**ABSTRACT**

The mobile population is increasing day by day and to meet the ever-increasing demand of the mobile users is not a simple task. A grueling research in various fields of science has already begun in various parts of the globe to find a new and innovative means of mobile communication, which must completely satisfy the mobile users. Modern day mobile phones come with rich multimedia support and various facilities that make our lives exciting and easy. Keeping this important point under consideration this report has been framed on the various facilities and services provided by the latest trends in mobile communication, enabling users to view and share rich multimedia content on mobile devices

The report starts with a brief introduction of multimedia and mobile multimedia. Then there is a brief discussion on the various generations of mobile networks. The various elements that make up the multimedia rich mobile communications are discussed next. There is a brief discussion of the protocols used in multimedia based mobile communication. It also contains information about the multimedia services available right now. Advantages and Disadvantages are discussed next. Its future scope: Rich Communication Suite is briefly introduced. The report ends with a suitable conclusion, discussing about the various upcoming challenges of the multimedia based communication industry

**KEYWORDS**

Media, Mobile Multimedia, GSM, GPRS, EDGE, CDMA, SMS, MMS, WCDMA, UMTS, IPTV, Streaming, IP Multimedia Subsystems, Rich Communication Suite

**INTRODUCTION**

In communications, **media** (singular **medium**) are the [storage](http://en.wikipedia.org/wiki/Data_storage_device) and [transmission](http://en.wikipedia.org/wiki/Data_transmission) channels or tools used to [store](http://en.wikipedia.org/wiki/Recording) and deliver [information](http://en.wikipedia.org/wiki/Information) or [data](http://en.wikipedia.org/wiki/Data).[1] It is the form and technology used to communicate information.[2] In general, "media" refers to various means of communication. For example, television, radio, and the newspaper are different types of media. The term can also be used as a collective noun for the press or news reporting agencies. In the computer world, "media" is also used as a collective noun, but refers to different types of data storage options.[3] Multimedia is the integration of multiple forms of media. This includes text, graphics, audio, video, etc. For example, a presentation involving audio and video clips would be considered a "multimedia presentation".[4] Mobile multimedia is defined as a set of protocols and standards for multimedia information exchange over wireless networks. Mobile multimedia is one of the mainstream systems for the next generation mobile communications, featuring large voice capacity, multimedia applications and high-speed mobile data services.[5] It is one of the mainstream systems for the next generation mobile communications and includes various applications like voice capacity, multimedia applications and high-speed mobile data services.

The need for communications to be mobile is explained in three ways:

* **User mobility:** The user is forced to move from one location to location during fulfilling his activities.
* **Device mobility:** User activities require a device to fulfill his needs regardless of the location in a mobile environment.
* **Service mobility:** The service itself is mobile and can be used in different systems and move seamlessly among those systems.[5]

Multimedia rich mobile communications finds a wide variety of applications in our daily lives. With various available services in mobile communication, sharing of data has become much easier. Accessing information has never been easier. The mobile service providers now give access to internet, voice messaging, video calls, MMS and much more in a mobile environment.

**LITERATURE SURVEY**

From the early analog mobile generation (1G) to the last deployed Third Generation (3G) the paradigm has changed. The new mobile generation not only tries to improve the quality of voice communications, but also tries to give the user access to a new global communication reality. The aim is to reach communication ubiquity (anytime, anywhere) and to provide users with a new set of services.

The first generation of systems for mobile telephony was analog, circuit switched, and it only carried voice traffic. The analog phones used in 1G were less secure and prone to interference where the signal is weak. Analog systems include AMPS, NMT and ETACS.

The second-generation phones cover all speech into digital code, resulting in a clear signal that can be encrypted for security. Most also include some kind of messaging, as well as support for Centrex style services such as voice mail and caller ID. The most popular is GSM (Global System for Mobile Communications), but several others are used around the world. They can send data, but usually at less than 10 kilobits per second (Kbps); by comparisons, most modems achieve a real speed of atleast 30 Kbps. 2G networks include GSM, D-AMPS (TDMA) and CDMA. 2G networks can support SMS applications.

The successor of the 2G technology is the 2.5G. 2.5 G supports higher data speeds. The term 2.5G also applies to technology such as WAP (Wireless Application Protocol), which uses a version of the web to fit into a mobile phone’s slow data rate and small screen. 2.5G networks include EDGE (Enhanced Data Rates) and GPRS (General Packet Radio Service). These networks support WAP, MMS, SMS mobile games, and search and directory. Though MMS was introduced in the 2.5G, it really gained its momentum and fame only with the introduction of 3G.

The present hype is around the Third Generation (3G) phones, which is expected to play a very important role until at least 2010. 3G systems will provide a variety of advanced services, including data transfer at up to 2 megabits per second (Mbps). 3G will support multimedia applications such as full-motion video, video conferencing and Internet access. 3G will cover bot only the connection between a mobile terminal and its base station, called the WAN (Wireless Area Network), but also the LAN (Local Area Network). 3G is a generic term covering a range of future wireless network technologies, including WCDMA (Wideband Code Division Multiple Access), CDMA2000 (Code Division Multiple Access), UMTS (Universal Mobile Telecommunications Service) and EDGE.

Fourth generation wireless system is a packet switched wireless system with wide area coverage and high throughput. It is designed to be cost effective and to provide high spectral efficiency. The 4g wireless uses Orthogonal Frequency Division Multiplexing (OFDM), Ultra Wide Radio Band (UWB), and Millimeter wireless. Data rate of 20mbps is employed. Mobile speed will be up to 200km/hr. The high performance is achieved by the use of long term channel prediction, in both time and frequency, scheduling among users and smart antennas combined with adaptive modulation and power control. Frequency band is 2-8 GHz. it gives the ability for worldwide roaming to access cell anywhere.[8] Fourth Generation networks are already in the labs, targeted for deployment beginning in 2010. They will provide data rates up to 100 Mbps, enough for tele-presence. This is a type of virtual reality, defined as full stimulation of all senses required to provide the illusion of actually being somewhere else – an illusion that cannot be distinguished from the real thing.[6][7][8]

**ELEMENTS OF MULTIMEDIA RICH MOBILE COMMUNICATION**

The following are the various elements that contribute to Multimedia Rich Mobile Communication:-

**Voice and Video:** Voice calls and voice recognition systems are one of the elements. When a user cannot complete a call due to some reasons, the voice call service gives him a chance to leave a message, which can be retrieved at a later time. Voice over Internet Protocol (Voice over IP, VoIP) is one of a family of internet technologies, [communication protocols](http://en.wikipedia.org/wiki/Communication_protocol), and transmission technologies for delivery of [voice communications](http://en.wikipedia.org/wiki/Voice_communication) and [multimedia](http://en.wikipedia.org/wiki/Multimedia) sessions over [Internet Protocol](http://en.wikipedia.org/wiki/Internet_Protocol) (IP) networks, such as the [Internet](http://en.wikipedia.org/wiki/Internet).[9] Voice and video calls can be carried out across the Internet giving us ease in communication.

**Messaging:** Messaging service is not limited to text messaging only. **Multimedia Messaging Service**, or **MMS**, is a standard way to send messages that include [multimedia](http://en.wikipedia.org/wiki/Multimedia) content to and from [mobile phones](http://en.wikipedia.org/wiki/Mobile_phone). It extends the core [SMS](http://en.wikipedia.org/wiki/SMS) (Short Message Service) capability that allowed exchange of text messages only up to 160 characters in length. The most popular use is to send photographs from [camera-equipped handsets](http://en.wikipedia.org/wiki/Camera_phone), although it is also popular as a method of delivering news and entertainment content including videos, pictures, text pages and [ringtones](http://en.wikipedia.org/wiki/Ringtone). **Enhanced Messaging Service** (**EMS**), is a cross-industry collaboration between [Samsung](http://en.wikipedia.org/wiki/Samsung), [Ericsson](http://en.wikipedia.org/wiki/Ericsson), [Motorola](http://en.wikipedia.org/wiki/Motorola), [Siemens](http://en.wikipedia.org/wiki/Siemens_AG) and [Alcatel](http://en.wikipedia.org/wiki/Alcatel), among others. It is an application-level extension to [Short Message Service](http://en.wikipedia.org/wiki/Short_message_service) (SMS) for [cellular phones](http://en.wikipedia.org/wiki/Cellular_phone) available on [GSM](http://en.wikipedia.org/wiki/GSM), [TDMA](http://en.wikipedia.org/wiki/Time_division_multiple_access) and [CDMA](http://en.wikipedia.org/wiki/CDMA) networks. EMS is an intermediate technology, between SMS and [MMS](http://en.wikipedia.org/wiki/Multimedia_Messaging_Service), providing some of the features of MMS. EMS is a technology that is designed to work with existing networks, but may ultimately be made obsolete by MMS. An EMS enabled mobile phone can send and receive messages that have special text formatting (such as bold or italic), animations, pictures, icons, sound effects and special ring tones. EMS messages that are sent to devices that do not support it will be displayed as SMS messages, though they may be unreadable due to the presence of additional data that cannot be rendered by the device. In some countries, EMS messages cannot generally be sent between subscribers of different mobile phone carriers, as they will frequently be dropped by the inter-carrier network or by the receiving carrier. However, in other countries, such as the UK, inter-carrier interoperability is generally achieved.[10][11]

**Switched data:** Data switching is done in two forms – Circuit Switching and Packet Switching

**Circuit Switched Data** (**CSD**) is the original form of [data](http://en.wikipedia.org/wiki/Data) transmission developed for the [time division multiple access](http://en.wikipedia.org/wiki/Time_division_multiple_access) (TDMA)-based [mobile phone](http://en.wikipedia.org/wiki/Mobile_phone) systems like [Global System for Mobile Communications](http://en.wikipedia.org/wiki/Global_System_for_Mobile_Communications) (GSM). CSD uses a single radio [time slot](http://en.wikipedia.org/wiki/Time_slot) to deliver 9.6 [kbit/s](http://en.wikipedia.org/wiki/Kilobits_per_second) data transmission to the GSM [Network and Switching Subsystem](http://en.wikipedia.org/wiki/Network_and_Switching_Subsystem) where it could be connected through the equivalent of a normal [modem](http://en.wikipedia.org/wiki/Modem) to the [Public Switched Telephone Network](http://en.wikipedia.org/wiki/Public_Switched_Telephone_Network) (PSTN) allowing direct calls to any [dial-up](http://en.wikipedia.org/wiki/Dial-up) service.[12]

**High-speed circuit-switched data** (HSCSD), is an enhancement to [Circuit Switched Data](http://en.wikipedia.org/wiki/Circuit_Switched_Data) (CSD), the original data transmission mechanism of the [GSM](http://en.wikipedia.org/wiki/GSM) [mobile phone](http://en.wikipedia.org/wiki/Mobile_phone) system, four times faster than GSM, with data rates **up to 38.4 kbit/s**.

Channel allocation is done in [circuit-switched](http://en.wikipedia.org/wiki/Circuit_switching) mode, as with CSD. Higher speeds are achieved as a result of superior coding methods, and the ability to use multiple [time slots](http://en.wikipedia.org/wiki/Time_slot) to increase data throughput.[13]

**Packet switching** is a digital networking communications method that groups all transmitted data – regardless of content, type, or structure – into suitably-sized blocks, called [*packets*](http://en.wikipedia.org/wiki/Network_packet). Packet switching features delivery of variable-bit-rate data streams (sequences of packets) over a shared network. When traversing network adapters, switches, routers and other [network nodes](http://en.wikipedia.org/wiki/Network_node), packets are buffered and queued, resulting in variable delay and throughput depending on the traffic load in the network.

Packet switching contrasts with [circuit switching](http://en.wikipedia.org/wiki/Circuit_switching), a method which sets up a limited number of dedicated connections of constant bit rate and constant delay between nodes for exclusive use during the communication session. In case of traffic fees, for example in cellular communication, circuit switching is characterized by a fee per time unit of connection time, even when no data is transferred, while packet switching is characterized by a fee per unit of information.[14]

**Medium and High Multimedia:** Web surfing, Gaming, Video-Conferencing

Surfing the internet on mobile phones is becoming more and more common. Mobile phones usually connect to the internet via two different methods: Over a mobile phone operator's network, such as EDGE or HDSPA, or over local Wi-Fi (wireless internet), like the wireless internet connection you may have at home.

When it comes to mobile networks, there are different speeds available. GPRS (128kb/s) is the slowest, and EDGE (236kb/s) is the next step up. 3G (third generation) refers to a collection of different networks, which offer even faster speeds (384kb/s), letting you download a 3MB file (one song) in about a minute. HSDPA (sometimes dubbed '3.5G') is even quicker - up to 14.4Mb/s - though networks tend to offer 3.6Mbps, which can download a song in 8.3 seconds. Some mobile operators are already talking about 4G connection speeds, a term which often includes WiMax and LTE networks. LTE networks are currently being tested across the UK, with speeds reportedly reaching 150mb/s, but none are commercially accessible yet.[15] Another way to access the Internet from mobile phone is through a wireless network router.

A **mobile game** is a [video game](http://en.wikipedia.org/wiki/Video_game) played on a [mobile phone](http://en.wikipedia.org/wiki/Mobile_phone), [smartphone](http://en.wikipedia.org/wiki/Smartphone), [PDA](http://en.wikipedia.org/wiki/Personal_digital_assistant), [handheld computer](http://en.wikipedia.org/wiki/Handheld_computer) or [portable media player](http://en.wikipedia.org/wiki/Portable_media_player). This does not include games played on [handheld video game](http://en.wikipedia.org/wiki/Handheld_video_game) systems such as [Nintendo DS](http://en.wikipedia.org/wiki/Nintendo_DS) or [PlayStation Portable](http://en.wikipedia.org/wiki/PlayStation_Portable). Mobile games are played using the technologies present on the device itself. For [networked games](http://en.wikipedia.org/wiki/Networked_games), there are various technologies in common use. Examples include text message (SMS), multimedia message (MMS) or GPS location identification. However, there are non-networked applications that simply use the device platform to run the game software. The games may be installed [over the air](http://en.wikipedia.org/wiki/Over-the-air_programming), they may be [side loaded](http://en.wikipedia.org/wiki/Side_load) onto the handset with a cable, or they may be [embedded](http://en.wikipedia.org/wiki/Embedded_system) on the handheld devices by the [OEM](http://en.wikipedia.org/wiki/OEM) or by the mobile operator. Mobile games are usually downloaded via the mobile operator's radio network, but in some cases are also loaded into the mobile handsets when purchased, via infrared connection, [Bluetooth](http://en.wikipedia.org/wiki/Bluetooth), or memory card.[16]

A **videoconference** or **video-conference** is a set of interactive [telecommunication](http://en.wikipedia.org/wiki/Telecommunication) [technologies](http://en.wikipedia.org/wiki/Technology) which allow two or more locations to interact via two-way video and audio transmissions simultaneously. It has also been called 'visual collaboration' and is a type of [groupware](http://en.wikipedia.org/wiki/Groupware).

For example, a point-to-point (two-person) video conferencing [system](http://www.webopedia.com/TERM/S/system.html) works much like a video telephone. Each participant has a video camera, microphone, and speakers mounted on his or her computer. As the two participants speak to one another, their voices are carried over the network and delivered to the other's speakers, and whatever images appear in front of the video camera appear in a [window](http://www.webopedia.com/TERM/W/window.html) on the other participant's [monitor](http://www.webopedia.com/TERM/M/monitor.html).

Multipoint videoconferencing allows three or more participants to sit in a [virtual](http://www.webopedia.com/TERM/V/virtual.html) conference room and communicate as if they were sitting right next to each other. Until the mid-90s, the [hardware](http://www.webopedia.com/TERM/H/hardware.html) costs made videoconferencing prohibitively expensive for most organizations, but that situation is changing rapidly. Many analysts believe that videoconferencing will be one of the fastest-growing segments of the computer industry in the latter half of the decade.[17][18]

**TECHNOLOGY: PROTOCOLS IN USE**

**CDMA:**

CDMA (Code-Division Multiple Access) refers to any of several protocols used in so-called second-generation (2G) and third-generation ([3G](http://searchtelecom.techtarget.com/sDefinition/0,,sid103_gci214486,00.html)) [wireless](http://searchmobilecomputing.techtarget.com/sDefinition/0,,sid40_gci213380,00.html) communications. As the term implies, CDMA is a form of [multiplexing](http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci212614,00.html), which allows numerous signals to occupy a single transmission [channel](http://searchdatacenter.techtarget.com/sDefinition/0,,sid80_gci211770,00.html), optimizing the use of available [bandwidth](http://searchenterprisewan.techtarget.com/sDefinition/0,,sid200_gci211634,00.html). The technology is used in ultra-high-frequency ([UHF](http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci506806,00.html)) [cellular telephone](http://searchmobilecomputing.techtarget.com/sDefinition/0,,sid40_gci211763,00.html) systems in the 800-[MHz](http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci212562,00.html) and 1.9-GHz bands.

CDMA employs analog-to-digital conversion (ADC) in combination with [spread spectrum](http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci213041,00.html) technology. Audio input is first digitized into binary elements. The frequency of the transmitted signal is then made to vary according to a defined pattern (code), so it can be intercepted only by a receiver whose frequency response is programmed with the same code, so it follows exactly along with the transmitter frequency. There are trillions of possible frequency-sequencing codes, which enhance privacy and makes cloning difficult.

The CDMA channel is nominally 1.23 MHz wide. CDMA networks use a scheme called [soft handoff](http://searchmobilecomputing.techtarget.com/sDefinition/0,,sid40_gci507061,00.html), which minimizes signal breakup as a handset passes from one cell to another. The combination of digital and spread-spectrum modes supports several times as many signals per unit bandwidth as analog modes. CDMA is compatible with other cellular technologies; this allows for nationwide roaming.[19]

CDMA One, also written cdmaOne, refers to the original [ITU](http://whatis.techtarget.com/definition/0,,sid9_gci1252096,00.html) IS-95 ([CDMA](http://searchtelecom.techtarget.com/sDefinition/0,,sid103_gci213842,00.html)) [wireless](http://searchmobilecomputing.techtarget.com/definition/wireless) interface protocol that was first standardized in 1993. It is considered a second-generation (2G) mobile wireless technology.

Today, there are two versions of IS-95, called IS-95A and IS-95B. The IS-95A protocol employs a 1.25-[MHz](http://searchnetworking.techtarget.com/definition/MHz) carrier, operates in [radio-frequency](http://searchnetworking.techtarget.com/definition/radio-frequency) bands at either 800 MHz or 1.9 [GHz](http://searchnetworking.techtarget.com/definition/gigahertz), and supports data speeds of up to 14.4 [Kbps](http://searchnetworking.techtarget.com/definition/Kbps). IS-95B can support data speeds of up to 115 kbps by bundling up to eight channels.[20]

W-CDMA (Wideband Code-Division Multiple Access), an ITU standard derived from Code-Division Multiple Access ([CDMA](http://searchtelecom.techtarget.com/sDefinition/0,,sid103_gci213842,00.html)), is officially known as IMT-2000 direct spread. W-CDMA is a third-generation ([3G](http://searchtelecom.techtarget.com/sDefinition/0,,sid103_gci214486,00.html)) mobile wireless technology that promises much higher data speeds to mobile and portable wireless devices than commonly offered in today's market.

W-CDMA can support mobile/portable voice, images, data, and video communications at up to 2 [Mbps](http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci212534,00.html) (local area access) or 384 [Kbps](http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci212436,00.html) (wide area access). The input signals are digitized and transmitted in coded, spread-spectrum mode over a broad range of frequencies. A 5 [MHz](http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci212562,00.html)-wide carrier is used, compared with 200 [KHz](http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci212441,00.html)-wide carrier for narrowband CDMA.[21]

**GPRS:**

**General packet radio service (GPRS)** is a [packet oriented](http://en.wikipedia.org/wiki/Packet_oriented) [mobile data service](http://en.wikipedia.org/wiki/Mobile_Data_Service) on the [2G](http://en.wikipedia.org/wiki/2G) and [3G](http://en.wikipedia.org/wiki/3G) [cellular communication](http://en.wikipedia.org/wiki/Cellular_communication) systems [global system for mobile communications](http://en.wikipedia.org/wiki/Global_System_for_Mobile_Communications) (GSM). The service is available to users in over 200 countries worldwide. GPRS was originally standardized by [European Telecommunications Standards Institute](http://en.wikipedia.org/wiki/European_Telecommunications_Standards_Institute) (ETSI) in response to the earlier [CDPD](http://en.wikipedia.org/wiki/CDPD) and [i-mode](http://en.wikipedia.org/wiki/I-mode) packet switched cellular technologies. It is now maintained by the [3rd Generation Partnership Project](http://en.wikipedia.org/wiki/3rd_Generation_Partnership_Project) (3GPP).

It is a [best-effort](http://en.wikipedia.org/wiki/Best-effort) service, as opposed to [circuit switching](http://en.wikipedia.org/wiki/Circuit_switching), where a certain [quality of service](http://en.wikipedia.org/wiki/Quality_of_service) (QoS) is guaranteed during the connection. In 2G systems, GPRS provides data rates of 56-114 kbit/second. [2G](http://en.wikipedia.org/wiki/2G) cellular technology combined with GPRS is sometimes described as [*2.5G*](http://en.wikipedia.org/wiki/2.5G), that is, a technology between the second ([2G](http://en.wikipedia.org/wiki/2G)) and third ([3G](http://en.wikipedia.org/wiki/3G)) generations of mobile telephony. It provides moderate-speed data transfer, by using unused [time division multiple access](http://en.wikipedia.org/wiki/Time_division_multiple_access) (TDMA) channels in, for example, the GSM system. GPRS is integrated into GSM Release 97 and newer releases.

GPRS usage charging is based on volume of data, either as part of a bundle or on a pay as you use basis. An example of a bundle is up to 5 GB per month for a fixed fee. Usage above the bundle cap is either charged for per megabyte or disallowed. The pay as you use charging is typically per megabyte of traffic. This contrasts with [circuit switching](http://en.wikipedia.org/wiki/Circuit_switching) data, which is typically billed per minute of connection time, regardless of whether or not the user transfers data during that period.[22]

**EDGE:**

**Enhanced Data rates for GSM Evolution** (**EDGE**) (also known as **Enhanced** [**GPRS**](http://en.wikipedia.org/wiki/GPRS) (**EGPRS**), or [**IMT**](http://en.wikipedia.org/wiki/IMT-2000) **Single Carrier** (**IMT-SC**), or **Enhanced Data rates for Global Evolution**) is a digital [mobile phone](http://en.wikipedia.org/wiki/Mobile_phone) technology that allows improved data transmission rates as a [backward-compatible](http://en.wikipedia.org/wiki/Backward-compatible) extension of [GSM](http://en.wikipedia.org/wiki/GSM). EDGE is considered a pre-3G radio technology and is part of [ITU](http://en.wikipedia.org/wiki/ITU)'s [3G](http://en.wikipedia.org/wiki/3G) definition. EDGE was deployed on GSM networks beginning in 2003 — initially by [Cingular](http://en.wikipedia.org/wiki/Cingular) (now AT&T) in the [United States](http://en.wikipedia.org/wiki/United_States).

Through the introduction of sophisticated methods of coding and transmitting data, EDGE delivers higher bit-rates per radio channel, resulting in a threefold increase in capacity and performance compared with an ordinary GSM/GPRS connection.

[Evolved EDGE](http://en.wikipedia.org/wiki/Evolved_EDGE) continues in Release 7 of the [3GPP](http://en.wikipedia.org/wiki/3GPP) standard providing reduced latency and more than doubled performance e.g. to complement High-Speed Packet Access ([HSPA](http://en.wikipedia.org/wiki/High_Speed_Packet_Access)). Peak bit-rates of up to 1Mbit/s and typical bit-rates of 400kbit/s can be expected.

EDGE/EGPRS is implemented as a [bolt-on enhancement](http://en.wikipedia.org/wiki/Bolt-on_enhancement) for [2.5G](http://en.wikipedia.org/wiki/2.5G) [GSM](http://en.wikipedia.org/wiki/Global_System_for_Mobile_Communications)/[GPRS](http://en.wikipedia.org/wiki/General_Packet_Radio_Service) networks, making it easier for existing GSM carriers to upgrade to it. EDGE is a superset to GPRS and can function on any network with GPRS deployed on it, provided the carrier implements the necessary upgrade.

EDGE requires no hardware or software changes to be made in [GSM](http://en.wikipedia.org/wiki/Global_System_for_Mobile_Communications) core networks. EDGE-compatible transceiver units must be installed and the base station subsystem needs to be upgraded to support EDGE. If the operator already has this in place, which is often the case today, the network can be upgraded to EDGE by activating an optional software feature. Today EDGE is supported by all major chip vendors for both [GSM](http://en.wikipedia.org/wiki/GSM) and [WCDMA](http://en.wikipedia.org/wiki/WCDMA)/HSPA.[23]

**MULTIMEDIA MESSAGING SERVICE (MMS)**

Multimedia Messaging Service (MMS) is a new standard in mobile messaging. Like SMS (Short Messaging Service), MMS is a way to send a message from one mobile to another. The difference is that MMS can include not just text, but also sound, images and video. It is also possible to send MMS messages from a mobile phone to an email address.

Images could be downloaded from WAP sites, selected from a menu within the phone, or could even be photos taken using a built-in camera if the phone has one (e.g. the Nokia 7650, Sony Ericsson T300, etc).

MMS is an extension of the SMS protocol, making its usage familiar to existing SMS users. An MMS message is a single entity, not a collection of attachments. One of the main practical differences between MMS and SMS is that whilst SMS messages are limited to 160 bytes, an MMS message has no size limit and could be many Kbytes in size, or even larger. MMS requires a third generation (3G) network to enable such large messages to be delivered, although smaller messages can be sent even with second generation networks using GPRS.

Whilst mobile phone users can create and send their own MMS messages, perhaps the biggest use of MMS is likely to be companies sending MMS messages to subscribers, enquirers or customers. For example, a company could send visitors an MMS map to help them find their office. Other possible applications include weather reports, news & sport bulletins, etc.

MMS messages are delivered in a completely different way from SMS. The first step is for the sending device to encode the multimedia content in a fashion similar to sending a [MIME](http://en.wikipedia.org/wiki/MIME) e-mail (MIME content formats are defined in the MMS Message Encapsulation specification). The message is then forwarded to the [carrier's](http://en.wikipedia.org/wiki/Mobile_network_operator) MMS [store and forward](http://en.wikipedia.org/wiki/Store_and_forward) server, known as the MMSC. If the receiver is on another carrier, the relay forwards the message to the recipient's carrier using the Internet.[[5]](http://en.wikipedia.org/wiki/Multimedia_Messaging_Service#cite_note-4)

Once the MMSC has received a message, it first determines whether the receiver's handset is "MMS capable", that is it supports the standards for receiving MMS. If so, the content is extracted and sent to a temporary storage server with an [HTTP](http://en.wikipedia.org/wiki/HTTP) front-end. An SMS "control message" containing the [URL](http://en.wikipedia.org/wiki/URL) of the content is then sent to the recipient's handset to trigger the receiver's [WAP](http://en.wikipedia.org/wiki/Wireless_Application_Protocol) browser to open and receive the content from the embedded URL. Several other messages are exchanged to indicate status of the delivery attempt.[[6]](http://en.wikipedia.org/wiki/Multimedia_Messaging_Service#cite_note-5) Before delivering content, some MMSCs also include a conversion service that will attempt to modify the multimedia content into a format suitable for the receiver. This is known as "content adaptation".

If the receiver's handset is not MMS capable, the message is usually delivered to a web based service from where the content can be viewed from a normal internet browser. The URL for the content is usually sent to the receiver's phone in a normal text message. This behaviour is usually known as the "legacy experience" since content can still be received by a phone number, even if the phone itself does not support MMS.

The method for determining whether a handset is MMS capable is not specified by the standards. A database is usually maintained by the operator, and in it each [mobile phone number](http://en.wikipedia.org/wiki/MSISDN) is marked as being associated with a legacy handset or not. It can be a bit hit and miss since customers can change their handset at will and this database is not usually updated dynamically.

E-mail and web-based gateways to the MMS (and SMS) system are common. On the reception side, the content servers can typically receive service requests both from WAP and normal [HTTP](http://en.wikipedia.org/wiki/HTTP) browsers, so delivery via the web is simple. For sending from external sources to handsets, most carriers allow MIME encoded message to be sent to the receiver's phone number with a special domain. An example of this would be *PTN@messaging.carrier.com*, where PTN is the public telephone number. Typically the special domain name is carrier specific.[24][10]

Formats that can be embedded within MMS include:

* Text (formatted with fonts, colours, etc)
* Images (JPEG, GIF format)
* Audio (MP3, MIDI)
* Video (MPEG)

**STREAMING**

**Streaming media** is [multimedia](http://en.wikipedia.org/wiki/Multimedia) that is constantly received by and presented to an [end-user](http://en.wikipedia.org/wiki/End-user_%28computer_science%29) while being delivered by a streaming provider. The name refers to the delivery method of the medium rather than to the medium itself. The distinction is usually applied to media that are distributed over [telecommunications networks](http://en.wikipedia.org/wiki/Telecommunications_network), as most other delivery systems are either inherently streaming (e.g., [radio](http://en.wikipedia.org/wiki/Radio), [television](http://en.wikipedia.org/wiki/Television)) or inherently non-streaming (e.g., [books](http://en.wikipedia.org/wiki/Books), [video cassettes](http://en.wikipedia.org/wiki/Videotape), audio [CDs](http://en.wikipedia.org/wiki/Compact_Disc)). The verb 'to stream' is also derived from this term, meaning to deliver media in this manner. [Internet television](http://en.wikipedia.org/wiki/Internet_television) is a commonly streamed medium.

Live streaming, more specifically, means taking the media and broadcasting it live over the Internet. The process involves a camera for the media, an encoder to digitize the content, a media publisher where the streams are made available to potential end-users and a [content delivery network](http://en.wikipedia.org/wiki/Content_delivery_network) to distribute and deliver the content. The media can then be viewed by end-users live.

Security remains one of the main challenges with this new methodology. [Digital rights management](http://en.wikipedia.org/wiki/Digital_rights_management) (DRM) systems are an example of a solution to keep this content secure.

A media stream can be streamed either live or on demand. Live streams are generally provided by a means called true streaming. True streaming sends the information straight to the computer or device without saving the file to a hard disk. On Demand streaming is provided by a means called *progressive streaming* or [*progressive download*](http://en.wikipedia.org/wiki/Progressive_download)*.* Progressive streaming saves the file to a hard disk and then is played from that location. On Demand streams are often saved to hard disks and servers for extended amounts of time; while the live streams are only available at one time only (e.g. during the Football game).[25]

**IP MULTIMEDIA SUBSYSTEMS**

The **IP Multimedia Subsystem** (**IMS**) is an architectural framework for delivering [Internet Protocol](http://en.wikipedia.org/wiki/Internet_Protocol) (IP) [multimedia](http://en.wikipedia.org/wiki/Multimedia) services. It was originally designed by the wireless standards body [3rd Generation Partnership Project](http://en.wikipedia.org/wiki/3rd_Generation_Partnership_Project) (3GPP), as a part of the vision for evolving mobile networks beyond [GSM](http://en.wikipedia.org/wiki/GSM). Its original formulation (3GPP R5) represented an approach to delivering "Internet services" over [GPRS](http://en.wikipedia.org/wiki/GPRS). This vision was later updated by 3GPP, [3GPP2](http://en.wikipedia.org/wiki/3GPP2) and [TISPAN](http://en.wikipedia.org/wiki/TISPAN) by requiring support of networks other than GPRS, such as [Wireless LAN](http://en.wikipedia.org/wiki/Wireless_LAN), [CDMA2000](http://en.wikipedia.org/wiki/CDMA2000) and fixed line.

To ease the integration with the Internet, IMS uses [IETF](http://en.wikipedia.org/wiki/IETF) protocols wherever possible, e.g. [Session Initiation Protocol](http://en.wikipedia.org/wiki/Session_Initiation_Protocol) (SIP). According to the 3GPP, IMS is not intended to standardize applications but rather to aid the access of multimedia and voice applications from wireless and wireline terminals, i.e. create a form of [fixed-mobile convergence](http://en.wikipedia.org/wiki/Technological_convergence#Fixed-mobile_Convergence) (FMC). This is done by having a horizontal control layer that isolates the access network from the [service layer](http://en.wikipedia.org/wiki/Service_layer). From a logical architecture perspective, services need not have their own control functions, as the control layer is a common horizontal layer. However in implementation this does not necessarily map into greater reduced cost and complexity.

Alternative and overlapping technologies for access and provisioning of services across wired and wireless networks include combinations of [Generic Access Network](http://en.wikipedia.org/wiki/Generic_Access_Network), soft switches and "naked" SIP. It is easier to sell services than to sell the virtues of "integrated services", but additionally the task to sell an IMS based on a single service is also difficult as there are often (cheaper) alternatives to creating and deploying that particular service.[26]

**IPTV**

**Internet Protocol television** (**IPTV**) is a system through which [Internet television](http://en.wikipedia.org/wiki/Internet_television) services are delivered using the architecture and networking methods of the [Internet Protocol Suite](http://en.wikipedia.org/wiki/Internet_Protocol_Suite) over a packet-switched network infrastructure, e.g., the [Internet](http://en.wikipedia.org/wiki/Internet) and [broadband](http://en.wikipedia.org/wiki/Broadband) Internet access networks, instead of being delivered through traditional [radio frequency](http://en.wikipedia.org/wiki/Radio_frequency) broadcast, [satellite](http://en.wikipedia.org/wiki/Satellite) signal, and [cable television](http://en.wikipedia.org/wiki/Cable_television) (CATV) formats.

IPTV services may be classified into three main groups:

* [Live television](http://en.wikipedia.org/wiki/Live_television), with or without interactivity related to the current TV show;
* Time-shifted programming: catch-up TV (replays a TV show that was broadcast hours or days ago), start-over TV (replays the current TV show from its beginning);
* [Video on demand](http://en.wikipedia.org/wiki/Video_on_demand) (VOD): browse a catalog of videos, not related to TV programming.

IPTV is distinguished from general Internet-based or web-based multimedia services by its on-going standardization process (e.g., [European Telecommunications Standards Institute](http://en.wikipedia.org/wiki/European_Telecommunications_Standards_Institute)) and preferential deployment scenarios in subscriber-based telecommunications networks with high-speed access channels into end-user premises via [set-top boxes](http://en.wikipedia.org/wiki/Set-top_box) or other [customer-premises equipment](http://en.wikipedia.org/wiki/Customer-premises_equipment).[27]

*"IPTV is defined as the secure and reliable delivery to subscribers of entertainment video and related services. These services may include, for example, Live TV, Video On Demand (VOD) and* [*Interactive TV (iTV)*](http://en.wikipedia.org/wiki/Interactive_tv)*. These services are delivered across an access agnostic, packet switched network that employs the IP protocol to transport the audio, video and control signals. In contrast to video over the public Internet, with IPTV deployments, network security and performance are tightly managed to ensure a superior entertainment experience, resulting in a compelling business environment for content providers, advertisers and customers alike."*[28]

**ADVANTAGES AND DISADVANTAGES**

## Disadvantages:

* Aside from the fact that students can use cell phones to call their friends while in class, they can also access the Internet. With [smartphones](http://www.brighthub.com/guides/smartphones.aspx) starting to be readily available to more and more people, there's a big chance that students can go on social networks, play [mobile games](http://www.brighthub.com/mobile/games/articles/72245.aspx), chat, shop, browse websites, listen to music and watch videos all while they're in school.
* Cheating is a very big concern for teachers when it comes to students bringing cell phones to class. It's easy for students to exchange messages without the teacher knowing. It's the new passing of notes shenanigans in class rooms. Secretly recording videos of teachers or other students is another concern. These videos are often embarrassing and may even be the cause for educators to lose their job or dignity.
* Cell phones can also be used in illegal activities, which make the presence of mobile devices a really scary thought. Cell phones can be utilized for something small, like organizing a school yard fight, to something downright scary like drug deals and terrorist attacks. This is the reality everyone has to face in the presence of cell phones in class rooms.

## Advantages:

* Let us not forget that mobile devices do have a lot of positive uses in a school environment. Cell phones can serve as a connection between students and their parents. Taking photos of class presentations or projects and sending them to their parents will give students the affirmation they deserve even if they're not physically with their parents.
* Sharing notes with classmates can be easier too with [mobile technology](http://www.brighthub.com/guides/mobile-technology.aspx) present. Missed assignments and notes will be a thing of the past. Communicating with classmates with the help of cell phones can increase productivity and can foster a collaborative environment. The multimedia content that can be accessed through cell phones can also help students relax if they use it outside class hours. For every reason to keep a student from bringing a cell phone to school, there's an equally logical reason to believe that bringing a cell phone to school is a wise idea.[29]

**FUTURE SCOPE**

The GSMA’s Rich Communication Suite (RCS) will provide a feature-rich portfolio of services to unleash the communities hidden in a user’s phone book. Developed by the collaborative efforts of leading telecommunication companies, the first phase of RCS services launching in 2009 will offer an exciting range of features:

* Enhanced Address Book – provides presence and capability indications, enables users to initiate communications including voice calls, video calls, file transfers or messaging, and allows users to integrate multimedia elements, such as photos of contacts.
* Rich Call – enables users to exchange different types of content, such as video or photos, during a call.
* Rich Messaging – expands on traditional instant messaging to simplify and unify multiple messaging mediums and provide a richer user experience.

**What will RCS do?**

For end-users, RCS means a new range of exciting, feature rich services from operators that will make the mobile even more central to their private and business lives – sharing a special image with friends or sharing data with colleagues around the world. For the industry players involved in the initiative, it will assist the rapid adoption of the mobile applications and services to deliver the rich communications experience to their customers.

* RCS is not a competing service offering for people utilizing Internet based social networking services. RCS however allows to turn this new way of community communication into a real time communication experience.
* RCS will build on the 3 bn mobile communication community, where the main value proposition is real time mobile communication. Global inter connectivity and inter operability will ensure mass level user adoption.
* RCS is going to provide a superior user experience, offering services embedded within the native phone book.
* RCS industry initiative shows top 5 terminal vendors being fully committed to support RCS.

**Key services today, with more to follow**

- An enhanced phonebook presenting:

* Presence and service capability information.
* Context sensitive application launch pad – dependent on own and contact’s terminal and network capabilities.
* Communication history provided with each contact.

- Enriched call:

* Multimedia capability enables users to share videos, images, and files easily during a voice call.

- Enhanced messaging:

* One-to-one and one-to-many SMS, MMS, and instant messaging

- Full service interworking between mobile and PC users

The Rich Communication Suite is a consortium of service providers and vendors who are working on defining a set of rich services that can be offered to mobile subscribers as an integrated solution. RCS defines some standard capabilities like enhanced calls, enhanced messaging and enhanced phonebook which should be supported by mobile carriers the same way SMS is supported today.[30][31]

**CONCLUSION**

The way that we try to access the Internet is changing over time. Instant online presence, chat statuses, content sharing and multimedia streaming is becoming more and more common. With improving trends and more facilities being provided, the innovations are endless. The main task is to integrate various services so that they support and be compatible with each other. Integration is important because one service provided by a particular network to send multimedia data to another network, should follow that the receiving network should also support the corresponding services, otherwise incompatibility issues may come up.

Integrating small networks is a hard task to achieve. A bigger network is more vulnerable to security flaws, as the question of data sharing arises. The challenge is to deliver consistent user experience, which can only be provided if devices and network services are compatible with each other and the devices are also compatible with one another.

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