

Design, Deployment and Implementation of Local Area Network (LAN) at BAEC Head Quarter

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Abstract

A local area network (LAN) is a computer network within a small geographical area such as a home, school, computer laboratory, office building or group of buildings. A LAN is composed of interconnected workstations and personal computers which are each capable of accessing and sharing data and devices, such as printers, scanners and data storage devices, anywhere on the LAN. LANs are characterized by higher communication and data transfer rates and the lack of any need for leased communication lines. Communication between remote parties can be achieved through a process called Networking, involving the connection of computers, media and networking devices. When we talk about networks, we need to keep in mind three concepts, distributed processing, network criteria and network structure. The purpose of this Network is to design a Local Area Network (LAN) for a BAEC (Bangladesh Atomic Energy Commission) Head Quarter and implement security measures to protect network resources and system services. To do so, we will deal with the physical and logical design of a LAN. The goal of this Network is to examine the Local Area Network set up for a BAEC HQ and build a secure LAN system.

Keywords:

LAN, Design, Deployment, Implementation, BAEC

1. Introduction

A local area network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home [1]. A LAN can be small or large, ranging from a home network with one user to an enterprise network with thousands of users and devices in an office or school. A local area network (LAN) is a group of computers and associated devices that share a common communications line or wireless link [2]. Usually, the server has applications and data storage that are shared in common by multiple computer users. A local area network may serve as few as two or three users (for example, in a home network) [3]. Networks are divided into two main

categories: Local Area Networks (LANs) and Wide Area Networks (WANs). These two types of networks have different characteristics and different functionalities. In general, a LAN is a collection of computers and peripheral devices in a limited area such as a building or campus [4]. A LAN is usually under the domain of a single organization such as an institutional or department. The internet is, however, more than just a physical connection of LANs, internetworking protocols and standards are also needed. Network's models serve to organize, unify, and control the hardware and software components of communication and networking. The Internet has revolutionized many aspects of our daily lives [5]. It has affected the way we do business as well as the way we spend our leisure time. Count the ways you have use the internet recently. Perhaps you have sent electronic mail (email) to a business associate, paid a utility bill, read a newspaper from a distant city, or looked up a local movie schedule all by using the internet or maybe you researched a medical topic, booked a hotel reservation, chatted with a fellow trekker or comparison shopped for a car. The internet is a communication system that has brought a wealth of information to our fingertips and organized it for our use [6][7][8]. The internet is a structured, organized system. Bangladesh Atomic Energy Commission is a scientific research organization and regulatory body of [Bangladesh](#). Its main objective is to promote use of atomic energy for peaceful purposes. It was established on 27 February 1973. So it is important to Design, Deployment and Implementation of Local Area Network (LAN) at BAEC Head Quarter.

2. Bangladesh Atomic Energy Commission

Bangladesh Atomic Energy Commission (BAEC) was established in 1973 as a multidisciplinary R&D organization with the view of promoting peaceful uses of nuclear energy in Bangladesh. From the very beginning of its formation, BAEC started R&D works in areas covering

physical science, bioscience, engineering and nuclear medicine for human welfare and economic uplift of the country. At present, the BAEC has grown as the largest organization for scientific and technological research in Bangladesh.

3. Research Background

3.1 Networks

A network is a set of devices (often referred to as nodes) connected by communication links. A node can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network.

3.2 Local Area Networks

Local area networks, generally called LANs, are privately-owned networks within a single building or campus of up to a few kilometers in size. They are widely used to connect personal computers and workstations in company offices and factories to share resources (e.g., printers) and exchange information.

3.3 Topology

The topology is the geometric arrangement of a network elements. For example, Network devices can be interconnected in a ring topology or in a bus topology or linear bus.

3.4 Protocols

It is a guideline for communicating data between two devices. The protocols also determine type of error and data compression.

3.5 Media

The cable used in Lan to connect devices are twisted-pair wire, coaxial cables, or fiber optic.

3.6 The Server

Server is a computer that provides services to other computers (workstations or clients) on the network. A single server may provide a number of services also.

3.7 Communication Equipment

Communication equipments are **Router, Switch, Repeater, Bridge etc.**

3.8 Internet

The Internet is a worldwide telecommunications system that provides connectivity for millions of other, smaller networks; therefore, the Internet is often referred to as a network of networks. It allows computer users to communicate with each other across distance and computer platforms.

3.9 Internet Service Provider

An Internet service provider (ISP) is an organization that provides a myriad of services for accessing, using, or participating in the [Internet](#). Internet service providers can be organized in various forms, such as commercial, [community-owned](#), [non-profit](#), or otherwise [privately owned](#).

4. Network Security

4.1 Security Services and Processes

Security is fundamentally about protecting assets. Security is a path, not a destination. As we analyze our infrastructure and applications, we identify potential threats and understand that each threat presents a degree of risk. Security is about risk management and implementing effective countermeasures. Security services and processes depends on: Authentication, Authorization, Auditing, Confidentiality, Integrity [9].

4.2 Security in Linux Networks

The Linux operating system is built with security features, as it provides the file access permission mechanism, which prevents the unauthorized users in gaining access to the files [10].

4.3 Firewalls

A firewall is one of the most widely used solutions for the Internet world. All traffic inside to outside and vice versa, must pass through the firewall. Different types of firewalls have different types of rules and security policies. The authorized traffic will be sent based only on local policies. The firewall itself is protected, i.e.; it uses a trusted hardware and operating system [11].

5. Methodology

“Methodology” implies more than simply the methods intend to use to collect data. It is often necessary to include a consideration of the concepts and theories which underlie the methods.

More over methodology guides the researcher to involve and to be active in my particular field of enquiry. Right from selecting the topic and carrying out the whole research work till recommendations; research methodology drives the researcher and keeps him on the right track. The entire research plan is based on the concept of right methodology [12].

6. Implementation

6.1 Design, planning & deployment of LAN at BAEC Head Quarter

This day’s most organizations build their own LAN infrastructure with special consideration of security measures to protect their resources from any kind of attacks [13]. Building a well-secured LAN requires designing of network topology before deciding which physical devices to be purchased or technologies to deploy [14]. A topology design is defined as the identification of networks and their interconnection points, the size and the scope of the network, and the type of interconnecting devices used [15]. Every network requires a structured planning and designing before

deployment it that requires internet access [16], Internet connectivity factors should be included into the plan, Includes a practical design of network internet connectivity backbone [17]. Procedures of selecting equipment’s are added and planning designs their networks. The LAN of BAEC head quarter interconnects more than 90 computers using various network media. The previous LAN was not properly working; as a result, the internet service was interrupted. Hence, the previous LAN was redesigned and up gradated using a Proxy server of Dell T320, Router: Cisco 2901, and other network media. Currently, internet service is smoothly running at BAECHQ

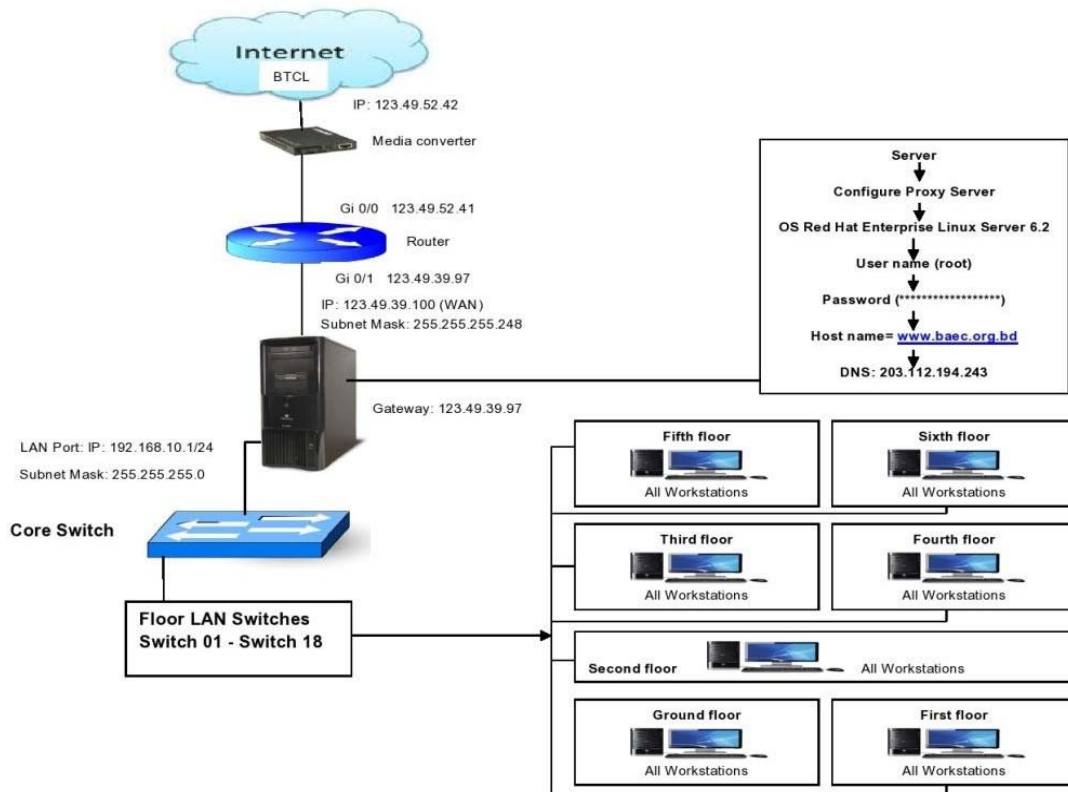


Figure 1.: LAN Connection of BAEC Head Quarter

7 Hardware Selection

7.1 LAN Related Device Selection

Router Model 2901; we are using Cisco router. It is reliable and trusted to IT

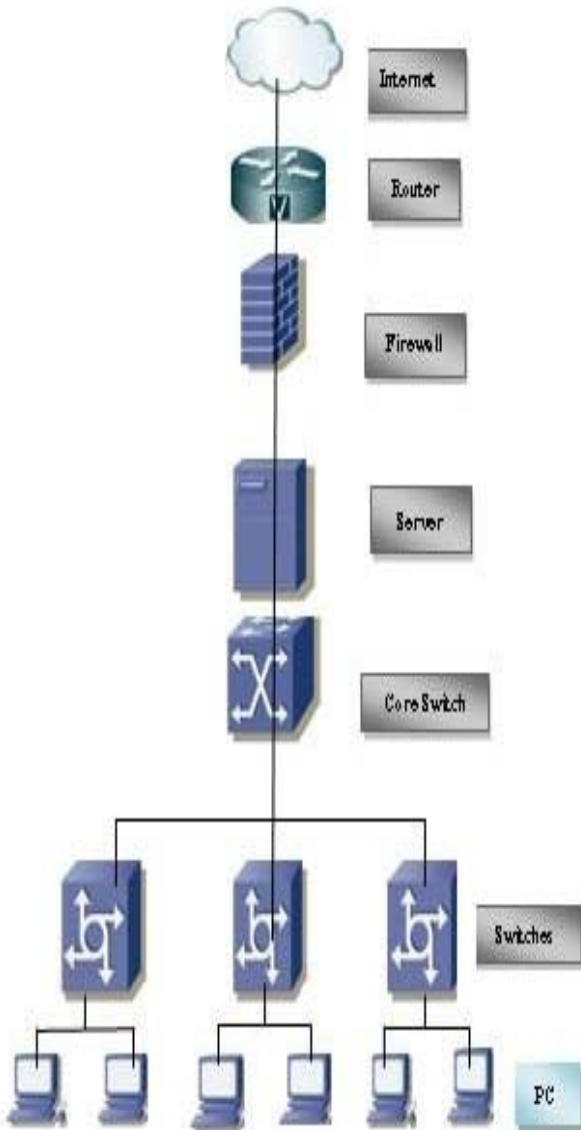


Figure: Local Area Network (LAN) Diagram at BAEC Head Quarter

Community. Bandwidth is a factor for router as well and 2900 series router required MBPSA Duplex operations easily choose a Cisco router supports upgrade IOS version will enable to enjoy some good facilities. Switch Model

2960; we also use Cisco manageable switch for their backbone. It is tested and performs well for IT backbone. Cable & Connector; Choosing good brand cable. Now days Cat-6 cables are most popular [18]. It will be best for LAN wearing (it has really good sailed protection). The RJ 45 and is 8 – Position modular connector that looks like a large phone plug [19]. Servers; Server Selection is important for each server services. Many reputed ISP in Bangladesh runs with brand servers. Need to choose a brand which spare parts are available local support for the brand is essential.

8. Configuration

8.1 Configuring Router

We install the routers hardware properly before configuring and commissioning. We install all hardware properly to avoid damage. We Read all supplied manual properly before installing router. We Take a PC/Laptop with terminal emulator software (Hyper Terminal for windowsminicomforLinux).ThePCshouldhaveatleastastand ardcommunicationport (Com-1) connect Router's console to Pc's communication port using console cable. We Turn on Pc's and router power switch. Terminal will display router's booting information. We have successfully booted router and configure using setup facility the router is now configured properly with initial configuration and ready touse.

8.2 Configure Server

Proxy Server satisfies web browser's query by sending requested web page. Proxy does two main operations. First operation is to reduce internet bandwidth charges. And the second option is to limit web access to authorized user/PC. Users configure their web browser's to use the proxy server instead of going to the internet directly [20]. When a user sends any web request, proxy takes the request. Proxy is the only service, which heavily uses CPU, memory and storage simultaneously. We Installing Operating System and then configuration following:

8.3 Operating System

Buying operating system (OS) in Bangladesh is really a big headache. There are very few commercial operating systems. All commercial operating systems supports are not also available locally. So, we need to depend on foreign support we choose OS Centos-6.5 which includes squid with its entire options precompiled [21]. Server OS should have a large amount of hardware support. Compare with your operating systems hardware compatibilities List (HCL), before choosing the OS.

Installation Media; Install Linux operating system from any comfortable media like CD ROM, Hard disk including all network installation method. Installing OS; we have chosen Centos-6.5 Linux operating system. All other versions installation is almost same. We cover Centos-6.5 installation step by step.

- a) Disk Partition Setup.
- b) Boot loader configures.
- c) Firewall configure manual.
- d) Set root Password.
- e) Package group selection automatically.
- f) Escape boot diskette creation.
- g) Video card configurations.
- h) Configuring monitor.
- i) Installation complete then reboot the system.

Network configuration is Linux; we configure Linux server to enjoy networking features. Linux Networking Facility by default Linux support network, when will install a system, Networking facility will be installed. Moreover, is a stalled system without a NIC card Networking will be available with to interface. IO helps to run all Network related services when other NIC is not available we can check/control network by "Network" service script nicely (/etc/rc.d/init.d/network). Use the following command connected to start/stop network Service.

```
[root@ns1 root] # Service network stop. [root@ns1 root] #
Service network start. [root@ns1 root] # Service network
status. Determining IP address; now a day's commonly all
Pc's come with a NIC, when Linux is installed this first
device is called "eth0" second one is "eth1" and so on. We
can determine the IP address of these interfaces using
"ifconfig"
```

```
[root@snmp root] # if config.
```

Assigning IP address using "if config". We can assign an IP address on "eth0" interface using the "if config" command. This is the most common method.

```
[root@snmp root] # if config eth0 10.0.0.100 net mask
255.255.255.0 up.
```

The "up" at the end of the command activates the interface after assigning the IP. But this procedure is not permanent. When you will reboot the system the IP setting will be lost. To make this IP permanent, you need to change the script file for the particular interface. All files will be found in "/etc/sysconfig/network-scripts" directory. Now restart the "network" service to take effect. We need to restart the network service each time makes any type of change into these files. [root@ns1 root] # service network restart use "ifconfig" command to see the change. It will show the new IP setting. [root@snmp root] # if config. Assigning IP address using "netconfig", we can also do it automatically using some graphical utility. "netgonfig" is a beautiful

utility that we can use to edit those files automatically. It will offer to fill up essential fields.

9. Result

Bangladesh Atomic Energy Commission (BAEC) is the largest scientific organization in Bangladesh. If we want to connect international network, we have to setup Local Area Network. For this in my paper, we have shown and practically configured Local Area Network at Bangladesh Atomic Energy Commission. We smoothly installed Local Area Network (LAN) networking at BAEC HQ. As a result of this LAN network, Bangladesh Atomic Energy Commission Head Quarter is getting a high speed internet service.

10. Future work

In Future, we extended our Local Area Network by adding Access Point (AP) and Wi-Fi devices. We add more network devices to service the end user who are working at BAEC Head Quarter.

11. Conclusion

This Research Paper proposed a secure design for network and system in Linux and windows environment using the latest technology. We should have an understanding with communication models, network service & architecture, media, devices and protocol suites. We are expected to have network service. Every network requires a regular maintenance such as storage maintenance, remote resource access, user management, log management and some other management. Monitoring is a regular task for all network system. It is mandatory when the system is dedicated to public service to make a user friendly and dependable monitoring system. After applying our proposed design, deployment and implemented highly reliable local area network mechanism. Therefore, all the mechanisms thoroughly discussed in this paper to work well together and provide strong Local Area Network (LAN) system at BAEC Head Quarter.

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