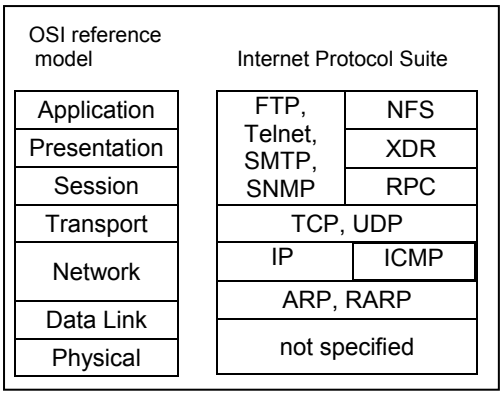
IP Networking Summary – Nicolai Schleifer, Daniel Vogtland – Group 24 – 22.06.2002

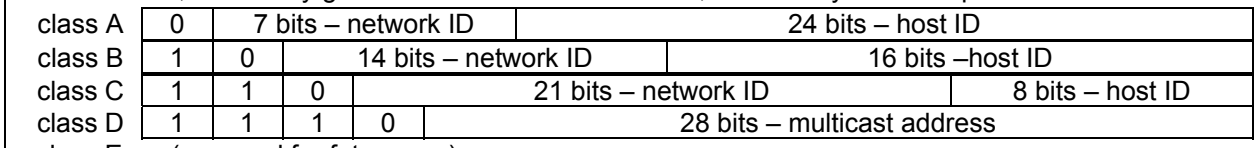


History:
The Internet Protocol Suite was first developed in the mid 1970s, by Stanford University and Bolt, Beranek and Newman, funded by the Defense Advanced Research Projects Agency (DARPA). DARPA wanted to establish a packet-switched network for communication of dissimilar computer systems at research institutions. TCP/IP was then included with BSD UNIX in the 1980 and has become the foundation on which the Internet and the World Wide Web of today are based.

Important Documents
Vinton Cerf, Robert Kahn: A Protocol for Packet Network Interconnection, IEEE, May 1974.
RFC 760, Jon Postel, Jan 1980
RFC 791, Jon Postel, Sep 1981

PROTOCOLS:
IP (Internet Protocol) provides unreliable, connectionless datagram (packet) delivery between Hosts
ICMP (Internet Control Message Protocol**)** handles error and control information between gateways and hosts
TCP (Transport Protocol) connection oriented protocol that provides a reliable, full duplex (receive, transmit at one time) byte stream for a user process.
UDP (User Datagram Protocol) is a connectionless, unreliable protocol for user processes
ARP (Address Resolution Protocol) maps an Internet address into a hardware address
RARP (Reverse Address Resolution Protocol) maps a hardware address into an Internet address

IP Addresses:
32 bit values, commonly given in dotted-decimal notation, where 4 bytes are separated with dots



class E (reserved for future use)
there are also **special case addresses** like broadcast addresses (to reach all hosts of a subnet or network) or the localhost (127.0.0.1)

Subnets:
the host ID auf a class A, B or C address can be divided into subnet ID and host ID
- ⇨ smaller routing tables, detail information of internal network organization is hidden for external routers, more efficient usage of available IP addresses

the **subnet mask** is a 32 bit value (one bits for network ID and subnet ID, zero bits for host ID)
- ⇨ in addition to its IP-address a host can differentiate between addresses on its own subnet, its own network and remote network addresses.

Routing is about finding the path for an IP datagram. **Routers** connect two or more networks, making them look to the user as just one. Routing is done from a "hop-to-hop" basis by using **routing tables**. Each host, acting like a router or not, determines its next routing-target from his own routing table, based on the destination address in the datagram to be routed. A routing table contains entries in the following format:
Destination IP address (host, network or default route), IP address of the next hop on the route to the final destination (next-hop router or directly connected network IP address), Flags (for type of entry: host, network, default route …) Routers forward packets, Hosts only send packets generated by themselves.

Switching is a data exchange service which is being used by IP to accommodate the actual transfer of the datagrams between different hosts. The type of switching being used for IP depends on the hardware interface IP is running on.
Circuit Switching means that a physical circuit is being established, maintained and terminated through a carrier network for each communication session. Example: ISDN.
Packet Switching means that there are different network devices sharing a single point-to-point link via multiplexing. Examples: ATM, Frame Relay, X.25.

Sources: R. Stevens, UNIX Network Programming. / Downes, Ford, Lew, Spanier, Stevenson, Internetworking Technologies Handbook, 2nd edition, Cisco Press, 1998. / Murhammer, Atakan, Bretz et al., TCP/IP Tutorial and Technical Overview, 6th edition, IBM, 1998. / various RFCs.