SNS COLLEGE OF ENGINEERING

An Autonomous Institution

Coimbatore-107

19IT503-INTERNET OF THINGS

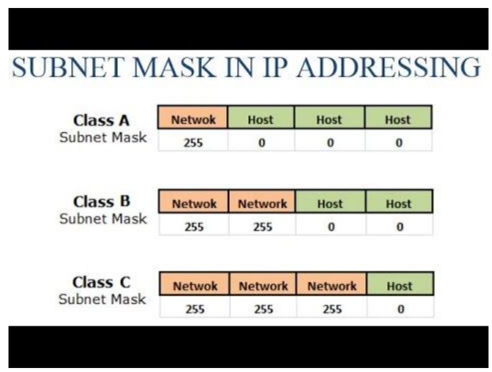
UNIT-1 IoT INTRODUCTION AND APPLICATIONS

Topic:3-Role of IPV6

IPV4-Basics

A home network example:

- **192.168.1.**3 - an host IP address
- **192.168.1**.0 - network address
- **192.168.1**.255 - broadcast address
- **Subnet mask** - 255.255.255.0. or ffffff00



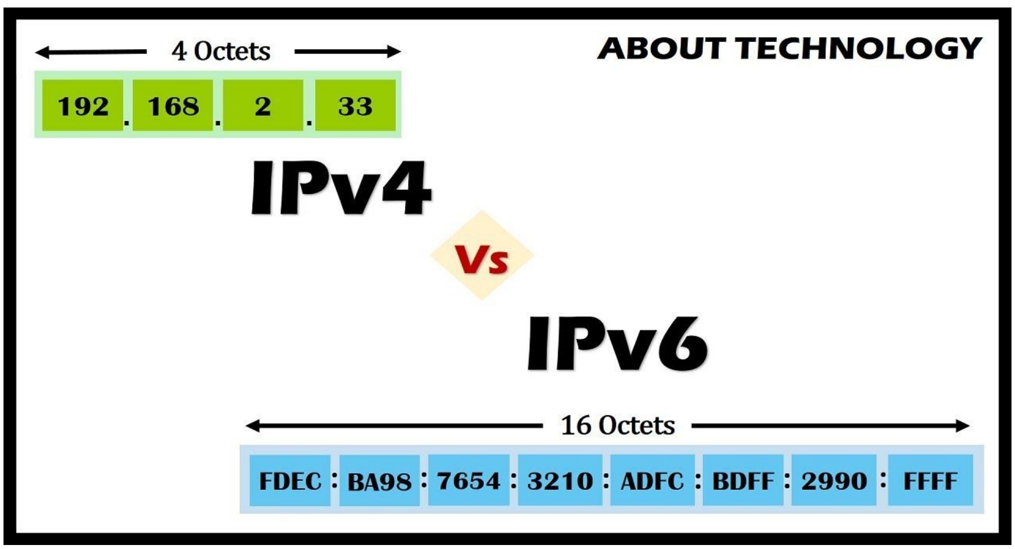
IPV4-Basics

Type of IP address Classes

Class	1st Octet Decimal Range	Network/Host portion (N=Network, H=Host)	Default Subnet Mask	Hosts per Network (Usable Addresses)	No. of Networks 2n
A	1 – 126	N.H.H.H	255.0.0.0	16,777,214 (2^{24} – 2)	28 = 256
B	128 – 191	N.N.H.H	255.255.0.0	65,534 (2^{16} – 2)	216 = 65,536
C	192 – 223	N.N.N.H	255.255.255.0	254 (2^{8} – 2)	224 = 16,777,216
D	224 – 239	Reserved for Multicasting			
E	240 – 254	Experimental; used for research			

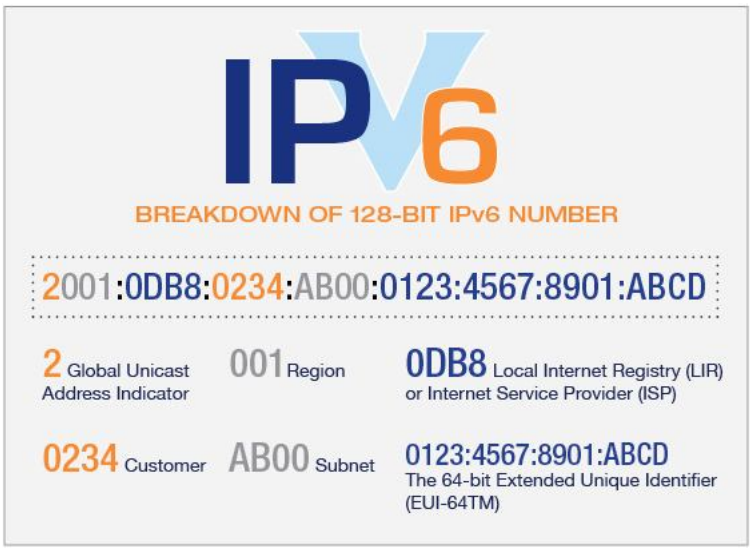
No of Subnets = 2^n, (n = Number of borrowed bits from host)
No of Hosts per Subnet = (2^h - 2), (h = Number of Host bits)

IPV4 and IPV6 Representation



IPV6-Introduction

- IPV6 Introduction



IPV6-Role

- **Internet Protocol version 6 (IPv6)** is the most recent version of the Internet Protocol (IP), the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet.

IPv6 provides:

- Abundant address spaces
- Globally unique object (thing) identification **(object ID (OID))**

IPV6-Role

- Connectivity can be provided in a standardized manner without additional status or address (re) processing
- Its intrinsic advantage over IPv4 or other schemes.
- For all end-point network locations and/or intermediary-point network locations to have a durable **unique network address (NAdr)**

IPV6-Role

- Some objects that have enough intelligence to (run a communication protocol stack so that they can) communicate are placed on a network, these objects can be tagged with an NAdr.
- If object is moving then OID from the NAdr and thus assign a general (OID, NAdr) tuple where the OID is completely invariant.

IPV6-Role

- For a stationary object, nonvariable, or mostly static environment, one could opt, to assign the OID to be identical to the NAdr where the object is expected to attach to the network.
- The object inherits the tuple (Nadr', Nadr').

IPV4 vs IPV6

- In IPv4 world, the 32-bit address space provides only $2^{32} \sim 10^{10}$ NAdr location can be identified uniquely.
- IPv6 offers a much larger 2^{128} space; hence, the number of available unique node addressees is $2^{128} \sim 10^{39}$.
- IPv6 has more than 340 undecillion (340,282,366,920,938,463,463,374,607,431,768,211,456) addresses, grouped into blocks of 18 quintillion addresses.

IPV4 vs IPV6

- Already today many tags operate with a 128-bit OID field that allows $2^{128} \sim 10^{39}$ ($\approx 3.4 \times 10^{38}$) unique identifiers, but the tuple (OID, NAdr = OID) could not be defined uniquely in the IPv4 world.

Advantages of IPV6

Scalability and expanded addressing capabilities:

- IPv6 has 128-bit addresses versus 32-bit IPv4 addresses. With IPv4, the theoretical number of available IP addresses is $2^{32} \sim 10^{10}$. IPv6 offers a much larger 2^{128} space. Hence, the number of available unique node addressees is $2^{128} \sim 10^{39}$.

Advantages of IPV6

Plug-and-play:

- IPv6 includes a “plug-and-play” mechanism that facilitates the connection of equipment to the network. The requisite configuration is automatic; it is a serverless mechanism.

Security:

- IPv6 includes and requires security in its specifications such as payload encryption and authentication of the source of the communication. End-to-end security, with built-in strong IP-layer encryption and authentication (embedded security support with mandatory IP security (IPsec) implementation), is supported.

Advantages of IPV6

Mobility:

- IPv6 includes an efficient and robust mobility mechanism namely an enhanced support for mobile IP, specifically, the set of mobile IPv6 (MIPv6) protocols, including the base protocol defined in RFC 3775.

IPV6 Role

- IPv6 mobility, specifically MIPv6, relies on IPv6 capabilities.
- In order to continue communication in spite of its movement, an MN (mobile nodes) could change its IP address each time it moves to a new link, but the MN would then not be able to maintain transport and higher-layer connections when it changes location.

IPV6 Role-Areas of Development and Standardization

- Despite significant technological advances in many subtending disciplines, difficulties associated with the evaluation of IoT solutions under realistic conditions in real world experimental deployments still hamper their maturation and significant rollout.
- IoT have to work with limited standardization, there are capability mismatches between different devices; also, there are mismatches between communication and processing bandwidth.

IPV6 Role-Areas of Development and Standardization

- While IoT systems can utilize existing Internet protocols, in a number of cases the power-, processing-, and capabilities-constrained IoT environments can benefit from additional protocols that help optimize the communications and lower the computational requirements.

IPV6 Role-Areas of Development and Standardization

The four "pillars" supporting or defining the IoT:

(i) M2M/MTC as the "Internet of devices";

(ii) RFID as the "Internet of objects";

(iii) WSN as the "Internet of transducers"

(iv) Supervisory Control And Data Acquisition (SCADA) as the "Internet of controllers"

IPV6 Role-Areas of Development and Standardization

- **Some areas of active research include but are not limited to the following:**
- Standardization at all layers/domains
- Architectures and middlewares for IoT integration
- Protocols for smart things: end-to-end/M2M protocols and standardization
- Mobility management
- Cloud computing and things internetworking

Conti…

- Lightweight implementations of cryptographic stacks
- End-to-end security capabilities for the things
- Bootstrapping techniques
- Routing protocols for the IoT
- Global connectivity

Thank you