

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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**A COMPREHENSIVE STUDY ON NETWORKING ISSUES**

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**ABSTRACT**

Now-a-days Information and Communication make it possible to bring the world in our hand. The advent of networking concept is a milestone for this world wide phenomenon. Network is used to share resources, to exchange data/information, to save money and also it acts a major role in the field of communication. The more complexity and rise up technology behind Network also increases the Security concerns. This paper summarizes the key concept of networking and explores the issues and challenges in networking. This paper focuses on the security measures also.

**KEYWORDS**

Connecting Devices, Network, Security, Threat, Topology.

**1. INTRODUCTION**

**1.1 NETWORKING BASICS**

Network is a set of devices (often referred as nodes) connected by communication medium. A node can be a computer, printer or any other device capable of sending and receiving data generated by other nodes on the network. Communication medium are roughly grouped into guided media, such as copper wire and fibre optics and unguided media, such as radio and lasers through air [1].

**1.2 PHYSICAL STRUCTURE**

For communication to occur two devices must be connected in some proper way. There are two possible types of connections point-to-point and multipoint. The term topology is schematic description of the arrangement of a network, including its nodes and connecting lines. There are two ways of defining network geometry: the physical topology and the logical (or signal) topology. The physical topology of a network is the actual geometric layout (Bus, Ring, Star and Hybrid) of workstations. Logical (or signal) topology refers to the nature of the paths the signals follow from node to node [3].

**1.3 NETWORK MODELS**

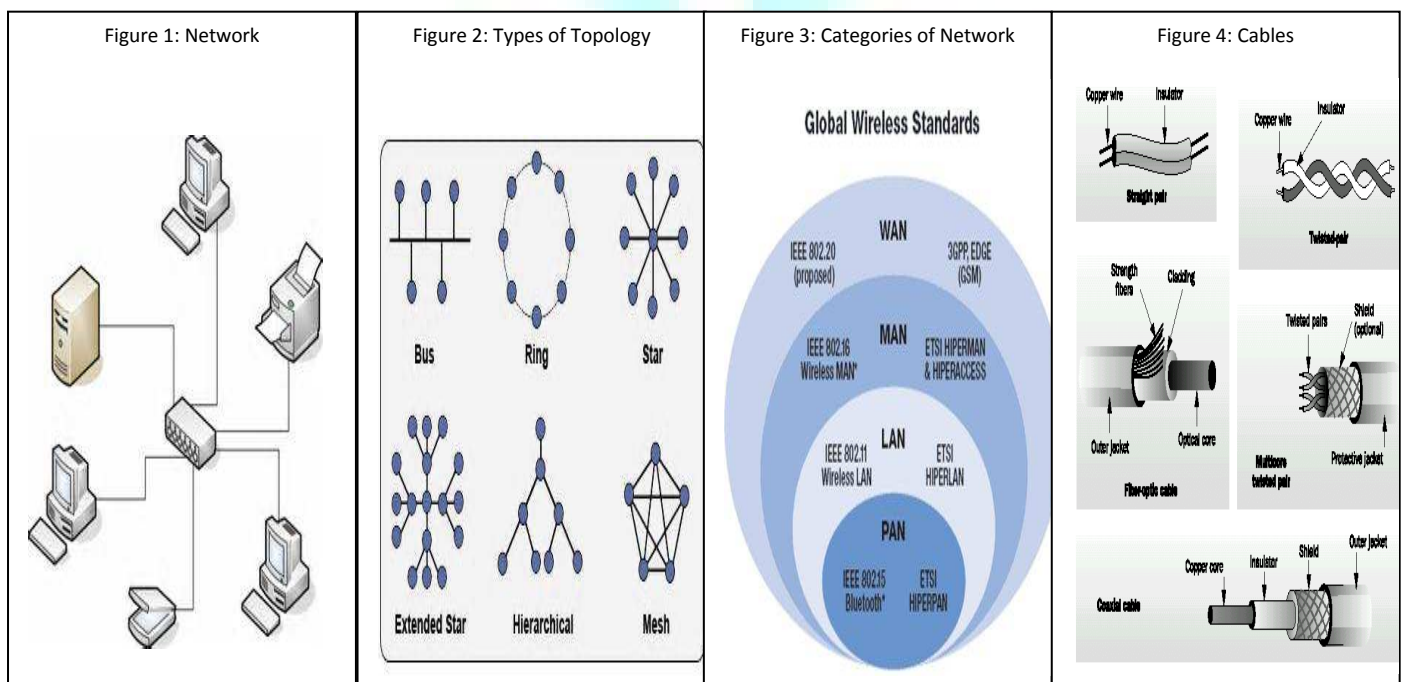
Standards are needed so that heterogeneous networks can communicate with one another. The two well known standards are the OSI model and the Internet Model. The OSI (Open System Interconnection) model defines seven (Application, Presentation, Session, Transport, Network, Data Link and Physical) layer network. The Internet model defines five (Application, Transport, Internet, Data Link and Physical) layer network [2].

**1.4 CATEGORIES OF NETWORKS**

Depending upon network size, communication media, management method and topology we can classify network as LAN, WAN, MAN (size), Wired network, Wireless network (communication media), Peer to Peer network, Client server network (management) and Ring Network, Bus network, Star network (topology).

**1.5 CONNECTING DEVICE**

When multiple computers are connected to each other, a computer network is formed. When multiple computer networks are connected to each other, it becomes an internetwork, or an internet. The connecting device (used to connect computers and computer network) can be classified into Networking device and Internetworking Device. Repeaters and Bridges are networking devices. Routers and Gateways are internetworking devices.



## 2. BACKGROUND

The history of computer networking and the Internet cross over the following [15]:

### BEFORE THE INVENTION OF COMPUTERS

Alexander Graham Bell's telephone (1876) provided the groundwork for networking connections. Thomas Edison's work with Electricity gave us the structural framework for future computer technology.

### ARPANET

Leonard Kleinrock (1961), an MIT professor, introduced the concept of computer packet switching in ARPANET, the first long-distance computer network. The first connection was made between UCLA and Stanford in 1969, with other nodes following. ARPANET grew for several years before its first public demonstration in 1972.

### FIRST EMAIL

Ray Tomlinson sent the first mail message in 1970, and email integration into ARPANET took place in 1973.

### TCP/IP

Bob Kahn and Vint Cerf in 1974 brought the idea of Transfer Control Protocol, or TCP protocol which allowed computers and networks of different varieties to connect to each other for the first time. The protocol was implemented in 1983, a year which also marked the split of ARPANET into the military controlled MILNET and a civilian network.

### WIDESPREAD ADOPTION

Throughout the 1970s and 80s, ARPANET grew into what we now recognize as the Internet, and computer networking became more complex. Other developments, such as the introduction of the World-Wide-Web standard in 1991, and the free release of Netscape Navigator 1.0 in 1994 helped computer networks become easier to use and more accessible.

## 3. NETWORKING ISSUES AND CHALLENGES

### 3.1 NETWORK PERFORMANCE

Two key elements of network performance are bandwidth and latency. Bandwidth is a gross measurement, taking the total amount of data transferred in a given period of time as a rate, without taking into consideration the quality of the signal itself. Bandwidth is also a limiting factor for the technology that connects the computer itself to the modem or device interacting with the direct Internet line [10].

Latency is a networking term to describe the total time it takes a data packet to travel from one node to another. In other contexts, when a data packet is transmitted and returned back to its source, the total time for the round trip is known as latency. Latency refers to time interval or delay when a system component is waiting for another system component to do something. This duration of time is called latency [12].

### 3.2 NETWORK CONNECTIVITY

It is quite common to hear about 'I cannot connect to the network'. This is because so many people have moved, tried to use, or otherwise integrated other types of systems such as Apple, Unix or Linux on their networks. Also some users now wish to connect their mobiles such as Blackberry's, iPhones and Palms to their home or corporate networks adding a new layer of complexity to the mix. To complicate things further, wireless (not a new technology) is a booming market growing bigger than ever with newer, faster and more secure technologies (such as 802.11n) which seem to come to market yearly and bring a new host of issues to the 'connectivity' issues one may already face. All of these technologies, systems and resources once connected, now suffer from many of the same issues [16].

### 3.3 NETWORK CONFIGURATION

When setting up systems, the biggest things that cause disruption are loss of main power source, incorrect cabling (or wireless configurations), lack of/or misconfigured protocols (such as IP) and problems with Windows systems such as misconfigured network services. Another issue to consider is the configuration of how client computers access shared resources, such as a network printer. After the initial configuration and testing of your network, the next steps should be to document it correctly [16].

### 3.4 NETWORK INFRASTRUCTURE

Network Infrastructure represents the Physical and Logical structure of the network [13].

#### Physical Network Diagram

The physical diagram presents the following information about existing network:

- Details of physical communication links, such as cable length, grade, and approximation of the physical paths of the wiring, analog, and ISDN lines.
- Servers, with computer name, IP address (if static), server role, and domain membership. A server can operate in many roles, including primary or backup domain controller, Dynamic Host Configuration Protocol (DHCP) service server, Domain Name System (DNS) server, Windows Internet Name Service (WINS) server, print server, router, and application or file server.
- Location of devices such as printers, hubs, switches, modems, routers and bridges, and proxy servers that are on the network.
- Wide area network (WAN) communication links (analog and ISDN) and the available bandwidth between sites. This could be an approximation or the actual measured capacity.
- Number of users at each site, including mobile users.

#### LOGICAL NETWORK DIAGRAM

The logical diagram shows the network architecture, including the following information:

- Domain architecture, including the existing domain hierarchy, names, and addressing scheme.
- Server roles, including primary or backup domain controllers, DHCP service servers, or WINS servers.
- Trust relationships, including representations of transitive, one-way, and two-way trust relationships.

## 4. SECURITY MEASURES

Today, Information is the most valuable resource to any organization. It's our duty to secure and also to protect the valuable things. Security deals with threats to information that is external to a computer system, while protection deals with threats that are internal. Security is a primary component of every network design. With the growth of large open networks, security threats have increased extensively in the past 20 years. Hackers have discovered more network vulnerabilities, and because one can now download applications that require little or no hacking knowledge to implement, applications and pose severe threats [11].

### 4.1 WHAT DOES SECURE MEAN?

Network security can be defined as protection of networks and their services from unauthorized alteration, destruction, or disclosure, and provision of assurance that the network performs in critical situations and have no harmful effects for neither user nor for employee [14]. Computer security attempts to ensure the confidentiality, integrity and availability of computing systems. Keep the computer system (Hardware, software and data are the components of computer system) away from attacks is known as security.

### 4.2 ATTACKS

Attacks can be classified into the following types [17]:

- Passive attacks include traffic analysis, monitoring of unprotected communications, decrypting weakly encrypted traffic, and capturing authentication information such as passwords
- Active attacks include attempts to circumvent or break protection features, to introduce malicious code, and to steal or modify information. Active attacks result in the disclosure or dissemination of data files, DoS, or modification of data.



- Distribution attacks focus on the malicious modification of hardware or software at the factory or during distribution.
- An insider attack involves someone from the inside, such as a disgruntled employee, attacking the network. Insider attacks can be malicious or non-malicious.
- Close-in attacks consist of regular individuals attaining close physical proximity to networks, systems, or facilities for the purpose of modifying, gathering, or denying access to information.
- In phishing attack the hacker creates a fake web site that looks exactly like a popular site such as the SBI bank or paypal. The phishing part of the attack is that the hacker then sends an e-mail message trying to trick the user into clicking a link that leads to the fake site.
- In a hijack attack, a hacker takes over a session between one and another individual and disconnects the other individual from the communication.
- In a spoof attack, the hacker modifies the source address of the packets he or she is sending so that they appear to be coming from someone else.
- A buffer overflow attack is when the attacker sends more data to an application than is expected. A buffer overflow attack usually results in the attacker gaining administrative access to the system in a command prompt or shell.
- In Exploit attack, the attacker knows of a security problem within an operating system or a piece of software and leverages that knowledge by exploiting the vulnerability.
- Password attack, an attacker tries to crack the passwords stored in a network account database or a password-protected file. There are three major types of password attacks: a dictionary attack, a brute-force attack, and a hybrid attack.

#### 4.3 VULNERABILITY AND CONTROLS

Vulnerability is a weakness in the security system. A threat is blocked by a control of vulnerability. A control is an action, device, procedure or technique that removes or reduces vulnerability. The four classes of threat are Interception, Interruption, Modification and Fabrication [4].

#### 4.4 NETWORK SECURITY CONTROLS

Security controls can also be categorized according to their nature:

- Physical controls e.g. fences, doors, locks and fire extinguishers.
- Procedural controls e.g. incident response processes, management oversight, security awareness and training.
- Technical controls e.g. user authentication (login) and logical access controls, antivirus software, firewalls.
- Legal and regulatory or compliance controls e.g. privacy laws, policies and clauses.

#### AUTHENTICATION, AUTHORIZATION, ACCESS CONTROL AND ENCRYPTION

Authentication verifies who you are. Usually, authentication by a server entails the use of a user name and password. Other ways to authenticate can be through cards, retina scans, voice recognition, and fingerprints. Authorization verifies what you are authorized to do. Authorization occurs after successful authentication. In authentication, the user or computer has to prove its identity to the server or client. Authorization is a process by which a server determines if the client has permission to use a resource or access a file [8]. Access control refers to security features that control who can access resources in the operating system. Applications call access control functions to set who can access specific resources or control access to resources provided by the application [7]. Encryption involves the process of transforming data so that it is unreadable by anyone who does not have a decryption key [9].

#### 5. FUTURE WORK

Mobility and Bring Your Own Device continue to be one of the biggest challenges for security organizations worldwide, and increasingly so in 2014. Mobile device use cases are so vast, and the conditions for securing devices on a user or enterprise basis can be so diverse that designing the right enterprise mobile security solution can be very challenging [6]. One of the problems with mobile networks is the lack of security information of the networks. Different from organization and home networks, the security measures and conditions of mobile networks are usually **unknown to the end users**. As a result, users may enter a mobile network filled with attacks without any prior protection and suffer serious damages [5]. Mobile and Cloud Security is one of the challenging issues in the future. Adequate training and Awareness about the importance of security will reduce these challenges.

#### 6. CONCLUSION

As the world becomes more connected by networks, the impact of the network security will certainly continue to grow. Security system should include the deployment of regularly updated firewalls, as well as gateway antivirus, Web security gateway solutions, intrusion detection and intrusion protection systems throughout the network. During transmission; use encryption to protect data whether online or via removable storage. Awareness about the risks of social engineering to the employee as well as employer reduces the risk in security. Training must be given to the staff about the value of data and how to protect it. The strongest network controls are authentication, authorization, access control and encryption.

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