growth with added WAPs or desktops. Additionally, in order to provide a better network, we added four WAPs on each floor: one for the left side, one for the right side, one in the lobby close to apartments, and a final wireless LAN in the middle of each lobby. This WAP will provide unsecured internet so that guests can connect and have a decently good connection to internet on each floor. By doing so, both residents and visitors can use wifi conveniently. This also provides a backup in case the secured network gets overloaded and a student just needs a quick way to surf the web.

Activity 9 - WAN

The Apollo Residence needs consistent, reliable service, but does not necessarily have constant predictable data, so we chose packet switched.

WAN Service
Ethernet 50 Mbps $1000 (*6 locations + 1 to ISP) = $7000/month
Ring pattern (not mission critical if the network goes down for an hour)

Activity 10 - ISP

Internet Service
DSL 50 mbps up, 50 mbps down $400 * 150% = $600/month
(They will need equal upload and download speeds to share information with the other schools in the WAN. It's not super important to have extremely fast internet because the students are working on school projects that are not essential to security or business.)

Activity 11 - Considering Security

Physical security

- There will be key card locks at each door and before getting onto the elevator.
- WAPs will be connected into the ceiling with security cables.
- WiFi will be secured, except for the two lobby public WiFi routers. Staff and students can use network ID and password to access the secured WiFi.
- Cameras in lobby areas, stairwells, and hallways that will be secured with security cables.
- To get into the building itself after 9:00 PM, must scan in key card.
- Key card must be used to access Floors 3-8 on the elevator
- Administrator office on 1st floor has a separate switch from the rest of the floor.
- Desktops in management office and front desk will be locked down with security cables
- Drawers at front desk will be locked and must have key to unlock it
- Management offices are locked the worker leaves each night and must use a key to unlock

Data Security

- Firewalls on each router, anti-virus software offered free to students
- Employees in management offices required to take training courses and update security software and patches periodically
- Detector and analyzer in switches to detect attacks and filter incoming packets
- Two-step login required for students, staffs and faculties to use secured network

Prevention

- Disaster drills for circumstances such as tornado, earthquake, fire, flood, power outage
- Plan if network goes down and have backup
- Recovery plan for disasters
- Backups saved at an offsite Data Center, which is built to withstand a F5 tornado and built away from fault lines and flood zones
- Mandatory training on data security and intrusion prevention will be provided to workers and for students during first week they start at the school

Activity 12 - Network Management

We will be adding SNMP to the backbone switch so that we know if any of the devices connected to its ports fail. This will not tell us exactly which device fails if there is a problem, but we will know which port has the error and will be able to shut it off. Because this is an apartment complex, it is not mission critical if part of the network goes down for an hour or so.

This also helps eliminate the need for a redundant network because we will know immediately which area of the network has failed. Again, because school deadlines can be moved if the network goes down, we do not think it is critical to install backup switches and routers for the building. We assume the campus will be able to acquire and install replacement parts in a reasonable amount of time if they were to break.

We will also be adding a bandwidth shaper that runs at 1 Gbps (adequate because this is much faster than our internet connection) because we don’t want 1 or 2 apartments to take up all the network capacity by streaming HD video. We will write a rule limiting the maximum bandwidth an apartment can use. We will also be adding a cache engine to save graphics or layouts that many people are requesting. This will help reduce waste of network capacity and improve user experience so that pages load faster because they are stored temporarily on campus.