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Network Data Management in 5G Network for user Data Privacy- A Survey

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Abstract:- Clock Synchronization by Hybrid Common Multiple (CSHCM) applying with (Least common multiple) LCM and Highest common factor (HSF) to neglect the clock offset and clock skew from all the sensor nodes where CSHCM will enable all the nodes to obtain the network synchronization using time by measuring the LCM of every clock time period. The group of networks are divided into clusters and formed nodes will reach the network synchronization time based on their own clock time period. In this paper, mobile communication-based technology evaluation is discussed with different challenges which will be captured for future generation mobile network systems. As per the study about existing researches, 5G network will provide high speed internet for everyone at any time. By comparing with other network connection 5G is quite different because of the novelty in features like connecting people, device control, etc., based on driver level performance and capability will provide a very new user experience and connect a massive enterprise. In this research paper, we did a survey and observed the analysis report which will be based on different aspects such as mmWave, MIMO, MEC, antenna technology, etc., and to protect the user data for their privacy encryption and decryption are the security process to preserve the user privacy in network management system. And we mainly focused on highlight some advanced facility towards 5G system with different algorithms are discussed.

Keywords:- *Clock Synchronization; 5G Network; Encryption; Decryption;Network Management.*

I. INTRODUCTION

In recent years, 5G network will be highly preferred for commercial uses to deliver the data which has fastest bandwidth to the customers and enable the speed connection between the provider and user with low latency communication which have the ability to reach the quality of services demand [1]. There are lot of improvements required for greater connectivity than ever before and there are benefits in 5G network as covered with core 5G architecture which is placed to the network edge, which also provide lower latency service which is also known to be edge computing. The most services are used for content delivery through networks and edge computing will be proposed in automated vehicles for wireless operations to monitor and control the large-scale models of Internet of things network which will work for smarter and contain the distributed power generation techniques. There are lot of varieties in enabling the 5G technology to the network by designed with wide range of heterogeneous requirements like latency, security, reliability, and more. Slicing of network will be used to play a major role in 5G network for flexible with efficient network using common infrastructure which will be made using different resources [2,3]. Network slicing is based on software defined networking and the network function virtualization. There are some benefits of using SDN network model which will be played major process in transport network and extended to the 5G concept which is highly considered for networking models.

Software defined network is an architecture of networking which will be worked dynamically to control the methods of encryption deployed on each network slices and it will be provide some encryption traffic between user and enode B or between network security gateways. An application layer encryption level on traffic will always used to reach the higher security level as end-to-end security model, but in 5G network it has some critical links within the resources of secured application with flow of metro nodes and aggregator nodes [4,5,6]. To protect the data, there is a requirement for privacy retention of time scale which will be selected based on the cryptographic models and it will be valuable for more sensible data to enhance the security to the user data. In the upcoming chapters, existing researches and their models were discussed and survey researches are discussed along with proposed model. The simulation results are discussed to showcase the efficiency of proposed model and accuracy will be highly achieved.

II. EXISTING METHODOLOGY

In existing CS using LCM model for avoiding the offset and skew of clock from the sensor nodes by proposing the CSLCM model to enable the nodes for synchronization and time will be calculated. The below flowchart will explain about the cluster creation and the node synchronization from the cluster group with intracluster and intercluster combination of different synchronization. The existing research has proposed with some algorithms and models which will not provide better results in enhancing the nodes to secure the user data which will be designed for network slicing to encrypt the data. In case of accuracy and reliability the existing model will failed to protect the user data with their higher energy consumption [7,8]. It will be processed with lower bandwidth speed of network to deliver the nodes to the user with low latency.

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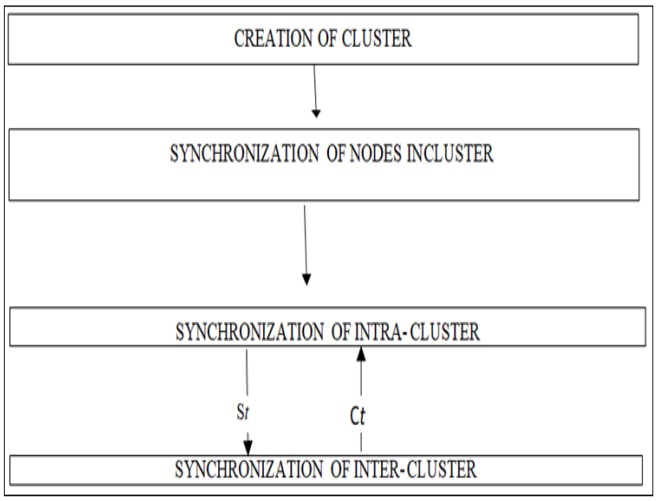

Fig 1 Existing Method of Creating and Synchronization of Clusters

The existing system have some drawbacks such as high energy consumption and low performance measures. To overcome such drawbacks and to enhance the existing model for better accuracy the proposed method is implemented as discussed in upcoming chapters in detail.

III. LITERATURE SURVEY

In this section, the existing researches where discussed briefly which will be done by the various researchers and experts using different methods. Such researches are studied for proposing methods to develop the enhanced model to execute better results. There are several networking models and methods are proposed along with different algorithms such as CACA, etc., The network model like 4G will be studied for better understanding the concept of data communication lower error rate and packet switching will be briefly studied. There are lot of drawbacks and merits in existing research found in the elaborated study. The below will contain the different existing research proposed in various aspects and concepts based on networking will be explained.

Qian, et.al., [9] Soft Handover or integrated- before-break is a system where the user hardware is constantly associated with the radio connection with no requirement for synchronization with contiguous cells. In this way, the client hardware is associated delicately with more than a node B simultaneously. Because of many reasons like symmetry in LTE, which depends on symmetrical recurrence division multiplexing, dedicated handover isn't upheld by 4G frameworks. Then again, 5G frameworks can uphold consistent delicate handover between the first cell and adjoining cells. To ensure a consistent handover in 5G frameworks with QoS for end users, a CACA algorithm ought to be given in the paper. A new multi-cell CACA is 5G frameworks is introduced in this paper.

Paul write, et.al., [10] Introduced CACA is thought about the "cell breathing" peculiarities which will make the overloaded cell inclusion shrink. The confirmation of the clients will be creation of cluster synchronization of nodes in cluster synchronization of intracluster synchronization of intercluster St Ct depending on a minimum bit rate to be accomplished, a distance from the base station, and a most extreme number of dynamic users in the cell. Taking different interference factor esteems, the introduced mathematical outcomes, which will uncover the adequacy of the recommended CACA in adjusting the load over to entire network organization by moving the traffic from over-loaded cells to the adjoining cells with less load, and subsequently, the general organization execution is gotten to the next level.

Zhoa, et.al., [11] An interactive multimedia application, for example, VR have a few key necessities that communicate medium should take care in request to have a smooth encounter. These prerequisites include higher uplink and down throughput necessity, low latency, and reliable throughput even at the cell edge. Now a days, 5G network faces an absence of resource accessibility for exceptionally complex applications like interactive multimedia. A call admission control scheme is proposed in this work to ensure that both interactive multimedia applications and non-interactive applications receive the necessary resources. The plan utilizes versatile specialists to assemble the resource necessity of the applications from the different servers on different client destinations occasionally and utilize this data to specifically offloading of non-interactive traffic to substitute accessible connections at whatever point such a connection is accessible meet intelligent applications traffic prerequisites. The developed scheme has been tried with various sizes of the 5G networks with a few computer-generated simulation users alongside other background load applications. Results are very uplifting and the framework is essentially implementable.

Fatima, et.al., [12] IoT will connect the idea through wireless and wired sensors over the network and used in several places like home office, etc., and the contribution of IoT will be based on RFID and electronic tags which make the technology to connect everything from various objects. The technology is simple but it faces several problems like security, bandwidth, speed of data transmission for smooth communication with existing networks. 4G networks are used with LPWA technology for power handling and standardized with 3GPP. Now, there are lot of connected devices are used for monitoring and collecting the for better communication which will increase the bit rates and efficient energy consumption.

Ramraj, et.al., [13] Faster improvements of internet will be leads to several security concerns with weak security patches and it reduces the users experience which will be threaten to the security of user data. The importance of computer network security is discussed and few security issues are discussed in various angle effectively and provide development of security nodes.

Peter, et.al., [14] 5G network become commercial now a days from 2019 to provide voice and data communication process which will be change the mobile network models using IoT and the sensitive latency and reliability of data is

adopted by latest ICT technologies. Software defined network is a virtual edge computing technique for multiple access and network slicing. The security challenges are evaluated such as creating new path for accessing data, security downgrading and visibility limitations are studied. The security on 5G network architecture is done by the international organization to elaborate the communication carriers which will be the difficult one to study about 5G networks.

Zhan, et.al., [15][16] Network security is increased for computer users and became a major concern of internet with security which will allows the user to understand the emergency process of security technology. The threats can occur due to the poor structure of internet and the number of attacks is reduced if the network web is enhanced with security patches. As a computer user, everyone should have some knowledge about the attacks which will be enable to respond for efficient security model. Enhanced firewall and encryption mechanisms for data protection is studied about the internet in this research.

Ni, et.al., [17,18] Wireless communication for networking will explore the rapid growth of internet and randomly security issues also grown with data loss. The system design and network design have to be made with call drop rate using mobile networks for better communication which will be straightly affect the user and the delay about identification is call drop with multiple reasons which will evaluate the poor performance of the network models. Radio frequencies are handling the failure of call drops which is common type and such process will be handled by GSM network. Solution to call drop is discussed and unique approaches to identify the root cause is studied in the proposed research.

Huang, et.al., [19,20] Wireless communication architecture will be based on adequate and suitable modulation using the importance of paramount and the lower bit error rate will be used to identify the capacity of data rate in LTE systems. The authors proposed call drop calculation using LTE system and OFDM model which is used for modulation techniques in LTE. LTE model will allow different users to share single channel by providing efficient spectral huge data rates. OFDM will divide the network channels into subcarriers with LTE functions based on dependability for LTE indicators.

IV. EVOLUTION OF TECHNOLOGY

➢ *Limitations of Existing Systems*

In existing research, the mobile network architecture and its concept are focused, but now a days 5G technologies in different views are focused based on various parameters. There is no existing research with entire detail on 5G network along with its challenges and advancements are discussed. MIMO, NOMA, MEC are few technological methods researched by few authors in existing models and some studied about beam forcing and mmWave methods. But not all the existing research covers the entire technology feature, so this article will cover the key data about 5G technology and advancements which will be an umbrella approach to showcase the different and multiple solutions in a same place for accelerating 5G network

➢ *5G Technology Emerging:*

5G technology provides high speed internet with low latency and highly connectivity between devices. 5G network will provide flexible model to develop modern generation of applications. Few services offered by 5G network is discussedbelow:

- M2M communications: 5G offers novel and machine to-machine communications which is known as IoT. It establishes connectivity between machines without humaninterference.
- Ultra-reliable low latency communications: It is real-time management of machines, high- speed vehicle-to-vehicle connectivity, industrial connectivity and security principles, and highly secure transport system, and multipleautonomous actions.
- Upgraded mobile broadband: Enhanced mobile broadband is major feature of 5G system, which uses massive MIMO antenna, mmWave, beamforming techniques to offer high-speedconnectivity worldwide.
- *For communities:* 5G provides very flexible internet connection to make smart homes, smart schools and good health carecenters, etc.

- *For businesses and industry:* 5G works on higher sspectrum ranges from 24 to 100 GHz. This higher frequency range provides low latency communication and high- speed wireless connectivity between IoT devices and industry 4.0, which opens a market for end-users to enhance their business models.

Table 1 Mobile Technology Evolution between 1G to 5G

Generation	Access model	Rate	Frequency	Bandwidth	Description
1G	*FDMA, AMPS*	*2.4Kbps*	*800 MHz*	*Analog*	*Voice*
2G	*GSM, TDMA,CDMA*	*10Kbps*	*800 MHz* *900 MHz* *1800 MHz*	*25MHz*	*Voice & Data*
3G	*WCDMA, UMTS, HSDPA*	*384Kbps – 5Mbps*	*800 MHz* *850 MHz* *900 MHz* *1800 MHz*	*25MHz*	*Voice, Data &Video calling*
4G	*LTEA, OFDMA*	*100Mbps –200Mbps*	*2.5 GHz* *3.5 GHz*	*100MHz*	*Voice, Data, Video calling, Online*

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					game, HD Tv
5G	*BDMA, NOMA, FBMC*	*10 Gbps – 50 Gbps*	*1.8 GHz 2.6 GHz30 – 300 GHz*	*30 - 300MHz*	*Voice, Data, Video call, UHD video, VR applications*

➢ *Multiple Input & Multiple Output System:*

MIMO is one of the major technologies used for wireless system in 5G network and it will be mainly used for sending and receiving the multiple signals through radio channel. It will be major system in WIFI, 3G, 4G and 4G LTE networks for reaching high spectral efficiency for data transmission. It will produce higher energy efficiency with lower throughput and lower reliable connectivity.

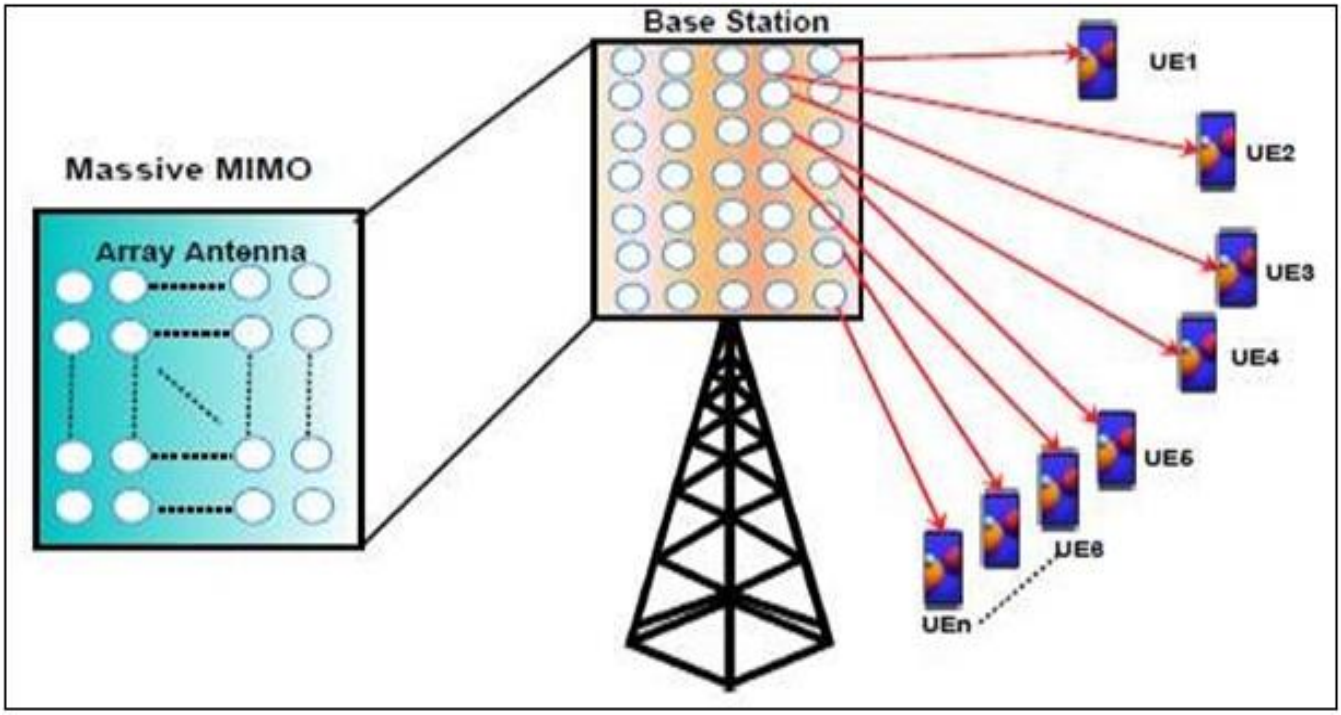

Fig 2 Representation of Multiple Input & Multiple Output Architecture

Enhanced MIMO technology is used in 5G network where the thousands of antennas are connected with base station to increase the throughput and efficiency of spectral model.Transmission rate are increased using enhanced MIMO by using additional antennas to transmit the energy to smaller regions for increasing the spectral efficiency and throughput. In technology, collection of data from various sensors with lower latency and higher data rate and reliability will be helps to transmit the real time collected data to monitoring the locations in various aspects such as smart cars, health monitoring systems, etc., Few major highlights of enhanced MIMO technology are as follows,

- Data rate- Gb per second.
- Connection between frequency and antenna size- low frequency signals,huge antenna.
- Number of user- 1G to 4G, one cell = 10 antennas. But 5G, one cell = >100 antennas.
- MIMO role in 5G- high spectral & energy efficiency enabled

➢ *5G Enabled IoT System:*

The 5G network plays a major role in developing IoT by connecting various devices like appliances, sensors, etc., which will collect the data in various aspects using sensors. 5G technology will provide high speed connectivity for data collection and transmission for processing the data. It is flexible network for unused spectrum with low-cost deployment using efficient technology in IoT. Applications of IoT*:*

- Smart home
- Farming
- Industries
- Hospitals
- Education
- Army, etc.,

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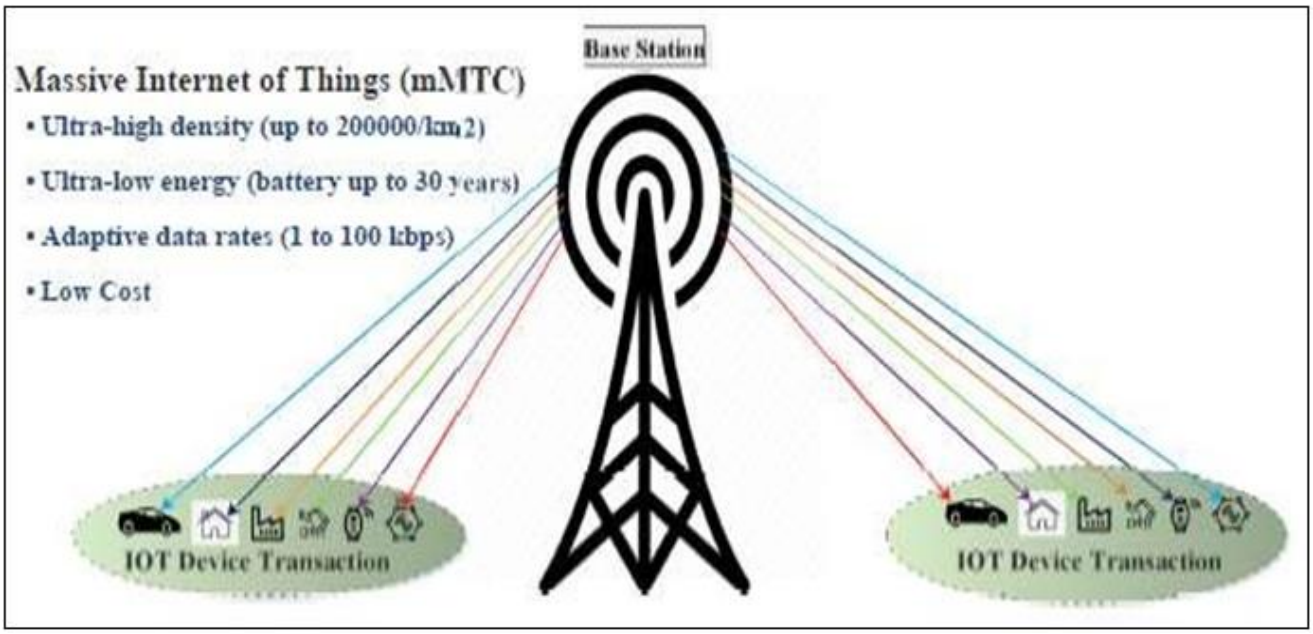

Fig 3 Representation of 5G Technology in Internet of Things

➢ *Highlights of 5G Technology in IoT:*

- It provides M2M communication.
- High speed internet betweendevices.
- Deal with moderate devicesconnect through network.
- Majorly implemented in privatehealthcare system, traffic management, industrial management, etc.,

➢ *5G Technology in Machine Learning:*

Machine learning techniques have various technologies, but implementing 5G network will enhance the better communication. It provides a solution to different complex problems with hand tuning process. It was broadly classified assupervised and unsupervised learningmethods.

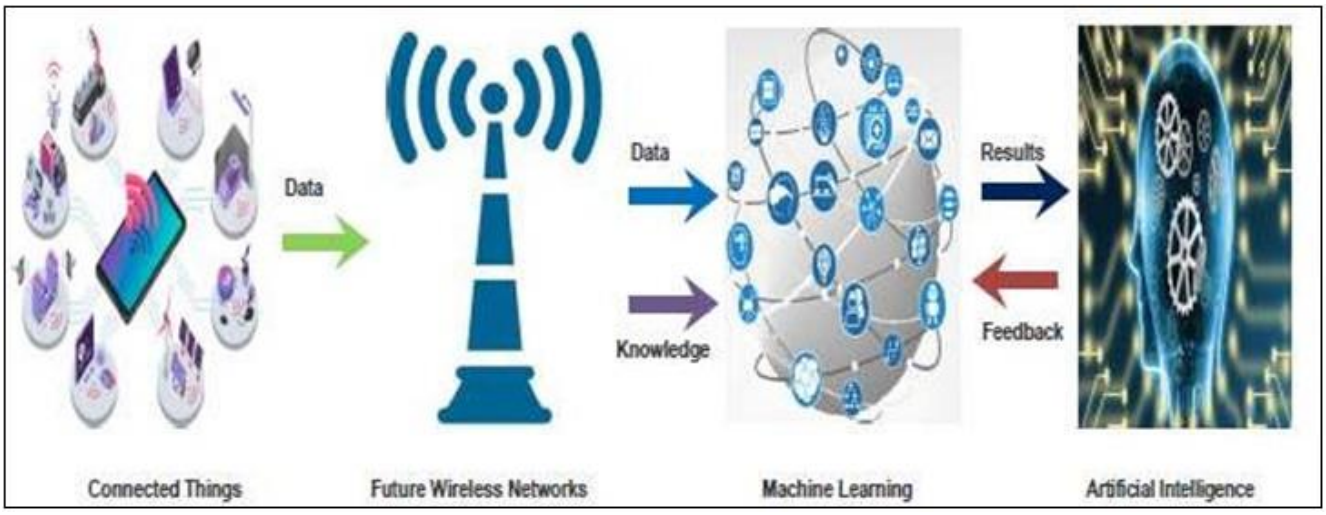

Fig 4 Representation of 5G in Machine Learning

Table 2 Small Cell Types

Cell types	Radius cover	Transmit power	Connection type	Price
Femto cell	30 – 165ft	100mW	Fibre, Wired	Low
Pico cell	330 – 820ft	250mW	Fibre, Wired	Low
Micro cell	1600 – 8000ft	2000 – 500mW	Fibre, Wired	Medium

Supervised learning works with labelleddata with some 5G network errors which will be categorized as regression andclassification problems by predicting thelinear regression algorithm. For predicting bandwidth and frequency accurately the statistical logistic regression algorithm is used. Whereas unsupervised learning is applied to enhance the performance and connectivity of network without any interruptions. The small cell technique is low powered cell radio access node which have range of 10meters to certain kilometres. It will play major role by proposing the 5G network with low power base stations by covering smaller areas.

Rollout will be done in small cells for 5G network with ultra high speed and lower in latency for communication. Technologies like MIMO, beam forcing, etc., will provide higher speed in 5G network for high-speed data transmission.

V. CONCLUSION

Emergence of 5G network is studied briefly in this research paper and the evolution of 1G to 5G is discussed with applications of mobile network and key features are discussed. This paper not described only about mobile broadband network but also different mobile network in existing are studied with different generation services like IoT, industry 4.0 is stated. Every network system will be explained with the tabular discussion to showcase the importance of technology with flexible, scalable and reliability of 5G network. And also, few 5G techniques like MIMO,NOMA, etc., are discussed.

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