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4G Wireless Networks

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ABSTRACT

One such development is fourth generation networks. Also called future generation or Next Generation Networks. The introduction of 4G has widened the scope of mobile communication. Now mobile is not only a device used for talking but its more or less a portable computer that can serve different purposes. 4G offers higher data rates with seamless roaming. The mobile user can communicate without any disturbance while switching his coverage network.

4G is still passing through research and therefore there are some problems that need to be fixed in order to benefit the users from it fully. In this report we discuss various challenges 4G is facing and solutions to those problems are discussed. We propose our own way of improving QoS in 4G by using combination of mobility protocol SMIP and SIP

Keywords:

4G Wireless Networks, mobile communication, QoS, SMIP, SIP

INTRODUCTION

Mobile communication means communicating while on move. Mobile communication itself has seen various developmental stages such as first generation (1G), second generation (2G), third generation (3G)and fourth generation (4G).

1G

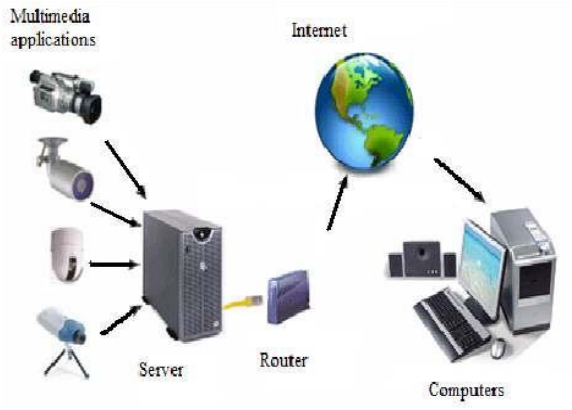
First generation of network came into use for the first time inJuly1978 inUSA.1Gconsisted of distributed transceivers that helped in communicating with mobile phone. The structure of the mobile phone was analogue and it could only be used for voice traffic. For the transmission of signals frequency modulation was in use.[1] There was one 25MHZ frequency band allocation from cell base station to the mobile phone and another 25MHZfrequencyband allocation for the signal from phone to the base station .In order to accommodate more users to the network each channel was separated from the other by a spacing of 30KHZ, but it was not effective enough in terms of the available spectrum. 1Gwould use frequency division multiple access (FDMA) techniques where the user had to wait for the first user to hang-up. The network capacity in 1Gwasincreased by implementing the frequency reuse .

2G

The first 2Gsystem was introduced in Finland in1991, by Radiolinja (now part of Elisa Oyo. In 2G the shift was made to fully digital encrypted communication rather than analogue in 1G. 2G solved the problem of higher number of active customers in the network. Now more users could use the service simultaneously. 2G also introduced the additional data transfer through mobile rather than only voice data as in 1G.For example SMS text messages.

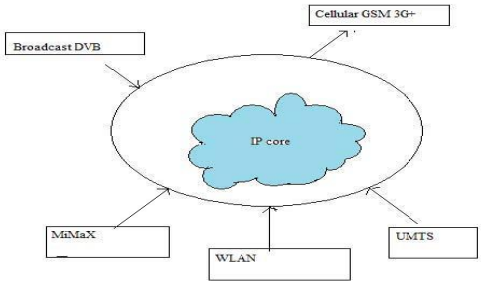
3G

To provide the higher data rate sat higher speed the need for advanced generation Was felt, and third generation was introduced that could full fill the growing needs of the mobile users. 3G uses higher frequency band of 2.5 GHZ and above with larger amount of bandwidth than 2G. 3Gcan provider higher data rates both in mobile and in fixed environments. It gives up to 2Mbps in stationary and about 384 Kbps in mobile environments[4].3G has encouraged the video streaming and IP telephony to develop further and provide cost effective services to mobile users.



4G

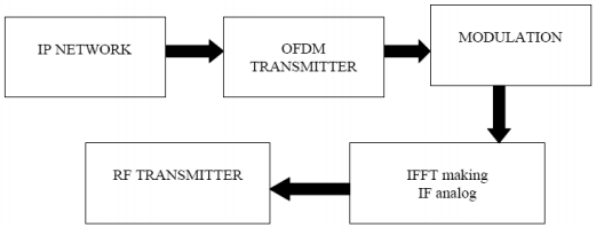
Fourth generation (4G) also called Next Generation Network (NGN) offers one platform for different wireless networks. These networks are connected through one IP core. 4G integrates the existing heterogeneous wireless technologies avoiding the need of new uniform standard for different wireless systems like World Wide Interoperability for Microwave Access(WiMAX), Universal Mobile Telecommunications System (UMTS), wireless local area network (WLAN)and General Packet Radio Service(GPRS). 4G networks will increase the data rates incredibly, by providing 100Mbps to 1Gbps in stationary and mobile environment respectively .In 4G the latency will be decreased considerably, because of all IP environments. 4Gcan be considered as a global network where users can find voice, data and video streaming at anytime and anywhere around the globe. In 4Gthe integration of network and its applications is seamless therefore there is no risk of delay.



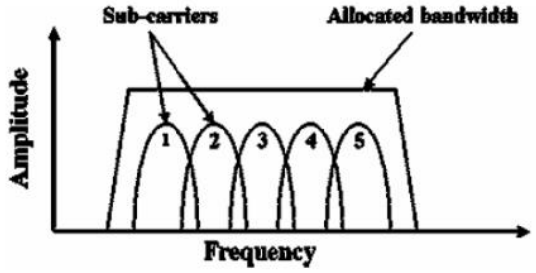
Support for interactive multimedia, voice, streaming video, Internet, and other Broadband services ·IP based mobile system ·High speed, high capacity, and low cost-per-bit ·Global access, service portability, and scalable mobile services ·Seamless switching, and a variety of Quality of Service-driven services ·Better scheduling and call-admission-control techniques ·Ad-hoc and multi-hop networks(the strict delay requirements of voice Make multi-hop network service a difficult problem) ·Better spectral efficiency ·Seamless network of multiple protocols and air interfaces(since 4Gwill be all-IP,look for 4G systems to be compatible with all common network. Including WCDMA,Bluetooth,andHyperLAN)·Aninfrastructuretohandlepre-existing3Gsystemsalongwithother wirelessTechnologies,some of which are currently under development.

Transmission in 4G

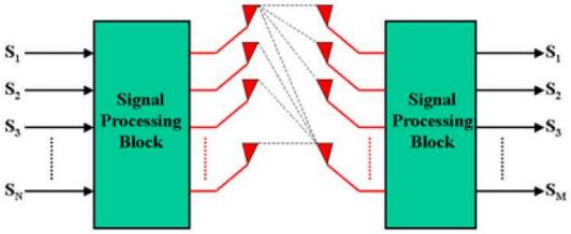
Fourth Generation wireless communication systems (4G) aim to allow peak data rates in the range of 1 Gbps for nomadic access and 100 Mbps for vehicular mobility. 4G services require extensive exploitation of advanced schemes such as Multiple Input Multiple Output (MIMO), base station cooperation, macro-diversity, inter-cell interference cancellation, multi hop relay techniques, hierarchical constellations, as well as multi-resolution techniques

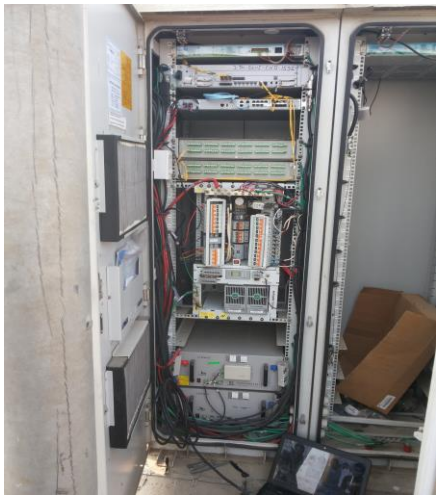


An OFDM transmitter accepts data from an IP network, converting and encoding the data prior to modulation. An IFFT(inverse fast Fourier transform)transforms the OFDM signal into an IF analog signal, which is sent to the RF transceiver. The receiver circuit reconstructs the data by reversing this process.



4G Hardware

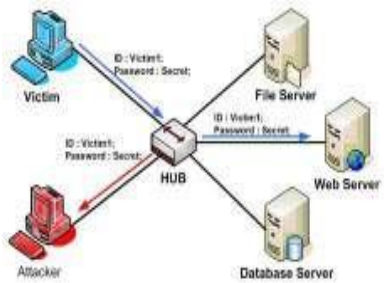




ODS RACK IN CELL PHONE TOWER ,Photo Taken From Practical Site Location

4G architecture Security

Security in digital world means to protect the digital systems from criminal and unauthorized usage. In terms of computers and mobile communications the need for security has increased overwhelmingly with the improvement in technology.



Conclusion

Mobile communication has become the vital aspect of our lives these days and its importance and scope cannot be denied in our lives. Mobile users demand for advance techniques with efficiency and sophistication. To provide them with the technology they anticipate is no doubt a challenging job. Fourth generation of mobile networks is developed to meet the requirements of users in data rates and speed. While keeping QoS assurance in focus these requirements need to be fulfilled.

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