

Address Space Utilization

Kameswari Chebrolu

Specific Scenario -- 2

- An organization has a physical network with 4000 hosts
- Current Solution: Give a class B address
 - Efficiency: $4000/2^{16} = \underline{6\%}$ ←
- How about assigning multiple class C addresses?
16 → 2^8 hosts
- Problem: 16 entries for same organization in the routing table

Solution--2

- Assign multiple contiguous class C addresses & aggregate
- 222.7.16.* through 222.7.31.*, top 20 bits in this range are the same (0001 bits, 20-bit network number)
- Advertise 222.7.16/20 as the organization's network address
- Goes by the name supernetting

Conclusions

- Subnetting: One class address shared among many physical networks
- Supernetting: Multiple class addresses shared among one physical network (Autonomous system -- AS) *→ organization*
- Network portion can take on any length

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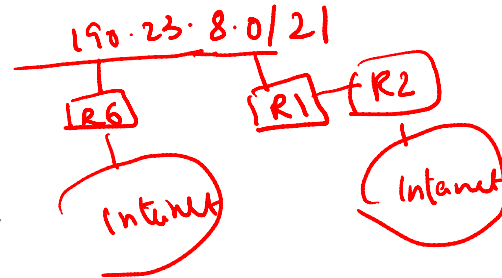
2 to (32)

Classless Interdomain Routing (CIDR)

- Use a new notation to represent network numbers (also called IP prefixes)
- Address block represented as A/X, where A is the address prefix and X is the prefix length
 - X can range from 2 till 32
 - X is represented as a network mask as well /21
255.255.248.0
- E.g. 222.7.16/20 (Mask 255.255.240.0) represents addresses in the range (222.7.16.0 to 222.7.31.255)
entry → internal

Longest Prefix Match

- Routers do a prefix match.
 - Does destination address fall in the range of addresses captured by prefix?
- Prefix match works if Internet topology is a tree
 - Shortest path between networks is unique
- Internet is a graph
 - Many networks multi-home
 - Many matching prefixes



Example

- Two prefixes in a forwarding table 190.23.8.0/21 and 190.23.0.0/16
 ↑ R6
 → R2
 – Address 190.23.8.1 matches both
- Go with the longest prefix match (e.g. 190.23.8.0/21)
- Challenge: Longest match between destination IP address and variable length prefixes in forwarding table
 - Lot of research in this space

Summary

- Class based addressing was found not to be scalable
- Subnetting: Share a single class address among multiple networks
- Supernetting: Share multiple class addresses on a single network
- Lead to CIDR (classless addressing) and Longest prefix match --- widely used now