CMSC417 Spring 2016 Lecture #10 3/2/2016

Agenda!

⇒ Sample Exams Posted
⇒ Exam on Monday

⇒ Subnetting cont'd
⇒ ARP
⇒ CIDR

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Subnetting Cont'd

host sends a packet

```
if ( subnet_mask & dest_ip_add == subnet & subnet_mask)
        // they are in our subnet
        // deliver locally (ARP)
else
        // they are somewhere else
        // use routing table, usually default route
```

router handling a packet

routing table contains entries that can have (subnet, mask) → next hop in addition to network → next hop

networks are a special case with mask implicity defined by the class

```
if ( dest_ip_addr & subnet_mask == subnet & subnet_mask)
    // use this entry, deliver to next hop
```

What happens if you have multiple matching entries? what does it mean? should it be possible?

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ARP (Address Resolution Protocol)

Convergence layer: glues L3 (IP) to L2 (Ethernet)

Problem

⇒ router gets a packet for IP X
⇒ IP X is locally attached
⇒ how do I send it to the host with IP X?

Solutions

⇒ Just flood? works, but inefficient
⇒ ARP - ask who has it

ARP

⇒ broadcast/flood "who has IP X"
⇒ unicast/respond "I, MAC Y, have IP X"

⇒ why is this better than flooding above given that it floods the request?

gratuitous ARP

⇒ send ARP replies (I have ...) without a request being made — usually to the broadcast addr
  - hosts do it on boot so everyone knows where they are. Why not just wait?

Proxy ARP and ARP spoofing

⇒ somebody other than the owner of IP X can respond
  - either with the "right" (proxy) or "wrong" (spoofing) answer
⇒ Good: scale ARP better; bridge two networks
⇒ Bad: attacks, stealing traffic, etc.

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CIDR | Classless Inter-Domain Routing

⇒ problem with classful routing
- everyone has > 256 hosts
- nobody needs > 65K hosts
- thus everyone wants class B addresses and they run out

⇒ How can we reallocate class A and C space to make more class Bs

⇒ short version is to move from the division between net/host addr being static based on the first 3 bits to it being dynamic and passed with routing information

8.x.x.x ⇒ 8/8
192.168.1.x ⇒ 192.168.1/16

<address>/<# of bits in net addr>

⇒ also called supernetting

Different from subnetting

⇒ prefix-based instead of mask-based
192.168.1.0/24 instead of 192.168.1.0/255.255.255.0
what does this mean?

⇒ subnetting can only break up a class and only if all subnets are physically co-located
- CIDR can aggregate adjacent classes
- since routing sends the # bits, broken up classes can be in separate locations

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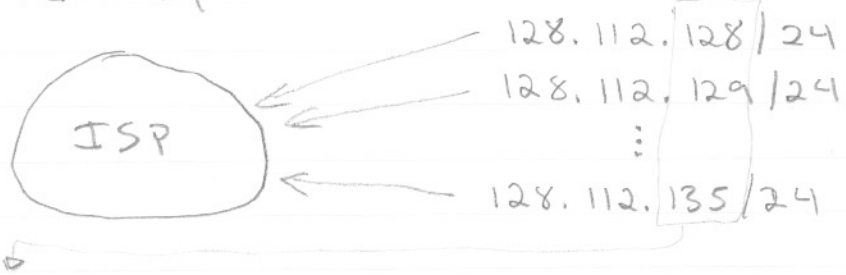
Aggregation

⇒ CIDR allowed aggregation of adjacent addresses into a prefix to use as a network ID

⇒ the same can be done at routers for routing table entries with the same next hop to save space

⇒ also in routing advertisements w/o needing the same next hop



3rd byte

128	1000 0000
129	1000 0001
⋮	
135	1000 0111

5 bits same

we know how to reach all IPs with the given first 16+5 bits ⇒ 128.112.128/19

advertise a single route to 128.112.128/19 instead of 8 routes

Multiple matches in CIDR

⇒ 179.69/16 and 179.69.10/24 both in RT

⇒ use longest-prefix (most-specific) match

- 179.69.10/24 in this case