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A NOVEL ADDRESSING TECHNIQUE FOR INTERNET OF THINGS WITH A REVIEW ON ITS OPERATING SYSTEMS

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***Abstract*—Internet of Things (IoT) is a technology which is drawing many researcher and industries towards it because of its features. According to the survey it is found that IoT is one of the technologies which will be major firm in research and industry market till 2025. The term IoT derives the meaning of connecting each and every object over internet and making is manageable or accessible remotely. This can be the major technical concept behind much application like smart home, remote security control, remote devices monitoring, smart healthcare system, and many internet applications. IPv4 has provided 232 IP addresses which numbers to approximately 4.3 billion. The recent development of the internet and its objects enforced to find the solution for the extinction of the IPv4. As a result the IPv6 model of IP has been gaining lot of impacts, according to the research it is assumed that the IPv6 will take complete performance by the 2025. This paper proposes a solution for the current problem in the existing IP requirement with a new IP format which will be compatible between IPv4 and IPv6. The proposed method is developed and analyzed using contiki operating system platform with a cooja simulator.**

Index Terms- Internet of Things, IPv4, IPv6, Contiki, Cooja

I. INTRODUCTION

Internet of Things (IoT) is a recent application oriented technological prototype which evolved mainly due to the trends in wireless communication technology [1]. The unique addressing methods are the one of the features of IoT which making many things to interact each other. IoT is gaining lot of impact in research and development, transportation, smart cities, smart homes, M2M, cloud computing and many as in figure-1.

Internet of Things can make any real entity recognizable, manageable and monitored by intelligence context. These types of service provided by IoT help the user to access the aggregate information which is collected by the real physical objects.

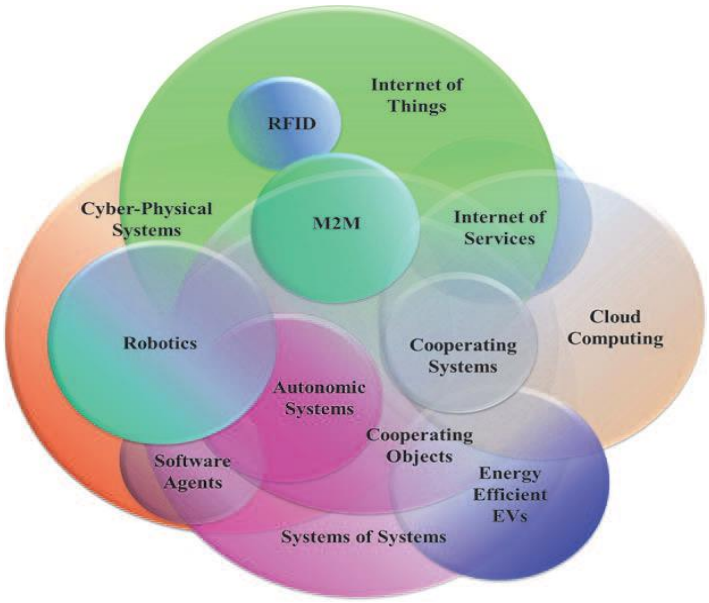

Figure-1: Impact of IoT[1]

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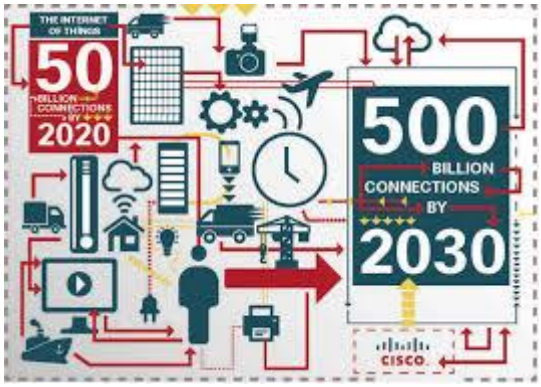

Figure-2: Impact of IoT [2]

This features and application has made IoT as the one of the Disruptive Civil Technologies according the list released by US with prospective impacts on its national power [3][4]. Apart from that IBM released an integral part of IoT concept called smart Earth in a US. Europe also recognized the action plan and need of IoT in upcoming frontier technology with raise in main technological challenge [5] [6]. A survey from cisco as in figure-2 predicts the number of connected device by 2030.

India's fast growing IT sector worldwide markets expected to reach $85 billion USD by the end of 2019, according to Gartner. Apart from this government of India is heavily investing to create a $15 billion IoT market by 2020. The goal is not only to enhance the lives of consumers but to make half of the IoT sector investment into industrial, commercial applications and machine to machine (M2M) applications. According to the Prime Minister Narendra Modi, the government envisions in developing 100 smart cities across the nation, with a public investment of more than US$150 billion during the next years [7]. Agriculture, Healthcare, manufacturing and Technology Implications are some of the major areas which is under this vision.

II. RELATED WORK

A. Addressing in IoT:

The major issue in IoT architecture is addressing and mapping due to M2M connection of wide variety of nodes. This creates a need of standard policies for addressing and mapping technique in IoT. Presently IPv4 protocol identifies the nodes by 4-byte address, this may not applicable in future with an increase in number of connected devices. As an overcome for this IPv6 protocol was proposed with a concept o 6LoWPAN for low power personal area network. To summarize only few research has been carried out in addressing and mapping of IoT with various header format for TCP/IP protocols [3][8].

B. Operating System for IoT:

IoT interconnects wide variant and range of devices including sensors, microelectronic devices which are equipped with a microcontroller, which can be accessed through internet. These wide range of devices need to have an operating system to establish M2M communications over some standards. All the devices of low resource constraints device for which there will be need of an efficient and compatible operating system. This sections brief out some of the operating system that are compatible with wide range of devices in IoT environment.[9]

Contiki Operating System [10]: An open source operating system designed for simulating wireless sensor networks protocols on network enabled sensor platform. It has many inbuilt modules to work on various platforms and with an inbuilt simulator called Cooja. This simulator is equipped with a modules various sensor motes like Sky motes, MicaZ motes, Eth motes, Trexb motes, wismote motes, ESB motes with its basic operational features. With a range of support including network feature the proposed addressing scheme is simulated using Contiki OS.

mbed Operating System [09]: this operating system is supported with a C++ framework for developing an IoT applications. It is designed for running over a resource constraints device with limited processing, storage and memory capacity. It also many options for device level security monitoring and management.

TinyOS [11]: An open source non-commercial operating special system designed for running on a resource constraints devices and compatible for IoT environment. This is widely used for wireless sensor networks with provision of having many features like, ubiquitous computing, network management.

MicroC OS [12]: A real time operating system designed for an IoT related embedded devices. It supports wide varieties of low power microcontroller devices.

RIOT [13]: One of the recent operating system developed for IoT enabled devices based on the microkernel operating system concepts. It is energy efficient and capable of having high degree of multiprogramming which make efficient utilization of microcontroller. It's a C++ framework operating system which supports modularity of programming and other features.

Brillo [14]: An operating system introduced in 2015 by Google for IoT with an idea of supporting Android platform. Similar to android operating systems this is designed to runs on low power devices like smart phone and others.

III. EXPERIMENTAL RESULTS AND SETUP

A. Proposed IP structure

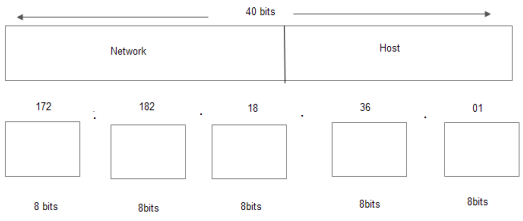

Figure-4: Proposed IP structure

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The proposed IP structure is of the 40 bit addressing as in figure- 4the more 8 bits have been added to the IPv4 structure. The 8 bits has been increased in the network part of the global addressing in order to grow the IP address in number. The IP address IPv4 was only able of assigning 4.3 billon addresses due its 32 bit address spaces. The IP address and the proposed model is compatible with the IPv4 as it is the same structure of IPv4 and the increases in its bit of the same structure make it compatible with the older addressing structure. When talking about in terms of the number of IP address the proposed model can assign up to 1094 billion global IP addresses which is the sufficient solution for the upcoming requirement of IP address.

A. Experimental setup

To carry out the experiment of the simulation of the IP address proposed model the Contiki OS is used. The Contiki OS is the virtual OS which is built to simulate and configure the IoT algorithms, it is the most efficient OS to simulate and a Cooja is the in built Tool to for simulation. The Contiki enables to simulate the low powered and memory devices.

Figure- 5 shows the Cooja platform for the simulation of the internet of thing. The Cooja platform is for the creating motes which can be used for the simulation of the internet algorithms on them.

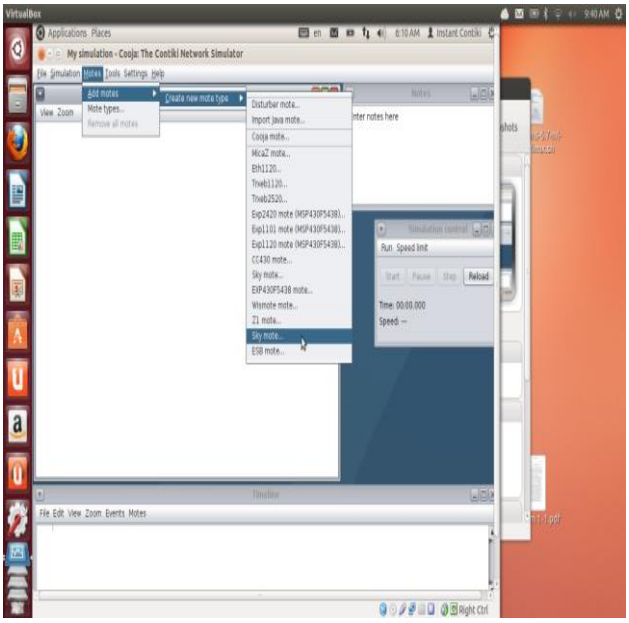

Figure-5 : New Simulation Setup

Once the process of new simulation is started now the motes to be added for the simulation. The Cooja provides the different types of motes, for the project the sky motes has been configured to be compatible with the designed algorithm for the IP's. For the selection of the motes click on the motes then the add motes and select the sky motes.

Figure-6 shows the adding the motes to the simulator sky platform for the assignment of the IP's In this process we have to select the number of the motes to be simulated the number of the motes to be added for the simulation and the position of the motes ,where the position of the motes to be random. The project is programmed for the random generation of the motes.

After the addition of the motes select the program for the compilation, after the compilation process the generated motes are assigned with the designed IP address and the out of the generated IP address are shown on the GUI and the same with features of the motes position, IP address and the mote Id are stored in the text document.

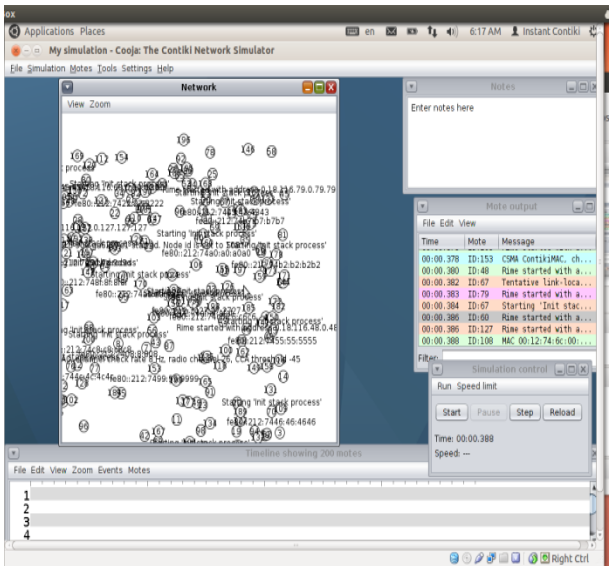

Figure-6 : Setup for increasing the nodes

IV. CONCLUSION

This research work carried out to propose a solution to IP extinct issue in the existing network architecture with new way of mapping and addressing objects in IoT. Scalability was one of the issues in networking and IoT, the proposed simulated model of the addressing structure provides 1096 billion IP addresses which is a solution for the extinct of IPv4 addressing issues and the designed to work compatibly with the IPv4 model of addressing. This can reduces the complexity of configuring the assignment of the global IP address.

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