

4G and Its Future Impact: Indian Scenario

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Abstract—This article discusses about the features of 4G, the edge it provides once operational, impact on India, barriers to implementation of 4G and recommendations to overcome these barriers.

Index Terms—4G, impact of 4G, advantages, barriers.

I. INTRODUCTION

The means of communication not until recently has been only voice and text. Voice and SMS services were given top priority by telecom networks. But, the Internet has provided many other services like electronic file sharing, online gaming, e-commerce and getting access to any information by just goggling which appeal to people as these services are cost effective and also reduces burden on the human part.

Making these services available on mobile devices has far more benefits and interesting situations. However, today's internet through cables and wireless limits connectivity only to a small region called Local Area Network (LAN) and Wireless Local Area Network (WLAN) hot spot respectively. Also getting an advanced service support to today's voice dominated telecom mobile networks is not an easy task either. Globally there is a perception that IP is the protocol that will enable new possibilities for telecom sector in future.

II. TECHNICAL ASPECTS OF 4G

4G fourth-generation wireless defines the stage of broadband mobile communications that supersede the third generation 3G, 4G used orthogonal frequency-division multiplexing - OFDM instead of time division multiple access - TDMA or code division multiple access - CDMA are increasingly marketing their services as being 4G, even when their data speeds are not as fast as the International Telecommunication Union (ITU) specifies. According to the ITU, a 4G network requires a mobile device to be able to exchange data at 100 Mbit/sec. A 3G network, on the other hand, can offer data speeds as slow as 3.84 Mbit/sec. OFDM is a type of digital modulation in which a signal is split into several narrowband channels at different frequencies. This is more competent than TDMA, which divides channels into

time slots and has multiple users take turns transmitting CDMA, which simultaneously transmits multiple signals on the same channel [1].

Ultra Wide Band Networks

Ultra Wideband technology is an advanced transmission technology that can be used in the implementation of a 4G network. Out of sight detection of noise is a typical activity of UWB. This high specific kind of noise does not cause interference with current radio frequency gadgets, but can be decoded by another device that recognizes UWB and can reassemble it back into a signal. Since the signal is disguised as noise, it can use any part of the frequency spectrum, i.e. it can use frequencies that are currently in use by other radio frequency gadgets. An Ultra Wideband device works by emitting a series of short, low powered electrical pulses that are not directed at one particular frequency other than spread across the entire spectrum. Frequencies between 3.1 to 10.6 GHz are used by Ultra Wideband. These pulse can be called "shaped noise" since they are not flat, but curves across the spectrum. On the other side, actual noise would look the same across a range of frequencies .

III. THE GAP THAT 4G FILLS

The factors that drive from 3G to 4G will be services that offer better quality (e.g. video and sound), more sophistication in association of a large quantity of information, and improved personalization.

Increasing consumers demand for most up-to-date technologies, whether it is a television, mobile, or shaving set, the latest technology whatever purchase must have new features. With the evolution of the Internet, the most of the features transform themselves to-ward faster access to information. Mobile SIM or devise subscribed customers pay extra on top of their basic bills for such features as instant messaging, stock quotes, and even Internet access right on their phones. However it is far from the limit of features; manufacturers magnetize customers to buy new phones with photo and even enhanced video capability. It is no longer a quantum leap to envision a time when access to all necessary information — the power of a personal computer — sits in the palm of one's hand. To maintain such a powerful system, we need such very high-speed pervasive wireless connectivity.

A number of technologies currently exist to provide users with high-speed digital wireless connectivity; examples are Bluetooth and 802.11. Standards provided by 802.11 are very high speed toward network connections over short distances, typically in the tens of meters. Wireless networks facilitators & Cellular providers look to increase speed on their long range networks. The goal of 4G (fourth-generation) wireless system is the same for long-range, high-speed

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wireless. Such a system is in its very nascent stages in many developed and developing countries. Due to its enticing advantages of Fourth-generation wireless needs to be standardized throughout the world to both users and service providers [2].

IV. WOULD BE IMPACT OF 4G ON INDIA

A. Government Organization

With the use of 4G technology the performance of the organization will improve by

- Reducing cost of travel
- Instant access to monitor performance of any employee
- Instant update on all government projects implemented and work in progress
- Increased revenues by auctioning spectrum

B. Educational Institutions

- Wider spectrum of use, quickly tracking student and teacher performance
- Evaluation of practices followed in education system
- Video conferencing with other schools/colleges
- Online guest lectures
- Infrastructure tracking
- Online tutoring

C. Electronics Industry

- An escalation in demand for new products
- New enterprises will emerge
- Competition will increase

D. Telecommunication Sector

- New markets emerge with new demand for technology
- New market strategies will be required

E. Citizens

- Can watch videos with HD quality
- High quality video calls

F. Private Organizations

- Many more business trips can be avoided
- High quality video conferencing
- Can track each and every move of an employee

G. Banking services industries

- Mobile banking will be efficient and secure than before
- Virtual draft and cheque may exists in future

H. Healthcare

- Online diagnosis becomes possible
- Specialist Doctors can be consulted online
- Emergency situations can be handled very efficiently

V. ADVANTAGES OF 4G

In a fourth-generation wireless system provides a variety of cellular device facilitates to a greater opportunity for a wider access of data. These cellular networking processes

would become data enabled networks on which cellular phones could operate like any other data devices. Sending data over the cell phone network is a profitable business. In the Knowledge age, access to data is the “killer app” that drives today’s market. The most telling example is growth of the Internet over the last 13 years. Innovations in Wireless networks provide a state-of-the-art to their products and mobility. This concept is already beginning a revolution in wireless networking, however instant access to the Internet from anywhere need to be re-engineered.

One may wonder how ubiquitous, high-speed wireless is already available. Wireless providers are constantly moving in the direction of expanding the bandwidth of their cellular networks. Unfortunately, the existing cellular networks do not have the available bandwidth necessary to handle data services. Data transfers slow at the speed of analog modems but the bandwidth is not allocated efficiently for data. Cellular providers are continuing to upgrade their networks in order to meet these higher trends, pre-requisite demand by 4G Wireless Systems.

4G uses advances protocol spectrum up to 4 times as effective & efficiently as 3G systems, have better ways of handling dynamic load changes, creating more bandwidth than 3G systems [2].

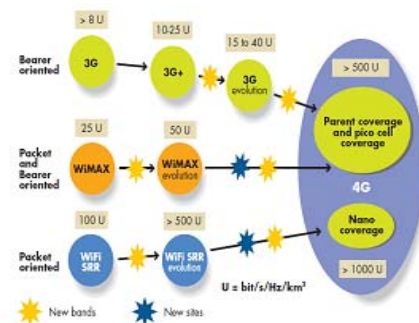


Fig. 1. Coverage performance trend from alcatel communication review [3]

VI. BARRIERS TO PROGRESS

Question: Why are the cellular providers not moving from 3G to 4G?

A marketplace of the cellular industry can be modeled to a game. There are three basic paths of diversion expected are as follows:

- 1) *Market restricts for conversion to 4G.* All end up upgrading to 2G and 3G services. These could be due to an apprehensive wireless system. The upgrades are incremental, and do not require a complete reworking of the system, so they are fairly cheap. The equipment required is already developed and in mass production in other places around the globe.
- 2) *If everyone makes the conversion to 4G.* The equipment and related technology needed for 4G will be cheaper, for the reason that of all of the cellular manufacturers investing in it. Cellular providers will promote additional services to its customers.
- 3) *Few players make the conversion to 4G.* Since not all of the players have chosen 4G, the equipment to be more expensive. Even though Sales force automation teams will be able to sell more services to their customers, it

will not be enough to cover the higher costs of converting to 4G. Therefore, if a few players choose the 4G strategy, but no one else follows, that player will be at a significant disadvantage. No cellular provider has enticement to move to 4G.

An area of information security which is often overlooked area of financial liability for cellular providers. These Providers could also lose money through counterfeit use of the cellular system or unauthorized disclosure of user information over the airwaves.

Connection speed		256Kbps	2Mbps	10Mbps	100Mbps
Content					
Google home page (160 KB)		00:00:05	00:00:01	00:00:00	00:00:00
Music track (5MB)		00:02:36	00:00:20	00:00:04	00:00:00
Video clip (20MB)		00:10:25	00:01:20	00:00:16	00:00:02
CD / low quality movie (700MB)		06:04:35	00:46:40	00:09:20	00:00:56
DVD / high quality movie (4GB)		34:43:20	04:26:40	00:53:20	00:05:20

Source: ITU calculation.
Note: *Rounded values

Fig. 2. Download time at different connection speeds [4]

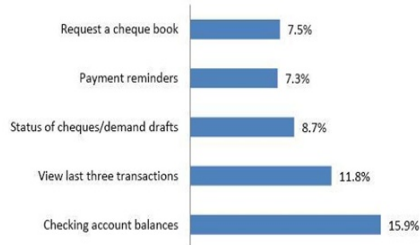


Fig. 3. Statistics on most popular mobile banking services [5]

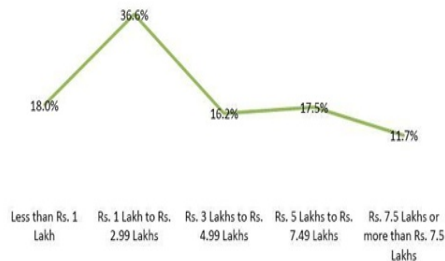


Fig. 4. Mobile banking users – Income profile [5]

VII. RECOMMENDATIONS

- 1) Promoting IPv6 for 4G deployment. This is required to scale for nation-wide broadband internet use.
- 2) Review spectrum allocation policies to promote self-configuring and self-optimizing networks (SON) with a distributed access infrastructure. SON in 4G may prove to be a highly cost effective infrastructure for India but this requires a careful regulatory framework.
- 3) Ensure that the security infrastructure deployed for 4G is scalable and accounts for new usage patterns like social networking, peer to peer applications.
- 4) Define latest capacity models for packet voice based. Capacity models based on voice carried on circuits are no longer relevant for 4G.
- 5) Apart from capacity, Quality of Service (QoS) models and Key Performance Indicators (KPI) are completely different in 4G. A comprehensive study is required to investigate such models in detail and enable appropriate monitoring mechanisms.
- 6) Prepare for India to lead future generations of wireless by promoting Indian IPR and Indian requirements in telecom standards.
- 7) Enhance security of the country

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