Problem 01 – (Broadband Wireless Communication):

In the previous era; wireless, mobile devices and their applications have experienced an exponential growth in terms of users, quality and coverage. Globally more people uses mobile devices like Radio, Satellite, Bluetooth, WiMAX, Wi-Fi, ZigBee, Routers, Adapters, Repeaters etc. than who have bank accounts and the number of user increases almost every day with the passage of time where a better quality service is expected on the user end. As a new century begins, market forces are accelerating the pace of wireless technology innovation. Faster, cheaper, and more power-efficient alternatives are rapidly evolving for wide-area, indoor, and short-range wireless communication. Anywhere and anytime access to the Internet is often quoted as the killer application, fueling much of recent growth in wireless standards and industry.[[1]](#footnote-1)

An application of wireless in my opinion which can be extremely interesting and valuable around the year 2030 is a wireless thought converter; basically a chip that is installed at the back of a person’s neck which converts his/her thoughts and then displays them on an LED screen. Such wired systems are already being used by a limited number of people like Stephen Hawking, and it can be really useful in future if commercialized - made cheap and wireless. It will aid physically handicapped people, more specifically those who suffer with ALS and those who are bound to a wheel-chair, as they can make use of a portable system that helps them communicate and commute.

Problem 02 – (1G to 4G):

*Main Features & Key Differentiators:*

**1G –** This technology was introduced back in the early 1980’s and back then it was the one and only mode to transfer voice samples using analog transmission methods. Network was divided into small cell where each cell operated at different frequency. It had multiple uses like; NMT, AMPS, TACS etc. The Spectrum was divided into number of channels and each user was allotted a separate channel that resulted in accommodation of only one user per channel. Cause why frequency could be reused which increased the system capacity and very large guard bands were used to avoid interference.

**2G –** This technology was introduced back in the mid 1990’s which empowered voice data compression and resulted in greater voice capacity. This supported increased number of users per channel. Standard uses like CDMA, TDMA which operates at same frequency. Advancement in 2G resulted in GPRS. Mobile voice service and various data services came into existence to accommodate more number of users with less number of base stations. Still large guard bands were used to avoid interference.

**3G –** This technology was introduced back in the early 2000’s. 3G network was a combination of the internet and wireless technology. Used standards like CDMA2000/EV-DO, TD-SCDMA, WCDMA/HSPA etc. The data rate was adjusted for optimal performance with data rate at least 200kbits/s. 3G got transformed and started supporting greater data rates like Megabits/s. It introduced access to advanced services and applications that required higher capacity to the users. Higher order modulation in 3G also enabled 50% more efficient data packaging and channels with high data rates were combined which resulted in increased peak data rates.

**4G –** This technology was introduced back in the early 2010’s which operates on LTE standards which resulted in the connectivity of a user in real time. 4G is a boost in the 3G technology based upon UMTS 3G technology. Technology used in 4G was MIMO – Multiple inputs multiple outputs (several antennas at the transmitting and the receiving end). Other technology is OFDM – Orthogonal frequency division multiplexing (achieves channel distortion minimization). Greater then 1000Megabits/s broadband data is provided to the mobile device users. MIMO utilization spatially separated paths and combined higher channel data rates. The wireless technology is growing every second and evolving by Shannon’s law for better and increased data capacity.

1. http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=986453 [↑](#footnote-ref-1)