Continue

Broadcasting of television using artificial satellites For the television channel "Satellite Television" launched in 1982, see Sky One § History. A number of satellite dishes Satellite television is a service that delivers television programming to viewers by relaying it from a communications satellite orbiting the Earth directly to the viewer's location.[1] The signals are received via an outdoor parabolic antenna commonly referred to as a satellite dish and a low-noise block downconverter. Diagram showing how modern satellite television works A satellite receiver decodes the desired television program for viewing on a television set. Receivers can be external set-top boxes, or a built-in television tuner. Satellite television provides a wide range of channels and services. It is usually the only television available in many remote geographic areas without terrestrial television or cable television service. Different receivers are required for the two types. Some transmissions and channels are unencrypted and therefore free-to-air, while many other channels are transmitted with encryption. Free-to-view channels are encrypted but not charged-for, while pay television requires the viewer to subscribe and pay a monthly fee to receive the programming.[2] Modern systems signals are relayed from a communications satellite on the X band (8–12 GHz) or Ku band (12–18 GHz) frequencies requiring only a small dish less than a meter in diameter.[3] The first satellite TV systems were a now-obsolete type known as television receive-only. These systems received weaker analog signals transmitted in the C-band (4–8 GHz) from FSS type satellites, requiring the use of large 2–3-meter dishes. Consequently, these systems were nicknamed "big dish" systems, and were more expensive and less popular.[4] Early systems used analog signals, but modern ones use digital signals which allow transmission of the modern television standard high-definition television, due to the significantly improved spectral efficiency of digital broadcasting. As of 2022, Star One D2 from Brazil is the only remaining satellite broadcasting in analog signals.[5][6] The satellites used for broadcasting television are usually in a geostationary orbit 36,000 km (22,000 mi) above the earth's equator. The advantage of this orbit is that the satellite's orbital period equals the rotation rate of the Earth, so the satellite appears at a fixed position in the sky. Thus the satellite dish antenna which receives the signal can be aimed permanently at the location of the satellite and does not have to track a moving satellite. A few systems instead use a highly elliptical orbit with inclination of +/−63.4 degrees and an orbital period of about twelve hours, known as a Molniya orbit. Satellite television, like other communications relayed by satellite, starts with a transmitting antenna located at an uplink facility.[7] Uplink satellite dishes are very large, as much as 9 to 12 meters (30 to 39 feet) in diameter.[7] The increased diameter results in more accurate aiming and increased signal strength at the satellite.[7] The uplink dish is pointed toward a specific satellite and the uplinked signals are transmitted within a specific frequency range, so as to be received by one of the transponders tuned to that frequency range aboard that satellite.[8] The transponder re-transmits the signals back to Earth at a different frequency (a process known as translation, used to avoid interference with the uplink signal), typically in the 10.7-12.7 GHz band, but some still transmit in the C-band (4–8 GHz), Ku-band (12–18 GHz), or both.[7] The leg of the signal path from the satellite to the receiving Earth station is called the downlink.[9] A typical satellite has up to 32 Ku-band or 24 C-band transponders, or more for Ku/C hybrid satellites. Typical transponders each have a bandwidth between 27 and 50 MHz. Each geostationary C-band satellite needs to be spaced 2° longitude from the next satellite to avoid interference; for Ku the spacing can be 1°. This means that there is an upper limit of 360/2 = 180 geostationary C-band satellites or 360/1 = 360 geostationary Ku-band satellites. C-band transmission is susceptible to terrestrial interference while Ku-band transmission is affected by rain (as water is an excellent absorber of microwaves at this particular frequency). The latter is even more adversely affected by ice crystals in thunder clouds. On occasion, sun outage will occur when the sun lines up directly behind the geostationary satellite to which the receiving antenna is pointed.[10] The downlink satellite signal, quite weak after traveling the great distance (see path loss), is collected with a parabolic receiving dish, which reflects the weak signal to the dish's focal point.[11] Mounted on brackets at the dish's focal point is a device called a feedhorn or collector.[12] The feedhorn is a section of waveguide with a flared front-end that gathers the signals at or near the focal point and conducts them to a probe or pickup connected to a low-noise block downconverter (LNB).[13] The LNB amplifies the signals and downconverts them to a lower block of intermediate frequencies (IF), usually in the L-band.[13] The original C-band satellite television systems used a low-noise amplifier (LNA) connected to the feedhorn at the focal point of the dish.[14] The amplified signal, still at the higher microwave frequencies, had to be fed via very expensive low-loss 50-ohm impedance gas filled hardline coaxial cable with relatively complex N-connectors to an indoor receiver or, in other designs, a downconverter (a mixer and a voltage-tuned oscillator with some filter circuitry) for downconversion to an intermediate frequency.[14] The channel selection was controlled typically by a voltage tuned oscillator with the tuning voltage being fed via a separate cable to the headend, but this design evolved.[14] Designs for microstrip-based converters for amateur radio frequencies were adapted for the 4 GHz C-band.[15] Central to these designs was concept of block downconversion of a range of frequencies to a lower, more easily handled IF.[15] Back view of a linear polarised LNB. The advantages of using an LNB are that cheaper cable can be used to connect the indoor receiver to the satellite television dish and LNB, and that the technology for handling the signal at L-band and UHF was far cheaper than that for handling the signal at C-band frequencies.[16] The shift to cheaper technology from the hardline and N-connectors of the early C-band systems to the cheaper and simpler 75-ohm cable and F-connectors allowed the early satellite television receivers to use, what were in reality, modified UHF television tuners which selected the satellite television channel for down conversion to a lower intermediate frequency centered on 70 MHz, where it was demodulated.[16] This shift allowed the satellite television DTH industry to change from being a largely hobbyist one where only small numbers of systems costing thousands of US dollars were built, to a far more commercial one of mass production.[16] In the United States, service providers use the intermediate frequency ranges of 950–2150 MHz to carry the signal from the LNBF at the dish down to the receiver. This allows for the transmission of UHF signals along the same span of coaxial wire at the same time. In some applications (DirecTV AU9-S and AT-9), ranges of the lower B-band[ambiguous] and 2250–3000 MHz, are used. Newer LNBFs in use by DirecTV, called SWM (Single Wire Multiswitch), are used to implement single cable distribution and use a wider frequency range of 2–2150 MHz.[citation needed] The satellite receiver or set-top box demodulates and converts the signals to the desired form (outputs for television, audio, data, etc.).[17] Often, the receiver includes the capability to selectively unscramble or decrypt the received signal to provide premium services to some subscribers; the receiver is then called an integrated receiver/decoder or IRD.[18] Low-loss cable (e.g. RG-6, RG-11, etc.) is used to connect the receiver to the LNBF or LNB.[13] RG-59 is not recommended for this application as it is not technically designed to carry frequencies above 950 MHz, but may work in some circumstances, depending on the quality of the coaxial wire, signal levels, cable length, etc.[13] A practical problem relating to home satellite reception is that an LNB can basically only handle a single receiver.[19] This is because the LNB is translating two different circular polarizations (right-hand and left-hand) and, in the case of K-band, two different frequency bands (lower and upper) to the same frequency range on the cable.[19] Depending on which frequency and polarization a transponder is using, the satellite receiver has to switch the LNB into one of four different modes in order to receive a specific "channel".[19] This is handled by the receiver using the DiSEqC protocol to control the LNB mode.[19] If several satellite receivers are to be attached to a single dish, a so-called multiswitch will have to be used in conjunction with a special type of LNB.[19] There are also LNBs available with a multi-switch already integrated.[19] This problem becomes more complicated when several receivers are to use several dishes (or several LNBs mounted in a single dish) pointing to different satellites.[19] A common solution for consumers wanting to access multiple satellites is to deploy a single dish with a single LNB and to rotate the dish using an electric motor. The axis of rotation has to be set up in the north–south direction and, depending on the geographical location of the dish, have a specific vertical tilt. Set up properly the motorized dish when turned will sweep across all possible positions for satellites lined up along the geostationary orbit directly above the equator. The dish will then be capable of receiving any geostationary satellite that is visible at the specific location, i.e. that is above the horizon. The DiSEqC protocol has been extended to encompass commands for steering dish rotors.[citation needed] There are five major components in a satellite system: the programming source, the broadcast center, the satellite, the satellite dish, and the receiver. "Direct broadcast" satellites used for transmission of satellite television signals are generally in geostationary orbit 37,000 km (23,000 mi) above the earth's equator.[20] The reason for using this orbit is that the satellite circles the Earth at the same rate as the Earth rotates, so the satellite appears at a fixed point in the sky. Thus satellite dishes can be aimed permanently at that point, and do not need a tracking system to turn to follow a moving satellite. A few satellite TV systems use satellites in a Molniya orbit, a highly elliptical orbit with inclination of +/-63.4 degrees and an orbital period of about twelve hours. Satellite television, like other communications relayed by satellite, starts with a transmitting antenna located at an uplink facility.[20] Uplink facilities transmit the signal to the satellite over a narrow beam of microwaves, typically in the C-band frequency range due to its resistance to rain fade.[20] Uplink satellite dishes are very large, often as much as 9 to 12 metres (30 to 39 ft) in diameter[20] to achieve accurate aiming and increased signal strength at the satellite, to improve reliability.[20] The uplink dish is pointed toward a specific satellite and the uplinked signals are transmitted within a specific frequency range, so as to be received by one of the transponders tuned to that frequency range aboard that satellite.[20] The transponder then converts the signals to Ku band, a process known as "translation," and transmits them back to earth to be received by home satellite stations.[20] A DTH Satellite dish from India. The downlinked satellite signal, weaker after traveling the great distance (see path loss), is collected by using a rooftop parabolic receiving dish ("satellite dish"), which reflects the weak signal to the dish's focal point.[21] Mounted on brackets at the dish's focal point is a feedhorn[21] which passes the signals through a waveguide to a device called a low-noise block converter (LNB) or low noise converter (LNC) attached to the horn.[21] The LNB amplifies the weak signals, filters the block of frequencies in which the satellite television signals are transmitted, and converts the block of frequencies to a lower frequency range in the L-band range.[21] The signal is then passed through a coaxial cable into the residence to the satellite television receiver, a set-top box next to the television. The reason for using the LNB to do the frequency translation at the dish is so that the signal can be carried into the residence using cheap coaxial cable. To transport the signal into the house at its original Ku band microwave frequency would require an expensive waveguide, a metal pipe to carry the radio waves.[16] The cable connecting the receiver to the LNB are of the low loss type RG-6, quad shield RG-6, or RG-11.[22] RG-59 is not recommended for this application as it is not technically designed to carry frequencies above 950 MHz, but will work in many circumstances, depending on the quality of the coaxial wire.[22] The shift to more affordable technology from the 50 ohm impedance cable and N-connectors of the early C-band systems to the cheaper 75 ohm technology and F-connectors allowed the early satellite television receivers to use, what were in reality, modified UHF television tuners which selected the satellite television channel for down conversion to another lower intermediate frequency centered on 70 MHz where it was demodulated.[16] An LNB can only handle a single receiver.[19] This is due to the fact that the LNB is mapping two different circular polarisations – right hand and left hand – and in the case of the Ku-band two different reception bands – lower and upper – to one and the same frequency band on the cable, and is a practical problem for home satellite reception.[19] Depending on which frequency a transponder is transmitting at and on what polarisation it is using, the satellite receiver has to switch the LNB into one of four different modes in order to receive a specific desired program on a specific transponder.[19] The receiver uses the DiSEqC protocol to control the LNB mode, which handles this.[19] If several satellite receivers are to be attached to a single dish a so-called multiswitch must be used in conjunction with a special type of LNB.[19] There are also LNBs available with a multi-switch already integrated.[19] This problem becomes more complicated when several receivers use several dishes or several LNBs mounted in a single dish are aimed at different satellites.[19] The set-top box selects the channel desired by the user by filtering that channel from the multiple channels received from the satellite, converts the signal to a lower intermediate frequency, decrypts the encrypted signal, demodulates the radio signal and sends the resulting video signal to the television through a cable.[22] To decrypt the signal the receiver box must be "activated" by the satellite company. If the customer fails to pay their monthly bill the box is "deactivated" by a signal from the company, and the system will not work until the company reactivates it. Some receivers are capable of decrypting the received signal itself. These receivers are called integrated receiver/decoders or IRDs.[22] Analog television which was distributed via satellite was usually sent scrambled or unscrambled in NTSC, PAL, or SECAM television broadcast standards. The analog signal is frequency modulated and is converted from an FM signal to what is referred to as baseband. This baseband comprises the video signal and the audio subcarrier(s). The audio subcarrier is further demodulated to provide a raw audio signal. Later signals were digitized television signals or multiplex of signals, typically QPSK. In general, digital television, including that transmitted via satellites, is based on open standards such as MPEG and DVB-S/DVB-S2 or ISDB-S.[citation needed] The conditional access encryption/scrambling methods include NDS, BISS, Conax, Digicipher, Irdeto, Cryptoworks, DG Crypt, Beta digital, SECA Mediaguard, Logiways, Nagravision, PowerVu, Viaccess, Videocipher, and VideoGuard. Many conditional access systems have been compromised. An event called sun outage occurs when the sun lines up directly behind the satellite in the field of view of the receiving satellite dish.[23] This happens for about a 10-minute period daily around midday, twice every year for a two-week period in the spring and fall around the equinox. During this period, the sun is within the main lobe of the dish's reception pattern, so the strong microwave noise emitted by the sun on the same frequencies used by the satellite's transponders drowns out reception.[23] DBS satellite dishes installed on an apartment complex in San Jose, CA (2006). Direct-to-home (DTH) can either refer to the communications satellites themselves that deliver service or the actual television service. Most satellite television customers in developed television markets get their programming through a direct broadcast satellite (DBS) provider.[24] Signals are transmitted using Ku band (12 to 18 GHz) and are completely digital which allows for higher picture and sound quality.[3] Programming for satellite television channels comes from multiple sources and may include live studio feeds.[25] The broadcast center assembles and packages programming into channels for transmission and, where necessary, encrypts the channels. The signal is then sent to the uplink[26] where it is transmitted to the satellite. With some broadcast centers, the studios, administration and up-link are all part of the same campus.[27] The satellite then translates and broadcasts the channels.[28] Most systems use the DVB-S standard for transmission.[24] With pay television services, the data stream is encrypted and requires proprietary reception equipment. While the underlying reception technology is similar, the pay television technology is proprietary, often consisting of a conditional-access module and smart card. This measure assures satellite television providers that only authorized, paying subscribers have access to pay television content but at the same time can allow free-to-air channels to be viewed even by the people with standard equipment available in the market. Some countries operate satellite television services which can be received for free, without paying a subscription fee. This is called free-to-air satellite television. Germany is likely the leader in free-to-air with approximately 250 digital channels (including 83 HDTV channels and various regional channels) broadcast from the Astra 19.2°E satellite constellation.[29] These are not marketed as a DBS service, but are received in approximately 18 million homes, as well as in any home using the Sky Deutschland commercial DBS system. All German analogue satellite broadcasts ceased on 30 April 2012.[30][31] The United Kingdom has approximately 160 digital channels (including the regional variations of BBC channels, ITV channels, Channel 4 and Channel 5) that are broadcast without encryption from the Astra 28.2°E satellite constellation, and receivable on any DVB-S receiver (a DVB-S2 receiver is required for certain high definition television services). Most of these channels are included within the Sky EPG, and an increasing number within the Freesat EPG. India's national broadcaster, Doordarshan, promotes a free-to-air DBS package as "DD Free Dish", which is provided as in-fill for the country's terrestrial transmission network. It is broadcast from GSAT-15 at 93.5°E and contains about 80 FTA channels. While originally launched as backhaul for their digital terrestrial television service, a large number of French channels are free-to-air on satellites at 5°W, and have recently been announced as being official in-fill for the DTT network. In North America (United States, Canada and Mexico) there are over 80 FTA digital channels available on Galaxy 19 (with the majority being ethnic or religious in nature). Other FTA satellites include AMC-4, AMC-6, Galaxy 18, and Satmex 5. A company called GloryStar promotes FTA religious broadcasters on Galaxy 19. Satellite TV has seen a decline in consumers since the 2010s due to the cord-cutting trend where people are shifting towards internet-based streaming television and free over-the-air television.[32] Main article: Television receive-only A C-band Andrew Corporation satellite dish used by TVRO systems. The term television receive-only, or TVRO, arose during the early days of satellite television reception to differentiate it from commercial satellite television uplink and downlink operations (transmit and receive). This was the primary method of satellite television transmissions before the satellite television industry shifted, with the launch of higher powered DBS satellites in the early 1990s which transmitted their signals on the Ku band frequencies.[4][33] Satellite television channels at that time were intended to be used by cable television networks rather than received by home viewers.[34] Early satellite television receiver systems were largely constructed by hobbyists and engineers. These early TVRO systems operated mainly on the C-band frequencies and the dishes required were large; typically over 3 meters (9.8 ft) in diameter.[35] Consequently, TVRO is often referred to as "big dish" or "Big Ugly Dish" (BUD) satellite television. TVRO systems were designed to receive analog and digital satellite feeds of both television or audio from both C-band and Ku-band transponders on FSS-type satellites.[36][37] The higher frequency Ku-band systems tend to resemble DBS systems and can use a smaller dish antenna because of the higher power transmissions and greater antenna gain. TVRO systems tend to use larger rather than smaller satellite dish antennas, since it is more likely that the owner of a TVRO system would have a C-band-only setup rather than a Ku band-only setup. Additional receiver boxes allow for different types of digital satellite signal reception, such as DVB/MPEG-2 and 4DTV. The narrow beam width of a normal parabolic satellite antenna means it can only receive signals from a single satellite at a time.[38] Simulsat or the Vertex-RSI TORUS, is a quasi-parabolic satellite earthstation antenna that is capable of receiving satellite transmissions from 35 or more C- and Ku-band satellites simultaneously.[39] In 1945 British science fiction writer Arthur C. Clarke proposed a worldwide communications system which would function by means of three satellites equally spaced apart in Earth orbit.[40][41] This was published in the October 1945 issue of the Wireless World magazine and won him the Franklin Institute's Stuart Ballantine Medal in 1963.[42][43] The first satellite relayed communication was achieved early on in the space age, after the first relay test was conducted by Pioneer 1 and the first radio broadcast by SCORE at the end of 1958, after at the beginning of the year Sputnik I became the first satellite in history. In 1960 TIROS 1 sent back the first televised image of Earth from space, becoming the first weather satellite.[44] AT+T Telstar 1 test (first satellite TV broadcast, July 11, 1962) The first public satellite television signals from Europe to North America were relayed via the Telstar satellite over the Atlantic ocean on 23 July 1962, although a test broadcast had taken place almost two weeks earlier on 11 July.[45] The signals were received and broadcast in North American and European countries and watched by over 100 million.[45] Launched in 1962, the Relay 1 satellite was the first satellite to transmit television signals from the US to Japan.[46] The first geosynchronous communication satellite, Syncom 2, was launched on 26 July 1963.[47] The subsequent first geostationary Syncom 3, orbiting near the International Date Line, was used to telecast the 1964 Olympic Games from Tokyo to the United States.[48][49] Intelsat I (1965), the world's first commercial communications satellite, was used among others to relay the Our World multi-national broadcast (1967), the first multi-satellite relayed television broadcast The world's first commercial communications satellite, called Intelsat I and nicknamed "Early Bird", was launched into geosynchronous orbit on April 6, 1965.[50] The first national network of television satellites, called Orbita, was created by the Soviet Union in October 1967, and was based on the principle of using the highly elliptical Molniya satellite for rebroadcasting and delivering of television signals to ground downlink stations.[51] Clip of the international broadcast of the first Moon landing, Neil Armstrong making humanity's first step onto an extraterrestrial body, transmitted from Honeysuckle Creek Tracking Station[52] and distributed globally via the Intelsat III F-4 satellite.[53] The first domestic satellite to carry television transmissions was Canada's geostationary Anik 1, which was launched on 9 November 1972.[54] An advertisement by the Australian Overseas Telecommunications Commission (OTC) for the Aloha from Hawaii via Satellite, broadcast via the Intelsat IV F-4 satellite, an early international broadcast event featuring Elvis Presley live in concert. ATS-6, the world's first experimental educational and direct broadcast satellite (DBS), was launched on 30 May 1974.[55] It transmitted at 860 MHz using wideband FM modulation and had two sound channels. The transmissions were focused on the Indian subcontinent but experimenters were able to receive the signal in Western Europe using home constructed equipment that drew on UHF television design techniques already in use.[56] The first in a series of Soviet geostationary satellites to carry direct-to-home television, Ekran 1, was launched on 26 October 1976.[57] It used a 714 MHz UHF downlink frequency so that the transmissions could be received with existing UHF television technology rather than microwave technology.[58] The satellite television industry developed in the US from the cable television industry as communication satellites were being used to distribute television programming to remote cable television headends. Home Box Office (HBO), Turner Broadcasting System (TBS), and Christian Broadcasting Network (CBN, later The Family Channel) were among the first to use satellite television to deliver programming. Taylor Howard of San Andreas, California, became the first person to receive C-band satellite signals with his home-built system in 1976.[59] In the US, PBS, a non-profit public broadcasting service, began to distribute its television programming by satellite in 1978.[60] In 1979, Soviet engineers developed the Moskva (or Moscow) system of broadcasting and delivering of TV signals via satellites. They launched the Gorizont communication satellites later that same year. These satellites used geostationary orbits.[61] They were equipped with powerful on-board transponders, so the size of receiving parabolic antennas of downlink stations was reduced to 4 and 2.5 metres.[61] On October 18, 1979, the Federal Communications Commission (FCC) began allowing people to have home satellite earth stations without a federal government license.[62] The front cover of the 1979 Neiman-Marcus Christmas catalogue featured the first home satellite TV stations on sale for $36,500.[63] The dishes were nearly 20 feet (6.1 m) in diameter[64] and were remote controlled.[65] The price went down by half soon after that, but there were only eight more channels.[66] The Society for Private and Commercial Earth Stations (SPACE), an organisation which represented consumers and satellite TV system owners, was established in 1980.[67] Early satellite television systems were not very popular due to their expense and large dish size.[68] The satellite television dishes of the systems in the late 1970s and early 1980s were 10 to 16 feet (3.0 to 4.9 m) in diameter,[69] made of fibreglass or solid aluminum or steel,[70] and in the United States cost more than $5,000, sometimes as much as $10,000.[71] Programming sent from ground stations was relayed from eighteen satellites in geostationary orbit located 22,300 miles (35,900 km) above the Earth.[72][73] Further information: Television receive-only By 1980, satellite television was well established in the US and Europe. On 26 April 1982, the first satellite channel in the UK, Satellite Television Ltd. (later Sky One), was launched.[74] Its signals were transmitted from the ESA's Orbital Test Satellites.[74] Between 1981 and 1985, TVRO systems' sales rates increased as prices fell. Advances in receiver technology and the use of gallium arsenide FET technology enabled the use of smaller dishes. Five hundred thousand systems, some costing as little as $2000, were sold in the US in 1984.[71][75] Dishes pointing to one satellite were even cheaper.[76] People in areas without local broadcast stations or cable television service could obtain good-quality reception with no monthly fees.[71][73] The large dishes were a subject of much consternation, as many people considered them eyesores, and in the US most condominiums, neighborhoods, and other homeowner associations tightly restricted their use, except in areas where such restrictions were illegal.[4] These restrictions were altered in 1986 when the Federal Communications Commission ruled all of them illegal.[68] A municipality could require a property owner to relocate the dish if it violated other zoning restrictions, such as a setback requirement, but could not outlaw their use.[68] The necessity of these restrictions would slowly decline as the dishes got smaller.[68] Originally, all channels were broadcast in the clear (ITC) because the equipment necessary to receive the programming was too expensive for consumers. With the growing number of TVRO systems, the program providers and broadcasters had to scramble their signal and develop subscription systems. In October 1984, the U.S. Congress passed the Cable Communications Policy Act of 1984, which gave those using TVRO systems the right to receive signals for free unless they were scrambled, and required those who did scramble to make their signals available for a reasonable fee.[73][77] Since cable channels could prevent reception by big dishes, other companies had an incentive to offer competition.[78] In January 1986, HBO began using the now-obsolete VideoCipher II system to encrypt their channels.[69] Other channels used less secure television encryption systems. The scrambling of HBO was met with much protest from owners of big-dish systems, most of which had no other option at the time for receiving such channels, claiming that clear signals from cable channels would be difficult to receive.[79] Eventually HBO allowed dish owners to subscribe directly to their service for $12.95 per month, a price equal to or higher than what cable subscribers were paying, and required a descrambler to be purchased for $395.[79] This led to the attack on HBO's transponder Galaxy 1 by John R. MacDougall in April 1986.[79] One by one, all commercial channels followed HBO's lead and began scrambling their channels.[80] The Satellite Broadcasting and Communications Association (SBCA) was founded on December 2, 1986, as the result of a merger between SPACE and the Direct Broadcast Satellite Association (DBSA).[75] Videocipher II used analog scrambling on its video signal and Data Encryption Standard–based encryption on its audio signal. VideoCipher II was defeated, and there was a black market for descrambler devices which were initially sold as "test" devices.[80] By 1987, nine channels were scrambled, but 99 others were available free-to-air.[77] While HBO initially charged a monthly fee of $19.95, soon it became possible to unscramble all channels for $200 a year.[77] Dish sales went down from 600,000 in 1985 to 350,000 in 1986, but pay television services were seeing dishes as something positive since some people would never have cable service, and the industry was starting to recover as a result.[77] Scrambling also led to the development of pay-per-view events.[77] On November 1, 1988, NBC began scrambling its C-band signal but left its Ku band signal unencrypted in order for affiliates to not lose viewers who could not see their advertising.[81] Most of the two million satellite dish users in the United States still used C-band.[81] ABC and CBS were considering scrambling, though CBS was reluctant due to the number of people unable to receive local network affiliates.[81] The piracy on satellite television networks in the US led to the introduction of the Cable Television Consumer Protection and Competition Act of 1992. This legislation enabled anyone caught engaging in signal theft to be fined up to $50,000 and to be sentenced to a maximum of two years in prison.[82] A repeat offender can be fined up to $100,000 and be imprisoned for up to five years.[82] Satellite television had also developed in Europe but it initially used low power communication satellites and it required dish sizes of over 1.7 metres. On 11 December 1988, however, Luxembourg launched Astra 1A, the first satellite to provide medium power satellite coverage to Western Europe.[83] This was one of the first medium-powered satellites, transmitting signals in Ku band and allowing reception with small dishes (90 cm).[83] The launch of Astra beat the winner of the UK's state Direct Broadcast Satellite licence holder, British Satellite Broadcasting, to the market. Commercial satellite broadcasts have existed in Japan since 1992 led by NHK which is influential in the development of regulations and has access to government funding for research. Their entry into the market was protected by the Ministry of Posts and Telecommunications (MPT) resulting in the WOWOW channel that is encrypted and can be accessed from NHK dishes with a decoder.[84] In the US in the early 1990s, four large cable companies launched PrimeStar, a direct broadcasting company using medium power satellites. The relatively strong transmissions allowed the use of smaller (90 cm) dishes. Its popularity declined with the 1994 launch of the Hughes DirecTV and Dish Network satellite television systems. Digital satellite broadcasts began in 1994 in the United States through DirecTV using the DSS format. They were launched (with the DVB-S standard) in South Africa, Middle East, North Africa and Asia-Pacific in 1994 and 1995, and in 1996 and 1997 in European countries including France, Germany, Spain, Portugal, Italy and the Netherlands, as well as Japan, North America and Latin America. Digital DVB-S broadcasts in the United Kingdom and Ireland started in 1998. Japan started broadcasting with the ISDB-S standard in 2000. On March 4, 1996, EchoStar introduced Digital Sky Highway (Dish Network) using the EchoStar 1 satellite.[85] EchoStar launched a second satellite in September 1996 to increase the number of channels available on Dish Network to 170.[85] These systems provided better pictures and stereo sound on 150–200 video and audio channels, and allowed small dishes to be used. This greatly reduced the popularity of TVRO systems. In the mid-1990s, channels began moving their broadcasts to digital television transmission using the DigiCipher conditional access system.[86] In addition to encryption, the widespread availability, in the US, of DBS services such as PrimeStar and DirecTV had been reducing the popularity of TVRO systems since the early 1990s. Signals from DBS satellites (operating in the more recent Ku band) are higher in both frequency and power (due to improvements in the solar panels and energy efficiency of modern satellites) and therefore require much smaller dishes than C-band, and the digital modulation methods now used require less signal strength at the receiver than analog modulation methods.[87] Each satellite also can carry up to 32 transponders in the Ku band, but only 24 in the C band, and several digital subchannels can be multiplexed (MCPC) or carried separately (SCPC) on a single transponder.[88] Advances in noise reduction due to improved microwave technology and semiconductor materials have also had an effect.[88] However, one consequence of the higher frequencies used for DBS services is rain fade where viewers lose signal during a heavy downpour. C-band satellite television signals are less prone to rain fade.[89] In a return to the older (but proven) technologies of satellite communication, the current DBS-based satellite providers in the US (Dish Network and DirecTV) are now utilizing additional capacity on the Ku-band transponders of existing FSS-class satellites, in addition to the capacity on their own existing fleets of DBS satellites in orbit. This was done in order to provide more channel capacity for their systems, as required by the increasing number of High-Definition and simulcast local station channels. The reception of the channels carried on the Ku-band FSS satellite's respective transponders has been achieved by both DirecTV & Dish Network issuing to their subscribers dishes twice as big in diameter (36") than the previous 18" (& 20" for the Dish Network "Dish500") dishes the services used initially, equipped with 2 circular-polarized LNBFs (for reception of 2 native DBS satellites of the provider, 1 per LNBF), and 1 standard linear-polarized LNB for reception of channels from an FSS-type satellite. These newer DBS/FSS-hybrid dishes, marketed by DirecTV and Dish Network as the "SlimLine" and "SuperDish" models respectively, are now the current standard for both providers, with their original 18"/20" single or dual LNBF dishes either now obsolete, or only used for program packages, separate channels, or services only broadcast over the providers' DBS satellites. On 29 November 1999 US President Bill Clinton signed the Satellite Home Viewer Improvement Act (SHVIA).[90] The act allowed Americans to receive local broadcast signals via direct broadcast satellite systems for the first time.[90] The 1963 Radio Regulations of the International Telecommunication Union (ITU) defined a "broadcasting satellite service" as a "space service in which signals transmitted or retransmitted by space stations, or transmitted by reflection from objects in orbit around the Earth, are intended for direct reception by the general public."[91] In the 1970s some states grew concerned that external broadcasting could alter the cultural or political identity of a state leading to the New World Information and Communication Order (NWICO) proposal. However, satellite broadcasts can not be restricted on a per-state basis due to the limitations of the technology. Around the time the MacBride report was released, satellite broadcasting was being discussed at the UN Committee on the Peaceful Uses of Outer Space (COPUOS) where most of the members supported prior consent restrictions for broadcasting in their territories, but some argued this would violate freedom of information. The parties were unable to reach a consensus on this and in 1982 submitted UNGA Res 37/92 ("DBS Principles") to the UN General Assembly which was adopted by a majority vote, however, most States capable of DBS voted against it. The "DBS Principles" resolution is generally regarded as ineffective.[92] Basic Interoperable Scrambling System Cable television List of satellite television companies Television receive-only Satellite television by region Commercialization of space Free-to-air Microwave antenna Molniya orbit Murphy v Media Protection Services Limited Satellite dish Satellite subcarrier audio Smart TV: provides television via internet connection SMATV Television antenna ^ ITU Radio Regulations, Section IV. Radio Stations and Systems – Article 1.39, definition: Broadcasting-satellite service ^ Campbell, Dennis; Cotter, Susan (1998). Copyright Infringement. Kluwer Law International. ISBN 90-247-3002-3. Retrieved 18 September 2014. ^ a b "Frequency letter bands". Microwaves101.com. 25 April 2008. Archived from the original on 14 July 2014. Retrieved 30 January 2014. ^ a b c "Installing Consumer-Owned Antennas and Satellite Dishes". FCC. Archived from the original on 2011-04-29. 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(Learn how and when to remove these messages) This article needs to be updated. The reason given is: Requires reliable non-social media sources. Please help update this article to reflect recent events or newly available information. (October 2024) This article may need to be rewritten to comply with Wikipedia's quality standards. You can help. The talk page may contain suggestions. (July 2024) This article may be in need of reorganization to comply with Wikipedia's layout guidelines. Please help by editing the article to make improvements to the overall structure. (July 2024) (Learn how and when to remove this message) (Learn how and when to remove this message) An IPTV set-top box connected to a TV set, designed to receive television from a service called MviewInternet Protocol television (IPTV), also called TV over broadband,[1][2] is the service delivery of television over Internet Protocol (IP) networks. Usually sold and run by a telecom provider, it consists of broadcast live television that is streamed over the Internet (multicast) — in contrast to delivery through traditional terrestrial, satellite, and cable transmission formats — as well as video on demand services for watching or replaying content (unicast).[3] IPTV broadcasts started gaining usage during the 2000s alongside the rising use of broadband-based internet connections.[2] It is often provided bundled with internet access services by ISPs to subscribers and runs in a closed network.[4] IPTV normally requires the use of a set-top box, which receives the encoded television content in the MPEG transport stream via IP multicast, and converts the packets to be watched on a TV set or other kind of display.[3] It is distinct from over-the-top (OTT) services, which are based on a direct one-to-one transmission mechanism. IPTV methods have been standardised by organisations such as ETSI.[5][6] IPTV has found success in some regions: for example in Western Europe in 2015, pay IPTV users overtook pay satellite TV users.[7] IPTV is also used for media delivery around corporate and private networks.[citation needed] Historically, many different definitions of IPTV have appeared, including elementary streams[clarification needed] over IP networks, MPEG transport streams over IP networks and a number of proprietary systems. One official definition approved by the International Telecommunication Union focus group on IPTV (ITU-T FG IPTV) is: IPTV is defined as multimedia services such as television/video/audio/text/graphics/data delivered over IP-based networks managed to provide the required level of quality of service and experience, security, interactivity and reliability.[8] Another definition of IPTV, relating to the telecommunications industry, is the one given by Alliance for Telecommunications Industry Solutions (ATIS) IPTV Exploratory Group in 2005: IPTV is defined as the secure and reliable delivery to subscribers of entertainment video and related services. These services may include, for example, Live TV, Video On Demand (VOD) and Interactive TV (iTV). These services are delivered across an access agnostic, packet switched network that employs the IP protocol to transport the audio, video and control signals. In contrast to video over the public Internet, with IPTV deployments, network security and performance are tightly managed to ensure a superior entertainment experience, resulting in a compelling business environment for content providers, advertisers and customers alike.[9] Up until the early 1990s, it was not thought possible that a television programme could be squeezed into the limited telecommunication bandwidth of a copper telephone cable to provide a video-on-demand (VOD) television service of acceptable quality, as the required bandwidth of a digital television signal was around 200 Mbit/s, which was 2,000 times greater than the bandwidth of a speech signal over a copper telephone wire. VOD services were only made possible as a result of two major technological developments: motion-compensated DCT video compression and asymmetric digital subscriber line (ADSL) data transmission.[10] Motion-compensated DCT algorithms for video coding standards include the H.26x formats from 1988 onwards and the MPEG formats from 1991 onwards.[11][12] Motion-compensated DCT video compression significantly reduced the amount of bandwidth required for a television signal, while at the same time ADSL increased the bandwidth of data that could be sent over a copper telephone wire. ADSL increased the bandwidth of a telephone line from around 0.1 Mbit/s to 2 Mbit/s, while DCT compression reduced the required bandwidth of a digital television signal from around 200 Mbit/s down to about 2 Mbit/s. The combination of DCT and ADSL technologies made it possible to practically implement VOD services at around 2 Mbit/s bandwidth in the 1990s.[10] The term IPTV first appeared in 1995 with the founding of Precept Software by Judith Estrin and Bill Carrico. Precept developed an Internet video product named IP/TV. IP/TV was an Mbone compatible Windows and Unix-based application that transmitted single and multi-source audio and video traffic, ranging from low to DVD quality, using both unicast and IP multicast Real-time Transport Protocol (RTP) and Real time control protocol (RTCP). The software was written primarily by Steve Casner, Karl Auerbach, and Cha Chee Kuan. Precept was acquired by Cisco Systems in 1998.[13] Cisco retains the IP/TV trademark. Telecommunications company US West (later Qwest) launched an IPTV service called TeleChoice in Phoenix, Arizona in 1998 using VDSL technology, becoming the first company in the United States to provide digital television over telephone lines.[14][15] The service was shut down in 2008.[16] Internet radio company AudioNet started the first continuous live webcasts with content from WFAA-TV in January 1998 and KCTU-LP on 10 January 1998.[17] Kingston Communications, a regional telecommunications operator in the UK, launched Kingston Interactive Television (KIT), an IPTV over digital subscriber line (DSL) service in September 1999. The operator added additional VOD service in October 2001 with Yes TV, a VOD content provider. Kingston was one of the first companies in the world to introduce IPTV and IP VOD over ADSL as a commercial service. The service became the reference for various changes to UK Government regulations and policy on IPTV. In 2006, the KIT service was discontinued, subscribers having declined from a peak of 10,000 to 4,000.[18][19] In 1999, NBTel (now known as Bell Aliant) was the first to commercially deploy Internet protocol television over DSL in Canada[20] using the Alcatel 7350 DSLAM and middleware created by iMagic TV (owned by NBTel's parent company Bruncor[21]). The service was marketed under the brand VibeVision in New Brunswick, and later expanded into Nova Scotia in early 2000[22] after the formation of Aliant. iMagic TV was later sold to Alcatel.[23] In 2002, Sasktel was the second in Canada to commercially deploy IPTV over DSL, using the Lucent Stinger DSL platform.[24] In 2005, SureWest Communications was the first North American company to offer high-definition television (HDTV) channels over an IPTV service.[25] In 2005, Bredbandsbolaget launched its IPTV service as the first service provider in Sweden. As of January 2009, they are not the biggest provider any longer; TeliaSonera, who launched their service later, now has more customers.[26] In 2007, TPG launched their IPTV service in Australia after a limited beta.[27][28] By 2010, iiNet and Telstra launched IPTV services in conjunction to internet plans.[29] In 2008, Pakistan Telecommunication Company Limited (PTCL) launched IPTV under the brand name of PTCL Smart TV in Pakistan. This service is available in 150 major cities of the country offering 140 live channels.[citation needed] In 2010, CenturyLink – after acquiring Embarq (2009) and Qwest (2010) – entered five U.S. markets with an IPTV service called Prism.[30] This was after successful test marketing in Florida. Later in 2010, Bell Canada (a major division, if not the largest division of BCE) announced it would begin offering residential and business/commercial customers in Montreal, Quebec and Toronto, Ontario IPTV over a number of different modalities, including fibre to the home, fibre to the node and DSL. This flavour of IPTV would be packaged with other services and branded as "Bell Fibe," providing Canadian customers with everything from local analogue trunk connectivity (POTS), to DSL and fibre Internet to TV service via IPTV.[31] Bell further announced in the September 13th (2010) press release it would begin deploying fiber optic Ethernet to homes in Montreal and Toronto. Bell has since continued to install fiber optic Ethernet to homes (fibre to the home) across Ontario and Quebec, Bell Canada's two largest customer territories. Bell was very successful with the deployment of the Bell Fibe product offering. Many customers in Ontario and Quebec switched from legacy (coaxial) cable companies to Bell's Fibe product because of Bell's marketing around IPTV and their at-home wireless PVR offering. Bell's wireless PVR would permit customers to place a TV anywhere they wanted - as long as they had a power outlet. Bell Fibe TV commercials would show young families watching TV outside on the couch with large 70+ inch LCDs and their Bell Fibe wireless PVR.[32] In Brazil, since at least 2012, Vivo has been offering the service Vivo TV Fibra in 200+ cities where it has FTTH coverage (4Q 2020 data) . Since at least 2018, Oi has also been offering IPTV under its FTTH service "Oi Fibra". Also, several regional FTTH providers also offer IPTV along with FTTH internet services. In 2016, Korean Central Television (KCTV) introduced the set-top box called Manbang, reportedly providing video-on-demand services in North Korea via quasi-internet protocol television (IPTV). Manbang allows viewers to watch five different TV channels in real-time, and find political information regarding the Supreme Leader and Juche ideology, and read articles from state-run news organizations. An IPTV set-top box on display from a Taiwanese provider The global IPTV market was expected to grow from 28 million subscribers at US$12 billion revenue in 2009 to 83 million and US$38 billion in 2013.[needs update] Europe and Asia are the leading territories in terms of the overall number of subscribers. But in terms of service revenues, Europe and North America generate a larger share of global revenue, due to very low average revenue per user (ARPU) in China and India, the fastest growing (and ultimately, the biggest markets) is Asia.[33] Deutsche Telekom Media Receiver 400 set-top box for an IPTV service in Germany Services also launched in Bosnia and Herzegovina, Bulgaria, Pakistan, Canada, Croatia, Lithuania, Moldova, Montenegro, Morocco,[34] North Macedonia, Poland, Mongolia, Romania, Serbia, Slovenia,[35] the Netherlands,[36] Georgia, Greece, Denmark, Finland, Estonia, Czech Republic, Slovakia, Hungary,[37][38] Norway, Sweden, Iceland, Latvia, Turkey, Colombia, Chile and Uzbekistan.[39] The United Kingdom launched IPTV early and after a slow initial growth, in February 2009 BT announced that it had reached 398,000 subscribers to its BT Vision service.[40] A free IPTV service by the public broadcasters was launched in 2024 named Freely. Claro has launched their own IPTV service called "Claro TV". This service is available in several countries in which they operate, such as Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua. IPTV is just beginning to grow in Central and Eastern Europe and Latin America, and now it is growing in South Asian countries such as Sri Lanka, Nepal Pakistan and India.[41] but significant plans exist in countries such as Russia. Kazakhstan introduced[42] its own IPTV services by the national provider Kazakhtelecom JSC[43] and content integrator Alacast under the "iD TV" brand in two major cities Astana and Almaty in 2009 and is about to go nationwide starting 2010.[needs update] Australian ISP iiNet launched Australia's first IPTV with Fetch TV.[44] In India, IPTV was launched by MTNL, BSNL and Jio in New Delhi, Mumbai and Punjab. APSFL is another IPTV provider in the state of Andhra Pradesh. In Nepal, IPTV was first launched by NEW IT VENTURE CORPORATION called Net TV Nepal, the service can be accessed through its app, web app and Set-top boxes provided by local ISPs, another IPTV was started by Nepal Telecom called WOW Time in 2016 which can be accessed through its app. In Sri Lanka, IPTV was launched by Sri Lanka Telecom (operated by SLT VisionCom) in 2008, under the brand name of PEO TV. This service is available throughout the country. Dialog TV has been available through the service since 2018. In Pakistan, IPTV was launched by PTCL in 2008, under the brand name of PTCL Smart TV. This service is available in 150 major cities of the country.[citation needed] In the Philippines, PLDT offers Cignal IPTV services as an add-on in certain ADSL and fiber optic plans.[45][46] In Malaysia, various companies have attempted to launch IPTV services since 2005. Failed PayTV provider MiTV attempted to use an IPTV-over-UHF service but the service failed to take off. HyppTV was supposed to use an IPTV-based system, but not true IPTV as it does not provide a set-top box and requires users to view channels using a computer. True IPTV providers available in the country at the moment are Fine TV and DETV. In Q2 2010, Telekom Malaysia launched IPTV services through their fibre to the home product Unifi in select areas. In April 2010, Astro began testing IPTV services on TIME dotCom Berhad's high-speed fibre to the home optical fibre network. In December 2010, Astro began trials with customers in high-rise condominium buildings around the Mont Kiara area. In April 2011, Astro commercially launched its IPTV services under the tag line "The One and Only Line You'll Ever Need", a triple play offering in conjunction with TIME dotCom Berhad that provides all the Astro programming via IPTV, together with voice telephone services and broadband Internet access all through the same fibre optic connection into the customer's home. In 2020, Astro launched "Plug-and-Play", which uses Unicast technology for streaming TV. In Turkey, TTNET launched IPTV services under the name IPtivibu in 2010. It was available in pilot areas in the cities of Istanbul, İzmir and Ankara. As of 2011, IPTV service is launched as a large-scale commercial service and widely available across the country under the trademark "Tivibu EV".[47][48] Superonline plans to provide IPTV under the different name "WebTV" in 2011. Türk Telekom started building the fibre optic substructure for IPTV in late 2007. IPTV has been widely used since around 2002[citation needed] to distribute television and audio-visual (AV) media around businesses and commercial sites, whether as live TV channels or Video on Demand (VOD). Examples of types of commercial users include airports, schools, offices, hotels, and sports stadiums, to name just a few. Hotel television systems are the in-suite television content presented in hotel rooms, other hotel environments and in the hospitality industry for in-room entertainment, as well as hospitals, assisted living, senior care and nursing homes. These services may be free for the guest or paid, depending on the service and the individual hotel's or hotel chain's policy. Generally, these services are controlled by using the remote control. A simplified network diagram for IPTV An IPTV head-end is a place where live TV channels and AV sources are encoded, encrypted, and delivered as IP multicast streams. Meanwhile, a video on demand (VOD) platform stores on-demand video assets and serves them as IP unicast streams when a user requests them. Sometimes, the VOD platform is located within the IPTV head-end. An interactive portal allows users to navigate within the different IPTV services, such as the VOD catalogue. A delivery network is a packet-switched network that carries IP packets, including unicast and multicast streams. Endpoints refer to user equipment that can request, decode, and deliver IPTV streams for display to the user. This can include computers, mobile devices, and set-top boxes. At a residential IPTV user's home, the home TV gateway is the piece of equipment that terminates the access link from the delivery network. Lastly, the user set-top box is the piece of endpoint equipment that decodes and decrypts TV and VOD streams for display on the TV screen. Depending on the network architecture of the service provider, there are two main types of video server architecture that can be considered for IPTV deployment: centralised and distributed. The centralised architecture model is a relatively simple and easy-to-manage solution. Because all media content is stored in centralised servers, it does not require a comprehensive content distribution system. Centralised architecture is generally good for a network that provides relatively small VOD service deployment, has adequate core and edge bandwidth or has an efficient content delivery network (CDN). A distributed architecture has bandwidth usage advantages and inherent system management features that are essential for managing a larger server network. Distributed architecture requires intelligent and sophisticated content distribution technologies to augment effective delivery of multimedia content over the service provider's network.[49] In many cases, the residential gateway that provides connectivity with the Internet access network is not located close to the IPTV set-top box. This scenario becomes very common as service providers start to offer service packages with multiple set-top boxes per subscriber. Networking technologies that take advantage of existing home wiring (such as power lines, phone lines or coaxial cables) or of wireless hardware have become common solutions for this problem, although fragmentation in the wired home networking market has limited somewhat the growth in this market.[50][51] In December 2008, ITU-T adopted Recommendation G.hn (also known as G.9960), which is a next-generation home networking standard that specifies a common PHY/MAC that can operate over any home wiring (power lines, phone lines or coaxial cables).[52] Groups such as the Multimedia over Coax Alliance, HomePlug Powerline Alliance, Home Phoneline Networking Alliance, and Quasar Alliance (Plastic Optical Fibre)[53] each advocate their own technologies. There is a growing standardisation effort on the use of the 3GPP IP Multimedia Subsystem (IMS) as an architecture for supporting IPTV services in telecommunications carrier networks. Both ITU-T and ETSI are working on so-called "IMS-based IPTV" standards (see e.g. ETSI TS 182 027[54]). Carriers will be able to offer both voice and IPTV services over the same core infrastructure and the implementation of services combining conventional TV services with telephony features (e.g. caller ID on the TV screen) will become straightforward.[55] IPTV supports both live TV as well as stored video-on-demand. Playback requires a device connected to either a fixed or wireless IP network in the form of a standalone personal computer, smartphone, touch screen tablet, game console, connected TV or set-top box. Content is compressed by Video and audio codecs and then encapsulated in MPEG transport stream or Real-time Transport Protocol or other packets. IP multicasting allows for live data to be sent to multiple receivers using a single multicast group address. This section needs to be updated. Please help update this article to reflect recent events or newly available information. (December 2020) In standards-based IPTV systems, the primary underlying protocols used are: Service-provider-based streaming: IGMP for subscribing to a live multicast stream (TV channel) and for changing from one live multicast stream to another (TV channel change). IP multicast operates within LANs (including VLANs) and across WANs also.[citation needed] IP multicast is usually routed in the network core by Protocol Independent Multicast (PIM), setting up correct distribution of multicast streams (TV channels) from their source all the way to the customers who wants to view them, duplicating received packets as needed. On-demand content uses a negotiated unicast connection. Real-time Transport Protocol (RTP) over User Datagram Protocol (UDP) or the lower overhead H.222 transport stream over Transmission Control Protocol (TCP) are generally the preferred methods of encapsulation. Web-based unicast only live and VOD streaming: Adobe Flash Player prefers RTMP over TCP with setup and control via either AMF or XML or JSON transactions. Apple iOS uses HLS adaptive bitrate streaming over HTTP with setup and control via an embedded M3U playlist file. Microsoft Silverlight uses smooth streaming (adaptive bitrate streaming) over HTTP. Web-based multicast live and unicast VOD streaming: The Internet Engineering Task Force (IETF) recommends RTP over UDP or TCP transports with setup and control using RTSP over TCP. Connected TVs, game consoles, set-top boxes and network personal video recorders: Local network content uses UPnP AV for unicast via HTTP over TCP or for multicast live RTP over UDP. Web-based content is provided through either inline Web plug-ins or a television broadcast-based application that uses a middleware language such as MHEG-5 that triggers an event such as loading an inline Web browser using an Adobe Flash Player plug-in. Local IPTV, as used by businesses for audio visual AV distribution on their company networks is typically based on a mixture of: Conventional TV reception equipment and IPTV encoders TV gateways that receive live Digital Video Broadcasting (DVB) MPEG transport streams (channels) from terrestrial aerials, satellite dishes, or cable feeds and convert them into IP streams Although IPTV and conventional satellite TV distribution have been seen as complementary technologies, they are likely to be increasingly used together in hybrid IPTV networks. IPTV is largely neutral to the transmission medium, and IP traffic is already routinely carried by satellite for Internet backbone trunking and corporate VSAT networks.[56] The copper twisted pair cabling that forms the last mile of the telephone and broadband network in many countries is not able to provide a sizeable proportion of the population with an IPTV service that matches even existing terrestrial or satellite digital TV distribution. For a competitive multi-channel TV service, a connection speed of 20 Mbit/s is likely to be required, but unavailable to most potential customers.[57] The increasing popularity of high-definition television increases connection speed requirements or limits IPTV service quality and connection eligibility even further. However, satellites are capable of delivering in excess of 100 Gbit/s via multi-spot beam technologies, making satellite a clear emerging technology for implementing IPTV networks. Satellite distribution can be included in an IPTV network architecture in several ways. The simplest to implement is an IPTV-direct to home (DTH) architecture, in which hybrid DVB-broadband set-top boxes in subscriber homes integrate satellite and IP reception to give additional bandwidth with return channel capabilities. In such a system, many live TV channels may be multicast via satellite and supplemented with stored video-on-demand transmission via the broadband connection. Arqiva's Satellite Media Solutions Division suggests "IPTV works best in a hybrid format. For example, you would use broadband to receive some content and satellite to receive other, such as live channels".[58] This section's factual accuracy may be compromised due to out-of-date information. Please help update this article to reflect recent events or newly available information. (July 2011) Hybrid IPTV refers to the combination of traditional broadcast TV services and video delivered over either managed IP networks or the public Internet. It is an increasing trend in both the consumer and pay TV markets.[59][60][61] The growth of Hybrid IPTV is driven by two major factors. Since the emergence of online video aggregation sites, like YouTube and Vimeo in the mid-2000s, traditional pay TV operators have come under increasing pressure to provide their subscribers with a means of viewing Internet-based video on their televisions. At the same time, specialist IP-based operators have looked for ways to offer analogue and digital terrestrial services to their operations, without adding either additional cost or complexity to their transmission operations. Bandwidth is a valuable asset for operators, so many have looked for alternative ways to deliver these new services without investing in additional network infrastructures. A hybrid set-top allows content from a range of sources, including terrestrial broadcast, satellite, and cable, to be brought together with video delivered over the Internet via an Ethernet connection on the device. This enables television viewers to access a greater variety of content on their TV sets, without the need for a separate box for each service. Hybrid IPTV set-top boxes may also enable users to access a range of advanced interactive services, such as VOD, catch-up TV, as well as Internet applications, including video telephony, surveillance, gaming, shopping, e-government accessed via a television set. From a pay-TV operator's perspective, a hybrid IPTV set-top box gives them greater long-term flexibility to deploy new services and applications as and when consumers require, most often without the need to upgrade equipment or for a technician to visit and reconfigure or swap out the device. This reduces the cost of launching new services, increases speed to market and limits disruption for consumers.[62] The Hybrid Broadcast Broadband TV (HbbTV) consortium of industry companies the establishment of an open European standard for hybrid set-top boxes for the reception of broadcast and broadband digital TV and multimedia applications with a single user interface.[63] These trends led to the development of Hybrid Broadcast Broadband TV set-top boxes that included both a broadcast tuner and an Internet connection – usually via an Ethernet port. The first commercially available hybrid IPTV set-top box was developed by Advanced Digital Broadcast, a developer of digital television hardware and software, in 2005. The platform was developed for Spanish pay TV operator Telefonica,[64] and used as part of its Movistar TV service, launched to subscribers at the end of 2005. An alternative approach is the IPTV version of the Headend in the Sky cable TV solution. Here, multiple TV channels are distributed via satellite to the ISP or IPTV provider's point of presence (POP) for IP-encapsulated distribution to individual subscribers as required by each subscriber. This can provide a huge selection of channels to subscribers without overburdening incoming Internet to the POP, and enables an IPTV service to be offered to small or remote operators outside the reach of terrestrial high-speed WAN connection. An example is a network combining fibre and satellite distribution via an SES New Skies satellite of 95 channels to Latin America and the Caribbean, operated by IPTV Americas.[65][needs update] The Internet protocol-based platform offers significant advantages, including the ability to integrate television with other IP-based services like high-speed Internet access and VoIP. A switched IP network also allows for the delivery of significantly more content and functionality. In a typical TV or satellite network, using broadcast video technology, all the content constantly flows downstream to each customer, and the customer switches the content at the set-top box. The customer can select from as many choices as the telecomms, cable or satellite company can stuff into the pipe flowing into the home. A switched IP network works differently. Content remains in the network, and only the content the customer selects is sent into the customer's home. That frees up bandwidth, and the customer's choice is less restricted by the size of the pipe into the home. An IP-based platform also allows significant opportunities to make the TV viewing experience more interactive and personalised. The provider may, for example, include an interactive programme guide that allows viewers to search for content by title or actor's name, or a picture-in-picture functionality that allows them to channel surf without leaving the programme they're watching. Viewers may be able to look up a player's stats while watching a sports game or control the camera angle. They also may be able to access photos or music from their PC on their television, use a wireless phone to schedule a recording of their favourite show, or even adjust parental controls so their child can watch a documentary for a school report, while they're away from home. A feedback channel from the viewer to the provider is required for this interactivity. Terrestrial, satellite, and some cable networks for television do not feature a feedback channel and thus don't allow interactivity. However, interactivity with those networks can be possible by combining TV networks with data networks such as the Internet or a mobile communication network. IPTV technology is used for video on demand (VOD),[66] which permits a customer to browse an online programme or film catalogue, to watch trailers and to then select a program. The playout of the selected item starts nearly instantaneously on the customer's TV or PC. Technically, when the customer selects the program, a point-to-point unicast connection is set up between the customer's decoder (set-top box or PC) and the delivering streaming server. The signalling for the trick mode functionality (pause, slow-motion, wind/rewind etc.) may be communicated using, for instance, RTSP. In an attempt to avoid content piracy, the VOD content is usually encrypted and digital rights management may be applied. A film that is chosen, for example, may be playable for 24 hours following payment, after which time it becomes unavailable. Another advantage is the opportunity for integration and convergence. This opportunity is amplified when using IMS-based solutions.[67] Converged services implies interaction of existing services in a seamless manner to create new value-added services. One example is on-screen caller ID, getting caller ID on a TV, and the ability to handle the call (send it to voice mail, etc.). IP-based services help to provide consumers anytime and anywhere access to content over their televisions, PCs, and mobile device, and to integrate services and content to tie them together. Within businesses and institutions, IPTV eliminates the need to run a parallel infrastructure to deliver live and stored video services. IPTV is sensitive to packet loss and delays. An IPTV channel has a minimum bandwidth requirement. Some systems are able to adapt to lower available bandwidth by reducing picture quality. Although a few countries have very high-speed broadband-enabled populations,[a] in other countries legacy networks struggle to provide 3–5 Mbit/s[68][needs update] and so simultaneous use of IPTV, VOIP and Internet access may not be viable. The last-mile delivery for IPTV usually has a bandwidth restriction that only allows a small number of simultaneous TV channel streams – typically from one to three – to be delivered.[69] The network delay inherent in the use of satellite Internet access is often held up as a reason why satellites cannot be successfully used for IPTV. In practice, however, delay is not an important factor for IPTV, since it is a service that does not require real-time transmission, as is the case with telephony or videoconferencing services. It is the delay of response to requests to change channel, display an EPG, etc. that most affects customers' perceived quality of service. Existing video transmission systems of both analogue and digital formats already introduce known quantifiable delays. Existing DVB TV channels that simulcast by both terrestrial and satellite transmissions experience the same 0.25-second delay difference between the two services with no detrimental effect, and it goes unnoticed by viewers. This section does not cite any sources. Please help improve this section by adding citations to reliable sources. Unsourced material may be challenged and removed. (July 2017) (Learn how and when to remove this message) Bandwidth capacity for simultaneously two HDTV streams, two SD streams, additional to HSD and voice Digital video is a sequence of digital images, called frames, each made up of pixels or picture elements. Three bytes are typically used to represent the colour of the high quality image. Movies use 24 frames per second, North America television uses approximately 30 frames per second where the Europe television frame rate is 25 frames per second. Each digital video has dimensions width and height; SDTV is 720 × 480 pixels, HDTV uses up to 1920 × 1080 pixels. For checking the bandwidth requirements, you need to dimension your IPTV service, such as defining number of SD and HD TV channels, number of planned subscribers, VOD and nPVR concurrency. Based on these, you can calculate required bandwidth on each DSL line, in access network and in core IP network.[70] Due to limitations in bandwidth, an IPTV channel is delivered to the user one at a time. Changing a channel requires requesting the head-end server to provide a different broadcast stream, much like VOD.[b] This could enable the service provider to accurately track each and every programme watched and the duration of watching for each viewer. In conjunction with regulatory differences between IPTV and cable TV, this tracking could pose a threat to privacy according to critics.[71] For IP multicast scenarios, since a particular multicast group (TV channel) needs to be requested before it can be viewed, the same privacy concerns apply. This section needs to be updated. Please help update this article to reflect recent events or newly available information. (March 2023) Some major telecoms vendors are active in this space, notably Accenture (Accenture Video Solution), Alcatel-Lucent (sometimes working with Movistar TV), Ericsson (notably since acquiring Tandberg Television), Huawei, NEC, PTCL Smart TV, Sri Lanka Telecom, Thomson, and ZTE, as are some IT houses, led by Microsoft. Miami-based AlphaOTT, Tokyo-based The New Media Group, Malaysian-based Select-TV, Oslo/Norway-based SnapTV, and California-based UTStarcom, Inc. also offer end-to-end networking infrastructure for IPTV-based services, and Hong Kong-based BNS Ltd. provides turnkey open platform IPTV technology solutions. Others include Movistar TV and PCCW. Google Fiber offers an IPTV service in various US cities which includes up to 1 Gigabit-speed internet and over 290 channels depending on package via the fibre optic network being built out in Kansas City Kansas and Kansas City Missouri. Many of these IPTV solution vendors participated in the biennial Multiservice Switching Forum Interoperability 2008 (GMI) event which was coordinated by the MultiService Forum (MSF) at five sites worldwide from 20 to 31 October 2008. Test equipment vendors including Netrounds, Codenomicon, Empirix, Ixia, Mu Dynamics, and Spirent joined solution vendors such as the companies listed above in one of the largest IPTV proving grounds ever deployed. For residential users, IPTV is often provided in conjunction with VOD and may be bundled with Internet services such as Internet access and voice over Internet Protocol (VoIP) telecommunications services. Commercial bundling of IPTV, VoIP and Internet access is sometimes referred to in marketing as triple play service. When these three are offered with cellular service, the combined service may be referred to as quadruple play. Historically, cable TV operators have been regulated differently from telecommunication operators. As IPTV allows TV and VOD to be transmitted over the Internet, new regulatory issues arise.[72] Professor Eli M. Noam highlights in his report "TV or Not TV: Three Screens, One Regulation?" some of the key challenges with sector-specific regulation that is becoming obsolete due to convergence in this field.[73] Content delivery network DVB-IPTV Hybrid Broadcast Broadband TV Over-the-top media service P2PTV SAT>IP Software as a service Streaming television

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2Australian video on demand service 10PlayLogo used since 2018FormerlyTenplay (2013–18)Type of siteVideo on demandOTTCatch uplive streamingPredecessor(s)ten.com.auHeadquartersPyrmont, New South Wales, AustraliaArea servedAustraliaOwnerParamount Networks UK & Australia(Paramount Global)ServicesStreaming serviceParentParamount Australia & New ZealandURL10play.com.auCommercialYesRegistrationOptionalUsers7 million (2023)[1][2]Launched29 September 2013; 11 years ago (2013-09-29)Current statusActive 10Play or 10 Play (formerly known as Tenplay, set to rebrand as 10 in Mid 2025[3]) is an Australian free video on demand and catch-up TV service run by Network 10. The service became available on 29 September 2013, replacing the network's old website that offered limited catch-up TV services.[4][5] 10Play offers online live streaming of Channel 10, 10 Peach Comedy, 10 Bold Drama, and Nickelodeon, as well as live sport via 10 Sport. 10Play is available across several platforms including Web, iOS and Android apps, FreeviewPlus certified TVs, Apple TV 4th Gen+, Fetch TV, Telstra TV, Chromecast, Android TV, Samsung TV, Sony Linux TV, Xbox One and Xbox Series X and Series S. As of September 2023[update], 10Play has over 7 million registered users.[1][2] On 29 September 2013, as a part of its online entertainment brand Tenplay, an online video on demand catch-up TV service for Network Ten, incorporating locally produced programs from Ten, Eleven and One along with back-catalogue content from local and international distributors. Tenplay became the third catch-up TV service released by a commercial Australian network, the first being PLUS7 from Yahoo7 and the Seven Network and the second being FIXPlay from Ninemsn and the Nine Network. On 31 October 2018, after Network 10 rebranded to a new logo and it multi-channels were renamed from Eleven to 10 Peach and from One to 10 Boss before later changing to 10 Bold, Tenplay was also rebranded to its new name and logo of 10Play. In 2024, Paramount announced that 10Play would be rebranded as simply 10, adopting the same branding as the network's linear television platform in 2025.[3] Live streaming of Network 10's primary channel commenced on 21 January 2016, although it was available only during selected hours.[6] 24-hour live streaming of the main channel commenced on 26 January 2018. A live stream of 10 Bold was available on a part-time basis until 21 February 2019. On 21 February 2019, 10 Bold switched to a 24-hour live stream and 10 Peach was added to the 10Play live streaming service. On 27 September 2020, 10 Shake was added to the 10Play live streaming service. On 2 December 2022, 10Play launched free ad-supported streaming television (FAST) channels.[7] On 31 August 2023, 51 Pluto TV FAST channels were added to the 10Play live streaming service.[8] 10Play provides on-demand access to almost all the TV programs that are broadcast on Network 10 linear broadcast channels (Channel 10, 10 Peach Comedy, 10 Bold Drama and Nickelodeon). Programs are categorised by these genres: Adventure Comedy Crime Documentary Drama Kids Lifestyle Light Entertainment Movies News Reality Sport Thriller After Paradise The Bold and the Beautiful Fast Tracked Days of Our Lives Fast Tracked The Caravan Darryl Beattie Adventures Dream Big I Kissed a Boy My Name is Captain Thunderbolt (Sometimes) Neighbours: Erinsborough High Neighbours Summer Stories Sidelines Terry's Talks NBL22: Next Level NBL23: Unrivalled TGB Round Ball Rules TL;DR To Kingdom Come United WOW – Women of Wrestling The Young and the Restless Fast Tracked Further information: 10 Sport A-League Women (2021–present) Australia Cup (2021–present) Women's Australia Cup (2023–present) Bellator MMA (2021–present) Pararoos Internationals (2023–present) Roshn Saudi League (2022–present) National Basketball League (2021–present) Through the streaming platform, 10Play provides live stream access to the whole Network 10 suite of channels, including the main and multi-channels. As of 21 February 2025[update], the following online only channels are also available:[8] Nickelodeon Nick Jr. Club TeenNick NickToons NickToons 90s NickToons 00s MTV Life MTV Reality MTV Biggest Pop MTV Love MTV On Tour! MTV The Shores MTV Ridiculousness MTV EMA Avatar: The Last Airbender South Park MasterChef Survivor Survivor US Haunt TV Nature Time True Stories Prisoner Puberty Blues Rush Wipeout Xtra Xtream Adventure The Wicket Tuna Channel Movie Sphere Thriller Movies Medical Emergency Comedy Dynamics Realmadrid.tv Dynasty Happy Days I Love Lucy Hawaii Five-O Matlock Mission Impossible Brady Bunch Drew Barrymore Judge Judy Becker B&B Classics Beverly Hills, 90210 Diagnosis: Murder Gunsmoke Graham Norton Twilight Zone I'm a Celebrity Bellator MMA NCIS Bondi Rescue Good Chef Bad Chef SpongeBob SquarePants Rugrats America's Next Top Model Australia's Next Top Model The Dog House 48 Hours World of Football Halloween Movies (every October) Christmas Movies (every December) Action and Adventure (2022–23) Aussie Drama (2022–23) CSI Dora the Explorer (2024) Little Kids (2022–23) Retro Cartoons (2022–23) Romance Movies (2024) The Traitors (2023) True Stories (2022–23) The Challenge (2022–23) NickMovies (2023–24) MTV Best of MTV Dating MTV Drama MTV EMA MTV Retro MTV Entertainment NickRewind NickClassics Baywatch Merlin Television portalAustralia portal Internet television in Australia

^ a b "10 Play celebrates 10 years with 7 million registered users". Mediaweek. 2023-09-28. Retrieved 2023-10-04. ^ a b Knox, David (5 October 2023). "10Play turns 10". TV Tonight. TV Tonight. Retrieved 5 October 2023. ^ a b Knox, David (24 September 2024). "10Play to be rebranded as 10". TV Tonight. TV Tonight. Retrieved 25 September 2024. ^ Southcott, Chris (29 September 2013). "TENplay launches: How does Network Ten's new catch-up service compare?". TechGeek. Archived from the original on 23 February 2016. Retrieved 14 February 2016. ^ Knox, David (30 September 2013). "TENplay, anywhere, anytime". TV Tonight. Archived from the original on 23 February 2016. Retrieved 14 February 2016. ^ Knox, David (20 January 2016). "Rumour: TEN to expand live streaming?". TV Tonight. Retrieved 30 October 2023. ^ Perry, Kevin (1 December 2022). "10 PLAY expands your free viewing options with addition of 13 new FAST Channels". TV Blackbox. Retrieved 1 August 2023. ^ a b Knox, David (31 August 2023). "51 FAST channels launch on Pluto TV". TV Tonight. TV Tonight. Retrieved 2 September 2023. Official website 10Play on Facebook 10Play on Instagram Retrieved from " 3 The following pages link to 10Play External tools (link count transclusion count sorted list) · See help page for transcluding these entries Showing 50 items. View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Big Brother (franchise) (links | edit) MTV (links | edit) Neopets (links | edit) Paramount Pictures (links | edit) Telstra (links | edit) UPN (links | edit) CBS (links | edit) Titanic (1997 film) (links | edit) Miramax (links | edit) USA Network (links | edit) Video on demand (links | edit) Nickelodeon (links | edit) Terrytoons (links | edit) Netflix (links | edit) Fleischer Studios (links | edit) Viacom (2005–2019) (links | edit) TV Guide (links | edit) Achtung Baby (links | edit) MTV2 (links | edit) VH1 (links | edit) Comedy Central (links | edit) Westinghouse Electric Corporation (links | edit) BET (links | edit) Prisoner (TV series) (links | edit) Paramount Network (links | edit) National Basketball League (Australia) (links | edit) Blockbuster (retailer) (links | edit) Desilu (links | edit) Gulf and Western Industries (links | edit) Paramount Parks (links | edit) Funimation (links | edit) Australian Survivor (links | edit) National Amusements (links | edit) ANT1 (links | edit) Network 10 (links | edit) List of assets owned by Paramount Global (links | edit) CBS News (links | edit) Vidéotron (links | edit) MP3.com (links | edit) Republic Pictures (links | edit) Spark New Zealand (links | edit) CBS Radio (links | edit) CBS Records (2006) (links | edit) Foxtel (links | edit) Paramount Media Networks (links | edit) ATV (Australian TV station) (links | edit) TEN (TV station) (links | edit) GLV/BCV (links | edit) Harmonix (links | edit) The Teaching Company (links | edit) View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500) Retrieved from " WhatLinksHere/10Play"