



IGNOU

Impact of 3G and 4G wireless networks on Higher Education

**Mr.P.V.Suresh,
Senior Lecturer,
SOCIS, IGNOU,
New Delhi**

First Generation networks

- **Technologies used:**
 - **PTT (Push to Talk)**
 - **MTT (Mobile Telephone System)**
 - **IMTS (Improved Mobile Telephone Service)**
 - **AMTS (Advanced Mobile Telephone Service)**

They are part of PSTN and are vehicle mounted (contd.)



IGNOU

(contd.)

- **They are based on Analog cell phone standards**
- **Exist during 1960 to 1980s**



IGNOU

Second Generation of Wireless Networks

- Radio signals used in 2G networks are digital
- Main flavors of 2G:
 - GSM
 - CDMA/CDMAOne



Global System for Mobile Communications(GSM)

Facts and Features of GSM:

- Digital call quality**
- Text messaging**
- Supports roaming**
- First GSM network launched in 1991 in Finland**
- They operate in 900, 1800, 850, 1900MHz bands (contd.)**



(contd.)

- **Bandwidth : 25MHz**
- **Data rate : 270 kbps appr.**
- **Transmission power of handset : 2W (GSM 850/900), 1W(GSM1800/1900)**
- **A cell can be of atmost 35 kms. Radius**
- **Uses cryptographic algorithms for over-the-air privacy**
- **GPRS helps in Internet connections**



IGNOU

Enhanced Data for Global Evolution(EDGE)

- Also , called as Enhanced Data rates for GSM Evolution
- It is also a technology useful for Internet connections
- It facilitates increased data transmission rate. So, video services get benefitted
- It is a superset of GPRS
- Data rate : 473 kbps (app.) (This is 3G requirement)



General Packet Radio Service

- Facilitates WAP access, MMS

Code Division Multiple Access (CDMA)

- It is a technology that transmits streams of bits and whose channels are divided using random sequences.
- It permits many mobile devices to share the same frequency channel
- Data rate : 144kbps

3G wireless networks

- **Facts and features :**
 - Ability to transfer both voice data (a telephone call) and non-voice data (downloading information, e-mail, instant messaging)
 - Video telephony
 - Japan and South Korea are first to adopt 3G
 - Supports high speed Internet access(contd.)



(contd.)

- **Frequencies at which 3G networks operate are usually different**
- **As of Dec. 2005, there are 100 3G networks in 40 countries**
- **Data rate : 384kbps (for mobile systems), 2Mbps (for stationary systems)**

Universal Mobile Telecommunications Systems (UMTS)

- **Features :**
 - **Data rate ranges between 384kbps and 3.6Mbps**
 - **Supports mobile video conferencing**
 - **Live TV**

GSM vs CDMA

- **At present , in CDMA , the speed ranges from 300 to 700kbps**
- **In GSM (with EDGE), it is around 275kbps**
- **So, CDMA offers a better data rate than GSM**
- **GSM phones have SIM cards (contd.)**

(contd.)

- **CDMA phones are not card enabled**
- **International and National roaming facilities are good in GSM networks**
- **GSM is having around 1 billion subscribers world wide**
- **CDMA is having around 270 million subscribers world wide**

Motivation for 4G

- **To meet the need of future high performance Multimedia (Real time audio, HD video content, Mobile TV)**
- **Wireless teleconferencing**
- **Seamless Mobility**
- **Larger bandwidth**
- **Larger speeds (20 to 100 mbps in mobile phone networks), 1Gbps in Wi-Fi networks**



Fourth Generation of Wireless Communications

- Integrates a large number of heterogeneous wireless technologies
- Leads to seamless mobility

Features of 4G networks

- Larger bandwidth
- Smoother handoff
- Seamless handoff across various wireless networks



Issues in integration of 4G technologies

- **Network Management**
 - **Horizontal Handoff (Intra system)**
 - **Vertical Handoff (Inter system)**
 - **Seamless Mobility**
 - **Quality of Service (QoS)**
 - **Dependability**
 - **Security**

Benefits to Higher Education due to 2G Wireless Networks

- **Being at a distance, it is possible to hear a lecture and interact with resource person by mobile phone**
- **You may not be able to visualize the resource person**
- **Possible to send and receive important information by SMS**

(contd.)

- **Learner can roam across the globe and still enjoy learning**
- **They should always be in a 2G or compatible network**
- **So, roaming facility for mobile devices of students is indispensable**
- **Live video is not suggested due to bandwidth constraints**
- **Learners can browse the website of their institution from their GPRS or EDGE enabled mobile devices (contd.)**



- **A MMS of the video lecture or simulations of various experiments that form part of the curriculum can be sent to all the students so that they can run the lecture or simulation offline**

Benefits to Higher Education due to 3G Wireless Networks

- **3G technology supports video telephony**
- **Live video lectures can be cast to the learner**
- **Two-way video conferencing becomes possible**
- **Faster downloads of assignments and performance of transactions such**

(contd.)

as payment of fee etc. becomes possible due to high speed internet access (384kbps for mobile and 2mbps for stationary systems)

- However, a roaming learner should always be in a 3G network for continuity of services

Benefits to higher education due to 4G wireless networks

- **4G networks exist only at experimental level**
- **4G networks are heterogeneous. So, a learner can access the services of the institution any time any where. There are no compatibility issues between networks**
- **This leads to seamless mobility of(cont.)**



higher education

- **Higher educational institutions can launch their own television channels dedicated to mobile devices. Higher data rates make it possible**
- **Demonstrations involving experiments at minute level can be delivered LIVE as 4G networks enable high definition video**
- **Utilization levels will dramatically increase in the case of mobile (contd.)**



learners due to higher data rates (20 to 200mbps in mobile and around 1gbps in stationary systems)

- Learner is guaranteed of service irrespective of time and location as 4G networks comprise of all networks**

SETTING UP OF A WIRELESS NETWORK

- Each device in a wireless network should have a wireless LAN card
- A wireless access point is needed in the area that needs to be declared as a wireless network
- If wireless devices need to have access to Internet, then an ISP should be contacted so that a router can be(contd.)



installed and connected to wireless access point. This enables access to Internet.

- Every wireless access point has a SSID (Service Set Identifier)**
- Each device in the wireless network also had a SSID which matches to the SSID of any one wireless access point**

Impact of wireless networks on the paradigm of m-learning

- **All administrative services can be offered through m-learning**
- **Most of the academic services can be offered**
- **Courses which are largely practical in nature such as MBBS etc. will be able to use 3G and 4G wireless networks only to some extent (contd.)**



- **Impact of 2G networks on m-learning will be minimal due to lower data rates**
- **Higher educational institutions can offer courses at international level due to 3G and 4G networks**

Conclusion

- **Wireless networks lead to leveraging of services being provided by higher educational institutions to learners**
- **As the networks move from generation to generation , more and more services can be offered by HEIs to learners**
- **The quality of education offered increases.**
- **Literacy rates will improve**

References

- **Yi-Bing Lin and Imrich Chlamtac, “Wireless and Mobile Network Architectures”, 2001, John Wiley & Sons**
- **Bud Bates, “Wireless Networked Communications”, 1994, McGraw Hill International Edition**
- **Eric Geier, “Wi-Fi hotspots: Setting up Public Wireless Internet Access”, 2006, CISCO press**
(contd.)



- **Aura Ganz, Zvi Ganz, and Kitti Wongthavarawat, “Multimedia Wireless Networks: Technologies, Standards and QoS”, 2003, Prentice Hall PTR**
- **Les Lloyd, “Best Technology Practices in Higher Education”, 2004, Information Today**
 - **<http://www.w3c.org>**
 - **<http://www.m-learning.org>**

Thanking you all,

P.V.Suresh

pvsuresh_2000@yahoo.com

pvsuresh@ignou.ac.in