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IMPLEMENTATION OF OBIQUITOUS TELEMEDICINE ON 5G NETWORKS

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Abstract— **To implement Telemedicine through wireless network, consider the communication needs of Emergency telemedicine scenario like moving ambulance and mobile pedestrian, transmission of physiological patient data to hospital, etc. The Fourth generation technology as a part of feasibility study for its use in wireless telemedicine applications. To overcome spectrum crisis and high energy consumption prevalent in 4G LTE-A Networks, we propose to implement Telemedicine in 5G Network. We are proposing wireless telemedicine application that separates indoor and outdoor scenarios by using various promising technologies available for 5G Networks, such as massive MIMO, energy-efficient communications, cognitive radio networks, and Body Area Networks (BAN).**

I. INTRODUCTION

5G Technology stands for 5th Generation Mobile technology. 5G technology has changed the means to use cell phones within very high bandwidth. 5G is a packet switched wireless system with wide area coverage and high throughput. 5G wireless uses OFDM and millimeter wireless that enables data rate of 20 mbps and frequency band of 2-8 GHz. 5G is going to be a packed based network . The 5G communication system is envisioned as the real wireless network, capable of supporting wireless World Wide Web (www) applications in 2010 to 2015 time frame.

There are two views of 5G systems: evolutionary and revolutionary. In the evolutionary view the 5G (or beyond 4G) systems will be capable of supporting www allowing a highly flexible network such as a Dynamic Adhoc Wireless Network (DAWN). In this view advanced technologies including intelligent antenna and flexible modulation are keys to optimize the adhoc wireless networks. In revolutionary view 5G systems should be an intelligent technology capable of interconnecting the entire world without limits. An example application could be a robot with built-in wireless communication with artificial intelligence. User never experienced ever before such a high value technology. The 5G technologies include all type of advanced features which makes 5G technology most powerful and in huge demand in near future. Amazing isn't it such a huge collection of technology being integrated into a small device. The 5G technology provides the mobile phone users more features and efficiency than the 1000 lunar module. A user of mobile phone can easily hook their 5G technology gadget with laptops or tablets to acquire broadband internet connectivity. Up till now following features of the 5G technology have come to surface- High resolution is offered by 5G for extreme mobile users, it also offers bidirectional huge bandwidth.- 5G technology's excellent quality service is based on Policy in order to evade errors.- It provides transporter class type gateway that has unequalled steadiness.- The 5G technology's billing interface is highly advanced making it efficient and appealing.- It offers huge quantity of broadcasting data, which is in Giga Bytes, sustaining more than 60,000 connections.- This technology also provides remote diagnostic feature.- Provides up to 25 megabytes per second connectivity. Also it supports the private virtual networks.

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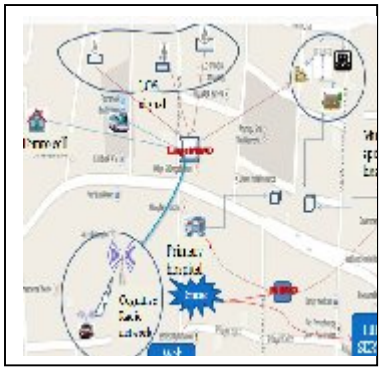

Fig.1. Proposed heterogeneous 5G Wireless cellular architecture on Telemedicine

II. LITERATURE SURVEY

The first category includes the performance requirements of 5G wireless communication systems. For instance, Cheng-Xiang Wang. [1] In this paper, the performance requirements of 5G wireless communication systems have been defined in terms of capacity, spectral efficiency, energy efficiency, data rate, and cell average throughput. architecture has been proposed with separated indoor and outdoor applications using DAS and massive MIMO technology. We have also discussed some potential key technologies that can be deployed in 5G wireless systems to satisfy the expected performance requirements, such as CR networks, SM, MFemtocells, VLC, and green communications, along with some technical challenges. [2] In this paper we have proposed a novel patient monitoring framework (ZK-BAN) for the indoor hospital BAN. A new patient monitoring framework and EPR for BAN environment, and a new Energy-aware Peering Routing protocol (EPR) which includes three parts (1) the new Hello protocol, (2) neighbour table construction algorithm, and (3) routing table construction algorithm. [3] A cooperative hybrid cognitive radio (CR) network is proposed to simultaneously operate on a dedicated licensed band and a secondary band. The licensed band is used for communications between a base station (BS) and mobile CR users, whereas the secondary band is used to facilitate the licensed band communication by coordinating multiple CR users to form distributed virtual antenna arrays (VAAs). The capacity of the proposed CR network is studied at both the link and system levels. At the link level (single VAA case), we present an amplify-and-forward-based cooperative signaling scheme that employs power control to prevent harmful noise propagation. The resulting virtual multiple-input-multiple-output (MIMO) link capacity is derived and compared with the real MIMO system. At the system level (multiple VAAs case), the system capacity is derived as a function of multiple parameters, including the primary user density, CR user density, primary exclusion region radius, and VAA radius. Under an average interference power constraint, the maximum system capacity is further calculated by solving an optimization problem with adjustable system parameters. Numerical studies reveal that the proposed cooperative hybrid CR network has a fundamental advantage over a pure CR network by being insensitive to the characteristics of the coexisting primary network. This merit, however, relies on a high CR user density and a wide bandwidth of the secondary band. [4] A key challenge of future mobile communication research is to strike an attractive compromise between wireless network's area spectral efficiency and energy efficiency. This necessitates a clean-slate approach to wireless system design, embracing the rich body of existing knowledge, especially on multiple-input-multiple-output (MIMO) technologies. This motivates the proposal of an emerging wireless communications concept conceived for single-radio-frequency (RF) large-scale MIMO communications, which is termed as SM. The concept of SM has established itself as a beneficial transmission paradigm, subsuming numerous members of the MIMO system family. The research of SM has reached sufficient maturity to motivate its comparison to state-of-the-art MIMO communications, as well as to inspire its application to other emerging wireless systems such as relay-aided, cooperative, small-cell, optical wireless, and power-efficient communications. Furthermore, it has received sufficient research attention to be implemented in test beds, and it holds the promise of stimulating further vigorous interdisciplinary research in the years to come. This tutorial paper is intended to offer a comprehensive state-of-the-art survey on SM-MIMO research, to provide a critical appraisal of its potential advantages, and to promote the discussion of its beneficial application areas and their research challenges leading to the analysis of the technological issues associated with the implementation of SM-MIMO. The paper is concluded with the description of the world's first experimental activities in this vibrant research field.

III. A POTENTIAL 5G WIRELESS CELLULAR ARCHITECTURE

To address the above challenges and meet the 5G system in telemedicine, we need a dramatic change in design of cellular architecture.

A. Massive MIMO

In massive MIMO systems, the transmitter and/or receiver are equipped with a large number of antenna

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elements (typically tens or even hundreds).Benefits of conventional MIMO systems, a massive MIMO system can also significantly enhance both spectral efficiency and energy efficiency. With MU MIMO, the BS can send separate signals to individual users using the same time-frequency resource. Main advantages enable the massive MIMO system to be a promising candidate for 5G wireless communication networks.

B. Spatial Modulation

It has been proposed for low-complexity implementation of MIMO systems without degrading system performance. Spatial modulation can mitigate three major problems in conventional MIMO systems: interchannel interference, inter-antenna synchronization, and multiple RF chains. With respect to single-antenna wireless systems, Only one transmit antenna is active at any time, while other antennas are idle. A block of information bits is split into two sub-blocks of log2(*NB*) and log2(*M*) bits. The first sub-block identifies the active antenna from a set of transmit antennas, while the second sub-block selects the symbol from the signal constellation diagram that will be sent from that active antenna. Therefore, SM is a combination of space shift keying (SSK) and amplitude/phase modulation.

C. Cognitive Radio Networks

It is used to improve the utilization of the congested RF spectrum. Adopting CR is motivated by the fact that a large portion of the radio spectrum is underutilized most of the time. In CR networks, a secondary system can share spectrum bands with the licensed primary system, either on an interference-free basis or on an interference-tolerant basis. In interference-free CR networks, CR users are allowed to borrow spectrum resources only when licensed users do not use them. A key to enabling interference-free CR networks is figuring out how to detect the spectrum holes (white space) that spread out in wideband frequency spectrums. In interference-tolerant CR networks, CR users can share the spectrum resource with a licensed system while keeping the interference below a threshold. In comparison with interference-free CR networks, interference-tolerant CR networks can achieve enhanced spectrum utilization by opportunistically sharing the radio spectrum resources with licensed users, as well as better spectral and energy efficiency.

D. Mobile Femtocell

It combines the mobile relay concept (moving network) with femtocell technology. First, MFemtocells can improve the spectral efficiency of the entire network. We can see that increasing the percentage of users that communicate with the BS through MFemtocells leads to an increase in spectral efficiency, which is much better compared to the case where users communicate directly with the BS (i.e., the direct transmission scheme). Second, MFemtocells can contribute to signaling overhead reduction of the network. The energy consumption of users inside an Mfemtocell can be reduced due to relatively shorter communication range and low signaling overhead.

E. Body Area Networks

Body area network (BAN) is an emerging technology in computer world, and plays very vigorous role in a society, mainly in health services. BAN helps in monitoring vital signs of a patient and can monitor patient's history in routine life activities to provide them accurate treatment. Doctors can check the complete details of patients from remote location and can recommend a suitable medication. The main purpose of this technology is to reduce the load at hospitals and provide efficient healthcare facility remotely using medical implant communication system (MICS) and Wireless medical telemetry system (WMTS). To monitor the patients in their natural environments is not practical when devices or sensors are connected through a wire that is why we use Wireless body area network (WBAN) to carrying out daily activities through unobtrusive and contented way. This technology can provide very cheaper, easier and quick respondent history of patient.

F. Green Communication

The design of 5G wireless systems should take into account minimizing the energy consumption in order to achieve greener wireless communication systems. By separating indoor traffic from outdoor traffic, the marcocell BS will have less pressure in allocating radio resources. It can transmit with low power, resulting in a significant reduction in energy consumption. VLC and mm-wave technologies can also be considered as energy efficient wireless communication solutions to be deployed in 5G wireless systems.

IV. System Implementation

A. MiXiM

MiXiM is an OMNeT++ modeling framework created for mobile and fixed wireless networks (wireless sensor networks, body area networks, ad-hoc networks, vehicular networks, etc.). MiXiM concentrates on the lower layers of the protocol stack, and offers detailed models of radio wave propagation, interference estimation, radio

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transceiver power consumption and wireless MAC protocols. MiXiM is merger of several earlier OMNeT++ frameworks.

Fig 2. Simulation Model

B. Castalia

Castalia is a simulator for Wireless Sensor Networks (WSN), Body Area Networks (BAN) and generally networks of low-power embedded devices. It is developed in the Networked Systems theme at NICTA, since 2007. Castalia is used by researchers and developers to test their distributed algorithms and/or protocols in realistic wireless channel and radio models, with a realistic node behavior especially relating to access of the radio. Castalia's salient features include: model for temporal variation of path loss, fine-grain interference and RSSI calculation, physical process modeling, node clock drift, and several popular MAC protocols implemented. Castalia is highly parametric. It provides tools to help run large parametric simulation studies, process and visualize the results.

C. Graphical resultst

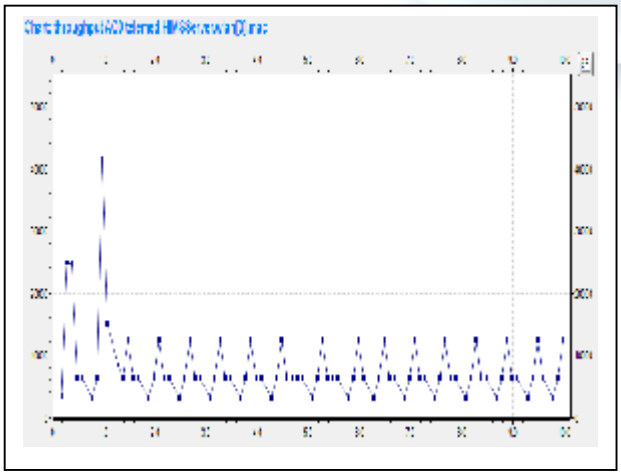

Fig 3. Throughput in HIMS Server

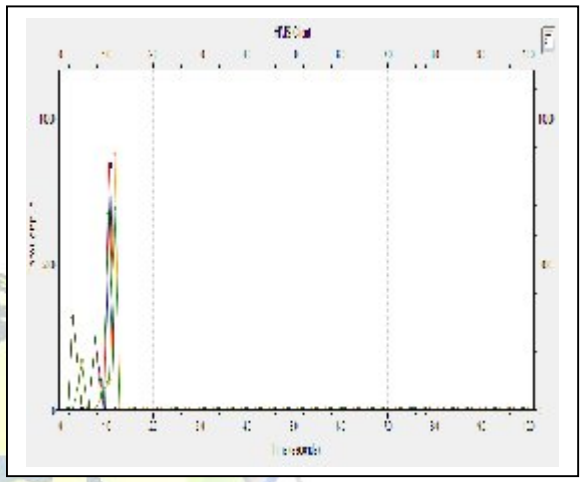

Fig 4. Throughput in HIMS Client

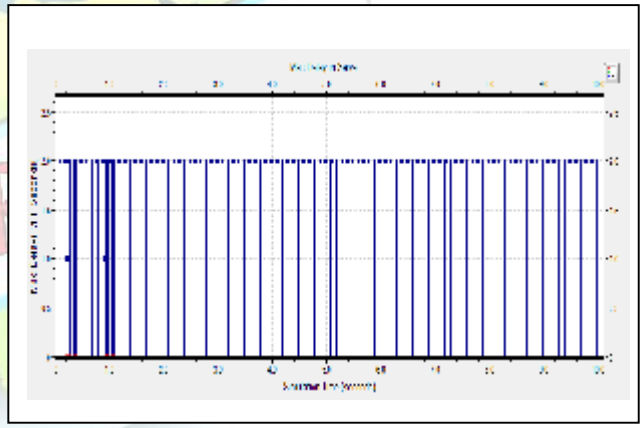

Fig 5. MAC Delay in HIMS Server

V. CONCLUSION

The performance requirement of 5G wireless communication systems have been defined in terms of capacity, spectral efficiency, energy efficiency, data rate, throughput and suppressed delay. A new ubiquitous 5G wireless architecture on Telemedicine has been proposed with separated indoor and outdoor applications using CR Networks and massive MIMO technology. Some short-range communication technologies, such as WiFi, femtocell, BAN, and mm-wave communication technologies, can be

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seen as promising candidates to provide high-quality and high-data-rate services to indoor users while at the same time reducing the pressure on outdoor BSs. We have also discussed some potential key technologies that can be deployed in 5G wireless systems to satisfy the expected performance requirements, such as CR networks, MFemtocells, BAN, and green communications, along with some technical challenges.

REFERENCES

[1] A. Hashimoto, H. Yorshino, and H. Atarashi, "Roadmap of IMT-Advanced Development," IEEE Microwave Mag., vol. 9, no. 4, Aug. 2008, pp. 80–88.

[2] WWRF, L. Sorensen and K. E. Skouby, User Scenarios 2020, report, July 2009; http://www.wireless-worldresearch. org.

[3] C. Han et al., "Green Radio: Radio Techniques to Enable Energy Efficient Wireless Networks," IEEE Commun. Mag., vol. 49, no. 6, June 2011, pp. 46–54.

[4] Nokia Siemens Networks, "2020: Beyond 4G: Radio Evolution for the Gigabit Experience," white paper, 2011.

[5] A. Bleicher, "Millimeter Waves May Be the Future of 5G Phones," IEEE Spectrum, Aug. 2013.

[6] V. Chandrasekhar, J. G. Andrews, and A. Gatherer, "Femtocell Networks: A Survey," IEEE Commun. Mag., vol. 46, no. 9, Sept. 2008, pp. 59–67.

[7] F. Rusek et al., "Scaling Up MIMO: Opportunities and Challenges with Very Large Arrays," IEEE Sig. Proc. Mag., vol. 30, no. 1, Jan. 2013, pp. 40–60.

[8] H. Haas, "Wireless Data from Every Light Bulb," TED website, Aug. 2011; http://bit.ly/tedvlc

[9] X. Hong et al., "Secondary Spectrum Access Networks: Recent Developments on the Spatial Models," IEEE Vehic. Tech. Mag., vol. 4, no. 2, June 2009, pp. 36–43.

[10] F. Haider et al., "Spectral Efficiency Analysis of Mobile Femtocell Based Cellular Systems," Proc. IEEE ICCT '11, Jinan, China, Sept. 2011, pp. 347–51.

[11] M. D. Renzo et al., "Spatial Modulation for Generalized MIMO: Challenges, Opportunities, and Implementation," Proc. IEEE, vol. 102, no. 1, Jan. 2014, pp. 56–103.

[12] C.-X. Wang and S. Wu, "Massive MIMO Channel Measurements and Modeling: Advances and Challenges" IEEE Wireless Commun.., submitted for publication.

[13] X. Hong et al., "Capacity Analysis of Hybrid Cognitive Radio Networks with Distributed VAAs," IEEE Trans.Vehic. Tech., vol. 59, no. 7, Sept. 2010, pp. 3510–23. [14] Mandellos G, Lymperopoulos D, Koukias M, Tzes A, Lazarou N, Vagianos C. A novel mobile telemedicine system for ambulance transport. Design and evaluation. In: Proceedings of the 26th annual international conference of the IEEE EMBS. San Francisco, CA, USA; September 2004. p. 3080–3.

[15] Kim D-K, Yoo SK, Park I-C, Choa M, Bae KY, Kim Y-D, et al. A mobile telemedicine system for remote consultation in cases of acute stroke. Journal of Telemedi- cine and Telecare 2009;15:102–7.

[16] Kumar, S., Kambhatla, K., Hu, F., Lifson, M., & Xiao, Y. (2008). Ubiquitous computing for remote cardiac patient monitoring: A survey. International Journal of Telemedicine and Applications.