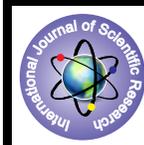# 4G Technology - Future Challenges

Prof. Anil P Gaikwad	PDVVPF's, IBMRD Vilad Ghat, Ahmednagar
Mr. Abhijit Suwarnakar	PDVVPF's, IBMRD Vilad Ghat, Ahmednagar
Mr. Ganesh Ragho	PDVVPF's, IBMRD Vilad Ghat, Ahmednagar

ABSTRACT   Based on the study, 4G mobile technologies is in a determining and Standardization stage. Since 4G is still in the cloud of the sensible standards creation, ITU and IEEE form several task forces to work on the possible completion for the 4G mobile standards as well. 3GPP LTE is an Evolution standard from UMTS, and WiMAX is another candidate from IEEE. These technologies have different characteristics and try to meet 4G characteristics to become a leading technology in the future market. Under these circumstances, this paper will present about the current trends and its underlying technologies to implement the 4G mobile technology. This paper also shows some of the future challenges scenarios that will benefit the 4th generation technology.

Challenges overcoming:

A. Security and Privacy:
The first step in analyzing cellular wireless security is to identify the security objectives. These are the goals that the security policy and corresponding technology should achieve.

Howard, Walker, and Wright, of the British company Vodafone, created objectives for 3G wireless that are applicable to 4G as well:

- To ensure that information generated by or relating to a user is adequately protected against misuse or misappropriation.
- To ensure that the security features are compatible with world-wide availability.
- To ensure that the security features are adequately standardized to ensure world-wide interoperability and roaming between different providers.
- To ensure that the level of protection afforded to users and providers of services is considered to be better than that provided in contemporary fixed and mobile networks.
- To ensure that the implementation of security features and mechanisms can be extended and enhanced as required by new threats and services.
- To ensure that security features enable new 'e-commerce' services and other advanced Applications (Howard, Walker, and Wright 2001, 22)

These goals will help to direct security efforts, especially when the system is faced with specific threats.

In 4G Networks, security measures must be established such that they enable data transmission to be as safe and secure as possible. The nature of the 4G network, gives an increased likelihood of security attacks due to vast facilities. Hence, multiple levels of security, including authentication, will be necessary to protect the data that gets transmitted across the network.

Wireless systems face a number of security challenges, one of which comes from interference, as more wireless devices begin to use the same section of electromagnetic spectrum, the possibility of interference increases. This can result in aloss of signal for users. Moreover, an abuser can intentionally mount a denial-of-service attack (lowering availability) by jamming the frequencies used. Iowa State University professor Steve Russell comments that "an RF engineer using $50 worth of readily-available components can build a simple short-range jammer for any of the common microwave frequencies" (Russell 2001, 174).The need of the hour is an efficient, user friendly, effective, extensible and complete 4G-architecture to confront the problems being faced.

B. Quality of Service:
With respect to network quality, many telecommunications providers are promising that there will be enhanced connectivity, and the quality of data that is transmitted across the network will be of the highest possible quality, as in the case of Ericsson's 4G Network for TeliaSonera. The company promises that "The new 4G network will do for broadband what mobile telephony did for voice. With real-time performance, and about 10 times higher data rates compared to today's mobile broadband networks, consumers can always be connected, even on the move". As a result, it is important for providers to develop an effective approach to the 4G Network that will enhance quality, provide effective security measures, and will ensure that all users are provided with extensive alternatives for downloading video, music, and picture files without delays. The main challenge that 4G networks are facing is integrating non-IP-based and IP-based devices. It is known that devices that are not IP address based are generally used for services such as VoIP. On the other hand, devices that are IP address based are used for data delivery. 4G networks will serve both types of devices. Consequently, integrating the mechanisms of providing services to both non-IP-based as well as IP-based devices is one of key

C. Cost Affordability and Managing User Accounts
With 4G networks, maintaining user accounts has become complicated. Due to heterogeneity of 4G networks and the frequent interaction of service providers, the billing system is not able to be figured out and managed. In terms of 4G Network cost and affordability, there are a number of issues to consider that reflect some degree of risk, as well as opportunity, so that these networks are successful once rolled out to the general public, and in general, 4G Networks are designed in order to create an environment that supports high-speed data transmission and increased profit margins for organizations that utilize these capabilities. Developing a successful 4G Network platform is a positive step towards the creation of a wireless and broadband environment that possesses rapid transmission speeds, data integrity modules, and other related events that encourage users to take additional risks in promoting successful utilization of these 4G tools.

D. Meeting Consumer Expectation
With the appropriate combination of resources, it is possible for 4G Networks to create alternatives that exceed consumer and industry expectations. Another key feature of 4G networks is high level of user-level customization. That is, each user can choose the preferred level of quality of service, radio environment, etc. Accessing 4G networks will be possible virtually by using any wireless device such as PDAs, cell phones, and laptops. In general, the possibilities associated with 4G Networks are endless, as high-speed data transmission and associated capabilities are more feasible than ever. This supports the notion that the demand for more complex networks and related capabilities are stronger than ever, as a greater number of consumers continue to buy into the potential that exists with advanced networks, such as 4G.
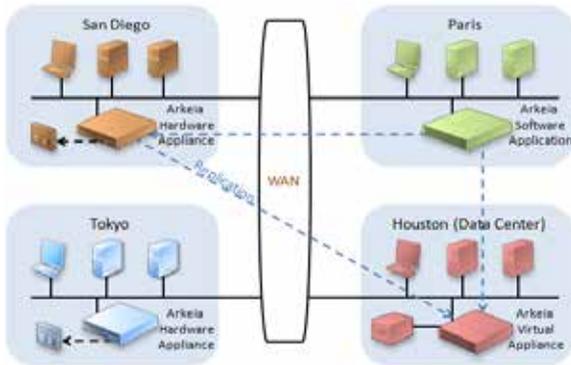
Fig. Accessing multiple networks and services through Multi-mode software

E. Integration of IP Devices

To provide better facilities with high data rates and higher bandwidths, 4G technologies provide integration of non IP devices and IP devices. This feature makes it easier to integrate the infrastructure of all current networks and consequently it will be easier for users to access services and applications regardless of the environment. By this, one can easily access different mobile and wireless networks simultaneously. Multimode software is the best solution to this problem. This is software that allows the user device to adapt itself to various wireless interfaces networks in order to provide constant net access with high data rate. This is all packet based. Unfortunately, to use packet, all cellular hardware will need to be upgraded or replaced. Consumers will be required to purchase new phones, and providers will need to install new equipment in towers. Essentially, the communication system will need to be rebuilt from the ground up, running off of data packets instead of voice information. However, given the current pace of technological development, most consumers buy new phones every six to twelve months, and providers are constantly rolling out new equipment to either meet expanding demand or to provide new or high-end services. All networks will be compatible once the switch is completed, eliminating roaming and areas where only one type of phone is supported. Because of this natural pace of hardware replacement, a mandated upgrade in a reasonable timeframe should not incur undue additional costs on cellular companies or consumers. The technological disadvantage of using packets is not really a disadvantage, but more of an obstacle to overcome. As the voice and data networks are merged, there will suddenly be millions of new devices on the data network. This will require either rethinking the address space for the entire Internet or using separate address spaces for the wireless and existing networks.

Conclusion:

4G wireless networks not only enable more efficient, scalable, and reliable wireless services but also provides wider variety of services. These opportunities come with a need for rethinking our security, privacy, architect and billing technologies have been used for previous generations. We believe, however, that future research will overcome these challenges and integrate newly developed services to 4G networks making them available to everyone, anytime and everywhere.

REFERENCE

[1]3GPP TS 23.107 v.5.9.0, "Quality of Service (QoS) Concept and Architecture," June 2003. | [2] Accenture, Accenture 4G accelerator solution. 2009. | [3] E. Buracchini, "The Software Radio Concept," IEEE Commun. Mag., vol. 38, no. 9, 2000, pp. 138–43. | [4] J. Chavis, What is a 4G network?, 2009 | [5] H. Eguchi, M. Nakajima, and G. Wu, "Signaling Schemes over a Dedicated Wireless Signaling System in the Heterogeneous Network," Proc. IEEE VTC, Spring 2002, pp. 464–67. | [6] Ericsson, Ericsson to build commercial 4G network for TeliaSonera. 2009. | [7] J. Fleck, "A Distributed Near Real-time Billing Environment," Telecommun. Info. Net. Architecture, 1999, pp. 142–48. | [8] F. Ghys and A. Vaaraniemi, "Component-based Charging in a Next-generation Multimedia Network," IEEE Commun. Mag., vol. 41, no. 1, Jan. 2003, pp. 99–102. | [9] S. Higgenbotham, Countdown to 4G: who's doing what, when, 2008. | [10] R. Jackson, T-Mobile 4G network coming with help from Comcast, 2009. | [11] T. H. Le and A. H. Aghvami, "Performance of an Accessing and Allocation Scheme for the Download Channel in Software Radio," Proc. IEEE Wireless Commun. And Net. Conf., vol. 2, 2000, pp. 517–21. | [12] A. Lyle, Clear, first 4G network launched, 2009 | [13] J. Al-Muhtadi, D. Mickunas, and R. Campbell, "A Lightweight Reconfigurable Security Mechanism for 3G/4G Mobile Devices," IEEE Wireless Commun., vol. 9, no. 2, Apr. 2002, pp. 60–65. | [14] N. Montavont and T. Noel, "Handover Management for Mobile Nodes in IPv6 Networks," IEEE Commun. Mag., vol. 40, no. 8, Aug. 2002, pp. 38–43. [15] D. Perkins, 4G: challenges and opportunities, 2007. |