

# Computer Networks

## #3 Internet



Universitas  
Komputer  
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# Internetworks

- Many networks exist in the world, often with different hardware and software.
- A collection of interconnected networks is called an internetwork or internet.
- The most notable internet is called Internet (uppercase letter I), a collaboration of more than hundreds of thousands of interconnected networks.

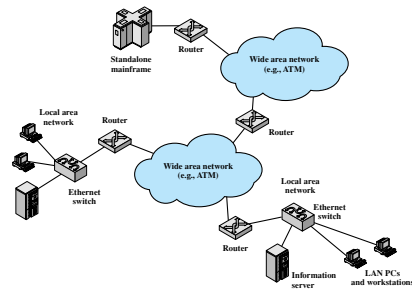
# Origins of the Internet

- The Internet evolved from the ARPANET, which was developed in 1969 by the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defense. It was the first operational packet-switching network. ARPANET began operations in four locations. Today the number of hosts is in the hundreds of millions, the number of users in the billions, and the number of countries participating nearing 200. The number of connections to the Internet continues to grow exponentially.
- The network was so successful that ARPA applied the same packet-switching technology to tactical radio communication (packet radio) and to satellite communication (SATNET). Because the three networks operated in very different communication environments, the appropriate values for certain parameters, such as maximum packet size, were different in each case. Faced with the dilemma of integrating these networks, Vint Cerf and Bob Kahn of ARPA started to develop methods and protocols for internetworking; that is, communicating across arbitrary, multiple, packet-switched networks.

- They published a very influential paper in May of 1974 [CERF74] outlining their approach to a Transmission Control Protocol. The proposal was refined and details filled in by the ARPANET community, with major contributions from participants from European networks, such as Cyclades (France), and EIN, eventually leading to the TCP (Transmission Control Protocol) and IP (Internet Protocol) protocols, which, in turn, formed the basis for what eventually became the TCP/IP protocol suite. This provided the foundation for the Internet.

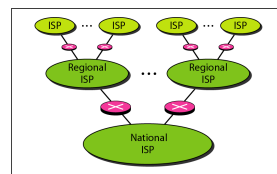
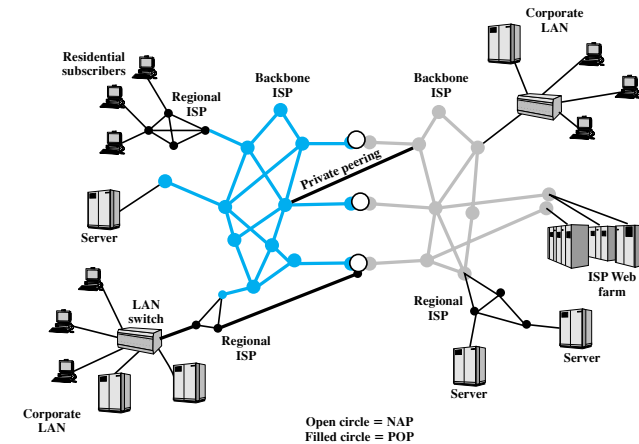
# Key Elements

- The purpose of the Internet, of course, is to interconnect end systems, called hosts (PCs, workstations, servers, mainframes, and so on)
- These networks are in turn connected by routers. Each router attaches to two or more networks. Some hosts, such as mainframes or servers, connect directly to a router rather than through a network.

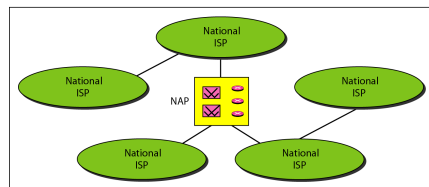


A host may send data to another host anywhere on the Internet. The source host breaks the data to be sent into a sequence of packets, called **IP datagrams** or **IP packets**. Each packet includes a unique numeric address of the destination host. This address is referred to as an **IP address**, because the address is carried in an IP packet. Based on this destination address, each packet travels through a series of routers and networks from source to destination. Each router, as it receives a packet, makes a routing decision and forwards the packet along its way to the destination.

# Internet Architecture



a. Structure of a national ISP



b. Interconnection of national ISPs

## Central Office (CO)

The place where telephone companies terminate customer lines and locate switching equipment to interconnect those lines with other networks.

## Customer Premises Equipment (CPE)

Telecommunications equipment that is located on the customer's premises (physical location) rather than on the provider's premises or in between. Telephone handsets, modems, cable TV set-top boxes, and digital subscriber line routers are examples. Historically, this term referred to equipment placed at the customer's end of the telephone line and usually owned by the telephone company. Today, almost any end-user equipment can be called customer premises equipment and it can be owned by the customer or by the provider.

## Internet Service Provider (ISP)

A company that provides other companies or individuals with access to, or presence on, the Internet. An ISP has the equipment and the telecommunication line access required to have a POP on the Internet for the geographic area served. The larger ISPs have their own high-speed leased lines so that they are less dependent on the telecommunication providers and can provide better service to their customers.

## Network Access Point (NAP)

In the United States, a network access point (NAP) is one of several major Internet interconnection points that serve to tie all the ISPs together. Originally, four NAPs—in New York, Washington, D.C., Chicago, and San Francisco—were created and supported by the National Science Foundation as part of the transition from the original U.S. government—financed Internet to a commercially operated Internet. Since that time, several new NAPs have arrived, including WorldCom's "MAE West" site in San Jose, California and ICS Network Systems' "Big East."

The NAPs provide major switching facilities that serve the public in general. Companies apply to use the NAP facilities. Much Internet traffic is handled without involving NAPs, using peering arrangements and interconnections within geographic regions.

## Network Service Provider (NSP)

A company that provides backbone services to an Internet service provider (ISP). Typically, an ISP connects at a point called an Internet exchange (IX) to a regional ISP that in turn connects to an NSP backbone.

## Point of Presence (POP)

A site that has a collection of telecommunications equipment, usually refers to ISP or telephone company sites. An ISP POP is the edge of the ISP's network; connections from users are accepted and authenticated here. An Internet access provider may operate several POPs distributed throughout its area of operation to increase the chance that their subscribers will be able to reach one with a local telephone call. The largest national ISPs have POPs all over the country.

# Internet Standards

- An Internet standard is thoroughly tested specification that is useful to and adhered to by those who work with the Internet.
- It is formalised regulation that must be followed.
- An Internet draft is a working document (a work in progress) with no official status and 6-month lifetime/
- Upon recommendation from the Internet authorities, a draft may be published as a Request for Comments (RFC).
- Each RFC is edited, assigned a number, and made available to all interested parties.

# Internet Protocol Standardization

- Ada 4 Badan yang bertanggung jawab dalam mengatur, mengontrol serta melakukan standarisasi protokol yang digunakan di Internet, yaitu Internet Society (ISOC), Internet Architecture Board (IAB), Internet Engineering Task Force (IETF), dan Internet Research Task Force (IRTF).
- Internet Society (ISOC) adalah badan personal yang mendukung, memfasilitasi, serta mempromosikan pertumbuhan internet. Sebagai Infrastruktur komunikasi global untuk riset, badan ini juga berurusan dengan aspek sosial dan politik dari jaringan internet.
- Internet Architecture Board (IAB) adalah badan koordinasi dan penasihat teknis bagi Internet Society (ISOC). Badan ini bertindak sebagai review teknik dan editorial akhir semua standar internet. Badan ini memiliki otoritas untuk menerbitkan dokumen standar internet yang dikenal dengan Request For Comment (RFC). Tugas lain dari badan ini ialah mengatur angka-angka dan konstanta yang digunakan dalam protokol internet seperti nomor port, tipe hardware, ARP (Address Resolution Protocol), dll. Tugas ini didelegasikan ke lembaga yang disebut IANA (Internet Assigned Numbers Authority).

- Internet Engineering Task Force (IETF) ialah badan yang berorientasi untuk membentuk standar Internet. Badan ini dibagi menjadi sembilan kelompok kerja (misalnya aplikasi, routing dan addressing, keamanan komputer) dan bertugas menghasilkan standar-standar internet. Untuk mengatur kerja badan ini, dibentuk badan Internet Engineering Steering Group (ISEG).
- Internet Research Task Force (IRTF) memiliki orientasi pada riset-riset jangka panjang.