International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 8 Aug. 2022, pp: 1576-1582 www.ijaem.net ISSN: 2395-5252

# Model network of army base

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Submitted: 15-08-2022 Revised: 27-08-2022 Accepted: 30-08-2022

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**ABSTRACT:**
This study observes how a network in an Army camp works. This is composed of different modules like ISP, Network Administration, Raw Intelligence, etc. which are further connected differently. However, they are connected through a single router. Anyone from a specific location can interact or access other parts with ease. In this project, we will start by working on basic router configuration and then covering the Routing technologies required to route data between branches. After that, we implemented WAN and Frame-relay is considered a good choice because it connects multiple locations using a single interface of the router and reduces the hardware costs.
For Internet connectivity, we are also using frame relay. In this setup, NAT is very essential which we have to translate. Live IP into local and vice-versa. In short, we can say a lot of technologies are studied and implemented for the successful completion of the project.
**Keywords:** Campus Network, Peer-to-peer, Network design, Qos, Routing.

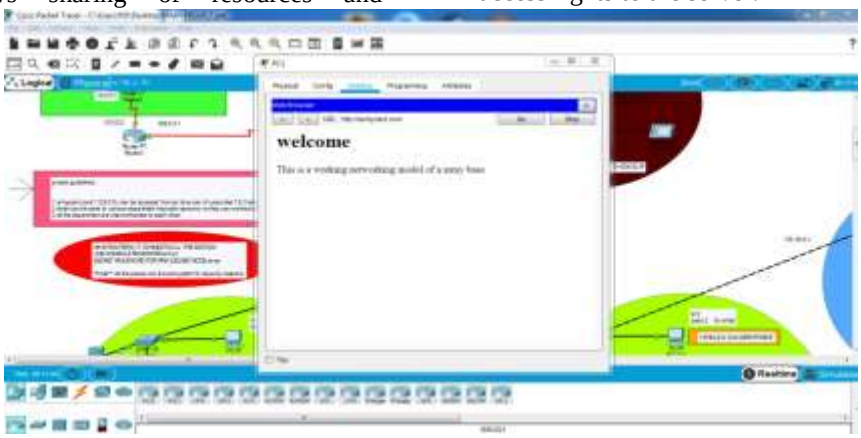
## I. INTRODUCTION:

A computer network, often simply referred to as a Network, is a collection of computers and devices connected by communications channels that facilitates communications among users and allows users to share resources with other users. A computer network allows sharing of resources and information among devices connected to the network. Networks may be classified according to a wide variety of characteristics.

A computer network consists of a collection of computers, printers, and other equipment that is connected so that they can communicate with each other.
Broadly speaking, there are two types of network configuration, peer-to-peer networks, and client/server networks.

Peer-to-peer networks are more commonly implemented where less than ten computers are involved and where strict security is not necessary. All computers have the same status, hence the term 'peer', and they communicate with each other on an equal footing. Files, such as word processing or spreadsheet documents, can be shared across the network and all the computers on the network can share devices, such as printers or scanners, which are connected to any one computer.

Client/server networks are more suitable for larger networks. A central computer, or 'server', acts as the storage location for files and applications shared on the network. Usually, the server is a higher-than-average performance computer. The server also controls the network access of the other computers which are referred to as the 'client' computers. Typically, teachers and students in a school will use the client computers for their work and only the network administrator (usually a designated staff member) will have access rights to the server.



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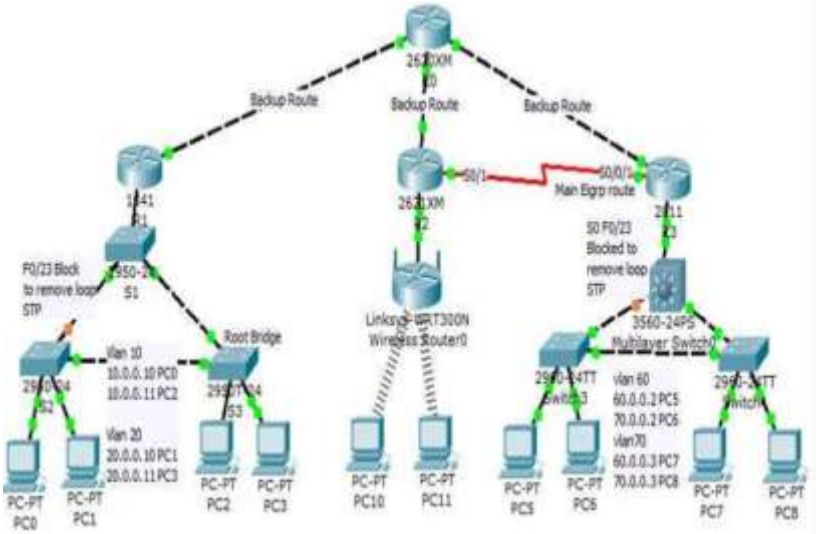
## II. METHODOLOGY:

The top-down network design approach is used to create the new design. This approach consists of four phases, i.e. (1) static routing, (2) logical network design, (3) physical network design, and (4) testing and optimizing the network design. In this paper, we limit our scope to the first three phases

**Static routing:**

Static routing is a kind of routing that must be manually set. The majority of network managers rely on static routing, which needs constant surveillance (Tamaz and Nino, 2021). This route is more prevalent in regions with common networks and physical settings. Static routing, in contrast to dynamic routing, cannot be altered independently of network conditions or configuration settings. It increases the routing effectiveness of a router and acts as a backup if the primary data transmission fails. It utilizes the links between the two approaches, therefore they cannot be updated automatically. Therefore, any static routes must be manually modified if the network architecture is altered. It uses fewer bytes than dynamic maps. Applicable when network traffic can be anticipated and controlled. They are made ineffectual due to the immensity and continuing development of the network. Because it is limited to relatively small networks, its implementation is straightforward (Rhamdani Suwastika and Nugroho, 2018). Several components of the system's configuration are modified based on the size of the network. Even while connecting to smaller networks is conceivable, it may become hard to provide updates to all routes as the web expands. Contrary to the majority of dynamic routing protocols, which each have its own set of fees, this kind of routing is free. There may be some drawbacks to employing static routing, but in the majority of circumstances, a static route is the most logical and efficient method to go. This strategy is the antithesis of dynamic routing. The phrase "dynamic routing" refers to a system in which routers adapt their behavior dynamically in response to changing network traffic volumes (Adil et al., 2020). It is considered the most fundamental kind of routing and involves considerable human processing. If the information flow must be modified often, this is typically the least efficient kind of routing that may be used.




In this routing, we have to use IP route commands through which we can specify routes for different networks. The administrator will analyze the whole inter-network topology and then specify the route for each n/w that is not directly connected to the router.

1 Step to perform static routing

(1) Create a list of all n/w present in an inter-network.

(2) Remove the n/w address from the list, which is directly connected to n/w.

(3) Specify each route for each routing n/w by using the IP route command.

Router (config) #IP route <destination n/w><mask><next hop IP>

Next hop IP is the IP address of the neighbor router that is directly connected to our router.

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**Logical Network Design:**

The focus of logical topology diagrams is the behavior of data lines inside a computer network. Throughout the planning and design phases of a network, these diagrams are used to depict how various network components are interconnected (Nishijim et al., 2020). Similar to a physical network diagram, this image will include nodes like servers, routers, and switches; however, the lines will represent data flow rather than real wire. Administrators can generate some logical network diagrams, including representations of their wide area network (WAN), local area network (LAN), Amazon Web Services (AWS), and other setups (De Landtsheer, Lucarelli, and Sauter, 2018). These diagrams may provide either a comprehensive analysis of the problem at hand or a broad overview. Having access to these diagrams enables managers to get a deeper understanding of the network's structure and performance, as well as expedite the detection of problem areas. This is especially true when the images also serve as system availability alerts. When a flow distribution matrix is supplied with the intent of establishing a logical topology, the first major delivery is a demand matrix. Multiplying the flow distribution matrix by an estimate of the network's total aggregate traffic yields the demand matrix, which may aid in decision-making. For instance, if a particular source-to-destination logical connection has a relative weighting of 1%, as indicated in the flow distribution matrix, then the demand for that logical connection is equivalent to 1% of the predicted aggregate traffic for the whole network (Penny, 2018). To generate a demand matrix from a flow distribution matrix, an accurate estimate of overall network traffic is required. This is necessary to create the demand matrix. This is not a simple task, however, since the position of the network's edge has a substantial influence on the total quantity of traffic that will be carried by the network when it is constructed. Due to the very strong communities of interest that exist between neighboring network nodes, it is essential, when determining the total amount of traffic that will traverse the newly constructed network tiers, to include just the traffic that flows through a network node.

1) Armycant.com (1.128.0.5) can be accessed from PC browsers of users like 7, 8, 5, etc. with the help of a DNS server.
2) Email can be sent to various department important persons i.e. they can communicate with each other through email.
3) All the departments are interconnected with each other.

**Physical Network Design:**

In contrast to a logical network diagram, which represents network communication, a physical network diagram illustrates the physical connections between network devices. Displays in graphical representation how data travels over a network (Yokoi and Tachibana, 2018). The physical network diagram illustrates the network's structure and all of its physical components, including ports, cables, racks, servers, specific models, etc. Information technology professionals often use them to visualize the communication strategy of the network architecture in homes and businesses. When mapping the architecture of your physical network, you should start with the devices and cable connections between them. In a physical network architecture diagram, the lines linking the icons representing components such as workstations, servers, routers, and switches depict cable connections (Tessinari et al., 2018). This is

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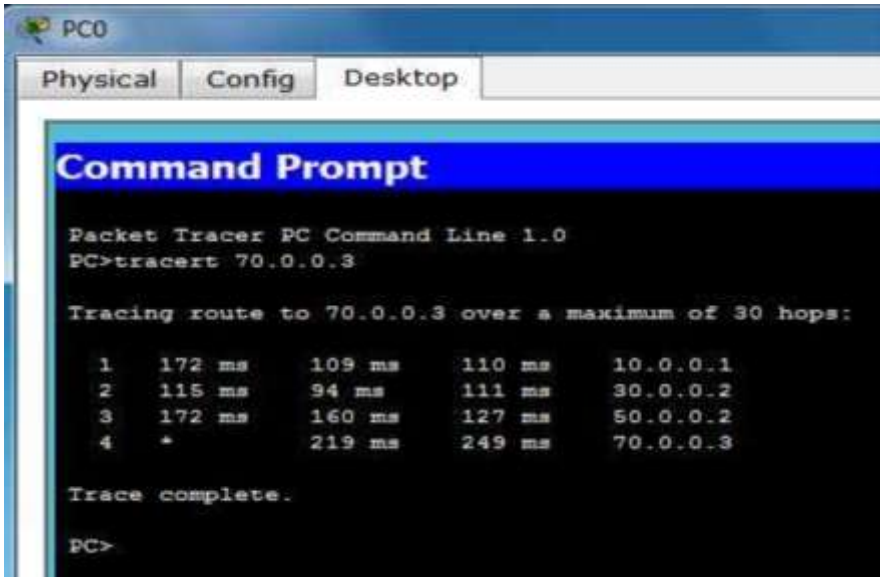
the "most precise" depiction of your network since it describes how the actual components are grouped and interconnected. In other words, this is the most "genuine" picture of your network. However, this kind of graphic is not always the most effective method to communicate information. Understanding how data is transported between devices and how it behaves inside your network is sometimes more important than understanding its underlying physical design since the two do not necessarily coincide. A network topology map illustrates the connections between the various network nodes, such as servers, routers, and firewalls. Using symbols, shapes, or icons, generates a graphical representation of a network's many components and connections (Yu et al., 2018). This is a good illustration of how to convey network architecture to end users, and it simplifies the problem as a whole. Depending on the utilized standards, a network diagram may be exceedingly simple or somewhat frequent. Physical network diagrams are designed to aid in the comprehension of the multiple physical network components. A physical network diagram may facilitate troubleshooting by illustrating the connection and function of each network component. When diagnosing a malfunctioning component of the system, it is useful to comprehend how the network's various components interact. Frequently, a physical diagram is used to depict the connections between network devices and other physical components. This diagram represents the network's topology and indicates whether or not the individual nodes are physically connected. A physical diagram is a visual representation of the IT industry's physical relationships. Their duties include network troubleshooting, the detection of security vulnerabilities and weak regions, and the management of internal network modifications.




A Cisco packet tracer is network simulator software. It is used for practicing most of the networking configurations. It helps to understand how to configure the networks. Packet tracer is a cross-platform visual simulation tool designed by Cisco systems that allow the user to create network topologies and imitate modern computer network.

## III. EVALUATION RESULT &DISCUSSION:

After we complete the design, we evaluate the design. We evaluate the design of the network in terms of performance and availability. We perform the availability evaluation using the GNS3 simulator. On the other hand, we perform performance evaluation by simulating using the real device due to the limitation of the GNS3 simulator in generating data that resembles the actual situation.

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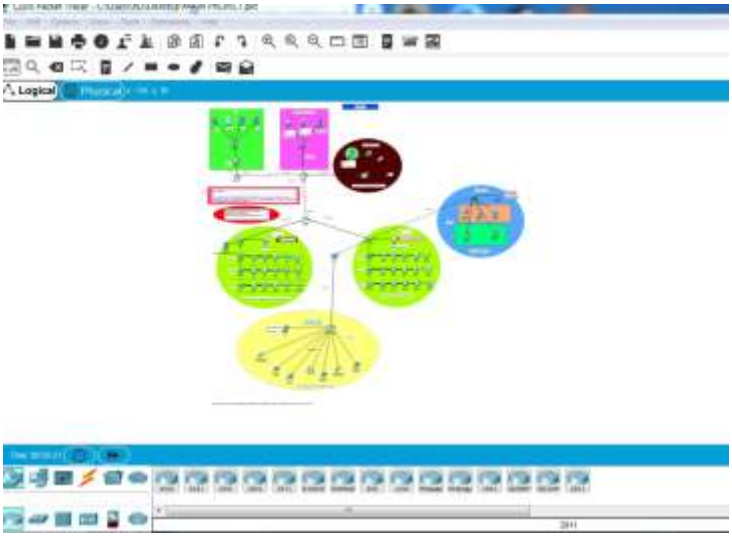

**Performance Testing:**

To test the performance of the network design, we create a testing environment by using several devices to make sure that voice traffic can be accommodated in the design proposed to the customer. The reason we need to create a testing environment is that from the GNS-3 simulator significant performance degradation happened. The topology created for this testing purpose can be seen in figure 3. The details of devices used and the naming can be seen in table3.

The router is configured by using the RIP feature. By using this feature, one router can be simulated as five instances by separating the routing table using RIP. The link between Core and Access03 is configured as a trunk to allow multiple VLANs across this interface.

The reason we used the router as an endpoint is that we need a way to obtain statistical data for specific traffic by utilizing the IP SLA feature in the Cisco Router. We need to make sure they reach the ability between RIP a to the main RIP to begin the testing and make sure the communication is sending and receiving the correct RIP

We also activated the SNMP parameter in the router to gather periodic data from IP SLA operation in this router. The SNMP will be used for PRTG Network Monitor to gather periodic data in IP SLA operation. Two scenarios will be tested in our environment. Both scenarios will be run in congested conditions–the bandwidth limit is 10Mbps and the bandwidth utilization is fluctuating between8-10Mbps.

In our first experiment, we do not implement the QoS in the devices. All traffic sent through the MikroTik firewall istreatedequallyincludingthisvoicetrafficgeneratedb yIPSLA.We've monitored the output from PRTG Network Monitor to get the periodic data per 1 minute so we can monitor the fluctuation of the network.

**Availability Testing:**

We continue to test the availability aspect of the network using two separate environments. The first one is using GNS3 to simulate the existing network (the setting can be seen in figure 11) and in the second one, we modify our existing testing environment as shown in figure 12. We measure the downtime when fail-over occurs in Core Switch if the active one has an issue such as reboot itself or failure that causes downtime for the active Core. Ping is used to comparing the convergence time in the existing network and the testing environment using real network devices. Before we start the scenario we already execute the ping 1000 times to monitor the convergence time of the network when a failure occurred. Two scenarios will be used, i.e. (1) Turn off / unplug the forwarding interface; (2) Reboot the active core

The reason we choose to do something with the active core rather than the standby one is that we need to measure the convergence time if the worst-case scenario happened.

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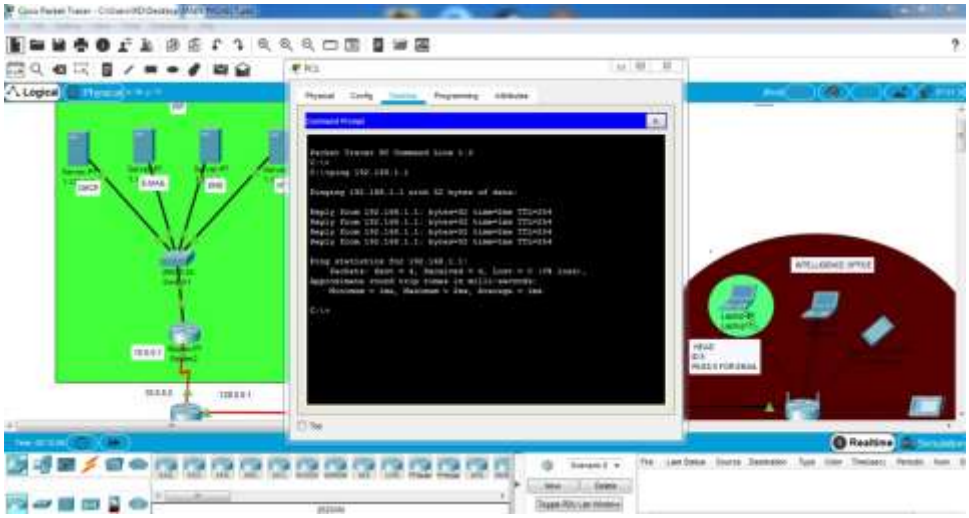
## IV. CONCLUSION:

```
PC>tracert 70.0.0.3

Tracing route to 70.0.0.3 over a maximum of 30 hops:

  1    109 ms     64 ms     124 ms     10.0.0.1
  2    124 ms     109 ms    140 ms     30.0.0.2
  3    140 ms     187 ms    187 ms     50.0.0.2
  4    220 ms     265 ms    203 ms     70.0.0.3

Trace complete.

PC>tracert 70.0.0.3

Tracing route to 70.0.0.3 over a maximum of 30 hops:

  1    125 ms     94 ms     78 ms      10.0.0.1
  2    125 ms     *         156 ms     80.0.0.1
  3    156 ms     156 ms    187 ms     100.0.0.2
  4    234 ms     155 ms    265 ms     70.0.0.3

Trace complete.

PC>
```

A converged network that can transport multiple kinds of traffic is believed to add more load to the network. One way to ensure every service is delivered with different treatments tailored to the characteristics and needs of each one is by using QoS. The implementation of QoS especially in congested or limited capacity links ensures the service can be delivered as requested. The converged network design created already surpasses the criteria to deliver voice traffic according to our test, therefore we can propose this design to be implemented in the customers. The availability aspect already improved from the previous design that is implemented too by significant value if the active core has trouble.



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