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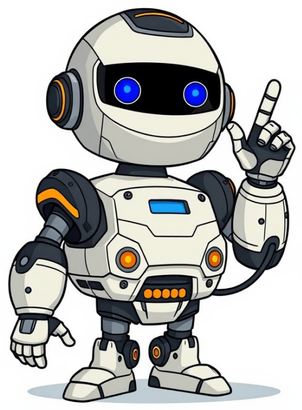

Telecommunication is the process of transmitting information over a distance using technology such as telephone lines, cable, or satellite. It is a key part of the modern world, as it allows people to communicate with each other and access information and resources from around the globe. Voice communication:This type of telecommunication involves the transmission of spoken words, such as through telephone calls or radio broadcasts. It can be done through various technologies, such as analog and digital phone lines, mobile networks, and voice-over-internet protocol (VoIP). Data communication:This type of telecommunication involves the transmission of digital data, such as text, images, and video. It can be done through various methods, such as email, instant messaging, and file transfer. Data communication relies on various technologies, including the internet, Ethernet, and serial communication. Multimedia communication:This type of telecommunication involves the transmission of a combination of voice, data, and video, such as through video conference calls or streaming services. It requires the use of technologies that can support the simultaneous transmission of multiple types of media, such as broadband internet and codecs. Satellite communication:This type of telecommunication involves the use of artificial satellites orbiting the Earth to transmit and receive signals for communication. Satellite communication is often used for long-distance communication or in areas where there is no access to other communication networks. It relies on the use of satellite dishes and antennas to transmit and receive signals. Wireless communication:This type of telecommunication involves the use of wireless technology, such as radio waves or infrared waves, to transmit and receive information. It includes technologies like cellular phones, WiFi, and Bluetooth. Wireless communication allows devices to communicate without the need for physical connections, such as cables or wires. Optical communication:This type of telecommunication involves the transmission of information using light, such as through fiber optic cables or laser communication systems. It is often used for high-speed communication over long distances, as it allows for the transmission of large amounts of data at high speeds. Optical communication relies on the use of lasers or LED lights to transmit information through fibers made of glass or plastic. A telecommunication network is a system of devices and technologies that are used to transmit and receive information over a distance. There are many types of telecommunication networks, including telephone networks, radio and television networks, the internet, satellite networks, cellular networks, and optical networks.- Advertisement - Telecommunication networks can be analog or digital, depending on the type of signals they transmit. Analog networks transmit information using continuous waves, while digital networks transmit information using discrete signals, such as ones and zeros. Telecommunication networks can be classified according to their scope and size. Local area networks (LANs)are small networks that are used to connect devices within a small geographic area, such as a home or office. Wide area networks (WANs)are larger networks that are used to connect devices over a larger area, such as a city or region. The internet is a global network of interconnected computers that allows for the transmission of data and information. It is made up of many smaller networks, including LANs and WANs, that are connected through servers, routers, and cables. Telephone systems:These systems allow for the transmission of voice communication over a distance. They can be analog or digital and can include technologies like circuit-switched systems, which establish a dedicated connection between two parties for the duration of the call, and packet-switched systems, which divide the voice data into packets and transmit them over the network. VoIP is a type of telephone system that uses the internet to transmit and receive calls. Radio and television:These are used for the transmission of audio and visual information over a distance. Radio and television signals are transmitted through the air using technologies like broadcasting, which transmits signals over a wide area, and satellite, which uses artificial satellites orbiting the Earth to transmit and receive signals. Cable television uses a network of cables to transmit signals. Internet:The internet is a global network of interconnected computers that allows for the transmission of data and information. It relies on technologies like TCP/IP, which is a set of protocols that defines how data is transmitted over the internet, and WiFi, which allows devices to connect to the internet wirelessly. Broadband is a type of internet connection that offers faster speeds and higher capacity than other types of internet connections. Satellite communication:This involves the use of artificial satellites orbiting the Earth to transmit and receive signals for communication. Satellite communication is often used for long-distance communication or in areas where there is no access to other communication networks. It requires the use of satellite dishes and antennas to transmit and receive signals. Cellular networks:These are wireless communication networks that use cells, or small geographic areas, to transmit and receive signals. They rely on technologies like GSM, CDMA, and LTE to transmit and receive data. Cellular networks allow devices like phones and tablets to connect to the internet and make calls when they are not within range of a WiFi network. Optical communication:This involves the transmission of information using light, such as through fiber optic cables or laser communication systems. It is often used for high-speed communication over long distances, as it allows for the transmission of large amounts of data at high speeds. Optical communication relies on the use of lasers or LED lights to transmit information through fibers made of glass or plastic. The future of telecommunication technology is likely to involve the continued development and advancement of existing technologies, as well as the emergence of new technologies. Some of the areas where we may see significant progress in the future include: 5G:The next generation of cellular networks, 5G, is expected to offer faster speeds, lower latency, and more capacity than previous generations. It is likely to be used for a wide range of applications, including internet of things (IoT) devices, self-driving cars, and virtual and augmented reality. Internet of things (IoT):The IoT refers to the interconnectedness of physical devices, such as appliances, vehicles, and sensors, through the internet. The telecommunication technology of the future is likely to involve the widespread adoption of the IoT, which will allow for the automation and integration of many aspects of our lives. Artificial intelligence:Artificial intelligence (AI) is likely to play a significant role in the future of telecommunication technology. It may be used to improve communication systems, such as by providing personalized recommendations or automating customer service. Quantum communication:Quantum communication involves the use of quantum mechanics to transmit information. It is expected to offer higher security and faster speeds than traditional communication methods. The telecommunication technology of the future may involve the use of quantum communication for sensitive data transmissions. Space-based communication:In the future, it is possible that we may see the development of communication systems that use satellites or other objects in space as relay stations. This could allow for the transmission of data and communication over long distances and to remote locations. Increased connectivity:The telecommunication technology of the future is likely to involve even greater levels of connectivity, with more devices and systems being connected to the internet and to each other. This could lead to the automation and integration of many aspects of our lives, as well as the development of new services and applications. Also, check Telecom Reforms in India and Futuristic 5G Applications. Telecommunication technology has evolved significantly over time. Early forms of telecommunication, such as the telegraph and the telephone, used electrical signals to transmit information over a distance. As technology has advanced, more sophisticated methods of telecommunication have been developed, including radio, television, and the internet. Some challenges facing the telecommunication industry include the need to keep up with rapidly changing technology, the need to protect against cyber threats, and the need to ensure that communication networks are reliable and secure. Additionally, there are often regulatory and policy issues that must be addressed, such as issues related to privacy and net neutrality. There are many career opportunities in the telecommunication industry, including roles in engineering, network design and management, customer service, sales, and marketing. Individuals with skills in areas such as computer science, electrical engineering, and network security may have particularly good job prospects in this field. There are many resources available for learning more about telecommunication technology, including online courses, books, and industry publications. Joining professional organizations and attending conferences and workshops can also be helpful in staying up to date with developments in the field. A modem is a device that allows computers and other devices to connect to the internet or other communication networks. It modulates and demodulates signals to transmit and receive data. A router is a device that connects computers and other devices to the internet or other communication networks. It routes data packets between devices and networks and can also serve as a firewall to protect against cyber threats. A switch is a device that allows computers and other devices to communicate with each other on a network. It receives data packets and sends them to their intended destination. A server is a computer that stores and manages data and applications and provides them to other computers and devices over a network. Servers are used to host websites, store and process data, and provide other services. The cloud refers to a network of servers that are connected over the internet and are used to store, process, and manage data and applications. It allows users to access data and applications from anywhere, as long as they have an internet connection. Informatec Digital Social Telecommunications: What are they and what are their functions?Telecommunications are essential for global communication and connection.They have evolved from primitive methods to advanced technologies such as 5G and the Internet of Things.They offer economic and healthcare benefits, but face access and security challenges.Its impact transforms education, work, and well-being, creating a more interconnected world.IntroductionTelecommunications are a fundamental component of our daily lives. From the moment we wake up and check our smartphones to when we connect to the Internet for work or school, they are present in every aspect of our modern society.Telecommunications refers to the transmission and reception of information, whether voice, data or images, through different media. These media range from fiber optic cables, copper cables, radio waves, satellites and wireless technologies. Today, telecommunications play a crucial role in global connectivity, enabling instant communication between people and organizations in different parts of the world. They have also revolutionized the way we access information and transformed the way we work, study, entertain ourselves and interact with others.The development of telecommunications has been the result of a long historical process that has evolved along with technological advances. From the first smoke signals and drums used by ancient civilizations to transmit messages, to the networks of high speed optical fiber and satellite communications as we know them today, telecommunications have experienced exponential growth in terms of speed, range and capacity. In this article, we'll delve into the different types of telecommunications, their functions, and their importance. We'll explore how telecommunications enable the transmission of information, remote communication, and access to information. We'll also analyze the benefits telecommunications offers in various fields, as well as the challenges facing this constantly evolving field. Read on to discover how telecommunications have transformed our world and how they continue to be a fundamental pillar for progress and connectivity in today's society.History of telecommunicationsFrom the earliest primitive methods of communication to the cutting-edge technologies we use today, the history of telecommunications has been a process of constant advancement and evolution. In this section, we will explore the important milestones that have marked the development of telecommunications over time. The beginning of telecommunications can be traced back to ancient civilizations, where rudimentary systems were used to transmit messages over long distances. For example, the ancient Egyptians used smoke signals and drums to communicate over long distances.As humanity advanced, more sophisticated methods of communication emerged. In the 19th century, the telegraph was invented, which allowed messages to be transmitted over distances using electrical signals through a system of wires. This revolutionary invention allowed for faster and more efficient communication, eliminating the need to send messages on horseback or by mail. in the messure that They discovered new technologies and more complex systems were developed, a fundamental change in the field of telecommunications occurred with the invention of the telephone. In 1876, Alexander Graham Bell patented the first telephone, allowing real-time voice transmission over wires.Throughout the 20th century, telecommunications experienced unprecedented growth. The invention of radio, television and satellite transmission systems further expanded communication capabilities, making it possible to reach mass audiences around the world. OSI Model: Uses and characteristicsHowever, the real turning point in the history of telecommunications came with the advent of the Internet. Beginning in the 1990s, the Internet became a ubiquitous tool that revolutionized the way we communicate and access information. Broadband connections, the interconnection of networks, and the development of web protocols and technologies enabled instant data transmission, global communication, and the exchange of information in real time.In conclusion, the history of telecommunications has been a fascinating journey from the earliest primitive methods of communication to the global connectivity we experience today. Each technological advancement has expanded the boundaries of communication, bringing people closer together and breaking geographical barriers. We will continue to explore the various types of telecommunications and their functions in the following sections of this article.Benefits and challenges of telecommunicationsTelecommunications offer a number of significant benefits in various areas of our society. However, they also face challenges that must be overcome to ensure equitable and secure access to communications. In this section, we will explore both the benefits and challenges of telecommunications in today's world.Benefits of telecommunicationsGlobal connectivityTelecommunications allow us to stay connected anytime, anywhere. Whether through phone calls, text messages, email, or social media platforms, we can instantly communicate with people all over the world. Access to informationInternet connectivity through telecommunications gives us unprecedented access to a vast amount of information. This allows us to research, learn and stay up to date on a wide variety of topics, as well as access online services such as banking, shopping and entertainment.Facilitation of trade and businessTelecommunications are fundamental to trade and business in the global economy. Through video conferencing, secure data transfers, and real-time communication with trading partners, companies can expand their operations across borders and reach new markets.Improving medical careTelecommunications play a crucial role in telemedicine, allowing doctors and patients to communicate remotely. This is especially beneficial in rural areas or regions with limited access to medical services, as it allows remote consultation and the exchange of medical information.Telecommunications challengesDigital divide: Although telecommunications have made enormous progress in recent years, significant inequalities in access to communications still exist. The digital divide persists between urban and rural regions, as well as between developed and developing countries. This limits the ability of some individuals and communities to fully benefit from telecommunications.Security and privacyWith the increased dependence on telecommunications, security and privacy concerns have also arisen. Security measures must be implemented. solid security to protect data transmitted via telecommunications and ensure user privacy.Obsolete infrastructure and systemsEfficient and reliable telecommunications require up-to-date infrastructure and systems. However, in some regions, infrastructure may be outdated or insufficient, making it difficult to provide quality services.In conclusion, they provide numerous benefits in terms of global connectivity, access to information, trade facilitation, and improved healthcare. However, they also face challenges in the form of digital divide, security and privacy, and the need for updated infrastructure. It is important to address these challenges to ensure that they continue to play a pivotal role in our modern society. Wifi repeater: settings to improve performanceFuture of telecommunicationsTelecommunications have evolved rapidly throughout history, and the future promises even more significant advancements and changes. In this section, we will explore the trends emerging and promising technologies that can shape the future of telecommunications.5GOne of the most prominent trends in the future of telecommunications is the implementation and expansion of 5G technology. This new generation of mobile networks promises ultra-fast connection speeds, increased capacity and reduced latency. 5G will enable better connectivity for smart devices, autonomous vehicles, Internet of Things and augmented and virtual reality applications, among others.Internet of Things (IoT)The advancement of IoT will also have a significant impact on telecommunications. With IoT, everyday devices are connected to each other and to the Internet, allowing communication and data exchange automatically and without human intervention. This will improve efficiency in sectors such as resource management, transportation and healthcare.artificial intelligence (AI)AI is revolutionizing many fields, and telecommunications is no exception. AI can boost the analysis and processing of large amounts of data generated by telecommunications, leading to more accurate decision-making and improved user experience. It can also help with tasks such as infrastructure maintenance and cybersecurity.Augmented reality (AR) and virtual reality (VR)These technologies are becoming increasingly important and have the potential to transform communications. AR and VR enable immersive and collaborative experiences, which will open up new possibilities in areas such as education, entertainment, virtual meetings and many more.Autonomous networks and network functions virtualization (NFV)Autonomous networks, which are based on automation and machine learning, aim to achieve more efficient and autonomous operation in telecommunications. In addition, network functions virtualization (NFV) allows network functions and services to be executed in software instead of physical hardware, which simplifies management and reduces costs.In summary, the future of telecommunications looks exciting, with advancements such as the deployment of 5G, the expansion of IoT, the increasing use of AI, the adoption of augmented and virtual reality technologies, and the implementation of autonomous networks and NFV. These advancements promise greater connectivity, efficiency and quality in our communications, and will open up new opportunities in a wide range of sectors.Impact on societyTelecommunications have transformed our society in multiple ways, creating new opportunities, improving the way we communicate and affecting various areas of our lives. In this section, we will explore the impact of telecommunications on different aspects of society.Communication and connectivityTelecommunications have revolutionized the way we communicate. Distance is no longer an obstacle thanks to the ability to make phone calls, send text messages, emails, and connect through social media and instant messaging platforms. Finally, they keep us connected at all times, facilitating personal, business, and social communication.Access to information and educationThanks to telecommunications, we have access to an almost unlimited amount of information. We can search for answers to our questions, learn new skills, and access educational resources online. Telecommunications have democratized access to education, allowing people to learn at their own pace and from anywhere in the world. The 5 Most Used Social Networks and Their Impact on SocietyEconomic developmentTelecommunications are a key driver of economic growth. They facilitate global trade by enabling business expansion and connecting with customers and suppliers around the world. They also foster innovation through the rapid transfer of knowledge and collaboration between researchers, entrepreneurs, and professionals from different sectors.Improving healthcare and well-beingThey have improved healthcare and well-being by enabling telemedicine, remote patient monitoring, and the sharing of medical information between healthcare professionals. This is especially beneficial in rural areas or areas with limited access to medical services, where telecommunications can save lives by connecting patients with specialists and medical resources.Changes in the way of workingThey have changed the way we work. More and more people have the option to work remotely, which provides flexibility and reduces the need for long commutes. In addition, telecommunications have enabled the creation of remote and collaborative work teams, facilitating communication and collaboration on international projects.Environmental impactWhile telecommunications have numerous benefits, they also have an environmental impact. Increasing energy consumption and production of electronic devices raise concerns about sustainability and the carbon footprint of telecommunications. However, telecommunications can also contribute to reducing emissions by enabling the adoption of remote working and teleconferencing initiatives, which reduce the need for physical travel.In short, telecommunications have a profound impact on different aspects of society, from the way we communicate to the way we work, access information and receive healthcare. While there are significant benefits, it is also important to consider the environmental impact and address the challenges that arise in relation to equitable access. Overall, telecommunications have improved our quality of life and continue to play a fundamental role in our increasingly connected society.Conclusion: Telecommunications: What are they and what are their functions?In this journey through the fascinating universe of telecommunications, we have learned that its importance transcends its mere definition. Telecommunications have become the backbone of our society, allowing us to communicate instantly regardless of distance, access an infinite flow of information and perform our daily tasks more efficiently.However, we must also be aware of the challenges that arise around equity of access, privacy and environmental impact. Ultimately, telecommunications challenge us to be responsible in their use, taking advantage of their benefits and mitigating their potential negative effects. As a society, we are constantly evolving, and telecommunications will continue to lead the way. path to a future increasingly connected and promising.Telecommunication has revolutionized how we connect, transforming every aspect of human life. Its indispensable for keeping family and friends connected while bolstering business operations through enhanced communication and security. But what exactly does telecommunication entail, and why is it so crucial? This article addresses the question what is telecommunication?, explores its diverse applications in daily life, banking, and business, and explains its critical role in our increasingly interconnected world.Telecommunication, or telecom, encompasses the transmission of voice, data, and video through various electronic devices and technologies, including telephones, computers, microwave communications, fiber optics, and satellites. It also covers media such as radio and television broadcasting and the extensive use of the Internet.The telecommunication industry constitutes a global network of businesses that provide the necessary equipment, software, and services to enable these communications.Key players in this industry include carriers or providers who manage the communication systems and sub-sectors like telecom infrastructure, billing companies, telecom software, network security providers, network operators, handset manufacturers, and value-added service providers. These components collectively facilitate the seamless exchange of information across the globe, evolving continuously to meet advancing technological and consumer demands.Advancements in telecommunication technologies have made way to interact with people globally. By adopting a sophisticated communication system, many businesses worldwide have gained productivity, improved customer service, and increased growth.Telecommunication connects long-distance family and friends via online calls, texts, emails, and social media.It powers the rapid growth of these platforms, facilitating instant communication and media sharing. Mobile technology keeps us connected with calls and texts and provides access to the internet for entertainment like news, movies, and music.Secure telecommunication technologies enable a range of financial activities. We can easily access bank accounts, transfer funds, pay bills, and shop online. Integrated voice responses and efficient call management improve customer service. Mobile banking apps simplify managing finances and transactions, enhancing user convenience and security.Telecommunication is crucial in healthcare, enabling telemedicine and remote patient monitoring. Doctors consult with patients via video calls, improving access to healthcare services, especially in remote areas.The role of telecommunication in education has grown, facilitating e-learning and virtual classrooms that connect teachers and students globally.In emergencies, reliable telecommunication is essential for coordinating rescue operations and disseminating information swiftly to the public.Telecommunication is vital in logistics, allowing real-time face-to-face communication with global partners. It accelerates decision-making and operational efficiency. Businesses leverage telecommunication for virtual meetings, connecting with employees, clients, and partners worldwide. Digital platforms, including websites and social media, help break geographical barriers, expand market reach, and increase profitability.In the digital era, telecommunication has become a cornerstone for business operations, including retail. An exemplary tool in this regard is ConnectPOS, a leading point-of-sale system that integrates seamlessly with telecommunication technologies. It enables businesses to conduct sales transactions efficiently and manage real-time data across multiple locations. With features that support cloud-based synchronization and mobile accessibility, ConnectPOS exemplifies how telecommunication can enhance operational efficiency and customer engagement in the retail sector.Telecommunication is crucial in the modern age as it fulfills our fundamental need to connect and communicate. It serves as the foundation for thriving governments, businesses, and communities, enabling families to stay in touch regardless of distance. The ability to communicate clearly across geographical boundaries is instrumental in building and maintaining strong relationships.Telecommunication is also vital for security, especially during emergencies or crises. In natural disasters, effective telecommunications infrastructure is essential for coordinating search and rescue operations, helping save lives and protect property. Additionally, military organizations worldwide depend on robust telecommunication systems to maintain secure and reliable communication channels critical for their operations.Economically, the telecommunication sector is a significant driver of global growth. According to data from Statista, the industry contributes approximately $520 billion annually to the global economy. This transformation from a simple tool for conversation to a key economic engine highlights the sectors expansive role.Moreover, telecommunication has a profound impact on education. It provides easy access to information, offering limitless opportunities for learning and personal growth. From internet searches to educational videos, people worldwide can acquire new skills and knowledge effortlessly. The rise of online courses and remote learning models further amplifies the pivotal role of telecommunication in shaping educational landscapes and making learning accessible to all.As we look toward the future, the telecommunications industry is poised to undergo significant transformations driven by technological advancements and changing user demands.1. 5G and BeyondThe rollout of 5G networks is already underway, offering unprecedented speed and connectivity. The next steps involve not only expanding 5G coverage but also beginning research into 6G technology, which promises even faster speeds, lower latency, and more reliable connections capable of supporting emerging technologies such as augmented reality (AR) and virtual reality (VR).2. Internet of Things (IoT) ExpansionIoT connectivity is set to explode with the increased deployment of 5G networks. This will enable a vast network of connected devices, from smart home products to industrial IoT applications. Enhanced telecommunications infrastructure will facilitate real-time data exchange and automation across various sectors, improving efficiency and opening new avenues for innovation.3. Artificial Intelligence and Machine LearningAI and ML are becoming integral to telecommunication networks. These technologies help optimize network management, predict network anomalies, personalize customer service, and improve security. Over time, AI-driven predictive maintenance could become standard, reducing downtime and enhancing service reliability.4. Increased Focus on CybersecurityAs the volume of data transmitted over telecommunication networks grows, so does the risk of cyber threats. Future trends will likely include the development of more advanced cybersecurity protocols to protect data integrity and privacy. This will be crucial in maintaining trust and ensuring the safety of both consumer and business data.5. Telecoms SustainabilityEnvironmental concerns are prompting the telecommunications industry to look for ways to decrease its carbon footprint. Future trends may include adopting more energy-efficient technologies and infrastructure, integrating renewable energy sources into network operations, and developing new, sustainable materials for hardware.Understanding the essentials of telecommunication underscores its pivotal role as a driving force in our world since the dawn of the 21st century. As we continue to witness rapid technological advancements, it is imperative for businesses and individuals alike to embrace these changes. By leveraging the power of telecommunication, we can enhance connectivity, boost efficiency, and open up new opportunities for innovation and growth. Now is the time to harness these tools to stay ahead in an increasingly connected and dynamic global landscape.Enhance your retail experience with ConnectPOS, leveraging the latest in telecommunication technology for seamless transactions and superior customer service. Reach out to us today to see how ConnectPOS can elevate your business operations! Telecommunications refers to the transmission of information over distances using electronic systems, such as telephones, radio, television, and the internet. It involves the exchange of data in the form of voice, video, or text between individuals, businesses, or machines through wired or wireless technologies. Telecommunications systems enable communication over local, regional, or global distances and can include technologies like landlines, mobile networks, fiber optics, satellite systems, and the internet. Essentially, telecommunications plays a crucial role in connecting people, organizations, and devices for a wide range of purposes, from personal conversations to business operations and data exchange.For example, a mobile phone call, an email sent over the internet, or a video conference using satellite systems are all examples of telecommunications.Why is telecommunications important?Telecommunications is important because it allows for the rapid exchange of information, which is essential for both personal and professional communication. It enables businesses to operate efficiently, manage remote workforces, conduct transactions, and collaborate globally. It also supports a wide range of services, from emergency communications to entertainment and education. The growth of the digital economy, including e-commerce and online services, relies heavily on effective and reliable telecommunications infrastructure.For individuals, telecommunications allows them to stay connected with family, friends, and colleagues, regardless of distance. It also provides access to information, services, and entertainment, contributing to education, social interactions, and economic participation.Understanding telecommunications through an exampleImagine a business that relies on a cloud-based system to manage its operations. Employees access the system remotely through the internet, which is a form of telecommunications. The company also holds virtual meetings with clients or partners, which are facilitated by video conferencing tools that use telecommunication technologies like broadband internet and satellite links. In this case, telecommunications are crucial for maintaining day-to-day business functions and enabling long-distance communication.In another example, a person makes an international phone call to a family member living abroad. The call is made using a mobile phone network, which is a part of telecommunications infrastructure, allowing the person to communicate across countries in real time.Heres how a telecommunications-related clause might appear in a contract:The Service Provider agrees to supply telecommunication services, including voice and data transmission, to the Client at the agreed-upon service levels. The Provider will ensure that all telecommunications systems are operational, with minimal downtime, and that any service interruptions are promptly addressed in accordance with the Service Level Agreement (SLA).ConclusionTelecommunications is a vital aspect of modern life, connecting people and businesses across the globe and enabling the efficient exchange of information. Whether for personal communication, business operations, or technological advancements, telecommunications systems provide the infrastructure needed for society to function and thrive in an increasingly interconnected world. Understanding the role of telecommunications is essential for businesses and individuals to navigate the digital landscape and make the most of communication technologies. This article contains general legal information and does not contain legal advice. Cobrief is not a law firm or a substitute for an attorney or law firm. The law is complex and changes often. For legal advice, please ask a lawyer. Transmission of information electromagnetically"Telecommunication" redirects here. For the A Flock of Seagulls song, see Telecommunication (song).Earth station at the satellite communication facility Raisting Earth Station in Raisting, Bavaria, GermanyTelecommunication, often used in its plural form or abbreviated as telecom, is the transmission of information over a distance using electrical or electronic means, typically through cables, radio waves, or other communication technologies. These means of transmission may be divided into communication channels for multiplexing, allowing for a single medium to transmit several concurrent communication sessions. Long-distance technologies invented during the 20th and 21st centuries generally use electric power, and include the electrical telegraph, telephone, television, and radio.Early telecommunication networks used metal wires as the medium for transmitting signals. These networks were used for telegraphy and telephony for many decades. In the first decade of the 20th century, a revolution in wireless communication began with breakthroughs including those made in radio communications by Guglielmo Marconi, who won the 1909 Nobel Prize in Physics. Other early pioneers in electrical and electronic telecommunications include co-inventors of the telegraph Charles Wheatstone and Samuel Morse, numerous inventors and developers of the telephone including Antonio Meucci, Philipp Reis, Elisha Gray and Alexander Graham Bell, inventors of radio Edwin Armstrong and Lee de Forest, as well as inventors of television like Vladimir K. Zworykin, John Logie Baird and Philo Farnsworth.Since the 1960s, the proliferation of digital technologies has meant that voice communications have gradually been supplemented by data. The physical limitations of metallic media prompted the development of optical fibre.[1][2][3] The Internet, a technology independent of any given medium, has provided global access to services for individual users and further reduced location and time limitations on communications.At the 1932 Plenipotentiary Telegraph Conference and the International Radiotelegraph Conference in Madrid, the two organizations merged to form the International Telecommunication Union (ITU).[4] They defined telecommunication as "any telegraphic or telephonic communication of signs, signals, writing, facsimiles and sounds of any kind, by wire, wireless or other systems or processes of electric signaling or visual signaling (semaphores)."The definition was later reconfirmed, according to Article 1.3 of the ITU Radio Regulations, which defined it as "Any transmission, emission or reception of signs, signals, writings, images and sounds or intelligence of any nature by wire, radio, optical, or other electromagnetic systems".As such, slow communications technologies like postal mail and pneumatic tubes are excluded from the telecommunication's definition.[5][6] The term telecommunication was coined in 1904 by the French engineer and novelist douard Estauni, who defined it as "remote transmission of thought through electricity".[7]Telecommunication is a compound noun formed from the Greek prefix tele- (), meaning distant, far off, or afar,[8] and the Latin verb communicare, meaning to share.[9][10] Communication was first used as an English word in the late 14th century. It comes from Old French comunicacion (14c., Modern French communication), from Latin communicationem (nominative communication), noun of action from past participle stem of communicare, "to share, divide out; communicate, impart, inform; join, unite, participate in," literally, "to make common", from communis.[11]Further information: History of telecommunicationMany transmission media have been used for long-distance communication throughout history, from smoke signals, beacons, semaphore telegraphs, signal flags, and optical heliographs to wires and empty space made to carry electromagnetic signals.A replica of one of Chappe's semaphore towersLong distance communication was used long before the discovery of electricity and electromagnetism enabled the invention of telecommunications. A few of the many ingenious methods for communicating over distances prior to that are described here.Homing pigeons have been used throughout history by different cultures. Pigeon post had Persian roots and was later used by the Romans to aid their military. Frontinus claimed Julius Caesar used pigeons as messengers in his conquest of Gaul.[12] The Greeks also conveyed the names of the victors at the Olympic Games to various cities using homing pigeons.[13] In the early 19th century, the Dutch government used the system in Java and Sumatra. And in 1849, Paul Julius Reuter started a pigeon service to fly stock prices between Aachen and Brussels, a service that operated for a year until the gap in the telegraph link was closed.[14]In the Middle Ages, chains of beacons were commonly used on hilltops as a means of relaying a signal. Beacon chains suffered the drawback that they could only pass a single bit of information, so the meaning of the message such as "the enemy has been sighted" had to be agreed upon in advance. One notable instance of their use was during the Spanish Armada, when a beacon chain relayed a signal from Plymouth to London.[15]In 1792, Claude Chappe, a French engineer, built the first fixed visual telegraphy system (or semaphore line) between Lille and Paris.[16] However semaphore suffered from the need for skilled operators and expensive towers at intervals of ten to thirty kilometres (six to nineteen miles). As a result of competition from the electrical telegraph, the last commercial line was abandoned in 1880.[17]Main articles: Telegraphy and TelephonyOn July 25, 1837, the first commercial electrical telegraph was demonstrated by English inventor Sir William Fothergill Cooke and English scientist Sir Charles Wheatstone.[18][19] Both inventors viewed their device as "an improvement to the [existing] electromagnetic telegraph" and not as a new device.[20]Samuel Morse independently developed a version of the electrical telegraph that he unsuccessfully demonstrated on September 2, 1837. His code was an important advance over Wheatstone's signaling method. The first transatlantic telegraph cable was successfully completed on July 27, 1866, allowing transatlantic telecommunication for the first time.[21]After early attempts to develop a talking telegraph by Antonio Meucci and a telefon by Johann Philipp Reis, a patent for the conventional telephone was filed by Alexander Bell in February 1876 (just a few hours before Elisha Gray filed a patent caveat for a similar device).[22][23] The first commercial telephone services were set up by the Bell Telephone Company in 1878 and 1879 on both sides of the Atlantic in the cities of New Haven and London.[24][25]Main articles: Radio and TelevisionIn 1894, Italian inventor Guglielmo Marconi began developing a wireless communication using the then-newly discovered phenomenon of radio waves, demonstrating, by 1901, that they could be transmitted across the Atlantic Ocean.[26] This was the start of wireless telegraphy by radio. On 17 December 1902, a transmission from the Marconi station in Glace Bay, Nova Scotia, Canada, became the world's first radio message to cross the Atlantic from North America. In 1904, a commercial service was established to transmit nightly news summaries to subscribing ships, which incorporated them into their onboard newspapers.[27]World War I accelerated the development of radio for military communications. After the war, commercial radio AM broadcasting began in the 1920s and became an important mass medium for entertainment and news. World War II again accelerated the development of radio for the wartime purposes of aircraft and land communication, radio navigation, and radar.[28] Development of stereo FM broadcasting of radio began in the 1930s in the United States and the 1940s in the United Kingdom,[29] displacing AM as the dominant commercial standard in the 1970s.[30]On March 25, 1925, John Logie Baird demonstrated the transmission of moving pictures at the London department store Selfridges. Baird's device relied upon the Nipkow disk by Paul Nipkow and thus became known as the mechanical television. It formed the basis of experimental broadcasts done by the British Broadcasting Corporation beginning on 30 September 1929.[31]Main article: Vacuum tubeVacuum tubes use thermionic emission of electrons from a heated cathode for a number of fundamental electronic functions such as signal amplification and current rectification.The simplest vacuum tube, the diode invented in 1904 by John Ambrose Fleming, contains only a heated electron-emitting cathode and an anode. Electrons can only flow in one direction through the devicefrom the cathode to the anode. Adding one or more control grids within the tube enables the current between the cathode and anode to be controlled by the voltage on the grid or grids.[32] These devices became a key component of electronic circuits for the first half of the 20th century and were crucial to the development of radio, television, radar, sound recording and reproduction, long-distance telephone networks, and analogue and early digital computers. While some applications had used earlier technologies such as the spark gap transmitter for radio or mechanical computers for computing, it was the invention of the thermionic vacuum tube that made these technologies widespread and practical, leading to the creation of electronics.[33]For most of the 20th century, televisions depended on a kind of vacuum tube the cathode ray tube invented by Karl Ferdinand Braun. The first version of such a television to show promise was produced by Philo Farnsworth and demonstrated to his family on 7 September 1927.[34] After World War II, interrupted experiments resumed and television became an important home entertainment broadcast medium.Also in the 1940s, the invention of semiconductor devices made it possible to produce solid-state devices, which are smaller, cheaper, and more efficient, reliable, and durable than vacuum tubes. Starting in the mid-1960s, vacuum tubes were replaced with the transistor. Vacuum tubes still have some applications for certain high-frequency amplifiers.Main articles: Computer network and InternetOn 11 September 1940, George Stibitz transmitted problems for his Complex Number Calculator in New York using a teletype and received the computed results back at Dartmouth College in New Hampshire.[35] This configuration of a centralized computer (mainframe) with remote dumb terminals remained popular well into the 1970s. In the 1960s, Paul Baran and, independently, Donald Davies started to investigate packet switching, a technology that sends a message in portions to its destination asynchronously without passing it through a centralized mainframe. A four-node network emerged on 5 December 1969, constituting the beginnings of the ARPANET, which by 1981 had grown to 213 nodes.[36] ARPANET eventually merged with other networks to form the Internet. While Internet development was a focus of the Internet Engineering Task Force (IETF) who published a series of Request for Comments documents, other networking advancements occurred in industrial laboratories, such as the local area network (LAN) developments of Ethernet (1983), Token Ring (1984)[citation needed] and Star network topology.The effective capacity to exchange information worldwide through two-way telecommunication networks grew from 281 petabytes (PB) of optimally compressed information in 1986 to 471 PB in 1993 to 2.2 exabytes (EB) in 2000 to 65 EB in 2007.[37] This is the informational equivalent of two newspaper pages per person per day in 1986, and six entire newspapers per person per day by 2007.[38] Given this growth, telecommunications play an increasingly important role in the world economy and the global telecommunications industry was about a $4.7 trillion sector in 2012.[39][40] The service revenue of the global telecommunications industry was estimated to be $1.5 trillion in 2010, corresponding to 2.4% of the world's gross domestic product (GDP).[39]Modern telecommunication is founded on a series of key concepts that experienced progressive development and refinement in a period of well over a century:Telecommunication technologies may primarily be divided into wired and wireless methods. Overall, a basic telecommunication system consists of three main parts that are always present in some form or another:A transmitter that takes information and converts it to a signalA transmission medium, also called the physical channel, that carries the signal (e.g., the "free space channel")A receiver that takes the signal from the channel and converts it back into usable information for the recipientIn a radio broadcasting station, the station's large power amplifier is the transmitter and the broadcasting antenna is the interface between the power amplifier and the free space channel. The free space channel is the transmission medium and the receiver's antenna is the interface between the free space channel and the receiver. Next, the radio receiver is the destination of the radio signal, where it is converted from electricity to sound.Telecommunication systems are occasionally "duplex" (two-way systems) with a single box of electronics working as both the transmitter and a receiver, or a transceiver (e.g., a mobile phone).[41] The transmission electronics and the receiver electronics within a transceiver are quite independent of one another. This can be explained by the fact that radio transmitters contain power amplifiers that operate with electrical powers measured in watts or kilowatts, but radio receivers deal with radio powers measured in microwatts or nanowatts. Hence, transceivers have to be carefully designed and built to isolate their high-power circuitry and their low-power circuitry from each other to avoid interference.Telecommunication over fixed lines is called point-to-point communication because it occurs between a transmitter and a receiver. Telecommunication through radio broadcasts is called broadcast communication because it occurs between a powerful transmitter and numerous low-power but sensitive radio receivers.[41]Telecommunications in which multiple transmitters and multiple receivers have been designed to cooperate and share the same physical channel are called multiplex systems. The sharing of physical channels using multiplexing often results in significant cost reduction. Multiplexed systems are laid out in telecommunication networks and multiplexed signals are switched at nodes through to the correct destination terminal receiver.Communications can be encoded as analogue or digital signals, which may in turn be carried by analogue or digital communication systems. Analogue signals vary continuously with respect to the information, while digital signals encode information as a set of discrete values (e.g., a set of ones and zeroes).[42] During propagation and reception, information contained in analogue signals is degraded by undesirable noise. Commonly, the noise in a communication system can be expressed as adding or subtracting from the desirable signal via a random process. This form of noise is called additive noise, with the understanding that the noise can be negative or positive at different instances.Unless the additive noise disturbance exceeds a certain threshold, the information contained in digital signals will remain intact. Their resistance to noise represents a key advantage of digital signals over analogue signals. However, digital systems fail catastrophically when noise exceeds the system's ability to autocorrect. On the other hand, analogue systems fail gracefully: as noise increases, the signal becomes progressively more degraded but still usable. Also, digital transmission of continuous data unavoidably adds quantization noise to the output. This can be reduced, but not eliminated, only at the expense of increasing the channel bandwidth requirement.Main article: Communication channelThe term channel has two different meanings. In one meaning, a channel is the physical medium that carries a signal between the transmitter and the receiver. Examples of this include the atmosphere for sound communications, glass optical fibres for some kinds of optical communications, coaxial cables for communications by way of the voltages and electric currents in them, and free space for communications using visible light, infrared waves, ultraviolet light, and radio waves. Coaxial cable types are classified by RG type or radio guide, terminology derived from World War II. The various RG designations are used to classify the specific signal transmission applications.[43] This last channel is called the free space channel. The sending of radio waves from one place to another has nothing to do with the presence or absence of an atmosphere between the two. Radio waves travel through a perfect vacuum just as easily as they travel through air, fog, clouds, or any other kind of gas.The other meaning of the term channel in telecommunications is seen in the phrase communications channel, which is a subdivision of a transmission medium so that it can be used to send multiple streams of information simultaneously. For example, one radio station can broadcast radio waves into free space at frequencies in the neighbourhood of 94.5MHz (megahertz) while another radio station can simultaneously broadcast radio waves at frequencies in the neighbourhood of 96.1MHz. Each radio station would transmit radio waves over a frequency bandwidth of about 180kHz (kilohertz), centred at frequencies such as the above, which are called the "carrier frequencies". Each station in this example is separated from its adjacent stations by 200kHz, and the difference between 200kHz and 180kHz (20kHz) is an engineering allowance for the imperfections in the communication system.In the example above, the free space channel has been divided into communications channels according to frequencies, and each channel is assigned a separate frequency bandwidth in which to broadcast radio waves. This system of dividing the medium into channels according to frequency is called frequency-division multiplexing. Another term for the same concept is wavelength-division multiplexing, which is more commonly used in optical communications when multiple transmitters share the same physical medium.Another way of dividing a communications medium into channels is to allocate each sender a recurring segment of time (a time slot, for example, 20 milliseconds out of each second), and to allow each sender to send messages only within its own time slot. This method of dividing the medium into communication channels is called time-division multiplexing (TDM), and is used in optical fibre communication. Some radio communication systems use TDM within an allocated FDM channel. Hence, these systems use a hybrid of TDM and FDM.Main article: ModulationThe shaping of a signal to convey information is known as modulation. Modulation can be used to represent a digital message as an analogue waveform. This is commonly called "keying"a term derived from the older use of Morse Code in telecommunicationsand several keying techniques exist (these include phase-shift keying, frequency-shift keying, and amplitude-shift keying). The Bluetooth system, for example, uses phase-shift keying to exchange information between various devices.[44][45] In addition, there are combinations of phase-shift keying and amplitude-shift keying which is called (in the jargon of the field) quadrature amplitude modulation (QAM) that are used in high-capacity digital radio communication systems.Modulation can also be used to transmit the information of low-frequency analogue signals at higher frequencies. This is helpful because low-frequency analogue signals cannot be effectively transmitted over free space. Hence the information from a low-frequency analogue signal must be impressed into a higher-frequency signal (known as the carrier wave) before transmission. There are several different modulation schemes available to achieve this [two of the most basic being amplitude modulation (AM) and frequency modulation (FM)]. An example of this process is a disc jockey's voice being impressed into a 96MHz carrier wave using frequency modulation (the voice would then be received on a radio as the channel 96FM).[46] In addition, modulation has the advantage that it may use frequency division multiplexing (FDM).Main article: Telecommunications networkA telecommunications network is a collection of transmitters, receivers, and communications channels that send messages to one another. Some digital communications networks contain one or more routers that work together to transmit information to the correct user. An analogue communications network consists of one or more switches that establish a connection between two or more users. For both types of networks, repeaters may be necessary to amplify or recreate the signal when it is being transmitted over long distances. This is to combat attenuation that can render the signal indistinguishable from the noise.[47] Another advantage of digital systems over analogue is that their output is easier to store in memory, i.e., two voltage states (high and low) are easier to store than a continuous range of states.Telecommunication has a significant social, cultural and economic impact on modern society. In 2008, estimates placed the telecommunication industry's revenue at US$4.7trillion or just under three per cent of the gross world product (official exchange rate).[39] Several following sections discuss the impact of telecommunication on society.On the microeconomic scale, companies have used telecommunications to help build global business empires. This is self-evident in the case of online retailer Amazon.com but, according to academic Edward Lenert, even the conventional retailer Walmart has benefited from better telecommunication infrastructure compared to its competitors.[48] In cities throughout the world, home owners use their telephones to order and arrange a variety of home services ranging from pizza deliveries to electricians. Even relatively poor communities have been noted to use telecommunication to their advantage. In Bangladesh's Narsingdi District, isolated villagers use cellular phones to speak directly to wholesalers and arrange a better price for their goods. In Cte d'Ivoire, coffee growers share mobile phones to follow hourly variations in coffee prices and sell at the best price.[49]On the macroeconomic scale, Lars-Hendrik Rller and Leonard Waverman suggested a causal link between good telecommunication infrastructure and economic growth.[50][51] Few dispute the existence of a correlation although some argue it is wrong to view the relationship as causal.[52]Because of the economic benefits of good telecommunication infrastructure, there is increasing worry about the inequitable access to telecommunication services amongst various countries of the worldthis is known as the digital divide. A 2003 survey by the International Telecommunication Union (ITU) revealed that roughly a third of countries have fewer than one mobile subscription for every 20 people and one-third of countries have fewer than one land-line telephone subscription for every 20 people. In terms of Internet access, roughly half of all countries have fewer than one out of 20 people with Internet access. From this information, as well as educational data, the ITU was able to compile an index that measures the overall ability of citizens to access and use information and communication technologies.[53] Using this measure, Sweden, Denmark and Iceland received the highest ranking while the African countries Niger, Burkina Faso and Mali received the lowest.[54]Telecommunication has played a significant role in social relationships. Nevertheless, devices like the telephone system were originally advertised with an emphasis on the practical dimensions of the device (such as the ability to conduct business or order home services) as opposed to the social dimensions. It was not until the late 1920s and 1930s that the social dimensions of the device became a prominent theme in telephone advertisements. New promotions started appealing to consumers' emotions, stressing the importance of social conversations and staying connected to family and friends.[55]Since then the role that telecommunications has played in social relations has become increasingly important. In recent years,[when?] the popularity of social networking sites has increased dramatically. These sites allow users to communicate with each other as well as post photographs, events and profiles for others to see. The profiles can list a person's age, interests, sexual preference and relationship status. In this way, these sites can play important role in everything from organising social engagements to courtship.[56]Prior to social networking sites, technologies like short message service (SMS) and the telephone also had a significant impact on social interactions. In 2000, market research group Ipsos MORI reported that 81% of 15- to 24-year-old SMS users in the United Kingdom had used the service to coordinate social arrangements and 42% to flirt.[57]News source preference of Americans in 2006.[58]Local TV59%National TV47%Radio44%Local paper38%Internet23%National paper12%Survey permitted multiple answersIn cultural terms, telecommunication has increased the public's ability to access music and film. With television, people can watch films they have not seen before in their own home without having to travel to the video store or cinema. With radio and the Internet, people can listen to music they have not heard before without having to travel to the music store.Telecommunication has also transformed the way people receive their news. A 2006 survey (right table) of slightly more than 3,000 Americans by the non-profit Pew Internet and American Life Project in the United States the majority specified television or radio over newspapers.Telecommunication has had an equally significant impact on advertising. TNS Media Intelligence reported that in 2007, 58% of advertising expenditure in the United States was spent on media that depend upon telecommunication.[59]Advertising expenditures in US in 2007[citation needed]MediumSpendingInternet7.6%$11.31billionRadio7.2%$10.69billionCable TV12.1%$18.02billionSyndicated TV2.8%$4.17billionSpot TV11.3%$16.82billionNetwork TV17.1%$25.42billionNewspaper18.9%$28.22billionMagazine20.4%$30.33billionOutdoor2.7%$4.02billionTotal100%$149billionSee also: List of telecommunications regulatory bodiesMany countries have enacted legislation which conforms to the International Telecommunication Regulations established by the International Telecommunication Union (ITU), which is the "leading UN agency for information and communication technology issues".[60] In 1947, at the Atlantic City Conference, the ITU decided to "afford international protection to all frequencies registered in a new international frequency list and used in conformity with the Radio Regulation". According to the ITU's Radio Regulations adopted in Atlantic City, all frequencies referenced in the International Frequency Registration Board, examined by the board and registered on the International Frequency List "shall have the right to international protection from harmful interference".[61]From a global perspective, there have been political debates and legislation regarding the management of telecommunication and broadcasting. The history of broadcasting discusses some debates in relation to balancing conventional communication such as printing and telecommunication such as radio broadcasting.[62] The onset of World War II brought on the first explosion of international broadcasting propaganda.[62] Countries, their governments, insurgents, terrorists, and militiamen have all used telecommunication and broadcasting techniques to promote propaganda.[62][63] Patriotic propaganda for political movements and colonization started the mid-1930s. In 1936, the BBC broadcast propaganda to the Arab World to partly counter similar broadcasts from Italy, which also had colonial interests in North Africa.[62] Modern political debates in telecommunication include the reclassification of broadband Internet service as a telecommunications service (also called net neutrality),[64][65] regulation of phone spam,[66][67] and expanding affordable broadband access.[68]According to data collected by Gartner[69][70] and Ars Technica[71] sales of main consumer's telecommunication equipment worldwide in millions of units was:Equipment / year197519801985199019941996199820002002200420062008Computers018204075100135130175230280Cell phonesN/AN/AN/AN/AN/AN/A1804004206608301000Optical fibre provides cheaper bandwidth for long-distance communication.In a telephone network, the caller is connected to the person to whom they wish to talk by switches at various telephone exchanges. The switches form an electrical connection between the two users and the setting of these switches is determined electronically when the caller dials the number. Once the connection is made, the caller's voice is transformed to an electrical signal using a small microphone in the caller's handset. This electrical signal is then sent through the network to the user at the other end where it is transformed back into sound by a small speaker in that person's handset.As of 2015[update], the landline telephones in most residential homes are analoguethat is, the speaker's voice directly determines the signal's voltage.[72] Although short-distance calls may be handled from end-to-end as analogue signals, increasingly telephone service providers are transparently converting the signals to digital signals for transmission. The advantage of this is that digitized voice data can travel side by side with data from the Internet and can be perfectly reproduced in long-distance communication (as opposed to analogue signals that are inevitably impacted by noise).Mobile phones have had a significant impact on telephone networks. Mobile phone subscriptions now outnumber fixed-line subscriptions in many markets. Sales of mobile phones in 2005 totalled 816.6million with that figure being almost equally shared amongst the markets of Asia/Pacific (204 m), Western Europe (164 m), CEMEA (Central Europe, the Middle East and Africa) (153.5 m), North America (148 m) and Latin America

(102 m).[73] In terms of new subscriptions over the five years from 1999, Africa has outpaced other markets with 58.2% growth.[74] Increasingly these phones are being serviced by systems where the voice content is transmitted digitally such as GSM or W-CDMA with many markets choosing to deprecate analog systems such as AMPS.[75]There have also been dramatic changes in telephone communication behind the scenes. Starting with the operation of TAT-8 in 1988, the 1990s saw the widespread adoption of systems based on optical fibres. The benefit of communicating with optical fibres is that they offer a drastic increase in data capacity. TAT-8 itself was able to carry 10 times as many telephone calls as the last copper cable laid at that time and today's optical fibre cables are able to carry 25 times as many telephone calls as TAT-8.[76] This increase in data capacity is due to several factors: First, optical fibres are physically much smaller than competing technologies. Second, they do not suffer from crosstalk which means several hundred of them can be easily bundled together in a single cable.[77] Lastly, improvements in multiplexing have led to an exponential growth in the data capacity of a single fibre.[78][79]Assisting communication across many modern optical fibre networks is a protocol known as Asynchronous Transfer Mode (ATM). The ATM protocol allows for the side-by-side data transmission mentioned in the second paragraph. It is suitable for public telephone networks because it establishes a pathway for data through the network and associates a traffic contract with that pathway. The traffic contract is essentially an agreement between the client and the network about how the network is to handle the data; if the network cannot meet the conditions of the traffic contract it does not accept the connection. This is important because telephone calls can negotiate a contract so as to guarantee themselves a constant bit rate, something that will ensure a caller's voice is not delayed in parts or cut off completely.[80] There are competitors to ATM, such as Multiprotocol Label Switching (MPLS), that perform a similar task and are expected to supplant ATM in the future.[81][82]Main articles: Radio, Television, and BroadcastingDigital television standards and their adoption worldwideIn a broadcast system, the central high-powered broadcast tower transmits a high-frequency electromagnetic wave to numerous low-powered receivers. The high-frequency wave sent by the tower is modulated with a signal containing visual or audio information. The receiver is then tuned so as to pick up the high-frequency wave and a demodulator is used to retrieve the signal containing the visual or audio information. The broadcast signal can be either analogue (signal is varied continuously with respect to the information) or digital (information is encoded as a set of discrete values).[41][83]The broadcast media industry is at a critical turning point in its development, with many countries moving from analogue to digital broadcasts. This move is made possible by the production of cheaper, faster and more capable integrated circuits. The chief advantage of digital broadcasts is that they prevent a number of complaints common to traditional analogue broadcasts. For television, this includes the elimination of problems such as snowy pictures, ghosting and other distortion. These occur because of the nature of analogue transmission, which means that perturbations due to noise will be evident in the final output. Digital transmission overcomes this problem because digital signals are reduced to discrete values upon reception and hence small perturbations do not affect the final output. In a simplified example, if a binary message 1011 was transmitted with signal amplitudes [1.0 0.0 1.0 1.0] and received with signal amplitudes [0.9 0.2 1.1 0.9] it would still decode to the binary message 1011 a perfect reproduction of what was sent. From this example, a problem with digital transmissions can also be seen in that if the noise is great enough it can significantly alter the decoded message. Using forward error correction a receiver can correct a handful of bit errors in the resulting message but too much noise will lead to incomprehensible output and hence a breakdown of the transmission.[84][85]In digital television broadcasting, there are three competing standards that are likely to be adopted worldwide. These are the ATSC, DVB and ISDB standards; the adoption of these standards thus far is presented in the captioned map. All three standards use MPEG-2 for video compression. ATSC uses Dolby Digital AC-3 for audio compression, ISDB uses Advanced Audio Coding (MPEG-2 Part 7) and DVB has no standard for audio compression but typically uses MPEG-1 Part 3 Layer 2.[86][87] The choice of modulation also varies between the schemes. In digital audio broadcasting, standards are much more unified with practically all countries choosing to adopt the Digital Audio Broadcasting standard (also known as the Eureka 147 standard). The exception is the United States which has chosen to adopt HD Radio. HD Radio, unlike Eureka 147, is based upon a transmission method known as in-band on-channel transmission that allows digital information to piggyback on normal AM or FM analog transmissions.[88] However, despite the pending switch to digital, analog television remains being transmitted in most countries. An exception is the United States that ended analog television transmission (by all but the very low-power TV stations) on 12 June 2009[89] after twice delaying the switchover deadline. Kenya also ended analog television transmission in December 2014 after multiple delays. For analogue television, there were three standards in use for broadcasting colour TV (see a map on adoption here). These are known as PAL (German designed), NTSC (American designed), and SECAM (French designed). For analogue radio, the switch to digital radio is made more difficult by the higher cost of digital receivers.[90] The choice of modulation for analogue radio is typically between amplitude (AM) or frequency modulation (FM). To achieve stereo playback, an amplitude modulated subcarrier is used for stereo FM, and quadrature amplitude modulation is used for stereo AM or C-QUAM.The OSI reference modelThe Internet is a worldwide network of computers and computer networks that communicate with each other using the Internet Protocol (IP).[91] Any computer on the Internet has a unique IP address that can be used by other computers to route information to it. Hence, any computer on the Internet can send a message to any other computer using its IP address. These messages carry with them the originating computer's IP address allowing for two-way communication. The Internet is thus an exchange of messages between computers.[92]It is estimated that 51% of the information flowing through two-way telecommunications networks in the year 2000 were flowing through the Internet (most of the rest (42%) through the landline telephone). By 2007 the Internet clearly dominated and captured 97% of all the information in telecommunication networks (most of the rest (2%) through mobile phones).[37] As of 2008[update], an estimated 21.9% of the world population has access to the Internet with the highest access rates (measured as a percentage of the population) in North America (73.6%), Oceania/Australia (59.5%) and Europe (48.1%).[93] In terms of broadband access, Iceland (26.7%), South Korea (25.4%) and the Netherlands (25.3%) led the world.[94]The Internet works in part because of protocols that govern how the computers and routers communicate with each other. The nature of computer network communication lends itself to a layered approach where individual protocols in the protocol stack run more-or-less independently of other protocols. This allows lower-level protocols to be customized for the network situation while not changing the way higher-level protocols operate. A practical example of why this is important is because it allows a web browser to run the same code regardless of whether the computer it is running on is connected to the Internet through an Ethernet or Wi-Fi connection. Protocols are often talked about in terms of their place in the OSI reference model (pictured on the right), which emerged in 1983 as the first step in an unsuccessful attempt to build a universally adopted networking protocol suite.[95]For the Internet, the physical medium and data link protocol can vary several times as packets traverse the globe. This is because the Internet places no constraints on what physical medium or data link protocol is used. This leads to the adoption of media and protocols that best suit the local network situation. In practice, most intercontinental communication will use the Asynchronous Transfer Mode (ATM) protocol (or a modern equivalent) on top of optic fibre. This is because for most intercontinental communication the Internet shares the same infrastructure as the public switched telephone network.At the network layer, things become standardized with the Internet Protocol (IP) being adopted for logical addressing. For the World Wide Web, these IP addresses are derived from the human-readable form using the Domain Name System (e.g., 72.14.207.99 is derived from Google). At the moment, the most widely used version of the Internet Protocol is version four but a move to version six is imminent.[96] At the transport layer, most communication adopts either the Transmission Control Protocol (TCP) or the User Datagram Protocol (UDP). TCP is used when it is essential every message sent is received by the other computer whereas UDP is used when it is merely desirable. With TCP, packets are retransmitted if they are lost and placed in order before they are presented to higher layers. With UDP, packets are not ordered nor retransmitted if lost. Both TCP and UDP packets carry port numbers with them to specify what application or process the packet should be handled by.[97] Because certain application-level protocols use certain ports, network administrators can manipulate traffic to suit particular requirements. Examples are to restrict Internet access by blocking the traffic destined for a particular port or to affect the performance of certain applications by assigning priority.Above the transport layer, there are certain protocols that are sometimes used and loosely fit in the session and presentation layers, most notably the Secure Sockets Layer (SSL) and Transport Layer Security (TLS) protocols. These protocols ensure that data transferred between two parties remains completely confidential.[98] Finally, at the application layer, are many of the protocols Internet users would be familiar with such as HTTP (web browsing), POP3 (e-mail), FTP (file transfer), IRC (Internet chat), BitTorrent (file sharing) and XMPP (instant messaging).Voice over Internet Protocol (VoIP) allows data packets to be used for synchronous voice communications. The data packets are marked as voice-type packets and can be prioritized by the network administrators so that the real-time, synchronous conversation is less subject to contention with other types of data traffic which can be delayed (i.e., file transfer or email) or buffered in advance (i.e., audio and video) without detriment. That prioritization is fine when the network has sufficient capacity for all the VoIP calls taking place at the same time and the network is enabled for prioritization, i.e., a private corporate-style network, but the Internet is not generally managed in this way and so there can be a big difference in the quality of VoIP calls over a private network and over the public Internet.[99]Despite the growth of the Internet, the characteristics of local area networks (LANs)computer networks that do not extend beyond a few kilometresremain distinct. This is because networks on this scale do not require all the features associated with larger networks and are often more cost-effective and efficient without them. When they are not connected with the Internet, they also have the advantages of privacy and security. However, purposefully lacking a direct connection to the Internet does not provide assured protection from hackers, military forces, or economic powers. These threats exist if there are any methods for connecting remotely to the LAN.Wide area networks (WANs) are private computer networks that may extend for thousands of kilometres. Once again, some of their advantages include privacy and security. Prime users of private LANs and WANs include armed forces and intelligence agencies that must keep their information secure and secret.In the mid-1980s, several sets of communication protocols emerged to fill the gaps between the data-link layer and the application layer of the OSI reference model. These included AppleTalk, IPX, and NetBIOS with the dominant protocol set during the early 1990s being IPX due to its popularity with MS-DOS users. TCP/IP existed at this point, but it was typically only used by large government and research facilities.[100]As the Internet grew in popularity and its traffic was required to be routed into private networks, the TCP/IP protocols replaced existing local area network technologies. Additional technologies, such as DHCP, allowed TCP/IP-based computers to self-configure in the network. Such functions also existed in the AppleTalk/ IPX/ NetBIOS protocol sets.[101]Whereas Asynchronous Transfer Mode (ATM) or Multiprotocol Label Switching (MPLS) are typical data-link protocols for larger networks such as WANs; Ethernet and Token Ring are typical data-link protocols for LANs. These protocols differ from the former protocols in that they are simpler, e.g., they omit features such as quality of service guarantees, and offer medium access control. Both of these differences allow for more economical systems.[102]Despite the modest popularity of Token Ring in the 1980s and 1990s, virtually all LANs now use either wired or wireless Ethernet facilities. At the physical layer, most wired Ethernet implementations use copper twisted-pair cables (including the common 10BASE-T networks). However, some early implementations used heavier coaxial cables and some recent implementations (especially high-speed ones) use optical fibres.[103] When optic fibres are used, the distinction must be made between multimode fibres and single-mode fibres. Multimode fibres can be thought of as thicker optical fibres that are cheaper to manufacture devices for, but that suffer from less usable bandwidth and worse attenuationimplying poorer long-distance performance.[104]Telephones portalTelecommunications portalActive networkingCell siteControl communicationsDigital RevolutionInformation AgeInstitute of Telecommunications ProfessionalsInternational Teletraffic CongressList of telecommunications encryption termsMilitary communicationNanonetworkNew mediaOutline of telecommunicationTelecommunications engineeringTelecommunications Industry AssociationTelecoms resilienceTelemetryUnderwater acoustic communicationWavelength-division multiplexingWired communication^ "How does a Gigabit Passive Optical Network (GPON) work?". European Investment Bank. Archived from the original on 7 June 2021. Retrieved 7 June 2021.^ Renewing U.S. Telecommunications Research. 2006. doi:10.17226/11711. ISBN978-0-309-10265-0. Archived from the original on 23 June 2021. Retrieved 25 June 2021.^ Cyphers, Bennett (16 October 2019). "The Case for Fiber to the Home, Today: Why Fiber is a Superior Medium for 21st Century Broadband". Electronic Frontier Foundation. Archived from the original on 3 June 2021. Retrieved 7 June 2021.^ "International Telegraph Conference (Madrid, 1932)". ITU. Archived from the original on 8 January 2023. Retrieved 8 January 2023.^ "Article 1.3" (PDF), ITU Radio Regulations, International Telecommunication Union, 2012, archived from the original (PDF) on 19 March 2015^ Constitution and Convention of the International Telecommunication Union, Annex (Geneva, 1992)^ Dilhac, Jean-Marie (2004). "From tele-communicare to Telecommunications" (PDF). Institute of Electrical and Electronics Engineers (IEEE). Archived from the original (PDF) on 2 December 2010.^ "Online Etymology Dictionary". Archived from the original on 25 December 2016. Retrieved 19 August 2016.^ "Telecommunication". Oxford Dictionaries. Oxford University Press. Archived from the original on 30 April 2013. Retrieved 28 February 2013.^ Telecommunication, tele- and communication, New Oxford American Dictionary (2nd edition), 2005.^ "communication". Online Etymology Dictionary. Archived from the original on 14 September 2016. Retrieved 19 August 2016.^ Levi, Wendell (1977). The Pigeon. Sumter, SC: Levi Publishing Co, Inc. ISBN978-0-85390-013-9.^ Blechman, Andrew (2007). Pigeons-The fascinating saga of the world's most revered and reviled bird. St Lucia, Queensland: University of Queensland Press. ISBN978-0-7022-3641-9. Archived from the original on 14 May 2008.^ "Chronology: Reuters, from pigeons to multimedia merger" (Web article). Reuters. 19 February 2008. Archived from the original on 26 March 2008. Retrieved 21 February 2008.^ Ross, David. "The Spanish Armada". Britain Express. Archived from the original on 4 January 2020. Retrieved 1 October 2007.^ "Les Tlgraphes Chappe". Cdrick Chatenet. l'Ecole Centrale de Lyon. 2003. Archived from the original on 9 April 2004.^ "CCIT/ITU-T 50 Years of Excellence" (PDF). International Telecommunication Union. 2006. Archived from the original (PDF) on 12 February 2020.^ Brockedone, William (11 March 2013). Cooke and Wheatstone and the Invention of the Electric Telegraph. Routledge. ISBN9780415846783.^ "Who made the first electric telegraph communications?". The Telegraph. Archived from the original on 8 August 2017. Retrieved 7 August 2017.^ Calvert, J. B. (19 May 2004). "The Electromagnetic Telegraph". Archived from the original on 16 June 2001.^ "The Atlantic Cable". Bern Dibner. Burndy Library Inc. 1959. Archived from the original on 1 July 2017 via Smithsonian Libraries.^ "Who is credited with inventing the telephone?", published 2022-02-22, updated 2024-9-12. Science Reference Section, Library of Congress.^ "Elisha Gray". Oberlin College Archives. Electronic Oberlin Group. 2006. Archived from the original on 28 June 2017.^ "Connected Earth: The telephone". BT. 2006. Archived from the original on 22 August 2006.^ "History of AT&T". AT&T. Archived from the original on 14 January 2003.^ Vujovic, Ljubo (1998). "Tesla Biography". Tesla Memorial Society of New York. Archived from the original on 14 January 2016.^ "TR Center - Talking Across the Ocean". www.theodorerooseveltcenter.org. Archived from the original on 17 April 2021. Retrieved 12 March 2021.^ Thompson, R.J. Jr. (2011). Crystal Clear: The Struggle for Reliable Communications Technology in World War II. Hoboken, NJ: Wiley. ISBN9781118104644.^ "Report 1946-04 Frequency Modulation". BBC Research & Development. January 1946. Archived from the original on 3 January 2020. Retrieved 3 January 2020.^ Thberge, P.; Devine, K.; Everrett, T (2015). Living Stereo: Histories and Cultures of Multichannel Sound. New York: Bloomsbury Publishing. ISBN9781623566654.^ "The Pioneers". MZTV Museum of Television. 2006. Archived from the original on 14 May 2013.^ Hoddeson, L. "The Vacuum Tube". PBS. Archived from the original on 15 April 2012. Retrieved 6 May 2012.^ Macksey, Kenneth; Woodhouse, William (1991). "Electronics". The Penguin Encyclopedia of Modern Warfare: 1850 to the present day. Viking. p.110. ISBN978-0-670-82698-8. The electronics age may be said to have been ushered in with the invention of the vacuum diode valve in 1902 by the Briton John Fleming (himself coining the word 'electronics'), the immediate application being in the field of radio.^ Postman, Neil (29 March 1999). "Philo Farnsworth". TIME Magazine. Archived from the original on 30 September 2009.^ "George Stibitz (19041995)". www.kerryr.net. Kerry Redshaw. Archived from the original on 15 August 2017. Retrieved 6 June 2023.^ Hafner, Katie (1998). Where Wizards Stay Up Late: The Origins Of The Internet. Simon & Schuster. ISBN978-0-684-83267-8.^ a b Hilbert, Martin; Lpez, Priscila (2011). "The World's Technological Capacity to Store, Communicate, and Compute Information". Science. 332 (6025): 6065. Bibcode:2011Sci...332...60H. doi:10.1126/science.1200970. PMID21310967. S2CID206531385.^ "video animation". The Economist. Archived from the original on 18 January 2012.^ a b c "Worldwide Telecommunications Industry Revenues". Plunkett's Telecommunications Industry Almanac 2010. 1 June 2010. Archived from the original on 28 March 2010.^ "Introduction to the Telecommunications Industry". Plunkett Research. Archived from the original on 22 October 2012.^ a b c Haykin, Simon (2001). Communication Systems (4thed.). John Wiley & Sons. pp.13. ISBN978-0-471-17869-9.^ Ambardar, Ashok (1999). Analog and Digital Signal Processing (2nded.). Brooks. pp.12. ISBN978-0-534-95409-3.^ "Coax Cable FAQ Series: What is RG Cable? Conwire". Conwire. 12 January 2016. Archived from the original on 8 August 2017. Retrieved 7 August 2017.^ Haykin, pp. 344403.^ Bluetooth Specification Version 2.0 + EDR Archived 14 August 2014 at the Wayback Machine (p. 27), Bluetooth, 2004.^ Haykin, pp. 88126.^ "ATIS Telecom Glossary 2000". ATIS Committee T1A1 Performance and Signal Processing (approved by the American National Standards Institute). 28 February 2001. Archived from the original on 2 March 2008.^ Lenert, Edward (December 1998). "A Communication Theory Perspective on Telecommunications Policy". Journal of Communication. 48 (4): 323. doi:10.1111/j.1460-2466.1998.tb02767.x.^ Mireille Samaan (April 2003). The Effect of Income Inequality on Mobile Phone Penetration (Honors thesis). Boston University. Archived from the original (PDF) on 14 February 2007. Retrieved 8 June 2007.^ Rller, Lars-Hendrik; Leonard Waverman (2001). "Telecommunications Infrastructure and Economic Development: A Simultaneous Approach". American Economic Review. 91 (4): 90923. CiteSeerX10.1.1.202.9393. doi:10.1257/aer.91.4.909. ISSN0002-8282.^ Christine Zhen-Wei Qiang and Carlo M. Rossotto with Kaoru Kimura. "Economic Impacts of Broadband" (PDF). siteresources.worldbank.org. Archived from the original on 12 August 2020. Retrieved 31 March 2016.^ Riaz, Ali (1997). "The role of telecommunications in economic growth: proposal for an alternative framework of analysis". Media, Culture & Society. 19 (4): 55783. doi:10.1177/016344397019004004. S2CID154398428.^ "Digital Access Index (DAI)". itu.int. Archived from the original on 2 January 2019. Retrieved 6 March 2008.^ "World Telecommunication Development Report 2003: Access Indicators for the Information Society: Executive Summary" (PDF). International Telecommunication Union (ITU). December 2003. p.22. Archived (PDF) from the original on 6 June 2023. Retrieved 6 June 2023.^ Fischer, Claude S. (January 1988). "Touch Someone: The Telephone Industry Discovers Sociability". Technology and Culture. 29 (1): 3261. doi:10.2307/3105226. JSTOR3105226. S2CID146820965..^ "How do you know your love is real? Check Facebook". CNN. 4 April 2008. Archived from the original on 6 November 2017. Retrieved 8 February 2009.^ "I Just Text To Say I Love You". Ipsos MORI. September 2005. Archived from the original on 27 December 2016.^ "Online News: For many home broadband users, the internet is a primary news source" (PDF). Pew Internet Project. 22 March 2006. Archived from the original (PDF) on 21 October 2013.^ "100 Leading National Advertisers" (PDF). Advertising Age. 23 June 2008. Archived (PDF) from the original on 27 July 2011. Retrieved 21 June 2009.^ "International Telecommunication Union: About ITU". ITU. Archived from the original on 15 July 2009. Retrieved 21 July 2009. (PDF) Archived 7 June 2011 at the Wayback Machine of regulation)^ Codding, George A. (1955). "Jamming and the Protection of Frequency Assignments". American Journal of International Law. 49 (3): 384388. doi:10.1017/S0002930000170046. JSTOR2194872..^ a b c d Wood, James (1992). History of international broadcasting. P. Peregrinus Limited. p.2. ISBN9780863413025.^ Garfield, Andrew (Fall 2007). "The U.S. Counter-propaganda Failure in Iraq". Middle East Quarterly. 14 (4): 2332. Archived from the original on 2 March 2009 via Middle East Forum.^ Wyatt, Edward (10 November 2014). "Obama Asks F.C.C. to Adopt Tough Net Neutrality Rules". New York Times. Archived from the original on 27 April 2019. Retrieved 15 November 2014.^ "Why the F.C.C. Should Heed President Obama on Internet Regulation". New York Times. 14 November 2014. Archived from the original on 9 July 2018. Retrieved 15 November 2014.^ McGill, Margaret Harding (26 September 2022). "FCC takes long-delayed step against spam text surge". Axios. Archived from the original on 8 February 2023. Retrieved 8 February 2023.^ Hall, Madison. "Robocallers are preying on the elderly with fake Medicare calls. It's a no-brainer to stop it, but nobody has". Business Insider. Archived from the original on 7 February 2023. Retrieved 8 February 2023.^ "Affordable Broadband: FCC Could Improve Performance Goals and Measures, Consumer Outreach, and Fraud Risk Management". www.gao.gov. February 2023. Archived from the original on 8 February 2023. Retrieved 8 February 2023.^ Arthur, Charles (4 March 2009). "Why falling PC sales means Windows 7 is on the way". The Guardian. ISSN0261-3077. Archived from the original on 19 May 2017. Retrieved 6 June 2023.^ "Mobile Phone Sales To Exceed One Billion in 2009". Palm Infocenter. 21 July 2005. Archived from the original on 8 March 2018. Retrieved 6 June 2023.^ Reimer, Jeremy (15 December 2005). "Total share: 30 years of personal computer market share figures". Ars Technica. Archived from the original on 12 May 2015. Retrieved 6 June 2023.^ Hacker, Michael; Burghardt, David; Fletcher, Linnea; Gordon, Anthony; Peruzzi, William (3 April 2015). Engineering and Technology. Cengage Learning. p.433. ISBN978-1305855779.^ "Gartner Says Top Six Vendors Drive Worldwide Mobile Phone Sales to 21% Growth in 2005" (Press release). Gartner. 28 February 2006. Archived from the original on 10 May 2012.^ Mbarika, V.W.A.; Mbarika, I. (2006). "Africa calling [African wireless connection]". IEEE Spectrum. 43 (5): 5660. doi:10.1109/MSPEC.2006.1628825. S2CID30385268.^ "Ten Years of GSM in Australia". Australia Telecommunications Association. 2003. Archived from the original on 20 July 2008.^ "Milestones in AT&T History". AT&T Knowledge Ventures. 2006. Archived from the original on 6 September 2008.^ Bhatti, Saleem (1995). "Optical fibre waveguide". Archived from the original on 24 May 2006.^ "Fundamentals of DWDM Technology" (PDF). Cisco Systems. 2006. Archived from the original (PDF) on 9 August 2012.^ Jander, Mary (15 April 2003). "Report: DWDM No Match for Sonet". Light Reading. Archived from the original on 24 July 2012.^ Stallings, William (2004). Data and Computer Communications (7th intled.). Pearson Prentice Hall. pp.33766. ISBN978-0-13-183311-1.^ Dix, John (2002). "MPLS is the future, but ATM hangs on". Network World. Archived from the original on 6 July 2007.^ Lazar, Irwin (22 February 2011). "The WAN Road Ahead: Ethernet or Bust?". Telecom Industry Updates. Archived from the original on 2 April 2015. Retrieved 22 February 2011.^ "How Radio Works". HowStuffWorks. 7 December 2000. Archived from the original on 2 January 2016. Retrieved 12 February 2023.^ "Digital Television in Australia". Digital Television News Australia. Archived from the original on 12 March 2018. Retrieved 6 June 2023.^ Stallings, William (2004). Data and Computer Communications (7th intled.). Pearson Prentice Hall. ISBN978-0-13-183311-1.^ "HDV Technology Handbook" (PDF). Sony. 2004. Archived from the original (PDF) on 23 June 2006.^ "Audio". Digital Video Broadcasting Project. 2003. Archived from the original on 27 September 2006.^ "Status of DAB (US)". World DAB Forum. March 2005. Archived from the original on 21 July 2006.^ Brian Stelter (13 June 2009). "Changeover to Digital TV Off to a Smooth Start". New York Times. Archived from the original on 14 December 2017. Retrieved 25 February 2017.^ "DAB Products". World DAB Forum. 2006. Archived from the original on 21 June 2006.^ Kahn, Robert; Cerf, Vinton G. (December 1999). "What Is The Internet (And What Makes It Work)". Corporation for National Research Initiatives (CNRI). Archived from the original on 15 July 2017. Retrieved 6 June 2023. Specifically see footnote xv.^ Jeff Tyson (2007). "How Internet Infrastructure Works". Computer.HowStuffWorks.com. Archived from the original on 10 April 2010. Retrieved 22 May 2007.^ "World Internet Users and Population Stats". Internet World Stats. 30 June 2008. Archived from the original on 2 February 2009.^ "OECD Broadband Statistics, December 2005". OECD. Archived from the original on 6 January 2009.^ Kozierok, Charles M. (2005). "The TCP/IP Guide - History of the OSI Reference Model". The TCP/IP Guide. Archived from the original on 4 September 2017. Retrieved 6 June 2023.^ "Introduction to IPv6". Microsoft Corporation. February 2006. Archived from the original on 13 October 2008.^ Stallings, pp. 683702.^ T. Dierks and C. Allen, The TLS Protocol Version 1.0, RFC 2246, 1999.^ Multimedia, Crucible (7 May 2011). "VoIP, Voice over Internet Protocol and Internet telephone calls". Archived from the original on 24 January 2018. Retrieved 30 June 2011.^ Martin, Michael (2000). "Understanding the Network". The Networker's Guide to AppleTalk, IPX, and NetBIOS (PDF). SAMS Publishing. ISBN0-7357-0977-7. Archived from the original (PDF) on 29 March 2009.^ Droms, Ralph (November 2003). "Resources for DHCP". Archived from the original on 4 July 2007.^ Stallings, pp. 50026.^ Stallings, pp. 51416.^ "Fiber Optic Cable single-mode multi-mode Tutorial". ARC Electronics. Archived from the original on 23 October 2018. Retrieved 6 June 2023.Goggin, Gerard, Global Mobile Media (New York: Routledge, 2011), p.176. ISBN978-0-415-46918-0.OECD, Universal Service and Rate Restructuring in Telecommunications, Organisation for Economic Co-operation and Development (OECD) Publishing, 1991. ISBN92-64-13497-2.Wheen, Andrew. Dot-Dash to Dot.Com: How Modern Telecommunications Evolved from the Telegraph to the Internet (Springer, 2011).Wikimedia Commons has media related to Telecommunications.International Teletraffic CongressInternational Telecommunication Union (ITU)ATIS Telecom GlossaryFederal Communications CommissionIEEE Communications SocietyInternational Telecommunication UnionEricsson's Understanding Telecommunications at the Wayback Machine (archived 13 April 2004) (Ericsson removed the book from their site in September 2005)Telecommunications at Wikipedia's sister projects:Definitions from WiktionaryMedia from CommonsNews from WikinewsQuotations from WikiquoteTexts from WikisourceTextbooks from WikibooksResources from WikiversityData from WikidataRetrieved from " is telecommunication. What is telecommunication network and its types. Basic telecommunications. What is telecommunication and its uses.