ICA 2, Networks, B1033634:

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# Design

## summary:

Based on the needs of the company the proposed design is a three-layer hierarchical network. these layers consist of Core, Distribution and access and will be redundant up to the access layer with 2 ISP connections to ensure 99.9% uptime. The network will also include a redundant firewall to ensure the network is as secure as possible. The network will utilise a high-performance core and distribution layers to ensure high and consistent performance for the company.

## General Specifications:

* 1Gbps internet connection w/ 100Mbps back-up connection
* 10Gbps core and distribution layer
* 768 Gigabit ethernet ports for networked devices
* WIFI throughout the building

## Subnet:

To calculate the subnet mask for the IP address 192.168.16.1/20, we need to determine the network portion and host portion of the IP address based on the prefix length (/20).

The IP address 192.168.16.1 is represented in binary as follows:

11000000.10101000.00010000.00000001

The prefix length of /20 indicates that the first 20 bits of the IP address are part of the network portion, and the remaining 12 bits are part of the host portion.

So, the subnet mask can be calculated by setting the first 20 bits to 1 and the remaining 12 bits to 0, as follows:

11111111.11111111.11110000.00000000

Converting this subnet mask to decimal notation, we get:

255.255.240.0

Therefore, the subnet mask for the IP address 192.168.16.1/20 is 255.255.240.0. This subnet mask allows for a maximum of 4094 hosts per subnet (2^12 - 2) and supports up to 16 subnets (based on the network portion of the IP address).

## Report:

### Why Hierarchical network?

The hierarchical network model is recommended for this application because they allow for easy management and are easily scalable. In this model each layer is grouped into a specific task. This allows for operational simplicity and high performance as traffic can be routed efficiently avoiding congestion and minimising latency.

### Routing protocol:

The existing network uses RIP v1 as it’s routing protocol. Which was fine when the company was small however RIP V1 has several drawbacks when it comes to the increased size of the proposed network. RIP (Routing Information Protocol) is a distance vector routing protocol, meaning it uses hop count as it’s matric, owing to this as a network grows the overhead required by RIP can greatly affect convergence times and processing times.

To address the limitations of RIP in a larger network, it is recommended to consider using OSPF as the routing protocol. OSPF is a link-state routing protocol that uses a hierarchical network model to efficiently manage network resources. It supports fast convergence, load balancing, and efficient use of network resources. Additionally, OSPF allows for support of variable-length subnet masks (VLSMs), which can provide more flexibility in network design.

OSPF is well-suited for large and complex networks and can provide reliable and efficient routing for a growing company.

# Packet Tracer Evidence:

## Overall network: Diagram Description automatically generated

## Packet ICMP test from PC1 to PC5:

A screenshot of a computer

Description automatically generated with low confidence

## PC 3 configuration:

A picture containing table

Description automatically generated

## Main router configuration: Diagram Description automatically generated

## PC 3 on 192.168.32/20 domainGraphical user interface, application Description automatically generated

## PC 1 on192.168.16.0/20 domain:

Graphical user interface, application

Description automatically generated

## PC 1 to 3 CMD ping:

Calendar

Description automatically generated with medium confidence

## Successful ping packet: Graphical user interface, application Description automatically generated

# Ethical and legal considerations

One of the primary legal concerns is data privacy and protection. The network must comply with data protection laws and regulations, such as the General Data Protection Regulation (GDPR), which ensures that personal data is processed lawfully, fairly, and transparently. This will mostly depend of the companies’ web servers and the database they are connected too.

Another legal concern is network security. The network must be designed to protect against cyber-attacks and data breaches. This includes implementing firewalls, intrusion detection and prevention systems, and secure authentication protocols. Companies have a legal obligation to responsibly hold employee’s information. Legal fee and fines can occur if the company does not take the necessary precautions.

Ethical concerns for the network include (but are not limited to) making sure the network is accessible to all users including those with disabilities. in addition to this a effort should be made to ensure there is a minimal environmental impact. This incudes, old network disposal, sourcing of materials, energy usage