Not always, we get what we need. But still we need to have our requirements fulfilled. Looks so generic? Yes, it does!! Not all companies have the capital to implement the requirements in the way they want to. Sometimes they don't get the right resources or they may not have the inventory based on the proposed design. A good solutions engineer comes with a solution considering all the factors required for the outcome of the project. Consider the following scenarios and come up with the best possible solution, which is robust, secure, dynamic and intelligent enough. Your team works on these requirements and need to come up with a design, which should be discussed within your team about the scope, feasibility, resources, interworking and the deadline. Once approved by the team, start implementing the elements individually and finally integrate the elements to complete the solution. The solution should basically have the customers' requirement fulfilled and also should be distinct enough when compared to your competitors.

# DNS

Your project task is to build a DNS implementation for a start‑up company in the city of Boston. As a Telecommunications Engineer you're expected to build a DNS Server for this company. Following is what is expected –

| Naming | Get a domain name of your choice for the start‑up |
|---|---|
| Addressing | IPv4 and IPv6 address for your organization |
| DNS Servers | Configure name servers to handle queries for your domain |
| Documentation | Document the details for future users |

**Guidelines**:
• You will assign a set of IP addresses that must be used for this project
• You will be assigned one of the following DNS server from the following – BIND, Posadis or PowerDNS

• Create any 5 DNS records
• Use IPv4 and IPv6 addresses in your implementation of records
• Create reverse domains in‑‑‑addr.arpa and ipv6.arpa for the addresses you have been allocated

• Configure a Master DNS server as well as a Slave DNS server, the Slave DNS should automatically update with Master DNS server.
• Test plan and implementation with examples

# DHCP

Your project task is to build a DHCP implementation in your company. As a Telecommunications Engineer you're expected to build a DHCP Server. Following is what is expected –

| Scope | A full range of IP addresses that can be leased from a DHCP server. |
|---|---|
| Address Pool | The IP addresses in a scope that are available for lease. |
| Exclusion Range | Address in the scope that are excluded from leasing. Excluded addresses are normally used to give hardware devices, such as routers, a static IP address. |
| Reservation | A means for assigning a permanent IP address to a client, server, or hardware device. Reservations are typically made for servers or hardware devices that need a static IP address. |
| Lease | The amount of time that a client may use an IP address before the client must re‑‑‑lease the IP address or request another one. |

**Guidelines:**
• You will be an assigned a set of IP addresses that must be used for this project

• Use IPv4 and **IPv6 addresses** in your implementation of DHCP • Dynamic allocation of Network addresses
• The Client⋯Server Protocol
• Test plan and implementation with examples

# Web Server & Firewall:
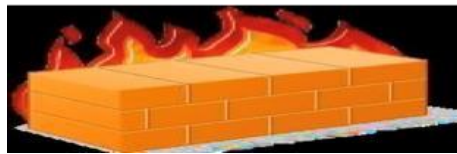


Suppose you must configure a web server in your company, how can this be practically implemented in your Linux machine? What do you think is the simplest way to secure your network from external networks attacks? Considering that you don't have much funding to buy more security devices, how do you think you can secure your server?

There are different ways by which we can secure a server for the above scenario. For example, it can be IP filtering, protocol filtering, etc. Make your network as much secure as possible.

**Guidelines:**

• Use only command line tools and packages
• Provide all the commands that you have used and give a brief description in one line.
• Provide the changes you have made to the files / folders for configuring the webserver as well as the firewall. Also, create a basic web page to be served by this web server.
• Make this page accessible to the clients in your network using a web browser.
• Make your server the most secured one in all possible ways.
• When you work / design your project, remember that you must give a demo. Plan accordingly.

# Backup



Isn't it always better to design a robust system? When there is a group of people working on a server, there is a possibility that the server might crash because of increase in usage or because

of the heavy- duty processes running on the servers. The best way is to systematically create a backup of every day's work from the current server to a different server.

**Guidelines:**

• Automate the process of backing up the data.

• The backup file should be zipped and sent to a different server.
• Describe briefly about how you backup automatically and how file transfer is made.
• Also provide the commands and configurations for sending the zipped file to a different location. • Mention which protocol you are using to complete this task.
• When you work/design your project remember that you must give a demo. Plan accordingly.

**Note:** You have the liberty to improvise and implement in different ways and with different tools but make sure it covers the requirement.

# Add-on: (Bonus Points)

1) The Address Resolution Protocol (ARP) is a telecommunication protocol used for resolution of Internet layer addresses into link layer addresses, a critical function in computer networks. Scapy is a powerful interactive packet manipulation program in python. It can forge or decode packets of a wide number of protocols, send them on the wire, capture them, match requests and replies, and much more. It can easily handle most classical tasks like scanning, tracerouting, probing, unit tests, attacks or network discovery (it can replace hping, 85% of nmap, arpspoof, arp-sk, arping, tcpdump, tethereal, p0f, etc.). It also performs very well at a lot of other specific tasks that most other tools can't handle, like sending invalid frames, injecting your own 802.11 frames, combining technics (VLAN hopping+ARP cache poisoning, VOIP decoding on WEP encrypted channel, …), etc.

To earn these bonus points, you must implement a malicious user in your network which hosts its own webserver. This malicious user is going to poison the arp entry for original web- server in the client's arp cache and once client sends a request to the ip address of the original webserver, the request will be received by the malicious user and user will see a Hacked Web- Page.

2) Implement IPSec VPN tunnels between two linux machines using openswan.

3) Implement NFS. There should be at least 2 clients (can be VMs on which other servers are hosted) to whom the shared file would be available.

## Project Report:

**Report should include your detailed work and methodology not limiting to the following:** • Behavior of the protocol
• Signaling
• Hierarchy
• Commands used
• Algorithm & Flow Chart
• Testing
• Working with an example (Integration)
• Future improvements

## Project Demo

• Every group will be responsible for preparing themselves for a demo and explaining the details of the project.

• Demonstrate the functionality of each protocol and integration of all the parts mentioned above.
• **Summary of the Demo:** The DHCP server should be able to lease IP to clients; the client should be able to access the web page hosted by the web browser by resolving its IP from the DNS, and later the Firewall should be able to block the client; the client must also be able to receive backup files from the backup server.