

Internetworking

Internetworking is the practice of interconnecting multiple computer networks,^{[1]:169} such that any pair of hosts in the connected networks can exchange messages irrespective of their hardware-level networking technology. The resulting system of interconnected networks are called an *internetwork*, or simply an *internet*.

The most notable example of internetworking is the Internet, a network of networks based on many underlying hardware technologies. The Internet is defined by a unified global addressing system, packet format, and routing methods provided by the Internet Protocol.^{[2]:103}

The term *internetworking* is a combination of the components *inter* ("between") and *networking*. An earlier term for an internetwork is *catenet*, a short-form of (*con*)*catenating networks*.

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Interconnection of networks

Internetworking started as a way to connect disparate types of networking technology, but it became widespread through the developing need to connect two or more local area networks via some sort of wide area network.

The first two interconnected networks were the ARPANET and the NPL network via Peter Kirstein's group at University College London.^[3] The network elements used to connect individual networks in the ARPANET, the predecessor of the Internet, were originally called gateways, but the term has been deprecated in this context, because of possible confusion with functionally different devices. By 1973-4, researchers in the United States, the United Kingdom and France had worked out an approach to internetworking where the differences between network protocols were hidden by using a common internetwork protocol, and instead of the network being responsible for reliability, as in the ARPANET, the hosts became responsible, as demonstrated in the CYCLADES network.^{[4][5][6]} Research by Donald Davies' team at NPL confirmed establishing a common host protocol would be more reliable and efficient.^[7]

Today the interconnecting gateways are called routers. The definition of an internetwork today includes the connection of other types of computer networks such as personal area networks.

To build an internetwork, the following are needed:^{[2]:103} A standardized scheme to address packets to any host on any participating network; a standardized protocol defining format and handling of transmitted packets; components interconnecting the participating networks by routing packets to their destinations based on standardized addresses.

Another type of interconnection of networks often occurs within enterprises at the Link Layer of the networking model, i.e. at the hardware-centric layer below the level of the TCP/IP logical interfaces. Such interconnection is accomplished with network bridges and network switches. This is sometimes incorrectly termed internetworking, but the resulting system is simply a larger, single subnetwork, and no internetworking protocol, such as Internet Protocol, is required to traverse these devices. However, a single computer network may be converted into an internetwork by dividing the network into segments and logically dividing the segment traffic with routers and having an internetworking software layer that applications employ.

The Internet Protocol is designed to provide an unreliable (not guaranteed) packet service across the network. The architecture avoids intermediate network elements maintaining any state of the network. Instead, this function is assigned to the endpoints of each communication session. To transfer data reliably, applications must utilize an appropriate Transport Layer protocol, such as Transmission Control Protocol (TCP), which provides a reliable stream. Some applications use a simpler, connection-less transport protocol, User Datagram Protocol (UDP), for tasks which do not require reliable delivery of data or that require real-time service, such as video streaming^[8] or voice chat.

Catenet

Catenet is an obsolete term for a system of packet-switched communication networks interconnected via gateways.^[9]

The term was coined by Louis Pouzin in October 1973 in a note circulated to the International Networking Working Group,^[10] later published in a 1974 paper "*A Proposal for Interconnecting Packet Switching Networks*".^[11] Pouzin was a pioneer in packet-switching technology and founder of the CYCLADES network, at a time when *network* meant what is now called a local area network. Catenet was the concept of linking these networks into a *network of networks* with specifications for compatibility of addressing and routing. The term catenet was gradually displaced by the short-form of the term internetwork, *internet* (lower-case *i*), when the Internet Protocol replaced earlier protocols on the ARPANET.

Networking models

Two architectural models are commonly used to describe the protocols and methods used in internetworking. The Open System Interconnection (OSI) reference model was developed under the auspices of the International Organization for Standardization (ISO) and provides a rigorous description for layering protocol functions from the underlying hardware to the software interface concepts in user applications. Internetworking is implemented in the Network Layer (Layer 3) of the model.

The Internet Protocol Suite, also known as the TCP/IP model, was not designed to conform to the OSI model and does not refer to it in any of the normative specifications in Requests for Comment and Internet standards. Despite similar appearance as a layered model, it has a much less rigorous, loosely defined architecture that concerns itself only with the aspects of the style of networking in its own historical provenance. It assumes the availability of any suitable hardware infrastructure, without discussing hardware-specific low-level interfaces, and that a host has access to this local network to which it is connected via a Link Layer interface.

For a period in the late 1980s and early 1990s, the network engineering community was polarized over the implementation of competing protocol suites, commonly known as the Protocol Wars. It was unclear which of the OSI model and the Internet protocol suite would result in the best and most robust computer networks.^{[12][13][14]}

See also

- History of the Internet

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