FUTURE ENRICHMENT OF WIRELESS TECHNOLOGY IN INDIA

Mr.V. ARUNKUMAR,
Assistant Professor,
Department of Computer Applications,
Vivekanandha College of Arts and Sciences for Women (Autonomous)

Mrs. S. SABITHA,
Assistant Professor,
Department of Computer Applications,
Vivekanandha College of Arts and Sciences for Women (Autonomous)

ABSTRACT:

We are in the middle of a major revolutionize in Mobile Wireless Networks. Obsessed by the colossal number of Mobile - Connected devices and the sturdy increase in the data rates, the main objective of Wireless Network operators has been to gratify the throughput of users and take full advantage of the network capability. However, this has lead to an energy inefficient network design. Our goal in this paper is to discuss the potential solutions and key enabling technologies that will facilitate network operators introduce power savings and improve energy efficiency in next-generation wireless networks. Specifically, we focus on the energy efficiency aspects of colossal Multiple-Input Multiple Output systems (or also referred to as Large-Scale Antenna Systems), Millimeter-wave Communications, and dense deployment of small cells. With the purpose of a vigor-proficient network design, we identify the recent advances, quantify how much gain can be achieved, and present a widespread précis of open tribulations in these locale.

1. INTRODUCTION

5G Technology stands for fifth Generation Mobile technology. From generation 1G to 2.5G and from 3G to 5G this world of telecommunication has seen a number of perfections along with enhanced concert with every passing day. This fast rebellion in mobile computing changes our day to day life that is way we work, interact, learn etc. This paper also spotlights on all foregoing generations of mobile communication along with fifth generation technology. Fifth generation network provide inexpensive Broadband Wireless Connectivity (very high speed). The paper throws light on network architecture of fifth generation technology. Currently 5G term is not officially used. In fifth cohort studies are being made on improvement of World Wide Wireless Web (WWWW), Dynamic ADHOC Wireless Networks (DAWN) and Real Wireless World. Fifth generation focus on (Voice Over IP) VOIP - enabled campaign that user will familiarity a high level of call volume and data communication.

Fifth generation technologies offers implausible data capabilities and unhindered call volumes and unrestricted data broadcast together within latest Mobile Operating System. Fifth generation should make a imperative dissimilarity and add more services and reimbursements to the world over 4G. Fifth generation should be more cerebral technology that interrelates the entire world exclusive of confines. This generation is expected to be released around

2020. The world of universal, continual access to information, craze and communication will open new facade to our lives and change our life fashion radically.

2. EVOLUTION OF WIRELESS TECHNOLOGIES

Mobile communication has matured to be smarter in last few years due to fast rebellion in mobile technology. This revolution is due to very high increase in telecoms customers. This revolution is from 1G- the first generation, 2G- the second generation, 3G- the third generation, and then the 4G- the fourth generation, 5G-the fifth second generation.

2.1. First Generation (1G)

1G emerged in 1980s. It contains Analog System and traditionally known as cell phones. It launches mobile technologies such as Mobile Telephone System (MTS), Advanced Mobile Telephone System (AMTS), Improved Mobile Telephone Service (IMTS), and Push to Talk (PTT). It uses analog radio signal which have frequency 150 MHz, voice call intonation is done using a technique called Frequency-Division Multiple Access (FDMA). It has low capability, unpredictable handoff, poor voice links, and no security at all since voice calls were played back in radio towers, making these calls susceptible to unwanted eavesdropping by third parties.

2.2. Second Generation (2G)

2G materialized in late 1980s. It uses digital signals for voice communication and has speed of 64 kbps. It affords facility of SMS (Short Message Service) and utilize the bandwidth of 30 to 200 KHz. Next to 2G, 2.5G system uses packet switched and circuit switched domain and afford data rate up to 144 kbps. E.g. GPRS, CDMA and EDGE

2.3. Third Generation (3G)

It uses Wide Brand Wireless Network with which intelligibility is amplified. The data are sent through the technology called Packet Switching. Voice calls are construing through Circuit Switching. Along with verbal communication it embraces data services, access to television/video, new services like Global Roaming. It maneuvers at a range of 2100MHz and has a bandwidth of 15-20MHz used for High-speed internet service, video chatting. 3G utilizes Wide Band Voice Channel that is by this the world has been constricted to a little village because a person can get in touch with other person situated in any part of the world and can even send communication too.

2.4. Fourth Generation (4G)

4G offers a downloading speed of 100Mbps. 4G affords same feature as 3G and additional services like Multi-Media Newspapers, to watch T.V programs with more lucidity and send Data much quicker than prior generations. LTE (Long Term Evolution) is considered as 4G technology. 4G is being developed to contain the QoS and rate necessities set by impending applications like wireless broadband access, video chat, mobile TV, HDTV content, Digital Video Broadcasting (DVB), negligible services like voice and data, and other services that exploit bandwidth.

3. COMPARISON OF 1G TO 5G

CONTENT	1G	2G	3G	4G	5G
START	1970	1990	2004	NOW	SOON (2020)
DATA BANDWIDTH	2kbps	64kbps	2Mbps	1Gbps	>1Gbps
MULTIPLEX	FDMA	TDMA	CDMA	CDMA	CDMA
SWITCHING	Circuit	Circuit	Packet	All packet	All Packet
CORE NETWORK	PSTN	PSTN	Packet N/W	Internet	Internet

4. CHALLENGES IN MIGRATION FROM 4G

4.1. Multi mode user terminals

By means of 4G, there will be a necessity to design a single user terminal that can operate in different wireless networks and surmount the design troubles such as limitations on the size of the device, its cost and power exploitation. This trouble can be solved by using software radio approach.

4.2. Choice among various wireless systems.

Every wireless system has its distinctive characteristics and roles. The choice of most suitable technology for an unambiguous service at an unambiguous place and at unambiguous time. This will be applied by making the choice according to the best possible fit of consumer QoS (Quality of Service) necessities.

4.3. Security

Reconfigurable, adaptive and inconsequential fortification mechanisms should be designed.

4.4. Network infrastructure and QoS support

Integrating the current non-IP and IP-based systems and providing QoS declaration for end-to-end services that engage different systems is a confront.

4.5. Attacks on Application Level

Software applications which will offer an new feature to the consumer but will commence new bugs.

5. THEORETICAL FRAMEWORK

5G Technology is a name used in various research papers and projects to designate the next most imperative stage of mobile communication standards beyond the 4G standards currently, 5G is not a term legitimately used for any particular specifications. 3GPP standard release beyond 4G and LTE. The realization of standards under a 5G umbrella would likely be around the year of 2020.

6. KEY TERMS OF 5G TECHNOLOGY:

- 5G is a completed wireless communication with almost no restriction; somehow people called it REAL wireless world.
- Additional features such as Multimedia Newspapers, also to watch T.V programs with the clarity as to that of an HD T.V.
- We can send Data much faster than that of the earlier generations.

- 5G will bring almost faultless real world wireless or called “WWWW: World Wide Wireless Web”
- Real wireless world with no more inadequacy to access and zone issues.
- Wearable devices with AI competences.
- Internet protocol version 6 (IPv6), where a visiting care-of mobile IP address is assigned according to location and the connected network.
- One amalgamated global standard.
- High Altitude Stratospheric Platform Station (HAPS) systems.

7. 5G ARCHITECTURE

Fifth generation mobile systems model is all-IP based model for wireless and mobile networks interoperability The All-IP Network (AIPN) is capable to fulfill growing demands of the cellular communications market. It is a frequent platform for all radio access technologies. The AIPN uses packet switching and its constant progression provides optimized concert and cost. In fifth generation Network Architecture consist of a user incurable (which has a crucial role in the new architecture) and a number of autonomous, autonomous radio access technologies (RAT). Cloud computing is a model for apposite On-Demand network access to configurable computing resources (e.g., networks, servers, storage, applications, and services). Cloud computing allows consumers to use applications without installation and access their personal data at any computer with internet access.

CCR links the Reconfigurable Multi Technology Core (RMTC) with Remote Reconfiguration Data from RRD attached to Reconfiguration Data models (RDM). The main dispute for a RMTC is to deal with escalating different radio access technologies. The core is a meeting of the Nanotechnology, Cloud Computing and radio, and pedestal on All IP Platform. Core revolutionizes its communication functions depending on status of the network and/or user demands. RMTC is associated to diverse radio access technologies collection from 2G/GERAN to 3G/UTRAN and 4G/EUTRAN in totaling to 802.11x WLAN and 802.16x WMAN. Other standards are also facilitating such as IS/95, EV- DO, CDMA2000. Interoperability process criterion and mechanisms enable both terminal and RMTC to select from various access systems.

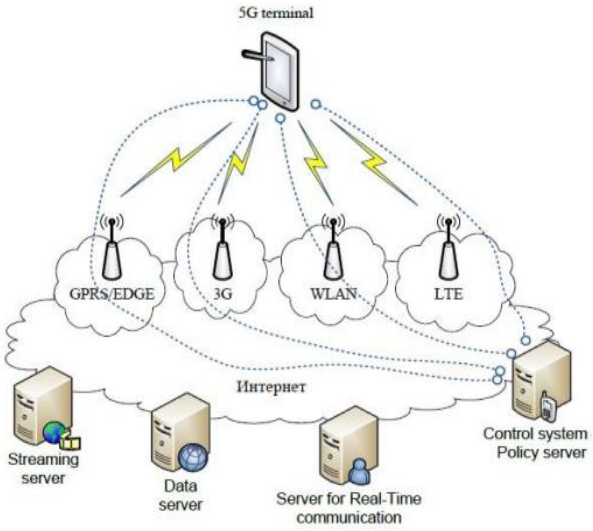

Fig: 5G Network Architecture

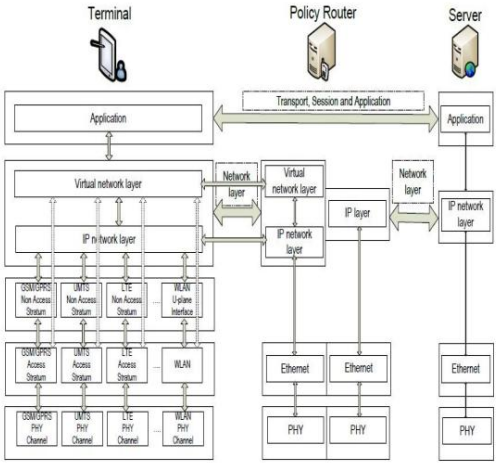

Fig: Proposed Architecture of 5G

8. CONCEPT OF 5G TECHNOLOGY

8.1. Two Views of 5G exist today:

8.1.1. View 1 – The hyper-connected vision: In this view of 5G, mobile operators would create a blend of pre-existing technologies covering 2G, 3G, 4G, Wi-fi and others to allow higher exposure and accessibility, and higher network sturdiness in terms of cells and devices, with the key differentiator being superior connectivity as an enabler for Machine-to-Machine (M2M) services and the Internet of Things (IoT). This vision may embrace a new radio technology to aid squat power, squat throughput field devices with long obligation cycles of ten years or more.

8.1.2. View 2 – Next-generation radio access technology: This is more of the traditional 'generation-defining' view, with specific targets for data rates and latency being identified, such that new radio interfaces can be assessed against such criterion. This in turn makes for a clear discrimination between a technology that convenes the criteria for 5G, and another which does not. Both of these approaches are important for the headway of the industry, but they are divergent sets of requirements associated with unambiguous new services. However, the two views described are frequently taken as a single set and therefore requirements from both the hyper-connected view and the next-generation radio access technology view are cluster together.

9. 5G TECHNOLOGY REQUIREMENTS:

As a result of this amalgamation of necessities, many of the industry inventiveness's that have improved with work on 5G categorize a set of eight necessities:

- 1-10Gbps connections to end points in the field (i.e. not theoretical maximum)
- 1 millisecond end-to-end round trip delay (latency)
- 1000x bandwidth per unit area
- 10-100x number of connected devices
- (Perception of) 99.999% availability
- (Perception of) 100% coverage
- 90% reduction in network energy usage
- Up to ten year battery life for low power, machine-type devices

Because these requirements are specified from different perspectives, they do not make an entirely coherent list – it is difficult to conceive of a new technology that could meet all of these conditions simultaneously. Equally, at the same time as these eight necessities are often presented as a solitary list, no use case, service or application has been identified that requires

all eight recital characteristics across an whole network concurrently. Indeed some of the requirements are not linked to use cases or services, but are instead aspiration statements of how networks should be built, independent of service or technology – no use case needs a network to be appreciably cheaper, but every operator would like to pay less to construct and scuttle their network. It is more likely that various combinations of a subset of the overall list of requirements will be supported 'when and where it matters'.

Finally, while imperative in their own exact, six of these necessities are not generation major characteristic. These are considered below:

9.1. Superficial 99.999% accessibility and 100% geological coverage:

These are not utilizing case drivers, nor procedural issues, but monetary and business case pronouncements. 99.999% accessibility and 100% exposure are realizable using any existing technology, and could be attained by any network operator. Operators choose where to situate cells pedestal on the outlay to organize the site to ascertain a cell to swathe a specific area balanced alongside the advantage of the cell providing exposure for a specific geographic area. This in turn makes certain cell sites and coverage areas - such as rural areas and indoor coverage - the subject of difficult business decisions.

9.2. Connection density (1000x bandwidth per unit area, 10-100x numbers of connections):

These essentially amount to 'cumulative' requirements i.e. requirements to be met by networks that include 5G as an incremental technology, but also require continued support of pre-existing generations of network technology. The support of 10-100 times the number of connections is dependent upon a range of technologies working together, including 2G, 3G, 4G, Wi-fi, Bluetooth and other complementary technologies. The addition of 5G on top of this ecosystem should not be seen as an end solution, but just one additional piece of a wider evolution to enable connectivity of machines. The Internet of Things (IoT) has already begun to gain significant momentum, independent of the arrival of 5G.

Congregation mutually of these requirements will have momentous insinuations for OPEX on backhaul and clout, since each cell or hotspot must be powered and all of the additional traffic being generated must be backhauled.

9.3. Reduction in network energy usage and improving battery life:

The reduction of power consumption by networks and devices is fundamentally important to the economic and ecological sustainability of the industry. A general industry principle for minimizing power usage in network and terminal equipment should pervade all generations of technology, and is recognized as an ecological goal as well as having a significant positive impact on the OPEX associated with running a network. At present it is not clear how a new generation of technology with higher bandwidths being

deployed as an overlay (rather than a replacement) on top of all pre-existing network equipment could result in a net reduction in power consumption.

Some use cases for M2M require the connected device in the field to lie dormant for extended periods of time. It is important that modernism in how these campaigns are motorized and the compactness of the signaling they use when becoming dynamic and associated is pursued. However, this requirement is juxtaposed with 5G headline requirements on data rate – what is required for mass sensor networks is very occasional connectivity with minimal throughput and signaling load. Work to develop such technology predates the present 5G requirements and is previously being pursued in Standards cadavers.

These six requirements should be and are being pursued by the industry today using a range of techniques (some of which are covered later in the paper) but these amount to progress of presented network technology and topology or chances facilitates by changing hardware distinctiveness and competence.

Thus in the strictest terms of measurable network deliverables which could enable revolutionary new use case scenarios, the potential attributes that would be unique to 5G are limited to **sub-1ms latency and >1 Gbps downlink speed.**

10. IMPENDING 5G USE CASES

10.1. Imagining the mobile services of the next decade

As with each preceding generation, the rate of adoption of 5G and the ability of operators to monetize it will be a direct function of the new and unique use cases it unlocks. Thus the key issues in the order of 5G for operators are basically:

a) What could users do on a network which convenes the 5G requirements scheduled above that is not presently probable on an already obtainable network?
b) How could these prospective services be lucrative?

Figure 1 exemplifies the latency and bandwidth/data rate requirements of the choice of use cases which have been conversed in the context of 5G to date. These probable 5G utilize cases and their linked network requirements are described below.

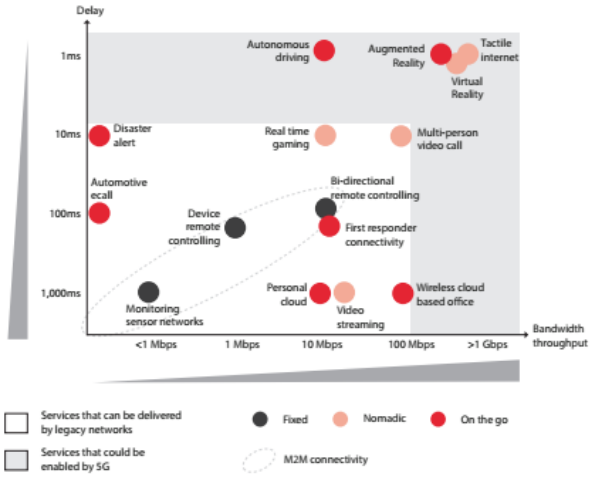

Figure 1: Bandwidth and latency requirements of potential 5G use cases

10.2. Virtual Actuality/Enlarged Reality/Immersive or Tangible Internet

These technologies have a number of probable use cases in both distraction (e.g. gaming) and also additional realistic

circumstances such as industrialized or medication, and could broaden to many wearable technologies. For example, an operation could be performed by a robot that is tenuously proscribed by a surgeon on the other side of the world. This type of application would necessitate both elevated bandwidth and squat latency beyond the capacity of LTE, and therefore has the probable to be a key business sculpts for 5G networks. However, it should be pointed out that VR/AR systems are very much in their immaturity and their improvement will be basically reliant on advances in a host of other technologies such as proposal sensors and Heads Up Display (HUD). It remains to be seen whether these applications could become lucrative businesses for operators in the future.

10.3. Independent driving/Connected cars

Enabling vehicles to communicate with the outside world could result in considerably more efficient and safer use of existing road infrastructure. If all of the vehicles on a road were connected to a network incorporating a traffic management system, they could potentially travel at much higher speeds and within greater proximity of each other without risk of accident - with fully-autonomous cars further reducing the potential for human error. While such systems would not require high bandwidth, providing data with a command response time close to zero would be crucial for their safe operation, and thus such applications obviously necessitate the 1 millisecond hindrance time provided in the 5G requirement. In addition a fully 'driverless' car would need to be driverless in all geographies, and hence would require full road network coverage with 100% reliability to be a viable proposition.

11. OTHER 5G CONCEPTS

There are many innovative ideas that are being scrutinized and urbanized for the new 5th generation mobile system. Some of these involve:

- **Pervasive networks:** This technique being painstaking for 5G cellular systems is where a user can collectively be linked to several Wireless Access technologies and faultlessly moves between them.
- **Group co-operative relay:** This is a technology that is being measured to make the high data rates accessible over a wider area of the cell. Currently data rates retreating towards the cell edge where interfering levels are higher and signal echelons lower.
- **Cognitive radio technology:** In case cognitive radio technology was used for 5th generation, 5G cellular systems, then it would allocate the user equipment / handset to see at the radio landscape in which it is located and choose the best radio access network, intonation scheme and other specification to construct itself to gain the greatest connection finest recital.
- **Wireless mesh networking and dynamic Ad-Hoc Networking:** With the variety of different approach schemes it will be probable to link to others adjoining to provide Ad-Hoc Wireless Networks for much fastest data flows.

- **Smart antennas:** Next main part of any 5G cellular system will be that of chic feelers. Using these it will be available to alter the grin path to allow further straight connections and frontier intrusion and raise overall cell capability.

12. CONCLUSION:

5G will give the preliminary infrastructure for structure chic cities, which will shove mobile network performance and capacity requirements to their restrictions. It supports interactive multimedia, voice, video Internet and other broadband services, superior powerful and more stunning, and has Bi-directional, exact transfer data. It will give fantastically quick broadband speeds, but more significantly it will have sufficient competence wherever you go to attain each function you want it to without a decrease in promptness or association no problem how many people are linked at the same time.

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