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A Methodology for Improvement Aspects of 4.5 G

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ABSTRACT:
This paper focuses the problems of 4G technology and provides a revolutionary approach to 4.5G with a brief description of different current technologies. As to solve the problems of data transfer rate of 2 G technology, 3G networks which are a mix of circuit switched and packet switched networks is launched. Based on the study, 3G mobile technology is in a determining and standardization stage. In spite of this 4G wireless technology offers higher data rates and the ability to roam across multiple heterogeneous wireless networks as well. But several issues require further research and development due to poor battery life and high power consumption with 4G communication. Therefore, we view 4.5G as a logical extension of our global virtual network.

KEYWORDS: 4G Mobile Technologies, WiMAX, Wifi , LTE, CDMA

I.INTRODUCTION:

The present time is just right to start the research of 4.5G mobile communications because of possibility, according to the historical indication of a generation revolution once a decade, and now we are near the end of 4G standardization phase .Necessity according to 4G goals, 4.5G is necessary but not sufficient to the mobile communication strategy, in which many problems are only partly solved and there are still many problems left to be solved in the next generation, i.e.4.5G.There is plenty of related research on the next generation mobile communications and the 4.5G topics are becoming hotter and hotter. This paper is organized as follows. Chapter 2 provides a brief review of the development history and status of different mobile communications, together with an analysis of the problems of 4G and requirement of 4.5G. After a survey of related 4G features framework based on the key concept of integration, and then describe each of the two features (diversity and adaptability) of the three relevant targets (terminals, networks, and applications) in detail.

II. REVIEW OF MOBILE COMMUNICATIONS:

The history and status of mobile communications are shortly listed in the following, together with the respective evaluations on the chief contributions. First generation (1G) wireless telecommunications the brick-like analog phones that are now collector's items - introduced the cellular architecture that is still being offered by most wireless companies today. Second generation (2G) wireless supported more users within a cell by using digital technology, which allowed many callers to use the same multiplexed channel. But 2G was still primarily meant for voice communications, not data, except some very low data-rate features, like short messaging service (SMS). So-called 2.5G allowed carriers to increase data rates with a software upgrade at the base transceivers stations (BTS), as long as consumers purchased new phones too. Third generation (3G) wireless offers the promise of greater bandwidth, basically bigger data pipes to users, which will allow them to send and receive more information. All of these architectures, however, are still cellular.

The cellular architecture is sometimes referred to as a "star architecture" or "star topology" or "spoke and hub," because users within that cell access a common centralized BTS. The advantage is that given enough

Property	**1G**	**2G**	**2.5G**	**3G**	**4G**
Starting time	1985	1992	1995	2002	2010-2012
Driven Technique	Analogue signal processing	Digital signal processing	Packet switching	Intelligent signal processing	Intelligent software Auto configuration
Representative Standard	AMPS, TACS, NMT	GSM, TDMA	GPRS, I-Mode, HSCSD, EDGE	IMT-2000 (UMTS, WCDMA, CDMA2000)	OFDM, UWB
Radio Frequency (HZ)	400M-800M	800M-900M	1800M-1900M	2G	3G-5G
Bandwidth (bps)	2.4K-30K	9.6K-14.4K	171K-384K	2M-5M	10M-20M
Multi-address Technique	FDMA		TDMA, CDMA	CDMA	FDMA, TDMA,CDMA
Cellular Coverage	Large area		Medium area	Small area	Mini area
Core Networks	Telecom networks	Telecom networks	Telecom network	Telecom networks, Some IP network	All-IP networks
Service Type	Voice Mono-service Person-to-person	Voice, SMS Mono-media Person-to-person	Data service	Voice, Data Some Multimedia Person-to-machine 0-7803-	Multimedia Machine-to-machine

time and money, carriers can build nationwide networks, which most of the big carriers have done. Some of the disadvantages include a singular point of failure, no load balancing, and spectral inefficiencies. The single biggest disadvantage to cellular networks going forward is that as data rates increase, output power will have to increase, or the size of the cells will have to decrease to support those higher data rates. Since

Significant increases in output power scare both consumers and regulators; it is far more likely that we will see significantly smaller cells. This will further reduce the return on investment in already fragile 3G business plans. Fourth generation (4G) wireless was originally conceived by the Defense Advanced Research Projects Agency (DARPA), the same organization that developed the wired Internet. It is not surprising, then, that DARPA chose the same distributed architecture for the wireless Internet that had proven so successful in the wired Internet. Although experts and policymakers have yet to agree on all the aspects of 4Gwireless,two
Characteristics have emerged as all but certain components of 4G: end-to-end Internet Protocol (IP), and peer-to-peer networking. An all IP network makes sense because consumers will want to use the same data applications they are used to in wired networks. A peer-to-peer network, where every device is both a transceiver and a router/repeater for other devices in the network, eliminates this spoke-and-hub weakness of cellular architectures, because the elimination of a single node does not disable the network.

III 4 G FRAMEWORKS:

We summarize our proposal of 4G features with one sentence, or even more simply, with one word: integration, i.e. seamless integration of terminals, networks, and applications (together with users). A more detailed analysis and explanation of the definition is as follows.

1. The discussion domain includes three relevant targets, i.e. terminals, networks, and applications. Out of the 4G domain, the user is the only target.
2. The kernel word of the definition is so-called integration, which means the convergence of first the three different targets; second the various modes of each target, which lead to the feature of diversity.
3. The modifier “seamless”, which means the character and requirement of integration, implies the support of the adaptability feature between the three targets, each one of which is largely miscellaneous. The 4G vision framework presented by us is illustrated in Fig.1. Note that networks are transparent to the user. In order to clarify the concept, we define two kinds of diversity: external diversity and internal diversity.
4. External diversity is outside the target, which brings along the demand of the adaptability feature to all targets.

Internal diversity is inside each of the targets, and it acts as the solution for adaptability requirements. In short, the need for adaptability is caused by external diversity, and it is solved by internal diversity. Here both the external and internal diversity of users are the cause of all adaptability requirements, which implies that the user is out of the technical domain of 4G visions. The two main features, i.e. diversity and adaptability of the three targets – terminal, network, and application 4G Feature Descriptions

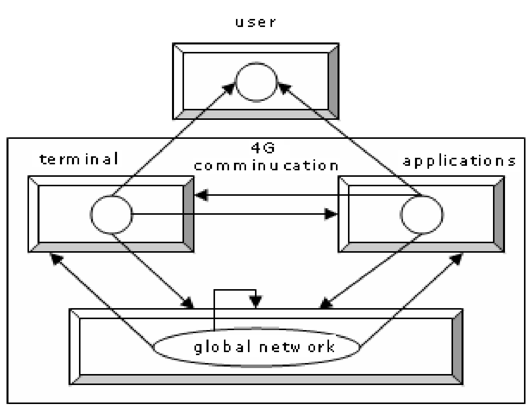

Fig.1. 4G feature framework

a) User Diversity: The external diversity of users, i.e. people in different situations, includes e.g. culture,educational background, economic capability, physical property, personal preference, etc. The internal diversity of users, i.e. people with different interfaces, include e.g. vision, hearing, speech, touch sense, hands and fingers, body, etc. Note that as for users, both their external and internal diversity are to be adapted by the other two targets: terminal and application. Moreover, for adapting the two kinds of user diversity, both the external and internal diversity of terminals and applications are the solution.
b) Terminal Diversity and Adaptability: The terminals’ external diversities are the differences of terminals in both static and mobile attributes. Static attributes include e.g. functionality, weight, size, battery life, human interface, antenna, processing capability, security, style, and cost. Mobile attributes include dynamic attributes of both temporal and spatial features. The former category contains e.g. moving speed and acceleration, along with stationary, pedestrian or vehicular qualities, while the latter is connected to spatial range, e.g. indoors, on-campus, in urban and rural environments, and also direction. The internal diversity of terminals means that one terminal may integrate multiple functions, modes, interfaces, flexibilities, etc. There are three targets for terminal adaptability. For users, it includes the provision of

different terminals to satisfy different users and an individual user's various requirements. As for applications, we hope that miscellaneous services can be delivered to one single terminal. When networks are concerned, a single terminal can reach a wide range of networks despite of location and mobile rate.

c) Network Diversity and Adaptability: The external diversity of networks is obvious. Internet is assorted by nature, while wireless networks keep the same property. For instance air interfaces can integrate all kinds of standards and work on different frequencies. Moreover, multiple operators deploy networks with multiple standards and protocols. The internal diversity of networks means that one network can interconnect with other different networks and transfer various kinds of loads, e.g. cellular systems with various coverage.

IV. PROBLEMS WITH CURRENT SYSTEM:

4G is the fourth generation of wireless communications currently known in the world. It is characterized by higher speed of data transfer and improved quality of sound. Although many people may be confused by the number of "G's" now existing in the world, the principle of distinguishing them is simple, the bigger the number, the higher the speed of data transfer. Really, we can already see that the 3G systems that are now widely used and built all over the world are the most advanced ones, enabling people to watch TV programs, use IP telephony, make video calls and simply use fast internet connection anywhere. This is all something that could never be imagined before. But 4G seems to be even faster. The existing 4G technologies, Wi-Fi and WiMAX support data transfers of up to 100 megabit per second. Theoretically they support even higher speeds of up to 1 gigabit per second which is even more than most ADSL providers can give today. For those who don't understand how fast 4G technologies are, just try to imagine that you can download a movie in DVD quality for only 6 minutes. Impressive, isn't it? Sounds too good to be true, and to some extent it is not. The matter is that 4G technology, being a mobile technology utilizing broadband radio frequencies based on the same principles as the existing 3G systems like UMTS or CDMA, WiMAX and Wi-Fi have some distinctive features that distinguish them from the rest of the mobile technologies. First, they function on the basis of the IPv6 protocol that means that even if they can be used for voice calls, such voice calls will be all-VoIP, as they support only packet data transfer, while 3G systems use both packet data and voice transmission. In this point of view 4G is not completely a "mobile" technology as we are accustomed to understand it. It is more like radio internet than mobile network, although there have already been attempts to introduce such a system instead of the existing 3G network. China's government, for example, decided to skip the 3G stage and spent more than 18 $ million for the construction of a brand new 4G network.

Another major disadvantage of the 4G networks may be considered only temporary and technical - using them as networks for mobile phones takes high power consumption (3G systems had a similar problems in the past though).

According to experts, the most important problems in the development of 4G systems is the lack of funding, as only few investors risk to give their money for new researches in this field. Such unwillingness is caused by the risk to lose money while developing a system that will not attract as many subscribers as it may be desired. Two leading technologies comprise Worldwide Interoperability for Microwave Access, better known as WiMAX, and LTE, which stands for Long Term Evolution. Both of these 4G technologies are IP-based and use a digital modulation method known as orthogonal frequency-division multiplexing (OFDM).

Foretelling the future is problematic. It is not yet clear exactly what features 3G will actually contain and what kinds of services it will provide. It is, therefore, rather difficult to predict what kind of system will constitute the 4G mobile-telecommunication system. The only safe description is that it is something that will come after 3G. Mobile telecommunication is an area that has developed enormously during the last few years, and the pace of development is not going to get any slower. In 1990 GSM was still under development and not a single GSM network was operational. There were some national (and even regional) 1G mobile phone networks, but they had only a few users, and the offered services typically included only speech with precious few supplementary services. The total subscriber base was probably only about two million worldwide. Not even the bravest telecommunication analyst would have dared to predict 500 million mobile phone users worldwide 10 years later, with penetration rates exceeding 70% in some markets. Our analyst wouldn't have been a telecommunication analyst for long, but locked behind closed doors and provided with some therapy. Thus, trying to predict the telecommunication systems and services that will be in use in 2010 is outright foolish. Despite this, we will have a try in this section. Note that the term *4G* is not defined yet and nobody knows exactly what it is, so anyone can claim to know the truth about it. The term is used quite liberally and has therefore developed a sense of legitimacy. Marketing personnel love to talk and write about 4G. There are frequent press releases stating that this or that technology will implement 4G. It is good to be a bit suspicious about these. There will not be a single network branded as 4G in the same way that there is 2G-GSM or 3G-UMTS. Instead, 4G will be a collection of networks and a wide variety of smart devices communicating with each other. Many of those component networks are already in existence in some form, but they keep evolving, and gradually they are given internetworking functional. The future 4G-compatible networks will certainly include the UMTS and the enhanced GSM deployments, but they may also include wireless LAN (WLAN) networks (e.g., the 802.11-family and HiperLAN2), satellite networks, broadcast networks such as digital audio broadcasting (DAB) or even digital video broadcasting (DVB), and many other types of networks we don't know about yet. The 4G technology will provide for a collection

V THE FUTURE:

This will be a departure from a one-network-can-do-anything approach. These networks must cooperate seamlessly. The user will not have to know which network provides the service. The smart device can analyze its environment and choose the best available service provider and technology (service discovery). The selection is made according to the user's preferences stored in a user profile. This evaluation is a continuous process, and if the smart device finds a better system, it can perform a seamless HO to the more appropriate radio interface. The evaluation is based not only on radio path characteristics, as in current networks, but on other parameters, such as cost, and security. Both the network entities and the smart devices will be able to configure themselves so that they can adapt to new requirements. This includes software downloads if a device notices that there is a new system available that it cannot use with its current configuration. There will be a wide variety of smart-device classes, the smartest of which will be authentic multipurpose devices capable of altering their functionality according to current requirements. Most devices will, however, be cheaper application-specific appliances that can do only one thing, but do it well and reliably (multipurpose devices such as PCs tend to be quite unreliable).There will be several "layers" of networks. At the lowest level, the network could consist of the users' smart devices communicating directly with each other ad hoc networks. A laptop computer can send data via a Bluetooth link to a printer and receive data from a fixed network modem via another Bluetooth link. A remote control terminal can send a command via an IR link to a central control unit at home, which then adjusts heating and lighting via wireless links. All these devices are personal; they must include suitable security applications so that nobody else can use them; that is, a neighbor shouldn't be able to adjust your home's heating and security systems. Only very limited mobility is allowed, as links are typically quite short-range. Data transmission speeds may be hundreds of Mbps for some applications. The next level could consist of LANs, such as WLANs. These networks are typically shared, so there may be other people using them. Mobility is still quite local; a WLAN network may cover an office building or a house. WLANs may also be set up in airports, conference centers, and other traffic hot spots. Data transmission speeds are quite high, certainly tens of Mbps, maybe even more in future WLAN technologies. The cellular level may consist of 2G and 3G technologies, such as GSM/GPRS and UMTS, or actually enhanced forms of such current systems and also with 4 G technology.. Each user will probably own several mobiles, or whatever people will call these telecommunication modules in the future. Quite often, these modules will be embedded into other equipment, such as cars, laptop computers, and household appliances. Moreover, there will be communication chips in various kinds of vending machines, traffic-control systems, payment terminals, and so on. These modules are starting to understand each other little by little, so the 4.5G rollout will be a gradual process. The European

Commission has set up a research program called Information society Technologies which, among its many projects, handles the issues that will need to be solved for 4.5G.

VI CONCLUSION:

As 4.5G networks are gaining wide popularity, it is currently thought to be the next generation of mobile computing. Its usage and advantages make it distinguished from all other peer technologies and cellular networks. In order to keep its services available all the time, there is a dire need to improve its services provision efficiency 4.5G is the next evolution in wireless broadband connectivity, designed primarily for data transport versus voice networks pulling double-duty as data movers. Nowadays, the mobile Internet communications can play a significant role in the telecommunications. Sector resolving certain issues and bottlenecks of the personal communications with most European countries close to 100% penetration and a global projection of 4 billion mobile users by 2011 As we are moving to the next generation, we are still lacking the precise definition of the architecture and the successful deployment path of the 4.5G technology. Several theories have been developed looking at different standards and aiming to select and develop the most promising one. In this paper we are introducing a study that aims to explain a new concept of "4.5G readiness" revealing long run national strategies for 4.5G deployment and suggesting some critical metrics that could indicate the future of this environment. The concept will be refined by a field trial with real users after an initial test phase in controlled environments in future

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