Obtaining IP Addresses

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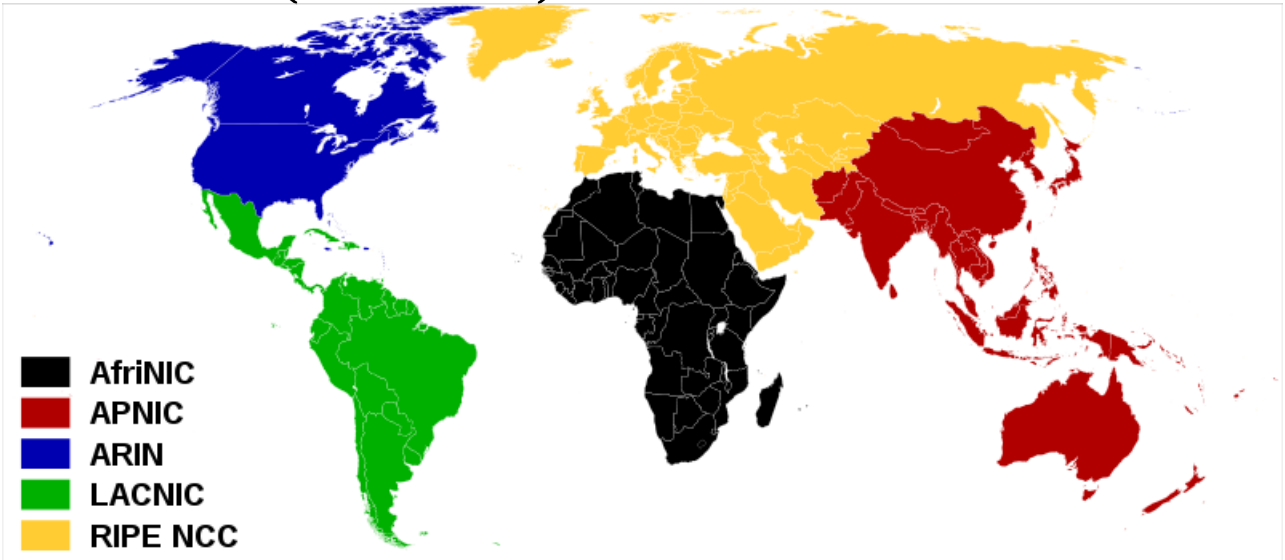
Organization

IP PREFIX

- How does an organization get an address block?
- Ans: From provider Internet Service Provider (ISP)
- Indian: Reliance, Tata
- International: Sprint, AT&T

Internet Service Provider (ISP)

- How does an ISP get address blocks?
- Ans: From Regional Internet Registries (RIR) which are controlled by Internet Corporation for Assigned Names and Numbers (ICANN)



Organization

- How does an organization get an address block?
- Ans: From provider Internet Service Provider (ISP)

isp FOLLOWS SAME STRATEGY AS CIDER .... while allocating adresses

ISP's Block	10000101 11000101 10000000 00000000	133.197.128.0/18
Organization 0	10000101 11000101 10000000 00000000	133.197.128.0/19
Organization 1	10000101 11000101 10100000 00000000	133.197.160.0/21
Organization 2	10000101 11000101 10101000 00000000	133.197.168.0/21
Organization 3	10000101 11000101 10110000 00000000	133.197.176.0/21
……	……	

During routing process: ISP Routers will advertize send me anything with addresses beginning 133.197.128.0/18

Host

- Organization has an IP prefix
  - How does a host get a specific IP address?
- Address needs to be unique and location-dependent → Re-configurable address
- Before any communication, the host needs an IP address and default router's IP address

Organisation can have many PHYSICAL NEETWORKS...

and it can do subnetting

unlike ethernet

IP ADDR
mask
defsult router
DNS server

even to reach the host remotely.... we needs it ip addr.... so to assign ip, we need ip....CHICKEN EGG

Configuration

- Manual Configuration
  - Windows: control-panel-> Network and Internet -> Network Connections -> Local Area Connection -> TCP/IPv4 -> properties
  - Unix: ifconfig
  - Remote configuration difficult, error prone
- Automatic Configuration: Dynamic Host Configuration Protocol (DHCP)
  - Dynamically get address from a server
  - “plug-and-play”

Idea

- DHCP server maintains a pool of available addresses
  - based on → IP-Prefix allocated to that Organisation
- Addresses handed out on demand (leased for some specific time)
  - if u shut down... then u can give that ip to other
  - Host periodically needs to renew the lease
- Advantages: Ease of configuration (automated), reuse of IP addresses, supports portability
  - changeo subnet etc
- But how does the host know address of DHCP server?

DHCP Operation

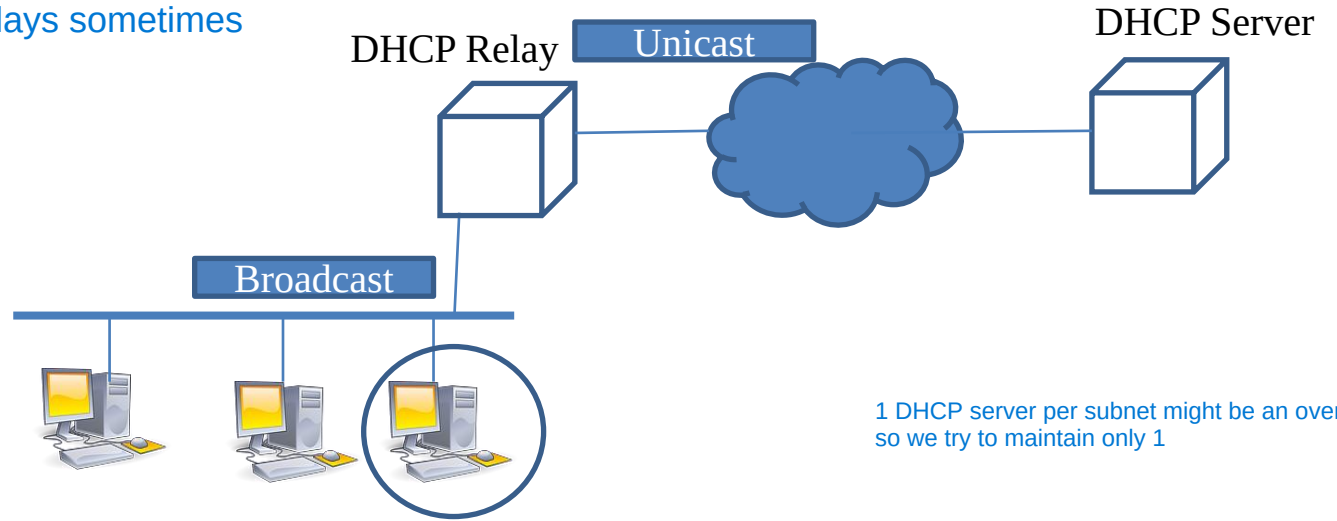
- Operates at application layer using UDP protocol
- A newly booted/attached host ‘broadcasts’ DHCP discover message
  - IP address: 255.255.255.255 goes as link-layer broadcast (broadcast restricted to physical network)
  - Received by all hosts/routers in the physical network
- DHCP Server replies to host (others ignore message)

mac set as ffffffffff

Relay Operation

- One DHCP server over multiple subnets

even routers can act as RElays sometimes



1 DHCP server per subnet might be an overkill at times so we try to maintain only 1

Message Exchange

- Host broadcasts “DHCP discover” msg

it can make use of the MAC addr of host to allocate ip

IP Addr allocated to that host

- DHCP server responds with “DHCP offer” msg
- Host requests IP address: “DHCP request” msg

at times, we may have multiple dhcp servers... so mutiple offers.

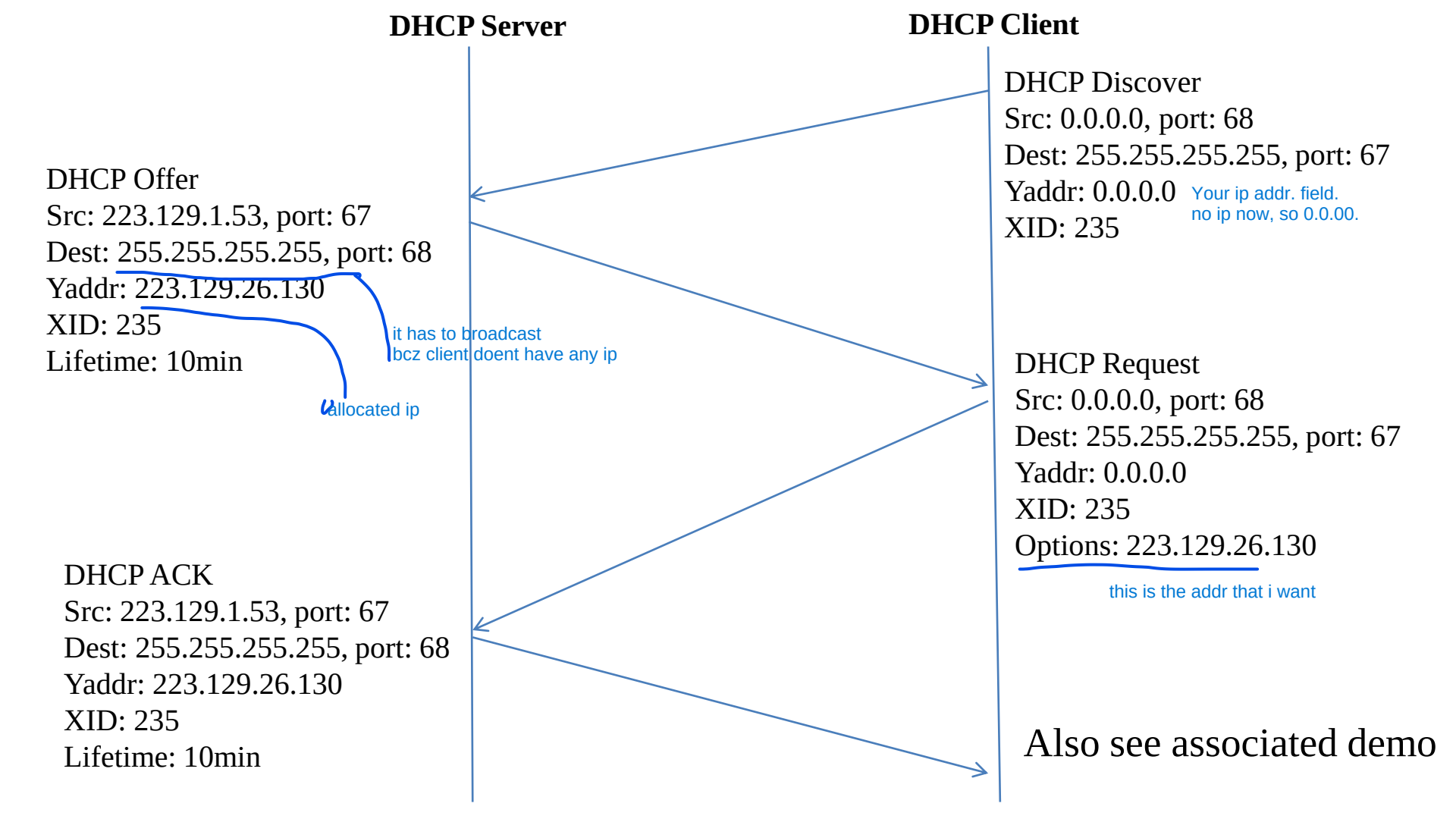
- DHCP server confirms address: “DHCP ack” msg
- DHCP server also passes subnet mask, default router, domain name, DNS server info etc if host asks for it

DHCP Packet Format

request/ reply

Operation (1)	Htype (1) ethernet	Hlen (1) 6	Hops (1)
Xid (4)			
Secs (2)		Flags (2)	
Ciaadr (4)			
Yiaddr (4)			
Siaddr (4)			
Giaddr (4)			
Chaddr (4)			
Sname (64)			
File (128)			
Options (312)			

16 bit, but only 1 bit is used ...
brioadcast flag: set 1 if host doesnt have any ip.


DHCP Server
DHCP Client
DHCP Discover
Src: 0.0.0.0, port: 68
Dest: 255.255.255.255, port: 67
Yaddr: 0.0.0.0
Your ip addr. field.
no ip now, so 0.0.00.
XID: 235
DHCP Offer
Src: 223.129.1.53, port: 67
Dest: 255.255.255.255, port: 68
Yaddr: 223.129.26.130
XID: 235
Lifetime: 10min
it has to broadcast
bcz client doent have any ip
allocated ip
DHCP Request
Src: 0.0.0.0, port: 68
Dest: 255.255.255.255, port: 67
Yaddr: 0.0.0.0
XID: 235
Options: 223.129.26.130
this is the addr that i want
DHCP ACK
Src: 223.129.1.53, port: 67
Dest: 255.255.255.255, port: 68
Yaddr: 223.129.26.130
XID: 235
Lifetime: 10min
Also see associated demo

Router Configuration

- How are router interface addresses configured?
- By a system administrator manually via a network management tool

Summary

- IP addresses crucial for communication
- Organizations get IP prefixes from ISPs
- ISPs get from RIRs
- Hosts gets from DHCP server
- Ahead: Supporting Protocols – ARP, ICMP

Demo in Linux

- Run a packet capture tool like wireshark or tcpdump
- Run “dhclient eth0” (replace eth0 with whatever is the correct interface).
- Stop packet capture and analyze captured packets