

Study on the Computer networks and data communication

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Abstract: A computer network or data network is a telecommunications network that allows computers to exchange data. In computer networks, networked computing devices pass data to each other along data connections. The connections (network links) between nodes are established using either cable media or wireless media. The best-known computer network is the Internet. Network computer devices that originate, route and terminate the data are called network nodes. Nodes can include hosts such as personal computers, phones, servers as well as networking hardware. Two such devices are said to be networked together when one device is able to exchange information with the other device, whether or not they have a direct connection to each other. Computer networks support applications such as access to the World Wide Web, shared use of application and storage servers, printers, and fax machines, and use of email and instant messaging applications. Computer networks differ in the physical media used to transmit their signals, the communications protocols to organize network traffic, the network's size, topology and organizational intent. Data communications refers to the transmission of this digital data between two or more computers and a computer network or data network is a telecommunications network that allows computers to exchange data. The physical connection between networked computing devices is established using either cable media or wireless media. The best-known computer network is the Internet. This tutorial should teach you basics of Data Communication and Computer Network (DCN) and will also take you through various advance concepts related to Data Communication and Computer Network. Networking engineering is a complicated task, which involves software, firmware, chip level engineering, hardware, and electric pulses. To ease network engineering, the whole networking concept is divided into multiple layers. Each layer is involved in some particular task and is independent of all other layers. But as a whole, almost all networking tasks depend on all of these layers. Layers share data between them and they depend on each other only to take input and send output.

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Introduction

A computer network, sometimes known as a data network, is a kind of telecommunications network that enables computers to communicate with one another. Data is passed between networked computing devices through data links in computer networks. Cable or wireless media are used to establish connections (network links) between nodes. The Internet is the most well-known computer network. Network nodes are computer devices that originate, transport, and terminate data on a network. Hosts such as personal computers, phones, servers, and networking gear are examples of nodes. When one device can share information with another device, whether or not they have a direct connection, they are said to be networked together. Access to the World Wide Web, shared usage of application and storage servers, printers, and fax machines, and the use of email and instant messaging apps are all supported via computer networks. The physical medium used to carry signals, the communications protocols used to arrange network traffic, the network's scale, topology, and organizational intent all vary across computer networks.

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Making devices talk to each other for the purposes of communication is nothing new. Early forays into telephony such as the telegraph and telephone have since evolved into more complicated devices, and now a computer can be networked to the Internet, another PC, or even a home stereo. In the early 1960s, individual computers had to be physically shared, making the sharing of data and other information difficult. Seeing this was impractical, researchers developed a way to "connect" the computers so they could share their resources more efficiently. Hence, the early computer network was born. Through the then-new communication protocol known as packet switching, a number of applications, such as secure voice transmission in military channels became possible. These new circuits provided the basis for the communication technologies of the rest of the 20th century, and with further refinement these were applied to computer networks. These networks provided the basis for the early ARPANET, which was the forerunner of the modern Internet. The Advanced Research Projects Agency (ARPA) submitted the proposal for the project on June 3, 1968 which was approved a few

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weeks later. This proposal entitled “Resource Sharing Computer Networks” would allow ARPA not only the further sharing of their data, but would allow them to further their research in a wide variety of military and scientific fields. After being tested in four locations, the network spread and the new protocols created for its use evolved into today’s World Wide Network. In 1977, early PC-based Local Area Networks, or LANs (Local Area Networks) were spreading, and while initially restricted to academics and hobbyists, they eventually found their way into the workplace and in homes, although the explosion into the latter two arenas is a relatively recent phenomenon. LAN variants also developed, including Metropolitan Area Networks (MANs) to cover large areas such as a college campus, and Wide Area Networks (WANs) for university-to-university communication. With the widespread use of computers in the corporate world, the speed and convenience of using them to communicate and transfer data has forever altered the landscape of how people conduct business. Networks have become an integral part of the corporate world. Ubiquitous computing and Internet-capable cellular phones have allowed people to remain connected, even if the individual is away from a fully wired office environment.

Data communications refers to the transmission of this digital data between two or more computers and a computer network or data network is a telecommunications network that allows computers to exchange data. The physical connection between networked computing devices is established using either cable media or wireless media. The best-known computer network is the Internet. Data communications is the transfer of data (a digital bitstream or a digitized analog signal [1] over a point-to-point or point-to-multipoint communication channel. Examples of such channels are copper wires, optical fibers, wireless communication channels, storage media and computer buses. The data are represented as an electromagnetic signal, such as an electrical voltage, radiowave, microwave, or infrared signal [2]. Networking is the exchange of information and ideas among people with a common profession or special interest, usually in an informal social setting. Networking is used by professionals to expand their circles of acquaintances, to find out about job opportunities in their fields, and to increase their awareness of news and trends in their fields or in the greater world. (The term computer networking refers to linking multiple devices so that they can readily share information and software resources [3]. Analog or analogue transmission is a transmission method of conveying voice, data, image, signal or video information using a continuous signal which varies in amplitude, phase, or some other property in proportion to that of a variable. The messages are either represented by a

sequence of pulses by means of a line code (baseband transmission), or by a limited set of continuously varying wave forms (passband transmission), using a digital modulation method [4] [5]. The passband modulation and corresponding demodulation (also known as detection) is carried out by modem equipment. According to the most common definition of digital signal, both baseband and passband signals representing bit-streams are considered as digital transmission, while an alternative definition only considers the baseband signal as digital, and passband transmission of digital data as a form of digital-to-analog conversion. Data transmitted may be digital messages originating from a data source, for example a computer or a keyboard [6]. It may also be an analog signal such as a phone call or a video signal, digitized into a bit-stream, for example, using pulsecode modulation (PCM) or more advanced source coding (analog-to-digital conversion and data compression) schemes. This source coding and decoding is carried out by codec equipment. The meanings of source and receiver are very simple [7]. The device that transmits the data is known as source and the device that receives the transmitted data is known as receiver. Data communication aims at the transfer of data and maintenance of the data during the process but not the actual generation of the information at the source and receiver. Datum mean the facts information statistics or the like derived by calculation or experimentation. The facts and information so gathered are processed in accordance with defined systems of procedure. Data can exist in a variety of forms such as numbers, text, bits and bytes [8]. The Figure is an illustration of a simple data communication system. A data communication system may collect data from remote locations through data transmission circuits, and then outputs processed results to remote locations. Figure provides a broader view of data communication networks. The different data communication techniques which are presently in widespread use evolved gradually either to improve the data communication techniques already existing or to replace the same with better options and features. Then, there are data communication jargons to contend with such as baud rate, modems, routers, LAN, WAN, TCP/IP, ISDN, during the selection of communication systems. Hence, it becomes necessary to review and understand these terms and gradual development of data communication methods [9].

Types of Networking

Networking often begins with a single point of common ground. The most obvious is a professional affiliation, such as stock brokers, but some people find effective networking opportunities in a college alumni group, a church or synagogue social group,

or a private club. For professionals, the best networking opportunities may occur at trade shows, seminars, and conferences, which are designed to attract a large crowd of likeminded individuals. Networking helps a professional keep up with current events in the field, and develops relationships that may boost future business or employment prospects. Needless to say, it also provides opportunities to help other people find jobs, make connections and catch up on the news [10]. Computer interface devices Answering the call of customers frustrated with cord clutter, many[who?] manufacturers of computer peripherals turned to wireless technology to satisfy their consumer base [citation needed]. Originally these units used bulky, highly limited transceivers to mediate between a computer and a keyboard and mouse; however, more recent generations have used small, high-quality devices, some even incorporating Bluetooth. These systems have become so ubiquitous that some users have begun complaining about a lack of wired peripherals. [who?] Wireless devices tend to have a slightly slower response time than their wired counterparts; however, the gap is decreasing. [citation needed] Computer interface devices such as a keyboard or mouse are powered by a battery and send signals to a receiver through a USB port by way of a radio frequency (RF) receiver. The RF design makes it possible for signals to be transmitted wirelessly and expands the range of effective use, usually up to 10 feet. Distance, physical obstacles, competing signals, and even human bodies can all degrade the signal quality. Concerns about the security of wireless keyboards arose at the end of 2007, when it was revealed that Microsoft's implementation of encryption in some of its 27 MHz models was highly insecure

Business Networking

What is network security? How does it protect you? How does network security work? What are the business benefits of network security? You may think you know the answers to basic questions like, What is network security? Still, it's a good idea to ask them of your trusted IT partner. Why? Because small and medium-sized businesses (SMBs) often lack the IT resources of large companies. That means your network security may not be sufficient to protect your business from today's sophisticated Internet threats. Small business owners network to develop relationships with people and companies they may do business with in the future. These connections help them establish rapport and trust among people in their own communities [11]. Successful business networking involves regularly following up with contacts to exchange valuable information that may not be readily available outside the network.

Online Networking

Professional networking platforms such as LinkedIn provide an online location for people to engage with other professionals, join groups, post blogs, and share information. And, of course, they provide a place to post a resume that can be seen by prospective employers, to search for jobs, or to identify job candidates [12]. These days, a business-to-business customer pipeline can be developed almost entirely through the use of a social networking site. Online networking forum allows professionals to demonstrate their knowledge and connect with like-minded people. LinkedIn is the largest professional network, but there are many others. Some cater to particular subsets of people, such as Black Business Women Online. Others have a different focus, such as MeetUp, which encourages its members to meet in person off-site. Lunchmeet is just what it sounds like: It's a mobile app that identifies folks in your field who are available locally for a meet-up [13].

Brief history of Data Communication

Data has been sent via non-electronic means since the advent of communication. Analog signal data has been sent electronically since the advent of the telephone. However, the first data electromagnetic transmission applications in modern time were telegraphy (1809) and teletypewriters (1906), which are both digital signals. The fundamental theoretical work in data transmission and information theory by Harry Nyquist, Ralph Hartley, Claude Shannon and others during the early 20th century, was done with these applications in mind [14]. Data communication is utilized in computers in computer buses and for communication with peripheral equipment via parallel ports and serial ports such as RS-232 (1969), Firewire (1995) and USB (1996). The principles of data transmission are also utilized in storage media for Error detection and correction since 1951. Data communication is utilized in computer networking equipment such as modems (1940), local area networks (LAN) adapters (1964), repeaters, repeater hubs, microwave links, wireless network access points (1997), etc. In telephone networks, data communication is utilized for transferring many phone calls over the same copper cable or fiber cable by means of Pulse code modulation (PCM), i.e. sampling and digitization, in combination with Time division multiplexing (TDM) (1962). Telephone exchanges have become digital and software controlled, facilitating many value added services [15]. For example, the first AXE telephone exchange was presented in 1976. Since the late 1980s, digital communication to the end user has been possible using Integrated Services Digital Network (ISDN) services. Since the end of the 1990s, broadband access techniques such as ADSL, Cable modems, fiber-to-the-building (FTTB) and

fiber-to-the-home (FTTH) have become widespread to small offices and homes. The current tendency is to replace traditional telecommunication services by packet mode communication such as IP telephony and IPTV. Transmitting analog signals digitally allows for greater signal processing capability. The ability to process a communications signal means that errors caused by random processes can be detected and corrected. Digital signals can also be sampled instead of continuously monitored. The multiplexing of multiple digital signals is much simpler to the multiplexing of analog signals. Because of all these advantages, and because recent advances in wideband communication channels and solid-state electronics have allowed scientists to fully realize these advantages, digital communications has grown quickly. Digital communications is quickly edging out analog communication because of the vast demand to transmit computer data and the ability of digital communications to do so. The digital revolution has also resulted in many digital telecommunication applications where the principles of data transmission are applied. Examples are second-generation (1991) and later cellular telephony, video conferencing, digital TV (1998), digital radio (1999), telemetry, etc. Data communications is the physical transfer of data (a digital bit stream or a digitized analog signal[1]) over a point-to-point or point-to-multipoint communication channel. Examples of such channels are copper wires, optical fibers, wireless communication channels, storage media and computer buses. The data are represented as an electromagnetic signal, such as an electrical voltage, radiowave, microwave, or infrared signal. While analog transmission is the transfer of a continuously varying analog signal over an analog channel, digital communications is the transfer of discrete messages over a digital or an analog channel. The messages are either represented by a sequence of pulses by means of a line code (baseband transmission), or by a limited set of continuously varying wave forms (passband transmission), using a digital modulation method. The passband modulation and corresponding demodulation (also known as detection) is carried out by modem equipment. According to the most common definition of digital signal, both baseband and passband signals representing bit-streams are considered as digital transmission, while an alternative definition only considers the baseband signal as digital, and passband transmission of digital data as a form of digital-to-analog conversion. Data transmitted may be digital messages originating from a data source, for example a computer or a keyboard. It may also be an analog signal such as a phone call or a video signal, digitized into a bitstream for example using pulse-code modulation (PCM) or more advanced source coding (analog-to-digital conversion and data

compression) schemes. This source coding and decoding is carried out by codec equipment.

CONCLUSION

While the age-old concept of the network is foundational in virtually all areas of society, Computer Networks and Protocols have forever changed the way humans will work, play, and communicate. Forging powerfully into areas of our lives that no one had expected, digital networking is further empowering us for the future. New protocols and standards will emerge, new applications will be conceived, and our lives will be further changed and enhanced. While the new will only be better, the majority of digital networking's current technologies are not cutting-edge, but rather are protocols and standards conceived at the dawn of the digital networking age that have stood solid for over thirty years.

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