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QUANTUM FOG CLOUD MODEL IN INTERNET OF THINGS WITH ANALYSIS OF GREEN COMPUTING

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Abstract

The technology of Quantum Green Computing has been discussed in this paper. It also discusses the need of the many implementation techniques and approaches in relation with Fog-Cloud Computing. Moreover, we would like to introduce the latest algorithms like Stack Algorithm, Address Algorithm and many others which will help in the analysis of Green-Quantum Computing Technology in the modern society and would create a technological revolution. With the Internet of Things rising in the modern world time, new security issues have also been developed. So, our proposed Model the Fog-Things Model will help us to determine the security issues and indeed secure the entire IoT network.

Keywords: Quantum Algorithms; Cloud Computing; Green Computing; Quantum Computing; Fog Computing; Internet of Things; Quantum Key Distribution.

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1. Introduction

The current generation is heavily dependent on computers. As reducing the number of computers is not possible, turning computers green is the motto. We believe that by switching from paper to electronic mode of communications, we are ―green. Thus, a bit is done to save the environment and generate less CO2. But electronic greeting cards or e-mails are not so green. During the manufacture of a computer it requires about 1.8 tons of water, chemicals and fossil fuels. On an average, it emits about 0.1 tons of CO2 every year. According to research, computers generate an estimated 35 million tons of CO2 into the atmosphere each year. The emissions by computers contribute to about 2 per cent of world's total carbon dioxide emissions. After every two or three years, every computer turns into junk. In some not so developed countries the story is completely different. They use their computers for a longer period and even those considered junk in the developed nations are used here. The junk computers are often dumped in landfills, which causes pollution of the soil with toxic elements like cadmium and mercury. Many of us are unaware that

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even shutting down a computer does not turn it off completely. This is because the computer's power supply will remain physically switched on, with a partially powered motherboard waiting for a signal to boot up again. A computer uses about 8W of electricity per hour when shut down but not switched off. That's about 1KW of electricity being wasted per week. So simply turning off a PC can have a major impact on energy consumption as well as on environment. In the next five years, it is expected that the energy cost spent by most U.S. data centers will be as much the cost as on hardware, and two times as much as they currently do on server management and administration costs.

2. Analysis of Green Computing

2.1.What is Green Computing or Green Computation?

Green computing is the proficient use of computing and IT resources. Protection of the environment and saving energy cost should be our primary motive in today's world. Green computing or Green IT, is the analysis and practice of environmental friendly computing or IT. A major challenge is the designing, manufacturing, its usage, and proper disposal of computers, servers, and related subsystems—such as monitors, printers, storage devices, and the various networking devices like routers — both in an efficient and effective manner with very less or as low as possible effect on the environment [2]. The need of the hour is to reduce the use of toxic substances, increasing energy efficiency, and to promote the reusability of devices related to computing and IT waste. Green computing provides practical strategies for a better future. Thus, green IT includes the scope of sustainability of environmental, the economics of energy efficiency, and the total cost which includes the cost of disposal and recycling. Hence Green IT deals with the study and application of using computing resources efficiently.

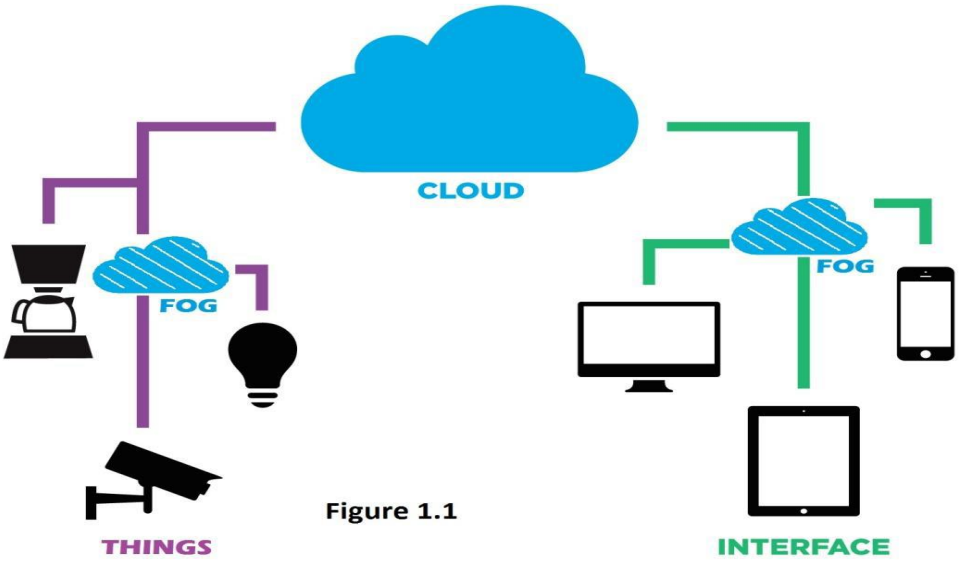

Figure 1.1

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2.2.Relation of Fog-Cloud Computing with Green Computing

It is a resource where system software, processing of power, data and artificial intelligence are accessed over the internet and they are widely used in IoT networks. Among the many benefits of Fog-cloud computing one of them is allowing anybody to access the environmental benefits of virtualization. Most of the servers in an organization, the data center's run at 40 per cent of the total capacity, most cloud service provider's system run at exactly 70 per cent capacity or more. By choosing cloud computation and particularly by adopting online computer processing power of PaaS or IaaS organizations may therefore minimize their carbon emission rate, and as well as making the server to implement and run more efficiently and effectively. Fog-Cloud computing reduces the need for most users to run high-power PCs and laptops and can also remove the problems of storage capacity and help us to identify distinctly the layers of the data storage in the network.

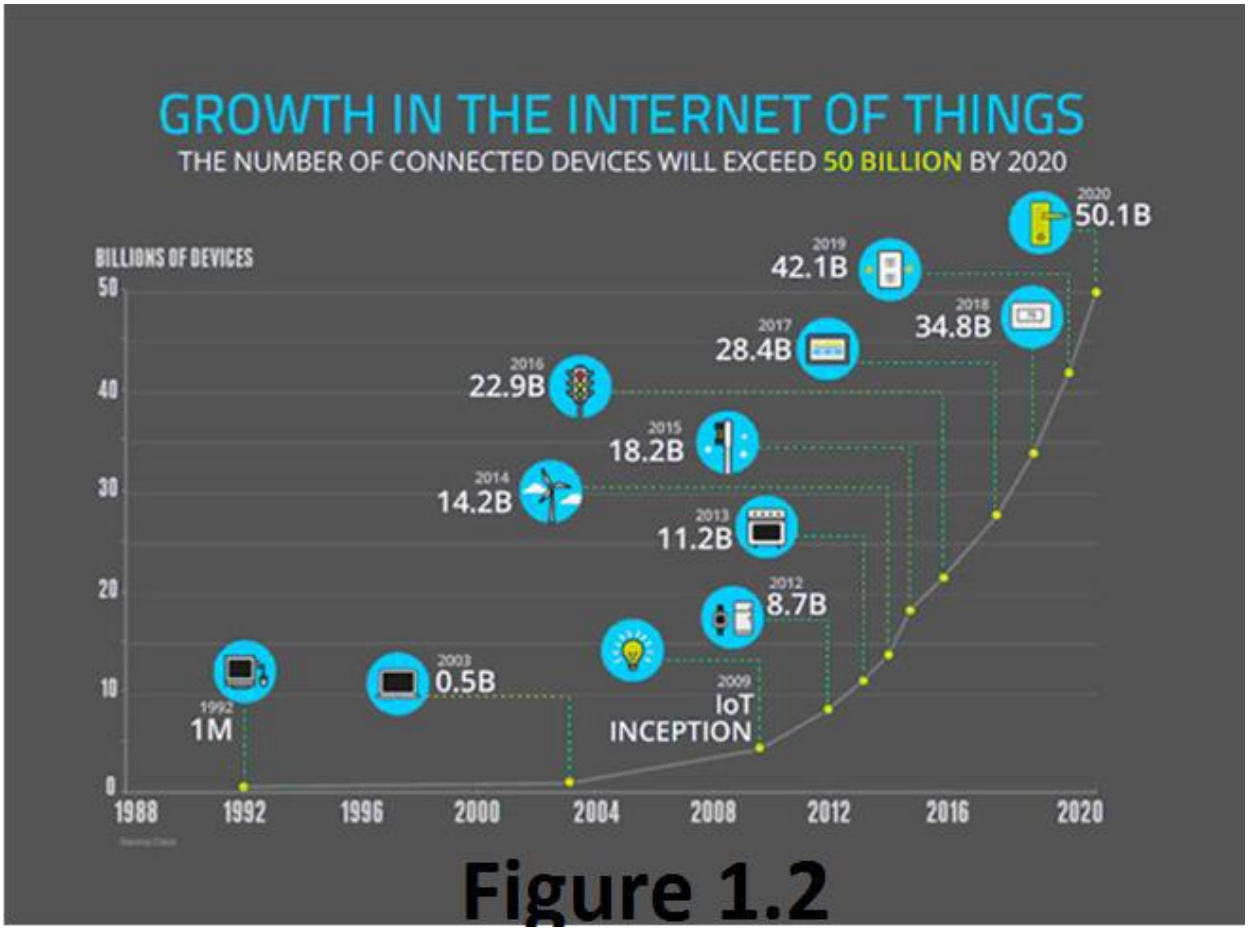

Figure 1.2

3. Techniques of Green Computing (The Cloud-Fog Model Comparison)

One of the most valued and limited resource available to the world is energy, a large amount of which is consumed to power up computers and its infrastructure. High-performance parallel and distributed computing system, including of data centers, supercomputers, clusters, real-time systems and grids not only consume large amount of power but they also require external

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systems for cooling. The growth in computing is proportional to the consumption of indispensable natural resources such as fossil fuels and oil, strengthening the danger of energy shortage. These issues have since been raised by the researchers and the possible measures are being taken.

Requirements	Cloud Computing	Fog Computing
Latency	High	Low
Delay Jitter	High	Very low
Location of Service	Within the Internet	At the edge of the local network
Distance between client and server	Multiple hops	One hope
Security	Undefined	Can be defined
Attack on data enroute	High probability	Very low probability
Location awareness	No	Yes
Geo-distribution	Centralized	Distributed
No. of server nodes	Few	Very large
Support for Mobility	Limited	Supported
Real time interactions	Supported	Supported
Type of last mile connectivity	Leased Line	Wireless

3.1.Lesser Power Consuming Hardware

Personal Computers can be designed in such a way that it uses less electricity by using a processor which consumes less power, separate graphics card should be replaced by onboard graphics, using passive cooling rather than energy consuming fans.

3.2.The Technique of Virtualization of Grid

The usage of computer software to simulate or copy the actual hardware is known as Virtualization. Many networks within data centers, server system applies virtualization in its cover with of many network physical servers and with many virtual servers that run as applications on a small number of larger computers. To users, virtual servers can be configured in such a way that they appear as physical machines on their network. To increase energy conservation, virtualization can be implemented at much lower level like in memory and server networks, this will help the building blocks to get friendly with the environments. To allow this, virtualization of memory software is available to be implemented which will reallocate memory across all the layer both physical and virtual depending upon their complexity rates. This system will allow less accessed memory or files to be stored in less efficient and low power consumption drives while more frequently memory can be stored in advanced drives.

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3.3.Better recycling and re-using of Products

Many rules and regulatory body is in place to check the work and implementations of the organizations, like the Society of Electrical and Electronics (SEE) body make specific rules that came to play in the year 2007. The WEEE Rules makes the IT producers and sellers to recycle products, and have significant implications for all IT departments while disposing any equipment.

The situation will be much better if we do not dispose the hardware and we repair it. Doing so will not only save excess products being manufactured but will also reduce the risk of environmental factors, and will be much cost effective than fully disposal of the hardware. The recent days P. Cs and the P. D. As are the most common hardware to be disposed and therefore needs to be recycled and reused.

3.4.Less Pollutant Manufacture

Are we aware of the various chemicals needed to produce a computer? Most of the harmful chemicals like Lead, P.V. Cs are used to manufacture them. By minimizing the use of such chemicals, computer manufacturers can prevent the environment to get effected by these chemicals. This might also enable more electronics waste to be safely recycled. There are several other ways of saving energy and reducing greenhouse gas,

- Delete the unwanted memory in your computer
- Often, we ignore our mail and mailbox. Remember these need space and memory, so try to keep things updated and refresh then up.
- Also, we can limit the number of receiver of the mail like not sending unwanted spams all the network which in turn creates network jam
- We can eventually minimize the size of the attachments.

4. The Quantum Fog – Cloud Computing Analysis

By seeing a detailed analysis of the total electrical consumption, we see that the power which is consumed in various data centers around the world is about 0.5% of the annual total usage. Now if we consider the cooling equipment and the temperature devices the figure will just become double, this is the main point of concern in this whole system. Now the main benefits of an algorithm would be when it could display the result in an economic friendly way and could harness the use of excess power so as to reduce the overall costs.

4.1.Quantum- Time Reduced Algorithm Topology

In this type of algorithm Topology, the conversion is done at a much lesser frequency than the primitive approach. This algorithm has a unique ability to compare the frequency of its execution with that of its core and the use various kinds of approaches to make the algorithm more efficient and reliable. Simulators like Power-Aware, which is responsible for making the runtime tasks to be executed in the core, now this is used to calculate the results and compare the reduced algorithm using a key comparison method. The result which is got from this algorithm is then

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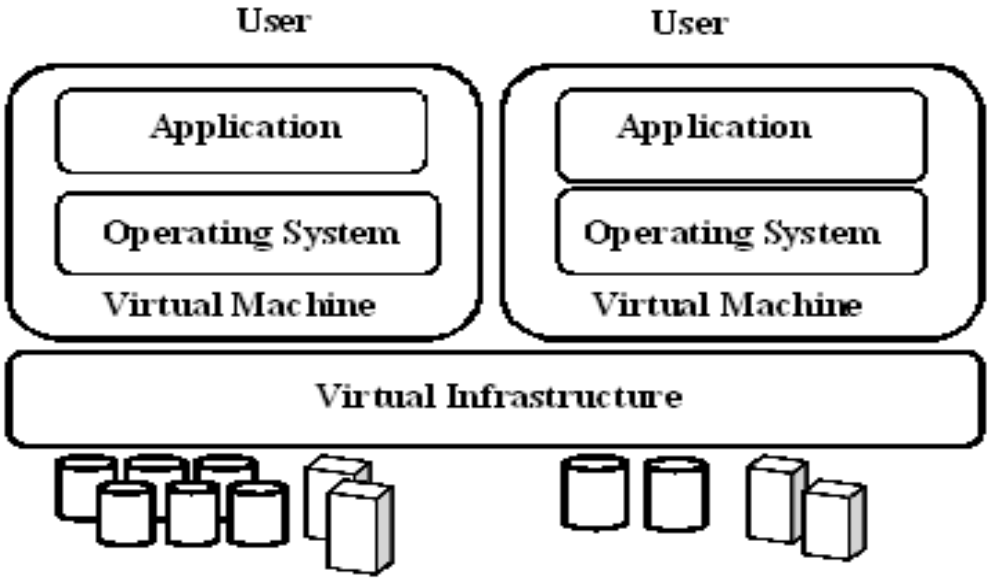
passed and checked by an Energy-Aware modulator, and is responsible for mapping the whole dynamic core results, and thus it makes the whole comparison algorithm efficient.



4.2.Quantum Discrete Overloaded EDF Topology

If we only want to consider the power ratio of the C.P.U itself then the Overloaded EDF Topology enables us to get much better benefits than its primitive counterparts and according to a detailed analysis it has very lower complexity both in space and time than its counterpart like posed protocol. When we consider the total energy of the entire architecture i.e. The C.P.U energy and the Computational energy, the other computational topologies apply the conditional procedure of speed setting optimization and reduced combinations of techniques. For the case when the CPU power and device power are comparable, this protocol gain better advantage then the primitive algorithms regarding the space and size of the code. If we consider the device power consumption to be greater than the CPU power consumption than this protocol is not applicable in that case. If the system device operates in many voltage or power ranges than the system power can me make variable or dynamic which is much more beneficial than then its static counterparts which are much less feasible. This system could change the power curve which we can get from the existing algorithms but yet we have a risk of get stable sources. We can use many variable task schedulers to reduce our headache to make the algorithm operate in an efficient way to help reduce the steps.

4.3.'Q' bit-by-bit scheme

The algorithm proposed by Hart Dog is such a protocol which generates its results by implementing bit by bit method to the chamber which needs the least power and thereby this process increases the transfer or conversation rate. This protocol can be used to cover the info rate, the algorithm needs a good number of comparison complexity and then analyses itself. As compared to a very practical misbalanced algorithm this technique has very less complexity in

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time and space. This technique implements a good number of sorting and distraction algorithm to add and subtract the integral bits one by one at a time, and therefore at the beginning itself it becomes very expensive and not at all eco-friendly. By analyzing the total overall complexity of the primitive protocol technique, we found that if we increase the number of comparisons of the sorting algorithm the complexity will increase in any case, so there will be no improvement in the long run and this problem is solved by bit-by-bit comparison. Therefore, this technique will be an efficient one to test the modern methods of computing.

4.4.Quantum - 3D Green Chips

Novel geometric integration of silicon dies has a new dimension which can be explored by Three-Dimensional (3D) integration. A range of vertical and horizontally oriented cross-die interconnection techniques are developed and has come into play. Taking the example of, silicon via of 3D-Intregated Circuits connecting multiple die or wafer layers in a single chip are giving implantation methods to reduce the length of the channel as we as to make it more efficient. Nowadays these 3D micro level chips are capable of mixing and scaling different technological systems and numerous technological advancements like in the field of transistors such as CMOS (complementary metal oxide- semiconductor transistor) logics, memory, analogue sensors, and even MEMS systems by using the fact over various kinds of numeric layers. Specifically, the overall performance of the system could be improved in a 3D architecture instead of using the conventional 2D implementations. The increase in improvement is directly proportional to the number of tiles. The account for the smaller proportion of these packets is due to the respective energy control protocols. Thus, using these 3D Green chips one can get better implementation instead of conventional 2D applications.

4.5.The Internet of Things Fog Model (Fog- Things Model)

IoT data needs to be protected on fog nodes as well as in transit from fog nodes to the cloud. To control physical access to fog nodes deployed in remote areas, such as utility field substations or alongside roadways and railways, use Cisco video surveillance an access control solutions. Protect data as it travels between fog nodes and the cloud by using Cisco cybersecurity solutions. They provide protection before, during, and after attacks. The Internet of Things (IoT) speeds up awareness and response to events. It’s transforming whole industries, including manufacturing, oil and gas, utilities, transportation, public safety, and local government.

But the IoT requires a new kind of infrastructure. The cloud by itself can’t connect and analyze data from thousands and millions of different kinds of things spread out over large areas. Capturing the power of the IoT requires a solution that can:

- Connect new kinds of things to your network. Some of them might be in harsh environments. Others might communicate using industrial protocols, not IP.
- Secure the things that produce data. And secure the data as it travels from the network edge to the cloud. This requires a combination of physical security and cybersecurity.
- Handle an unprecedented volume, variety, and velocity of data. Billions of previously unconnected devices are generating more than two exabytes of data each day. Sending all of it to the cloud for analysis and storage is not practical. Plus, in the time it takes to send data to the cloud for analysis, the opportunity to act on it might be gone.

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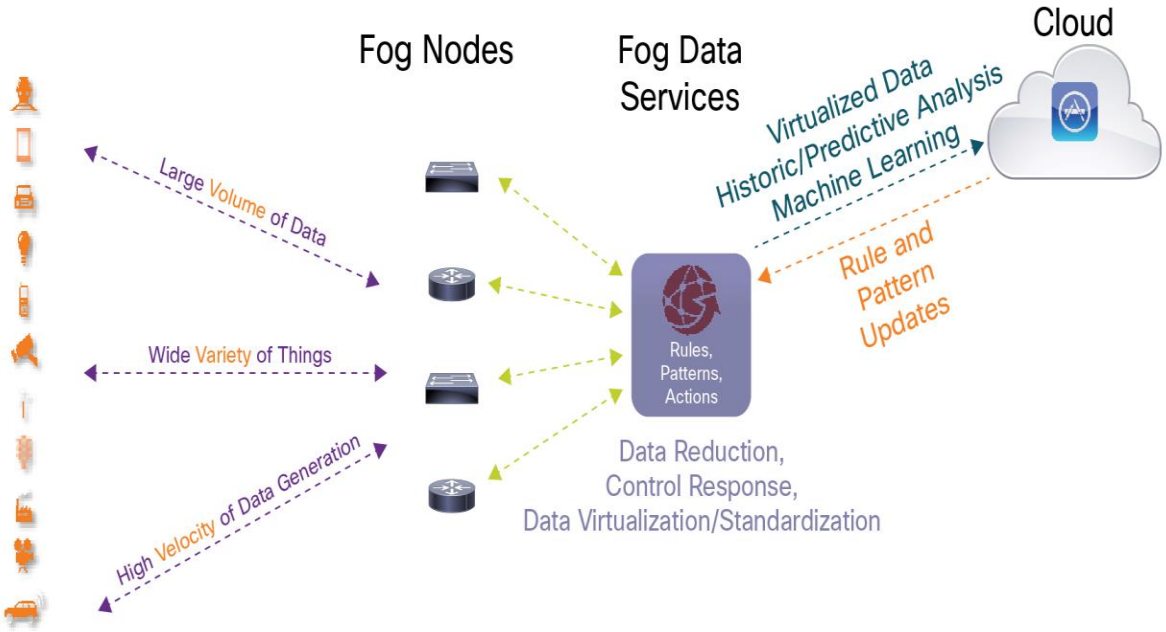
5. Application Platform

To simplify fog application development, we've replicated the familiar cloud application development model. That's software as a service (SaaS) built on PaaS and IaaS. Here's how it works:

- IaaS: Host new or existing applications on fog nodes. Use the Cisco API, which combines the host operating system and Linux. The currently works with DNA routers. Fog applications can also send IoT data to the cloud by translating non-standard and proprietary protocols to IP.
- PaaS: Develop fog applications. Our first IoT PaaS offering, called Fog-Things Model simplifies fog application development in several ways:
- Device abstraction: Fog applications need to communicate with many types of IoT devices. Creating a separate application for each vendor's temperature sensor, for example, would be impractical. Cisco DSX saves application developers this effort by providing an abstracted view of IoT devices.
- Support for multiple development environments. IoT applications that deliver machine as a service (MaaS) are typically developed in various environments and programming languages. With fog nodes, can support multiple development environments.
- Simplified management of fog applications. Managing a growing number of fog applications would also be impractical. This simplifies management and automates policy enforcement.
- SaaS: Using this model, a robot vendor, for example, can specify the functions a particular customer can use. The customer pays only for these features. The vendor can later give the customer access to additional features by making a simple software change from headquarters.



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6. Conclusions

In recent times technology is an active contributor in achieving the goals set for Green Computing. The current IT industry is doing extensive research to make the term Green Computing sustainable and efficient. Recycling of equipment's, reducing the use of paper, virtualization, cloud computing, power management, green manufacturing is the main motto of the term Green computing. The major challenges which prevail the effectiveness of green computing are tremendous and will affect the performance of the system drastically. The various combined measures of Government sector people with the Non-Government Organizations (NGOs) are to be much appreciated. The government are taking huge steps to encourage the producers to follow the standards of green computing and therefore playing a major role in the cause; use green methods to save our environment and no doubt to reduce energy consumptions as well. But all of the current research is on improvement of technologies but it will only work when these technologies can work efficiently. The future of automation and computing lie in the hands of such researches who are finding effective solutions of green computing.

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7. Future Developments

A recent study showed how Internet of Things is rapidly inflowing the technology. With the new technology comes newer security issues which should be handled in more specific manner otherwise it would lead to a drastic effect which may cost our lives. So, improvement can be done in the field of security concerns which is the major concern in the major IT industry. Newer algorithms and Complexity will help to reduce the relaxation and increase the speed of such advancement in technology.

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