# VANIER
## CÉGEP/COLLEGE

**FACULTY OF SCIENCE AND TECHNOLOGY**

**420-421-VA NETWORKS section 00001**

# FINAL PROJECT REPORT
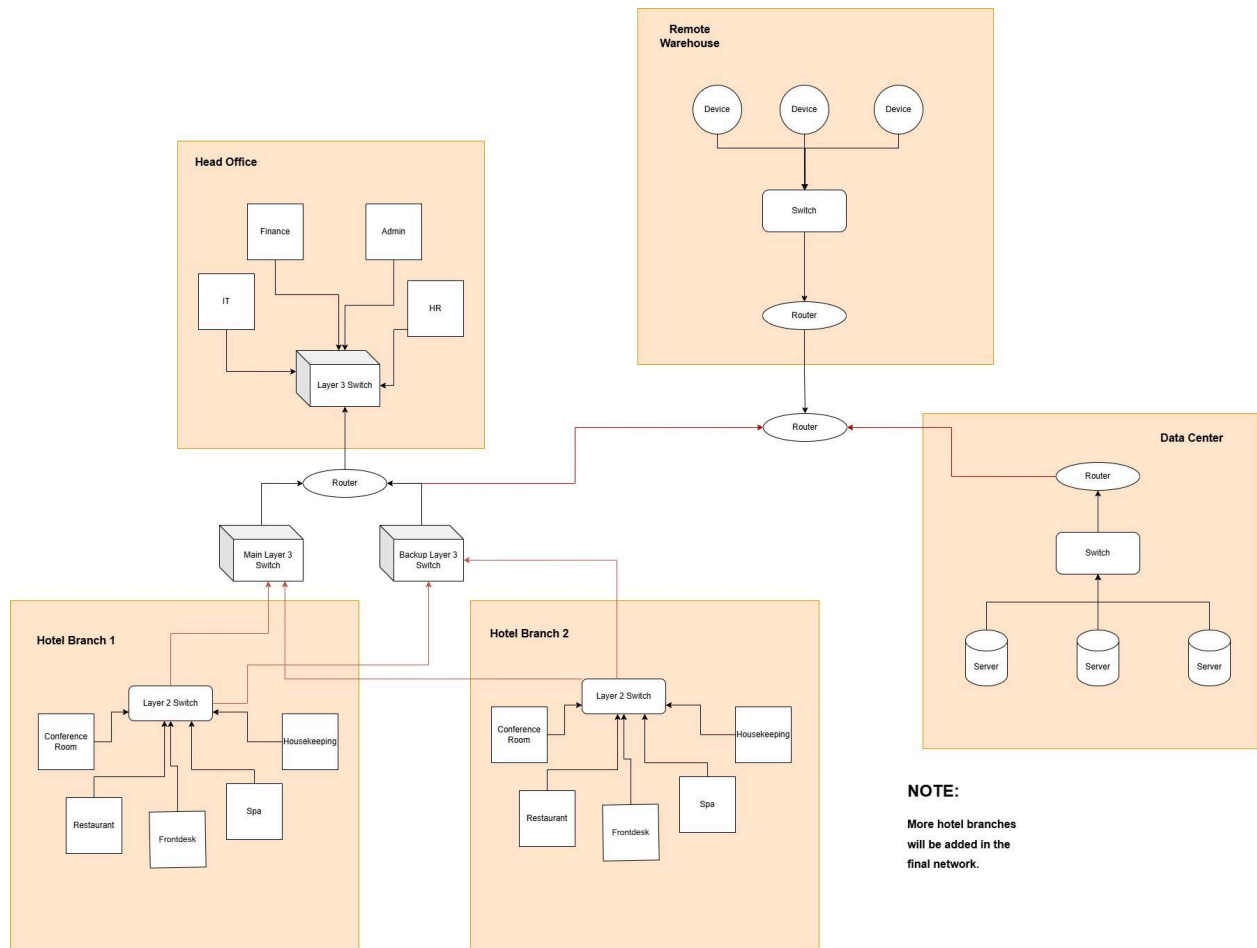
**Presented by**

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**Due Date**

Friday, December 13th, 2024

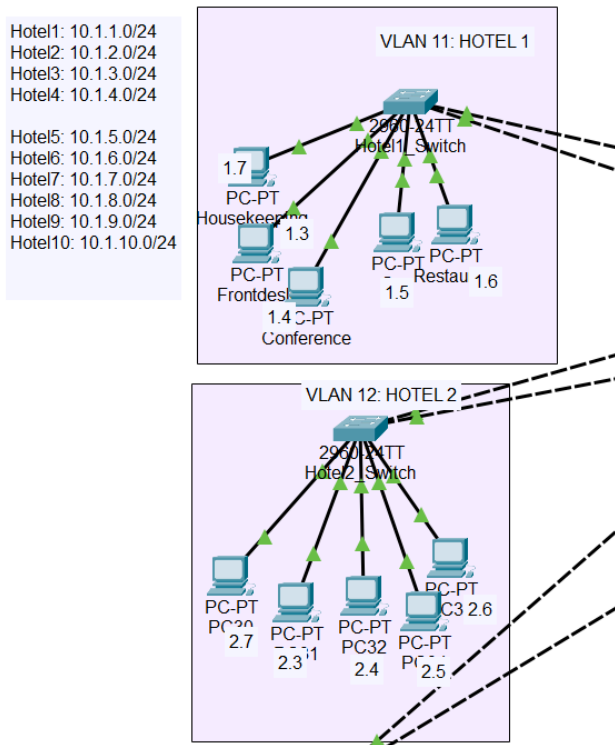# NETWORK TOPOLOGY DIAGRAM



The network topology is organized as such:

## GLOBAL TOPOLOGY

The network is organized in a tree topology with devices being connected hierarchically. The root node is a central router which connects to the router linking all the hotel branches together, as well as the data center, head office and remote warehouse routers respectively.

# HOTEL BRANCH

Hotel1: 10.1.1.0/24
Hotel2: 10.1.2.0/24
Hotel3: 10.1.3.0/24
Hotel4: 10.1.4.0/24

Hotel5: 10.1.5.0/24
Hotel6: 10.1.6.0/24
Hotel7: 10.1.7.0/24
Hotel8: 10.1.8.0/24
Hotel9: 10.1.9.0/24
Hotel10: 10.1.10.0/24

**VLAN 11: HOTEL 1**

2960-24TT
Hotel1 Switch

1.7
PC-PT
Housekeeping
1.3

PC-PT
Frontdesk
1.4 C-PT
Conference

PC-PT PC-PT
Restau 1.6
1.5

**VLAN 12: HOTEL 2**

2960-24TT
Hotel2 Switch

PC-PT
PC30
2.7

PC-PT PC-PT
2.3 1 PC32
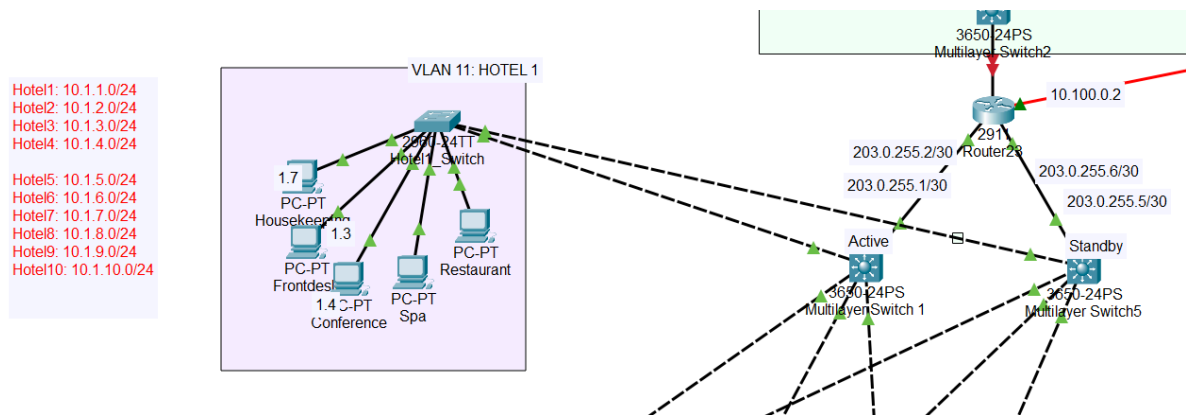2.4

PC-PT
C3 2.6

PC-PT
PC 2.5

Each hotel branch is organized in a star topology, where the PCs belonging to the various departments in each branch (frontdesk, housekeeping, restaurant, conference rooms, spa) are connected to a central Layer 2 switch.

This offers easy scalability as more devices can be connected to the central switch as required.

Star topologies also offer better equipment and high-speed options which are both suitable for a hotel network.

Defective nodes are also easier to manage in a star topology, as they are quickly isolated.

## CONNECTION BETWEEN HOTEL BRANCHES



Hotel1: 10.1.1.0/24
Hotel2: 10.1.2.0/24
Hotel3: 10.1.3.0/24
Hotel4: 10.1.4.0/24

Hotel5: 10.1.5.0/24
Hotel6: 10.1.6.0/24
Hotel7: 10.1.7.0/24
Hotel8: 10.1.8.0/24
Hotel9: 10.1.9.0/24
Hotel10: 10.1.10.0/24

The hotel branch switches are then connected to two Multilayer (Layer 3) switches: the first being the main Multilayer (Layer 3) switch, the second being a backup switch. The Layer 2 switches are connected to these two Layer 3 switches in a mesh topology.

This provides the network with fault tolerance in case of failure. If the link to the main Layer 3 switch breaks, then communication can still occur through the backup Layer 3 switch.

Additionally, the mesh topology is often used in WANs, making a good choice for connecting the hotel branches to the head office.

The Layer 3 switches are both linked to another router that connects to the main central router, also known as the root node of the tree topology.

## HEAD OFFICE
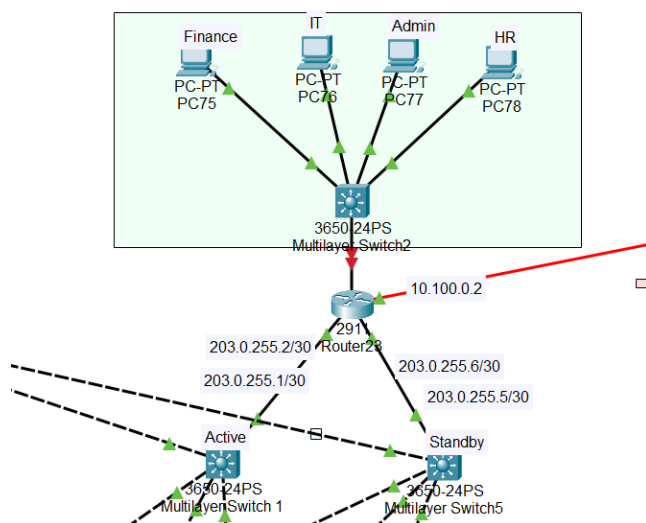
The head office is also organized in a star topology with PCs from the various departments (Administration, Finance, Human Resources and IT support) being connected to a central Multilayer (Layer 3) switch. This switch connects to a router which is then connected to both the Multilayer switches that connect the hotel branches together.

## DATA CENTER
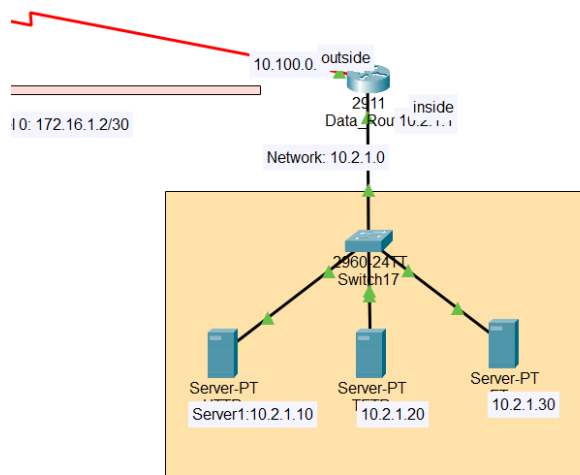


The data center is organized similarly in a star topology with servers connected to a central switch. This switch is then connected to the main central router, also known as the root node of the tree topology.

### REMOTE WAREHOUSE
The remote warehouse is organized in a star topology with devices connected to a central Layer 2 switch. This switch is then connected to a router which connects to the central router, also known as the root node of the tree topology.

## IP ADDRESSING SCHEME
All devices on the network were given private IP addresses. Starting with 10, every device on the network has a Class A IP address.

The hotel VLANs' IP addresses as well as the devices on those VLANs increment by 1 in the following pattern:

**HOTEL 1:** 10.1.1.0**/24**

**DEVICES' IP:** 10.1.1.1

10.1.1.2

10.1.1.3

10.1.1.4

10.1.1.5

**HOTEL 2:** 10.1.2.0**/24**

**DEVICES' IP:** 10.1.2.1

10.1.2.2

10.1.2.3

10.1.2.4

10.1.2.5

**HOTEL 3:** 10.1.3.0**/24**

**DEVICES' IP:** 10.1.3.1

10.1.3.2

10.1.3.3

10.1.3.4

10.1.3.5

....

**HOTEL 9:** 10.1.9.0**/24**

**DEVICES' IP:** 10.1.9.1

10.1.9.2

10.1.9.3

10.1.9.4

10.1.9.5

**HOTEL 10:** 10.1.10.0**/24**

**DEVICES' IP:** 10.1.10.1

10.1.10.2

10.1.10.3

10.1.10.4

10.1.10.5

The **/24** indicates that the first 24 bits of the IP address are used for the network while the remaining 8 bits of the IP address are allocated to the host portion.
The Multilayer (Layer 3) switches that connect all the hotel branches together have multiple IP addresses that follow a similar incremental pattern:

**MAIN MULTILAYER (LAYER 3) SWITCH:**

**GATEWAY IP ADDRESSES:**
> **HOTEL 1:** 10.1.1.1
> **HOTEL 2:** 10.1.2.1
> **HOTEL 3:** 10.1.3.1
>
> ...
> **HOTEL 9:** 10.1.9.1
> **HOTEL 9:** 10.1.10.1

For the purposes of fault tolerance, redundancy was built-in to the system in the form of IP address allocation. In the case of failure of the main Layer 3 switch, the devices on the network can switch to the backup switch.

**BACKUP MULTILAYER (LAYER 3) SWITCH:**
> **GATEWAY IP ADDRESS:**
>> **HOTEL 1:** 10.1.1.2
>> **HOTEL 2:** 10.1.2.2
>> **HOTEL 3:** 10.1.3.2
>>
>> ...
>> **HOTEL 9:** 10.1.9.2
>> **HOTEL 9:** 10.1.10.2

## ROUTING PROTOCOLS

For routing, the OSPF protocol is used for dynamic routing, and to facilitate communication between the Multilayer switches and the central router that connects all the hotel branches.

## VLAN CONFIGURATIONS

Each hotel branch has its own VLAN. Starting from the first hotel which is VLAN11, the second hotel is VLAN12, the third hotel is VLAN13, and so on and so forth until VLAN20 which is the VLAN name for the tenth hotel branch. DTP (Dynamic Trunking Protocol) was used to configure trunk links between switches.

## SECURITY MEASURES

The network uses a GRE (Generic Routing Encapsulation) Tunnel for secure communication between the hotel branches and the data center. The GRE Tunnel is

configured between the router that connects all the hotel branches and the data center router.

Redundancy in the form of virtual IP addresses for the Multilayer switches connecting the hotel branches was implemented. In the case of failure, devices can use the virtual IP address, which allows for seamless failover.