

# Research paper on network design analysis

[Technology](#), [Internet](#)



In computer network analysis, there are several network designs usually deployed by different users due to different adaptations and the type of processing or transactions required for the business. This is mainly because there are some factors that affect the basic design and the type of networking equipment required.

However, in each and every network design, there are six sub-sections which are present. These subsections are discussed below in some details to enable the network owner understand operation of the required network and how it will be set up. These subsystems or subsections include: entrance room, backbone cabling, telecommunications subsections, network equipment and horizontal cabling.

The other subsystem is the backbone cabling subsystem. This is the network section charged with the responsibility of ensuring that all data is passed effectively within the network and shared in a timely manner within the network. For this purpose, this subsection requires cabling using high capacity or bandwidth cables like coaxial or fiber cables. Considering the number of users and the main task of the network, the most appropriate cable for this subsection in the assigned network analysis is the coaxial cable. This is because the coaxial cable is less costly yet has higher capacity and bandwidth compared to UTP cables.

The third subsection is the telecommunications network equipment subsystem. This is the section that deals mainly with heavy network devices like servers and some routers. These devices usually have high data capacity thus are mostly used as mass storage and routing devices. For this reason, the best connection required for this purpose is high speed connection which

requires a person to use a high speed connection to the work stations and outer network. For this reason, the most common connection cable is the coaxial cable for the reasons outlined earlier. Also, these pieces of equipment require to be kept in locked or safe places away from sabotage by the customers.

The telecommunications subsystem includes multiple data and voice transfer equipment which are usually telephones and fax machines. These devices do not require much high speed of data transmission hence the most appropriate choice of cable is the UTP. This closet is distributed all over the building thus if optic cable is used, the cost of the network may be too high to meet. Use of UTP is limited to a maximum speed of 100 Mbs and length of 800 meters. Examining this closet, no single cable can run a whole length of 800 meters hence the cable can be used.

Horizontal cabling and work stations are of lower levels of data transfer. The horizontal cabling connects devices to the backbone cabling and network facilities like printers. If this network subsystem is done using coaxial cables, the rates of data transfer can be lower than the cable capacity thus it would be better to use UTP which have bandwidth of almost the same order. The rate at which most computers transfer data across the network is limited to a maximum of 35 Mbs thus use of UTP is sufficient enough. Lastly, the work area subsystem is the most dynamic part of the network thus needs to keep simple and flexible.

The other bit that needs some clear understanding is the bit that deals with cost of the machines and other equipment which is also dictated by the task to be accomplished by the network design. To begin with, billing task is not

as demanding as some other cyber tasks. However, the billing process will also require an internet connection since it would be virtually impossible to connect to an organization to where the bills are paid without an internet connection. For this reason, the network has to be connected to the outer metropolitan network either by a dial up connection or fixed line connections. For the network owner to fully understand the best connection to use, let us have a review of some network fundamentals and connection properties.

Turning to dial up connection, an internet subscriber makes a dial up call through a public telephone switched network provider and requests for a connection. This connection is then leased to the user for a specified duration after which the allocation is cut by the service provider. This means that the connection to the internet is very temporary and can't be fully relied for real time internet transactions requiring a lot of time in the internet.

A look at the fixed line internet connection, the connection is made permanently to a leased public line. The most common public line in use currently when it comes to internet access is the optic fiber. This line provides the internet subscriber with a fixed connection which is always up and provides a lot of real time transactions chances.

Considering that my client will be dealing with billing, this process requires a lot of real time transactions. This is mainly because the clients requiring using my client's network will have to access their bills online, put their payment details and possibly transfer funds online. This would mean a lot of time will be spent by the client while working online. For this reason, I would prefer a fixed line internet connection for my client. This is due to real time

transaction advantage of this type of connection and expense. On the expense section, dial up connections require purchasing of internet connection bundle packages by either CDMA or GSM providers. This is much more costly compared to having a fixed line connection. Due to the high bandwidth required to cater for graphics, I would recommend to my client to use a fiber optic internet connection link. This is because the link is both economical compared to satellite connection and have a very high data capacity. It is in the entrance room only where some optic cable will be used and interfaced with the network's backbone through an optic-to-coaxial adapter.

Having covered that in the internet connection requirement and subsystems of the network architecture as well as the best cables to use so as to keep the design as simple as possible and most efficient, I would like to present to basic network layout whereby I will begin by some explanation on the equipment as well as data flow between the network and the outer networks (MANs or WANs) and within the local network and end the section with a diagram.

The size of the network is only four computers (work stations), one network shared printer, a server, two routers, vertical and horizontal cabling and some switches. The telecommunications sub closet is not very much important in this situation since the geographical size of this network is very small.

## **Information flow within the network and communication with other networks**

The router is connected to a switch through the firewall. This device takes any information from the router and makes intelligent decisions of the port to which the specified target is connected. This device is very much important compared to a hub and considering the tasks it accomplishes. It acts as a storage device for IP addresses and assigns each machine that connects to the network an IP address to enable it access network resources. A hub does not have such provisions. An alternative device which would be used together with a hub is a DHCP server which in terms of cost is far much costly compared to a switch.

Since all devices in the network are connected either directly or indirectly to the switch, this device as the main transaction highway for the process of internal communications. This means that even a simple network printing task is done by use of the switch. For fast data access, the cable used between the switch and the router should be coaxial or advanced UTP with high data capacity like CAT6E. A connection to the server should also be done using a coaxial cable to enable fast data transmission even in cases of multiple connections. A wireless router for transmitting wireless signals is also connected to the switch where it is allocated an IP through which the laptops by wireless connection are able to access network resources.

If any person or user wants to access any file from a remote machine which isn't the server, sharing options have to be turned on. However, this should happen only for read only options whereby the users can only read data from one computer using another but cannot modify it. This would reduce the need for users to use flash disks which would infect the computers with

viruses. The server is a file server thus another option would be to share the sever files which allow read only for end users and read and write privileges to the administrator. This would serve an option instead of having to share the drives in all computers. The printer can be connected to the switch directly if it is a universal printer whose drives are not of must be installed in a certain machine. This applies mostly for printers which have hard drives and act as plug and play devices.

## **Diagram of the network design**

Specifications of the different types of devices required.

One network router – mostly with a Cisco OS to enable rapid data transfer

One wireless router to broadcast for the laptops, configuration depends on the adaptations of the router. For simplicity, use a Cisco wireless router.

## **One LAN switch**

Optic to coaxial connector

Coaxial cables and UTP cables whose lengths depend on the geographical layout of the network and their ports or connectors

An optic cable may be required depending on the distance of the client from the nearest leased public optic line

These components are what we can term as network equipment and have the hidden costs while carrying out the audit for the network.

## **The other devices are:**

- A server. Due to tastes and preferences, the client may use any machine probably a tower with the features shown: 4GB and above DDR3 RAM, 500GB and above HDD, 2. 6 GHz and above clock speed, 3MB and above

cache memory, two or more VGA connections, 2 or more UTP ports and Intel core i3 or more recent processor. This will enable this machine to have fast speed for transmitting data. The large hard disk size enables for easy installation of the OS and files storage in the shared disk partitions.

- Two work stations. These are the desktop or tower machines to be used by clients under normal circumstances. My recommendation for this would be machines with the following features: 2GB and above RAM and a clock speed of 2. 1GHz or higher. The size or memory storage or cache memory may not be very significant as in the case of a server.

- Laptops. These are bought to ease flexibility in access the internet and other network resources. They can connect to the network either by wireless means or wired connection. For better performance, I would recommend a laptop with the following features: 2GB and above RAM, hard disk drive of not less than 160GB and a clock speed of not less than 1. 6GHz.

- Network printer. This can be of any kind though the best would be a universal printer with its own hard drive. Due to cost constrain illustrated in the case, I would recommend a local printer attached to one of the workstations (desktops or towers) and then shared as a network resource. The discussion on all these devices gives the network owner a chance to make an informed choice. Incorporation of information regarding to telecommunications subsection is also very much relevant since the client might have a plan of expansion in future.