

Motivation

- There are many different LAN and WAN technologies, and computers are connected by many different technologies.
- No single networking technology is best for everyone.
- Any system that spans a large organization must accommodate multiple technologies.

Universal Service

- In the early days of networking (1970s), different networks performed different functions.
- One reason the telephone system is so useful is that any telephone can reach any other telephone. This is called universal service.
- Allowing arbitrary computers to communicate greatly increases the usefulness of each computer.
- Providing universal service requires interconnecting different networks with different technologies.

Internetworking

internetworking - a scheme for interconnecting multiple heterogeneous networks.

internetwork or internet - a set of interconnected networks.

- Internetworking uses both hardware and software.
 - Hardware provides physical connections between dissimilar networks.
 - Software on all attached computers provides universal service.

Routers

router - a hardware component (special-purpose computer) used to interconnect networks.

- A router has a separate I/O interface for each network it connects.
- A network treats a connection to a router the same as a connection to any other computer.
- A router forwards and transforms packets as necessary.

Internet Architecture

- Networks can be connected by routers in a variety of ways.
- Rarely is a single router used.
 - A router has finite capacity.
 - Using more than one router increases reliability.

Virtual Network

- Internet software gives the appearance of a single seamless communication system called a virtual network.
 - Many computers are attached.
 - Universal service is provided.
 - A common addressing scheme is used.
- All details of the underlying physical networks and connections are hidden from users and application programs.
- A virtual network doesn't actually exist. It just appears to exist—an illusion.

Protocols for Internetworking

- The most widely used internetworking protocols are the TCP/IP Internet Protocols.
- TCP/IP was the first internetworking protocol suite.
- Work on TCP/IP began in the 1970s.
- ARPA provided the initial funding.
- NSF picked up funding in the mid 1980s.
- TCP/IP is vendor and platform independent.
- TCP/IP is the protocol suite used in the global Internet.

Protocols for Internetworking

- Other internet protocols:
 - IPX (Internet Packet eXchange by Novell).
 - VINES (Banyan Virtual Integrated NEtwork Service).
 - AppleTalk (Apple).

TCP/IP Layering

- The original ISO 7-Layer Reference Model was devised before internetworking and does not contain a layer for internet protocols.
- It also contains a layer devoted to session protocols, now much less important.
- The TCP/IP Layering Model has 5 layers.

Quiz: How does the TCP/IP 5-layer model compare with the TCP/IP 4-layer model discussed earlier? What's the difference?

Hosts, Routers, Protocol Layers

host computer or host - any computer system connected to a network that runs applications.

- TCP/IP considers a host to be any computer system—a supercomputer or a toaster.
- TCP/IP allows any pair of hosts on an internet to communicate directly.
- Hosts and routers need TCP/IP software.
 - Hosts do not need layer 1 or 2 protocols.
 - Routers do not need layer 4 or 5 protocols.