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Comparative analysis on 4g and 3g telecommunication

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ABSTRACT: 4G means **fourth generation**. It is fourth generation of mobile telecommunications technology, succeeding 3G. A 4G system must provide capabilities defined by ITU in IMT Advanced. Potential & current applications include amended mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing, 3D television, & cloud computing. Two 4G candidate systems are commercially deployed: Mobile WiMAX standard first used in South Korea in 2007, & first-release Long Term Evolution (LTE) standard . This has however been debated if these first-release versions should be considered to be 4G or not, as discussed in technical definition section below. In United States, Sprint (previously Clearwire) has deployed Mobile WiMAX networks since 2008, while Metro PCS became first operator to offer LTE service in 2010.

[1] INTRODUCTION

4G, short for fourth generation , is fourth generation of mobile telecommunications technology , succeeding 3G. A 4th Generation system would be expected to provide support to potential & current applications including mobile web access , IP telephony , gaming services , high-definition mobile TV , video conferencing , 3D television , & cloud computing. The first operational cellular communication system was set up in Norway in 1981 & was followed by similar systems in United States & United Kingdom. These first generation systems provided voice transmissions by using frequencies around 900MHz & analog modulation. The second generation (2G) of wireless mobile network was based on low-band digital data signaling . The most popular 2G wireless technology is known as Global Systems for Mobile Communications (GSM). The first GSM systems used a 25MHz frequency spectrum in 900MHz band. Initiation for 3G started in 1980s. Initially it focused on multimedia applications such as videoconferencing for mobile phones. 3G thinking had to evolve as internet user demanded more & more wireless applications & services. As personal wireless handsets become more common than fixed telephones , it is clear that personal wireless Internet access will follow & users will want broadband Internet access.

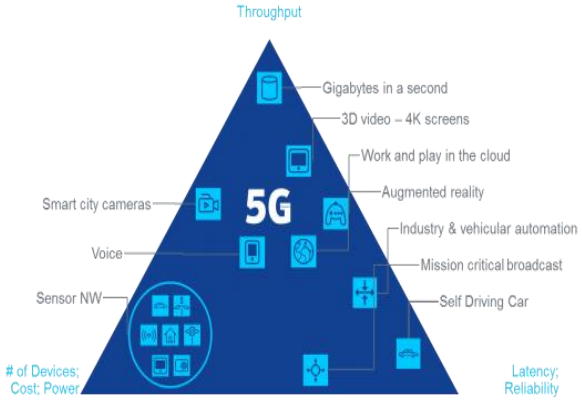

Fig 1 5G diagram

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Fig 2 Show various 4G devices

The Next Generation Mobile Networks Alliance feels that 5G should be rolled out by 2020 to meet business & consumer demands. In addition to providing simply faster speeds , they predict that 5G networks also would need to meet new use cases , such as Internet of Things (network equipment in buildings or vehicles for web access) as well as broadcast-like services & lifeline communication in times of natural disaster.

[2] HISTORICAL EVOLUTION

History of G

The first cell phones could barely keep a call connected let alone send a text message & now we are streaming content across wireless spectrum while cruising web & talking to friends. A long way indeed. Where does it go from here & will wireless spectrum stand up to test? We will soon find out.

2G Rises to Challenge

When smart phones were first introduced, there was no texting as well as undoubtedly horrible connections. Then came 2G or 2nd Generation networks as well as by having them came capability to transfer & get information, although velocities were actually sluggish - 9.6 kb|s - slower than old, screechy, modems that we used to utilize in early days of Internet. Slowly technological innovation strengthened & information rates were raised, by having latter types of 2G getting to speeds of about 56kb|s & we thought that was fast. The 4G system was originally envisioned by the Defense Advanced Research Projects Agency (DARPA). The DARPA selected the distributed architecture & end-to-end Internet protocol (IP), & believed at an early stage in peer-to-peer networking in which every mobile device would be both a transceiver & a router for other devices in the network, eliminating the spoke-and-hub weakness of 2G & 3G cellular systems. Since the 2.5G GPRS system, cellular systems have provided dual infrastructures: packet switched nodes for data services, & circuit switched nodes for voice calls.

[3] PROBLEM FORMULATION

A CPU networks or data networks is telecommunications networks which allows computers to exchange data. In CPU networks , networked computing devices exchange data with each other using data link. connections between nodes are established using either cables media or wireless media. best-known CPU networks is Internet. Network CPU devices that originate , route & terminate data are called networks nodes. Nodes could include hosts such as personal computers , phones , servers as well as networksing hardware. Two such devices could be said to be networked together when one device is able to exchange information with other device , whether or not they have direct connection to each other. For modern glass opticalfiber , maximum transmission distance is limited not by direct material absorption but by several types of dispersion , or spreading of optical pulses as they travel along fiber. Dispersion in opticalfiber is caused by variety of factors. Intermodal dispersion , caused by different axial speeds of different transverse modes , limits performance of multi-mode fiber. Because single-mode fibers supports only one transverse mode , intermodal dispersion is eliminated. In single-mode fibers performance is primarily limited by chromatic dispersion (also called group velocity dispersion) , which occurs because index of glass varies slightly depending on wavelength of light , & light from real optical transmitters necessarily has nonzero spectral width (due to modulation). Polarization mode dispersion , another source of limitation , occurs because although single-mode fibers could sustain only one transverse mode , it could carry that mode with two different polarizations , & slight imperfections or distortions in fibers could alter propagation velocities for two polarizations. This phenomenon is called fibers birefringence & could be counteracted by polarization-maintaining opticalfiber. Dispersion limits bandwidth of fibers because spreading optical pulse limits rate that pulses could follow one another on fibers & still be distinguishable at receiver.

Band	Description	Wavelength Range
O band	Original	1260 to 1360 nm

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E band	Extended	1360 to 1460 nm
S band	short wavelengths	1460 to 1530 nm
C band	conventional ("erbium window")	1530 to 1565 nm
L band	long wavelengths	1565 to 1625 nm
U band	ultralong wavelengths	1625 to 1675 nm

Table 1 Wavelengths of diff. bands

When communications link must span larger distance than existing fiber-optic technology system is capable of , signal must be regenerated at intermediate points in link byoptical communications repeaters. Repeaters add substantial cost to communication system , & so system designers attempt to minimize their use.

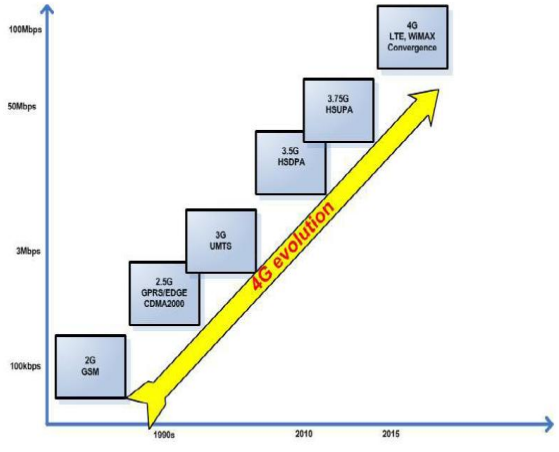

Fig 3 Evolution of wireless cellular standards

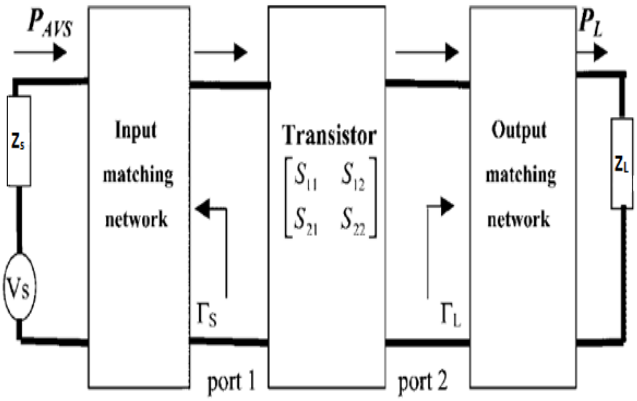

Fig 4 Block Diagram of transducer power gain

Gain

The need to obtain a desired gain performance is another important consideration in amplifier design task. transducer power gain GT, quantifies gain of amplifier placed between source & load.

$$G_T = \frac{\text{Power delivered to the load}}{\text{Available power from the source}} = \frac{P_L}{P_{Avs}} = \frac{(1-|\Gamma_L|^2)|S_{21}|^2(1-|\Gamma_S|^2)}{|1-\Gamma_L\Gamma_{out}|^2|1-S_{11}\Gamma_S|}$$

(19)

Here, PL is average power delivered to load & PAvs is maximum power available from source. Figure 3.8 shows block diagram of transducer power gain with PAvs & Pl labeled.

[4] PROPOSED WORK

Features of Fourth Generation Technology

Fourth generation (4G) technology will offer many advancement to the wireless market, including downlink data rates well over 100 Mbps, low latency, very efficient spectrum use and low-cost implementations. With impressive network capabilities, 4G enhancement promise to bring the wireless experience to an entirely new level with impressive user applications, such as sophisticated graphical user interfaces, high-end gaming, high-definition video and high-performance imaging. Consumer

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expectations for mobile handsets and similar products are becoming more and more sophisticated.

Consumers are demanding a better user experience along with more advanced and useful applications on a more ergonomic device. The current 3G devices are good, but they will have to improve in areas like imaging and processing power to support future 4G applications like three dimensional (3D) and holographic gaming, 16 megapixel (MPixel) smart cameras and high-definition (HD) camcorders. Applications like these will demand more processing power than the current 3G handsets offer, requiring more efficient applications processors.

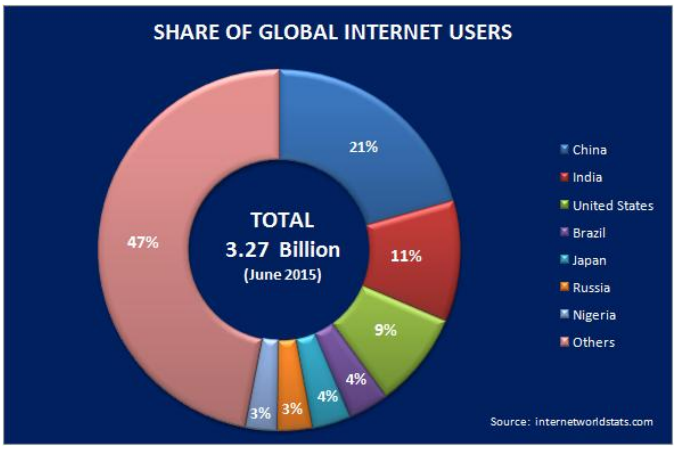

Fig 5 represents the distribution of the Internet users among countries.

The move to 4G networks will allow service providers to offer the impressive applications that will drive users to upgrade to the new phones. Current downlink data rates are less than 10 megabits per second (Mbps); 4G systems will offer downlink data rates well over 100 Mbps, an improvement of 10 times over 3G. 4G systems will also have low latency, improving the consumer experience. With flexible network connections, efficient use of spectrum and impressive user applications, 4G will offer what consumers want. Long Term Evolution (LTE) technology is sometimes called 3.9G or Super 3G and has been developed by the Third Generation Partnership Project (3GPP) as an improvement to the current Universal Mobile Telecommunications System (UMTS). By using Orthogonal Frequency Division Multiple Access (OFDMA), LTE will be able to provide download rates of 150 Mbps for multi-antenna (2x2) multiple-input multiple output (MIMO) for the highest category terminals. For these terminals upload rates in the 50 Mbps range will allow an efficient transfer of data.

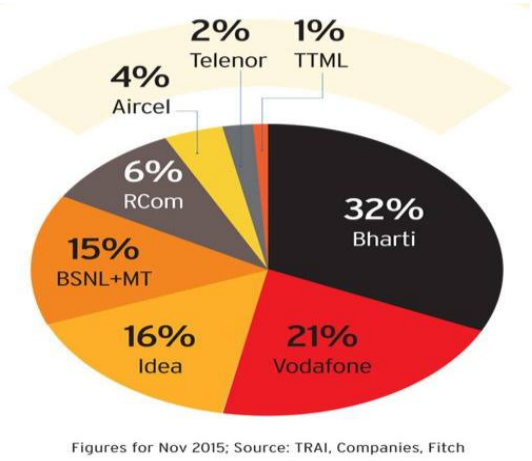

Fig 6

Survey Report : Breakup of the wireless internet service providers in India, clearly Bharti Airtel leads this segment by big margins. Similarly, Jio has developed an app - Switch N Walk - that lets users transfer their entire data from one phone to another in about five minutes. "Jio is not built like any other telecom operator. It is a true internet age company. You should have the agility of Internet and at the same time the infrastructure of telecom companies which internet companies miss," says a Jio executive. It has created different teams for each of its applications, and its total workforce is around 25,000. "The network infrastructure is ready and going through extensive tests to ensure a seamless experience for subscribers. Business platforms, too, are being tested in a limited use environment.

[5] Result and discussion

GSMA Intelligence forecasts that an additional 1.6 billion citizens worldwide will become mobile Internet users over the next six years, bringing the total number to 3.8 billion, or around half of the world's expected population by 2020."Our new findings underline how mobile is now the gateway to the Internet for billions of citizens across the world and will be responsible for connecting millions of currently 'offline' global citizens to the Internet in the years to 2020 and beyond," said Anne Bouverot, Director General of the GSMA. The GSMA (GSM Association) defines a mobile Internet subscriber as an individual who has accessed an Internet

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service on one or more of their mobile devices. Any activity that consumes mobile data is considered a mobile Internet service, including web browsing, mobile instant messaging, mobile social networking, email, app downloads and online gaming, video and music. Mobile Internet subscriber estimates and forecasts were based on primary research conducted by GSMA Intelligence. Overall, 42 markets have been surveyed worldwide with an equal split between developed (21) and developing countries (21). These 42 countries represent 74% of the global mobile market in terms of unique mobile subscribers. Almost all of the additional mobile Internet users expected over the next six years will come from the developing word.

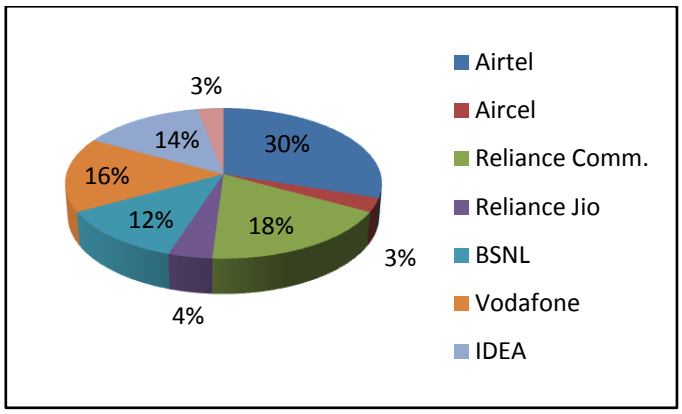

Fig 7 ISP of people surveyed

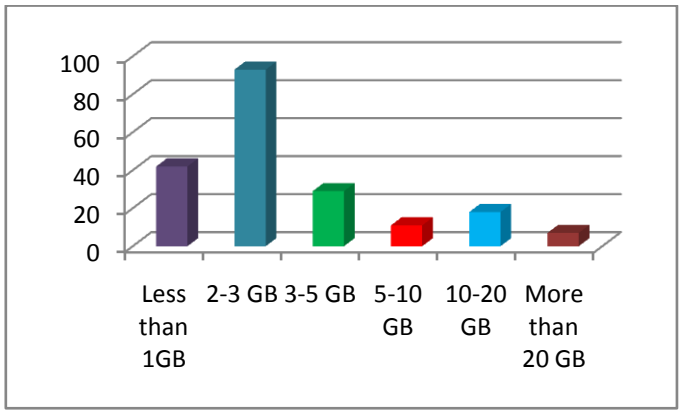

Fig 8. 3 GB of Data though most of the users feel they need larger data packs.

This survey is indicative of the patch road ahead of the Indian Internet Service providers. Though on papers the prospect of future technology looks good but the actual ground report portrays a dismal story and if the Indian telcos want to hold on to the Indian market then they will have to do a lot better hen this and will have to have a robust technology infrastructure along with strict administrative values. Rather than cut throat competition which has left Telcos high and dry they should focus on their deliverables as no big branding and advertisement can win you a loyal customer then your quality of service. Having invested heavenly on 4G branding, Airtel has already suffered initial setbacks. The branding won many new customers to Airtel but the company Infrastructure was not ready for the load and it resulted in many customers porting their no.s to rival service providers.

[6] CONCLUSION & FUTURE SCOPE

India's 4G and 3G user base will touch 300 million by March 2018, according to a market research undertaken by the investment group, Credit Lyonnais Securities Asia (CLSA). The report adds that the smartphone population in India is expected to reach 350 million by March 2018, 210 million of which will be 4G. The estimate underscores the phenomenal increase in the country's smartphone penetration in recent months, and the expansion witnessed in high-speed internet coverage in the country At present, mobile services across the second, third and fourth generation platforms are offered in India on 800 MHz, 900 MHz, 1800 MHz, 2100 MHz and 2300 MHz bands. The government has indicated it will auction super-efficient 4G spectrum in the 700 MHz band but has yet to finalise a timetable. As affordability for 3G and 4G data increases, fuelling data usage and spends, the addressable market will expand to 300 million subscribers by March 2018. India's 3G and 4G subscribers have tripled to 120 million in 24 months," CLSA said in its report. "Yet, current data tariffs limit usage, restricting the market for 3G and 4G to high average revenue per unit (ARPU) subscribers." India's internet connectivity coverage is not widespread despite rapid adoption of smartphones. India is ranked second after China in the world's largest smartphone market ranking. But the expensive data tariffs and lacks of reliable networks in rural areas are some of the key challenges slowing India's high-speed internet adoption. Amidst a flurry of service providers in the country, only Bharti Airtel and Reliance Jio have pan-India 4G spectrum in 2,300MHZ, which will help them lead the pack. Reliance Jio's commercial launch is still a mystery as the company has given a vague timeline of the second half of this year for launching the services. Vodafone and Idea still

have some gaps to fill in the 4G coverage nationwide. According to Bernstein research firm, Idea is required to spend Rs. 40 billion to 120 billion this summer and Vodafone is likely to spend up to 160 billion to close the gaps. Industry experts feel that 4G LTE technology, now at its nascent stage in India, can be a game changer in near future. It will help boost growth of web access further and help companies offering the services enhance revenues faster. They point to the success of TD-LTE network of China Mobile. China is another major market for mobile network. While Reliance Jio Infoco is launching the service a little late, the company has been investing heavily in spectrum and network equipments. This will reduce chances of network coverage issue and service quality. Rival operators, likely to join the 4G rollout race in late 2015 and next year, are not likely to skimp on service and network quality either. In the end, it is a winning proposition for the users.

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