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Communication has been one of the most fundamental aspects of human development. It took the eccentric genius of Nikola Tesla to come up with the design of the first radio transmitter in 1891. The first transatlantic radio communication in 1901 was a sign of further things to come. Communication technologies that have been developed over the last century have largely shaped human interaction and have played a crucial role in sustaining human relationship be it social or otherwise. When Dr. Martin Cooper of Motorola came up with its first wireless cellphone in 1978, it was clear that the dynamics of wireless communication were about to change. With the advent of wireless technology, a transition from point-to-point communication toward person- to-person communication (i. e.; independent of position) had begun. The first cellular network in the world was built in 1977 in Chicago and turned on in 1978. By the end of 1978 it had over 1300 customers. In 1979 a cellular network (the 1G generation) was launched in Japan by NTT.

The first generation cellular networks, which were based on analog technology with FM modulation, had weak security and could be intercepted using scanners. Another first generation cellular telephone system (1G) is the Advanced Mobile Phone Services (AMPS). Second generation (2G) wireless systems employs digital modulation and advanced call-processing capabilities and has enhanced security. In view of the processing complexity required for these digital systems, two offered advantages are the possibility of using spectrally efficient radio transmission schemes such as Time Division Multiple Access (TDMA) or Code Division Multiple Access (CDMA), in comparison to the analog Frequency Division Multiple Access (FDMA)

schemes previously employed and the provision for implementation of a wide variety of integrated speech and data services such as paging and low data rate network access. Examples of 2G wireless systems include the Global System for Mobile communication (GSM), TDMA IS-54/IS-136 and Personal Digital Cellular (PDC).

In anticipation of the growing consumer demands, the next generation of wireless systems endeavours to provide person-to-person communication of the circuit and packet multimedia data. Third Generation (3G) wireless systems have evolved from mature 2G networks with the aim of providing universal access and global roaming. More important these systems are expected to support multi-dimensional (multi-information media, multi transmission media, and multi-layered networks) high-speed wireless communication- an important milestone toward achieving the grand vision of ubiquitous personal communications. Introduction of wide band packet-data services for wireless Internet up to 2Mbps will be the main attribute of 3G system. Mobile phones are rapidly becoming the preferred means of personal communication, creating the world's largest consumer electronics industry. The rapid and efficient deployment of new wireless data and Internet services has emerged as a critical priority for communications equipment manufacturers.

Network components that enable wireless data services are fundamental to the next-generation network infrastructure. Wireless data services are expected to see the same explosive growth in demand that Internet services and wireless voice services have seen in recent years. The number of mobile subscribers in India stands at close to 900 million and connections to the <https://assignbuster.com/3g-wireless-communication-technology-essay-sample/>

tune of 7 million continue to be added every month. In anticipation of the growing consumer demands, the next generation of wireless systems endeavours to provide person-to-person communication of the circuit and packet multimedia data. While Europe and United States have moved onto 3G and 4G, India is still reeling under the wake of the 2G scam. The recent introduction of 3G mobile services in India have however brought in enhanced data and voice transmission and are welcome signs in the improvement in mobile communication technology. The essay deals in-depth with 3G wireless technology and the difference with its successors (3. 5G and 4G) and predecessor (2G).

3G (3rd generation mobile telecommunications)

3G wireless technology represents the convergence of various 2G wireless telecommunications systems into a single global system that includes both terrestrial and satellite components. One of the most important aspects of 3G wireless technology is its ability to unify existing cellular standards, such as CDMA, GSM, and TDMA, under one umbrella. It improves the efficiency of data can be transferred through the cellular phone. The data transfer rates for third generation mobile telecommunications is up to 2 Megabits per second. Aside from this feature, 3G cellular phones also have conventional voice, fax and data services, as well as high-resolution video and multimedia services which can be used while on the move.

It also includes mobile office services such as virtual banking and online-billing, video conferencing, online entertainment and access to the Internet.

International Mobile Telecommunications-2000 (IMT-2000), better known as

3G or 3rd Generation, is a family of standards for mobile telecommunications
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defined by the International Telecommunication Union, which includes GSM EDGE, UMTS, and CDMA2000 as well as DECT and WiMAX. Services include wide-area wireless voice telephone, video calls, and wireless data, all in a mobile environment. Compared to 2G and 2.5G services, 3G allows simultaneous use of speech and data services and higher data rates (up to 14.4 Mbit/s on the downlink and 5.8 Mbit/s on the uplink with HSPA+). Thus, 3G networks enable network operators to offer users a wider range of more advanced services while achieving greater network capacity through improved spectral efficiency.

The International Telecommunication Union (ITU) defined the third generation (3G) of mobile telephony standards - IMT-2000 - to facilitate growth, increase bandwidth, and support more diverse applications. For example, GSM (the current most popular cellular phone standard) could deliver not only voice, but also circuit-switched data at download speeds up to 14.4 kbps. But to support mobile multimedia applications, 3G had to deliver packet-switched data with better spectral efficiency, at far greater speeds.

To get from 2G to 3G, mobile operators had make "evolutionary" upgrades to existing networks while simultaneously planning their "revolutionary" new mobile broadband networks. This led to the establishment of two distinct 3G families: 3GPP and 3GPP2. The 3rd Generation Partnership Project (3GPP) was formed in 1998 to foster deployment of 3G networks that descended from GSM. 3GPP technologies evolved as follows.

- General Packet Radio Service (GPRS) offered speeds up to 114 Kbps.
- Enhanced Data Rates for Global Evolution (EDGE) reached up to 384 Kbps.
- UMTS

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Wideband CDMA (WCDMA) offered downlink speeds up to 1.92 Mbps. • High Speed Downlink Packet Access (HSDPA) boosted the downlink to 14Mbps. • LTE Evolved UMTS Terrestrial Radio Access (E-UTRA) is aiming for 100 Mbps. GPRS deployments began in 2000, followed by EDGE in 2003. While these technologies are defined by IMT-2000, they are sometimes called “2.5G” because they did not offer multi-megabit data rates. EDGE has now been superseded by HSDPA (and its uplink partner HSUPA). According to the 3GPP, there were 166 HSDPA networks in 75 countries at the end of 2007. The next step for GSM operators: LTE E-UTRA, based on specifications completed in late 2008.

A second organization, the 3rd Generation Partnership Project 2 (3GPP2) — was formed to help North American and Asian operators using CDMA2000 transition to 3G. 3GPP2 technologies evolved as follows. • One Times Radio Transmission Technology (1xRTT) offered speeds up to 144 Kbps. • Evolution Data Optimized (EV-DO) increased downlink speeds up to 2.4 Mbps. • EV-DO Rev. A boosted downlink peak speed to 3.1 Mbps and reduced latency. • EV-DO Rev. B can use 2 to 15 channels, with each downlink peaking at 4.9 Mbps. • Ultra Mobile Broadband (UMB) was slated to reach 288 Mbps on the downlink. 1xRTT became available in 2002, followed by commercial EV-DO Rev. 0 in 2004.

Here again, 1xRTT is referred to as “2.5G” because it served as a transitional step to EV-DO. EV-DO standards were extended twice. Revisions A services emerged in 2006 and are now being succeeded by products that use Revision B to increase data rates by transmitting over multiple channels.

The 3GPP2's next-generation technology, UMB, may not catch on, as many <https://assignbuster.com/3g-wireless-communication-technology-essay-sample/>

CDMA operators are now planning to evolve to LTE instead. In fact, LTE and UMB are often called 4G (fourth generation) technologies because they increase downlink speeds an order of magnitude. This label is a bit premature because what constitutes “ 4G” has not yet been standardized. The ITU is currently considering candidate technologies for inclusion in the 4G IMT-Advanced standard, including LTE, UMB, and WiMAX II. Goals for 4G include data rates of least 100 Mbps, use of OFDMA transmission, and packet-switched delivery of IP-based voice, data, and streaming multimedia.

Advent of 3G

The first pre-commercial 3G network was launched by NTT DoCoMo in Japan in 1998, 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; broader availability of the system was delayed by apparent concerns over its reliability. 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 USA, telecommunication companies use W-CDMA technology with the support of around 100 terminal designs to operate 3G mobile networks.

In Europe, mass market commercial 3G services were introduced starting in March 2003 by 3 (Part of Hutchison Whampoa) in the UK and Italy. The European Union Council suggested that the 3G operators should cover 80% of the European national populations by the end of 2005.

Roll-out of 3G networks was delayed in some countries by the enormous costs of additional spectrum licensing fees. In many countries, 3G networks do not use the same radio frequencies as 2G, so mobile operators must build entirely new networks and license entirely new frequencies; an exception is the United States where carriers operate 3G service in the same frequencies as other services. 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. Other delays were due to the expenses of upgrading equipment for the new systems.

By June 2007 the 200 millionth 3G subscriber had been connected. Out of 3 billion mobile phone subscriptions worldwide this is only 6.7%. In the countries where 3G was launched first - Japan and South Korea - 3G penetration is over 70%. In Europe the leading country is Italy with a third of its subscribers migrated to 3G. Other leading countries by 3G migration include UK, Austria, Australia and Singapore at the 20% migration level.

In 2008, India entered into 3G Mobile arena with the launch of 3G enabled Mobile services by Mahanagar Telephone Nigam Limited (MTNL). MTNL is the first Mobile operator in India to launch 3G services. 3G mobile services subsequently are now being offered by Airtel, Vodafone, Idea and Reliance etc. Here is a snippet of the 3G data usage plans being offered by MTNL after 3G was launched in India for the first time.

Data rates

ITU has not provided a clear definition of the data rate users can expect from

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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 speed of 2 Mbit/s and maximum of 14.4 Mbit/s for stationary users, and 348 Kbit/s in a moving vehicle,” the ITU does not actually clearly specify minimum or average rates or what modes of the interfaces qualify as 3G, so various rates are sold as 3G intended to meet customers’ expectations of broadband speed.

Security

- * Protection against active attacks on the radio interface.
 - * New integrity mechanism added to protect critical signaling information on the radio interface
 - * Enhanced authentication protocol provides mutual authentication and freshness of cipher/integrity key towards the user
 - * Enhanced encryption
 - * Stronger algorithm, longer key
 - * Encryption terminates in the radio network controller rather than the base station
 - * Core network security
 - * Potential for secure global roaming
 - * Ensure that the resources and services provided are adequately protected against misuse or misappropriation
 - * Ensure that the security features standardised are compatible with world-wide availability
 - * Ensure that the security features are adequately standardised to ensure world-wide interoperability and roaming between different serving networks
 - * Ensure that the level of protection afforded to users and providers of services is better than that provided in contemporary
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fixed and mobile networks (including GSM) * Ensure that the implementation of 3GPP security features and mechanisms can be extended and enhanced as required by new threats and services

3G Standards

The dream of 3G is to unify the world's mobile computing devices through a single, worldwide radio transmission standard. Imagine being able to go anywhere in the world secure in the knowledge that your mobile phone is compatible with the local system, a scenario known as "global roaming". Unfortunately, the process of unifying the numerous international standards has proved to be extremely difficult. After difficult negotiation, a 3G "standard" called IMT-2000 emerged as a rather unsatisfactory compromise. IMT-2000, in fact, represents several incompatible standards lumped together under one banner. The hope of IMT-2000 is that phones using these different standards will be able to move seamlessly between all networks, thus providing global roaming. The rather fragmented nature of IMT-2000 has resulted in a proliferation of confusion acronyms (e. g., TDMA, UMTS, EDGE) often referred to as "alphabet soup". Possibly the most important acronym to remember is "UMTS": this is the 3G standard for Europe and Japan.

UMTS is the successor to the current ultra-successful GSM mobile phone standard in Europe. UMTS is being very heavily sold as the 3G standard. 3G combines high-speed mobile access with Internet Protocol (IP) based services. This doesn't just mean fast mobile connection to the World Wide Web - by liberating us from slow connections, cumbersome equipment and

immovable access points, 3G will enable new ways to communicate, access information, conduct business and learn.

3G Standards

International Telecommunications Unit (ITU): IMT-2000 consists of five radio interfaces:

- * W-CDMA
- * CDMA2000
- * CDMA2001
- * TD-CDMA / TD-SCDMA
- * UWC-136

WCDMA - Wideband Code Division Multiple Access: A technology for wideband digital radio communications of Internet, multimedia, video and other capacity- demanding applications. WCDMA has been selected for the third generation of mobile telephone systems in Europe, Japan and the United States. Voice, images, data, and video are first converted to a narrowband digital radio signal. The signal is assigned a marker (spreading code) to distinguish it from the signal of other users. WCDMA uses variable rate techniques in digital processing and it can achieve multi-rate transmissions. WCDMA has been adopted as a standard by the ITU under the name IMT-2000 direct spread.

CDMA 2000 - Code Division Multiple Access 2000: Commercially introduced in 1995, CDMA quickly became one of the world's fastest-growing wireless technologies. In 1999, the International Telecommunications Union selected CDMA as the industry standard for new " third-generation" (3G) wireless

systems. Many leading wireless carriers are now building or upgrading to 3G CDMA networks in order to provide more capacity for voice traffic, along with high-speed data capabilities. Today, over 100 million consumers worldwide rely on CDMA for clear, reliable voice communications and leading-edge data services.

CDMA 20001X for Voice and Data: CDMA2000 1X technology supports both voice and data services over a standard (1X) CDMA channel, and provides many performance advantages over other technologies. First, it provides up to twice the capacity of earlier CDMA systems (with even bigger gains over TDMA and GSM), helping to accommodate the continuing growth of voice services as well as new wireless Internet services. Second, it provides peak data rates of up to 153 kbps (and up to 307 kbps in the future), without sacrificing voice capacity for data capabilities. CDMA2000 1X phones also feature longer standby times. And because it's backwards-compatible with earlier CDMA technology, CDMA2000 1X provides an easy and affordable upgrade path for both carriers and consumers.

CDMA 20001xEV- DO for Faster Data: For those who want higher-speed or higher capacity data services, a data-optimized version of CDMA2000 called 1xEV-DO provides peak rates of over 2 Mbps, with an average throughput of over 700 kbps comparable to wire line DSL services and fast enough to support even demanding applications such as streaming video and large file downloads. CDMA2000 1xEV-DO also delivers data for the lowest cost per megabyte, an increasingly important factor as wireless Internet use grows in popularity. 1xEV-DO devices will provide "always-on" packet data

connections, helping to make wireless access simpler, faster and more useful than ever.

UMTS - Universal Mobile Telecommunications System:

The name for the third generation mobile telephone standard in Europe, standardized by ETSI. UMTS offers tele-services (like speech or SMS) and bearer services, which provide the capability for information transfer between access points. It is possible to negotiate and renegotiate the characteristics of a bearer service at session or connection establishment and during on-going session or connection. Both connection-oriented and connectionless services are offered for Point-to-Point and Point-to-Multipoint communication. EDGE - Enhanced Data for Global Evolution:

A technology that gives GSM the capacity to handle services for the third generation of mobile telephony. EDGE was developed to enable the transmission of large amounts of data at a high speed, 384 kilobits per second. EDGE uses the same TDMA (Time Division Multiple Access) frame structure, logic channel and 200 kHz carrier bandwidth as today's GSM networks, which allows existing cell plans to remain intact.

Network Architecture:

Features of 3G:

The most significant features offered by third generation (3G) mobile technologies are the momentous capacity and broadband capabilities to support greater numbers of voice and data customers - especially in urban centres - plus higher data rates at lower incremental cost than 2G. 3G uses 5

MHz channel carrier width to deliver significantly higher data rates and <https://assignbuster.com/3g-wireless-communication-technology-essay-sample/>

increased capacity compared with 2G networks. The 5 MHz channel carrier provides optimum use of radio resources for operators who have been granted large, contiguous blocks of spectrum. On the other hand, it also helps to reduce the cost to 3G networks while being capable of providing extremely high-speed data transmission to users. It also allows the transmission of 384kbps for mobile systems and 2Mbps for stationary systems. 3G users are expected to have greater capacity and improved spectrum efficiency, which will allow them to access global roaming between different 3G networks. The main characteristics of 3G are to provide mobile multimedia services at transmission rate of 144kbps at the high speed 384kbps at the speed of walking 2Mbps indoors. This theoretical maximum (2Mbps) is close to the speed of LAN connections that many households nowadays have. In addition, 3G networks can offer faster data transmission than the slowest.

Benefits of 3G

Packet-based data provides several advantages over the existing circuit-switched techniques used for carrying mobile voice. It allows higher call volumes and support for multimedia data applications, such as video and photography. Users will be charged on how much data they transmit, not on how much time they are connected to the network, because with 3G you are constantly online and only pay for the information you receive.

Evolution of Wireless Communication Technologies

Evolution from 2G to 2.5G

In the 2G and 2.5G mobile, several technological developments have been introduced to increase the capacity bandwidth of the networks and to enable

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provision of new services in these platforms. Standard bandwidth for data services in GSM networks is 9.6 Kbps per time slot. However, many providers offer 14.4 Kbps per time slot using more efficient modulation technologies. To increase the available capacity at the end user's site in GSM networks, two approaches are used: * Deployment of several time slots. This is called HSCSD (High Speed Circuit Switched Data). * Deployment of packet oriented IP based technologies like GPRS and EDGE. When using HSCSD technology, a maximum capacity of 38.4 Kbps will be achieved if 9.6 Kbps per time slot is used (and 57.6 Kbps in the case of 14.4 Kbps per time slot). In both cases, the assumption is that all 8 time slots are used: 4 time slots for uplink and 4 for downlink. GPRS, on the other hand, is packet-based and is optimized for IP traffic. In GPRS, the capacity per time slot depends on the deployed technology: * CS1: 9.05 Kbps per time slot

* CS2: 13.4 Kbps per time slot

* CS3: 15.6 Kbps per time slot

* CS4: 21.4 Kbps per time slot.

In theory, using 8 time slots and CS4 technology, a maximum capacity of 171.3 Kbps can be achieved.

EDGE can be seen as a technology with the same characteristics as GPRS, but with more efficient modulation techniques and, consequently, higher capacities per time slot. Theoretically, it is possible to achieve 59 Kbps per time slot, providing a maximum capacity of 472 Kbps. The capacity will depend on the deployed technology (MsC1 to MsC9), and a maximum capacity per time slot of 48 Kbps is considered realistic in mature EDGE networks giving a maximum overall capacity of 384 Kbps.

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One important issue here is that even though GPRS and EDGE are capable of offering high bandwidth connectivity to the end users, the amount of frequency resources in the GSM network is far below the resources necessary to cope with the ever increasing demand of the end users for data services.

The technological evolution path towards 3G networks and the standards that will be deployed in different markets depend primarily on the current 2G markets. The natural consequence of this has been the definition of a variety of variants of IMT-2000 standard, which can be chosen by different operators based on parameters like reusability, interoperability, etc.

Mobile telephones have been a tremendous success story. Although GSM was originally conceived as a pan-European system there are now over 400 operators in 157 countries worldwide. Since the launch of the first GSM systems in the early nineties, customer numbers have grown very quickly resulting in today's highly competitive mass market. In particular, the more recent development of 'pre-pay' packages has been very successful in attracting new customers. For many mobile operators more than 50% of their customers use pre-pay. At present, GSM use is dominated by voice services, although there has been a great increase in uses for the short message service (SMS), a text-based messaging system. GSM provides a 'circuits witched' data service similar to PSTN dial-up data services. The nominal GSM data rate is 9.6 Kbit/s. In recent years, a new coding scheme has been approved that takes this data rate to 14.4 Kbit/s although not all operators will adopt this. However, these data rates do not provide high speed access to services such as e-mail and the World Wide Web (WWW).

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Also, the use of 'circuit-switched' connections, where the channel is dedicated to one user, is not the most efficient way of carrying the 'bursty' traffic of these types of services that are accessed over the Internet.

Evolution from 2.5G to 3G

GPRS networks evolved to EDGE networks with the introduction of 8PSK encoding. 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 can be considered a 3G radio technology and is part of ITU's 3G definition, but is most frequently referred to as 2.75G. EDGE was deployed on GSM networks beginning in 2003—initially by Cingular (now AT&T) in the United States.

EDGE is standardized by 3GPP as part of the GSM family, and it is an upgrade that provides a potential three-fold increase in capacity of GSM/GPRS networks. The specification achieves higher data-rates by switching to more sophisticated methods of coding (8PSK), within existing GSM timeslots.

Evolution towards 4G

Both 3GPP and 3GPP2 are currently working on further extensions to 3G standards, named Long Term Evolution and Ultra Mobile Broadband, respectively. Being 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 speed requirements for 4G (which is 1 Gbit/s for stationary and 100 Mbit/s for mobile operation), these standards are

classified as 3.9G or Pre-4G. 3GPP is currently standardizing LTE Advanced as future 4G standard. A first set of 3GPP requirements on LTE Advanced has been approved in June 2008. The working groups are currently evaluating various proposals for standardization. LTE Advanced will be standardized as part of the Release 10 of the 3GPP specification.

3G APPLICATIONS

There are several applications that will be enabled by the broadband wireless communication channels that will come with 3G. These applications include:

AUDIO

Audio or video over the Internet is downloaded (transferred, stored and played) or streamed (played as it is being sent but not stored). The different compression algorithms such as MP3 can be used. With 3G, MP3 files will be downloadable over the air directly to the phone via a dedicated server. The large computational power available in the 3G phones helps the decoding of MP3 formats.

VOICE OVER INTERNET PROTOCOL

Another audio application for 3G is Voice over IP (VoIP) - the ability to route telephone calls over the Internet to provide voice telephone service at local call rates to anywhere in the world. With the higher data rates supported by 3G, VoIP will be available on mobile phones.

STILL IMAGES

Still images such as photographs, pictures, letters, postcards, greeting cards,

presentations and static web pages can be send and received over mobile networks just as they are across an IP based network.

MOVING IMAGES

Sending moving images in a mobile environment has several vertical market applications including monitoring parking lots or building sites for intruders or thieves, sending images of a patient from an ambulance to a hospital, mobile video conferencing applications etc.

VIRTUAL HOME ENVIRONMENT (VHE)

A Universal Mobile Telecommunications Services (UMTS) service that is often mentioned in the vendor's brochures is so called Virtual Home Environment, a service that simply lets customers have seamless access with a common look and feel to their services from home, office or on the move in any city as if they were at home. VHE is therefore aimed at roamers, a small subset of mobile phone users. VHE could also allow some other useful services by placing their Universal Identity Module into any terminal and those terminals could be other than mobile devices (if smart cards are more widely supported than they are today).

ELECTRONIC AGENTS

Electronic agents are supposed to play an important role for mobile working in the future - as agents are dispatched to carry out searches and tasks on the Internet and report back to their owners. This is an efficient way to get things done on the move. Electronic agents are defined as " mobile programs that go to places in the network to carry out their owner's instructions". Agents are self-contained programs that roam communication

networks, delivering and receiving messages or looking for information or services. Certainly, 3G terminals will give their owners much more control over their lives than today's mobile phones. They will be e-assistance, e-secretaries, e-advisors, e-administrators etc. This kind of control is what home automation applications anticipate.

DOWNLOADING SOFTWARE

In the 21st century, software will increasingly be downloaded electronically from the Internet rather than purchased as boxed products in stores. This is like file transfer applications that involve downloading the software itself. We might, for example need WinZip or adobe acrobat to read a file and can download that over the 3G network to a 3G terminal. Additionally Application Service Provision (ASP) market in which software platforms and server software is being hosted by third parties and accessed by client software mimics this thin client world in which the bandwidth is high enough for applications and files to be retrieved from the Internet on the fly whenever they are needed.

Issues surrounding 3G

Although 3G was successfully introduced to users across the world, some issues are debated by 3G providers and users: * Expensive input fees for the 3G service licenses in some jurisdictions * Differences in licensing terms between states

* Level of debt incurred by some telecommunication companies, which makes investment in 3G difficult

* Lack of state support for financially troubled operators

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- * Cost of 3G phones
- * Lack of coverage in some areas
- * High prices for 3G in some countries
- * Demand for high speed services in a hand-held device
- * Battery life of 3G phones

Conclusion

3G network is one of the leading technologies in today's wireless technology. It is an exciting new technology that is being incorporated into mobile devices across the globe. Users are now able to make person-to-person calls, download data and do a variety of other tasks they never imagined possible all via their 3G cell phones. With 3G you can do everything you do now, but you can do it much better, a lot faster and from almost anywhere! Some of the main advantages are that 3G allows for higher call volumes and supports multimedia data applications such as video, email, SMS, games etc. A great deal of potential exists for new applications in the future as 3G packet based networks will allow users to be on line all the time. The capabilities of wireless networks in terms of bandwidth and other drawbacks must still, however, be improved upon. While many of the developed nations are now 4G capable, 3G presents an array of opportunities for the developing world. A faster adoption of 3G services would prove to be extremely beneficial for India as it will allow for a greater amount of information dissemination in lesser time! A significant research for 5G is already being done and would completely change the dynamics of the communication industry.

With the recent technological breakthroughs in digital signal processing, RF and battery technologies as well as developments in modern VLSI chip designs, the dream of ubiquitous communication between anyone, anywhere, at any time is becoming a reality. To cut it short, we can say that the wireless information super highway is converging to 3G and during the coming decade we will see how 3G and successive wireless communication technology will make the other wireless communication methods obsolete.