A Review on Mobile Multimedia

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Abstract — the initial work for mobile multimedia is displayed. The aim is to enable simultaneously research, hardware & software development at the infrastructure level & technology implementation. In this paper an evaluation scenario towards 3G networks is shown. Also different multimedia technologies & Multimedia services are presented. Wireless standards IEEE 802.11 WLAN & 802.15 WPAN are explained with wireless data transfer technologies. Mobile multimedia plays a major role in media communication. Different applications of mobile multimedia are provided. Mobile Multimedia can be used in network aware applications. In the end level of services are discussed with respective applications.

Keywords— Mobile multimedia, Evaluation scenario, WLAN, WPAN, Multimedia services, Multimedia applications.

I. INTRODUCTION

In the wireless communication group of IEEE 802.11 protocols and telecom services like GSM, GPRS use wide spectrum. These services serve as database for development of new services in telecom technologies. Voice services are primary service which is unable to satisfy today's users' requirements. So to fulfil customers' demands which include video conferencing, cloud computing, GPS, You Tube, Mobile Banking etc. focus on mobile multimedia is compulsory. These services use larger bandwidth so development of new technologies is necessary. In today's environment delivery of mobile multimedia services has primary focus for all network operators. In mobile multimedia packet switched systems are used which eliminates use of circuit switched systems. These services can be upgraded towards all IP networking systems. The task is to fit the WEB services to Mobile users with efficient bandwidth utilization. The three basic levels of mobile multimedia infrastructure are as follows:
(a) Application & Service level, (b) System Software level and (c) Basis Technology level.

Mobile Multimedia

A group of standards used for transferring of multimedia information through wireless networks is known as Mobile Multimedia. Multimedia information contains text, images, graphics, audio, videos, improved the quality of the information. Position dependent Communication Systems (PDCS) uses the concept of Mobile Multimedia. Mobility as one of the key feature of mobile multimedia which can be divided as follows:
(a)Consumer Mobility: In this type the user is forced to move from one location to another location during

fulfilling his activities. For consumer use of information and resources is required independent of his actual position.
(b)Device Mobility: Here user activities require a device to fulfil his needs independent of the location in a mobile environment.
(c)Service Mobility: In this type service used is portable and includes applications in different systems.
The key feature of mobile multimedia is to deliver multimedia content to customers & partners at required places and required time. The demand of mobile multimedia services invites the players to involve in the business with mobile multimedia. Every service in the mobile multimedia requires that their output and service fees must be divided into following categories:
(a) Cellular Operator: They provide consumer to access mobile services like GSM, GPRS and UMTS with infrastructure.
(b)Data Provider: Data providers license data and prepare it for end-user consumers. They gather information to deliver convenient services to mobile user consumers.
(c)Internet Service Provider: These types of service providers are responsible for creating the multimedia information. Usually they provide it via the fixed Internet. They contain fixed infrastructure.
(d)Equipment Manufacturer: They provide hardware and software for multimedia services. They cannot deal with data creation and delivering of services.

II. ENABLING TECHNOLOGIES

A. Wireless Wide Area Networks:

In 1991 the second-generation (2G) mobile digital systems were implemented. It has higher user capacity and low cost for operators. For consumers they provide short messages and cheaper data services with addition of speech services. Different 2G systems are classified as GSM and cdmaone. 2.5G system is advanced technology of 2G systems which use packet-switching technique in GPRS (General Packet Radio System). It gives data rate of up to 20 kbps. Wireless wide area networks deals with encryption and authentication for network security. They use equipment like SONET, Frame Relay and ATM.
The third generation cellular system was proposed in 2001. In last two or three years all areas have been covered for 3G services. The ITU has given number of recommendations such as user bandwidth, multimedia services and flexibility. It also include that IMT-2000 should operate in the 2-GHz band. In 1999 ITU selected five standards for global services:

- CDMA 2000
- TD-SCDMA (Time Division Synchronous CDMA)
- WCDMA (Wideband CDMA)
- UWC-136
- DECT (Digital Enhanced Cordless Telecommunications)

- CDMA 2000 (Evolution of IS 95 CDMA)
  cdmaone is known as cdma2000. It can be classified in two versions 1x and 3x.The 1x uses the 1.25 MHz bandwidth with data rate of 600 kbps. The 3x uses 3.75 MHz and data rate of 2 Mbps. The maximum data rate in the 1x EV-DO downlink is 2.5 Mbps.
- TD-SCDMA (Time Division Synchronous CDMA)
  It includes common set of protocols used for both FDD and TDD. TD-SCDMA is combination of TDMA system with CDMA. TD-SCDMA removes interference in the uplink/downlink.TD-SCDMA can support all wireless network technologies such as Wide Area Network, Local Area Network and Adhoc networks to deliver all services in whole coverage area. So TD-SCDMA is a fully-compatible 3G standard.
- WCDMA (Wideband CDMA)
  WCDMA was implemented near about 2001. EDGE is modified technology of GSM and cdma2000 is modified technology of cdmaone. WCDMA is a 3G system which has bandwidth of 5 MHz and data rates of up to 384 kbps for large area coverage.

EDGE is an improved technology of GPRS. Data rates of 60 kbps with improved spectrum efficiency. Higher order modulation technique is used.

- UWC-136 (Evolution of IS-136)
  TDMA is the base for DECT. Bandwidth of 1.6 MHz provides highest bit rates of 2 Mbps; DECT uses one carrier with bandwidth of 1.728 MHz .
  DECT is a standard for cordless personal telephony. It was established by ETSI. DECT is used for cordless communication systems which supports only indoor and pedestrian environment. It does not allow full network coverage so do not satisfy to all requirements of third generation system.

Wireless wide area networks have different applications in different layers of data communication which contains Application layer, Session layer, Transport layer and Data Link layer.

B. Wireless Local Area Networks (WLAN)

IEEE 802.11 protocol for Wireless local area network (WLAN) operated with 2.4 GHz band. It can deliver data rates of 11 Mbps. New systems developed for WLAN uses 5 GHz band. Products are classified in two protocols:
(a) IEEE 802.11a
(b) HIPERLAN 2 (H2)
These standards have 20 MHz carrier spacing. OFDM modulation is used. They can provide data rate of approximately 54 Mbps. The difference between these two is the MAC protocol, where HiperLAN 2 supports more QoS and mobility.
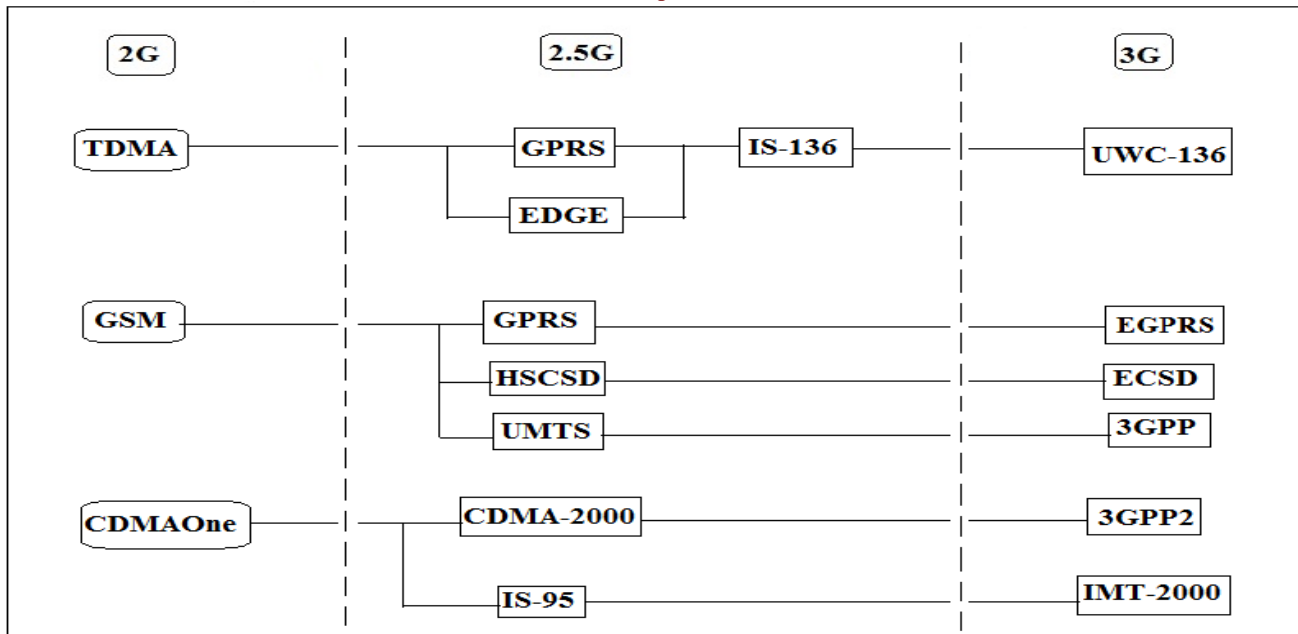
Figure 1: Evaluation scenarios towards 3G services

IEEE 802.11x

This standard provides different WLAN technologies. It can be operated in 2.4 and 5 GHz bands. These Physical layer specifications are based on infrared (IR) technology and the more popular direct sequence spread spectrum (DSSS) and frequency-hopping spread spectrum (FHSS) systems with 1 and 2 Mbps data rates respectively.

Higher data rates of 5.5 and 11Mbps can be provided by the IEEE 802.11b protocols. The latest standard IEEE 802.11g has been developed to achieve data rates higher than 22 Mbps. IEEE 802.11a uses OFDM technique for 5 GHz band which provide 54 Mbps data rate. IEEE 802.11e is the recent standard for wireless communication.

HiperLAN/2

As stated by European Telecommunications Standards Institute (ETSI), HiperLAN/2 is a flexible WLAN standard. It is designed to provide high speed data rate up to 54 Mbps to different networks such as 3G mobile networks, ATM networks; Internet Protocol based networks and wireless LAN systems. It has applications in data, voice and video services with defined Quality of Service (QoS). HiperLAN/2 systems can be established in classrooms, residential houses, corporate offices, industry areas and hot spot areas like exhibition halls, malls etc. where radio transmission can be possible. It is another option of wired technology. HiperLAN/2 offer several benefits as compared to 802.11a with improved quality of service (QoS) features. Some suggestion for HiperLAN/2 is that it will lose out to 802.11a protocol. Some of the features established by ETSI will be provided in improved versions of the 802.11a standard.

Wi-Fi

The Wireless Ethernet Compatibility Alliance (WECA) is trade association related to wireless standards certification. It is known as Wi-Fi Alliance. WECA does not define standards. It certifies equipment manufactured from different suppliers will operate successfully. For testing of products 802.11b standard can be used.

C. Wireless Personal Area Networks

For short distance wireless communication Bluetooth can be used. It consumes low power and it has low-cost implementation design. Bluetooth can be used in mobiles, laptops, PDAs. The primary version of Bluetooth provides up to 700 kbps but higher data rates up to 10Mbps are developed in nearby past times.

IrDA

Infrared Data association (IrDA) is an organization for establishing Infrared standards. IrDA contains set of protocols which covers all layers of data transfer. IrDA include designs of network management and interoperability. IrDA protocols have IrDA DATA as key feature for data delivery and IrDA CONTROL for transmitting the control information. IrDA provides wireless connectivity for devices. IrDA is a point-to-point transmission method. It is an adhoc data transmission standard. It can be operated within range of 0 to 1 meter. It provides data rate of 9600 bps to 16 Mbps.

HomeRF

HomeRF is a small part of the International Telecommunication Union (ITU). Its aim is to develop standard for low cost RF voice and data communication.

Shared Wireless Access Protocol (SWAP) is developed by HomeRF Working Group. The SWAP is an industry designed standard which allows wireless connectivity between PCs, cordless telephones and other devices to communicate through voice and data. It uses a dual protocol stack:

(i) DECT for voice and
(ii) 802.11 packets for data.

It provides good reliability. It also reduces effect of radio interference. It can be applied to remote control, home networking etc.

Bluetooth

Bluetooth is a technology which provides high-speed data transfer with wireless media. It uses microwave wireless link with lower power consumption. It is designed to connect mobiles, laptops, PDAs with each other. User cannot create any interruption while initializing Bluetooth connectivity. It does not require line-of-sight positioning. This technology is improved version of wireless LAN techniques but is most popular due to its small size and reduced cost. If more than one Bluetooth-enabled device comes within range of each other then devices transfer address information. They create small networks between each other without the user permission.

IEEE 802.15 WPAN (Wireless Personal Area Network)

The 802.15 WPAN is used for short distance wireless communication networks. These WPANs is applicable for use in wireless networking of portable devices such as PCs, cell phones, pagers and user devices. It permits these devices to communicate with another device. Here the aim is to develop standards and recommended improvements which are applicable in many areas effectively.

III. MULTIMEDIA SERVICES

A. Overview

In 1992 Mobile Multimedia Services were came into existence. At that time ITU realized the importance of mobile communications. It was started with a project named FPLMTS (Future Public Land Mobile Telecommunications System). Its aim is to combine the world under a single standard. It was renamed as IMT-2000.

IMT-2000 is a group of standards provided by a set of ITU-R Suggestions. The primary objectives for IMT-2000 are as follows:

- Users with high mobility have data rates of 144 Kbps or 384 Kbps with large coverage area and low mobility users have 2 Mbps with limited coverage area.
- Capability of providing different mobile applications and services.
- Increased spectrum efficiency
- New techniques can be developed with more flexible features.

- Design point of view they are common worldwide

The main applications of mobile multimedia are voice communications, e-mail, short messages, multimedia, data services and the broadband integrated service digital network access. Wireless data transfer techniques include smart antennas, power control algorithms and good receivers with improved performance. Position Dependent Communication System is used for Multimedia Services. The aim of constructing PDCS is to provide Location based services. The present version of PDCS consists of an indoor routing planner and speech recognition and synthesis. The overall function of PDCS is to fulfil the user demands with new technology as per user's convenience. To ensure portability between mobile platforms the PDCS is programmed in Java. For the speech I/O the Via Voice speech package was chosen.

B. Classification of Services

Mobile multimedia services want to combine the Internet, mobiles, telephones and broadcast media into single equipment. IMT-2000 systems can be classified in six different classes of service. Three of the service classes are exist to some levels on 2G networks, while three more are new and consist mobile multimedia. To increase data rate following services can be used.

Voice. In the latest trend of high-speed data, voice service is the most significant service for the mobile market. 2G systems do not provide good call quality while 3G will offer better call quality as compared with the fixed telephone network. But higher call quality is available at higher price. New technique called Voice mail is synchronized with email through voice recognition and synthesis.

Messaging. It is an improved service of paging system. It can be correlated with Internet email. Messaging services was provided in 2G systems. But 3G service allows email attachments up to 25 MB. Applications include online payment and electronic booking through internet.

Switched Data. This service contains fax service and dialup access service to Internet. Dial-up access is now an old service due to available of always on access services.

High Multimedia. It includes use of very high speed Internet access. It is also used for high definition video and high quality audio on demand. It can be also used in online shopping and mobile to mobile multimedia streaming, online gaming. It is the most famous 3G service in consumers. For Web surfing it provides sufficient data rate in downlink. Here downlink frequency is higher than uplink frequency.

Interactive High Multimedia. This can be applied for high quality videoconferencing and for tele- presence.

C Levels of Services

1. **Primary Services**: These services are base for more complex applications and services. They contain features of higher level services and applications. It can also be used for network aware applications for mobile multimedia.

2. **Value Added Services**: These services are fitted in intermediate level. These types of services contain high data rate PAN wireless home networking, Peer to Peer communication, Internet access, video calling, telemetry, GPS.

3. **Higher order Applications:** These services attract interests of professional network users. They serve the full range of user requirements. Here applications include business applications, electronic transaction, and wireless applications entertainment applications, telematics, electronic medical service, e-government, e-learning etc.

IV CONCLUSION

In this paper the concept of Mobile Multimedia is introduced. Different types of mobility are given. Three sources of mobile multimedia are also discussed. Several types of wireless networks are also explained with brief explanation about the technologies & standards used in communication network. Wireless Local Area Network (WLAN), Wireless Wide Area Network (WAN), Wireless Personal Area Network (WPAN) is explained with different applications. In that WCDMA, CDMA 2000, Wi Fi, Bluetooth, IrDA, HomeRF etc. techniques were discussed. In the last section different applications & services of mobile multimedia were presented.

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