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Evaluation of IPV6 and MOFI IOT

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Abstract— One of the internet's new revolution is Internet of Things (IOT) due to this objects themselves can recognize one another, get intelligence, transfer information to each other about their own and their ability to access the information that has been combined by other things.. The basic design of the IPV6 was that only end devices are the one with high intelligence and network is used for delivery of packets simply. In present Internet it is observed that inefficiency is created in Internet Protocol (IP) networking due to the location based packet delivery. The inefficiency comes in the environment when more objects or devices are mobile and there is chance of existence of multiple copies. Device-to-Device networking in non-stationary communication, identification of device should not be done by its location but identifier (ID) is used. Thing should be identified by its identifier (ID) rather than its location. In addition, the ID should provide compatibility with existing device IDs. The Identifier ID and existing device IDs must be compatible with one another. This article describes the limitations of IPV4 and IPv6. The limitations need to be fulfilled by Mobile Oriented Future Internet (MOFI) IoT.

Keywords— IoT, Thing ID, ID-based, Internetworking, framework

I. Internet of Things

One of the internet's new revolution is Internet of Things (IoT) Due to this objects themselves can recognize one another, get intelligence, transfer information to each other about their own and their ability to access the information that has been combined by other things. The internet of things (IoT) is the network of physical objects or devices such as vehicles, buildings or embedded systems with sensors, electronics, software, sensors, and network connectivity which allows the exchange and collection of data. People and things can be connected at any instant of time, any location, with anything and anyone, more broadly they can use any type of service in the network, following any route or path in the network. The Internet of Things opens up a modern world of connected and intelligent devices that can work together to offer virtually unlimited capabilities. Most of the new capabilities will be personalized by using this technology. The ability to customize product services to customers and individuals provides much value to the IoT.

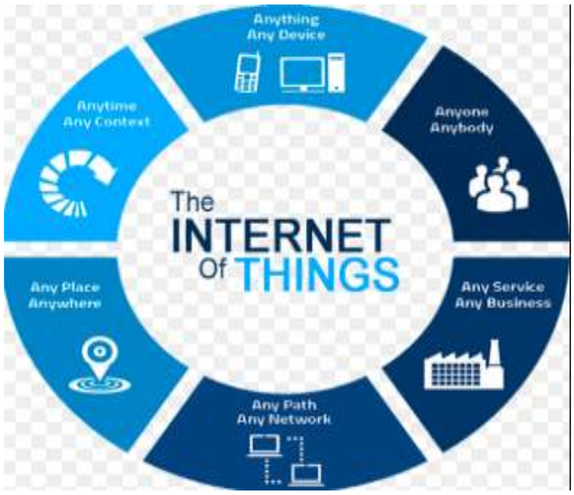

Figure 1. Internet of things

II. Applications of IOT

The primary use internet of things (IoT) is the network of physical objects in billions and provides connectivity and sharing of data. The physical devices or objects are automobiles, mobile nodes and other smart items which needs connectivity to the global world. The buildings and other objects made with sensors that are hardware based, software, electronics and the network that connect the objects to aggregate all the data and transfer this data to one another, then this type of network is the internet of things (IoT). This provides integral role in mathematical calculations in computer science, exchange of data in computers network and telecommunication networks and physical processes. Multiple connected computers in the network first they monitor and then they control the physical processes. The physical processes use feedback loops in which computations are affected by physical processes and vice versa. IoT is widely used in transportation based on intelligence, smart cities, smart grids and smart homes. Its computing system which is embedded, uniquely identify each thing, but there is need of interoperation in the internet in the pre-existing infrastructure. The experts in the field of IoT estimates there will be approximately 50 billion things or objects in the 2020. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020.

Figure 2. Applications of IoT

III. INTERNET PROTOCOL (IP)

IP is generally observed the most suitable technology, the reason that it was modelled to achieve the same target in previous different environments in computer networks. It is an issue of concern that success stories of IP are from few years and now the use is almost in the all existing link layers that are LTE, WiFi and Ethernet etc. The All-IP network name is used for this purpose.

IV. IPV4 AND IPV6

When the internetworking frame considered IP networking as the solution, then IPV4 cannot be the solution, the reason is that IPV4 address are almost fully used. The solution for the IoT internetworking is IPv6, has the address pool of 10^{38} addresses which may be enough to support the load of IoT devices in number of addresses. The expected number of IoT devices will be approximately equal to $5x10^{10}$ in 2020.

IPV4	IPV6
Source & Destination addresses are 32 bits	Source and Destination Addresses are 128 bits
IPsec support is optional	IPsec support is required.
No identification of packet flow for QoS handling by routers is present within the IPV4 header	Packet flow identification for QoS handling by routers is included in the IPV6 header using the flow label field.
Fragmentation is done by both routers and the sending host.	Fragmentation is not done by routers, only by the sending host.
Header includes a checksum.	Header does not include a checksum.
Header includes options	All optional data is moved to IPV6 extension headers.

Figure 3. IPV4 and IPV6 Comparison

V. CHARTERTISTICS OF IOT

IOT has some heterogeneous characteristics from the present Internet environment, in case of long term or future oriented goals. The device facing the most frequent problems in term of limitation in case of processing, memory and power. Unreliability of links in thing based networks and the bandwidth limitations are mostly observed in wireless personal area networks. The problem is to run a large network and to provide stability in the network. Hundreds of millions of objects or devices are always in chance they are mobile or moving from one place to another. In the IPV6 original design this environment was not considered.

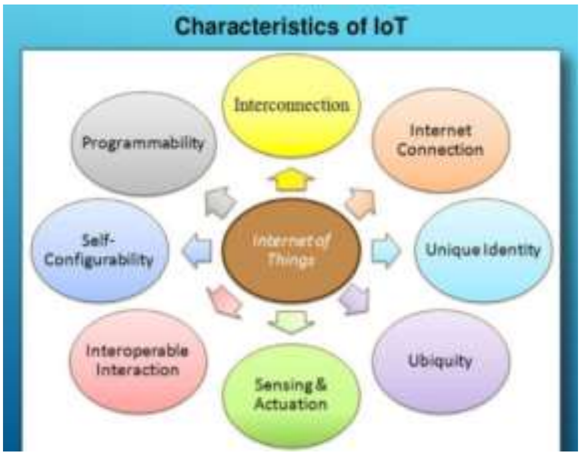

Figure 4. Characteristics of IoT

VI. LIMITATIONS OF IPV6

The basic design of the IPV6 was that only end devices are the one with high intelligence and network is used for delivery of packets simply. In present Internet it is observed that inefficiency is created in IP networking due to the location based packet delivery. The inefficiency comes in the environment when more objects or devices are mobile and there is chance of existence of multiple copies.

VII. IOT ENVIRNMENT NEEDS

Device-to-Device networking in non-stationary communication, identification of device should not be done by its location but identifier (ID) is used. Thing should be identified by its identifier (ID) rather than its location. In addition, the ID should provide compatibility with existing device IDs. The ID and existing device IDs must be compatible with one another. Such mechanism can be used which provides scalability to framework of IoT internetworking. The internetworking framework of IoT should the support the devices which are limited in terms of networking, power, storage and processing. The framework should provide efficiency in case changing topologies, difficult environments and large scale networks. Enhance the reuse of preexisting utilization of the infrastructure of network that is IPV4 type core network.

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VIII. MOFI

The name system for MOFI assumes two stages. The present stage uses host-centric and the next stage uses object centric. To get high scalability the distributed architecture, the name space includes object category, domain name, local name and parameters. Functions such as locator separation, software-centric, in-network, identifier and network model etc. encouraged from MOFI, can be employed and achieved by Software Define Network. Monitoring federated infrastructures, MOFI ontology semantically within which the model is then implemented, is driven by a practical need and requirements of a solution deployed in a large scale federation. MOFI has been uniquely designed for the consideration in evalvability as well as mobility and innovation perspectives.

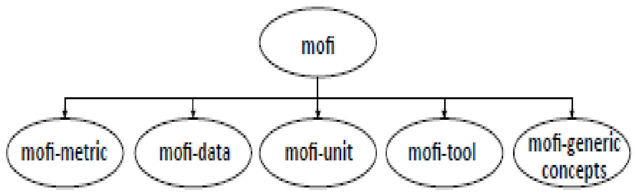

Figure 5. MOFI Ontology

IX. MOFI IOT

The solution that fulfills the requirements and the framework is known as Mobile Oriented Future Internet (MOFI), is based on architecture called Future Internet Architecture. The technology that has brought the revolution in field of networking technology, MOFI in which the dominant are mobile hosts in mobile environment. MOFI basically follows ID dependent networking and supports autonomy in every domain because of this it can be utilized as valuable base for modelling IOT internetworking frame. MOFI will not be assumed as the IOT environment, the efficiently revised version based on frame work is known as MOFI-IOT.

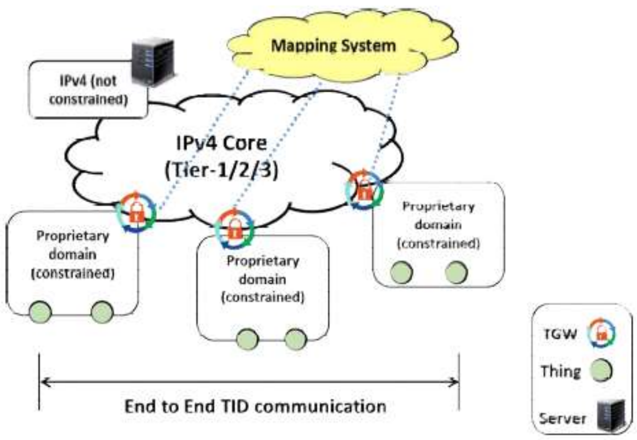

Figure 6. MOFI IOT Structure

X. IPV6 VS MOFI IOT

IPV6 address depends on location while MOFI IOT does not dependent on location. Both uses End-to-End ID and traffic control. MOFI IOT uses End-to-End ID only and special purpose traffic is used. IPV6 required evolution to IPV6, the other one do not require any revolution. IPV6 mobility support is redirection while MOFI-IOT mobility support is best in circumstances after knowing the location to changing mapping system. The route scalability is fixed based on aggregation, the other depend on domain specific and domain Gate Way (GW) IPV4 address. Domain specific is used for intra-domaining while domain GW IPV4 address is used for inter-domaining. Thing ID for the purpose of Identification not uses by IPV6 but use by MOFI-IOT. IPV6 may not uses scalability while MOFI-IOT uses scalability. Support of constrained things or devices, IPV6 is inefficient and MOFI-IOT is efficient. The reason is the first one is end to end while the other is device or thing assisted based on GW. IPV6 uses end to end traffic control which is inefficient while MOFI-IOT uses domain specific traffic control which is efficient. Require IPV6 evolution in thing networks and core in case of IPV6 while MOFI-IOT uses proprietary thing networks and IPV4 core.

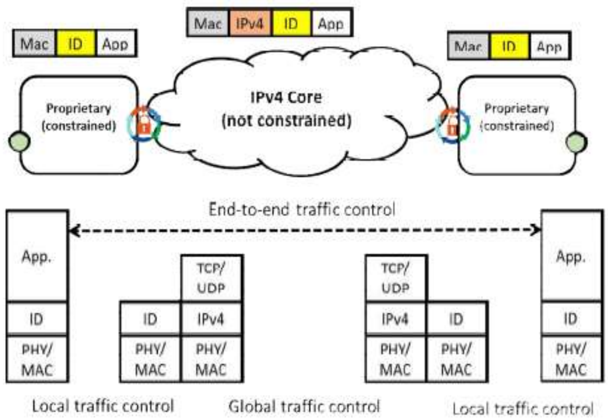

Figure 7. MOFI IOT Protocol Stack

CONCLUSION

IPV6 framework is one of the best technologies of this era. However there are some limitations in IPV6 framework. In this paper we have discussed the limitations of IPV6 in IOT based environment, evaluation of IPV6 and MOFI-IOT, and how MOFI-IOT has overcome the limitations of IPV6 to make the framework more efficient.

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