Proxy arp

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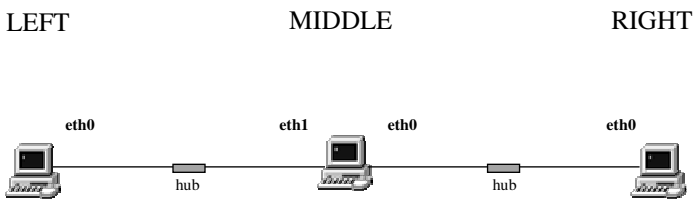
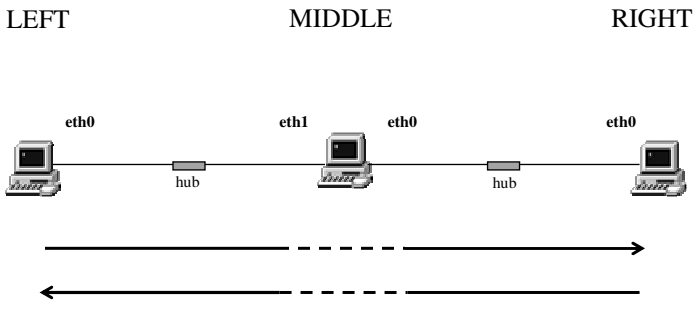
Given this setup…



… we want LEFT to ping RIGHT and get a reply



2 common techniques

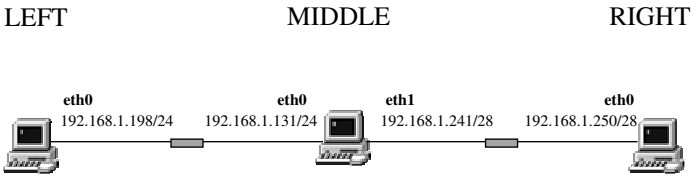
- routing
- bridging

  separate discussion!

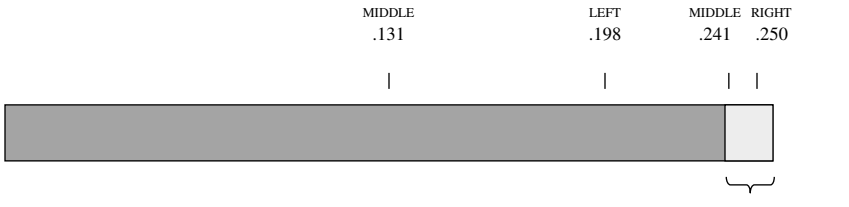
… and a more "non-standard" method

- proxy ARP

Proxied host – addressing



Significance of the addressing
(embedding)



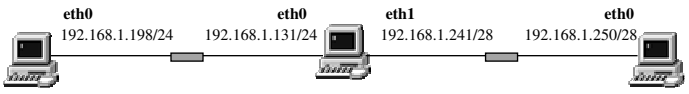
Embedded subset –192.168.1.240/28
(ie, 255.255.255.240, size 16 from 240 thru 255)

Overall Network – 192.168.1.0/24 (ie, 255.255.255.0, size 256 from 0 thru 255)

Proxied host – effect

MIDDLE proxying for RIGHT

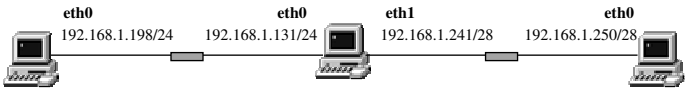
LEFT MIDDLE RIGHT



" $ ping 192.168.1.250 "

- LEFT calculates (wrongly) target RIGHT lies in same domain/LAN
  (192.168.1.250 & 255.255.255.0 → 192.168.1.0)
- LEFT arps for RIGHT, consequently
- RIGHT does not receive LEFT's arp request but MIDDLE does
- MIDDLE replies to LEFT (falsely) with his eth0's hardware address
- LEFT proceeds to frame/send data (a ping) to MIDDLE/eth1
- MIDDLE forwards to RIGHT (where tcpdump reveals)

Proxied host – implementation




```
echo 1 > /proc/sys/net/ipv4/ip_forward
echo 1 > /proc/sys/net/ipv4/conf/eth0/proxy_arp

ifconfig eth1 192.168.1.241 netmask 255.255.255.240
ifconfig eth0 192.168.1.131 netmask 255.255.255.0
```

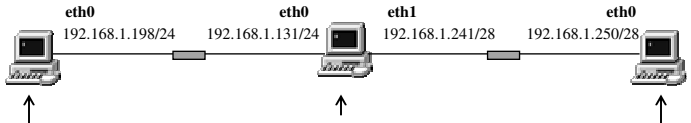
```
ifconfig eth0 192.168.1.250 netmask 255.255.255.240
```

```
ifconfig eth0 192.168.1.198 netmask 255.255.255.0
```

Technically, we're finished

- MIDDLE now arp-replies to LEFT on behalf of RIGHT
  - that's proxy arp
  - mission accomplished
- Note – whenever they have anything to send the other
  - LEFT automatically arps for RIGHT, because RIGHT's address falls *within* those LEFT considers "its own"
  - RIGHT does *not* automatically arp for LEFT, because LEFT's address falls *outside* those RIGHT considers "its own"
- For left, proxy arp complements the existing arp LEFT will issue
- For right, there is no mechanism for reply
- If we want reply capability, we're not finished

Achieving ping reply (technically, optional!)
method A - routing the reply



echo 1 > /proc/sys/net/ipv4/ip_forward
echo 1 > /proc/sys/net/ipv4/conf/eth0/proxy_arp

ifconfig eth1 192.168.1.241 netmask 255.255.255.240
ifconfig eth0 192.168.1.131 netmask 255.255.255.0

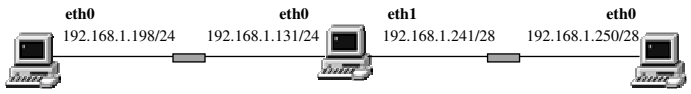
new → ifconfig eth0 192.168.1.250 netmask 255.255.255.240
route add default gw 192.168.1.241*

ifconfig eth0 192.168.1.198 netmask 255.255.255.0

*RIGHT won't route to MIDDLE packets for remote LEFT unless told to do it. This tells it.

OR.. achieving ping reply (technically, optional!)

method B – proxy-arping the reply




```
echo 1 > /proc/sys/net/ipv4/ip_forward
echo 1 > /proc/sys/net/ipv4/conf/eth0/proxy_arp

ifconfig eth1 192.168.1.241 netmask 255.255.255.240
ifconfig eth0 192.168.1.131 netmask 255.255.255.0

echo 1 > /proc/sys/net/ipv4/conf/eth1/proxy_arp
```

new →

```
ifconfig eth0 192.168.1.250 netmask 255.255.255.240
route add host 192.168.1.198 eth0*
```

```
ifconfig eth0 192.168.1.198 netmask 255.255.255.0
```

*RIGHT won't arp for remote LEFT unless it thinks it's local. This claims it is, prompts RIGHT to arp.

Rules

- give IP addresses to both of proxying machine's interfaces
- create routes so proxying machine knows which hosts reside on left, and which on right
- turn on proxy-arp on proxying machine's interface(s) you wish to issue arp replies for other machines
- arrange for proxied-for machine(s) to have a reverse path for any packets it wants to send to machines on far side of proxying machine

Info

- see “man arp” under –s, and “man 7 arp”
- “Linux Advanced Routing and Traffic Control HOWTO,” Section 16.3 Pseudo-bridges with Proxy-ARP*
- “Guide to IP Layer Network Administration with Linux,” Section 9.3 Breaking a network in two with proxy ARP

* Instead of “ProxyARP Subnetting HOWTO,” which is outdated