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5G Wireless Technology- An overview of the current Trends

Muhammad Irfan[1], Jan Sher[1], Naveed Ullah[1], Muhammad Sulaiman[1], Junaid Saleem[1]
[1]Department of computer science, Abdul Wali Khan University Mardan, KPK, Pakistan

Abstract- 5G Wireless technology networks or 5th Generation wireless systems which is used for videos and audios communication announcement the next major time period of mobile telecommunications Criterions time the current next Generation mobile networks confederated .in this paper we are studying different Technologies in 5G The handover of 5G the Models of 5G its architecture, its different components and METIS Task Force Networks. 2-Day video recording is available. Its components access/backhaul integration, direct device-to-device communication, flexible duplex, flexible spectrum usage multi-antenna transmission, ultra-lean design, user/control separation architecture of 5G is highly advanced, its network elements and various terminals are characteristically upgraded to afford a new situation. Likewise, service providers can implement the advance technology to adopt the value-added services easily.

Keywords: Cellular Technology, Wireless Communication, 5th Generation

I. INTRODUCTION

In 2008, the South Korean IT R&D program of "5G mobile communication systems based on beam-division multiple access and relays with group cooperation" was formed. In 2012, the UK Government announced the establishment of a 5G Innovation Centre at the University of Surrey – the world's first research center set up specifically for 5G mobile researches. In 2012, NYU WIRELESS was established as a multidisciplinary research center, with a focus on 5G wireless researches, as well as its use in the medical and computer-science fields. The center is funded by the National Science Foundation and a board of 10 major wireless companies (as of July 2014) that serve on the Industrial Affiliates board of the center. NYU WIRELESS has conducted and published channel measurements that show that millimeter wave frequencies will be viable for multi-gigabit-per-second data rates for future 5G networks.

In 2012, the European Commission, under the lead of Neelie Kroes, committed 50 million euros for research to deliver 5G mobile technology by 2020. In particular, 5G is the fifth-generation wireless broadband cellular technology which is based on the IEEE802.11ac standard. At least, that's what the wireless companies envision for the future of mobile. While many parts of the world are still awaiting the rollout of 4G networks, the telecom industry is already looking ahead to the next generation of cellular technology, called 5G. 5G radio access technology will be a key component of the Networked Society [1-3]. It will address high traffic growth and increasing demand for high-bandwidth connectivity. It will also support massive numbers of connected devices and meet the real-time, high-reliability communication needs of mission-critical applications. 5G will provide wireless connectivity for a wide range of new applications and use cases, including wearables, smart homes, traffic safety/control, critical infrastructure, industry processes and very-high-speed media delivery. As a result, it will also accelerate the development of the Internet of Things (IoT) [17-23]. The overall aim of 5G is to provide ubiquitous connectivity for any kind of device and any kind of application that may benefit from being connected. 5G networks will not be based on one specific radio-access technology. Rather, 5G is a portfolio of access and connectivity solutions addressing the demands and requirements of mobile communication beyond 2020 [4-8].

The first 5G wireless channel models have been published. A group of eight partners of the METIS Task Force completed work, and published the first 'interim' 5G channel models officially accepted by the METIS community. METIS, an Integrated Project under the European Union Seventh Framework Program (FP7) for research and development, counts as members 29 key mobile industry players and it is a major large-scale global research activity on 5G. These interim channel models were presented for the first time to the 5G technical community at the Brooklyn 5G Summit which IEEE ComSoc partnered with Ted Rappaport. Actual documentation of the models is available at METIS website and they appear to cover channel models for 2.3 GHz, 2.6 GHz, 5.25 GHz, 26.4 GHz, and 58.68 GHz. The 5G architecture main concentrated on three aspects namely flexibility, scalability and service oriented management. These three aspects are interrelated to each other.

II. DIFFERENT 5G MODELS

5G continues to generate buzz and grab the efforts and the attention of many of us in the Communications Technology Industry. The interest of IEEE ComSoc members is such that, for example, 7 out of the top-10 most downloaded papers in May are 5G related. The May 2014 special issue of the IEEE CTN on 5G brought our readers up to date on the current state of 5G technology. Just a few weeks later, with the rapid research progress and industry interest in the topic, an update is due. News of preliminary 5G wireless channel models, reports of 5G live network test results, renewed focus in emerging architectures, and evaluation and plans for the impact of 5G are the key topics in this update. Let's get to the details.

A. First prototype of 5G Model

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B. Speed of 5G in Live Test Network

The benchmark came from Ericsson that reported in its website achieving 5 Gbps speed in live test of pre standard 5G, using an innovative new radio interface concept in combination with advanced Multiple-Input Multiple-Output (MIMO) technology with wider bandwidths, higher frequencies and shorter transmission time intervals. As far as frequency, the 5G test network used a 15 GHz frequency band, which is higher and shorter range than current 3G/4G cellular frequencies that top out at around 2.6 GHz, i.e. 2600 MHz LTE Band 7. The choice of short-range would make deployments of this technology suitable for densely populated urban areas, where many base stations could be deployed to offer super-fast speeds over a small area.

C. D2D Technology of 5G Architecture Model

There has been much interest in applying Device-2-Device (D2D) principles to public safety and proximity based services. Because of the high profile of this topic, IEEE ComSoc Communications Magazine July 2014 issue and Wireless Communications Magazine June 2014 issue feature several articles where IEEE ComSoc experts and industry leaders exciting area of D2D and has summarized its recent findings in use cases, design approaches and performance aspects. The common thread in these D2D articles is an ongoing need/interest in expanding the definition of heterogeneous cellular networks to include D2D capabilities with location, performance and capacity gains [9-16].

We are still in the early stages of defining 5G. There are different visions and a range of proposed solutions. How do we know if those visions and solutions meet the needs of millions of people and billions of connected devices? The European Commission's Directorate-General for Communications Networks, Content, and Technology wants to learn about these unknowns issuing a 5G introduction in Europe—SMART 2014/0008 call for tenders to gather data for the Strategic Planning of 5G Introduction in Europe aim to help plan the critical phases for 5G mobile wireless systems deployment [24-28], from the research and innovation activities to infrastructure investments and prospects for early commercial developments.

III. 5G NETWORK ARCHITECTURE

The 5G architecture main concentrated on three aspects namely flexibility, scalability and service oriented management. These three aspects are interrelated to each other to drive the 5G technology to fulfill the various requirements in the network flexibility. The architecture will be flexible enough to handle the requirements of the use case service. Scalability will assist by flexibility to fulfil the requirements of the services. The new generation of RAN networks needs to be efficiently handled multiple layers and a variety of air interfaces in the access and the backhaul domains. They have to control the dynamic traffic, user behavior, and active nodes involved. This need to be able to differentiate a larger variety The operators with both fixed and mobile network infrastructure cost reduction is a grater improvement in the 5G technology. Reuse of network infrastructure on transport and access layer (Fixed mobile convergence (FMO)) against SDN/NFV is seen as enables to allow multi-operator network infrastructure and resource sharing. The architecture will provide the necessary flexibility to realize efficient integration and cooperation of functional block [29-33] according to individual service. The function can be flexibly modified, tailor and created by the function co-coordinator according to the dataflow and can be moved to the relevant network demand.

The architecture is based on WSDN approach to enables on demand creation of customized virtual networks using shared resources and effective service adaptive decoupling of control and data plane in order to provide routing and mobility management as shown in Figure 1. When compared to present 4G certain functionalities of the user equipment's may be partially controlled by the operator

[34-36]. The flexibility may be limited by capabilities of the network such as sensors, which may not be updated with all new functionalities.

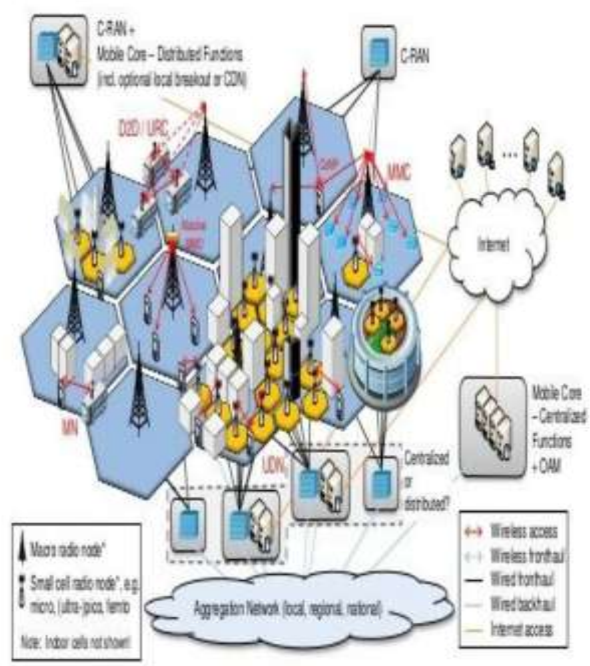

Figure 1: Architecture of 5G Technology

IV. Components of 5G

The architecture model of 5G consists of the following main components.

A. Phantom Cell

Network densification using small cells with low power nodes is promising solution with mobile traffic explosion, especially in high traffic area (hot spot area). These cells develop advanced centralized RAN (C-RAN) architecture for commercial use. Advanced C-RAN adopts the centralized network architecture with many branches of remote radio equipment (RRE) and utilizes LTE advanced carrier aggregation (CA) functionality between macro and small cell carrier. CA functionality help to maintain the connectivity and mobility under the macro cell coverage while small cells called „Add-on" cells achieve higher throughput performance and larger capacity. The advanced C-RAN architecture handles all processing for CA and handover within a centralized baseband unit (BBU) at eNodeB, which drastically reduces the amount of signaling to the core network. The "Phantom cell" concept is based on a multi-layer network architecture, which spills the control (C) plane and user data (U) plane between macro cell and small cell using different frequency bands The major benefits of the phantom cell architecture are similar to those of advanced C-RAN architecture for LTE-Advanced, which include enhanced capacity by small cell, easy deployment of higher frequency bands. The concept of phantom cell architecture includes advanced functionalities such as inter node aggregation, relaxed backhauling and signaling requirements and enhanced small cell discovery. 5G concept user Phantom cell architecture as the baseline which to integrate future multilayer networks using lower and high frequency bands.

B. Access/Backhaul Integration

Wireless technology is already frequently used as part of the backhaul solution. Such wireless-backhaul solutions typically operate under line-of-sight conditions using proprietary radio technology in higher frequency bands, including the millimeter wave (mmW) band.

In the future, the access (base-station-to-device) link will also extend to higher frequencies. Furthermore, to support dense low-power deployments, wireless backhaul will have to extend to cover non-line-of-sight conditions, similar to access links. In the 5G era, the wireless-access link and wireless backhaul should not therefore be seen as two separate entities with separate technical solutions. Rather, backhaul and access should be seen as an integrated wireless-access solution able to use the same basic technology and operate using a common spectrum pool. This will lead to more efficient overall spectrum utilization as well as reduced operation and management effort.

C. Device-To-Device Communication

The possibility of limited direct device-to-device (D2D) communication has recently been introduced as an extension to the LTE specifications. In the 5G era, support for D2D as part of the overall wireless-access solution should be considered from the start. This includes peer-to-peer user-data communication directly between devices, but also, for example, the use of mobile devices as relays to extend network coverage. D2D communication in the context of 5G should be an integral part of the overall wireless-access solution, rather than a stand-alone solution. Direct D2D communication can be used to offload traffic, extend capabilities and enhance the overall efficiency of the wireless-access network. Furthermore, in order to avoid uncontrolled interference to other links, direct D2D communication should be under network control. This is especially important for the case of D2D communication in licensed spectrum.

D. Flexible Duplex Communication

Frequency Division Duplex (FDD) has been the dominating duplex arrangement since the beginning of the mobile communication era as shown in Figure 2. In the 5G era, FDD will remain the main duplex scheme for lower frequency bands. However, for higher frequency bands – especially above 10GHz – targeting very dense deployments, In very dense deployments with low-power nodes, the TDD-specific interference scenarios (direct base-station-to-base-station and device-to-device interference) will be similar to the 'normal' base-station-to-device and device-to-base-station interference that also occurs for FDD. Furthermore, for the dynamic traffic variations expected in very dense deployments, the ability to dynamically assign transmission resources (time slots) to different transmission directions may allow more efficient utilization of the available spectrum. To reach its full potential, 5G should therefore allow for very flexible and dynamic assignment of TDD transmission resources. This is in contrast to current TDD-based mobile technologies, including TD-LTE, for which there are restrictions on the downlink/uplink configurations, and for which there typically exist assumptions about the same configuration for neighbor cells and also between neighbor operators.

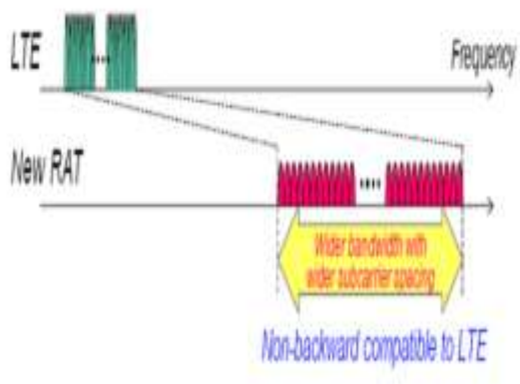

Figure 2: Flexible Duplex Communication

V. CONCLUSION

5G is the next step in the evolution of mobile communication and will be a key component of the Networked Society. In particular, 5G will accelerate the development of the Internet of Things. To enable connectivity for a wide range of applications and use cases, the capabilities of 5G wireless access must extend far beyond those of previous generations of mobile communications. These capabilities include very high achievable data rates, very low latency and ultra-high reliability. Furthermore, 5G wireless access needs to support a massive increase in traffic in an affordable and sustainable way, implying a need for a dramatic reduction in the cost and energy consumption per delivered bit. 5G wireless access will be realized by the evolution of LTE for existing spectrum in combination with new radio access technologies that primarily target new spectrum. Key technology components of 5G wireless access include access/backhaul integration, device-to-device communication, flexible duplex, flexible spectrum usage, multi-antenna transmission, ultra-lean design, and user/control separation.

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