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Survey on Iot for Future Smart Systems: Review of Present Challenges, Next Generation Trends and Perspective

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Abstract: *In a modern well growing world, we are looking forward for trillions of smart devices should be connected with smart technologies like high quality video streaming, self-driven cars, smart home ,smart environment, e-health care etc. Whereas for all these smart ideas high data rates, large bandwidth, increase in capacity, low latency, high throughput is essential. This paper also gives a knowledge about predominant distribution of key enabling technologies like carrier aggregation, Multiple-input Multiple output[MIMO], massive-MIMO[M-MIMO],Coordinated multipoint processing [Comp] ,D2D communications, centralized radio access network[CRAN],Software defined wireless sensor networking[SD-WSN],Network function virtualisation[NFV] and Cognitive radios[CRs] .This paper also gives an overview of advance 5G IOT in artificial intelligence, machine learning and deep learning ,QoS. Atlast this paper provocates in execution of 5G IOT expected high data rates needed for both cloud based platforms and IOT devices based edge computing.*

Keywords*: Internet of Things (IoT), 5G, carrier aggregation, CoMP, CRAN, CRs, HetNets, MIMO,M-MIMO, NFV, SD-WSN, QoS.*

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I. INTRODUCTION

1.1 Iot overview

The well developing technology IOT is revolving accurately to word "Smartness" which defines ability of obtaining things independent and applying knowledge [1]. Mostly IOT relates "Things or Devices or Sensors",smart, unambiguously addressable focusing on their communicating protocol which is flexible and self-sufficient with inbuilt protection. Internet oriented vision has setup a way to International Telecommunication Union (ITU) "from anytime, anyplace connectivity for anyone"[2]. In short the utmost determination is "to plug and play smart objects". The idea of IOT is different which covers almost transports, hospitals, smart home/office. In medical field IOT has helped the society with developing remote patient monitoring, smart biosensor, smart ambulance, telemedicine. The cause for the interest of the world countries in IoT trends and developments is because of its successful benefits like country's economic feasibility, growth, employment, civilized environment, infrastructure, employment rate, citizen's health and services.

1.2 Implementation techniques of 5G deployment

A small cellular architecture is needed in the form ,micro, pico ,or femto cell to encourage the coverage and lower the path loss of mm waves so this made a initiative for the fresh concept which is small, low power cellular

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base station (BS). It has low power, compact and are portable BSs .Huge number of these small cells form a strong networks acting as relay and boost signal within end user and base station. Antennas attached to this base stations are smaller and lighter so that it can be easily fitted in roofs of the building without any difficulty. To encourage the advantage of these small cells and remove complexity of antennas in urban we also introduce M-MIMO technology.M-MIMO currently we are using for 4G network the BSs controls traffic efficiently using antenna ports also in 5G technology we use M-MIMO technology which gives the solutions of fixing more antennas ports. Later there is also a disadvantage of having interference due to many antenna ports.to get rid of it we use beam forming is introduced [3].As 5G technology aim is to integrate different heterogeneous networks which leads to implementation of IOT vision.5G technology introduces new technique called beam division

multiple access (BDMA) which base station permit orthogonal beam to every mobile device so that this technique would divide beam as per the position of the mobile. This technique provides multiple access to device with larger capacity and with lesser interference. Data rates are fulfilled using mm Waves. M-MIMO and beam forming for spectral efficiency, whereas high throughput with low latency fulfilled introducing full-duplex technology results at antennas transceiving methodology. Silicon transistors are used because the transceiver should be full duplex and it must be operating in both time division duplexing (TDD) and frequency division multiplexing (FDD) [4].

II. CHARACTERISTICS EMPLOYED IN 5G PHY LAYER TO SUPPORT 5G-IOT

2.1 Carrier aggregation

Carrier aggregation was incorporated in 4G LTE-A. It was based on release 10 of the 3 GPP. It consists of 5 component carriers of LTE-A having a bandwidth of 20 MHz and improves upto 100 MHz.in mobile it receive more than one CC .Multiple CCs with various BW can be combined in uplink and downlink whereas different band is known as inter-band carrier aggregation and same band known as intra-band aggregation.in thus technique we select one cc as primary component carrier(PCC)while other bands are called as secondary component carrier .In rel-10 only two cc in downlink and no cc in uplink, where in rel-11 improved with 2 cc in uplink, where in rel-12 FDD/TDD has been added, where in rel-13 5 to 32 of 20 MHZ aggregated CCs. Thus the carrier aggregation is vital technique it has the problem of having intermodulation product which may interfere with signal.

2.2 Massive MIMO (M-MIMO)

In MIMO technology LTE-A is a vital part which based on idea of spatial multiplexing. Multiple antennas data streams are multiplexed and transmitted over various spatially separated channels. In 5G Radio Access Network is based on M- MIMO in "macro assisted small cells". Macro cell is provided with lower band frequencies in control plane traffic using omnidirectional antenna and whereas user data traffic is provided by highly directional M-MIMO beam at mm Waves band frequency. Multiple narrow beams at the same time get transmitted from base station to the same mobile station at different location which improves the throughput and lower the correlation among elements of antenna. When comparing M-MIMO conventional technology rather using pilot waveform for channel estimation M- MIMO uses TDD mode and depend reciprocation mechanism of uplink and downlink channel [3].It has proved that it is beneficial towards improved radiation efficiency, increased protection against interference, decrease in latency and low power and low cost setup [5].

2.3 Coordinated multipoint accessing (COMP)

Coordinated multipoint was introduced earlier, later it was standardized by 3GPP in rel-10 and incorporated in LTE-An .Effective way to enhance the cell edge user throughput is to make transmission in downlink and reception in uplink. Here distributed MIMO is used for both transmission and reception from several antennas to lower the received spatial interference and improved received signal quality. COMP is also known as transceiver technique where interference is reduced. Coordinating multipoint and reception between spatially distributed BSs using channel state information also includes coordinated scheduling and joint transmission [6].

2.4 Heterogeneous networks (Hetnets)

HetNets comprised of femto cells, pico cells, micro cells, macro cells and different RAT. It requires low power nodes for date offloading[7].Working on green aspect spectral efficiency is maximized by revising the spectrum tightly and with low downlink and uplink transmission [6] makes energy efficient. Massive number of equipment sharing ultra dense networks needs intelligence mitigation techniques. In order to overcome HetNets uses enhanced intercell interference coordination e-ICIC and fe-ICIC6.The HetNet enabled 5G IOT based solution are given in [8].

2.5 D2D communications

Collaboration between macro cell BS and low power BS in short range communications is not so efficient .Hence we go for a new technique D2D which allows low power consumption, better QOS ,load balance minimum for a shorter range(<200m) communication[3].D2D communications outcomes has an issue of significant security and interference management issues [9]. Still research in process.

2.6 Centralized radio access network (CRAN)

CRAN is greener and cleaner communication by rearranging function of base station. It provides the radio function to the base station which is remote radio unit or remote radio head whereas baseband unit is provided to cloud based central processor. This encourages centralized intelligence, cooperative communication

among cells, improved cell utilization and reduces complexity and cost at base station end [6].

III. ARTIFICIAL INTELLIGENCE DRIVEN USE CASES FOR 5G FOR IOT NETWORKS

3.1 Big data processing enhancement

In 5G Intelligent IOT has the big chances to approach situations like communication channel congestion and data processing .The combination of AI algorithms and 5G technology is the main principle of 5G intelligent IOT is to improve big amount of data smartly, minimizing the communication channels and developing the usage of channels in a very efficient manner [10].Where the implementation of Artificial intelligence as a key components we will acquire a safe environment which will run application safely ,in turn it will provide us an knowledge to decide intelligently uninterrupted [14].

3.2 Expanding the horizon of healthcare

In healthcare 5G and AI is combined to make better millions people lives by elevating the existing system Chen et al [11] which will provide more support to the children, mentally ill and elderly people. Generic algorithm and simulated results were used for 5G to find drone base stations under the conditions of best coverage, energy and cost [12].

3.3 Intelligent networking

One of the AI'S application is 5G networks implementation [13] where we discuss about the architecture of independent self-managing network giving improvement in NFV management having machine learning based decision making mechanism. The more adaptive controlled mechanism is distributed next to base NFV functions to reduce the cost of the system, while QOS are in high level.

3.4 Smart transportation systems

Continuous connectivity in vehicles gives the integration of 5G with IOT is reality. This integration provides to access internet self-driven vehicle are used with the help of internet. Car manufacturers of this generation had advanced their thoughts and ideas towards discovering several techniques to get this technology to the transportation systems field. Many researches have been done in relation to self- driven vehicles with connecting to internet. A smart transportation system facilitates connection between passenger's smart phone and the vehicle itself [15].

IV. CONCLUSION

This paper gives us overview of deployed 5G IOT techniques. The survey gives a knowledge about evolution of wireless technologies development from those days till now. This paper discuss about QOS need in 5G IOT where the traffic requirements differs from other 5G network applications. High data transmission rates with low latency from the 5G-IoT nodes are vital for the cloud based application layer programs running state of the artificial intelligence, machine and deep learning algorithms for efficient real-time data processing and prediction.

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