

Internet address architecture

Lecture 3

Introduction

- Every device connected to Internet has at least 1 IP address
- IPv4 addr
 - 32 bits → dotted decimal notation
- IPv6 addr
 - 128 bits → colon hexadecimal notation
 - Block = 4 hexadecimals

IPv6 addresses

- Leading zeros can be omitted in a block
- All 0's in a block → ::
 - Can be used only once in an IPv6 addr
- IPv4-mapped IPv6 addr → ::ffff:a.b.c.d

Classful addressing

- Class (A, B, C, D, E) determines allocation size
 - A, B, C unicast
 - D multicast
 - E reserved

- Now → classless addressing

Subnetting

- IPv4 address = network + host
- Subnetting splits host → subnet + host
- Simplifies routing tables in a network
- Subnet mask tells |subnet|

Broadcast addresses

- Broadcast target is marked by all 1's
- Limited
- Directed
 - Policy dictates if directed broadcast is forwarded

IPv6 address structure

- Scope
 - Node local, link local, global
- Link-local
 - Prefix (64b) + interface ID (64b)
- IID → usually modified EUI-64

Modified EUI-64

- EUI-48
 - First 24b → Organizationally unique identifier (OUI)
 - Last 2 bits of the first byte of OUI
 - U : 1=locally administered
 - G : 1=multicast
- Modified EUI-64 = OUI + 0xFFFE + 3B
 - “modified” → u bit inverted

CIDR & aggregation

- CIDR notation
- Routing table size reduction
 - Fig. 2-8

Special-use addresses

- IPv4 → Tab. 2-7
 - Private → one in each class
 - Loopback
 - Test
 - Reserved
 - Multicast
 - Broadcast
 - Unspecified

Special-use addresses

- IPv6 → Tab. 2-8
 - Default route
 - Unspecified
 - Loopback
 - V4→v6 transition related
 - Test and documentation
 - Link local
 - multicast

Multicast addresses

- Tab. 2-9
 - SSM vs. ASM
 - GLOP (233) → 16 b ASN
 - UBM (234)
 - Administrative scope → analogous to private unicast addr

IPv6 multicast addresses

- No "broadcast" in IPv6
- Reserved block → ff00::/8
 - ff02 → link local multicast
 - ff0e → global multicast
- P=1 (ff3)
 - UBM (IPv6) or
 - Link scoped → IID used
 - T=1
- R=1 (ff7)

Anycast

- Closest
- DNS, RP, 6to4 servers

Allocation

- IANA, top of the hierarchy
- RIR
- Provider aggregatable vs. provider independent (PI)

Assignment

- IPv4 → Global + loopback + all hosts multicast
- IPv6 → global + loopback + all nodes multicast