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Line of smartphones by Apple Inc.For other uses, see iPhone (disambiguation).iPhoneFront face of the latest flagship model, the iPhone 16 Pro, in Desert TitaniumDeveloperAppleManufacturerContract manufacturers: FoxconnPegatronWistronTata GroupTypeSmartphoneRelease dateJune29, 2007; 17 years ago(2007-06-29)Units sold2.3billion (as of January1, 2024[update])Operating systemiOSStorage64, 128, 256, 512GB or 1TB[note 1] flash memory (current models)SoundBluetoothStereo speaker (iPhone 7 and up)Microphone3.5mm headphone jack (until iPhone 7)30-pin dock connector (until iPhone 5)Lightning port (iPhone 5 iPhone 14)USB-C port (iPhone 15 and up)PowerBuilt-in rechargeable lithium-ion batteryOnline servicesApp StoreApple OneiCloudApple PayRelatediPadComparison of iPhone modelsWebsiteapple.com/iphoneThis article is part of a series on theiPhone1st generation3G3GS44s55c5s6 / 6 Plus6s / 6s Plus7 / 7 Plus8 / 8 PlusXXRXS / XS Max1111 Pro / 11 Pro Max12 / 12 Mini12 Pro / 12 Pro Max13 / 13 Mini13 Pro / 13 Pro Max14 / 14 Plus14 Pro / 14 Pro Max15 / 15 Plus15 Pro / 15 Pro Max16 / 16 Plus16 Pro / 16 Pro Max16eSE1st2nd3rdList of iPhone models Telephones portalThe iPhone is a line of smartphones developed and marketed by Apple that run iOS, the company's own mobile operating system. The first-generation iPhone was announced by thenApple CEO and co-founder Steve Jobs on January 9, 2007, at Macworld 2007, and launched later that year. Since then, Apple has annually released new iPhone models and iOS versions; the most recent models being the iPhone 16 and 16 Plus, alongside the higher-end iPhone 16 Pro and 16 Pro Max, and the lower-end iPhone 16e (which replaces the iPhone SE). As of January 1, 2024, more than 2.3 billion iPhones have been sold, making Apple the largest vendor of mobile phones in 2023.The original iPhone was the first mobile phone to use multi-touch technology. Throughout its history, the iPhone has gained larger, higher-resolution displays, video-recording functionality, waterproofing, and many accessibility features. Up to the iPhone 8 and 8 Plus, iPhones had a single button on the front panel, with the iPhone 5s and later integrating a Touch ID fingerprint sensor. Since the iPhone X,[note 2] iPhone models have switched to a nearly bezel-less front screen design with Face ID facial recognition in place of Touch ID for authentication, and increased use of gestures in place of the home button for navigation.The iPhone, which operates using Apple's proprietary iOS software, is one of the two major smartphone platforms in the world, alongside Android. The first-generation iPhone was described by Steve Jobs as a "revolution" for the mobile phone industry. The iPhone has been credited with popularizing the slate smartphone form factor, and with creating a large market for smartphone apps, or "app economy", laying the foundation for the boom of the market for mobile devices. In addition to the apps that come pre-installed on iOS, there are nearly 2 million apps available for download from Apple's mobile distribution marketplace, the App Store, as of August2024[update].Main article: History of the iPhoneDevelopment of an Apple smartphone began in 2004, when the company started to gather a team of 1,000 employees led by hardware engineer Tony Fadell, software engineer Scott Forstall, and design officer Jony Ive,[1] to work on the highly confidential "Project Purple".[2][3]Then Apple CEO Steve Jobs steered the original focus away from a tablet (which was later revisited in the form of the iPad) towards a phone.[4] Apple created the device during a secretive collaboration with Cingular Wireless (later renamed AT&T Mobility) at an estimated development cost of US$150million over thirty months.[5] According to Jobs in 1998, the "i" word in "iMac" (and thereafter "iPod", "iPhone" and "iPad") stands for internet, individual, instruct, inform, and inspire.[6][7]Apple rejected the "design by committee" approach that had yielded the Motorola ROKR E1, a largely unsuccessful "iTunes phone" made in collaboration with Motorola. Among other deficiencies, the ROKR E1's firmware limited storage to only 100 iTunes songs to avoid competing with Apple's iPod nano.[8][9] Cingular gave Apple the liberty to develop the iPhone's hardware and software in-house, a rare practice at the time,[10][11] and paid Apple a fraction of its monthly service revenue (until the iPhone 3G),[12] in exchange for four years of exclusive U.S. sales, until 2011.[13]Jobs unveiled the first-generation iPhone to the public on January 9, 2007, at the Macworld 2007 convention at the Moscone Center in San Francisco.[14] The iPhone incorporated a 3.5-inch multi-touch display with few hardware buttons, and ran the iPhone OS operating system with a touch-friendly interface, then marketed as a version of Mac OS X.[15] It was the first mobile phone to use multi-touch technology.[16] The device launched on June 29, 2007, at a starting price of US$499 in the United States, and required a two-year contract with AT&T.[17] The price was reduced by a third after two months. The resulting complaints forced Jobs to issue an apology and offer a partial rebate to early purchasers of the Phone.[18]Worldwide iPhone availability:iPhone available since its original releaseiPhone available since the release of the iPhone 3GOn July 11, 2008, at Apple's Worldwide Developers Conference (WWDC) 2008, Apple announced the iPhone 3G, and expanded its launch-day availability to twenty-two countries, and it was eventually released in 70 countries and territories.[19][20] The iPhone 3G introduced faster 3G connectivity, and a lower starting price of US$199 (with a two-year AT&T contract).[21] It proved commercially popular, overtaking Motorola RAZR V3 as the best selling cell phone in the U.S. by the end of 2008.[22] Its successor, the iPhone 3GS, was announced on June 8, 2009, at WWDC 2009, and introduced video recording functionality.[23]The original iPhone on display under glass at the January 2007 Macworld showThe iPhone 4 was announced on June 7, 2010, at WWDC 2010, and introduced a redesigned body incorporating a stainless steel frame and a rear glass panel.[24] At release, the iPhone 4 was marketed as the "world's thinnest smartphone";[24] it uses the Apple A4 processor, being the first iPhone to use an Apple custom-designed chip. It introduced the Retina display, having four-times the display resolution of preceding iPhones, and was the highest-resolution smartphone screen at release;[24] a front-facing camera was also introduced, enabling video calling functionality via FaceTime.Users of the iPhone 4 reported dropped/disconnected telephone calls when holding their phones in a certain way, and this issue was nicknamed "antennagate".[25] In January 2011, as Apple's exclusivity agreement with AT&T was expiring, Verizon announced that they would be carrying the iPhone 4, with a model compatible with Verizon's CDMA network releasing on February 10.[26][27]The iPhone 4s was announced on October 4, 2011, and introduced the Siri virtual assistant, a dual-core A5 processor, and an 8 megapixel camera with 1080p video recording functionality. The iPhone 5 was announced on September 12, 2012, and introduced a larger 4-inch screen, up from the 3.5-inch screen of all previous iPhone models, as well as faster 4G LTE connectivity.[28] It also introduced a thinner and lighter body made of aluminum alloy, and the 30-pin dock connector of previous iPhones was replaced with the new, reversible Lightning connector.[28]Bottom angle comparison between iPhone 5c (top), iPhone 5s (middle), and iPhone 4s (bottom)The iPhone 5s and iPhone 5c were announced on September 10, 2013. The iPhone 5s included a 64-bit A7 processor, becoming the first ever 64-bit smartphone;[29] it also introduced the Touch ID fingerprint authentication sensor.[30] The iPhone 5c was a lower-cost device that incorporated hardware from the iPhone 5, into a series of colorful plastic frames.[31]On September 9, 2014, Apple introduced the iPhone 6 and iPhone 6 Plus, and included significantly larger screens than the iPhone 5s, at 4.7-inch and 5.5-inch respectively; both models also introduced mobile payment technology via Apple Pay.[32] Optical image stabilization was introduced to the 6 Plus' camera. The Apple Watch was also introduced on the same day, and is a smartwatch that operates in conjunction with a connected iPhone. Some users experienced bending issues from normal use with the iPhone 6 and 6 Plus, particularly on the latter model, and this issue was nicknamed "bendgate".[33]The iPhone 6s and 6s Plus were introduced on September 9, 2015, and included a more bend-resistant frame made of a stronger aluminum alloy, as well as a higher resolution 12 megapixel main camera capable of 4K video recording.[34] The first-generation iPhone SE was introduced on March 21, 2016, and was a low-cost device that incorporated newer hardware from the iPhone 6s, in the frame of the older iPhone 5s.[35]The iPhone 7 and 7 Plus were announced on September 7, 2016, which introduced larger camera sensors, IP67-certified water and dust resistance, and a quad-core A10 Fusion processor utilizing big.LITTLE technology;[36] the 3.5mm headphone jack was removed, and was followed by the introduction of the AirPods wireless earbuds.[37] Optical image stabilization was added to the 7's camera. A second telephoto camera lens was added on the 7 Plus, enabling two-times optical zoom, and "Portrait" photography mode which simulates bokeh in photos.[38]The iPhone 8, 8 Plus, and iPhone X were announced on September 12, 2017, in Apple's first event held at the Steve Jobs Theater in Apple Park. All models featured rear glass panel designs akin to the iPhone 4, wireless charging, and a hexa-core A11 Bionic chip with "Neural Engine" AI accelerator hardware. The iPhone X additionally introduced a 5.8-inch OLED "Super Retina" display with a "bezel-less" design, with a higher pixel density and contrast ratio than previous iPhones with LCD displays, and introduced a stronger frame made of stainless steel. It also introduced Face ID facial recognition authentication hardware, in a "notch" screen cutout, in place of Touch ID;[39][40] the home button was removed to achieve the bezel-less design, replacing it with a gesture-based navigation system.[41] At its US$999 starting price, the iPhone X was the most expensive iPhone at launch.[42]Picture of the cameras on the iPhone 13 ProThe iPhone XR, iPhone XS, and XS Max were announced on September 12, 2018. All models featured the "Smart HDR" computational photography system, and a significantly more powerful "Neural Engine".[43] The XS Max introduced a larger 6.5-inch screen. The iPhone XR included a 6.1-inch LCD "Liquid Retina" display, with a "bezel-less" design similar to the iPhone X, but does not include a second telephoto lens; it was made available in a series of vibrant colors, akin to the iPhone 5c, and was a lower-cost device compared to the iPhone X and XS.[44]The iPhone 11, 11 Pro, and 11 Pro Max were announced on September 10, 2019. The iPhone 11 was the successor to the iPhone XR, while the iPhone 11 Pro and 11 Pro Max succeeded the iPhone XS and XS Max. All models gained an Ultra-Wide lens, enabling two-times optical zoom out, as well as larger batteries for longer battery life.[45][46] The second-generation iPhone SE was introduced on April 17, 2020, and was a low-cost device that incorporated newer hardware from the iPhone 11, in the frame of the older iPhone 8, while retaining the home button and the Touch ID sensor.[47]The iPhone 12, 12 Mini, 12 Pro, and 12 Pro Max were announced via a livestream event on October 13, 2020. All models featured OLED "Super Retina XDR" displays, introduced faster 5G connectivity, and the MagSafe magnetic charging and accessory system; a slimmer flat-edged design was also introduced, which combined with stronger glass-ceramic front glass, added better drop protection compared to previous iPhones.[48][49] The iPhone 12 Mini introduced a smaller 5.4-inch screen, while the 12 Pro and 12 Pro Max had larger screens of 6.1-inch and 6.7-inch respectively. The iPhone 12 Pro and 12 Pro Max additionally added a Lidar sensor for better accuracy in augumented reality (AR) applications.The iPhone 13, 13 Mini, 13 Pro, and 13 Pro Max were announced via a livestream event on September 14, 2021. All models featured larger camera sensors, larger batteries for longer battery life, and a narrower "notch" screen cutout.[50] The iPhone 13 Pro and 13 Pro Max additionally introduced smoother adaptive 120Hz refresh rate "ProMotion" technology in its OLED display, and three-times optical zoom in the telephoto lens.[51] The low-cost third-generation iPhone SE was introduced on March 8, 2022, and incorporated the A15 Bionic chip from the iPhone 13, but otherwise retained similar hardware to the second-generation iPhone SE.The iPhone 14, 14 Plus, 14 Pro, and 14 Pro Max were announced on September 7, 2022. All models introduced satellite phone emergency calling functionality. A new 14 Plus model introduced the large 6.7-inch screen size, first seen on the iPhone 12 Pro Max, into a lower-cost device.[52] The iPhone 14 Pro and 14 Pro Max additionally introduced a higher-resolution 48-megapixel main camera, the first increase in megapixel count since the iPhone 6s; it also introduced always-on display technology to the lock screen, and an interactive status bar interface integrated in a redesigned screen cutout, entitled "Dynamic Island".[53]The iPhone 15, 15 Plus, 15 Pro, and 15 Pro Max were announced on September 12, 2023. Starting with this group of devices, all models switch to using USB-C as their power connector to comply with European Commission regulations, replacing Apple's proprietary Lightning connector after eleven years of use in previous models.[54] The 15 and 15 plus now feature the Dynamic Island, which debuted with the iPhone 14 Pro (effectively retiring the "notch" display cutout), a 48-megapixel main camera, slightly curved edges, and a color-infused frosted glass back.[55][56][57] The 15 Pro and Pro Max also replace the mute switch with the "Action" button, and stainless-steel material to titanium.[57]The iPhone 16, 16 Plus, 16 Pro, and 16 Pro Max were announced on September 9, 2024. The former two introduced a vertical camera layout with refined "Fusion" and Ultra-Wide cameras.[58] The 16 Pro and Pro Max have larger 6.3-inch and 6.9-inch displays, a 48-megapixel Ultra-Wide camera, and the largest batteries in an iPhone up to that point.[59] All models now include access to new Apple Intellegence AI features,[60] a refined thermal system, support for Wi-Fi 7, and a new button dubbed the "Camera Control", allowing easier access to camera features. On February 19, 2025, the 16e was announced as the newest member of the 16 family. This model is going to have a longer battery life thanks to the A18 chip and the new Apple C1, which is the first cellular modem designed by Apple.[61] It will have a 6.1-inch screen, and the same 48-megapixel camera as previous models, but lacks the wider shot option due to its cheaper purchasing price.[62]Main article: List of iPhone models46 iPhone models have been produced. The models in bold are devices of the latest generation:iPhone models currently in production[63]Release dateModelSystem-on-a-chipSeptember 22, 2023iPhone 15Apple A16iPhone 15 PlusSeptember 20, 2024iPhone 16Apple A18iPhone 16 PlusiPhone 16 ProApple A18 ProiPhone 16 Pro MaxFebruary 28, 2025iPhone 16eApple A18Availability and support lifespan of all iPhone modelsModelRelease(d)DiscontinuedSupportStatusWith OSDateEndedFinal OS[a]Lifespan[b]Max[c]Min[d]iPhoneiPhone OS 1.0June29, 2007(2007-06-29)June9,2008(2008-06-09)June21,2010(2010-06-21)iPhone OS 3.1.32years, 11months2yearsDiscontinued and unsupportediPhone 3GiPhone OS 2.0July11,2008(2008-07-11)August9,2010(2010-08-09)March3,2011(2011-03-03)iOS 4.2.12years, 7months6monthsiPhone 3GSiPhone OS 3.0June19,2009(2009-06-19)September12,2012(2012-09-12)September18,2013(2013-09-18) (late, single update: February21,2014(2014-02-21))iOS 6.1.3(6.1.6)4years, 2months1yeariPhone 4iOS 4.0June24,2010(2010-06-24)September10,2013(2013-09-10)September17,2014(2014-09-17)iOS 7.1.24years, 2months1yeariPhone 4siOS 5.0October14,2011(2011-10-14)September9,2014(2014-09-09)September13,2016(2016-09-13)(late, single update: July22,2019(2019-07-22))iOS 9.3.5(9.3.6)4years, 10months2yearsiPhone 5iOS 6.0September21,2012(2012-09-21)September10,2013(2013-09-10)September19,2017(2017-09-19)(late, single update: July22,2019(2019-07-22))iOS 10.3.3(10.3.4)4years, 11months4yearsiPhone 5ciOS 7.0September20,2013(2013-09-20)September9,2015(2015-09-09)September19,2017(2017-09-19)iOS 10.3.33years, 11months2yearsiPhone 5siOS 7.0September20,2013(2013-09-20)March21,2016(2016-03-21)September18,2019(2019-09-18)(last security update: January23,2023(2023-01-23))iOS 12.4.1(12.5.7)5years, 11months3years, 5monthsiPhone 6 / 6PlusiOS 8.0September19,2014(2014-09-19)September7,2016(2016-09-07)4years, 11months3yearsiPhone 6s / 6sPlusiOS 9.0September25,2015(2015-09-25)September12,2018(2018-09-12)September12,2022(2022-09-12)(last security update: March31,2025(2025-03-31))iOS 15.6.1 (15.8.4)6years, 11months4yearsDiscontinued and unsupported, critical security bug fixes onlyiPhone SE (1st)iOS 9.3March31,2016(2016-03-31)September12,2018(2018-09-12)6years, 5months4yearsiPhone 7 / 7PlusiOS 10.0September16,2016(2016-09-16)September10,2019(2019-09-10)5years, 11months3yearsiPhone 8 / 8PlusiOS 11.0September22,2017(2017-09-22)April15,2020(2020-04-15)September18,2023(2023-09-18)(last security update: March31,2025(2025-03-31))iOS 16.6.1(16.7.11)5years, 11months3years, 1monthiPhone XiOS 11.0.1November3,2017(2017-11-03)September12,2018(2018-09-12)5years, 10months5years, 1monthiPhone XS / XSMaxiOS 12.0September21,2018(2018-09-21)September10,2019(2019-09-10)currentlatest iOS6years, 9months5years, 9monthsDiscontinued, still supportediPhone XRiOS 12.0October26,2018(2018-10-26)September14,2021(2021-09-14)6years, 7months3years, 9monthsiPhone 11iOS 13.0September20,2019(2019-09-20)September7,2022(2022-09-07)5years, 8months2years, 9monthsiPhone 11 Pro / 11ProMaxiOS 13.0September20,2019(2019-09-20)October13,2020(2020-10-13)5years, 8months4years, 8monthsiPhone SE (2nd)iOS 13.4April24,2020(2020-04-24)March8,2022(2022-03-08)5years, 1month3years, 3monthsiPhone 12 / 12 MiniiOS 14.1October23,2020(2020-10-23) (12)November13,2020(2020-11-13) (12 Mini)September12,2023(2023-09-12) (12)September7,2022(2022-09-07) (12 Mini)4years, 7months2years, 9monthsiPhone 12 Pro / 12ProMaxiOS 14.1 (12 Pro)iOS 14.2 (12 Pro Max)October23,2020(2020-10-23) (12 Pro)November13,2020(2020-11-13) (12ProMax)September14,2021(2021-09-14)4years, 7months (12 Pro)4years, 7months (12ProMax)3years, 9monthsiPhone 13 / 13MiniiOS 15.0September24,2021(2021-09-24)September9,2024(2024-09-09) (13)September12,2023(2023-09-12) (13 Mini)3years, 8months1year, 9monthsiPhone 13 Pro / 13ProMaxiOS 15.0September24,2021(2021-09-24)September7,2022(2022-09-07)3years, 8months2years, 9monthsiPhone SE (3rd)iOS 15.4March18,2022(2022-03-18)February 19, 20253years, 2months3monthsiPhone 14 / 14PlusiOS 16.0September16,2022(2022-09-16) (14)October7,2022(2022-10-07) (14Plus)2years, 9months3monthsiPhone 14 Pro / 14ProMaxiOS 16.0September16,2022(2022-09-16)September12,2023(2023-09-12)2years, 9months1year, 9monthsiPhone 15 / 15PlusiOS 17.0September22,2023(2023-09-22)1year, 8monthsCurrent or still soldiPhone 15 Pro / 15ProMaxiOS 17.0September22,2023(2023-09-22)September9,2024(2024-09-09)1year, 8months9monthsDiscontinued, still supportediPhone 16 / 16PlusiOS 18.0September20,2024(2024-09-20)8monthsCurrent or still soldiPhone 16 Pro / 16ProMaxiOS 18.0September20,2024(2024-09-20)8monthsiPhone 16eiOS 18.3February28,2025(2025-02-28)3monthsLegend:Discontinued and unsupporteDiscontinued, bug fixes onlyDiscontinued, still supportedCurrent or still soldRemarks:^ Last regular iOS version (probably with feature updates), in parentheses: last iOS supported^ Min / max amount of time Apple support is/was available^ Maximal support lifespan = current or support ended date - released date^ Minimal support lifespan = current or support ended date - discontinued dateUp to the iPhone 4, all iPhones and other devices, such as iPod Touch models and iPads, were manufactured by Foxconn, based in Taiwan. In 2011, new CEO Tim Cook changed Apple's manufacturing strategy to diversify its supply base. The iPhone 4s in 2012 was the first model to be manufactured simultaneously by two stand-alone companies: Foxconn and Pegatron, the latter also based in Taiwan. Although Foxconn still produces more iPhones, Pegatron's orders have been slowly increased: the company made part of the iPhone 5c line in 2013, and 30% of iPhone 6 devices in 2014. The 6 Plus model was produced solely by Foxconn.[64] In 2019, Apple investigated reports that some Foxconn managers had used rejected parts to build iPhones.[65] In India, Apple pays Wistron, a Taiwan-based manufacturer with a plant near Bangalore, to assemble iPhones to sell in the region.[66]In 2022, Apple announced that a portion of the iPhone 14 would be manufactured in Tamil Nadu, India, as a response to China's "zero-COVID" policy that has negatively affected global supply chains for many industries.[67] Apple has stated that they plan to shift 25% of iPhone production to India by 2025.[68]Main article: iPhone hardwareApple directly sub-contracts hardware production to external OEM companies, maintaining a high degree of control over the end product. The iPhone contains most of the hardware parts of a typical modern smartphone. Some hardware elements, such as 3D Touch and the Taptic Engine, are unique to the iPhone. The main hardware of the iPhone is the touchscreen, with current models offering screens of 4.7 inches and larger. All iPhones include a rear-facing camera; the front-facing camera dates back to the iPhone 4. The iPhone 7 Plus introduced multiple lenses to the rear-facing camera. A range of sensors are also included on the device, such as a proximity sensor, ambient light sensor, accelerometer, gyroscopic sensor, magnetometer, facial recognition sensor or fingerprint sensor (depending on the model) and barometer. In 2022, Apple added satellite communications to the iPhone, with the release of the iPhone 14 and iPhone 14 Pro.[69]Main articles: iOS and iOS version historyThe iPhone runs iOS.[70] It is based on macOS's Darwin and many of its userland APIs, with Cocoa replaced by Cocoa Touch, and AppKit replaced by UIKit. The graphics stack runs on Metal, Apple's low-level graphics API. The iPhone comes with a set of bundled applications developed by Apple,[71] and supports downloading third-party applications through the App Store.[72]Apple provides free updates to iOS over-the-air, or through Finder and iTunes on a computer.[73] Major iOS releases have historically accompanied new iPhone models.[74][75] The most recent version is iOS 18.[76]See also: iOS SDK and App StoreAt WWDC 2007 on June 11, 2007, Apple announced that the iPhone would support third-party Ajax web applications that share the look and feel of the iPhone interface.[77] On October 17, 2007, Steve Jobs, in an open letter posted to Apple's "Hot News" weblog, announced that a software development kit (SDK) would be made available to third-party developers in February 2008.[78] The iPhone SDK was officially announced and released on March 6, 2008.[79] The App Store was launched with the release of iPhone OS 2.0, on July 11, 2008.[80]Apple requires all third-party apps to be downloaded from the App Store, with exceptions for ad-hoc apps used within enterprises. Developers must pay a yearly $99 fee as part of Apple's Developer Program;[81] if their membership expires, their apps are removed from the App Store, though existing users retain the ability to redownload the app.[82] Developers can release free apps, or paid apps for which Apple takes a 30% cut of proceeds.[83] Developers earning less than $1million in annual sales qualify for the App Store Small Business Program, with Apple only taking a 15% fee.[84]Though iOS has far lower market share than Android, its app ecosystem has been described as superior, with higher-quality apps, and more iOS-exclusive releases.[85] Android's version fragmentation,[86] less uniform hardware, and lower app revenues have been cited as key factors.All apps must pass Apple's app review process before being distributed in the App Store.[87] Apple may also stop distributing apps it deems inappropriate. For example, in 2009, Apple rejected the Newspapers app due to The Sun's "obscene" topless Page 3 girls.[88] In 2018, Apple removed Tumblr from the App Store, citing illegal content, causing Tumblr to ban all adult content from their platform.[89] The App Store's review process has been criticized by developers as "frustrating", "anti-competitive", and "asinine".[90][91][92][93]Users can also install native apps outside of the App Store through jailbreaking,[94] or through exploits, such as TrollStore. Jailbreaking may cause security issues, and is not supported by Apple.[95]As of October2013[update], Apple has passed 60billion app downloads.[96] As of September2016[update], there have been over 140billion app downloads from the App Store.[97] In January 2017, the App Store had over 2.2million apps for the iPhone.[98][99] As of August 2024, Apple's App Store contains nearly 2 million applications.[100]Main article: iOS jailbreakingApple restricts the installation of unapproved third-party apps and does not allow full access to the iPhone's filesystem. According to Jonathan Zittrain, the emergence of closed devices like the iPhone has made computing more proprietary than it was in the PC era.[101] Jailbreaking allows users to install apps not available on the App Store, customize their device in ways not allowed by Apple, and bypass SIM locks without carrier approval.[102] Some jailbreak tweaks were later copied by Apple and implemented into iOS, like multitasking, widgets, and copy and paste.[103]Apple attempted to use the DMCA to fight jailbreaking; however in 2010, the U.S. found jailbreaking to be legal.[104] Jailbroken iPhones are at higher risk of malware due to Apple's lesser control of the app ecosystem.[105] In the United States, Apple cannot void an iPhone's warranty solely due to jailbreaking.[106] Jailbreaks rely on exploits. Apple has improved the iPhone's hardware and software security, making these exploits harder to find; as a result, recent iPhones cannot currently be jailbroken.[107]The iPhone contains a range of accessibility features to support users' visual, auditory, and motor needs. iPhones can notify users through onscreen banners, audio alerts, vibrations, or the LED flash; vibration patterns can be customized by users. Since iOS 15, Siri can read notifications out loud through earphones, and, since iOS 16, through the device's speakers.[108]Users with motor needs can use Assistive Touch to customize the way they navigate through menus; it can assist users who have difficulties with some gestures, like pinching, and makes these gestures available by tapping on a menu. The user can create their own gestures and customize the layout of the AssistiveTouch menu. If the user has trouble pressing the Home button, it can be set so that it can be activated with an onscreen tap. Gestures, like rotate and shake, are available even when if the iOS device is mounted on a wheelchair. Head Tracking can be used to control an iPhone using facial movements recognized by the front camera.[109]Low-vision users can enable VoiceOver, a screen reader which describes what is on the screen, while Siri allows for hands-free interaction. The iPhone also supports wireless braille displays to help users read its interface. Text can be enlarged system-wide. The Magnifier app uses the iPhone's Lidar scanner to identify objects, for example doors, people, and objects, and can describe them to the user, as well as their distance. Door Detection can alert the user through sound, speech, and haptics.[109]Hearing aids that are part of the Made for iPhone program can be controlled from an iPhone. These hearing aids also feature Live Listen, which enables the iPhone to act as a directional microphone, beaming its audio to compatible hearing aids.[110] Live Listen can help the user hear a conversation in a noisy room or hear someone speaking across the room.[111] Apple built Live Listen support into all AirPods, which can also relay audio from a connected iPhone's microphone. Closed captioning and external TTY devices are supported, while Live Caption can transcribe audio across all apps and display it onscreen. Sound Recognition can recognize surrounding noises, including door bells, kettles, water running, and babies crying, and notify the user with an onscreen alert.[109]Guided Access helps people with autism, ADHD, or sensory challenges stay focused on a single app. With Guided Access, a parent, teacher, or therapist can limit an iOS device to stay on one app by disabling the Home button and limit the amount of time spent in an app. The user can restrict access to the keyboard or touch input on certain areas of the screen.The original iPhone was heavily promoted before its official announcement, creating buzz and anticipation.[112] Upon its release, it was marketed heavily in television, web and print ads created in partnership with TBWA\Chiat\Day.[113]Apple's premium market positioning has led the iPhone to be seen as a status symbol.[114][115][116]The Apple ecosystem has been described as a key moat that increases iPhone brand loyalty. iMessage has especially been singled out with its "green bubbles" phenomena. In iMessage, SMS messages from Android users appear as green bubble, rather than the blue bubbles used for texts from other iPhone users. Until the introduction of Rich Communication Services (RCS) support in iOS 18 in 2024, group chats between iOS and Android were poorly supported, with reactions displayed as text rather than bubbles, and images being sent through MMS, which degraded image quality. Some teens described being "ostracized" after switching to Android,[117] which Google labeled "bullying".[118] This has been described by critics as a key factor leading 87% of U.S. teenagers to use iPhones.[119]Many iPhones bought through a monthly carrier contract are SIM locked, restricting their use to one particular carrier.[120] While the iPhone was initially sold in the U.S. only on the AT&T network with a SIM lock in place, various hackers found methods to bypass that SIM lock.[121] More than a quarter of first-generation iPhones sold in the U.S. were not registered with AT&T. Apple speculated that they were likely shipped overseas and unlocked, a lucrative market before the iPhone 3G's worldwide release.[122][123] Today, many carriers either remove the SIM lock automatically after a certain period, or do it upon request, either for free or for a small fee.[124] iPhones bought from Apple are not SIM locked.[120] Many carriers also sell the iPhone unlocked when purchased outright rather than on a long-term contract.Since 2013, iPhone buyers can obtain a trade in discount when buying a new iPhone directly from Apple. The program aims to increase the number of customers who purchase iPhones at Apple Stores rather than carrier stores.[125] In 2015, Apple unveiled the iPhone Upgrade Program, a 24-month leasing agreement, which Fortune described as a "change [in] iPhone owners' relationships with mobile carriers".[126]iPhone 6s's interior; the side on the left contains the display and the side on the right contains hardware and batteryOnly Apple Stores and Apple Authorized Service Providers are allowed by Apple to perform genuine replacements.[127] Apple has taken steps to make third-party repairs more difficult. iPhone components are soldered, and many are glued together.[128] iPhones receive low repairability scores, in part due to the difficulty of obtaining genuine parts, and the difficulty undertaking each repair.[129] This has given rise to the right to repair movement, aimed at giving users cheaper options for repairing their phones. Apple has lobbied against right to repair legislation.[130] Multiple jurisdictions aim to introduce right to repair laws, including the EU,[131] UK,[132] and U.S.[133]In the past, Apple bricked iPhone 6 models after their home buttons were replaced, displaying an Error 53 message; Apple called this a bug, and released an update to address the issue.[134] On iPhones with a Touch ID sensor, the home button cannot be replaced by users or independent repair shops without losing Touch ID functionality, since Apple has not made their calibration tool public.[135]Starting with the iPhone XR, Apple displays warnings in the Settings app if the battery, display, or camera are replaced by a third party.[136] Additionally, some features are disabled when a part labeled "non-genuine" is detected, like True Tone, or the battery health measurement. iFixit notes that a proprietary, cloud-linked System Configuration tool is required to "complete" a part repair, meaning that even replacing a genuine part with another genuine part will fail Apple's "genuine parts" check unless said tool is used.[137]In 2022, Apple rolled out a self-service repair program, allowing any user to buy parts, rent repair tools from Apple, and obtain repair manuals. The program received a degree of praise by iFixit and repair advocates, who also critically noted that Apple maintains control over the parts supply.[138][139]Apple introduced App Tracking Transparency (ATT) with iOS 14.5 in April 2021. ATT requires apps to ask for explicit permission before being allowed to track the user across other apps and websites. If the user refuses, the app cannot access Apple's Identifier for Advertisers (IDFA), an identifier used to serve personalized ads.[140] ATT does not prevent personalized ads that are based on the user's behavior within the app itself.[141] The feature has been criticized by some as anti-competitive, including Facebook, whose shares fell by 26% after its rollout.[142] Apple exempts their own apps from their anti-tracking measures, which has led to anti-trust investigations by the French and German governments.[143][144]In July 2010, Apple claimed that it collected iPhone users' GPS coordinates and nearby Wi-Fi networks twice a day; a Wall Street Journal investigation found that Google's Android sent this data "several times an hour".[145][146]In September 2010, forensic expert Christopher Vance discovered a hidden unencrypted file named "consolidated.db" that contained a record of iPhone users' locations.[147][148] The file was added with the June 2010 iOS 4 update, though previous versions of iOS stored similar information in a file called "h-cells.plist".[149] On April 20, 2011, The Guardian publicized research by Alasdair Allan and Pete Warden, who found that anyone with physical access to an iPhone could obtain a detailed record of its owner's location and movements over the past year.[150] Moreover, the file was automatically backed up by iTunes onto any computer the iPhone was synchronized with.[151] A Wall Street Journal investigation found that users' locations were still stored when location services are disabled.[152] The controversy led to U.S. congressional scrutiny and an FCC investigation,[148] and was dubbed "Locationgate" by the media.[153]Apple responded on April 27, 2011, claiming that the data was used to cache nearby Wi-Fi hotspots and cell towers in order to improve location speed and accuracy. The company also claimed that locations being collected when location services were off, and being stored for more than a year, were both bugs.[153] Apple issued an update for iOS (version 4.3.3, or 4.2.8 for the CDMA iPhone 4) which reduced the size of the cache, encrypted it, stopped it being backed up to iTunes, and erased it entirely whenever location services were turned off.[154] Nevertheless, in July 2014, a report on state-owned China Central Television called iPhone tracking a "national security concern".[155]Currently, iPhones contain a "Frequent Locations" database which records where users have been, along with exact times they arrived and left, raising concerns that the data could be used in court.[156] This feature can be turned off.[157]In August 2021, Apple announced plans to scan iCloud Photos for child abuse imagery (through an algorithm called "NeuralHash"), and filter explicit images sent and received by children using iPhones (dubbed "Conversation Safety"), to be rolled out later that year.[158] More than 90 policy and human rights groups wrote an open letter to condemn both features.[159] Apple's plan to implement NeuralHash on-device rather than in the cloud led the EFF and security experts to call it a "backdoor" that could later be expanded to detect other types of contents, and would decrease users' privacy.[160] Apple claimed the system was "misunderstood",[161] but announced in December 2022 that the photo-scanning feature would never be implemented.[162] The other feature, Conversation Safety, was added in iOS 15.2.[163]Apple's iOS operating system is regarded by some security experts as more secure against common malware than Android.[164] Less than 1% of mobile malware targets iOS.[165]Prior to 2014, the iPhone stored all "messages, pictures and videos, contacts, audio recordings [...] and call history" in unencrypted form, enabling easy access by law enforcement.[166] This changed with iOS 8, which adopted file-based encryption. Apple does not hold the decryption key, and cannot be compelled to turn over user data, even when presented with a government warrant.[167] Companies like Grayshift and Cellebrite developed exploits that enable law enforcement to extract user data from iPhones without needing the user's passcode.[168][169]In 2015 and 2016, a dispute unfolded between Apple and the FBI. The FBI had recovered the iPhone 5c of one of the San Bernardino attackers, and iCloud backups of that phone from a month and a half before the shooting. The U.S. government attempted to obtain a court order under the All Writs Act compelling Apple to produce a modified version of iOS that would allow investigators to brute force the device passcode.[170][171] Tim Cook responded on the company's website, outlining a need for encryption, arguing that a backdoor would compromise the privacy of all iPhone users.[172] The DOJ withdrew its request after the FBI bought an exploit to bypass the iPhone's passcode.[173] As a countermeasure, Apple implemented USB Restricted Mode,[174] which was subsequently exploited too.[169]In 2016,researchers discovered the Pegasus suite of exploits targeting iOS and Android, which led to significant international media coverage.[175] Some Pegasus exploits are zero-click, meaning that they can fully compromise the device with no user interaction, for example by sending a malformed iMessage to the user that would not even trigger a notification.[176] Pegasus can collect most data, including chats, passwords, and photos, and can turn on the phone's microphone and camera remotely.[177][178] Apple quickly issued an update fixing FORCEDENTRY and other known Pegasus exploits,[179] though Pegasus continued to be used, relying on new exploits.[180] Apple announced a new bug bounty for vulnerabilities, and added an optional Lockdown Mode to iOS 16 that reduces the iPhone's attack surface.[181][182] Many security researchers have criticized Apple's bug bounty for underpaying researchers, being uncommunicative, and being slow to fix vulnerabilities, and two Apple employees told The Washington Post that the company "has a massive backlog of bugs that it hasn't fixed".[183]Prominent victims of Pegasus include Jamal Khashoggi, and numerous activists, businessmen and politicians.[184] Pegasus has been widely used since 2011,[185] and is still used by law enforcement and governments as of July 2022.[186]The original iPhone has been described as "revolutionary",[187] a "breakthrough handheld computer",[188] and "the best phone that anybody has ever made".[189] It is now Apple's bestselling product, and has been credited with helping to make Apple one of the world's most valuable publicly traded companies by 2011.[190] Newer iterations have also received praise and awards.[191][192]Before the iPhone, smartphones were mostly used for texting, calls, and email; more advanced functions were harder to use and inconvenient on a small screen.[193] They were also hard to develop for, and lacked a thriving app ecosystem like the App Store (released in 2008).[194][195] Many phones were heavily customized by mobile carriers, which led to feature fragmentation and prevented these phones from turning into thriving software platforms.[196] In contrast, Apple's iPhone SDK provided a wide range of APIs, made mobile development far more accessible,[197][198] and was instrumental in turning the iPhone into a "Swiss army knife" with a wide range of features and apps.[193]Successive iPhone models have generated significant fan enthusiasm, with many customers queuing up in front of Apple Stores on launch day.[199] As of 2021, the iPhone has higher brand loyalty than any other smartphone.[200]The iPhone's success has led to the decline of incumbents Nokia, BlackBerry, and Motorola.[201][202] RIM, Symbian and Microsoft all attempted to develop more modern operating systems to compete with the iPhone, like Maemo, Windows Phone, and BlackBerry 10; all were unsuccessful. Google successfully started over on their Android project,[193] and designed it for mass adoption by carriers and phone hardware manufacturers.[203] Today

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Retrieved December 3, 2024.iPhone at Wikipedia's sister projectsDefinitions from WiktionaryMedia from CommonsNews from WikinewsQuotations from WikiquoteTexts from WikisourceTextbooks from WikibooksResources from WikiversityOfficial websiteVideo of Steve Jobs announcing the first-generation iPhone at Macworld 2007 on YouTubeEvolution of the iPhone at TechEngage, February 3, 2021Retrieved from " 2Third generation of wireless mobile telecommunications technologyFor other uses, see 3G (disambiguation).A USB modem for 3G plugged into a laptop.Part of a series on theWireless network technologiesAnalog0G1G (1.5G)Digital2G (2.5G, 2.75G, 2.9G)3G (3.5G, 3.75G, 3.9G/3.95G)4G (4G/4.5G, 4.5G, 4.9G)5G (5.5G)6GMobile telecommunicationsvte3G refers to the third-generation of cellular network technology. These networks were rolled out beginning in the early 2000s and represented a significant advancement over the second-generation (2G), particularly in terms of data transfer speeds and mobile internet capabilities. The major 3G standards are UMTS (developed by 3GPP, succeeding GSM) and CDMA2000 (developed by Qualcomm, succeeding cdmaOne);[1][2] both of these are based on the IMT-2000 specifications established by the International Telecommunication Union (ITU).While 2G networks such as GPRS and EDGE supported limited data services, 3G introduced significantly higher-speed mobile internet and enhanced multimedia capabilities, in addition to improved voice quality.[3] It provided moderate internet speeds suitable for general web browsing and multimedia content including video calling and mobile TV,[3] supporting services that provide an information transfer rate of at least 144 kbit/s.[4][5]Later 3G releases, often referred to as 3.5G (HSPA) and 3.75G (HSPA+) as well as EV-DO, introduced important improvements, enabling 3G networks to offer mobile broadband access with speeds ranging from several Mbit/s up to 42 Mbit/s.[6] These updates improved the reliability and speed of internet browsing, video streaming, and online gaming, enhancing the overall user experience for smartphones and mobile modems in comparison to earlier 3G technologies. 3G was later succeeded by 4G technology, which provided even higher data transfer rates and introduced advancements in network performance.A new generation of cellular standards has emerged roughly every decade since the introduction of 1G systems in 1979. Each generation is defined by the introduction of new frequency bands, higher data rates, and transmission technologies that are not backward-compatible due to the need for significant changes in network architecture and infrastructure.Several telecommunications companies marketed wireless mobile Internet services as 3G, indicating that the advertised service was provided over a 3G wireless network. However, 3G services have largely been supplanted in marketing by 4G and 5G services in most areas of the world. Services advertised as 3G are required to meet IMT-2000 technical standards, including standards for reliability and speed (data transfer rates). To meet the IMT-2000 standards, Third-generation mobile networks, or 3G, must maintain minimum consistent Internet speeds of 144Kbps.[5] However, many services advertised as 3G provide higher speed than the minimum technical requirements for a 3G service.[7] Subsequent 3G releases, denoted 3.5G and 3.75G, provided mobile broadband access of several Mbit/s for smartphones and mobile modems in laptop computers.[8]3G branded standards:The UMTS (Universal Mobile Telecommunications System) system, standardized by 3GPP in 2001, was used in Europe, Japan, China (with a different radio interface) and other regions predominated by GSM (Global Systems for Mobile Communications) 2G system infrastructure. The cell phones are typically UMTS and GSM hybrids. Several radio interfaces are offered, sharing the same infrastructure:The original and most widespread radio interface is called W-CDMA (Wideband Code Division Multiple Access).The TD-SCDMA radio interface was commercialized in 2009 and only offered in China.The latest UMTS release, HSPA+, can provide peak data rates up to 56Mbit/s in the downlink in theory (28Mbit/s in existing services) and 22Mbit/s in the uplink.The CDMA2000 system, first offered in 2002, standardized by 3GPP2, used especially in North America and South Korea, sharing infrastructure with the IS-95 2G standard. The cell phones are typically CDMA2000 and IS-95 hybrids. The latest release EVDO Rev. B offers peak rates of 14.7Mbit/s downstream.The 3G systems and radio interfaces are based on spread spectrum radio transmission technology. While the GSM EDGE standard ("2.9G"), DECT cordless phones and Mobile WiMAX standards formally also fulfill the IMT-2000 requirements and are approved as 3G standards by ITU, these are typically not branded as 3G and are based on completely different technologies.The common standards complying with the IMT2000/3G standard are:EDGE, a revision by the 3GPP organization to the older 2G GSM based transmission methods, which utilizes the same switching nodes, base station sites, and frequencies as GPRS, but includes a new base station and cellphone RF circuits. It is based on the three times as efficient 8PSK modulation scheme as a supplement to the original GMSK modulation scheme. EDGE is still used extensively due to its ease of upgrade from existing 2G GSM infrastructure and cell phones.EDGE combined with the GPRS 2.5G technology is called EGPRS, and allows peak data rates in the order of 200kbit/s, just like the original UMTS WCDMA versions and thus formally fulfill the IMT2000 requirements on 3G systems. However, in practice, EDGE is seldom marketed as a 3G system, but a 2.9G system. EDGE shows slightly better system spectral efficiency than the original UMTS and CDMA2000 systems, but it is difficult to reach much higher peak data rates due to the limited GSM spectral bandwidth of 200kHz, and it is thus a dead end.EDGE was also a mode in the IS-136 TDMA system, no longer used.Evolved EDGE, the latest revision, has peaks of 1Mbit/s downstream and 400kbit/s upstream but is not commercially used.The Universal Mobile Telecommunications System, created and revised by the 3GPP. The family is a full revision from GSM in terms of encoding methods and hardware, although some GSM sites can be retrofitted to broadcast in the UMTS/W-CDMA format.W-CDMA is the most common deployment, commonly operated on the 2,100MHz band. A few others use the 850, 900, and 1,900MHz bands.HSPA is an amalgamation of several upgrades to the original W-CDMA standard and offers speeds of 14.4Mbit/s down and 5.76Mbit/s up. HSPA is backward-compatible and uses the same frequencies as W-CDMA.HSPA+, a further revision and upgrade of HSPA, can provide theoretical peak data rates up to 168Mbit/s in the downlink and 22Mbit/s in the uplink, using a combination of air interface improvements as well as multi-carrier HSPA and MIMO. Technically though, MIMO and DC-HSPA can be used without the "+" enhancements of HSPA+.The CDMA2000 system, or IS-2000, including CDMA2000 1x and CDMA2000 High Rate Packet Data (or EVDO), standardized by 3GPP2 (differing from the 3GPP), evolving from the original IS-95 CDMA system, is used especially in North America, China, India, Pakistan, Japan, South Korea, Southeast Asia, Europe, and Africa.CDMA2000 1x Rev. E has an increased voice capacity (by three times the original amount) compared to Rev. 0 EVDO Rev. B offers downstream peak rates of 14.7Mbit/s while Rev. C enhanced existing and new terminal user experience.While DECT cordless phones and Mobile WiMAX standards formally also fulfill the IMT-2000 requirements, they are not usually considered due to their rarity and unsuitability for usage with mobile phones.[9]The 3G (UMTS and CDMA2000) research and development projects started in 1992. In 1999, ITU approved five radio interfaces for IMT-2000 as a part of the ITU-R M.1457 Recommendation; WiMAX was added in 2007.[10]There are evolutionary standards (EDGE and CDMA) that are backward-compatible extensions to pre-existing 2G networks as well as revolutionary standards that require all-new network hardware and frequency allocations. The cell phones use UMTS in combination with 2G GSM standards and bandwidths, but do not support EDGE. The latter group is the UMTS family, which consists of standards developed for IMT-2000, as well as the independently developed standards DECT and WiMAX, which were included because they fit the IMT-2000 definition.While EDGE fulfills the 3G specifications, most GSM/UMTS phones report EDGE ("2.75G") and UMTS ("3G") functionality.[11]Cellular network standards and generation timeline.3G technology was the result of research and development work carried out by the International Telecommunication Union (ITU) in the early 1980s. 3G specifications and standards were developed in fifteen years. The technical specifications were made available to the public under the name IMT-2000. The communication spectrum between 400MHz to 3GHz was allocated for 3G. Both the government and communication companies approved the 3G standard. The first pre-commercial 3G network was launched by NTT DoCoMo in Japan in 1998,[12] branded as FOMA. It was first available in May 2001 as a pre-release (test) of W-CDMA technology. The first commercial launch of 3G was also by NTT DoCoMo in Japan on 1 October 2001, although it was initially somewhat limited in scope;[13][14] broader availability of the system was delayed by apparent concerns over its reliability.[15][16][17][18][19]The first European pre-commercial network was an UMTS network on the Isle of Man by Manx Telecom, the operator then owned by British Telecom, and the first commercial network (also UMTS based W-CDMA) in Europe was opened for business by Telenor in December 2001 with no commercial handsets and thus no paying customers.The first network to go commercially live was by SK Telecom in South Korea on the CDMA-based 1xEV-DO technology in January 2002. By May 2002, the second South Korean 3G network was by KT on EV-DO and thus the South Koreans were the first to see competition among 3G operators.The first commercial United States 3G network was by Monet Mobile Networks, on CDMA2000 1x EV-DO technology, but the network provider later shut down operations. The second 3G network operator in the US was Verizon Wireless in July 2002, also on CDMA2000 1x EV-DO. AT&T Mobility was also a true 3G UMTS network, having completed its upgrade of the 3G network to HSUPA.The first commercial United Kingdom 3G network was started by Hutchison Telecom which was originally behind Orange S.A.[20] In 2003, it announced first commercial third generation or 3G mobile phone network in the UK.The first pre-commercial demonstration network in the southern hemisphere was built in Adelaide, South Australia, by m.Net Corporation in February 2002 using UMTS on 2100MHz. This was a demonstration network for the 2002 IT World Congress. The first commercial 3G network was launched by Hutchison Telecommunications branded as Three or "3" in June 2003.[21]In India, on 11 December 2008, the first 3G mobile and internet services were launched by a state-owned company, Mahanagar Telecom Nigam Limited (MTNL), within the metropolitan cities of Delhi and Mumbai. After MTNL, another state-owned company, Bharat Sanchar Nigam Limited (BSNL), began deploying the 3G networks country-wide.Emtel launched the first 3G network in Africa.[22]Videotelephony through cellular networks were made possible using 3G technologiesJapan was one of the first countries to adopt 3G, the reason being the process of 3G spectrum allocation, which in Japan was awarded without much upfront cost. The frequency spectrum was allocated in the US and Europe based on auctioning, thereby requiring a huge initial investment for any company wishing to provide 3G services. European companies collectively paid over 100 billion dollars in their spectrum auctions.[23]Nepal Telecom adopted 3G Service for the first time in southern Asia. However, its 3G was relatively slow to be adopted in Nepal. In some instances, 3G networks do not use the same radio frequencies as 2G, so mobile operators must build entirely new networks and license entirely new frequencies, especially to achieve high data transmission rates. Other countries' delays were due to the expenses of upgrading transmission hardware, especially for UMTS, whose deployment required the replacement of most broadcast towers. Due to these issues and difficulties with deployment, many carriers could not or delayed the acquisition of these updated capabilities.In December 2007, 190 3G networks were operating in 40 countries and 154 HSDPA networks were operating in 71 countries, according to the Global Mobile Suppliers Association (GSA). In Asia, Europe, Canada, and the US, telecommunication companies use W-CDMA technology with the support of around 100 terminal designs to operate 3G mobile networks.The roll-out of 3G networks was delayed by the enormous costs of additional spectrum licensing fees in some countries. The license fees in some European countries were particularly high, bolstered by government auctions of a limited number of licenses and sealed bid auctions, and initial excitement over 3G's potential. This led to a telecoms crash that ran concurrently with similar crashes in the fibre-optic and dot.com fields.The 3G standard is perhaps well known because of a massive expansion of the mobile communications market post-2G and advances of the consumer mobile phone. An especially notable development during this time is the smartphone (for example, the iPhone, and the Android family), combining the abilities of a PDA with a mobile phone, leading to widespread demand for mobile internet connectivity. 3G has also introduced the term "mobile broadband" because its speed and capability made it a viable alternative for internet browsing, and USB Modems connecting to 3G networks, and now 4G became increasingly common.By June 2007, the 200 millionth 3G subscriber had been connected of which 10 million were in Nepal and 8.2 million in India. This 200 millionth is only 6.7% of the 3 billion mobile phone subscriptions worldwide. (When counting CDMA2000 1x RTT customersmax bitrate 72% of the 200kbit/s which defines 3Gthe total size of the nearly-3G subscriber base was 475 million as of June 2007, which was 15.8% of all subscribers worldwide.) In the countries where 3G was launched first Japan and South Korea 3G penetration is over 70%.[24] In Europe the leading country[when?] for 3G penetration is Italy with a third of its subscribers migrated to 3G. Other leading countries[when?] for 3G use include Nepal, UK, Austria, Australia and Singapore at the 32% migration level.According to ITU estimates,[25] as of Q4 2012 there were 2096 million active mobile-broadband[vague] subscribers worldwide out of a total of 6835 million subscribersthis is just over 30%. About half the mobile-broadband subscriptions are for subscribers in developed nations, 934 million out of 1600 million total, well over 50%. Note however that there is a distinction between a phone with mobile-broadband connectivity and a smart phone with a large display and so onalthough according[26] to the ITU and informatandm.com the US has 321 million mobile subscriptions, including 256 million that are 3G or 4G, which is both 80% of the subscriber base and 80% of the US population, according[25] to ComScore just a year earlier in Q4 2011 only about 42% of people surveyed in the US reported they owned a smart phone. In Japan, 3G penetration was similar at about 81%, but smart phone ownership was lower at about 17%.[25] In China, there were 486.5 million 3G subscribers in June 2014,[27] in a population of 1,385,566,537 (2013 UN estimate).Since the increasing adoption of 4G networks across the globe, 3G use has been in decline. Several operators around the world have already or are in the process of shutting down their 3G networks (see table below). In several places, 3G is being shut down while its older predecessor 2G is being kept in operation; Vodafone UK is doing this, citing 2G's usefulness as a low-power fallback.[28] EE in the UK, plans to switch off their 3G networks in early 2024.[29] In the US, Verizon shutdown their 3G services on 31 December 2022,[30] T-Mobile shut down Sprint's networks on 31 March 2022 and shutdown their main networks on 1 July 2022,[31] and AT&T has done so on 22 February 2022.[32]Currently 3G around the world is declining in availability and support. Technology that depends on 3G for usage are becoming inoperable in many places. For example, the European Union plans to ensure that member countries maintain 2G networks as a fallback[citation needed], so 3G devices that are backwards compatible with 2G frequencies can continue to be used. However, in countries that plan to decommission 2G networks or have already done so as well, such as the United States and Singapore, devices supporting only 3G and backwards compatible with 2G are becoming inoperable.[33] As of February 2022, less than 1% of cell phone customers in the United States used 3G; AT&T offered free replacement devices to some customers in the run-up to its shutdown.[34]It has been estimated that there are almost 8,000 patents declared essential (FRAND) related to the 483 technical specifications which form the 3GPP and 3GPP2 standards.[35][36] Twelve companies accounted in 2004 for 90% of the patents (Qualcomm, Ericsson, Nokia, Motorola, Philips, NTT DoCoMo, Siemens, Mitsubishi, Fujitsu, Hitachi, InterDigital, and Matsushita).Even then, some patents essential to 3G might not have been declared by their patent holders. It is believed that Nortel and Lucent have undisclosed patents essential to these standards.[36]Furthermore, the existing 3G Patent Platform Partnership Patent pool has little impact on FRAND protection because it excludes the four largest patent owners for 3G.[37][38]ITU has not provided a clear[39][vague] definition of the data rate that users can expect from 3G equipment or providers. Thus users sold 3G service may not be able to point to a standard and say that the rates it specifies are not being met. While stating in commentary that "it is expected that IMT-2000 will provide higher transmission rates: a minimum data rate of 2Mbit/s for stationary or walking users, and 348kbit/s in a moving vehicle,"[40] the ITU does not actually clearly specify minimum required rates, nor required average rates, nor what modes[clarification needed] of the interfaces qualify as 3G, so various[vague] data rates are sold as '3G' in the market.In a market implementation, 3G downlink data speeds defined by telecom service providers vary depending on the underlying technology deployed; up to 384kbit/s for UMTS (WCDMA), up to 7.2Mbit/sec for HSPA, and a theoretical maximum of 21.1Mbit/s for HSPA+ and 42.2Mbit/s for DC-HSPA+ (technically 3.5G, but usually clubbed under the tradename of 3G).[citation needed]See also: Mobile security Attacks based on the GSM networks3G networks offer greater security than their 2G predecessors. By allowing the UE (User Equipment) to authenticate the network it is attaching to, the user can be sure the network is the intended one and not an impersonator.[41]3G networks use the KASUMI block cipher instead of the older A5/1 stream cipher. However, a number of serious weaknesses in the KASUMI cipher have been identified.In addition to the 3G network infrastructure security, end-to-end security is offered when application frameworks such as IMS are accessed, although this is not strictly a 3G property.The bandwidth and location capabilities introduced by 3G networks enabled a wide range of applications that were previously impractical or unavailable on 2G networks. Among the most significant advancements was the ability to perform data-intensive tasks, such as browsing the internet seamlessly while on the move, as well as engaging in other activities that benefited from faster data speeds and enhanced reliability.Beyond personal communication, 3G networks supported applications in various fields, including medical devices, fire alarms, and ankle monitors. This versatility marked a significant milestone in cellular communications, as 3G became the first network to enable such a broad range of use cases.[42] By expanding its functionality beyond traditional mobile phone usage, 3G set the stage for the integration of cellular networks into a wide array of technologies and services, paving the way for further advancements with subsequent generations of mobile networks.Both 3GPP and 3GPP2 are working on the extensions to 3G standards that are based on an all-IP network infrastructure and using advanced wireless technologies such as MIMO. These specifications already display features characteristic for IMT-Advanced (4G), the successor of 3G. However, falling short of the bandwidth requirements for 4G (

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Media related to 3G at Wikimedia CommonsPrecededby2nd Generation (2G) Mobile Telephony Generations Succeededby4th Generation (4G)Retrieved from " 3Mobile phone specification system project3rd Generation Partnership Project 2Abbreviation3GPP2TypeStandards organizationThe 3rd Generation Partnership Project 2 (3GPP2) was a collaboration between telecommunications associations to make a globally applicable third generation (3G) mobile phone system specification within the scope of the ITU's IMT-2000 project. In practice, 3GPP2 was the standardization group for CDMA2000, the set of 3G standards based on the earlier cdmaOne 2G CDMA technology.The participating associations were ARIB/TTC (Japan), China Communications Standards Association, Telecommunications Industry Association (North America) and Telecommunications Technology Association (South Korea).The agreement was established in December 1998.Ultra Mobile Broadband (UMB) was a 3GPP2 project to develop a fourth-generation successor to CDMA2000. In November 2008, Qualcomm, UMB's lead sponsor, announced it was ending development of the technology, favoring LTE instead.[1]3GPP2 should not be confused with 3GPP; 3GPP is the standard body behind the Universal Mobile Telecommunications System (UMTS) that is the 3G upgrade to GSM networks, while 3GPP2 was the standard body behind the competing 3G standard CDMA2000 that is the 3G upgrade to cdmaOne networks that was used mostly in the United States (and to some extent also in Japan, China, Canada, South Korea and India).GSM/UMTS were the most widespread 2G/3G wireless standards worldwide. Most countries used only the GSM family. A few countries, including China, the United States, Canada, Ukraine, Trinidad and Tobago, India, South Korea and Japan, used both standards.3GPP2 had its last activity in 2013,[2] and the group has been dormant ever since. The 3GPP2 website was taken offline in 2023, primarily due to CDMA carriers deploying 3GPP's LTE instead of UMB the decade prior and later shutting down CDMA networks making the 3GPP2 redundant and unneeded. However, as of 2024 the 3GPP2 website has since come back online.^ Qualcomm halts UMB project, Reuters, 13 November 2008^ "3GPP2 Technology Webinar". 3GPP2.3GPP2 Official Web siteAbout 3GPP2TIA U.S. 3GPP2 Standards DeveloperThis article about wireless technology is a stub. You can help Wikipedia by expanding it.vteRetrieved from " 4Mobile telecommunications standards body3rd Generation Partnership ProjectAbbreviation3GPPFormation1998; 27years ago(1998)TypeStandards organizationRegion served WorldwideWebsitewww.3gpp.orgThe 3rd Generation Partnership Project (3GPP) is an umbrella term for a number of standards organizations which develop protocols for mobile telecommunications. Its best known work is the development and maintenance of:[1]GSM and related 2G and 2.5G standards, including GPRS and EDGEUMTS and related 3G standards, including HSPA and HSPA+LTE and related 4G standards, including LTE Advanced and LTE Advanced Pro5G NR and related 5G standards, including 5G-AdvancedAn evolved IP Multimedia Subsystem (IMS) developed in an access independent manner3GPP is a consortium with seven national or regional telecommunication standards organizations as primary members ("organizational partners") and a variety of other organizations as associate members ("market representation partners"). The 3GPP organizes its work into three different streams: Radio Access Networks, Services and Systems Aspects, and Core Network and Terminals.[2]The project was established in December 1998 with the goal of developing a specification for a 3G mobile phone system based on the 2G GSM system, within the scope of the International Telecommunication Union's International Mobile Telecommunications-2000, hence the name 3GPP.[3] It should not be confused with 3rd Generation Partnership Project 2 (3GPP2), which developed a competing 3G system, CDMA2000.[4]The 3GPP administrative support team (known as the "Mobile Competence Centre") is located at the European Telecommunications Standards Institute headquarters in the Sophia Antipolis technology park in France.[5]The seven 3GPP Organizational Partners are from Asia, Europe and North America. Their aim is to determine the general policy and strategy of 3GPP and perform the following tasks:The approval and maintenance of the 3GPP scope;The maintenance of the Partnership Project Description;Take the decision to create or cease a Technical Specification Groups, and approve their scope and terms of reference;The approval of Organizational Partner funding requirements;The allocation of human and financial resources provided by the Organizational Partners to the Project Co-ordination Group;Act as a body of appeal on procedural matters referred to them.Together with the Market Representation Partners (MRPs) perform the following tasks:The maintenance of the Partnership Project Agreement;The approval of applications for 3GPP partnership;Take the decision against a possible dissolution of 3GPP.The Organizational Partners are:[6]Organizational PartnersOrganizationCountry/regionWebsiteAssociation of Radio Industries and Businesses (ARIB)JapanARIBAlliance for Telecommunications Industry Solutions (ATIS)USAATISChina Communications Standards Association (CCSA)ChinaCCSAEuropean Telecommunications Standards Institute (ETSI)EuropeETSITelecommunications Standards Development Society (TSDSI)IndiaTSDSITelecommunications Technology Association (TTA)South KoreaTTATelecommunication Technology Committee (TTC)JapanTTCThe 3GPP Organizational Partners can invite a Market Representation Partner to take part in 3GPP, which:Has the ability to offer market advice to 3GPP and to bring into 3GPP a consensus view of market requirements (e.g., services, features and functionality) falling within the 3GPP scope;Does not have the capability and authority to define, publish and set standards within the 3GPP scope, nationally or regionally;Has committed itself to all or part of the 3GPP scope;Has signed the Partnership Project Agreement.As of January2025[update], the Market Representation Partners are:[6]Market Representation PartnersOrganizationWebsite5G-ACIA Automotive Association Americas Networking Alliance (5GDNA) Smart Network and Services Industry Association (6G-IA) Slicing Association (5GSA) Media Action Group (5G-MAG) Edge Computing Consortium (AECC) India Forum Operators Association of India (COAI) Society of Automotive Engineers (CSAE) //ctia.org/Global Satellite Operators Association (GSOA) Certification Forum (GCF) mobile Suppliers Association (GSA) //www.gsma.com/IPV6 Forum Generation Mobile Networks (NGMN) Safety Communication Europe (PSCE) Forum Cell Forum //tcca.info/TD Industry Alliance Broadband Alliance standards are structured as Releases. Discussion of 3GPP thus frequently refers to the functionality in one release or another.Version[7]Released[8]InfoPhase 11992GSM FeaturesPhase 21995GSM Features, EFR Codec,Release 961997 Q1GSM Features, 14.4kbit/s User Data Rate,Release 971998 Q1GSM Features, GPRSRelease 981999 Q1GSM Features, AMR codec, EDGE, GPRS for PCS1900Release 992000 Q1Specified the first UMTS 3G networks, incorporating a CDMA air interface[9]Release 42001 Q2Originally called the Release 2000 added features including an all-IP Core Network[10]Release 52002 Q1Introduced IMS and HSDPA[11]Release 62004 Q4Integrated operation with Wireless LAN networks and adds HSUPA, MBMS, enhancements to IMS such as Push to Talk over Cellular (PoC), GAN[12]Release 72007 Q4Focuses on decreasing latency, improvements to QoS and real-time applications such as VoIP.[13] This specification also focus on HSPA+ (High Speed Packet Access Evolution), SIM high-speed protocol and contactless front-end interface (Near Field Communication enabling operators to deliver contactless services like Mobile Payments), EDGE Evolution.Release 82008 Q4First LTE release. All-IP Network (SAE). New OFDMA, FDE and MIMO based radio interface, not backwards compatible with previous CDMA interfaces. Dual-Cell HSDPA. UMTS HNB.Release 92009 Q4SAES Enhancements, WiMAX and LTE/UMTS Interoperability. Dual-Cell HSDPA with MIMO, Dual-Cell HSUPA. LTE HeNB. Evolved multimedia broadcast and multicast service (eMBMS).Release 102011 Q1LTE Advanced fulfilling IMT Advanced 4G requirements. Backwards compatible with release 8 (LTE). Multi-Cell HSDPA (4 carriers).Release 112012 Q3Advanced IP Interconnection of Services. Service layer interconnection between national operators/carriers as well as third-party application providers. Heterogeneous networks (HetNet) improvements, Coordinated Multi-Point operation (CoMP). In-device Co-existence (IDC).Release 122015 Q1Enhanced Small Cells (higher order modulation, dual connectivity, cell discovery, self configuration), Carrier aggregation (2 uplink carriers, 3 downlink carriers, FDD/TDD carrier aggregation), MIMO (3D channel modeling, elevation beamforming, massive MIMO), New and Enhanced Services (cost and range of MTC, D2D communication, eMBMS enhancements)[14]Release 132016 Q1LTE-Advanced Pro. LTE in unlicensed, LTE enhancements for Machine-Type Communication. Elevation Beamforming / Full-Dimension MIMO, Indoor positioning.[15]Release 142017 Q2Energy Efficiency, Location Services (LCS), Mission Critical Data over LTE, Mission Critical Video over LTE, Flexible Mobile Service Steering (FMSS), Multimedia Broadcast Supplement for Public Warning System (MBSP), enhancement for TV services over eMBMS, massive Internet of Things, Cell Broadcast Service (CBS)[16]Release 152018 Q2First 5G NR ("New Radio") release. Support for 5G Vehicle-to-x service, IP Multimedia Core Network Subsystem (IMS), Future Railway Mobile Communication System[17]Release 162020 Q3The 5G System Phase 2: 5G enhancements, NR-based access to unlicensed spectrum (NR-U), Satellite access[18]Release 172022 Q1TSG RAN: Several features that continue to be important for overall efficiency and performance of 5G NR: MIMO, Spectrum Sharing enhancements, UE Power Saving and Coverage Enhancements. RAN1 will also undertake the necessary study and specification work to enhance the physical layer to support frequency bands up to 71GHz.TSG SA groups focused on further enhancements to the 5G system and enablers for new features and services:Enhanced support of: non-public networks, industrial Internet of Things, low complexity NR devices, edge computing in 5GC, access traffic steering, switch and splitting support, network automation for 5G, network slicing, advanced V2X service, multiple USIM support, proximity-based services in 5GS, 5G multicast broadcast services, Unmanned Aerial Systems (UAS), satellite access in 5G, 5GC location services, Multimedia Priority Service...[19]Release 182023 Q45G-Advanced. Introducing further machine-learning based techniques at different levels of the wireless network. Edge computing, Evolution of IMS Multimedia Telephony Service, Smart Energy and Infrastructure, Vehicle-Mounted Relays, Low Power High Accuracy Positioning for industrial IoT scenarios, Enhanced Access to and Support of Network slicing, Satellite backhaul in 5G...[20][21][19]Release 19 [22]2025 Q45G-Advanced.Each release incorporates hundreds of individual Technical Specification and Technical Report documents, each of which may have been through many revisions. Current 3GPP standards incorporate the latest revision of the GSM standards.The documents are made available without charge on 3GPP's web site. The Technical Specifications cover not only the radio part ("Air Interface") and Core Network, but also billing information and speech coding down to source code level. Cryptographic aspects (such as authentication, confidentiality) are also specified.The 3GPP specification work is done in Technical Specification Groups (TSGs) and Working Groups (WGs).[23]There are three Technical Specifications Groups, each of which consists of multiple WGs:RAN (Radio Access Network): RAN specifies the UTRAN and the E-UTRAN. It is composed of six working groups.WGShorthandScopeSpecificationsRAN WG1RAN1Radio Layer 1 (Physical layer)List of specsRAN WG2RAN2Radio Layer 2 and Radio Layer 3 Radio Resource ControlList of specsRAN WG3RAN3UTRAN, E-UTRAN, NG-RAN architecture and related network interfacesList of specsRAN WG4RAN4Radio performance and protocol aspectsList of specsRAN WG5RAN5Mobile terminal conformance testingList of specsSA (Service and System Aspects): SA specifies the service requirements and the overall architecture of the 3GPP system. It is also responsible for the coordination of the project. SA is composed of six working groups.WGShorthandScopeSpecificationsSA WG1SA1ServicesList of specsSA WG2SA2ArchitectureList of specsSA WG3SA3SecurityList of specsSA WG4SA4CodecList of specsSA WG5SA5Management, Orchestration and ChargingList of specsSA WG6SA6Application Enablement and Critical Communication ApplicationsList of specsCT (Core Network and Terminals): CT specifies the core network and terminal parts of 3GPP. It includes the core network terminal layer 3 protocols. It is composed of five working groups.WGShorthandScopeSpecificationsCT WG1CT1User Equipment Core Network protocolsList of specsCT WG2CT2closedCT WG3CT3Interworking with external networksList of specsCT WG4CT4Core Network ProtocolsList of specsCT WG5CT5closedCT WG6CT6Smart Card Application AspectsList of specsGERAN (GSM/EDGE Radio Access Network):The closure of GERAN was announced in January 2016.[24] The specification work on legacy GSM/EDGE system was transferred to RAN WG, RAN6. RAN6 was closed in July 2020 (.The 3GPP structure also includes a Project Coordination Group, which is the highest decision-making body. Its missions include the management of overall timeframe and work progress.3GPP standardization work is contribution-driven. Companies ("individual members") participate through their membership to a 3GPP Organizational Partner. As of December 2020, 3GPP is composed of 719 individual members.[25]Specification work is done at WG and at TSG level:[26]the 3GPP WGs hold several meetings a year. They prepare and discuss change requests against 3GPP specifications. A change request accepted at WG level is called "agreed".the 3GPP TSGs hold plenary meetings quarterly. The TSGs can "approve" the change requests that were agreed at WG level. Some specifications are under the direct responsibility of TSGs and therefore, change requests can also be handled at TSG level. The approved change requests are subsequently incorporated in 3GPP specifications.3GPP follows a three-stage methodology as defined in ITU-T Recommendation I.130:[27]stage 1 specifications define the service requirements from the user point of view.stage 2 specifications define an architecture to support the service requirements.stage 3 specifications define an implementation of the architecture by specifying protocols in details.Test specifications are sometimes defined as stage 4, as they follow stage 3.Specifications are grouped into releases. A release consists of a set of internally consistent set of features and specifications.Timeframes are defined for each release by specifying freezing dates. Once a release is frozen, only essential corrections are allowed (i.e. addition and modifications of functions are forbidden). Freezing dates are defined for each stage.The 3GPP specifications are transposed into deliverables by the Organizational Partners.List of mobile phone generationsUniversal Mobile Telecommunications System (UMTS)3GPP Long Term EvolutionEvolution to 3GIP Multimedia Subsystem3GP3GPP2 The 3GPP's counterpart in the CDMA2000 sphere.GSM servicesLoRaWANTelecoms & Internet converged Services & Protocols for Advanced Networks (TISPAN)Open Mobile AllianceService data adaptation protocolService layerEuropean Telecommunications Standards Institute^ 3GPP Scope and Objectives, 31 August 2007^ "About 3GPP". 3GPP. Retrieved 10 March 2019.^ "3GPP Background". 7 June 2000. Archived from the original on 6 July 2000.^ "3rd Generation Partnership Project 2". Archived from the original on 23 January 2004. Retrieved 25 November 2012.^ "Mobile Competence Centre". 3GPP. Retrieved 10 March 2019.^ a b "Partners". 3GPP. Retrieved 1 January 2025.^ Releases^ "3GPP Specifications Releases (and phases and stages)". Retrieved 16 September 2010.^ Overview of 3GPP Release 99, Summary of all Release 99 Features. ETSI Mobile Competence Centre, Version xx/07/04^ Overview of 3GPP Release 4, Summary of all Release 4 Features, v.1.1.0 (draft) ETSI Mobile Competence Centre 2004^ Summary of all Release 5 Features, ETSI Mobile Competence Centre, Version 9 September 2003^ Overview of 3GPP Release 6, Summary of all Release 6 Features, Version TSG #33, ETSI Mobile Competence Centre 2006^ Review of the Work Plan at Plenaries #31, 3GPP, SP-060232 3GPP TSG SA#31 Sanya, 1316 March 2006^ "Highlights of 3GPP Release 12". Retrieved 20 November 2014.^ "Release 13 priorities". Retrieved 20 November 2014.^ "3GPP Portal > Specifications". portal.3gpp.org. Retrieved 27 October 2016.^ "3GPP Portal > Specifications". portal.3gpp.org. Retrieved 27 October 2016.^ "3GPP Portal > Specifications". portal.3gpp.org. Retrieved 14 July 2020.^ a b "5G evolution toward 5G advanced: An overview of 3GPP releases 17 and 18". Ericsson. 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Retrieved 11 April 2011.^ closure of GERAN^ 3GPP membership^ 3GPP TR 21.900 Technical Specification Group working methods^ ITU-T Recommendation I.1303GPP website3GPP Standards List of Acronyms & Terminology3GPP freely published, detailed technical specifications3GPP releases descriptionsETSI GSM UMTS 3GPP Numbering Cross ReferenceTS/TRspecification numberingTool for visualizing multiple inter-related 3gpp standardsTool for visualizing, decoding, encoding network protocol messages defined by 3gppLTE-3GPP.info: online 3GPP messages decoder fully supporting Rel.15Retrieved from " 5Multimedia file format families3GPFilename extension.3gp, .3gppInternet mediatypevideo/3gpp, audio/3gppUniform Type Identifier(UTI)public.3gppDevelopedby3GPPInitial release4April 2003; 22 years ago(2003-04-04)[1]Latest release17.0.0[1]7April 2022; 3 years ago(2022-04-07) Type of formatContainer formatContainerforaudio, video, textExtendedfromMPEG-4 Part 12Open format?YesFree format?No3G2Filename extension.3g2, .3gp2, .3gpp2Internet mediatypevideo/3gpp2, audio/3gpp2Uniform Type Identifier(UTI)public.3gpp2Developedby3GPP2Initial releaseJanuary2004; 21years ago(2004-01)[2]Latest releaseC.S0050-B v1.0[2]September2024; 9months ago(2024-09) Type of formatContainer formatContainerforaudio, video, textExtendedfromMPEG-4 Part 12Open format?YesFree format?yes3GP (3GPP file format) is a digital multimedia container format defined by the 3GPP2 for 3G CDMA2000 multimedia services. It is very similar to the 3GP file format but consumes less space and bandwidth, and has some extensions and limitations in comparison to 3GP.3GP is defined in the ETSI 3GPP technical specification.[1] 3GP is a required file format for video and associated speech/audio media types and timed text in ETSI 3GPP technical specifications for IP Multimedia Subsystem (IMS), Multimedia Messaging Service (MMS), Multimedia Broadcast/Multicast Service (MBMS) and Transparent end-to-end Packet-switched Streaming Service (PSS).[3][4][5][6]3G2 is defined in the 3GPP2 technical specification.[2]The factual accuracy of parts of this article (those related to 3GP codec list (see release 12 of 2016 p.65)) may be compromised due to out-of-date information. The reason given is: 3GP has expanded codec lists while 3G2 has stagnated. Please help update this article to reflect recent events or newly available information. (February 2021)Relations between ISO Base Media File Format, MP4 File Format, 3GPP file format and 3GPP2 file format. Based on the 3GPP2 technical specification published on 18 May 2007.[7]The 3GP and 3G2 file formats are both structurally based on the ISO base media file format defined in ISO/IEC 14496-12 MPEG-4 Part 12,[8][9][10] but older versions of the 3GP file format did not use some of its features.[7] 3GP and 3G2 are container formats similar to MPEG-4 Part 14 (MP4), which is also based on MPEG-4 Part 12. The 3GP and 3G2 file format were designed to decrease storage and bandwidth requirements to accommodate mobile phones. They are good for lower end smartphones for faster streaming & download.3GP and 3G2 are similar standards, but with some differences:3GP file format was designed for GSM-based phones and may have the filename extension .3gp3GPP2 file format was designed for CDMA-based phones and may have the filename extension .3g2Some cell phones use the .mp4 extension for 3GP video.The 3GP file format stores video streams as MPEG-4 Part 2, H.263, or MPEG-4 Part 10 (AVC/H.264), and audio streams as AMR-NB, AMR-WB, AMR-WB+, AAC-LC, HE-AAC v1 or Enhanced aacPlus (HE-AAC v2). 3GPP allowed use of AMR and H.263 codecs in the ISO base media file format (MPEG-4 Part 12), because 3GPP specified the usage of the Sample Entry and template fields in the ISO base media file format as well as defining new boxes to which codecs refer. These extensions were registered by the registration authority for code-points in ISO base media file format ("MP4 Family" files).[11][12] For the storage of MPEG-4 media specific information in 3GP files, the 3GP specification refers to MP4 and the AVC file format, which are also based on the ISO base media file format. The MP4 and the AVC file format specifications described usage of MPEG-4 content in the ISO base media file format.[8]A 3GP file is always big-endian, storing and transferring the most significant bytes first. [citation needed]The 3G2 file format can store the same video streams and most of the audio streams used in the 2007 3GP file format. In addition, 3G2 stores audio streams as EVRC, EVRC-B, EVRC-WB, 13K (QCELP), SMV or VMR-WB, which was specified by 3GPP2 for use in ISO base media file format.[12] The 3G2 specification also defined some enhancements to 3GPP Timed Text. 3G2 file format does not store Enhanced aacPlus (HE-AAC v2) and AMR-WB+ audio streams.[7] For the storage of MPEG-4 media (AAC audio, MPEG-4 Part 2 video, MPEG-4 Part 10 H.264/AVC) in 3G2 files, the 3G2 specification refers to the MP4 file format and the AVC file format specification, which described usage of this content in the ISO base media file format. For the storage of H.263 and AMR content 3G2 specification refers to the 3GP file format specification.[7]Most 3G capable mobile phones support the playback and recording of video in 3GP format (memory, maximum filesize for playback and recording, and resolution limits exist and vary).[citation needed]Some newer/higher-end phones without 3G capabilities may also playback and record in this format (again, with said limitations).[citation needed]Audio imported from CD onto a PlayStation 3 when it is set to encode to the MPEG-4 AAC format copies onto USB devices in the 3GP format. [citation needed]The Nintendo 3DS used 3GP technology to play YouTube videos.Apple iDevices used to support files for playback only as passthrough files, hence no editing ability, but since iOS 9 this has been deprecated meaning files of this format have to be manually converted to H.264.[citation needed]When transferred to a computer, 3GP movies can be viewed on Microsoft Windows, Apple macOS, and the various Linux-based operating systems; on the former two with Windows Media Player[13] and Apple QuickTime[14] respectively (their built-in media players), and on all three with VLC media player.[15] Programs such as Media Player Classic, K-Multimedia Player, Totem, RealPlayer, MPlayer, and GOM Player can also be used.3GP and 3G2 files can be encoded and decoded with open source software FFmpeg.[16] Media tags can be read and written on Linux, macOS and Windows using the open source AtomicParsley command-line utility.[17]computer programming portalComparison of (audio/video) container formatsSIF (Source Input Format)CIF (Common Intermediate Format)^ a b c ETSI 3GPP 3GPP TS 26.244; Transparent end-to-end packet switched streaming service (PSS); 3GPP file format (3GP) Retrieved on 2009-06-02.^ a b c "3GPP2 C.S0050, 3GPP2 File Formats for Multimedia Services, File Format for Multimedia Services for cdma2000". 3GPP2. 2003. 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Retrieved 2024-06-24.3GPP codecs specifications; 3G and beyond / GSM, 26 series3GPP file format (3GP); 3GPP TS 26.244; Transparent end-to-end packet switched streaming service (PSS) - specification3GPP2 specifications3GPP2 File Formats for Multimedia Services; 3GPP2 C.S0050-B Version 1.0 - specificationRFC3839, MIME Type Registrations for 3rd Generation Partnership Project (3GPP) Multimedia filesRFC4393, MIME Type Registrations for 3GPP2 Multimedia FilesRFC4281, The Codecs Parameter for "Bucket" Media Types3GP & 3G2 File FormatsRetrieved from " 6Multimedia file format families3GPFilename extension.3gp, .3gppInternet mediatypevideo/3gpp, audio/3gppUniform Type Identifier(UTI)public.3gppDevelopedby3GPPInitial release4April 2003; 22 years ago(2003-04-04)[1]Latest release17.0.0[1]7April 2022; 3 years ago(2022-04-07) Type of formatContainer formatContainerforaudio, video, textExtendedfromMPEG-4 Part 12Open format?YesFree format?No3G2Filename extension.3g2, .3gp2, .3gpp2Internet mediatypevideo/3gpp2, audio/3gpp2Uniform Type Identifier(UTI)public.3gpp2Developedby3GPP2Initial releaseJanuary2004; 21years ago(2004-01)[2]Latest releaseC.S0050-B v1.0[2]September2024; 9months ago(2024-09) Type of formatContainer formatContainerforaudio, video, textExtendedfromMPEG-4 Part 12Open format?YesFree format?yes3GP (3GPP file format) is a digital multimedia container format defined by the Third Generation Partnership Project (3GPP) for 3G UMTS multimedia services, largely based on MPEG-4 Part 12. A 3GP container may consist of H.263 or H.264 video codecs or AMR or AAC-LC audio codecs.3G2 (3GPP2 file format) is a multimedia container format defined by the 3GPP2 for 3G CDMA2