IPv6 Addressing methods in IoT smart Environment

Kulandai Priya V*1, M. Deepika*2, M. Baby Nirmala*3

*1, *2, *3 Department of Computer Science, Holy Cross College, trichy, tamilnada,India.
*1priyamanickam77@gmail.com, *2deepika_mrs@rediffmail.com, *3babynirmala7@yahoo.co.in

Abstract— the present one of the serious research topic is Internet of things (IoT). Two or more small smart objects or
smart machines connect via Internet. The machines will convey the messages one another; this is called Internet of things. The
machines are associated with IP based (or) Non IP based
techniques. In this article discussed about the IPv6 and Internet of
tings. Proposed a IPv6 based Architecture for IoT cloud and
also provide a IPv6 addressing techniques.

Keywords—— IPv6, IoT, 6LoWPAN, Cloud Computing.

I. INTRODUCTION

In the word Internet of things getting familiar today’s word. Internets of things assume an imperative job in the field of
data Communications. Internet of things has five layer framework namely perception layer, network access layer, network layer, application layer and presentation layer [6]. Physical layer has sensors and actuators. Wireless connectivity may NFC, Bluetooth, GSM, HSPA, IEEE 802.15.4 (e.g., ZigBee), IEEE 802.11ah, 3GPP LTE-A Application layer Protocols are COAP, MQTT, AMQP, XMPP, RESTFUL and Web-sockets. IoT has its own applications like a smart home, smart health, smart grid, smart parking, smart city, industrial automation etc. internet of things services is categorised in to four main services these are identity related services, information aggregation services, collaborative services and ubiquitous services [10]. So that the IoT developments are grouping with its layer technology now we focus on it physical to networking layer technology. How the data flow from sensors to IoT cloud seamlessly using IPv6. The Current generation of Internet Protocols (IP), version4 (IPv4), has been in use for more than two decade. It has serious limitations in terms of security. Due to the limitations, the Internet Engineering Task Force(IETF) began a design and standards to develop a new generation Internet Protocol called IPv6 version 6(IPv6) emerged in 1998. IPv6 Internet is considered as the next-generation internet protocol and satisfies the requirements of large-scale WSNs due to obvious advantages in the address space, addressability, security, mobility, QoS support, etc [1] Mapping IPv6 to the IoT is facing some challenges; one of them is that most of the
identification codes are 64 bits or 96 bits, while IPv6 is 128 bits. Different and limited methods are proposed for mapping the 64 and 96 bits addresses to 128 bits.[9].

Hence this paper section I deal with introduction part: Section II presents the review of the literature. Section III presence the general Architecture IoT and also provides the addressing techniques of the IPv6 addressing mechanism. Section IV. Section V concludes the research works.

II. REVIEW OF LITERATURE

The analysts have proposed diverse structure to make the world keen with internet of things and cleared up how the IoT functions. IoT - IPv6 Addressing techniques which are recently created by the specialists are summed up underneath

Raj et al. have proposed a smart card based IoT smart parking Architecture. This is providing a better parking solution for the smart city IoT environment. Authors also have proposed secure authentication methods. Limitation of this paper authors have not deals with IPv6 techniques in sensor levels. Teemu et al. proposed the scalability of the IPv6 addressing for the nodes and networking equipments. They highlighted heterogeneity of the networking strategies in IPv6. authors have give attention on mobility implication to address in networks, address allocation solutions in IPv6 networks. Geng et al: have proposed the architecture of the interconnecting system of multi-frequency band 6LoWPAN accessing to IPv6 Internet. Chuangchusong et al. Proposes an equipped methodologies of IPv4-in-IPv6 which helps IPv6 natively and provides IPv4 connectivity by using IPv4-in-IPv6 tunneling methods to change the network IPv4 to IPv6. Murugesan et al. proposes Trust-ND to secure IPv6 address auto-configuration mechanism based on a distributed trust mechanism. Experiment result shows that this mechanism is more lightweight and uses less bandwidth while still able to fulfils the required security feature. Xiaoling et al. portrays the standard of IPv6 routing innovation and examinations the principle routing method, presents IPv6 routing table and bundle exchange innovation, neighbour revelation innovation, summed up the specialized highlights of IPv6 routing. It contrasts IPv6 and IPv4 in routing methods and examinations the execution issues in LAN, and the upside of virtual LAN dependent on IPv6, and estimates the possibility of IPv6 routing. Ziegler et al. demonstrated that IPv6 addressing capacity is largely sufficient machine-to-machine communication at the scale. Proposes the galactic and intergalactic addressing schemes proposal

III. PROPOSED WORK

The following section presents an overview of the IPv6-IoT Architecture. The IPv6 convention is utilized to correspondence between the versatile clients, and shrewd applications through IoT. Figure delineates the proposed Architecture and Its parts namely 6LoWPAN Network, Edge.
Router, integrated cloud storage and visualizing tool and mobile users. Following the architecture there are some addressing methods that are involving the IoT-IPv6 network discussed.

A. Users:

The users are the recipient or beneficiary of the IoT Systems. Users can get to the accessible applications through their versatile anyplace, they should be associated with the IoT frameworks, so that the before enlisted their subtleties and validate with incorporated IoT framework by means of picturing help like android applications or some other UI components. Enlistment should in the framework so client can did different dimensions of confirmation to get to the administrations.

B. IoT Cloud Data Storing and Data visualization:

The IoT cloud data storing and data visualizing, the data from the nodes through IPv6 internet. IoT cloud maintains a secure database to store all information’s. Core switch controls both storing and service controlling. Cloud storage is useful for the IoT users. To get access the information’s anywhere, anyplace, anytime.

C. LoWPAN Networks Sensor Nodes:

The IoT is furnished with sensor nodes which can be detecting the data from the environment. All the nodes are called constrain nodes, constrain nodes are set with IP Addresses with the help of 6LoWPAN. IP based addressing to individual low power devices, 6LowPan promises to bring more devices to the internet. The 6LoWPAN innovation endeavours to take care of the great IOT issue. Low Power gadgets with constrained handling power should be a piece of the internet of things. Utilizing 6LowPAN, the littlest of the IOT gadgets would now be able to be a piece of the system and can converse with the outside world.

D. Edge Routers:

One of the networking devices is edge router that forwards data packets between two networks (IPv6 and 6LoWPAN).

IV. IPv6 Addressing

Development of the IPv6 there are some important techniques to improve the existing techniques from exhausted IPv4. Routing and addressing techniques, Multi-protocol techniques, Enhanced security architecture we provide the IPv6 addressing techniques.

The Internet Protocol version 6 has 128 bit address space that would provide us 128 bit possible address.

1) IPv6 Address Syntax: IPv6 128 bit address can be represented in binary formate.

```
00100000000000000000000000101010000000111
1100000000000011100000111000000000000000000000100000000000000000000000000000000
```

These formats going to divided along 16-bit boundaries in the following ways.

```
00100000000000000000000000101010000000111
1100000000000011100000111000000000000000000000100000000000000000000000000000000
```

Each of the 16 bit blocks are converted into 4 blocks 4 digits and represents the hexadecimal numbers and delaminated by using colons. 2001:DB8:0:2F3G:2AA:FF:FE:FE28:9C5A.

2) Global Addressing: the three initial digits 001 among the 128 bits identify the types as global addressing. It has combination of global Routing prefix, subnet ID and interface ID, the packet will be deliver to destination.

```
001 Global Routing Prefix Subnet ID Interface ID
```

3) Local Addresses: it has link, site and unique local address techniques. The address scope of link–local address is a single link. This method pockets format starts with FE80:/64 prefix.

```
1111 0010 00 00...000 Interface ID
```

Figure 1. IoT General Architecture

Figure 2. IPv6 Global Addressing:

Figure 3. IPv6 Link Local Addressing:

IJSRCSAMS
Volume 7, Issue 5 (September 2018) www.ijsrcsams.com
TABLE 1: IoT IPV6 AND IoT IPV6 ADDRES SING

<table>
<thead>
<tr>
<th>Addressing methods IoT IPv6 version 4</th>
<th>Addressing methods IoT IPv6 version 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addressing Internet Address Classes</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Multicast Addressing (224::0/0/0/0/0)</td>
<td>IPv6 multicast addressing (FF00::/8)</td>
</tr>
<tr>
<td>Broadcast Addressing</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Unspecified Addresses as 0.0.0.0</td>
<td>Unspecified Addresses as : 1</td>
</tr>
<tr>
<td>Loopback address as 127::0.0.1</td>
<td>Loopback address as 1</td>
</tr>
<tr>
<td>Public IP Addresses</td>
<td>Global Addresses</td>
</tr>
<tr>
<td>Private IP Addresses</td>
<td>Site local addresses (FEW:://16)</td>
</tr>
<tr>
<td>APIPA Addresses (169.254.0.0/16)</td>
<td>Link-Local Addresses (FE80:://64)</td>
</tr>
<tr>
<td>Syntax: Dotted decimal notations</td>
<td>Colon hexadecimal notations</td>
</tr>
<tr>
<td>Mask: Dotted decimal or prefix length</td>
<td>Prefix Length notation only</td>
</tr>
<tr>
<td>DNS forward: AResource Recds</td>
<td>AAAResource records</td>
</tr>
<tr>
<td>DNS reverse: INADDR AREA domain</td>
<td>IPv6 ARA domain</td>
</tr>
</tbody>
</table>

Table 1 gives the different Addressing conditions both IoT IPv4 and IPv6 methods.

The address scope of link-local address is a single link. The format of the packet starts with FE80:://10 prefix this is mainly used for intranet purposes that are not connected to the IPv6 internet.

![Fig. 4 Site Local Addresses](image)

4) **Multi cast Addressing**: a multicast addressing has the fields flag, scope, and 80 bits fields and 32 bits of the a group Id field.

To identify all IoT nodes for the node-local and link-local scopes, FF01::1 (node-local scop all —nodes address).

To identify the routers for the node-local, link-local, and site local scopes.

FF01::2(node-local scope all-routers address)

FF02::2(link-local scope all-routers address)

FF05::2(site-local scope all-routers address)

![Fig. 5 IPv6 Multicast Addressing](image)

V. CONCLUSIONS

An innovative IoT technology rapidly growing, tiny node sends and receives millions of data through IPv6 internet technology. In this article by analyzing the architecture and addressing details of IPv6, many features revealed to prove it contribution for IoT. IPv6 gets the data from the tiny devices with the help of 6LoWPAN networks via edge router. In this paper we provide IPv6 addressing mechanism a general IoT Low end Architecture and also its components. Future work will be 6LoWPAN and IPv6 security methods to provide better and enhanced Routing techniques like QoS and Energy efficiency methods.

REFERENCES


