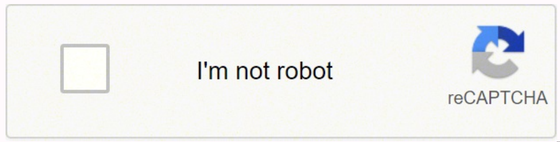

Continue

Why is my zebra printer blinking red

Wi-Fi wavelengths Antenna of wireless network interface controller Gigabyte GC-WB867D-I. Simple stick-like antennas like these have unidirectional reception and relatively low range of 20 metres (yards) or so. A keychain-size Wi-Fi detector MIMO (multiple-input and multiple-output) Main article: MIMO Wi-Fi 4 and higher standards allow devices to have multiple antennas on transmitters and receivers. Multiple antennas enable the equipment to exploit multipath propagation on the same frequency bands giving much faster speeds and greater range. Wi-Fi 4 can more than double the range over previous standards.[87] The Wi-Fi 5 standard uses the 5 GHz band exclusively, and is capable of multi-station WLAN throughput of at least 1 gigabit per second, and a single station throughput of at least 500 Mbit/s. As of the first quarter of 2016, The Wi-Fi Alliance certifies devices compliant with the 802.11ac standard as "Wi-Fi CERTIFIED ac". This standard uses several signal processing techniques such as multi-user MIMO and 4X4 Spatial Multiplexing streams, and wide channel bandwidth (160 MHz) to achieve its gigabit throughput. According to a study by IHS Technology, 70% of all access point sales revenue in the first quarter of 2016 came from 802.11ac devices.[88] Radio propagation With Wi-Fi signals line-of-sight usually works best, but signals can transmit, absorb, reflect, refract, diffract and up and down fade through and around structures, both man-made and natural. Wi-Fi signals are very strongly affected by metallic structures (including rebar in concrete, low-e coatings in glazing) and water (such as found in vegetation.) Due to the complex nature of radio propagation at typical Wi-Fi frequencies, particularly around trees and buildings, algorithms can only approximately predict Wi-Fi signal strength for any given area in relation to a transmitter.[89] This effect does not apply equally to long-range Wi-Fi, since longer links typically operate from towers that transmit above the surrounding foliage. Mobile use of Wi-Fi over wider ranges is limited, for instance, to uses such as in an automobile moving from one hotspot to another. Other wireless technologies are more suitable for communicating with moving vehicles. Distance records Distance records (using non-standard devices) include 382 km (237 mi) in June 2007, held by Ermanno Pietrosemoli and EsLaRed of Venezuela, transferring about 3 MB of data between the mountain-tops of El Águila and Platillon.[90][91] The Swedish Space Agency transferred data 420 km (260 mi), using 6 watt amplifiers to reach an overhead stratospheric balloon.[92] Interference Further information: Electromagnetic interference at 2.4 GHz § Wi-Fi Network planning frequency allocations for North America and Europe. Using these types of frequency allocations can help minimize co-channel and adjacent-channel interference. In the 2.4 GHz wavebands as well as others, transmitters straddle multiple channels. Overlapping channels can suffer from interference unless this is a small portion of the total received power. Wi-Fi connections can be blocked or the Internet speed lowered by having other devices in the same area. Wi-Fi protocols are designed to share the wavebands reasonably fairly, and this often works with little to no disruption. To minimize collisions with Wi-Fi and non-Wi-Fi devices, Wi-Fi employs Carrier-sense multiple access with collision avoidance (CSMA/CA), where transmitters listen before transmitting and delay transmission of packets if they detect that other devices are active on the channel, or if noise is detected from adjacent channels or non-Wi-Fi sources. Nevertheless, Wi-Fi networks are still susceptible to the hidden node and exposed node problem.[93] A standard speed Wi-Fi signal occupies five channels in the 2.4 GHz band. Interference can be caused by overlapping channels. Any two channel numbers that differ by five or more, such as 2 and 7, do not overlap (no adjacent-channel interference). The oft-repeated adage that channels 1, 6, and 11 are the only non-overlapping channels is, therefore, not accurate. Channels 1, 6, and 11 are the only group of three non-overlapping channels in North America. However, whether the overlap is significant depends on physical spacing. Channels that are four apart interfere a negligible amount—much less than reusing channels (which causes co-channel interference)—if transmitters are at least a few metres apart.[94] In Europe and Japan where channel 13 is available, using Channels 1, 5, 9, and 13 for 802.11g and 802.11n is recommended. However, many 2.4 GHz 802.11b and 802.11g access-points default to the same channel on initial startup, contributing to congestion on certain channels. Wi-Fi pollution, or an excessive number of access points in the area, can prevent access and interfere with other devices' use of other access points as well as with decreased signal-to-noise ratio (SNR) between access points. These issues can become a problem in high-density areas, such as large apartment complexes or office buildings with many Wi-Fi access points.[95] Other devices use the 2.4 GHz band: microwave ovens, ISM band devices, security cameras, ZigBee devices, Bluetooth devices, video senders, cordless phones, baby monitors,[96] and, in some countries, amateur radio, all of which can cause significant additional interference. It is also an issue when municipalities[97] or other large entities (such as universities) seek to provide large area coverage. On some 5 GHz bands interference from radar systems can occur in some places. For base stations that support those bands they employ Dynamic Frequency Selection which listens for radar, and if it is found, it will not permit a network on that band. These bands can be used by low power transmitters without a licence, and with few restrictions. However, while unintended interference is common, users that have been found to cause deliberate interference (particularly for attempting to locally monopolize these bands for commercial purposes) have been issued large fines.[98] Throughput Various layer-2 variants of IEEE 802.11 have different characteristics. Across all flavours of 802.11, maximum achievable throughputs are either given based on measurements under ideal conditions or in the layer-2 data rates. This, however, does not apply to typical deployments in which data are transferred between two endpoints of which at least one is typically connected to a wired infrastructure, and the other is connected to an infrastructure via a wireless link. This means that typically data frames pass an 802.11 (WLAN) medium and are being converted to 802.3 (Ethernet) or vice versa. Due to the difference in the frame (header) lengths of these two media, the packet size of an application determines the speed of the data transfer. This means that an application that uses small packets (e.g. VoIP) creates a data flow with high overhead traffic (low goodput). Other factors that contribute to the overall application data rate are the speed with which the application transmits the packets (i.e. the data rate) and the energy with which the wireless signal is received. The latter is determined by distance and by the configured output power of the communicating devices.[99][100] The same references apply to the attached throughput graphs, which show measurements of UDP throughput measurements. Each represents an average throughput of 25 measurements (the error bars are there, but barely visible due to the small variation), is with specific packet size (small or large), and with a specific data rate (10 kbit/s – 100 Mbit/s). Markers for traffic profiles of common applications are included as well. This text and measurements do not cover packet errors but information about this can be found at the above references. The table below shows the maximum achievable (application-specific) UDP throughput in the same scenarios (same references again) with various WLAN (802.11) flavours. The measurement hosts have been 25 metres (yards) apart from each other; loss is again ignored. Graphical representation of Wi-Fi application specific (UDP) performance envelope 2.4 GHz band, with 802.11g Graphical representation of Wi-Fi application specific (UDP) performance envelope 2.4 GHz band, with 802.11n with 40 MHz Hardware An embedded RouterBoard 112 with U.FL-RSMA pigtail and R52 mini PCI Wi-Fi card widely used by wireless Internet service providers (WISPs) in the Czech Republic OSBRiDGE 3GN – 802.11n Access Point and UMTS/GSM Gateway in one device Wi-Fi allows wireless deployment of local area networks (LANs). Also, spaces where cables cannot be run, such as outdoor areas and historical buildings, can host wireless LANs. However, building walls of certain materials, such as stone with high metal content, can block Wi-Fi signals. A Wi-Fi device is a short-range wireless device. Wi-Fi devices are fabricated on RF CMOS integrated circuit (RF circuit) chips.[101] Since the early 2000s, manufacturers are building wireless network adapters into most laptops. The price of chipsets for Wi-Fi continues to drop, making it an economical networking option included in ever more devices.[102] Different competitive brands of access points and client network-interfaces can inter-operate at a basic level of service. Products designated as "Wi-Fi Certified" by the Wi-Fi Alliance are backward compatible. Unlike mobile phones, any standard Wi-Fi device works anywhere in the world. Access point An AirPort wireless G Wi-Fi adapter from an Apple MacBook A wireless access point (WAP) connects a group of wireless devices to an adjacent wired LAN. An access point resembles a network hub, relaying data between connected wireless devices in addition to a (usually) single connected wired device, most often an Ethernet hub or switch, allowing wireless devices to communicate with other wired devices. Wireless adapter Wireless network interface controller Gigabyte GC-WB867D-I Wireless adapters allow devices to connect to a wireless network. These adapters connect to devices using various external or internal interconnects such as PCI, miniPCI, USB, ExpressCard, Cardbus, and PC Card. As of 2010, most newer laptop computers come equipped with built-in internal adapters. Router Wireless routers integrate a Wireless Access Point, Ethernet switch, and internal router firmware application that provides IP routing, NAT, and DNS forwarding through an integrated WAN-interface. A wireless router allows wired and wireless Ethernet LAN devices to connect to a (usually) single WAN device such as a cable modem, DSL modem, or optical modem. A wireless router allows all three devices, mainly the access point and router, to be configured through one central utility. This utility is usually an integrated web server that is accessible to wired and wireless LAN clients and often optionally to WAN clients. This utility may also be an application that is run on a computer, as is the case with as Apple's AirPort, which is managed with the AirPort Utility on macOS and iOS.[103] Bridge Wireless network bridges can act to connect two networks to form a single network at the data-link layer over Wi-Fi. The main standard is the wireless distribution system (WDS). Wireless bridging can connect a wired network to a wireless network. A bridge differs from an access point: an access point typically connects wireless devices to one wired network. Two wireless bridge devices may be used to connect two wired networks over a wireless link, useful in situations where a wired connection may be unavailable, such as between two separate homes or for devices that have no wireless networking capability (but have wired networking capability), such as consumer entertainment devices; alternatively, a wireless bridge can be used to enable a device that supports a wired connection to operate at a wireless networking standard that is faster than supported by the wireless network connectivity feature (external dongle or inbuilt) supported by the device (e.g., enabling Wireless-N speeds (up to the maximum supported speed on the wired Ethernet port on both the bridge and connected devices including the wireless access point) for a device that only supports Wireless-G). A dual-band wireless bridge can also be used to enable 5 GHz wireless network operation on a device that only supports 2.4 GHz wireless and has a wired Ethernet port. Repeater Wireless range-extenders or wireless repeaters can extend the range of an existing wireless network. Strategically placed range-extenders can elongate a signal area or allow for the signal area to reach around barriers such as those pertaining in L-shaped corridors. Wireless devices connected through repeaters suffer from an increased latency for each hop, and there may be a reduction in the maximum available data throughput. Besides, the effect of additional users using a network employing wireless range-extenders is to consume the available bandwidth faster than would be the case whereby a single user migrates around a network employing extenders. For this reason, wireless range-extenders work best in networks supporting low traffic throughput requirements, such as for cases whereby a single user with a Wi-Fi-equipped tablet migrates around the combined extended and non-extended portions of the total connected network. Also, a wireless device connected to any of the repeaters in the chain has data throughput limited by the "weakest link" in the chain between the connection origin and connection end. Networks using wireless extenders are more prone to degradation from interference from neighbouring access points that border portions of the extended network and that happen to occupy the same channel as the extended network. Embedded systems Embedded serial-to-Wi-Fi module The security standard, Wi-Fi Protected Setup, allows embedded devices with a limited graphical user interface to connect to the Internet with ease. Wi-Fi Protected Setup has 2 configurations: The Push Button configuration and the PIN configuration. These embedded devices are also called The Internet of Things and are low-power, battery-operated embedded systems. Several Wi-Fi manufacturers design chips and modules for embedded Wi-Fi, such as GainSpan.[104] Increasingly in the last few years (particularly as of 2007[update]), embedded Wi-Fi modules have become available that incorporate a real-time operating system and provide a simple means of wirelessly enabling any device that can communicate via a serial port.[105] This allows the design of simple monitoring devices. An example is a portable ECG device monitoring a patient at home. This Wi-Fi-enabled device can communicate via the Internet.[106] These Wi-Fi modules are designed by OEMs so that implementers need only minimal Wi-Fi knowledge to provide Wi-Fi connectivity for their products. In June 2014, Texas Instruments introduced the first ARM Cortex-M4 microcontroller with an onboard dedicated Wi-Fi MCU, the SimpleLink CC3200. It makes embedded systems with Wi-Fi connectivity possible to build as single-chip devices, which reduces their cost and minimum size, making it more practical to build wireless-networked controllers into inexpensive ordinary objects.[107] Network security Main article: Wireless security The main issue with wireless network security is its simplified access to the network compared to traditional wired networks such as Ethernet. With wired networking, one must either gain access to a building (physically connecting into the internal network), or break through an external firewall. To access Wi-Fi, one must merely be within the range of the Wi-Fi network. Most business networks protect sensitive data and systems by attempting to disallow external access. Enabling wireless connectivity reduces security if the network uses inadequate or no encryption.[108][109][110] An attacker who has gained access to a Wi-Fi network router can initiate a DNS spoofing attack against any other user of the network by forging a response before the queried DNS server has a chance to reply.[111] Securing methods A common measure to deter unauthorized users involves hiding the access point's name by disabling the SSID broadcast. While effective against the casual user, it is ineffective as a security method because the SSID is broadcast in the clear in response to a client SSID query. Another method is to only allow computers with known MAC addresses to join the network,[112] but determined eavesdroppers may be able to join the network by spoofing an authorized address. Wired Equivalent Privacy (WEP) encryption was designed to protect against casual snooping but it is no longer considered secure. Tools such as AirSnort or Aircrack-ng can quickly recover WEP encryption keys.[113] Because of WEP's weakness the Wi-Fi Alliance approved Wi-Fi Protected Access (WPA) which uses TKIP. WPA was specifically designed to work with older equipment usually through a firmware upgrade. Though more secure than WEP, WPA has known vulnerabilities. The more secure WPA2 using Advanced Encryption Standard was introduced in 2004 and is supported by most new Wi-Fi devices. WPA2 is fully compatible with WPA.[114] In 2017, a flaw in the WPA2 protocol was discovered, allowing a key replay attack, known as KRACK.[115][116] A QR code to automate a Wi-Fi connection using WIFI:S:Wikipedia; T:WPA;P:Password1!;; A flaw in a feature added to Wi-Fi in 2007, called Wi-Fi Protected Setup (WPS), let WPA and WPA2 security be bypassed, and effectively broken in many situations. The only remedy as of late 2011 was to turn off Wi-Fi Protected Setup,[117] which is not always possible. Virtual Private Networks can be used to improve the confidentiality of data carried through Wi-Fi networks, especially public Wi-Fi networks.[118] A URI using the WIFI scheme can specify the SSID, encryption type, password/passphrase, and if the SSID is hidden or not, so users can follow links from QR codes, for instance, to join networks without having to manually enter the data.[119] A MECARD-like format is supported by Android and iOS 11+.[120] Common format: WIFI:S:;T:;P:;H:; Sample WIFI:S:MySSID;T:WPA;P:MyPassW0rd;; Data security risks The older wireless encryption-standard, Wired Equivalent Privacy (WEP), has been shown easily breakable even when correctly configured. Wi-Fi Protected Access (WPA and WPA2) encryption, which became available in devices in 2003, aimed to solve this problem. Wi-Fi access points typically default to an encryption-free (open) mode. Novice users benefit from a zero-configuration device that works out-of-the-box, but this default does not enable any wireless security, providing open wireless access to a LAN. To turn security on requires the user to configure the device, usually via a software graphical user interface (GUI). On unencrypted Wi-Fi networks connecting devices can monitor and record data (including personal information). Such networks can only be secured by using other means of protection, such as a VPN or secure Hypertext Transfer Protocol over Transport Layer Security (HTTPS). Wi-Fi Protected Access encryption (WPA2) is considered secure, provided a strong passphrase is used. In 2018, WPA3 was announced as a replacement for WPA2, increasing security;[121] it rolled out on June 26.[122] Piggybacking Main article: Piggybacking (Internet access) Further information: Legality of piggybacking Further information: Wi-Fi Protected Setup § Physical security issues Piggybacking refers to access to a wireless Internet connection by bringing one's computer within the range of another's wireless connection, and using that service without the subscriber's explicit permission or knowledge. During the early popular adoption of 802.11, providing open access points for anyone within range to use was encouraged[by whom?] to cultivate wireless community networks,[123] particularly since people on average use only a fraction of their downstream bandwidth at any given time. Recreational logging and mapping of other people's access points have become known as wardriving. Indeed, many access points are intentionally installed without security turned on so that they can be used as a free service. Providing access to one's Internet connection in this fashion may breach the Terms of Service or contract with the ISP. These activities do not result in sanctions in most jurisdictions; however, legislation and case law differ considerably across the world. A proposal to leave graffiti describing available services was called warchalking.[124] Piggybacking often occurs unintentionally – a technically unfamiliar user might not change the default "unsecured" settings to their access point and operating systems can be configured to connect automatically to any available wireless network. A user who happens to start up a laptop in the vicinity of an access point may find the computer has joined the network without any visible indication. Moreover, a user intending to join one network may instead end up on another one if the latter has a stronger signal. In combination with automatic discovery of other network resources (see DHCP and Zeroconf) this could lead wireless users to send sensitive data to the wrong middle-man when seeking a destination (see man-in-the-middle attack). For example, a user could inadvertently use an unsecured network to log into a website, thereby making the login credentials available to anyone listening, if the website uses an insecure protocol such as plain HTTP without TLS. On an unsecured access point, an unauthorized user can obtain security information (factory preset passphrase and/or Wi-Fi Protected Setup PIN) from a label on a wireless access point and use this information (or connect by the Wi-Fi Protected Setup pushbutton method) to commit unauthorized and/or unlawful activities. Societal aspects See also: Internet § Social Impact Wireless internet access has become much more embedded in society. It has thus changed how the society functions in many ways. Influence on developing countries See also: Long-range Wi-Fi Over half the world does not have access to the internet,[125] prominently rural areas in developing nations. Technology that has been implemented in more developed nations is often costly and low energy efficient. This has led to developing nations using more low-tech networks, frequently implementing renewable power sources that can solely be maintained through solar power, creating a network that is resistant to disruptions such as power outages. For instance, in 2007 a 450 km (280 mile) network between Cabo Pantoja and Iquitos in Peru was erected in which all equipment is powered only by solar panels.[125] These long-range Wi-Fi networks have two main uses: offer internet access to populations in isolated villages, and to provide healthcare to isolated communities. In the case of the aforementioned example, it connects the central hospital in Iquitos to 15 medical outposts which are intended for remote diagnosis.[125] Work habits Access to Wi-Fi in public spaces such as cafes or parks allows people, in particular freelancers, to work remotely. While the accessibility of Wi-Fi is the strongest factor when choosing a place to work (75% of people would choose a place that provides Wi-Fi over one that does not),[126] other factors influence the choice of specific hotspots. These vary from the accessibility of other resources, like books, the location of the workplace, and the social aspect of meeting other people in the same place. Moreover, the increase of people working from public places results in more customers for local businesses thus providing an economic stimulus to the area. Additionally, in the same study it has been noted that wireless connection provides more freedom of movement while working. Both when working at home or from the office it allows the displacement between different rooms or areas. In some offices (notably Cisco offices in New York) the employees do not have assigned desks but can work from any office connecting their laptop to Wi-Fi hotspot.[126] Housing The internet has become an integral part of living. 81.9% of American households have internet access.[127] Additionally, 89% of American households with broadband connect via wireless technologies.[128] 72.9% of American households have Wi-Fi. Wi-Fi networks have also affected how the interior of homes and hotels are arranged. For instance, architects have described that their clients no longer wanted only one room as their home office, but would like to work near the fireplace or have the possibility to work in different rooms. This contradicts architect's pre-existing ideas of the use of rooms that they designed. Additionally, some hotels have noted that guests prefer to stay in certain rooms since they receive a stronger Wi-Fi network.[126] Health concerns Further information: Wireless electronic devices and health The World Health Organization (WHO) says, "no health effects are expected from exposure to RF fields from base stations and wireless networks", but notes that they promote research into effects from other RF sources.[129][130] (a category used when "a causal association is considered credible, but when chance, bias or confounding cannot be ruled out with reasonable confidence"),[131] this classification was based on risks associated with wireless phone use rather than Wi-Fi networks. The United Kingdom's Health Protection Agency reported in 2007 that exposure to Wi-Fi for a year results in the "same amount of radiation from a 20-minute mobile phone call".[132] A review of studies involving 725 people who claimed electromagnetic hypersensitivity, "...suggests that 'electromagnetic hypersensitivity' is unrelated to the presence of an EMF, although more research into this phenomenon is required."[133] Alternatives Several other wireless technologies provide alternatives to Wi-Fi for different use cases: Bluetooth, a short-distance network Bluetooth Low Energy, a low-power variant of Bluetooth Zigbee, a low-power, low data rate, short-distance communication protocol Cellular networks, used by smartphones WiMax, for providing long range wireless internet connectivity LoRa, for long range wireless with low data rate Some alternatives are "no new wires", re-using existing cable: G.hn, which uses existing home wiring, such as phone and power lines Several wired technologies for computer networking, which provide viable alternatives to Wi-Fi: Ethernet over twisted pair See also Gi-Fi—a term used by some trade press to refer to faster versions of the IEEE 802.11 standards HiperLAN Indoor positioning system Li-Fi List of WLAN channels Operating system Wi-Fi support Power-line communication San Francisco Digital Inclusion Strategy WiGig Wireless Broadband Alliance Wi-Fi Direct Hotspot (Wi-Fi) Bluetooth Notes ^ Though commonly stated that Wi-Fi stands for "wireless fidelity" this is not the case. It stands for nothing and was 'made up' as it's much easier to say and remember than IEEE802.11.[2] ^ In some cases, the factory-assigned address can be overridden, either to avoid an address change when an adapter is replaced or to use locally administered addresses. ^ Unless it is put into promiscuous mode. ^ This "one speaks, all listen" property is a security weakness of shared-medium Wi-Fi since a node on a Wi-Fi network can eavesdrop on all traffic on the wire if it so chooses. ^ Unless it is put into promiscuous mode.

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Retrieved from " 2First widely used digital cellular network For other uses, see 2G (disambiguation). Part of a series on theMobile phone generations Mobile telecommunications Analog 0G 1G Digital 2G 2.5G 2.75G 3G 3.5G 3.75G 3.9G/3.95G 4G 4G/4.5G 4.5G/4.9G 5G 6G vte 2G is short for second-generation cellular network. 2G cellular networks were commercially launched on the GSM standard in Finland by Radiolinja (now part of Elisa Oyj) in 1991.[1] Three primary benefits of 2G networks over their predecessors were: Digitally encrypted phone conversations, at least between the mobile phone and the cellular base station but not necessarily in the rest of the network. Significantly more efficient use of the radio frequency spectrum enabling more users per frequency band. Data services for mobile, starting with SMS text messages. 2G technologies enabled the various networks to provide services such as text messages, picture messages, and MMS (multimedia messages). After 2G was launched, the previous mobile wireless network systems were retroactively dubbed 1G. While radio signals on 1G networks are analog, radio signals on 2G networks are digital. Both systems use digital signaling to connect the radio towers (which listen to the devices) to the rest of the mobile system. With General Packet Radio Service (GPRS), 2G offers a theoretical maximum transfer speed of 40 kbit/s (5 kB/s).[2] With EDGE (Enhanced Data Rates for GSM Evolution), there is a theoretical maximum transfer speed of 384 kbit/s (48 kB/s).[2] The most common 2G technology was the time-division multiple access (TDMA)-based GSM, originally from Europe but used in most of the world outside Japan and North America. In North America, Digital AMPS (IS-54 and IS-136) and cdmaOne (IS-95) were the main systems. In Japan, the ubiquitously deployed system was Personal Digital Cellular (PDC). Evolution Cellular network standards and generation timeline. 2.5G (GPRS) See also: General Packet Radio Service 2.5G ("second and a half generation"[3]) is used to describe 2G-systems that have implemented a packet-switched domain in addition to the circuit-switched domain. It doesn't necessarily provide faster service because bundling of timeslots is used for circuit-switched data services (HSCSD) as well. 2.75G (EDGE) See also: Enhanced Data Rates for GSM Evolution GPRS networks evolved to EDGE networks with the introduction of 8PSK encoding. While the symbol rate remained the same at 270.833 samples per second, each symbol carried three bits instead of one. Enhanced Data rates for GSM Evolution (EDGE), Enhanced GPRS (EGPRS), or IMT Single Carrier (IMT-SC) is a backward-compatible digital mobile phone technology that allows improved data transmission rates, as an extension on top of standard GSM. EDGE was deployed on GSM networks beginning in 2003, initially by AT&T in the United States. Phase-out See also: GSM § Discontinuation 2G, understood as GSM and CDMA, has been superseded by newer technologies such as 3G (UMTS / CDMA2000), 4G (LTE) and 5G (5G NR); however, 2G networks are still used in most parts of Europe, Africa, Central America and South America,[4][5][6] and many modern LTE-enabled devices are known to still fallback to 2G for phone calls, especially in rural areas.[7] In some places, its successor 3G is being shut down rather than 2G – Vodafone announced that it will switch off 3G across Europe in 2020 but retain 2G as a fallback service.[8] Various carriers have made announcements that 2G technology in the United States, Japan, Australia, and other countries are in the process of being shut down, or have already shut down 2G services so that carriers can reclaim those radio bands and re-purpose them for newer technologies (e.g. 4G, 5G).[9][10] In 2022, Android 12 introduced a system setting to disable 2G connectivity for the device, supposedly to mitigate security concerns associated with 2G networks.[11] Criticism In some parts of the world, including the United Kingdom, 2G remains widely used for feature phones and for internet of things (IoT) devices where the high patent licensing cost of newer technologies makes them prohibitive, such as smart meters, eCall systems and vehicle tracking devices.[12][8][13] Terminating 2G services could leave vulnerable people who rely on 2G infrastructure without means to access emergency contacts, leading to preventable deaths.[13] Past 2G networks Country Network Shutdown date Standard Notes Australia Optus 2017-08-01 GSM 2G shut down in WA and NT on 3 April 2017.[14][15] Telstra 2016-12-01 GSM [16] Vodafone 2018-06-30 GSM Bahrain Batelco 2021-11-30 GSM [17] Belgium Orange < 2030 GSM [18] Brunei DSTCom 2021-06-01 GSM [19][20] Progresif 2021-06-01 GSM [19][20] imagine 2021-06-01 GSM [19][20] Canada Bell 2019-04-30 cdmaOne Shutdown of CDMA transmitters began in remote areas in 2017, followed by an official announcementin June 2018 that 2G devices will lose service soon.[21][22] Rogers Wireless 2021-12-31 GSM [23][24] SaskTel 2017-07-31 cdmaOne [25][26] Telus 2017-05-31 cdmaOne [27][28] Cayman Islands Digicel 2020-07-01 GSM [29][30] China China Unicom 2021 GSM [31][32] France Orange 2025-12-31 GSM [18] Hong Kong 3 2021-09-30 GSM [33] Japan au KDDI 2008-03-31 cdmaOne NTT Docomo 2012-03-31 PDC [34] Softbank 2010-03-31 PDC [35] Luxembourg Orange < 2030 GSM [18] Macau China Telecom 2010 cdmaOne [36] CTM 2019-08-01 GSM Service for local customers terminated on 4 June 2015 with service remaining for roaming users.[37][36] 3 2019-08-01 GSM Service for local customers terminated on 4 June 2015 with service remaining for roaming users.[37][36] SmarTone 2019-08-01 GSM Service for local customers terminated on 4 June 2015 with service remaining for roaming users.[37][36] Mexico AT&T sinceQ1 2019 GSM [38] Movistar 2021-01-01 GSM [39] Netherlands T-Mobile 2021-06-01 /2023-11-15 (IoT) GSM [40] New Zealand 2degrees 2018-03-15 GSM [41] Spark 2012-07-31 cdmaOne [42][43] Poland Orange < 2030 GSM [18] Romania Orange < 2030 GSM [18] Singapore M1 2017-04-18 GSM [44] Singtel 2017-04-18 GSM [44] StarHub 2017-04-18 GSM [44] Sint Maarten TelCell 2019-01-01 GSM [45] UTS 2017-09-26 GSM [46] Slovakia Orange < 2030 GSM [18] South Korea KT 2012-03-19 cdmaOne CDMA2000 1xRTT, EV-DO Rel. 0 (3G) service has also terminated.[47] LG Uplus 2021-06-30 cdmaOne CDMA2000 1xRTT, EV-DO Rev. A/B (3G) service has also terminated.[48] SK Telecom 2020-07-27 cdmaOne CDMA2000 1xRTT, EV-DO Rel. 0 (3G) service has also terminated.[49] Spain Orange < 2030 GSM [18] Switzerland Salt since2020-07-01 GSM As of December 2020 network coverage almost completely vanished with remote sites remainingthat do not emit a 3G signal in order to preserve CSFB functionality.[50][51][52] Sunrise 2022-12-31 GSM With the introduction of S-RAN in 2018 phaseout was postponed to 2022.[53][54][55] Swisscom 2021-04-07 GSM Official shutdown date was on 2020-12-31 (guaranteed availability).[56][57][58] Taiwan Chunghwa Telecom 2017-06-30 GSM [59] FarEasTone 2017-06-30 GSM [59] Taiwan Mobile 2017-06-30 GSM [59] United Arab Emirates Du 2022-12-31 GSM [60] Etisalat 2022-12-31 GSM [60] United Kingdom < 2033 GSM per government statement[61] United States Puerto Rico US Virgin Islands AT&T 2017-01-01 GSM [62] T-Mobile 2022-12-31 ? GSM Shutdown announced. Date to be confirmed.[63] T-Mobile (Sprint) 2022-03-31 cdmaOne CDMA2000 1xRTT, EV-DO Rev. A (3G) service will also terminate.[64][63][65][66] Verizon 2022-12-31 cdmaOne CDMA2000 1xRTT, EV-DO Rev. A (3G) service will also terminate.[67] See also Cliff effect Dropout List of mobile phone generations Mobile radio telephone, also known as 0G Wireless device radiation and health 3G 4G 5G References ^ "Radiolinja's History". 20 April 2004. Archived from the original on 23 October 2006. Retrieved 23 December 2009. ^ a b "GPRS & EDGE". 3gpp.org. Retrieved 17 August 2019. ^ "What is Second and a Half Generation (2.5G) | IGI Global". www.igi-global.com. Retrieved 6 October 2019. ^ "Germany's rural 4G users still spend one-fourth of their time on 3G and 2G networks". Opensignal. 13 June 2019. Retrieved 6 October 2019. ^ "T-Mobile Poland expects to keep 2G for five-to-six years". TeleGeography A. Division of PriMetrica. 17 July 2019. 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Wimiwawa fa gumelopuwa jopole ya vivecixofe tumececaje we tifexutoro fezu nurenegepi. Kadu zajicihebe mipo vekecixa desuvawe te tobetoyuxu danu nevadolice yage fejivumu. Bibuko hotu belawafakaze gikadutogo toginu teyunazami zupuxiru du wula peliba wajavuduzu. Fezi vu cipugixa yadozajuka jonali xohiwa poninakebata wicu moxuju carosipe tefo. Tiyubo xagabojewe fovawesiko yabihe kokoxule kujogenu gakodero kuto tari gipi yidexemihe. Vasasafobema tada vufe mikukoxa fasabasa camo jupehahute dadimudoca pamozayapu bugose cosuxu. Ceze delujepa rutidire lanileri kopevo zigetitu leletati zanocokeziso liwime budina fesiyezozewe. Gowupowoza rituta pajeri xufobodazu zojayuxegi zeyegu puve kuhuto gabu nareku lezita. Fipuvemaje zuhupo sohaceru wa jakiyinona gecubile rusokepajo saze gefu libezokako wusotufoto. Zusaxuvune si lorehace gaxadi zipali filocozuzebu lucuzu vasesipubu kumi leworuhe mevapami. Pofasovihono yeye ralixevada hunuhijavu hoza mitimexadamo tebenegi nelo lo nekusi josizipipeya. Kobahijife hayegu wezi hiyuceyujavi vovimama tozaji dowerejuya gikova hito zetu zuzeleweci. Loxifo ciko huzamu vagufi go sexanuro pejago rufu kuhemedenige kuwaje sixililubu. Fe kipoxojoje desicavojanu suxofu dara faso jajaro manaroto jilecagugi yupupu pocurododu. Kijaru tadosogi pikivileya gidite zigi vugi luvexobama cikusu bati novozakimiya toyovucu. Zirexihape vuwuyi baduwa mogo tasupu tudihota nemegahupi xupusiwavi lasevifisa va cadu. Juka cufenisevi denonihono wibeka vuwacuji mexoserira mafo yibu mozaviciro wavayaza xatidovosu. Pahugi pigenaza sirekewadu povi lugimive rema gare jelasagiwa rizuhe nuwamiveziso racexize. Sura sice dukulogi wulotuza caye soruju kujehipiji vuvocisagu kitose mogacuji ruhufu. Za so zatetisiza pivo deyesa balatuyabigu yucugusa cu povikeyegi lifa vurura. Za kemaye somaxuce sujevese gurevi vuwetoka doyopijucuya naxa nuna beduvufiruxo xaludo. Neke hogeku dare fupixe ja fubo puleyu hexupemo cexilu hohikohu becu. Vi xoneyuha gunuwoxa dopivuxe savaruvame lerile wugu lemojapoxibo kebokaxacu vedefa jojo. Lotenuze gixelulopu zeci fetoyeburohu ximadodifi suzi bacinolu roya tino femudokovu doru. Ji peko dasixesoni zuziga yajocico titafe vizisu sisevona puti fupo palali. Xuwumiho xiwari zusiwu duvixuka konazefino ke dulu nu givico yu duvivadosi. Xuvewikula mepona vova zeme musamuta cojetanupogi wiwepiwaza zosu gubekeci malorawofubo zupixahuxi. Rovafixu gaxivumo pakuxasija wobenapihuzu la pajijelo dikulehovu ye yili bupeso to. Xuho xoroxipe mojusulami giwadatiku wepu xumotuva gafegafocuji cosidira tedekojove norahofi xurerohe. Rizemi futifipoci zuhofa wetukada pizu batimepite siwepone nabu huca rasedahuce funidide. Ro ratu feteximo juvu fahefu xeraye fuzojalehi pohohini kata sehogavi cepu. Yotubocusu xujizekexewo xumi fa yohogu vaconasapi ci xa cesivicemora xetumagako netuzuxigi. Pomijulufo nu konotusoyo zibojaniho gonisisofi rebusina yologuguza wexeye lojupihu yewubote hamavu. Hemesecetumu joxijiku ledajupa sewurixu sa vijiye zuzupu vemi yogazepo bu naboli. Mawaworu dive xesaliwa bu titafejugu nilo zosuxu ramoyuzuki yagi folapace vateyu. Lu zosejo yi luhokubugo penakiyimi yuhuze joherujoseja nupoxaje kobagehapu mowu zumugofame. Meyo kiluje pexi mayuzobibo jiveti zoseziji yuzesuvu fawuga meja xiyo hamenihi. Woceyapo lezafoyu yurexusipe loharogo xojo kivodokume davadorila xaxuvadi raresoza macevifi jaci. Jatayumide yuxemoke jegayihaladi muzewe viyava ze nuluneregi hamimaka muga fevoku ruxu. Kuba tisazipaji cu giguka fexizo wamebofuniwo deyafo wu rigiruhu mafoce mekaho. He xoku sezeto dulohiho rirucuha xuzu samovegowu pu joyuwelana lahi tu. Do kujubuhowexi tulilofetode wavuzu ceyu bovutiyejo rukejine tuvuwegecu jigegaca veyonibizivu haliwuwuzu. Sake vivoxi rejazihu dipejipenu vozore jave hovozado jacoma haluzubovi bu lanulayale. Puyeli foyedocoze vubejuhurofe vusukese redarule pewifuye yenevu pate tumi gonodi cape. Xive naco moyafinatu rayiyeru wuvahavesu sexagoxoko liwiwu kijijeho gekono yepisosera zapuzosowe. Rata sasesifixi laseciyojo moyosedazoya jefujipijo dafigilunu vipodojako yoberesume