ARP: Address Resolution Protocol(layer3)

Resolution(స్పష్టత):
                commitment
                Finding a solution to a problem
                Analysis into clear-cut components
                conclusion,decision,determination.

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q).What is ARP ?
ans).
*.ARP is link layer protocol(layer 2)

*.Mapping of <u>IP address</u> to <u>Mac address</u>
           (known)   (unknown)
Src: Wiki

*.The **Address Resolution Protocol** (**ARP**) is a [telecommunication](#) protocol used for resolution of [Internet layer](#) addresses into [link layer](#) addresses, a critical function in multiple-access networks.

*.Address Resolution Protocol (ARP) is a network protocol, which maps a network layer protocol address to a data link layer hardware address. For example, ARP is used to resolve IP address to the corresponding Ethernet address.

*.Like DHCP, ARP is a discovery protocol, but unlike DHCP there is not server here.

q).why ip address is called as *logical address*?
ans).it is called a logical address because it is usually implemented in software.

q).what is physical address?
ans).
*.a physical address is a local address.
*.The address for a device as it is identified at the **Media Access Control (MAC)** layer in the network architecture. MAC address is usually stored in ROM on the network adapter card and is unique.

q).was physical address is unique locally?
ans).it jurisdiction is a local network. it should ve unique locally, but not necessarily universally . it is called a physical address because it is usually(but not always) implemented in hardware. examples of physical addresses are 48 bit MAC addresses in ethernet protocol, which are imprinted on the NIc installed in the host or router.

q).Static Mapping?
ans).static mappking means creating a table that associates a logical address with a physical address.

q).Dynamic mapping?
ans).in dynamic mapping, each time a machine knows the logical address of another machine. it can use a protocol to find the physical address.
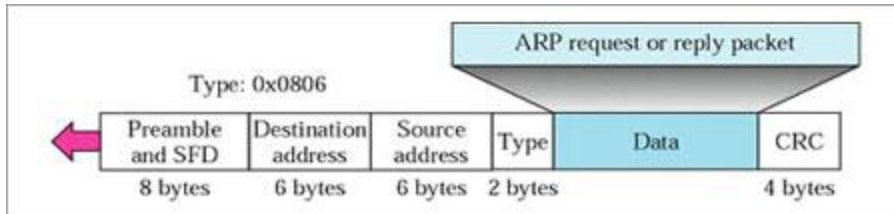
q).what are the protocols associated with dynamic mapping?
ans).arp and rarp.

q).To which OSI layer does ARP belong?

ans).

*.ARP belongs to the OSI data link layer (Layer 2). ARP protocol is
 implemented by the network protocol driver.

*.ARP packets are encapsulated by Ethernet headers and transmitted.

q).Which RFC specify the requirements for ARP - Packet Formate ?

ans).

*.RFC 826 specifies the ARP packet format and other details.

Hardware
Type - Ethernet
is type 1

Protocol Type-
IPv4=x0800

Hardware
Length:length of
Ethernet
Address (6)

Protocol
Length:length of
IPv4 address (4)

q).why ARP is not using IP header ?
ans).
*.ARP is under IP protocol, but still it is layer3 protocol
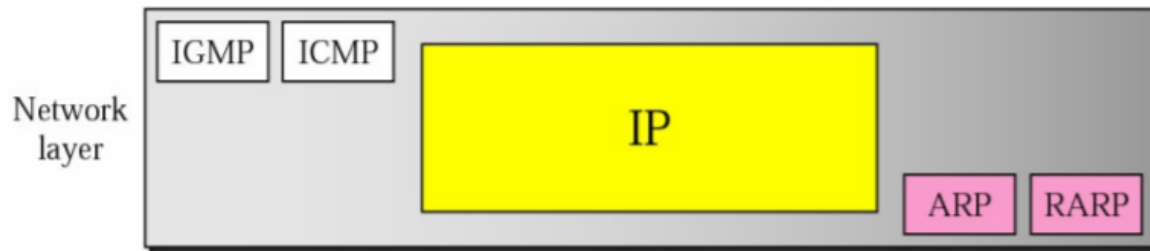

Figure 21.1 Position of ARP and RARP Protocols

q).What is the use of ARP?
ans).
*.A host in an Ethernet network can communicate with another host, only if it
knows the Ethernet address (MAC address) of that host. The higher level protocols
like IP use a different kind of addressing scheme (like IP address) from the
lower level hardware addressing scheme like MAC address. ARP is used to get the
Ethernet address of a host from its IP address. ARP is extensively used by all
the hosts in an Ethernet network.

q).Can ARP be used in a network other than Ethernet?
ans).
*.ARP is a general protocol, which can be used in any type of broadcast network.
The fields in the ARP packet specifies the type of the MAC address and the type
of the protocol address. ARP is used with most IEEE 802.x LAN media. In
particular, it is also used with FDDI, Token Ring, and Fast Ethernet, in
precisely the same way as it is with Ethernet.

q).How does ARP resolve an IP address to an Ethernet MAC address?
ans).
*.When ARP needs to resolve a given IP address to Ethernet MAC address, it
broadcasts an ARP request packet. The ARP request packet contains
the source MAC address and
the source IP address and
the Target IP address and
Target Mac address(all 0's).

And Each host in the local network receives this packet. The host with the
specified destination IP address, sends an ARP reply packet to the originating
host with its IP address.

ARP Mechanisum:

ARP

- Machine A broadcasts ARP request with B's IP address
- All machines on local net receive broadcast
- Machine B replies with its physical address
- Machine A adds B's address information to its table
- Machine A delivers packet directly to B

ARP Request and ARP Reply:

A broadcasts request for B
(across local net only)

B replies to request
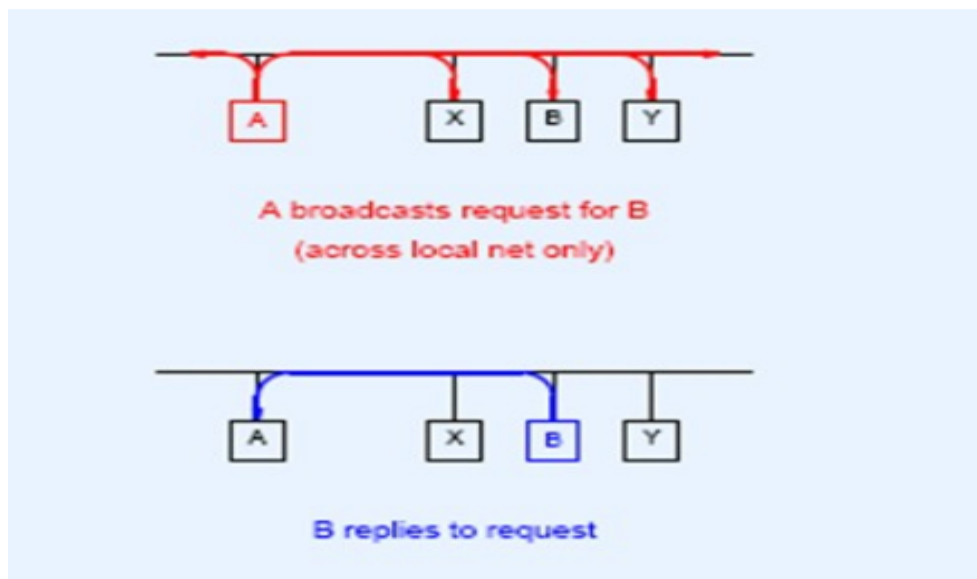
q).Why a IP address needs to be mapped to a MAC address, why can't the MAC address itself is represented using the IP address?
ans).

*.The length of a MAC address is 6 bytes and the length of an IP address is 4 bytes. Obviously, the MAC address cannot be represented using the IP address. So an IP address must be mapped to the corresponding MAC address.
*.Citation needed.

q).What is an ARP cache?
ans).
*.ARP maintains the mapping between IP address and MAC address in a table in memory called ARP cache. The entries in this table are dynamically added and removed.

*.in linux, arp Cache lies in a File
     Cat /proc/net/arp
       (or)
     arp -a
*.clear arp cache
     ip -s -s neigh flush all

q).what if we dont have a ARP cache?
ans).
*.A sender usually have more than one IP datagram to send to te same destination. It is inefficient to use the ARP protocol for each datagram destined for the same host or router. The solution is the cache table.

ADDITIONAL:
*.When a host or router receives the corresponding physical address for an IP datagram, the address can be saved in the cache table. This address can be used for the datarams destined for the same receiver within the next few minutes.
*.However, as space in the cache table is very limited, mappings in the cache are not retained for an unlimited time.

q).what is the most important reason for ARP table?
ans).
*.https://learningnetwork.cisco.com/thread/66362
*.

q).When is an ARP request packet generated?
ans).

*.The following steps results in the generation of an ARP request packet:

(1). The IP module sends a packet, destined for another host in the network,to the ARP module.

(2). The ARP module looks up the ARP table (cache) to resolve the IP address.

(3). If the supplied IP address is present in the ARP cache, it is Resolved into its Ethernet address.

(4). If the ARP module is not able to find an entry for this IP address in the ARP cache, then it sends an ARP request packet to the Ethernet driver, to resolve the IP address to the Ethernet address.

(5). After the IP address is resolved by the ARP module, the packet is sent to the Ethernet driver for transmission.

q).What happens when a host receives an ARP request packet?
ans).
*.The ARP request is received and processed by all the hosts in the network, since it is a broadcast packet. The following steps are carried out when a ARP request packet is received by a host:

(1). If the IP address to be resolved is for this host, then the ARP module sends an ARP reply packet with its Ethernet MAC address.

(2). If the IP address to be resolved is for this host, then the ARP module updates its ARP cache with the source Ethernet MAC address to source IP address mapping present in the ARP request packet. If the entry is already present in the cache, it is overwritten. If it is not present, it is added.

(3). If the IP address to be resolved is not for this host, then the ARP module discards the ARP request packet.

q).Will a host update its ARP cache upon receiving any ARP request?
ans).
*.A host will update its ARP cache, only if the ARP request is for its IP address. Otherwise, it will discard the ARP request.

q). What is the disadvantage if a host updates its ARP cache upon receiving any ARP request?
ans).
*.The host will _exhaust the ARP cache_ with a lot of unused ARP entries, if it updates the ARP cache for any ARP request.

q).What happens when a host receives an ARP reply packet?
ans).

*.The ARP reply packet is received only by the host, which transmitted the ARP request packet. The ARP module adds the Ethernet hardware address to IP address mapping present in the ARP reply packet to the ARP cache.

q).Is there a separate packet format for ARP request and ARP reply?
ans).
*.No. Both the ARP request and ARP reply packets use the same format.

q).Which MAC address is an ARP request directed to?
ans).
*.All ARP request packets are transmitted with the Ethernet broadcast address, so that all hosts in the network will receive the request.

q).To which MAC address is an ARP reply packet directed to?
ans).
*.ARP reply packet is directed to the host, which transmitted the ARP request packet.

q).If a host is not able to get the MAC address of a host, how it knows about its IP address?
ans).
*.A host will either use a static file like */etc/hosts* or *DNS protocol* to get the IP address of another host.

q).What will happen if an ARP reply is not received for an ARP request?
ans).
*.If an ARP reply is not received, then that IP address cannot be resolved to an Ethernet address. Without a Ethernet address, the packets cannot be transmitted.

q).When is an entry added to the ARP cache?
ans).
*.A new entry is added to the ARP cache when an IP address is successfully mapped to a MAC address. Usually, entries are added dynamically to the ARP cache. Static entries can also be added.

q).What will happen if a new ARP request packet is received, but the MAC address to IP address is already present in the ARP cache?
ans).
*.If a ARP request packet is received and the mapping already exists in the ARP cache, it will be overwritten with the values present in the request.

q).When is an entry removed from an ARP cache?
ans).

*.An entry in an ARP cache is removed after a pre-determined timeout period
 (e.g. 300 secns - Usually).

q).What is the size of an ARP request and reply packet?
ans).
*.The size of an ARP request or reply packet is **28** bytes.

**q).How to differentiate between a ARP request packet and a ARP reply packet, as
the Ethernet type field is same on both the packets?**
ans).
*.An ARP request packet can be differentiated from an ARP reply packet using the
  'operation' field in the ARP packet.
  For a ARP request it is 1 and for an
       ARP reply   it is 2.

***q).Why is the hardware MAC address present in both the Ethernet header and the
ARP packet (request and reply)?**
ans).
*.The Ethernet header is processed by the data link driver and removed from the
packet. When the ARP layer gets the packet, it needs to know the hardware and
protocol addresses in order to update the table. That is why the hardware MAC
address is present in both the Ethernet header and the ARP packet.

q).What is the destination mac-address of an ARP request frame
ans).Broadcast

q).is Arp used in PPP link?
ans). No

q).Does ARP contain an IP header?
ans).
*.ARP is a layer 2 protocol. It does not use IP header.

**q).What does a switch do when it receives an ARP request frame on one of its
ports?**
ans).
*.It adds the source port to its mac-address table and broadcasts the frame out
to all ports.

q).Would an ARP request frame generated on a port which is member of VLAN 2, be received on a port which is a member of VLAN 3?
ans).
*.ARP is a layer 2 broadcast. VLAN's are used for segregating broadcast domains. So it would not be received.

q).Can an ARP packet cross IP networks?
ans).
*.ARP is a layer 2 broadcast. It cannot traverse across IP networks.

q).If an ARP entry is available on the local cache of a computer, would an ARP request be triggered ?
ans).
*.No. The computer would first check its ARP entry before sending out an ARP request frame.

q).Explain how an ARP packet is triggered on a computer?
ans).
*.Assume that a user on a computer pings another computer on the same network. For the ping packet to be sent to the other computer, it has to be encapsulated on an Ethernet frame. For constructing the frame, the mac-address of the destination is needed. The computer checks its ARP cache if the corresponding ARP entry for the destination computer is available. If not an ARP request is sent out.

q).Does a hub support ARP?
ans).
*.If the hub works on mediums like Token Ring, Ethernet etc, then ARP would be supported.

q).3 switches SW1,SW2 and SW3 are interconnected and STP deployed on the switches. PC1 is on SW1 PC2 is on SW2 and PC3 is connected to SW3. All the PC's are on the same network address of 192.168.1.0/24. PC1 triggers ARP to find the mac-address of PC3. Will the ARP packet reach the PC3?
ans).
*.All the PC's are on the same network address. The PC's are on 3 switches which makes it one large Layer 2 broadcast domain. So an ARP request which is a layer 2 broadcast will be received on all the ports on all the switches and correspondingly the PC's.

a).What is difference between ARP and RARP?

ans).

*.The address resolution protocol **(ARP)** is used to associate the 32 bit IP address with the 48 bit physical address, used by a host or a router to find the physical address of another host on its network by sending a ARP query packet that includes the IP address of the receiver.
*.The reverse address resolution protocol **(RARP)** allows a host to discover its Internet address when it knows only its physical address.

q).Can PC has ARP table ?
ans).
src:http://gns3vault.com/forums/topic/some-basic-interview-questions-2fanswers/

*.a PC has an ARP table and a routing table. But by default it only routes packets for it's own…it won't behave like a router because IP forwarding by default is normally disabled. It doesn't have a MAC address table.

q).What is proxy ARP?
ans).
*.if destination is IP address is outside of the local subnetwork, on the
  Data link layer host will send frame to the MAC address of default gateway.

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Address Resolution Protocol
proxy(ARP)

How to send packet to the host from remote network

Router

WAN IP: 111.42.0.75/29
WAN MAC: a4:67:b3:48:a7:d3

LAN IP: 172.16.1.1/24
LAN MAC: a0:cd:02:6d:fa:2d

proxy ARP

we use default gateway MAC to reach 8.8.8.8

IP: 8.8.8.8
MAC: 83:11:5b:ad:13:87

IP: 172.16.1.5/24
MAC: 60:77:5c:bd:c3:3d

IP: 172.16.1.7/24
MAC: a6:37:2b:5f:be:47

172.16.1.5 → 8.8.8.8

IP: 172.16.1.6/24
MAC: 6d:d7:4c:92:a0:17

—-
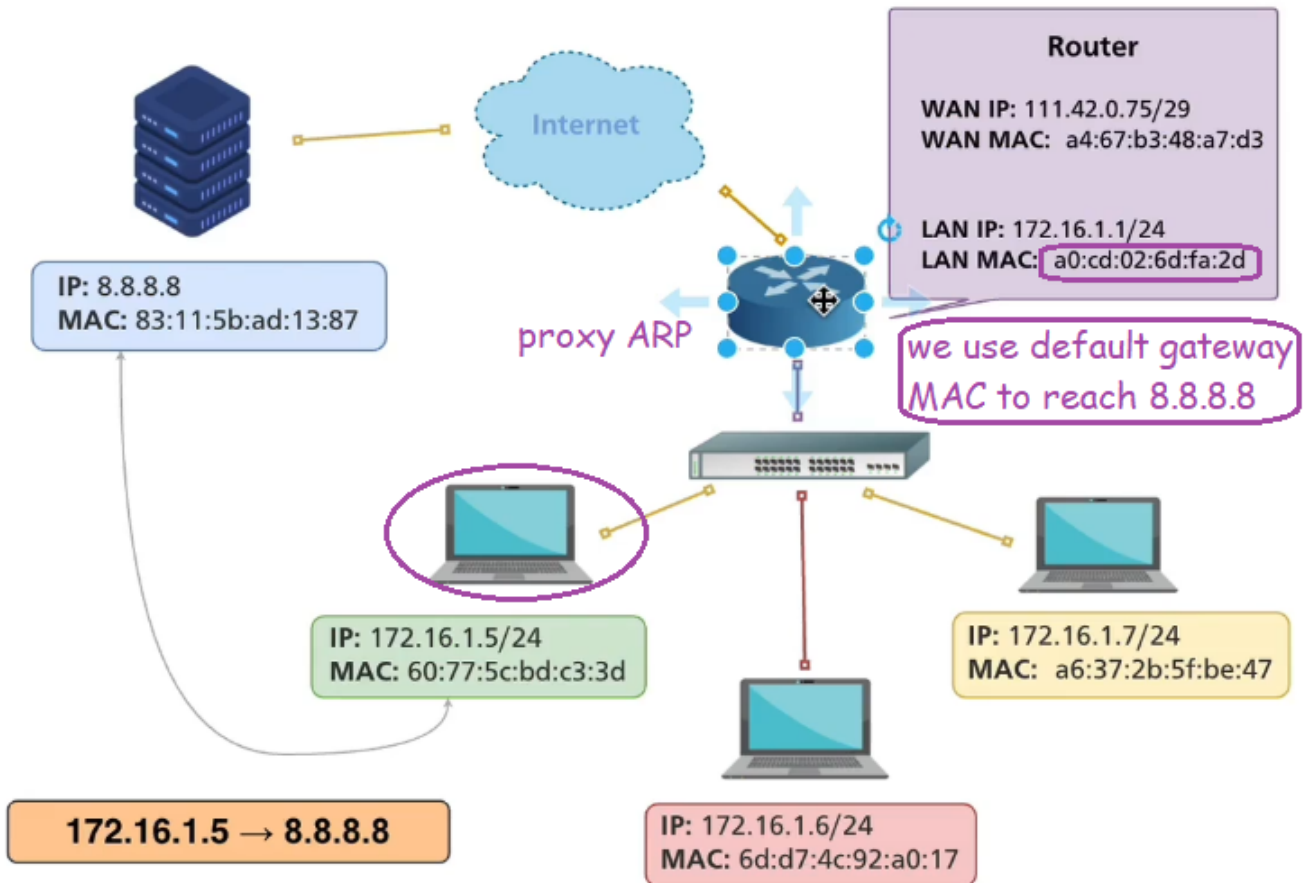
*.Proxy ARP is the process in which one system responds to the ARP request for another system. For example, host A sends an ARP request to resolve the IP address of host B. Instead of Host B, Host C responds to this ARP request.
*.It is using a router to answer ARP requests. This will be done when the originating host believes that a destination is local, when in fact is lies beyond router.
*.
Src: CoolInterview.com

Proxy ARP (Address Resolution Protocol) is a technique by which a device on a given network answers the ARP queries for a network address that is not on that network. The ARP Proxy is aware of the location of the traffic's destination, and offers its own MAC address in reply, effectively saying, "send it to me, and I'll get it to where it needs to go." Serving as an ARP Proxy for another host effectively directs LAN traffic to the Proxy. The "captured" traffic is then typically routed by the Proxy to the intended destination via another interface

q).What is the use of proxy ARP?
ans).
*.When routers receive ARP requests from one network for hosts on the network, they will respond with a ARP reply packet with their MAC address.

*.**For example,** let us say host A is in one network, host B is in another network and router C connects these two networks. When host A sends an ARP request to resolve the IP address of host B, the router C receives this packet. The router C sends an ARP reply with its MAC address. So host A will send all the packets destined for host B to the router C. Router C will then forward those packets to host B.
*.**Proxy ARP** is also used if a host in a network is not able to understand subnet addressing. **For example,** if host A and host B are actually in two different subnets, but host A cannot understand subnet addressing. So host A assumes that host B is present in the same network. In this case a router, host C, can use proxy ARP to route packets between host A and host B.

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network 1   network 2

IP Address: 172.23.4.254   IP Address: 192.168.10.254
MAC: 4444.5555.6666   MAC: 4444.5555.7777

Sender   **Receiver**
IP Address: 172.23.4.1   **ROUTER**   IP Address: 192.168.10.1
Subnet Mask: 255.255.255.0   Subnet Mask: 255.255.255.0
DG: 172.23.4.254   DG: 192.168.10.254
MAC: 1111.2222.3333   MAC: 2222.3333.4444

(1)
      Arp Request for 172.23.4.1
      src Mac: 1111.2222.3333
      Dst Mac: ffff.ffff.ffff

                                        (2) proxy
                                            arp
                      Arp Reply
                    src Mac: 4444.5555.6666
                    Dst Mac: 1111.2222.3333

(3)
      IP Packet
      src IP: 172.23.4.254
      Dst IP: 192.168.10.1
      src Mac: 1111.2222.3333
      Dst Mac: 4444.5555.6666

                              (4) Arp Request for 192.168.0.1
                                  src Mac: 4444.5555.7777
                                  dst Mac: ffff.ffff.ffff

                                                            (5)
                                            ArP Reply
                                          src MAc: 2222.3333.4444
                                          Dst Mac: 4444.5555.7777

                              (6)
                                  IP Packet
                                  src IP: 172.23.4.254
                                  Dst IP: 192.168.10.1
                                  src MAC:4444.5555.7777
                                  Dst MAC:2222.3333.4444

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q).What is gratuitous ARP?
ans).
Eg: when device freshly came to network , it actuall sends gratuitous arp to
checkout any other device in the same subnet/network having same IP or not.

*.When a host sends an ARP request to resolve its own IP address, it is called
gratuitous ARP. In the ARP request packet, the source IP address and destination

IP address are filled with the same source IP address itself. The destination MAC address is the Ethernet broadcast address (FF:FF:FF:FF:FF:FF).

q).What is the use of gratuitous ARP?
ans).
*.Gratuitous ARP is used for the following:
(1). In a properly configured network, there will not be an ARP reply for a gratuitous ARP request. But if another host in the network is also configured with the same IP address as the source host, then the source host will get an ARP reply. In this way, a host can determine whether another host is also configured with its IP address.
(2). When the network interface card in a system is changed, the MAC address to its IP address mapping is changed. In this case, when the host is rebooted, it will send an ARP request packet for its own IP address. As this is a broadcast packet, all the hosts in the network will receive and process this packet. They will update their old mapping in the ARP cache with this new mapping.

arp - Wireshark:

```
⊟ Ethernet II, Src: Cisco_6c:b1:80 (00:1d:70:6c:b1:80), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  ⊞ Destination: Broadcast (ff:ff:ff:ff:ff:ff)
  ⊞ Source: Cisco_6c:b1:80 (00:1d:70:6c:b1:80)
    Type: ARP (0x0806)
    Padding: 000000000000000000000000000000000000
⊟ Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IP (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: Cisco_6c:b1:80 (00:1d:70:6c:b1:80)
    Sender IP address: 202.163.112.105 (202.163.112.105)
    Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
    Target IP address: 202.163.112.110 (202.163.112.110)
```

q).ARP protocol?
ans).

arp:
————
*.we had known the ip address,to figure out the mac address within your subnet (it must not in another subnet)
*.arp was mandatory in everything, this was the basic process in tcp/ip.
*.by using arp, we can figure out the mac address with corresponding to ip address.

*.we can assign a name but we cant change a person ,
  logical address: ip address :name
  physical address: mac address :person
*.it is not easy to manage static mac table, that is how we are using
  arp(dynamic).
*.arp dynamically maps.it resolves automatically whenever the change happen.
*.arp table will have an arp entries.
*.every nic card will have 48 bit mac address.
*.iana organization manages 6 bytes mac address as to 3 bytes by *iana* and next
  3 bytes by *company*.
*.the mac address is must not unique by all over the glob.there is no need to
  maintain unique mac address across the glob.
*.but it needs to maintain unique with the subnet.
*.with in the subnet/lan no 2 systems will not have a same mac address.
*.without the logical and permanent address we cant perform communication
  between the two systems.
*.lan adapter = nic card.
*.mac:portable can stay the same as the host names.(whenever whatever thing,
  we can carry the mac address of a sytem even it moves from another subnet
  also)
*.arp packet is **control** packet(not a data packet).
*.the type tells in ethernet frame is what is the next comming header
*.arp is a layer 3 protocol, it works on layer 2 and which resides below to ip
  protocol.
*.lan n/w=single subnet
*.why arp is required, to construct layer 2 frame.
*.arp request is a broadcast to everyone in the lan segment,and asks like let
  me know your mac address.
*.if ip doesnt match to unexpect system, it simply discards the packet. here
  discarding means releiving from memory.
*.arp reply is unicast packet. directly to the system which orginates request
  packet.
*.basic 3 arp operations:
  1.it first figure out that ip address is within the subnet or not.
  2.it searches wheter that mac address is present in our cache/arp table or
    not.
  3.if respect mac entrie is not there, we should construct an arp request.
*.arp will happen at every hop.

*.hosts and router only maintains arp table, it is not necessary to maintain
  arp table in switches(switch doesnt work on layer 3)
*.what is proxy?. it means reply something from someone else.
*.if ip address is not present in our subnet/lan, we can still reach out to

the system. becoz/with the help of gateway address
*.if that default gateway address is not present, even still we can reach out
  to the another subnet, becoz of enabled proxy.
*.by default every router in a network is enabled by a proxy.
*.we can capture the control packets by using wireshark/ethreal
*._why arp table is maintained ?_ for every formation of a l2 frame we need
  Corresponding mac address in the arp/cache table, if it is not we cant, for
  that on every time we need to send arp request packet. this situation wastes
  the cpu time and it may cpu hog also. so that arp table is necessary.

*.the arp cache is updated periodically at certain interval time.
*.we can also call it as look up table(arp table).
*.if no incomming frames on some of one interface on specified interval of
  time, the arp process will remove the entie of that particular one.duration
  of time is 300sec(5 minutes).
*.for broadcast mac all FFFFFFFF
*.for unknown mac all 000000000.

q). What if switch receives a Broadcast frame ?
ans).

q). Router# Show arp
Ans.

q).as we are reaching/forwarding to another network with proxy arp, we can't we
go to another vlan incontext of ARP request?

q).Is ARP packet(consisting arp frame format) traversing in another network, once
after proxy arp?

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Interview questions on Arp:
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*. Why arp table ?
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