**Fundamental Concepts on (Domain)**

**3.1 Domain Fundamentals & Description**

**Introduction**

This networking is primarily about TCP/IP network protocols and ethernet network architectures, but also briefly describes other protocol suites, network architectures, and other significant areas of networking. This networking tutorial is written for all audiences, even those with little or no networking experience

**3.1 Networking Overview**

It explains in simple terms the way networks are put together, and how data packages are sent between networks and subnets along with how data is routed to the internet. This networking tutorial is broken into five main areas which are:

1. Basics - Explains the protocols and how they work together
2. Media - Describes the cabling and various media used to send data between multiple points of a network.
3. Architecture - Describes some popular network architectures. A network architecture refers to the physical layout (topology) of a network along with the physical transmission media (Type of wire, wireless, etc) and the data access method (OSI Layer 2). Includes ethernet, Token Ring, ARCnet, AppleTalk, and FDDI. This main area of the networking tutorial can and should be skipped by those learning networking and read later.
4. Other Transport Protocols - Describes IPX/SPX, NetBEUI, and more.
5. Functions - Explains some of the functionality of networking such as routing, firewalls and DNS

The reader may read this networking tutorial in any order, but for beginners, it would be best to read through from the beginning with the exception of sections 2 (media), 3 (architecture), and 4 (other). At some point, however, the reader should be able to break from the basics and read about routing and IP masquerading. There are no links to various reading material or software packages inside this networking tutorial, except under the references section. This is because it is more structured, and makes it easier to keep the networking tutorial current.

This networking tutorial will first talk about the network basics so the reader can get a good grasp of networking concepts. This should help the reader understand how each network protocol is used to perform networking. The reader will be able to understand why each protocol is needed, how it is used, and what other protocols it relies upon. This networking tutorial explains the data encapsulation techniques in preparation for transport along with some of the network protocols such as IP, TCP, UDP, ICMP, and IGMP. It explains how ARP and RARP support networking. In functional areas, such as routers, several examples are given so the user can get a grasp on how networking is done in their particular situation. This networking tutorial covers routing, IP masquerading, and firewalls and gives some explanation of how they work, how they are set up, and how and why they are used. Firewalls and the available packages are described, but how to set them up is left to other documentation specific to the operating system and the package. Application protocols such as FTP and Telnet are also briefly described. Networking terms are also explained and defined.

This networking tutorial explains the setup of networking functions using Linux Redhat version 6.1 as an operating system (OS) platform. This will apply to server functions such as routing and IP masquerading. For more documentation on setting up packages, read documentation on this web site and other locations specific to the operating system and the package. If you know how to set up other operating servers such as Windows NT, you can apply the information in this networking tutorial to help you understand how to configure services on that OS platform.

This networking tutorial was written because I perceived a need for a basic networking document to explain how these networking services work and how to set them up, with examples. It will help a novice to learn networking more quickly by explaining the big picture concerning how the system works together. I have seen much good networking documentation, but little that explains the theory along with practical setup and applications.

A network consists of multiple computers connected using some type of interface, each having one or more interface devices such as a Network Interface Card (NIC) and/or a serial device for PPP networking. Each computer is supported by network software that provides the server or client functionality. The hardware used to transmit data across the network is called the media. It may include copper cable, fiber optic, or wireless transmission. The standard cabling used for the purposes of this document is 10Base-T category 5 ethernet cable. This is twisted copper cabling which appears at the surface to look similar to TV coaxial cable. It is terminated on each end by a connector that looks much like a phone connector. Its maximum segment length is 100 meters.

**Network Categories**

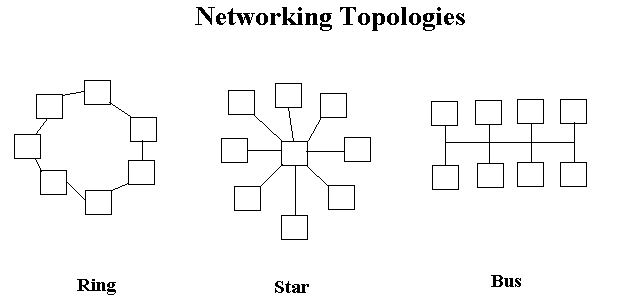
There are two main types of network categories which are:

* Server based
* Peer-to-peer

In a server based network, there are computers set up to be primary providers of services such as file service or mail service. The computers providing the service are are called servers and the computers that request and use the service are called client computers.

In a peer-to-peer network, various computers on the network can act both as clients and servers. For instance, many Microsoft Windows based computers will allow file and print sharing. These computers can act both as a client and a server and are also referred to as peers. Many networks are combination peer-to-peer and server based networks. The network operating system uses a network data protocol to communicate on the network to other computers. The network operating system supports the applications on that computer. A Network Operating System (NOS) includes Windows NT, Novell Netware, Linux, Unix and others.

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| **Three Network Topologies**  The network topology describes the method used to do the physical wiring of the network. The main ones are bus, star, and ring. |  |



1. Bus - Both ends of the network must be terminated with a terminator. A barrel connector can be used to extend it.
2. Star - All devices revolve around a central hub, which is what controls the network communications, and can communicate with other hubs. Range limits are about 100 meters from the hub.
3. Ring - Devices are connected from one to another, as in a ring. A data token is used to grant permission for each computer to communicate.

There are also hybrid networks including a star-bus hybrid, star-ring network, and mesh networks with connections between various computers on the network. Mesh networks ideally allow each computer to have a direct connection to each of the other computers. The topology this documentation deals with most is star topology since that is what ethernet networks

# 1.3.2 Network Applications

There are three categories of applications with regard to networks:

1. Stand alone applications - Includes editors
2. Network versions of stand alone applications - May be licensed for multiple users.
3. Applications only for a network include databases, mail, group scheduling, groupware.

**Models for network applications**

1. Client-server - Processing is split between the client which interacts with the user and the server performing back end processing.
2. Shared file systems - The server is used for file storage and the processing of the file is done on the client computer.
3. Applications that are centralized - An example is a Telnet session. The data and the program run on the central computer and the user uses an interface such as the Telnet client or X server to send commands to the central computer and to see the results.

### E-mail Systems

* Novell GroupWise - Also called Windows Messaging
* Microsoft Mail
* Microsoft Exchange - This is for the Microsoft Exchange Server. There is a Microsoft Exchange client for the Microsoft Exchange server and a client for an internet mail account only.
* Lotus Notes
* cc:Mail - From Lotus and IBM

**Mail API**

Mail application programming interfaces (APIs) allow e-mail support to be integrated into application programs.

* MAPI - Microsoft's Messaging API incorporated throughout Microsoft's office products provides support for mail at the application level.
* VIM - Vendor-Independent Messaging protocol from Lotus is supported by many vendors exclusive of Microsoft.

Message Handling Service (MHS)

* MHS and Global MHS by Novell
* MHS by OSI - It is called MOTIS (message-oriented text interchange system).

X.500

This is a recommendation outlining how an organization can share objects and names on a large network. It is hierarchical similar to DNS, defining domains consisting of organizations, divisions, departments, and workgroups. The domains provide information about the users and available resources on that domain, This X.500 system is like a directory. Its recommendation comes from the International Telegraph and Telephone Consultative Committee (CCITT).