

Internet Protocol

Internet Protocol

The Internet Protocol (IP) is the network layer communications protocol in the Internet protocol suite for relaying datagrams across network boundaries - The Internet Protocol (IP) is the network layer communications protocol in the Internet protocol suite for relaying datagrams across network boundaries. Its routing function enables internetworking, and essentially establishes the Internet.

IP has the task of delivering packets from the source host to the destination host solely based on the IP addresses in the packet headers. For this purpose, IP defines packet structures that encapsulate the data to be delivered. It also defines addressing methods that are used to label the datagram with source and destination information.

IP was the connectionless datagram service in the original Transmission Control Program introduced by Vint Cerf and Bob Kahn in 1974, which was complemented by a connection-oriented service that became the basis for the Transmission Control Protocol (TCP). The Internet protocol suite is therefore often referred to as TCP/IP.

The first major version of IP, Internet Protocol version 4 (IPv4), is the dominant protocol of the Internet. Its successor is Internet Protocol version 6 (IPv6), which has been in increasing deployment on the public Internet since around 2006.

Internet protocol suite

foundational protocols in the suite are the Transmission Control Protocol (TCP), the User Datagram Protocol (UDP), and the Internet Protocol (IP). Early - The Internet protocol suite, commonly known as TCP/IP, is a framework for organizing the communication protocols used in the Internet and similar computer networks according to functional criteria. The foundational protocols in the suite are the Transmission Control Protocol (TCP), the User Datagram Protocol (UDP), and the Internet Protocol (IP). Early versions of this networking model were known as the Department of Defense (DoD) Internet Architecture Model because the research and development were funded by the Defense Advanced Research Projects Agency (DARPA) of the United States Department of Defense.

The Internet protocol suite provides end-to-end data communication specifying how data should be packetized, addressed, transmitted, routed, and received. This functionality is organized into four abstraction layers, which classify all related protocols according to each protocol's scope of networking. An implementation of the layers for a particular application forms a protocol stack. From lowest to highest, the layers are the link layer, containing communication methods for data that remains within a single network segment (link); the internet layer, providing internetworking between independent networks; the transport layer, handling host-to-host communication; and the application layer, providing process-to-process data exchange for applications.

The technical standards underlying the Internet protocol suite and its constituent protocols are maintained by the Internet Engineering Task Force (IETF). The Internet protocol suite predates the OSI model, a more comprehensive reference framework for general networking systems.

Internet Control Message Protocol

The Internet Control Message Protocol (ICMP) is a supporting protocol in the Internet protocol suite. It is used by network devices, including routers - The Internet Control Message Protocol (ICMP) is a supporting protocol in the Internet protocol suite. It is used by network devices, including routers, to send error messages and operational information indicating success or failure when communicating with another IP address. For example, an error is indicated when a requested service is not available or that a host or router could not be reached. ICMP differs from transport protocols such as TCP and UDP in that it is not typically used to exchange data between systems, nor is it regularly employed by end-user network applications (with the exception of some diagnostic tools like ping and traceroute).

A separate Internet Control Message Protocol (called ICMPv6) is used with IPv6.

Internet Message Access Protocol

In computing, the Internet Message Access Protocol (IMAP) is an Internet standard protocol used by email clients to retrieve email messages from a mail - In computing, the Internet Message Access Protocol (IMAP) is an Internet standard protocol used by email clients to retrieve email messages from a mail server over a TCP/IP connection. IMAP is defined by RFC 9051.

IMAP was designed with the goal of permitting complete management of an email box by multiple email clients, therefore clients generally leave messages on the server until the user explicitly deletes them. An IMAP server typically listens on port number 143. IMAP over SSL/TLS (IMAPS) is assigned the port number 993.

Virtually all modern e-mail clients and servers support IMAP, which along with the earlier POP3 (Post Office Protocol) are the two most prevalent standard protocols for email retrieval. Many webmail service providers such as Gmail and Outlook.com also support for both IMAP and POP3.

IPv6

Internet Protocol version 6 (IPv6) is the most recent version of the Internet Protocol (IP), the communications protocol that provides an identification - Internet Protocol version 6 (IPv6) is the most recent version of the Internet Protocol (IP), the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. IPv6 was developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion, and was intended to replace IPv4. In December 1998, IPv6 became a Draft Standard for the IETF, which subsequently ratified it as an Internet Standard on 14 July 2017.

Devices on the Internet are assigned a unique IP address for identification and location definition. With the rapid growth of the Internet after commercialization in the 1990s, it became evident that far more addresses would be needed to connect devices than the 4,294,967,296 (2³²) IPv4 address space had available. By 1998, the IETF had formalized the successor protocol, IPv6 which uses 128-bit addresses, theoretically allowing 2¹²⁸, or 340,282,366,920,938,463,463,374,607,431,768,211,456 total addresses. The actual number is slightly smaller, as multiple ranges are reserved for special usage or completely excluded from general use. The two protocols are not designed to be interoperable, and thus direct communication between them is impossible, complicating the move to IPv6. However, several transition mechanisms have been devised to rectify this.

IPv6 provides other technical benefits in addition to a larger addressing space. In particular, it permits hierarchical address allocation methods that facilitate route aggregation across the Internet, and thus limit the expansion of routing tables. The use of multicast addressing is expanded and simplified, and provides additional optimization for the delivery of services. Device mobility, security, and configuration aspects have been considered in the design of the protocol.

IPv6 addresses are represented as eight groups of four hexadecimal digits each, separated by colons. The full representation may be shortened; for example, 2001:0db8:0000:0000:0000:8a2e:0370:7334 becomes 2001:db8::8a2e:370:7334.

Internet Protocol television

Internet Protocol television (IPTV), also called TV over broadband, is the service delivery of television over Internet Protocol (IP) networks. Usually - Internet Protocol television (IPTV), also called TV over broadband, is the service delivery of television over Internet Protocol (IP) networks. Usually sold and run by a telecom provider, it consists of broadcast live television that is streamed over the Internet (multicast) — in contrast to delivery through traditional terrestrial, satellite, and cable transmission formats — as well as video on demand services for watching or replaying content (unicast).

IPTV broadcasts started gaining usage during the 2000s alongside the rising use of broadband-based internet connections. It is often provided bundled with internet access services by ISPs to subscribers and runs in a closed network. IPTV normally requires the use of a set-top box, which receives the encoded television content in the MPEG transport stream via IP multicast, and converts the packets to be watched on a TV set or other kind of display. It is distinct from over-the-top (OTT) services, which are based on a direct one-to-one transmission mechanism.

IPTV methods have been standardised by organisations such as ETSI. IPTV has found success in some regions: for example in Western Europe in 2015, pay IPTV users overtook pay satellite TV users. IPTV is also used for media delivery around corporate and private networks.

IP address

An Internet Protocol address (IP address) is a numerical label such as 192.0.2.1 that is assigned to a device connected to a computer network that uses - An Internet Protocol address (IP address) is a numerical label such as 192.0.2.1 that is assigned to a device connected to a computer network that uses the Internet Protocol for communication. IP addresses serve two main functions: network interface identification, and location addressing.

Internet Protocol version 4 (IPv4) was the first standalone specification for the IP address, and has been in use since 1983. IPv4 addresses are defined as a 32-bit number, which became too small to provide enough addresses as the internet grew, leading to IPv4 address exhaustion over the 2010s. Its designated successor, IPv6, uses 128 bits for the IP address, giving it a larger address space. Although IPv6 deployment has been ongoing since the mid-2000s, both IPv4 and IPv6 are still used side-by-side as of 2025.

IP addresses are usually displayed in a human-readable notation, but systems may use them in various different computer number formats. CIDR notation can also be used to designate how much of the address should be treated as a routing prefix. For example, 192.0.2.1/24 indicates that 24 significant bits of the address are the prefix, with the remaining 8 bits used for host addressing. This is equivalent to the historically used subnet mask (in this case, 255.255.255.0).

The IP address space is managed globally by the Internet Assigned Numbers Authority (IANA) and the five regional Internet registries (RIRs). IANA assigns blocks of IP addresses to the RIRs, which are responsible for distributing them to local Internet registries in their region such as internet service providers (ISPs) and large institutions. Some addresses are reserved for private networks and are not globally unique.

Within a network, the network administrator assigns an IP address to each device. Such assignments may be on a static (fixed or permanent) or dynamic basis, depending on network practices and software features. Some jurisdictions consider IP addresses to be personal data.

IPv4

Internet Protocol version 4 (IPv4) is the first version of the Internet Protocol (IP) as a standalone specification. It is one of the core protocols of - Internet Protocol version 4 (IPv4) is the first version of the Internet Protocol (IP) as a standalone specification. It is one of the core protocols of standards-based internetworking methods in the Internet and other packet-switched networks. IPv4 was the first version deployed for production on SATNET in 1982 and on the ARPANET in January 1983. It is still used to route most Internet traffic today, even with the ongoing deployment of Internet Protocol version 6 (IPv6), its successor.

IPv4 uses a 32-bit address space which provides 4,294,967,296 (2³²) unique addresses, but large blocks are reserved for special networking purposes. This quantity of unique addresses is not large enough to meet the needs of the global Internet, which has caused a significant issue known as IPv4 address exhaustion during the ongoing transition to IPv6.

Internet

The Internet (or internet) is the global system of interconnected computer networks that uses the Internet protocol suite (TCP/IP) to communicate between - The Internet (or internet) is the global system of interconnected computer networks that uses the Internet protocol suite (TCP/IP) to communicate between networks and devices. It is a network of networks that consists of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies. The Internet carries a vast range of information resources and services, such as the interlinked hypertext documents and applications of the World Wide Web (WWW), electronic mail, internet telephony, streaming media and file sharing.

The origins of the Internet date back to research that enabled the time-sharing of computer resources, the development of packet switching in the 1960s and the design of computer networks for data communication. The set of rules (communication protocols) to enable internetworking on the Internet arose from research and development commissioned in the 1970s by the Defense Advanced Research Projects Agency (DARPA) of the United States Department of Defense in collaboration with universities and researchers across the United States and in the United Kingdom and France. The ARPANET initially served as a backbone for the interconnection of regional academic and military networks in the United States to enable resource sharing. The funding of the National Science Foundation Network as a new backbone in the 1980s, as well as private funding for other commercial extensions, encouraged worldwide participation in the development of new networking technologies and the merger of many networks using DARPA's Internet protocol suite. The linking of commercial networks and enterprises by the early 1990s, as well as the advent of the World Wide Web, marked the beginning of the transition to the modern Internet, and generated sustained exponential growth as generations of institutional, personal, and mobile computers were connected to the internetwork. Although the Internet was widely used by academia in the 1980s, the subsequent commercialization of the Internet in the 1990s and beyond incorporated its services and technologies into virtually every aspect of

modern life.

Most traditional communication media, including telephone, radio, television, paper mail, and newspapers, are reshaped, redefined, or even bypassed by the Internet, giving birth to new services such as email, Internet telephone, Internet radio, Internet television, online music, digital newspapers, and audio and video streaming websites. Newspapers, books, and other print publishing have adapted to website technology or have been reshaped into blogging, web feeds, and online news aggregators. The Internet has enabled and accelerated new forms of personal interaction through instant messaging, Internet forums, and social networking services. Online shopping has grown exponentially for major retailers, small businesses, and entrepreneurs, as it enables firms to extend their "brick and mortar" presence to serve a larger market or even sell goods and services entirely online. Business-to-business and financial services on the Internet affect supply chains across entire industries.

The Internet has no single centralized governance in either technological implementation or policies for access and usage; each constituent network sets its own policies. The overarching definitions of the two principal name spaces on the Internet, the Internet Protocol address (IP address) space and the Domain Name System (DNS), are directed by a maintainer organization, the Internet Corporation for Assigned Names and Numbers (ICANN). The technical underpinning and standardization of the core protocols is an activity of the Internet Engineering Task Force (IETF), a non-profit organization of loosely affiliated international participants that anyone may associate with by contributing technical expertise. In November 2006, the Internet was included on USA Today's list of the New Seven Wonders.

Voice over IP

Internet Protocol (VoIP), also known as IP telephony, is a set of technologies used primarily for voice communication sessions over Internet Protocol - Voice over Internet Protocol (VoIP), also known as IP telephony, is a set of technologies used primarily for voice communication sessions over Internet Protocol (IP) networks, such as the Internet. VoIP enables voice calls to be transmitted as data packets, facilitating various methods of voice communication, including traditional applications like Skype, Microsoft Teams, Google Voice, and VoIP phones. Regular telephones can also be used for VoIP by connecting them to the Internet via analog telephone adapters (ATAs), which convert traditional telephone signals into digital data packets that can be transmitted over IP networks.

The broader terms Internet telephony, broadband telephony, and broadband phone service specifically refer to the delivery of voice and other communication services, such as fax, SMS, and voice messaging, over the Internet, in contrast to the traditional public switched telephone network (PSTN), commonly known as plain old telephone service (POTS).

VoIP technology has evolved to integrate with mobile telephony, including Voice over LTE (VoLTE) and Voice over NR (Vo5G), enabling seamless voice communication over mobile data networks. These advancements have extended VoIP's role beyond its traditional use in Internet-based applications. It has become a key component of modern mobile infrastructure, as 4G and 5G networks rely entirely on this technology for voice transmission.

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