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Contents

1. Introduction

Every conceivable facet of human activity is taken into account while designing network topologies. The family, the marketplace, the workplace, and the classroom all have their very own distinct networks that make it possible to integrate the various resources that are readily available. The extent of an organization's capacity to network successfully has a substantial consequence on the level of commercial success the organization enjoys. The effectiveness of the network, as well as its capacity for communication, can be improved by proper planning. The use of Internet Protocol (IP) addresses allows for the effective routing of data packets across networks that are based on the TCP/IP protocol suite. In order to effectively control and direct traffic in a network, routers are an absolute necessity. It is now common practice for employers in both the public and commercial sectors to provide their employees with access to internal networks as well as computers in order to enable those employees to carry out the day-to-day responsibilities that are involved with their jobs. Because of the contributions that this technology made, we were able to considerably cut down the amount of time it required to do activities and enhance the efficiency of our business processes. The company is still having difficulty overcoming a variety of issues, and the network is one of those issues. According to Honni and Johanes(2016), the CISCO VLAN Link Protocol makes it simpler to execute administration tasks in switched networks. With the assistance of a security solution that goes by the name of virtual local area networks, or VLANs for short, it is possible to avoid the issue of authentication. Virtual local area networks, often known as VLANs, allow the administrators of a network to produce a certain level of isolation by isolating hosts across various broadcast domains. This is made possible through the use of VLANs. This is because virtual local area networks (VLANs) provide for a great deal of variety. Virtual local area networks (VLANs), which can be used to partition a large network into numerous smaller networks that function independently of one another, can assist minimize network traffic by reducing the number of broadcasts that are delivered to each network device.

T1-Building-block network design process

In the network design for each floor of the three-floor hotel, the components and their placements are as follows:

First Floor:

- Core Switch: The core switch is located in the Data Room on the first floor. It serves as a central point for connecting all the distribution switches and access points on this floor.
- Access Points: AP1, AP2, and AP3 are positioned on the first floor to provide wireless network connectivity to guests, staff, and management.

Second Floor:

- Distribution Switch: The distribution switch is placed in the Telco Room on the second floor. It connects to the core switch and facilitates network connectivity for devices on this floor.
- Access Points: AP4, AP5, and AP6 are deployed on the second floor to offer wireless access to users.

Third Floor:

- Distribution Switch: Similar to the second floor, the distribution switch is located in the Telco Room on the third floor. It connects to the core switch and provides network connectivity for devices on this floor.
- Access Points: AP7, AP8, and AP9 are positioned on the third floor to enable wireless network access.

Common Components:

- Ethernet Cabling: The Ethernet cables are used to establish connections between the core switch, distribution switches, and other network components on each floor.

- VLANs: VLAN 10 is designated for guests, VLAN 20 for staff, and VLAN 30 for management. This allows for segregation of network traffic and security purposes.
- Internet Connectivity: Each floor of the hotel is equipped with high-speed internet connectivity obtained from an Internet Service Provider (ISP).

1.1 Network Architecture Components

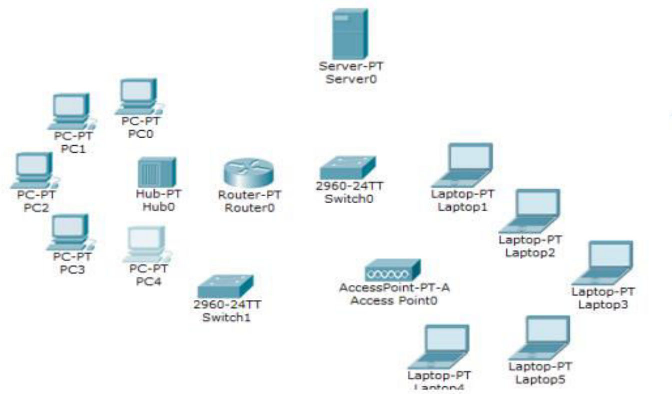


Figure 1 Components network

network design components for each floor of a three-floor hotel:

Component	First Floor	Second Floor	Third Floor
Core Switch	Located in Data Room		
Distribution Switch		Located in Telco Room	
Access Points	AP1, AP2, AP3	AP4, AP5, AP6	AP7, AP8, AP9
Ethernet Cabling	Connected to Core Switch and		

	Distribution Switches		
VLANs	VLAN 10 (Guests)	VLAN 20 (Staff)	VLAN 30 (Management)
Firewall		Located at Network Entry Point	
Internet Connectivity	High-speed connection from ISP		

The Access Layer is responsible for connecting users to the network, whether they do so by wired or wireless means. use gadgets like routers, switches, and wireless access points. The distribution layer is responsible for transmitting data packets to and from LANs via the same infrastructure. However, switches are usually quicker than LAN nodes because of the increasing traffic loads on the building's backbone. On this level, we employ a switch. Because it carries so much more data, the core layer connecting the buildings on a campus is typically quicker than the building backbone. To get here, Layer 3 switches are utilised. A company's data centre houses all of its servers (including those that manage the company's email and database needs). It is situated on the business premises and is connected to the mainframe at lightning speed.Online consumer participation gives online stores a competitive edge.

1.2 Application Systems

Based on the needs of the Melbourne hotel enterprise, the following application systems may be necessary:

- Property management system
- Reservation system
- Point of sale system

- Accounting system

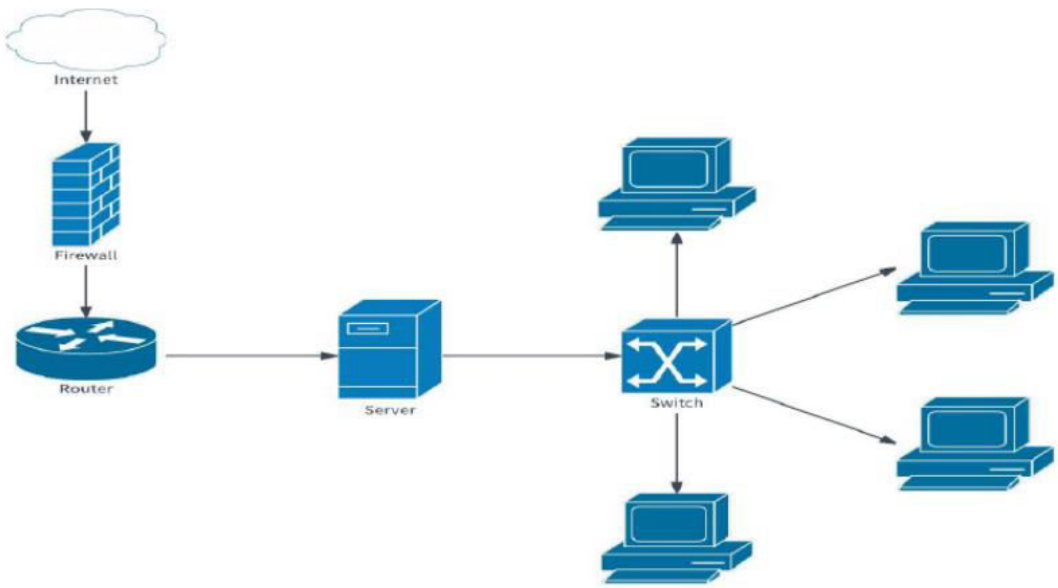
Application Number	Name of Application	Type of traffic Flow	Protocol use by Application	Employee that use the application	Data Stores (Servers, Host)	Approximate Bandwidth Requirement
1	File Sharing	Client/Server	FTP	ALL employee	Servers	52Mbps
2	Mail Sharing	Client/Server	SMTP,	All employee	Host	256kb
3	Web Browser	Client/Server	HTTP, FTP	All employee	Host	5 Mbps
4	Payroll	Client/Server	FTP	Finance Section	Server	0.5 Mbps
5	Desktop Video Conferencing	Client/Server	TCP, UDR	Management	Server	4 Mbps
6	CRM Software	Client/Server	FTP	Marketing Department	Server	300Kbps

1.3 Network Users

The network users for the Melbourne hotel enterprise campus may include hotel staff, guests, and third-party service providers. The company's primary network user is management, while the rest of the staff are considered secondary users who will only consume the data generated by the network. A firewall will be installed to safeguard any information coming into and leaving the business. The Internet service is provided by the telecoms company. Nearly the same amount of the current network traffic in each region will be replaced by the future traffic expected to be created there. It is essential to work together on paperwork, correspondence, payroll, etc. Access to the web, desktop video conferencing, and electronic mail are all convenient but not necessary.

1.4 Categorizing Network Needs

The LAN will allow workers to connect to the internet from any location in the office. The proximity of the computers eliminates the need for costly hardware and wires to connect them. The company will provide a wireless access point for employees to utilise with their personal mobile devices and wireless printing equipment. My recommendation is to use Workgroup Network because, ultimately, every computer is the same. A shared pool of resources can be contributed to and used by any system. For corporate networks, this is the norm. No additional hardware or software is required for setup.One of the system's biggest flaws is the subpar security it provides. That's why we use firewalls: to prevent unwanted intrusions.



1.5 Deliverables

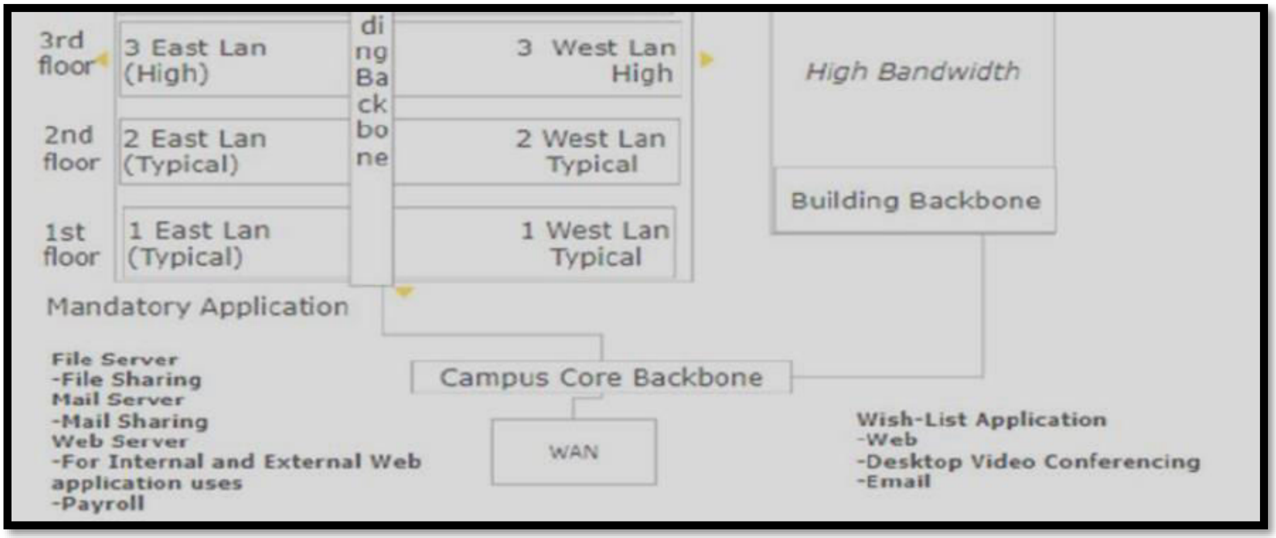


Figure 2 Logical design

T2- Design the physical design of the network based

Based on these considerations, the following logical design for the Melbourne hotel enterprise campus network could be proposed:

2.1 Designing Clients and Servers

Client-server refers to a network architecture in which several clients make service requests to a central server (the "Server Room"). Users of various services can interact with those servers through client PCs and view the resulting visual data. Like client servers, host servers await requests before acting on them. The host server's physical location is immaterial to the location of the client PCs. In most cases, the host server is equipped with state-of-the-art hardware, allowing for lightning-fast data transfers. High-end computers are given to individuals who generate a lot of network traffic, whereas medium-level machines are given to those who use the network infrequently. Multiple users can access the database at once since both the client and the host server are high-intelligence computers.

2.2 Designing Circuits

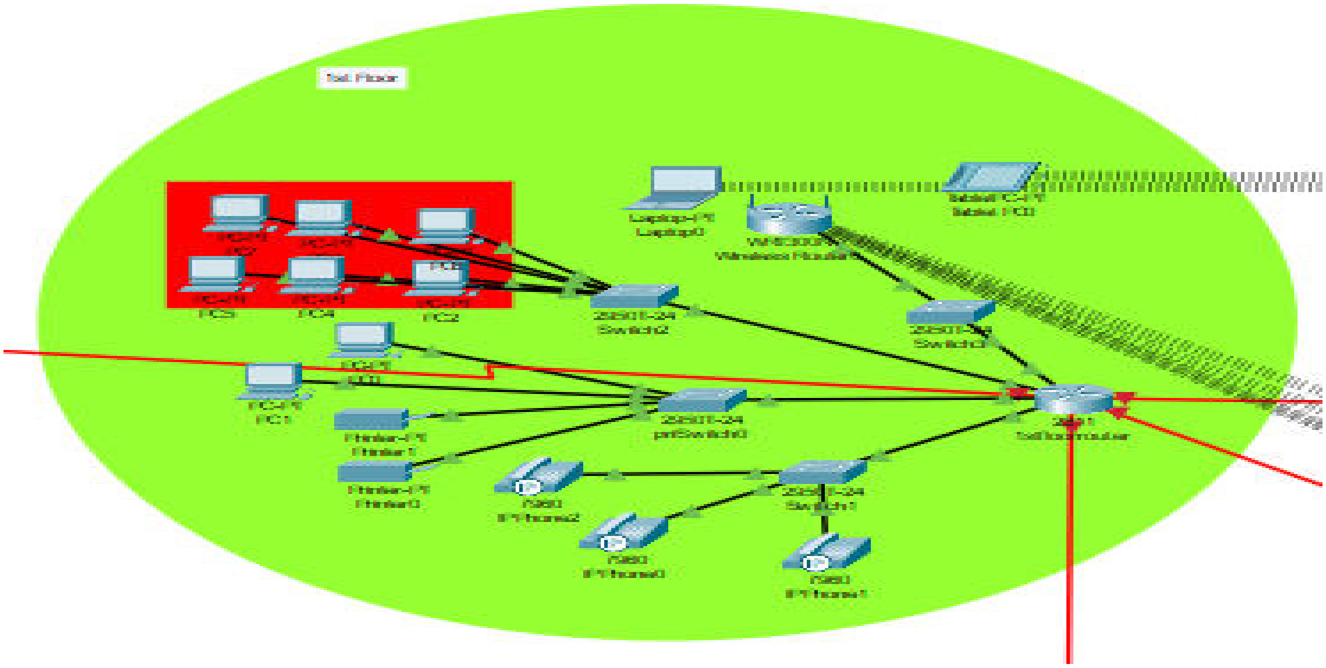
A single server (the "Server Room") handles service requests from several users by allocating system resources as needed. Users of various services can interact with those servers through client PCs and view the resulting visual data. Like client servers, host servers await requests before acting on them. The host server's physical location is immaterial to the location of the client PCs. In most cases, the host server is equipped with state-of-the-art hardware, allowing for lightning-fast data transfers. High-end computers are given to individuals who generate a lot of network traffic, whereas medium-level machines are given to those who use the network infrequently. Multiple users can access the database at once since both the client and the host server are high-intelligence computers. There are a total of 24 computers in the office building, along with 4 Internet routers and 2 printers on each floor. A VLAN based on a physical star topology was set up. To meet the specifications, a wireless IEEE 802.11ax network will be set up in both of these structures. Now, the system features both heavily travelled and less used nodes. A 10 Gbps layer 2 two switch (Distribution/backbone layer) will connect computers and printers on the second and fourth floors of a busy office building. The cables used will be Cat 6, 10 BASE-T ethernet. A typical traffic network would use 1000 Mbps Layer 2 switches (Distribution/backbone) and Cat 6, 1GBASE-T ethernet cable connectivity throughout the rest of the office building, while the administration building would have identical 1 Gbps layer 2 switches (Distribution/backbone) and Cat 6, 10 GBASE-T connectivity with computers and printers (Access Layer).Models with 48 ports are available so that the switch can grow with the number of connected computers without the need for immediate replacement. Due to the adoption of IEEE 802.11ax, all access points will communicate with the distribution switch through Cat 7 ethernet cable. Since wireless networks are limited to 14 Gbps by IEEE 802.1ax, upgrading the network's speed requires merely updating the Access Point switch for the relevant VLANs rather than installing new cables. The high throughput of the switches in this network allows Aps to offer 10/100 Gbps for frequently trafficked floors and 1/10/1000 Mbps for ordinary floors. All of the backbone switches can now link to the 100 Gbps layer 3 switch (the campus core backbone) via 10/100 Gbps optical fibre, allowing for more even distribution of network traffic across the building.

2.3 Network Design Tools

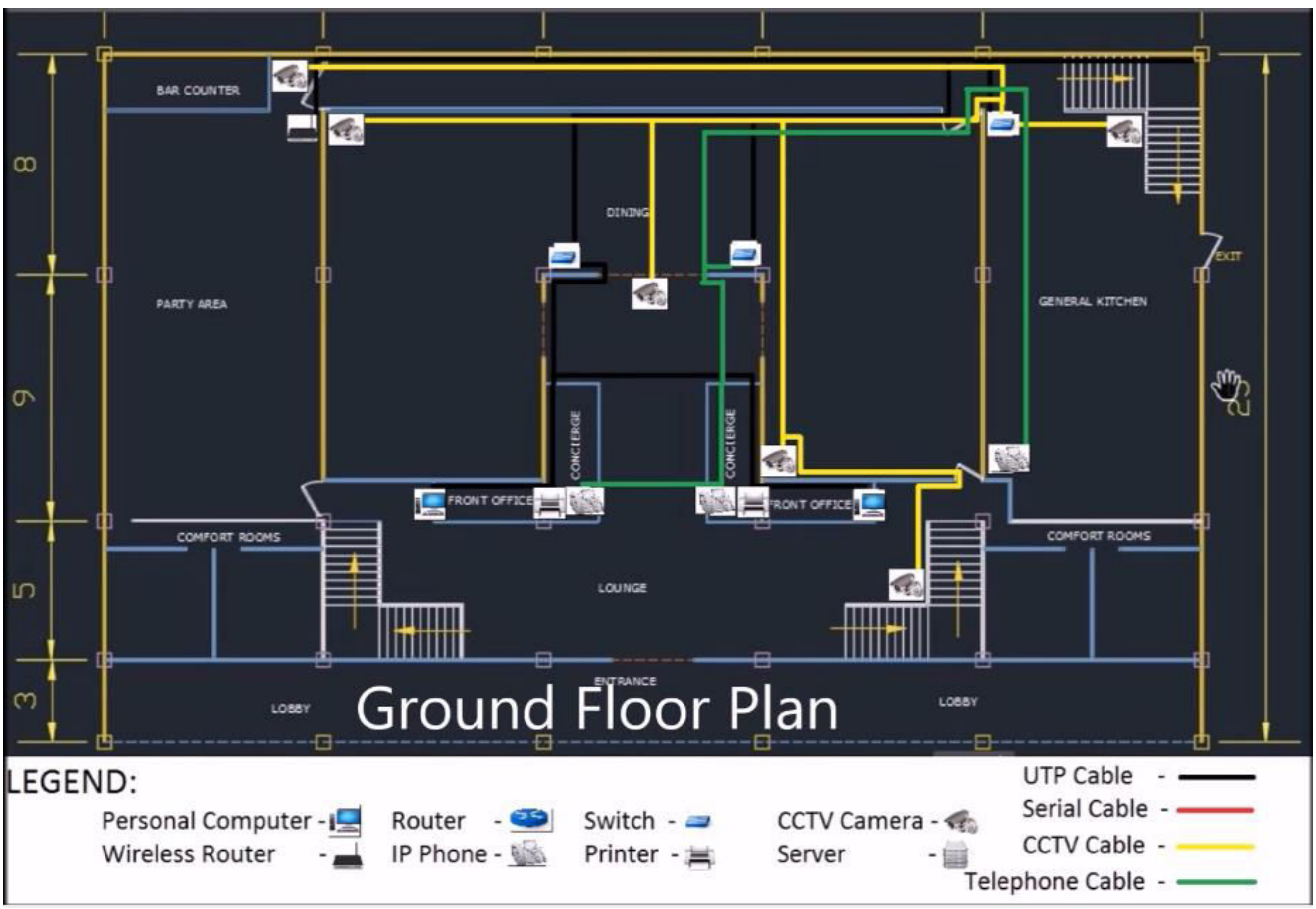
Network design and modeling tools have a wide range of applications in the design and modelling of interconnected systems. These days, designers can find everything they need to do their jobs online. You can choose between a free version and a paid one. The client needs certain modelling tools to create a hand-drawn network diagram. The client is responsible for providing details on the network's servers, clients, circuit diagrams, and other components. ConceptDraw Pro and SmartDraw are two such software. In addition, there are tools that can locate an existing network. In this scenario, the client provides the first starting point, and the programme uses that starting point to navigate the current network and automatically build or draw the network diagram. The client can choose a new network diagram after the current one is complete. When the current network diagram is extremely complex, these modelling applications become particularly useful. After finishing the diagram, you should include data about the expected volume of network traffic and evaluate its completeness. Network Performance Monitor, OpManager, and OpUtils are only a few examples of such programmes developed by SolarWind. As an alternative, you may use some sort of simulation modelling programme. This mathematical approach to network design mimics the behaviour seen in the actual world. After the simulation is complete, the user can look at the results to gain an approximation of the expected response and performance times. The results it predicts may or may not coincide with the real ones. The client can fix the problem by making changes to the network's blueprint and running the simulation again. Additionally, sophisticated modelling applications pay extra attention to trouble spots, such as bottlenecks. There are a number of different programmes that do this.

2.4 Deliverables

The deliverables for the physical design of the network for the Melbourne hotel enterprise campus could include:



Ground floor Topology



Ground floor Legend

Second Floor

1 router,3 switches,2 wireless routers,3 CCTV,IP-phones.

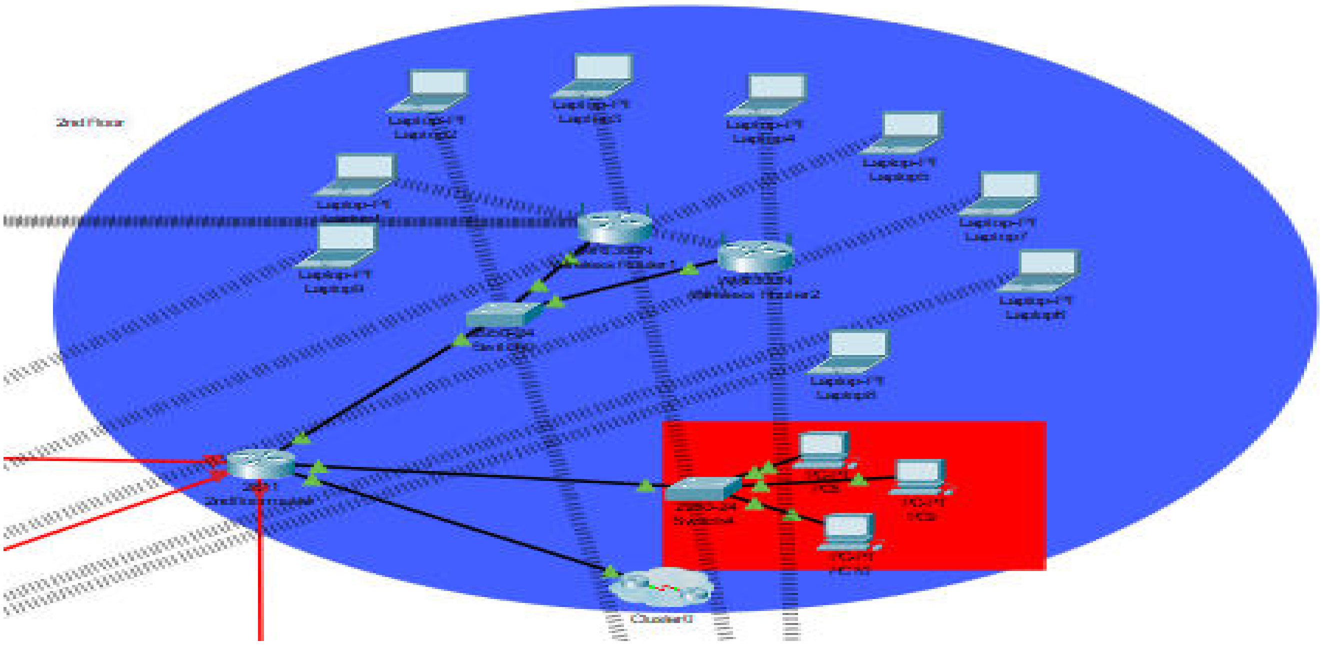
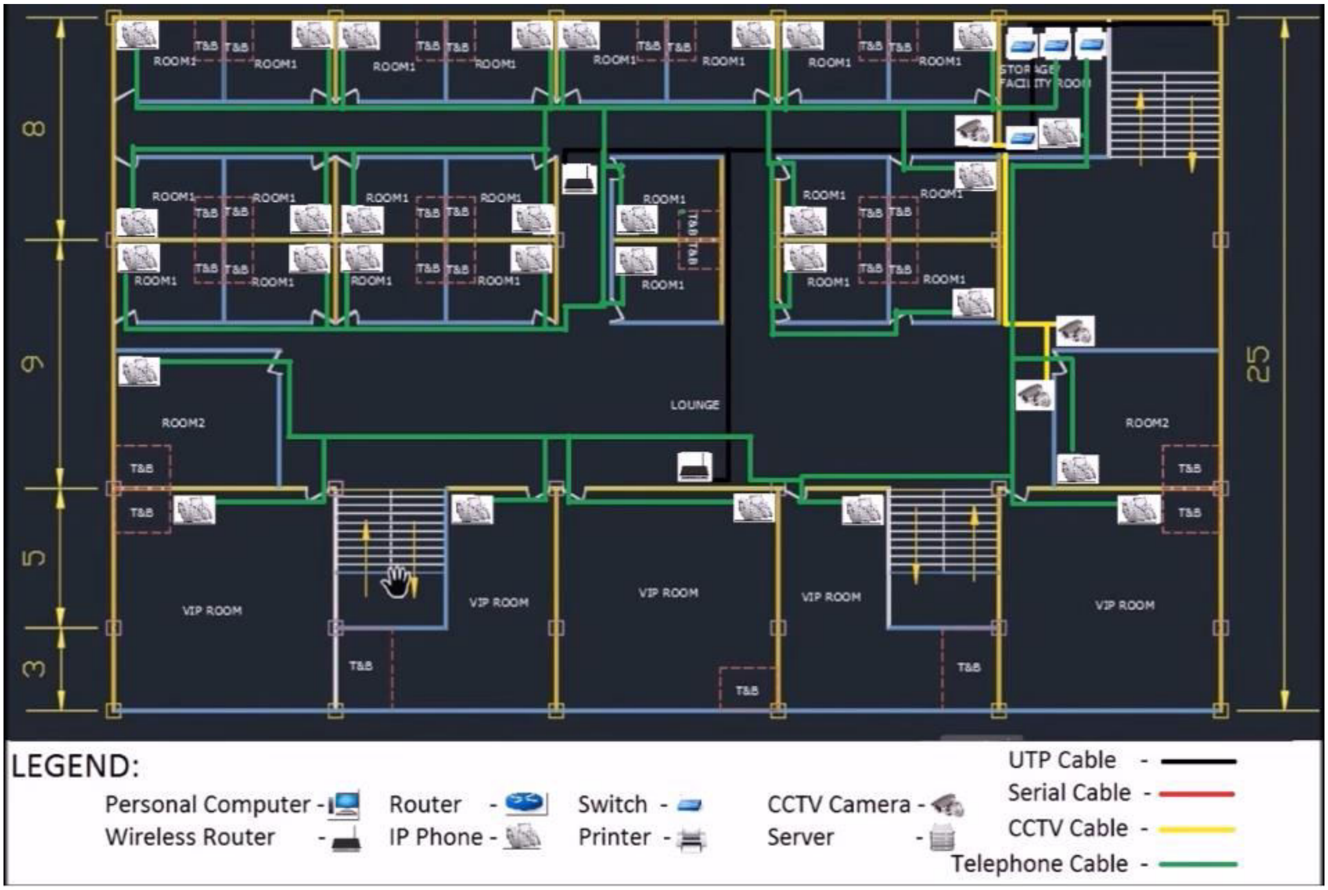
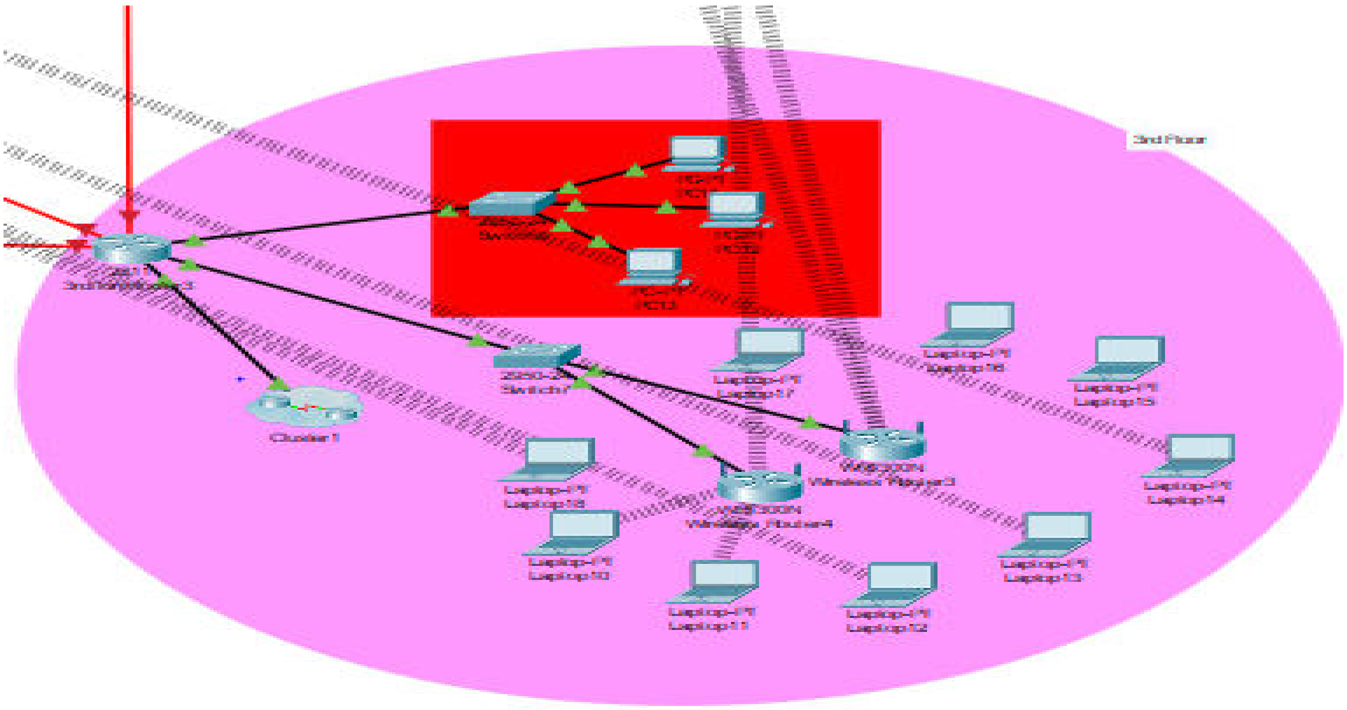


Figure 6: Second floor topology

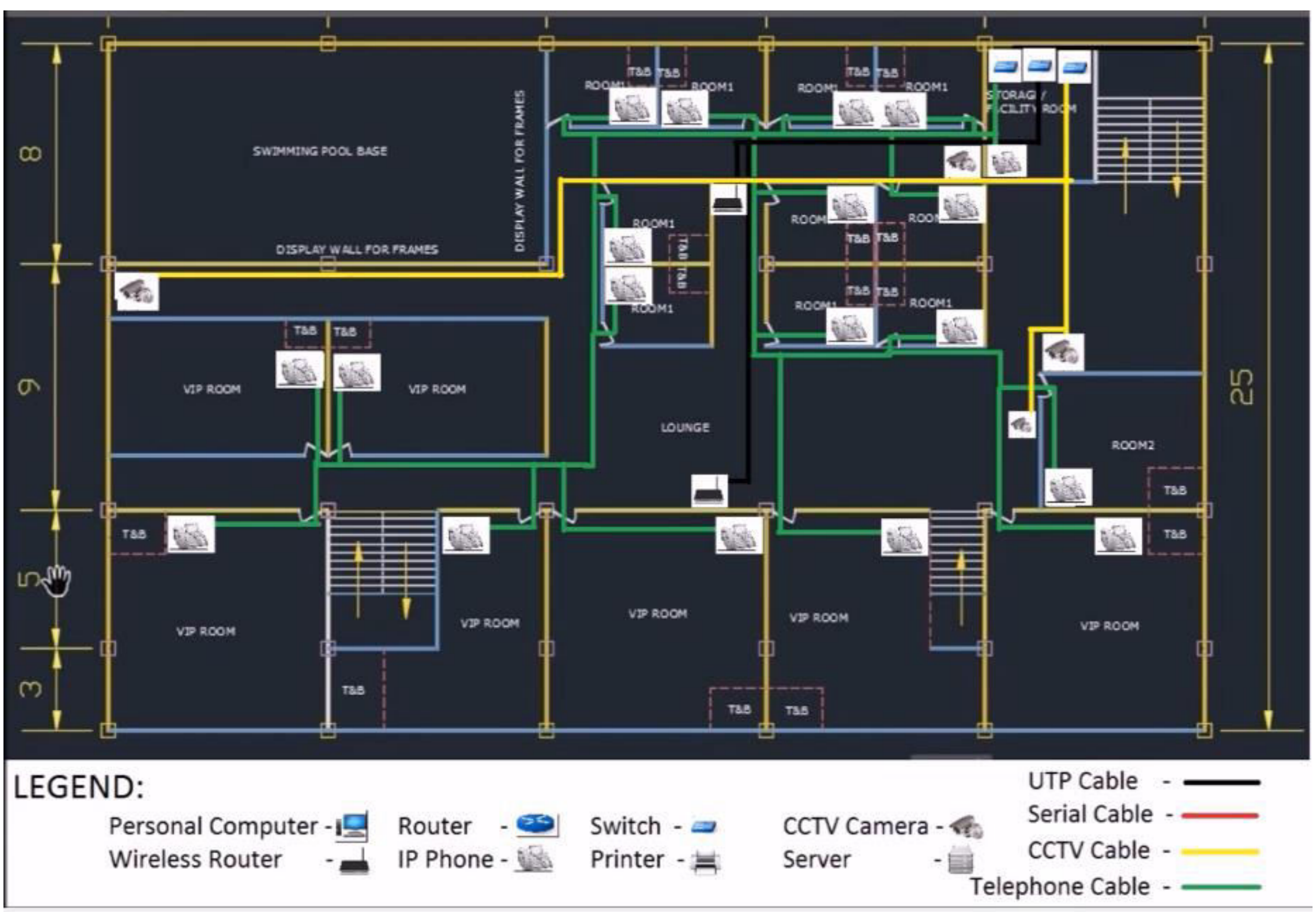


Second floor Legend

3rd Floor:

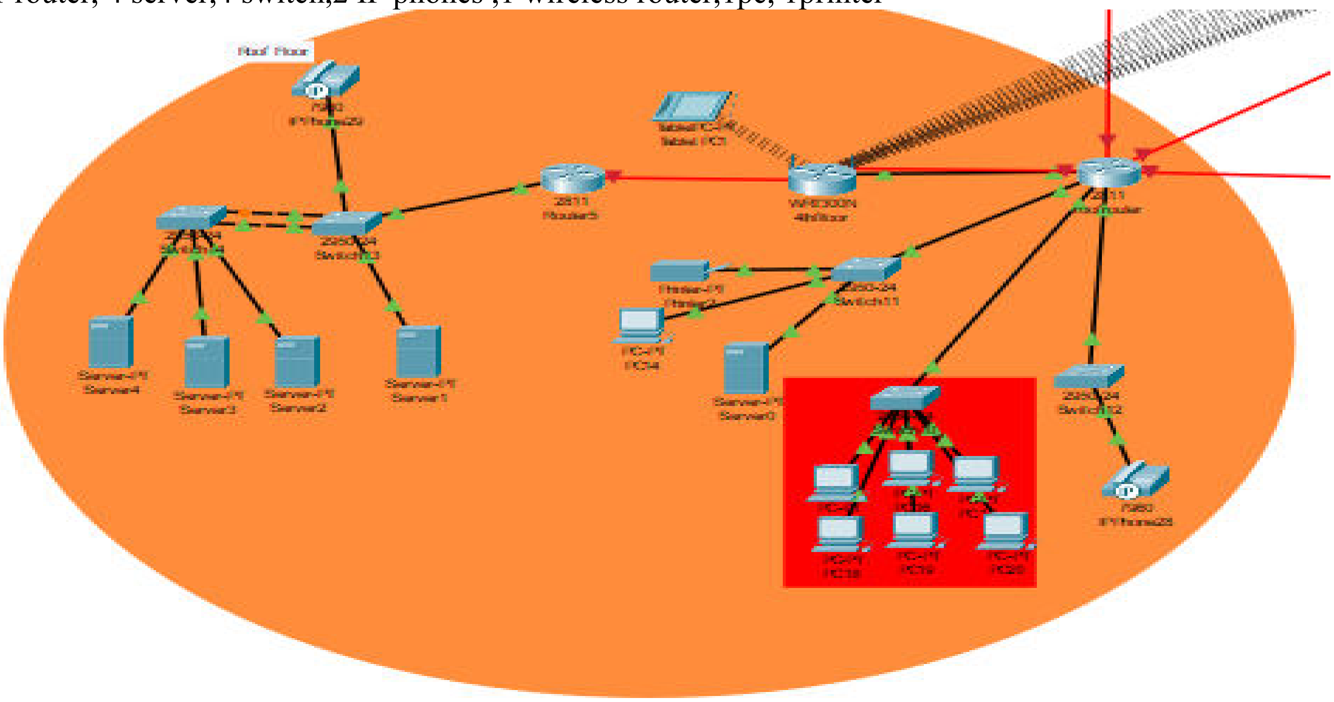


3rd Floor Topology



:3rd Floor Legend

1 router, 4 server,4 switch,2 IP phones ,1 wireless router,1pc, 1printer



Rooftoop Topology

T3- Interference from Wi-Fi access points (APs)

Minimize interference from Wi-Fi access points (APs) on different floors of a LAN network in Melbourne hotel, several strategies can be employed:

1. Channel Selection: Ensure that each AP is configured to operate on a different non-overlapping Wi-Fi channel. This helps to reduce interference between APs on different floors. By selecting channels wisely, you can allocate frequencies that minimize overlapping signals and optimize the overall network performance.
2. Signal Strength Optimization: Adjust the transmit power of each AP to limit the coverage area to its intended floor. By reducing the signal strength, you can contain the Wi-Fi

coverage within each floor and minimize the chances of interference bleeding over to adjacent floors.

3. Physical Placement: Strategically position the APs on each floor to ensure optimal coverage within the designated area without overlapping too much with APs from neighboring floors. Placement considerations should include factors such as building materials, obstructions, and the size and layout of the floors.

4. Antenna Selection and Orientation: Choose appropriate antennas for the APs that can provide directional coverage and focus the Wi-Fi signal towards the intended floor. Directional antennas can help minimize signal spillage to other floors and reduce interference.

3.1 Setting Up VLANs

On page 11-8 (n.d.), a section titled "VLAN Configuration Guidelines" details various rules that must be adhered to while adding or removing VLANs from a network. The switch module can handle 1005 unique VLANs.

Ethernet VLANs that are inside the "normal range" are designated by numbers between 1 and 1001. Only the numbers 1002–1005 may be used in VLANs for usage with Token Ring and FDDI.

The switch module does not support the media types Token Ring or FDDI. • VLAN configurations for VLANs 1 to 1005 are always saved in the VLAN database and in the switch module running configuration file; the switch module does not forward traffic in the FDDI, FDDI-Net, TrCRF, or TrBRF formats. All VLANs are affected by this.

• Extensive range VLANs (IDs 1006-4094) have a limited set of configuration choices, including just MTU, RSPAN VLAN, private VLAN, and UNI-ENI VLAN. The database that keeps track of VLAN information does not include extended-range VLANs.

• By design, the Spanning Tree Protocol (STP) is enabled in every VLAN only for NNIs. STP setup is optional on ENIs. NNIs and ENIs inside the same VLAN share spanning tree instances. The switch module can accommodate up to 128 spanning-tree instances. If a switch module is configured to allow fewer spanning-tree instances than the number of active VLANs, the spanning-tree protocol will be enabled for just 128 of the VLANs and disabled for the rest.

T4 Assumptions

Packet Tracer is a visual simulation tool that was developed by Cisco Systems. In order to build this project, we will use Packet Tracer, which is a cross-platform application.

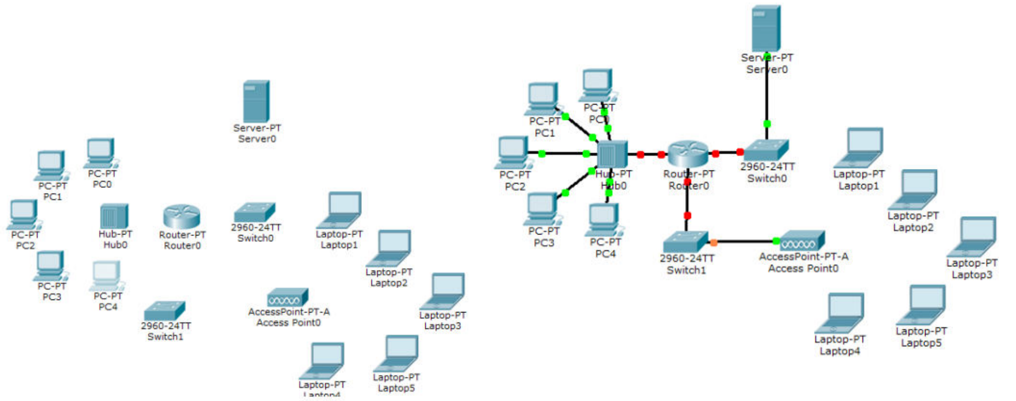


Figure 4 LAN components

The following step that has to be taken is to configure the IP address for the local area network (LAN) on the personal computer (PC), as well as the IP address for the server that is utilizing fast Ethernet.

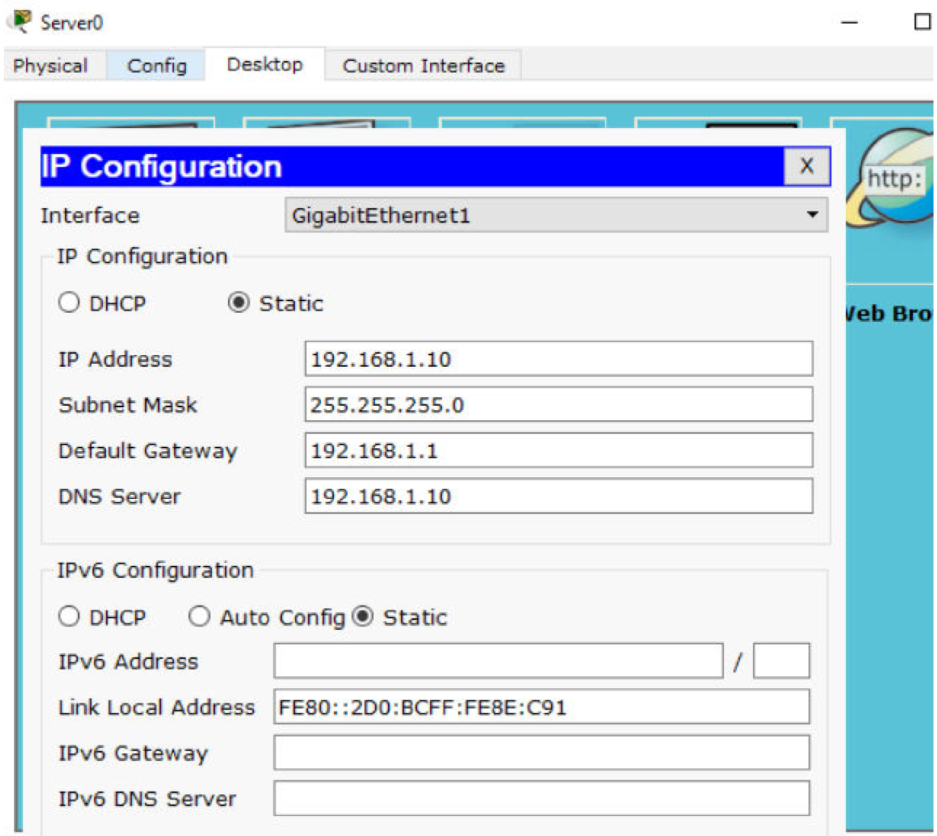


Figure 5 Ip configuration

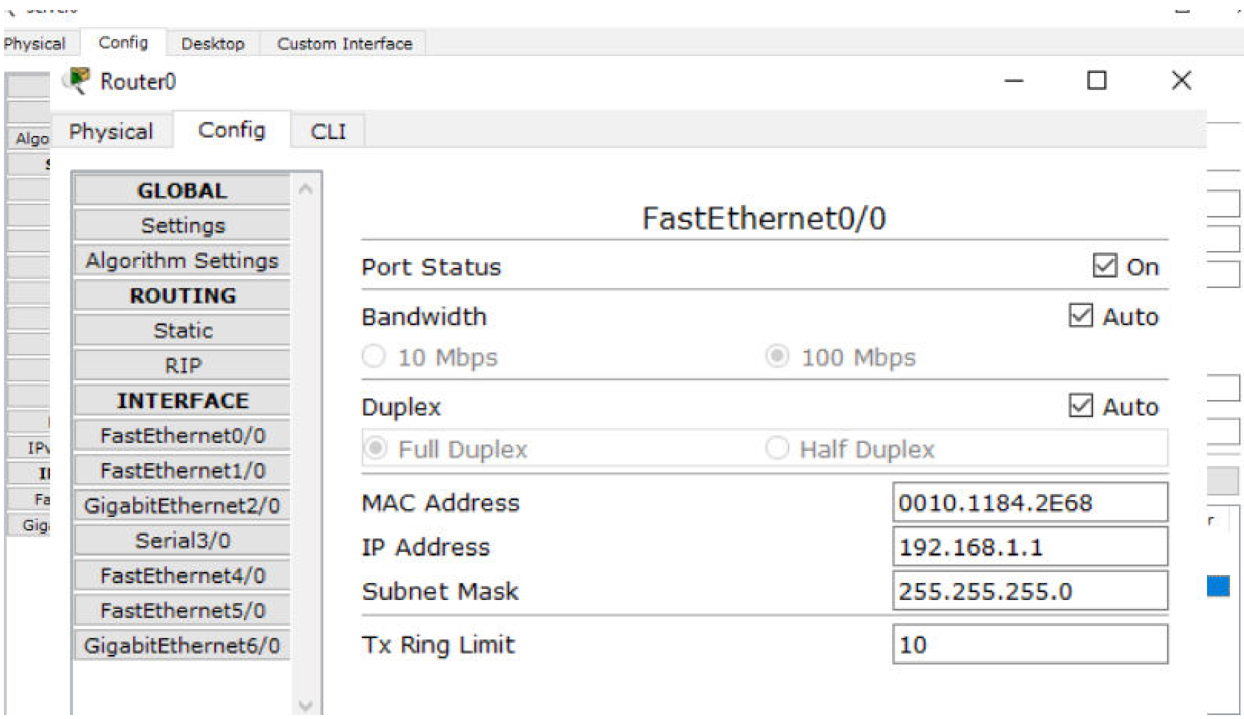


Figure 6 configuration

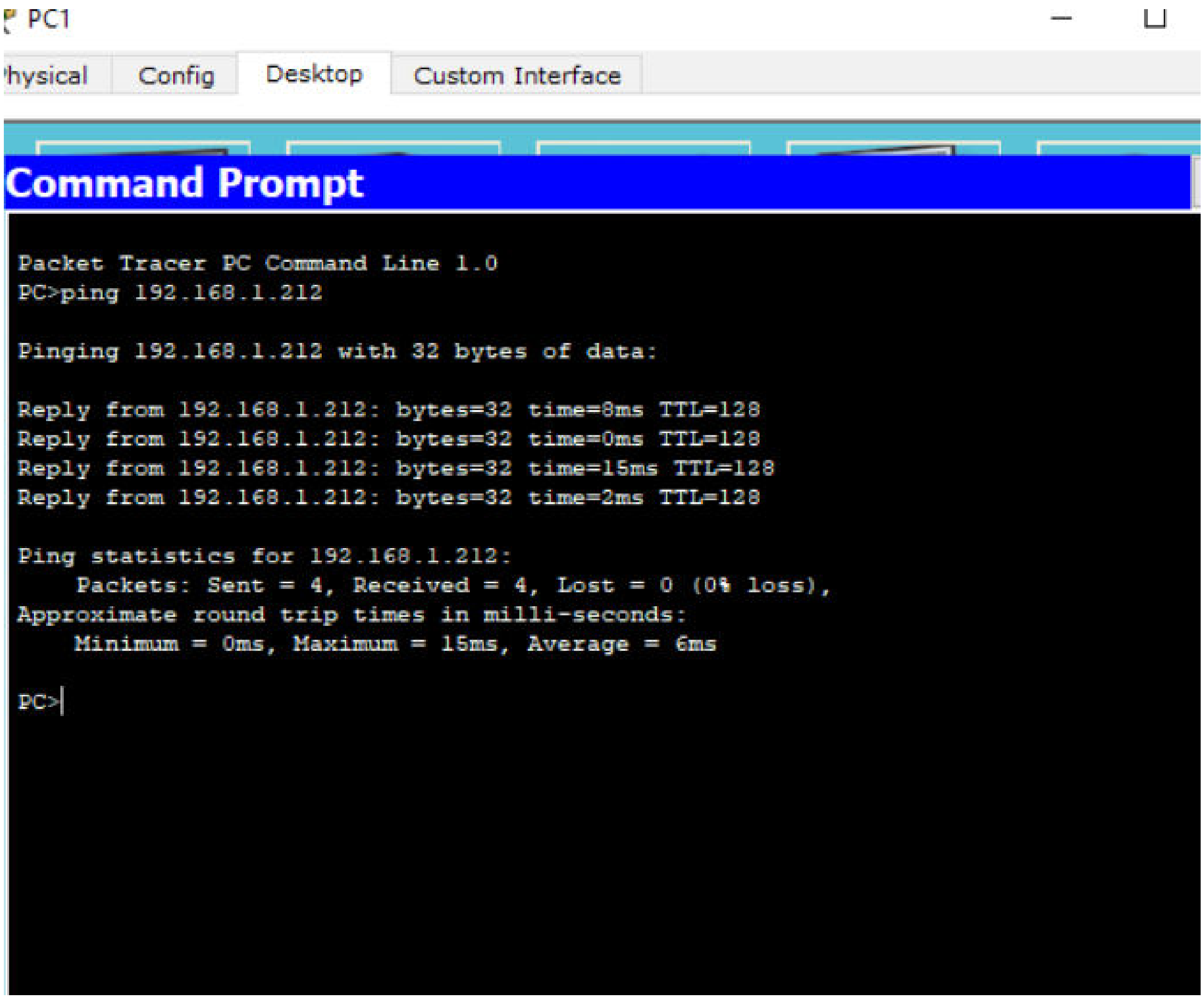
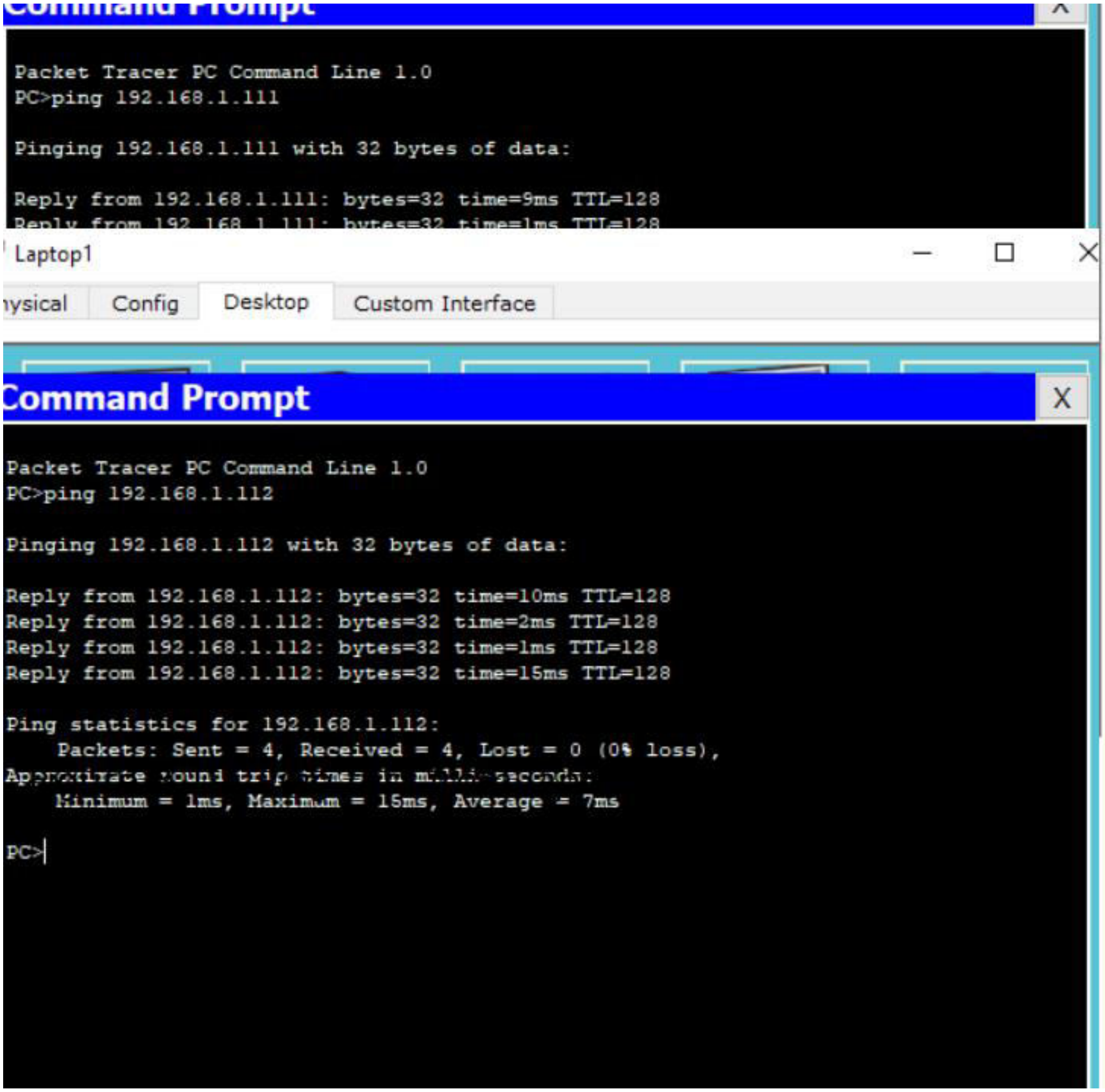


Figure 7 command prompt

In order to connect with laptops, it is necessary to set up a Wi-Fi network because the need called for laptops to be able to communicate with one another wirelessly. In the following steps, we will create a connection for the laptop in question that was mentioned earlier.



Packet Tracer PC Command Line 1.0
PC>ping 192.168.1.111
Pinging 192.168.1.111 with 32 bytes of data:
Reply from 192.168.1.111: bytes=32 time=9ms TTL=128
Laptop1
Config
Desktop
Custom Interface
Command Prompt
X
Packet Tracer PC Command Line 1.0
PC>ping 192.168.1.112
Pinging 192.168.1.112 with 32 bytes of data:
Reply from 192.168.1.112: bytes=32 time=10ms TTL=128
Reply from 192.168.1.112: bytes=32 time=2ms TTL=128
Reply from 192.168.1.112: bytes=32 time=1ms TTL=128
Reply from 192.168.1.112: bytes=32 time=15ms TTL=128
Ping statistics for 192.168.1.112:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Minimum = 1ms, Maximum = 15ms, Average = 7ms
PC>

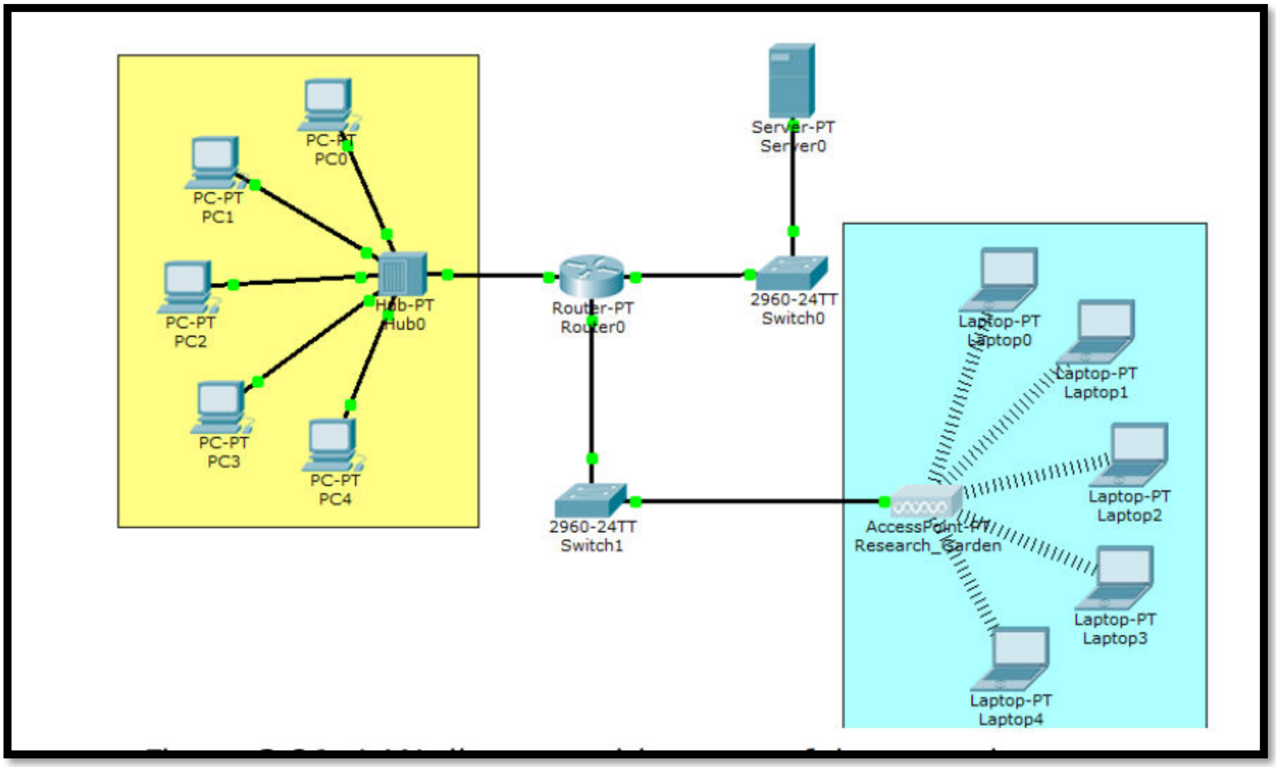


Figure 8 LAN diagramme

The following are some of the procedures that could be performed in order to reduce the amount of interruption caused by multiple-floor Wi-Fi access points (APs):

It is essential to ensure that access points are installed properly. When trying to achieve maximum coverage with minimal interference, the placement of access points is of the utmost importance. It is recommended that access points be strategically positioned on distinct floors in order to reduce the amount of interference that occurs between them. Selecting an Appropriate Channel In order to reduce the likelihood of interference, it is recommended that the access points located on each floor be programmed to a distinct range of wireless channels. To accomplish this, you will need to carry out a wireless site evaluation and position each access point on the channel that has the lowest volume of other users' data transmissions. Take control of the power grid. Regulating the power levels of access points is necessary in order to reduce interference. When the access points in a network are run at lower power levels, both the coverage area and the quantity of interference experienced are diminished.

Access points are able to be adjusted to lessen the signal strength of a signal as it travels through walls and floors in order to reduce interference on floors that are adjacent to them.

As part of the VLAN Segmentation, it is possible to set access points located on various levels so that they can communicate with each other across distinct VLANs. By dividing the network into distinct zones located on each floor, this eliminates any interference that could occur between floors.

The Quality of Service (QoS) is currently being prioritized. It is possible to set up the QoS system in such a way that it gives more priority to data originating from certain floors. This eliminates the possibility of critical programs on one floor being slowed down by applications running on other floors of the building.

The interference caused by Wi-Fi access points positioned on different levels can be reduced by applying these guidelines, which will result in improved wireless performance as well as a more satisfying experience for users.

It is essential to define the assumptions and provide an explanation of how the network was developed in order to satisfy the anticipated consumption in the case that the Melbourne hotel enterprise campus has a particular number of customers and workers.

In a similar vein, if one were to presume that particular applications or services are key to the operation of the hotel, it would be extremely important to document these presumptions and explain how the network was designed to ensure that these applications have high availability and performance. In addition, it would be necessary to describe how the network was designed to ensure that these applications have high availability and performance.

In general, assumptions should be recorded and discussed in order to create transparency in the design process and to aid stakeholders in understanding the reasoning behind the decisions taken during the design process. This will help ensure that the design will be successful. This can also be beneficial in detecting any potential risks or constraints posed by the design, as well as providing direction for any future adjustments or enhancements to the network that may be implemented in the future.

5. Conclusion

The most recent advances in technology will call for the establishment of networks that are not only more reliable but also place a greater emphasis on the practical applications to which they are best suited. It is anticipated that the completion of this project would result in the formation of a professional network. It is necessary to make certain that no device operates on its own, that there is high-speed connectivity, that the addition of devices does not impede the transmission of packets, and that any extra interfaces that are not intended for access are prohibited. This must be done in order to fulfill the requirements of the task. To be successful in reaching this objective, it is vital to make certain that all of these items are in place. It is possible to arrive at the judgment that these goals have been accomplished, and that the standards for both the job and the problem-solving have been completely satisfied. This is something that can be done. This would make it possible to arrive at the judgment that both the problem-solving and the work have been carried out to a suitable level.

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