**Internetworking**

Internetworking is combined of 2 words, inter and networking which implies an association between totally different nodes or segments. This connection area unit is established through intercessor devices akin to routers or gateway. The first term for associate degree internetwork was catenet. This interconnection is often among or between public, private, commercial, industrial, or governmental networks. Thus, associate degree internetwork could be an assortment of individual networks, connected by intermediate networking devices, that function as one giant network. Internetworking refers to the trade, products, and procedures that meet the challenge of making and administering internet works.

To enable communication, every individual network node or phase is designed with a similar protocol or communication logic, that is Transfer Control Protocol (TCP) or Internet Protocol (IP). Once a network communicates with another network having constant communication procedures, it’s called Internetworking. Internetworking was designed to resolve the matter of delivering a packet of information through many links.

There is a minute difference between extending the network and Internetworking. Merely exploitation of either a switch or a hub to attach 2 local area networks is an extension of LAN whereas connecting them via the router is an associate degree example of Internetworking. Internetworking is enforced in Layer three (Network Layer) of the OSI-ISO model. The foremost notable example of internetworking is the Internet.

There is chiefly 3 units of Internetworking:

1. Extranet
2. Intranet
3. Internet

Intranets and extranets might or might not have connections to the net. If there is a connection to the net, the computer network or extranet area unit is usually shielded from being accessed from the net if it is not authorized. The net isn’t thought-about to be a section of the computer network or extranet, though it should function as a portal for access to parts of the associate degree extranet.

1. **Extranet –** It’s a network of the internetwork that’s restricted in scope to one organization or entity however that additionally has restricted connections to the networks of one or a lot of different sometimes, however not essential. It’s the very lowest level of Internetworking, usually enforced in an exceedingly personal area. Associate degree extranet may additionally be classified as a Man, WAN, or different form of network however it cannot encompass one local area network i.e. it should have a minimum of one reference to associate degree external network.
2. **Intranet –** This associate degree computer network could be a set of interconnected networks, which exploits the Internet Protocol and uses IP-based tools akin to web browsers and FTP tools, that are underneath the management of one body entity. That body entity closes the computer network to the remainder of the planet and permits solely specific users. Most typically, this network is the internal network of a corporation or different enterprise. An outsized computer network can usually have its own internet server to supply users with browsable data.
3. **Internet –** A selected Internetworking, consisting of a worldwide interconnection of governmental, academic, public, and personal networks based mostly upon the Advanced analysis comes Agency Network (ARPANET) developed by ARPA of the U.S. Department of Defense additionally home to the World Wide Web (WWW) and cited as the ‘Internet’ to differentiate from all different generic Internetworks. Participants within the web, or their service suppliers, use IP Addresses obtained from address registries that manage assignments.

Internetworking has evolved as an answer to a few key problems: isolated LANs, duplication of resources, and an absence of network management. Isolated LANs created transmission problems between totally different offices or departments. Duplication of resources meant that constant hardware and code had to be provided to every workplace or department, as did a separate support employee. This lack of network management meant that no centralized methodology of managing and troubleshooting networks existed.

One more form of the interconnection of networks usually happens among enterprises at the Link Layer of the networking model, i.e. at the hardware-centric layer below the amount of the TCP/IP logical interfaces. Such interconnection is accomplished through network bridges and network switches. This can be typically incorrectly termed internetworking, however, the ensuing system is just a bigger, single subnetwork, and no internetworking protocol, akin to web Protocol, is needed to traverse these devices.

However, one electronic network is also reborn into associate degree internetwork by dividing the network into phases and logically dividing the segment traffic with routers. The Internet Protocol is meant to supply an associate degree unreliable packet service across the network. The design avoids intermediate network components maintaining any state of the network. Instead, this task is allotted to the endpoints of every communication session. To transfer information correctly, applications should utilize associate degree applicable Transport Layer protocol, akin to Transmission management Protocol (TCP), that provides a reliable stream. Some applications use a less complicated, connection-less transport protocol, User Datagram Protocol (UDP), for tasks that don’t need reliable delivery of information or that need period of time service, akin to video streaming or voice chat.

### Internetwork Addressing –

Internetwork addresses establish devices severally or as members of a bunch. Addressing schemes differ based on the protocol family and therefore the OSI layer. Three kinds of internetwork addresses area units are ordinarily used: data-link layer addresses, Media Access control (MAC) addresses, and network-layer addresses. 

1. **Data Link Layer addresses:** A data-link layer address unambiguously identifies every physical network association of a network device. Data-link addresses typically area units cited as physical or hardware addresses. Data-link addresses sometimes exist among a flat address area and have a pre-established and usually fastened relationship to a selected device. End systems usually have just one physical network association, and therefore have just one data-link address. Routers and different internetworking devices usually have multiple physical network connections and so eventually have multiple data-link addresses.
2. **MAC Addresses:** Media Access management (MAC) addresses encompass a set of data-link layer addresses. MAC addresses establish network entities in LANs that implement the IEEE MAC addresses of the data-link layer. MAC addresses different area units distinctively for every local area network interface. MAC addresses are forty-eight bits long and are expressed in form of twelve hexadecimal digits. The primary half dozen hexadecimal digits, which are usually administered by the IEEE, establish the manufacturer or merchant and therefore comprise the Organizational Unique Identifier (OUI). The last half dozen positional notation digits comprise the interface serial variety or another price administered by the particular merchant. MAC addresses are typically area units referred to as burned-in addresses (BIAs) as a result of being burned into read-only memory(ROM) and are traced into random-access memory (RAM) once the interface card initializes.
3. **Network-Layer Addresses:** Network addresses sometimes exist among a gradable address area and typically area units referred to as virtual or logical addresses. the connection between a network address and a tool is logical and unfixed, it usually relies either on physical network characteristics or on groupings that don’t have any physical basis. finish systems need one network-layer address for every network-layer protocol they support. Routers and different Internetworking devices need one network-layer address per physical network association for every network-layer protocol supported.

### Challenges to Internetworking –

Implementing useful internetwork isn’t at any certainty. There are several challenging fields, particularly in the areas of dependableness, connectivity, network management, and adaptability, and each and every space is essential in establishing associate degree economical and effective internetwork. A few of them are:-

* The initial challenge lies when we are trying to connect numerous systems to support communication between disparate technologies. For example, Totally different sites might use different kinds of media, or they could operate at variable speeds.
* Another essential thought is reliable service that should be maintained in an internetwork. Individual users and whole organizations depend upon consistent, reliable access to network resources.
* Network management should give centralized support associate degree troubleshooting capabilities on the internetwork. Configuration, security, performance, and different problems should be adequately addressed for the internetwork to perform swimmingly.
* Flexibility, the ultimate concern, is important for network enlargement and new applications and services, among different factors.