

Evolution and Needs of Technology regarding IoT

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Abstract— With the evolution of technology, the number of IOT sensors, the amount of data shared and needed for real life operations has increased drastically. New improved efficient ways are required in order to increase operational efficiency, improve the performance, automating all the business processes. We are now having compute intensive applications, it is now visible that with the emergence of 5g and with the vision of IOT technologies, we are going to have unprecedented increase in traffic and volume of data. Thinking about demand of data computation and driving solutions about them is essential. The problem now is how to run applications that require a lot of computations on computers that do not have much resources.

This paper provides the solution that how we can tackle data-intensive and computation-intensive applications by using different aspects of cloud and mobile edge computing. It describes the importance of the fifth generation network in meeting the computational and communication needs.

The analytics capabilities of the IoT utilize information to change over experiences into activity, affecting commerce forms and driving to other ways of working. In any case, there are still a number of specialized and security concerns that stay un-addressed. Security could be a major concern with IoT that has ruined its large-scale deployment. IoT gadgets regularly endure with security vulnerabilities that make them a straightforward target.

The greatest disadvantage of IoT is that it depends on centralized communication models to connected with the framework. It can too be said that all the gadgets in IoT setup are recognized, associated and approved through centralized cloud servers. However, centralized clouds and organizing hardware utilized within the existing IoT arrangements have tall upkeep and foundation fetched. As IoT frameworks are associated through these administrations, versatility can ended up a critical issue. In this paper we are going to discuss the importance of block chain in solving this problem

Index Terms— IOT (internet of things), 5g (fifth generation), B-chain (Block chain) , Edge Computing, 4C (computation, control, content)

1 INTRODUCTION

From the last few years the evolution in our communication technologies have affected our every aspect of life. Since the launch of fist generation cellular network to the present day many other generations have been launched (2g, 3g, 4g, 5g) with total different architectures, security, privacy and basic features. The Figure 1 and 2 show the evolution from 1g to fifth generation networks below.

Basically the fifth generation communications can be divided into three main categories depending upon the purpose they are being used for.

1. Enhanced Mobile Broad band
2. Massive IOT
3. Ultra reliable low latency communication

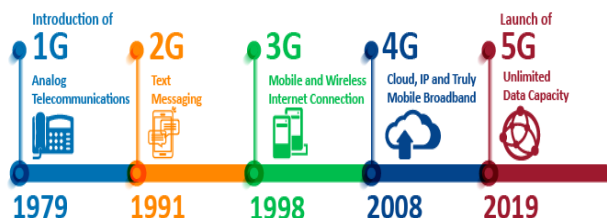
5G is not only going to provide the communication support but also going to provide computational support. It is going to support 4 C theory

Here 4Cs are

- Computation
- Control
- Content
- Delivery

Some of the use cases of this marvelous technology are self-driving cars, auto-pilot of the airplanes, Virtual and augmented Reality, Ultra reliable and high speed internet. The major need for 5g was aroused by the increasing demand of data intensive and computation intensive apps here as the re-

The Evolution of 5G



Figure

Now a days our educational and industrial communities are working to get fifth generation network completely functional, standardizing and commercialization of the 5g network is still under process.

sources were limited, gaining a network that provides both the computational and communication support. 5g will provide the network resource management, radio access, will act as a power supplier and will improve the performance.

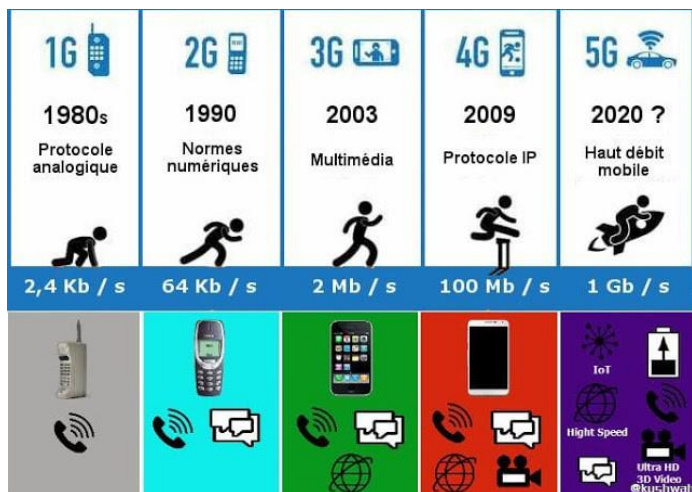


Figure 1

With the passage of time the mobile data traffic is increasing rapidly, this traffic is about to reach 77.49 Exabyte by 2022 and the annual growth rate will grow by 46 percent according to the survey of "Statista". Figure 3 shows the actual report from 2019 to 2022.

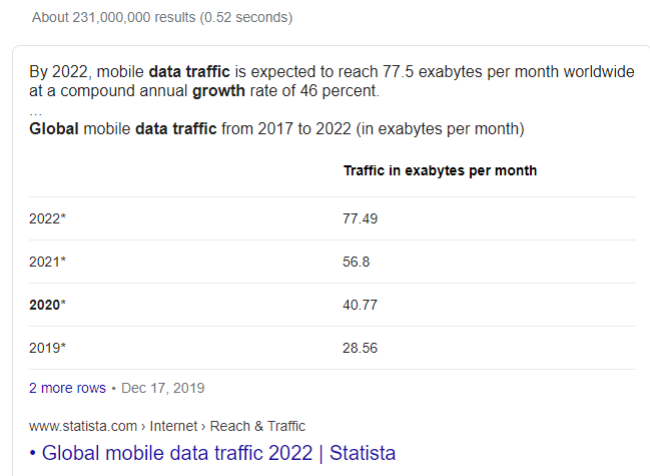


Figure 2

The traffic generated by many applications is going to increase drastically. This enormous increase will basically be because of the modern technologies and demands like:

- Increase in the number of sensors in IOT on various devices such as self-driving cars, etc.
- Internet gaming
- Augmented reality
- Virtual reality
- Internet video surveillance

It is also anticipated that number of the sensors only attached to the wearable devices will exceed 28.5 billion by the start of 2022.

Now if we think about our applications that are highly data and computation intensive and then we look at our devices, we will come to the point that we are using the devices that are relatively small in terms of resources, comparing to the applications they are using

Applications being used by devices > Resources of the device

In order to tackle this need of resources we have to move forward to the technologies like cloud, and the EDGE computing etc. Mobile edge computing is an emerging technology in the 5G world.

2 METHODS AND TECHNOLOGIES

Cloud computing

Despite recent advancements in the field of mobile hardware technologies, still that hardware and the resources that they are going to provide aren't strong and capable enough to cope up with the resource requirements of the applications, in order to deal with this thing a solution is to transfer the potential data to the Cloud.

Mobile cloud computing enables the developers to develop more complex applications, without thinking of the resources, it keeps the data storage in a data center that might actually be really far away from the real user.

Cloud is very significant but there are many limitations of the cloud, some of them are as follows

Privacy and Security

In cloud third parties are responsible for the privacy and security of the data, they can be attacked by hackers and that may lead to severe damage. In cloud privacy and security are really a big issue and success of a cloud depends highly upon this factor.

Intensive communication apps

The apps that need intensive communication and instructions aren't suitable to work on Cloud. It also doesn't suite the apps that must support widely spreaded users.

Latency

To fetch the data from the cloud, because the data centers are really far away from the user, so in order to fetch that data latency is really a big issue. Data is placed in form of bulks at a cloud that require time to fetch. Such as the time needed to fetch data from California to Netherlands is 150 milliseconds. This might be a very short period of time and not noticeable for regular apps but the apps that need real time information or real time instructions, for them it might have devastating results.

Edge Computing

In order to solve the problems that were present in cloud, edge computing is introduced.

According to granter

“a part of a distributed computing topology in which information processing is located close to the edge – where things and people produce or consume that information.”

At its fundamental level, edge computing brings computation and information capacity closer to the gadgets where it's being accumulated, instead of depending on a central area that can be thousands of miles absent. Typically done so that information, particularly real-time information, does not endure inactivity issues that can influence an application's execution. In expansion, companies can spare cash by having the handling done locally, lessening the sum of information that has to be prepared in a centralized or cloud-based area.

Edge computing was created due to the exponential development of IoT gadgets, which interface to the web for either getting data from the cloud or conveying information back to the cloud. And numerous IoT gadgets produce colossal sums of information amid the course of their operations

Edge computing solves the short comings of the cloud by removing latency, bandwidth problem, providing more security as compared to the Cloud

Figure 4 shows the working of the edge and interaction with the cloud

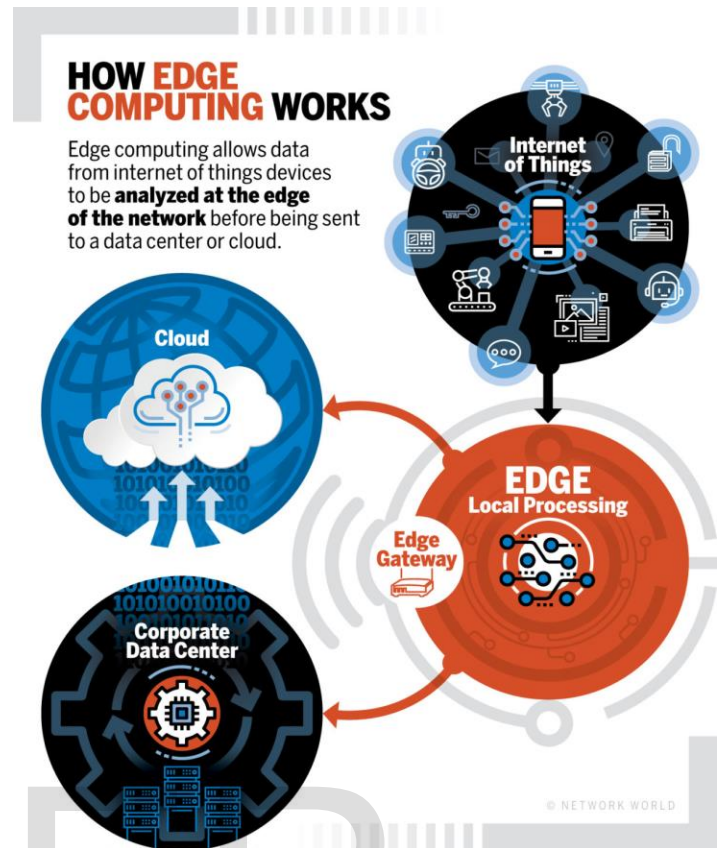


Figure 3

lot security and Block chain

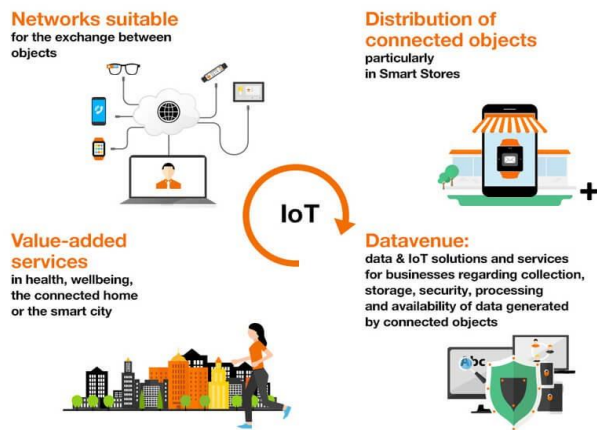
The combination of blockchain and the IOT has showed up as one of the foremost beneficial usecases or scenarios for the present era. Two huge companies, Volkswagen and Bosch accept that the decentralized information and IOT marketplaces ought to co-exist. Too, inquire about done by IDC says that 20% of all IoT organizations will have blockchain administrations empowered by 2019. Before understanding how blockchain and IoT combined can bring change to the world, let us to begin with clarifying what is IoT and what is blockchain.

We might begin with an case of a smartphone to get it the essentials of IoT. A smartphone is the as it were gadget merely might utilize for numerous of your needs- from tuning in to music, checking emails or messages, communicating with peers, observing motion pictures and playing games. The phone did not have these numerous capabilities many a long time back. Prior, individuals may as it were send a message or make a call with their cell phones. However, phones have gotten to be more intelligent nowadays since they are associated to the internet. This is the essential rule of the Web of Things that objects or gadgets can ended up more astute by getting

associated to the web. IoT can be classified into the taking after categories:

- Things receiving data
- Things that get data i.e Sensors
- Things acting after getting the data i.e Actuator

The Internet of Things



As IOT's effectiveness depends upon the data so keeping this data safe is a crucial task and for that we might use block chain.

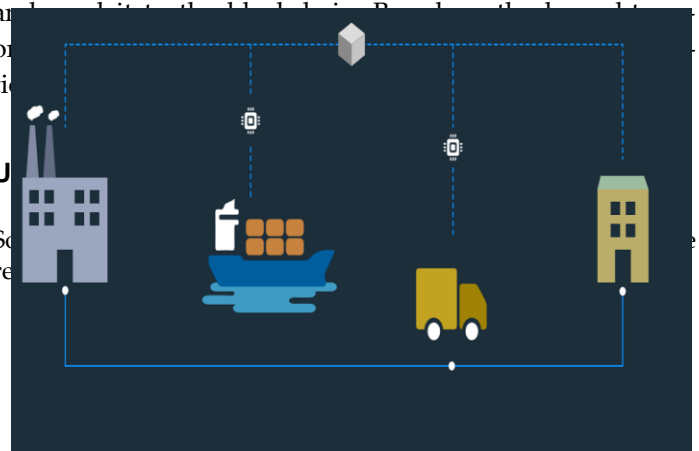
The Block-chain

The blockchain innovation is based on the concept of the decentralized organize that records and forms exchanges straightforwardly and safely. It may be a chain of squares that contain time-stamped advanced records which cannot be changed or erased once added to the blockchain. The records spared within the blockchain are disseminated over all hubs within the arrange where each hub has an upgraded duplicate of the record at all times. People continuously have a address in their intellect how blockchain is diverse from the current situation. Directly, each innovation company whether it is Airbnb or Uber imagines as a centralized substance when it comes to preparing installments or saving data. Based on the concepts of decentralization, blockchain secures the information from the hands of many centralized bodies in this manner decreasing the dangers of data burglary or hacking. As we said over that the victory of IoT depends on its potential to keep information secret and secure, bringing blockchain to IoT can rebuild.

3 HOW BLOCK CHAIN HELPS IOT

As the number of IoT gadgets increments, the number of intuitive between the server and gadgets increments the taken a toll. That's the reason why current frameworks cannot bolster expansive IoT networks. Also, cloud servers are defenseless to a single point of disappointment which implies the disappointment at one point can influence the whole ecosystem. Therefore, employing a peer-to-peer show rather than a client/server demonstrates can be the correct arrangement that IoT industry needs today. With decentralization input, capacity needs and computation can be disseminated over millions of IoT gadgets and central disappointment cannot have an effect on the full network. So, the utilize of blockchain in IoT can offer assistance the IoT gadgets to scale up efficiently.

As the blockchain is tamper-proof and decentralized, it can do what IoT precisely requires. Utilizing blockchain in IoT can assist you track billions of associated gadgets within the network. Integrating the blockchain in IoT gadgets can too decrease the costs of introducing and overseeing servers for an IoT organize. Blockchain employments cryptographic calculations which guarantee the secrecy and security of the information on the IoT organize. Blockchain in IoT moreover ensures the arrange from the man-in-middle assaults since it does not have a single string of communication. With smart contracts, understandings can be made which is able execute when certain conditions are met. For illustration, temperature sensors can get the information



Blockchain combined with IoT can move forward the traceability of the supply chain organize. IoT sensors like temperature sensors, movement sensors or GPS associated to the vehicles give data almost the shipment status. Information gotten from the sensors gets put away within the

blockchain, bringing traceability, auditability and straightforwardness within the framework.

Smart Homes

IoT gadgets permit the domestic security framework to controlled remotely from the smartphone. But the centralized demonstrate for trading data produced by IoT sensors need possession of information and security guidelines. By moving the information assembled from IoT gadgets to the blockchain can illuminate security issues.

In conclusion, blockchain and IoT are both emerging technologies with great potential, but still lacking widespread adoption due to technical and security concerns. Several companies in the market are already working on use cases combining the two technologies, as together they offer a way to minimize the security and accompanying business risks.

The Deloitte Garage Innovation Hub: IoT and Blockchain Showroom

Companies should start considering the implementation of blockchain and IoT to address their business issues, 'starting small' by learning from current use cases and projects in the industry. Deloitte Switzerland offers clients an interactive experience in a newly-opened Garage Innovation Hub in Zurich, where they can gain hands-on experience of IoT and blockchain technology, initiate discussions and share ideas on solutions. This innovation space is designed to help organizations define their strategy around IoT and blockchain, and to inspire them to pursue it.

Parking solutions



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4 RESULT

Edge computing solves the short comings of the cloud by removing latency, bandwidth problem, providing more security as compared to the Cloud, it is important to fasten the research in the field of edge computing and to adopt to it as well, as it is a stair case to climb in order to advance more and to fulfill our needs of resources.

Besides IOT security is the major factor on which the success and survival both of IOT depend we must work in order to survive. Block chain is an emerging technology and we must use the newly evolving technologies and adapt to them for our betterment.

5 CONCLUSION

The IOT worldview creates a critical heterogeneous sum of information day by day, which could be dealt with by centralized or decentralized stages. In this paper, we have laid out recent advancements as well as challenges related with data and computation. The inspiration for moving to edge computing is talked about with respect to Edge computing architecture-related issues.

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