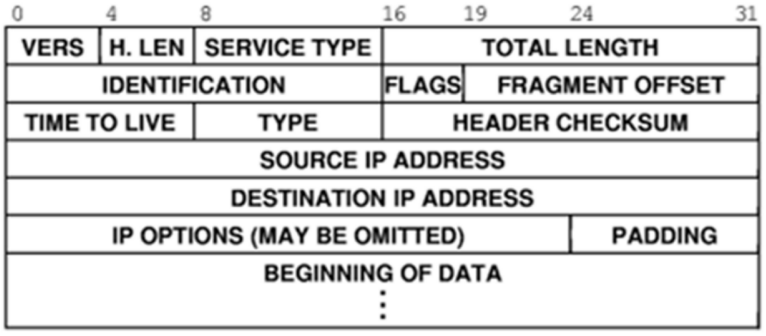
03. Data Communications. IP Delivery

Format of Internet Packets

The IP software defines its own internet packet format knows as an IP datagram.

It is a universal, virtual packet which has a particular format / structure which is very different to that of a hardware frame.

It can carry a single octet of data or multiple octets up to a maximum of 64K octets (including the header).

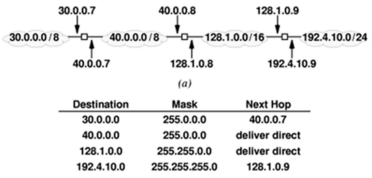


IP Datagram Header Format

Forwarding an IP Datagram

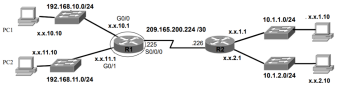
Remember: A router makes its routing decision based on the destination IP address.

Routing informations is stored in a routing table. This table must be initialized on boot-up and updated if the topology changes.



Destination	Mask	Next Hop
30.0.0.0	255.0.0.0	40.0.0.7
40.0.0.0	255.0.0.0	deliver direct
128.1.0.0	255.255.0.0	deliver direct
192.4.10.0	255.255.255.0	128.1.0.9

High-level Routing Table



Real router Routing Table

```
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
D        10.1.1.0/24 [90/2170112] via 209.165.200.226, 00:00:05, Serial0/0/0
D        10.1.2.0/24 [90/2170112] via 209.165.200.226, 00:00:05, Serial0/0/0
      192.168.10.0/24 is variably subnetted, 2 subnets, 3 masks
C        192.168.10.0/24 is directly connected, GigabitEthernet0/0
L        192.168.10.1/32 is directly connected, GigabitEthernet0/0
      192.168.11.0/24 is variably subnetted, 2 subnets, 3 masks
C        192.168.11.0/24 is directly connected, GigabitEthernet0/1
L        192.168.11.1/32 is directly connected, GigabitEthernet0/1
      209.165.200.0/24 is variably subnetted, 2 subnets, 3 masks
C        209.165.200.224/30 is directly connected, Serial0/0/0
L        209.165.200.225/32 is directly connected, Serial0/0/0
R1#
```

Routing Table of Router 1 (R1)

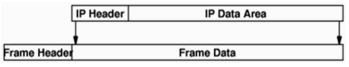
IP Encapsulation

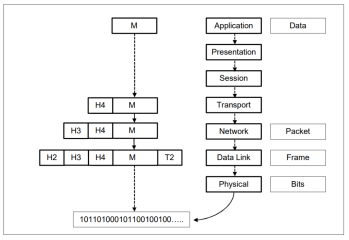
The physical network does not understand the datagram format. Instead, the datagram is placed in the data area of a hardware frame (this is known as encapsulation).

This process is applied on each leg of the transmission path.

The datagram is stored in memory without the additional frame header information.

The size of the frame header may vary as it traverses different network technologies.





Encapsulation and Information flow between the layers on an end-host