



## 5G Technology – A “Boon” or a “Bane”

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**Abstract**— At the beginning of the 21st century, new approaches began to take place in the city, such as the IoT and, more recently, the 4G and 5G wireless technology. As 5G is not yet into picture, still researches and studies are going on. This study focuses on the analysis of 5G technology, architecture and highlighting its advantages and disadvantages in order to decide whether it's a boon or a bane.

**Keywords**— 5G, Wireless communication, Need of 5G, 5G Mobile Network Architecture.

### I. INTRODUCTION



Fig 1. Food products originated through organic farming

The mobile wireless industry has started to create its technology and evolution since the early 1970s. In the present era, there are four generations in the mobile industry and those are 1G- the First generation, 2G- the Second generation, 3G- the Third Generation, 4G- the Fourth Generation and now soon we will be having the 5G technology which is also referred to as the 5<sup>th</sup> generation technology. It has totally changed the way of using cell phones with such a high bandwidth. The extension services of 5G mobile network improves the ecosystem of the telecommunication network and provide services to healthcare industry, agriculture industry, smart city project in an energy efficient manner. 5G builds foundation of digitalization from personal communication to the interconnection of society. So,

the world of universal, all time access to information, communication and entertainment will open new new dimension to our lives and will change our lifestyle rapidly.

### II. METHODOLOGY

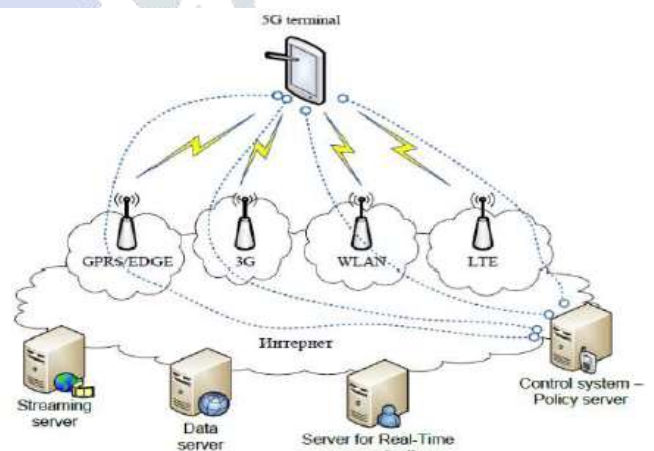


Fig 2. 5G Mobile Network Architecture

The system comprises of a user terminal and a large number of autonomous, independent radio technologies from which each of the radio technology is seen as the IP link to the outside digital world. Here, at first we have two OSI levels i.e the data-link and physical levels through which internet access is provided. The purpose of this IP link is to ensure enough data control and proper routing of IP packets from the source to the destination. All sort of application connections in the Internet between the client and server are established with the help of sockets. Each socket has got a unique IP address, communication port and a type of transport protocol. The local IP address and destination IP address should be always fixed and unchanged when there is an end-to-end connection and so as to maintain that connection. If we make any sort of changes to these parameters then it is referred to as closing a socket and then creating a new

one. The network abstraction is always provided by creating IP tunnels over IP interfaces in which the tunnels would be basically established or setup between the user terminal and the control system.

### III. 4G & 5G DIFFERENCE



Fig 3. 5G Vs 4G

1. 4G mostly focuses on the availability of raw bandwidth whereas 5G is aiming to provide connectivity for quick access to the internet users wherever possible i.e on top of a skyscraper or under down under a subway station.
2. 5G is not going to be a monolithic network as its going to be build around various different technologies thereby providing the ability to a number of connected devices. Also, it will provide ultra high speed link for HD video streaming, advanced biological and in several situations chemical quality.
3. There is a difference in the data bandwidth provided by these two technologies. Data bandwidth for 4G is 2Mbps to 1Gbps whereas for 5G it is 1Gbps and higher as per need.
4. The services provided by 4G include dynamic information access, wearable devices, HD streaming and global roaming. Even 5G provides all these features and any demand of users.

### IV. CHALLENGES FACED IN 5G IMPLEMENTATION

Following are the issues and challenges faced during the 5G implementation.

#### A) Complex Architecture and High data rate:

5G has got a very complex architecture i.e. it requires a large number of base stations to install within a small geographic area. This thereby will increase the cost of network as well as the data transfer rate thereby reducing the energy consumption. In order to increase the efficiency mMIMO (Massive Multiple Input and Multiple Output) uses a number of antennas in order to communicating devices.

#### B) Multiple Services:

5G has got a vast task offer various services such as heterogeneous networks and all those devices operating in various geographic locations. So, here the challenge is to provide universal and data-rich wireless services thereby fulfilling the needs of the users.

### C) High Energy Optimization Full Duplex Communication Channel :

5G uses full duplex communication channel i.e. it will access same channel for access and packet sending. But it will require high energy and also practical implementation is very complex because of interference.

### V. 5G FEATURES / CHARACTERISTICS

1. 5G technology allows the number of users mobile phones and cell phones records for printing purpose operations.
2. 5G provides support for virtual support network.
3. Also, the uploading and downloading speed of 5G is very much impressive.
4. 5G is very quick, easy to reliable as well as provides enhanced and available connectivity.
5. Also, the 5G carrier distribution gateways provide maximum stability without any sort of delay.

### VI. 5G APPLICATIONS

#### A) Mesmerizing Entertainment

As the number of internet users are increasing day by day so it becomes complicated to provide live streaming videos using 4G technology. So, here 5G comes into picture as it has got the potential to provide mesmerizing entertainment sessions anywhere in the world and most importantly at any time of the day as it has low latency and high bandwidth in it. So, it provides live virtual sports, videos, any sort of adventurous trips, and real world images with high quality and instantly.



Fig 4. Smart Gaming Using 5G

**B) Smart Environment Monitoring**

Nowadays, environment monitoring has become one of the biggest challenge for the entire world as a large number of living beings are suffering from various climatic and environmental disasters due to lack of attention and monitoring. Examples include earthquakes, floods, tsunamis, etc. Using 5G network we can easily transmit the information because of the sensor nodes that are fixed at various remote locations as well. This, thereby proves helpful in saving many lives by taking precautions earlier as we get to know.

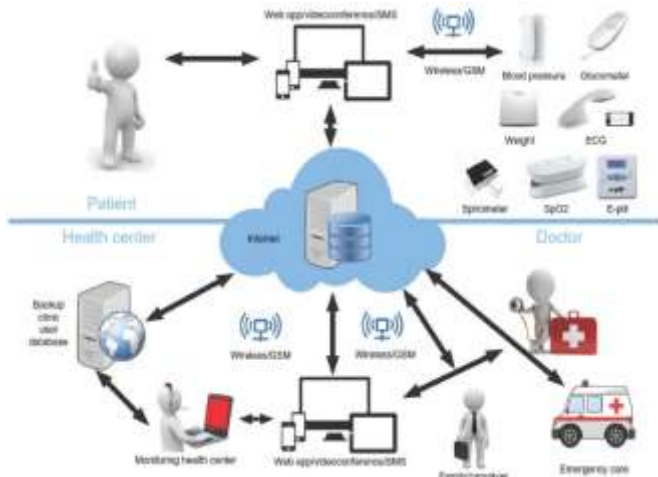


Fig 5. Environment Monitoring Using 5G

**C) Smart Watches**

5G will make our life easier for all these gadgets as it will lend the computing power that is required as well as the superfast speed and the reliable connectivity. 5G is estimated to provide powerful smartphone features in the wearables. In a technical study and report it is also been observed that both wearable and AI devices improve healthcare performance of the humans and also provides the smart device UI experience with more advanced features.



Fig 6. 5G in Smart Watches

**D) Smart Home Connectivity**

Basically, a smart home is nothing but a house in which almost all the appliances i.e. refrigerator, TV, AC, etc are connected and monitored through Internet. So, in general a smart phone connected Internet. So, all these appliances are controlled by using LoWPAN i.e. the

Low-Power Wireless Personal Area Networks. It is a sort of mobile communication protocol. Also, all these appliances are connected together with the help of IOT sensor nodes.



Fig 7. Home Connectivity Using 5G

**E) 5G in Medical Field**

The medical field has drastically grown in this century and will keep growing in the future. It proves that

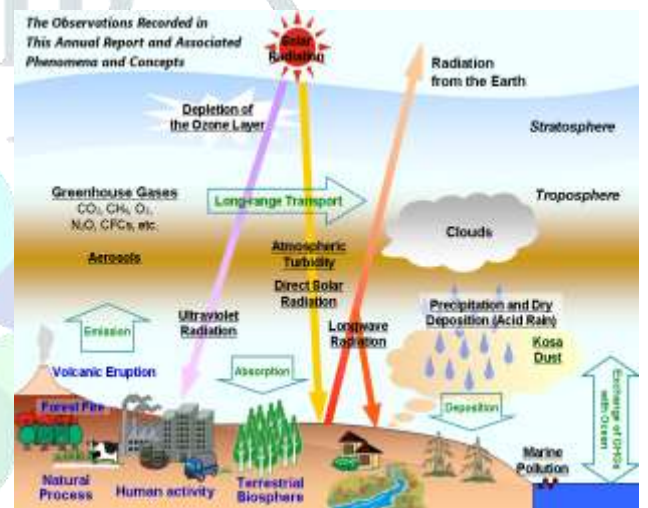


Fig 8. 5G in Smart Health

healthcare is still one of the challenges in both urban and rural areas. All these techniques i.e 5G, AI and robotics helps to provide healthcare facilities to patients from anywhere and anytime. So, here tiny sensor nodes will be implanted/attached to our wearable clothes. These nodes will be able to monitor vital parameters such as BP, blood sugar level, heartbeat, anxiety etc. on real time basis and will send the information to the hospitals and relatives on real time basis. Therefore, thi proves that the patient health can be monitored even by virtual visits instead of visiting everyday. Also, the records generated will be available to the physicians and the medical staff at anytime and anywhere for any sort of investigation purposes. 5G will be expensive but it will provide better convenient and real time medical facilities when needed. Also, with the help of it high-speed connectivity it will provide cloud storage facilities for electronic storage of medical records of patients.

**F) Smart Agricultural System Using 5G**

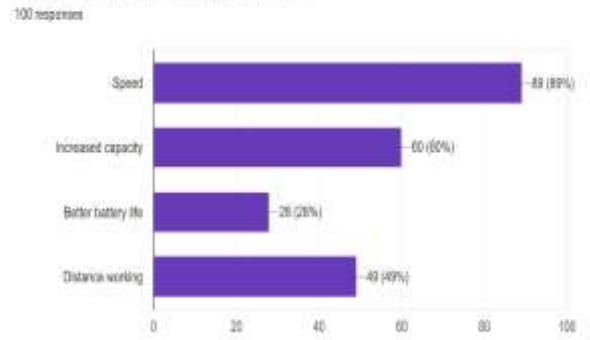
Our Indian agricultural system is based on traditional techniques. So, as this is a new modern era we can use modern techniques that is provided by 5G. This can be done with the help of sensor nodes that will be installed in the field.



Fig 9. 5G in Agricultural System

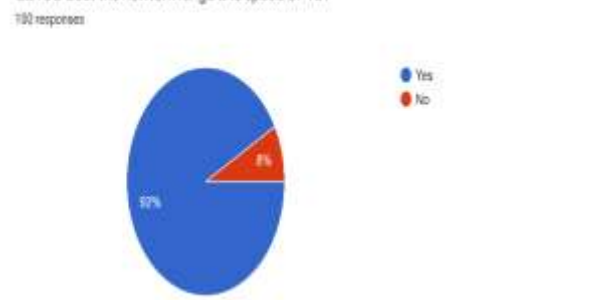
This will share the up-to-date information regarding the crops that can be measured by the sensor nodes which thereby increase the product quantity as well as quality. Smart Farming has got a lot of applications in it such as irrigation facilities for which water management is must, soil testing, how to apply fertilizers and pesticides to the crops, crop status, temperature and weather prediction, etc. All this can be achieved when 5G when actually come into picture which is not very far.

What do you think could be the features of 5G?



Can 5G beat the network range and speed of 4G?

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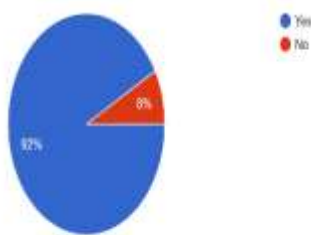


**VII. FIGURES AND RESULTS**

Public Survey

As we all know that 5G is not yet into India. But very soon it will be. So will it have an impact on the upcoming generation?

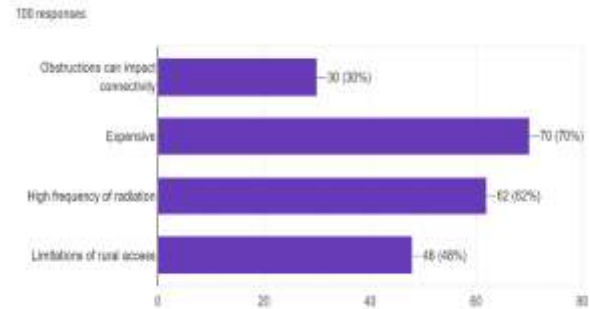
As we all know that 5G is not yet into India. But very soon it will be. So will it have an impact on the upcoming generation?  
100 responses.



What do you think could be the features of 5G?

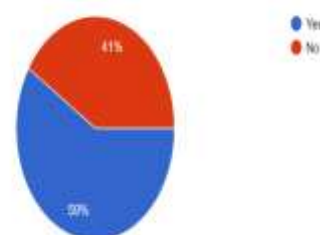
What do you think could be the drawbacks of 5G network?

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As it's gonna be something very new and trendy in the market it would be expensive. So will you prefer using 5G?

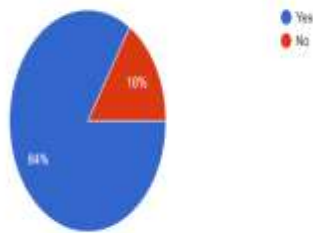
As it's gonna be something very new and trendy in the market it would be expensive. So will you prefer using 5G?  
100 responses.



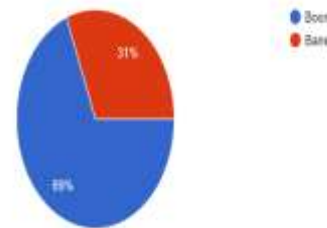
As the new technology brings lots of advantages, it has got some adverse effects too even on our health. So, do you think that the new technology can have an effect on our health?

So, lastly what is your opinion regarding the arrival and implementation of 5G technology. Will it be a boon or a bane?

As the new technology brings lots of advantages, it has got some adverse effects too even on our health. So, do you think that the new technology can have an effect on our health?  
100 responses



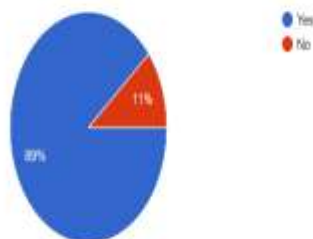
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100 responses



### VIII. HYPOTHESIS TESTING

Can the radiation affect the bird life as well?

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100 responses



Hypothesis testing is a sort of statistical reasoning that includes analysing data from a sample to derive inferences about a population parameter or probability distribution. First, a hypothesis is created regarding the parameter or distribution. This is known as the null hypothesis, abbreviated as  $H_0$ . After that, an alternative hypothesis (denoted  $H_a$ ) is defined which is the polar opposite of the null hypothesis. Using sample data it determines whether  $H_0$  is accepted or rejected. The conclusion states that the alternative hypothesis  $H_a$  goes true if  $H_0$  is rejected.

So, in this paper,

Null Hypothesis ( $H_0$ ) : 5G is a Bane

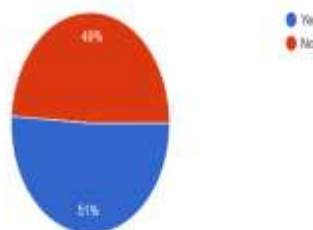
Alternative Hypothesis ( $H_1$ ) : 5G is a Boon

Nowadays most of us prefer to use a Wi-Fi setup for unlimited data use. So, will 5G network make Wi-Fi obsolete?

There are 3 tests based on which we can determine that our hypothesis is true or not :

1. Chi – squared test
2. T – test
3. Fisher’s Z test

Nowadays most of us prefer to use a Wi-Fi setup for unlimited data use. So, will 5G network make Wi-Fi obsolete?  
100 responses



In this paper, we will be using a 2 tailed T-test.

A T-test is an inferential statistic that determines if there is a significant difference in the means of two groups that are related in some manner.

- **Level of Significance**

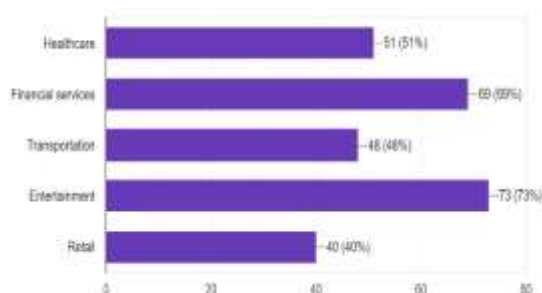
The chance of rejecting the null hypothesis when its true is the significance level i.e. A significance level of 0.05 means that there’s a 5% probability of discovering a difference. Lower significance levels indicates that more evidences will be required to reject the hypothesis.

- **Level of Confidence**

The confidence level indicates that the probability of a statistical parameter measured in a sample survey is also true for the entire crowd.

Which industries will benefit the most from 5G technology?

Which industries will benefit the most from 5G technology?  
100 responses



Sr. No.	Data
1	92
2	89
3	92
4	70
5	59
6	84
7	89
8	51
9	63
10	79
<b>Mean (x)</b>	76.8
<b>Standard Deviation (s)</b>	15.03921

Level of Significance = 0.05 i.e. 5%

Level of Confidence = 95%

The formula to find t-score is:

$$t = (x - \mu) / (s / \sqrt{n})$$

where x is the sample mean,

$\mu$  is the hypothesized mean,

s is the sample standard deviation, and n is the sample size.

The p-value, also known as the probability value, indicates how probable your data is to have happened under the null hypothesis. Once we know the value of t, we can find the corresponding p-value. If the p-value is less than some alpha level (common choices are .01, .05, and .10) then we can reject the null hypothesis and conclude that 5G is a Boon..

### Calculation of t-value:

**Step 1:** Determine what the null and alternative hypotheses are.

Null hypothesis (H0): 5G is a Bane.

Alternative hypothesis (Ha): 5G is a Boon.

**Step 2:** Find the test statistic.

In this case, the hypothesized mean value is considered 0.

$$t = (x - \mu) / (s / \sqrt{n}) = (76.8 - 0) / (15.03921 / \sqrt{10})$$

$$= 16.148$$

$$t\text{-value} = 16.148$$

### Calculation of p-value:

**Step 3:** Calculate the test statistic's p-value.

The t-Distribution table with n-1 degrees of freedom is used to calculate the p-value. In this paper, the sample size is n = 10, so n-1 = 9.

By plugging the observed value in the calculator, it returns a p-value. In this case, the p-value returned is less than 0.00001.

Since this p-value is less than our chosen alpha level of 0.05, we can reject the null hypothesis. Thus, we have sufficient evidence to say that 5G is actually a Boon for our society and for the upcoming generations.

## IX. CONCLUSION

So, as per the public survey and all the testings we, hereby conclude that 5G is a Boon as it is very fast and

reliable. Fifth generation technologies provides various data potentials and unrestricted call volumes and also infinite data broadcast together within latest mobile OS. 5G will be more intelligent and and useful technology that will interconnect the entire world without any sort of limits and this technology is most likely to be in use somewhere around 2022. This new fifth generation technology will open new phase in our lives and will change our lifestyle importantly.

## X. FUTURE SCOPE

As we all know that 5G is not yet into implementation so the future scope of nano technology will be immense as it combines with AI. So, in this technology, one will be able to control his robot's intelligence using mobile phone or any other device. So, over here, our mobile will be automatically typing a message what our brain is thinking at that time. Also, the scientists and researchers have announced the term 6G as the 17<sup>th</sup> most search word where we will be having a 6G iPod. The iPod will be coming in 7 different colours and has got an aluminium body to withstand the daily body usage by attaching it to the shirt firmly or our dress whatever we're wearing.

## XI. ACKNOWLEDGEMENT

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