Network Protocols

Internet Protocol (IP)

(mostly about IPv4, IPv6 is later)

Basic properties

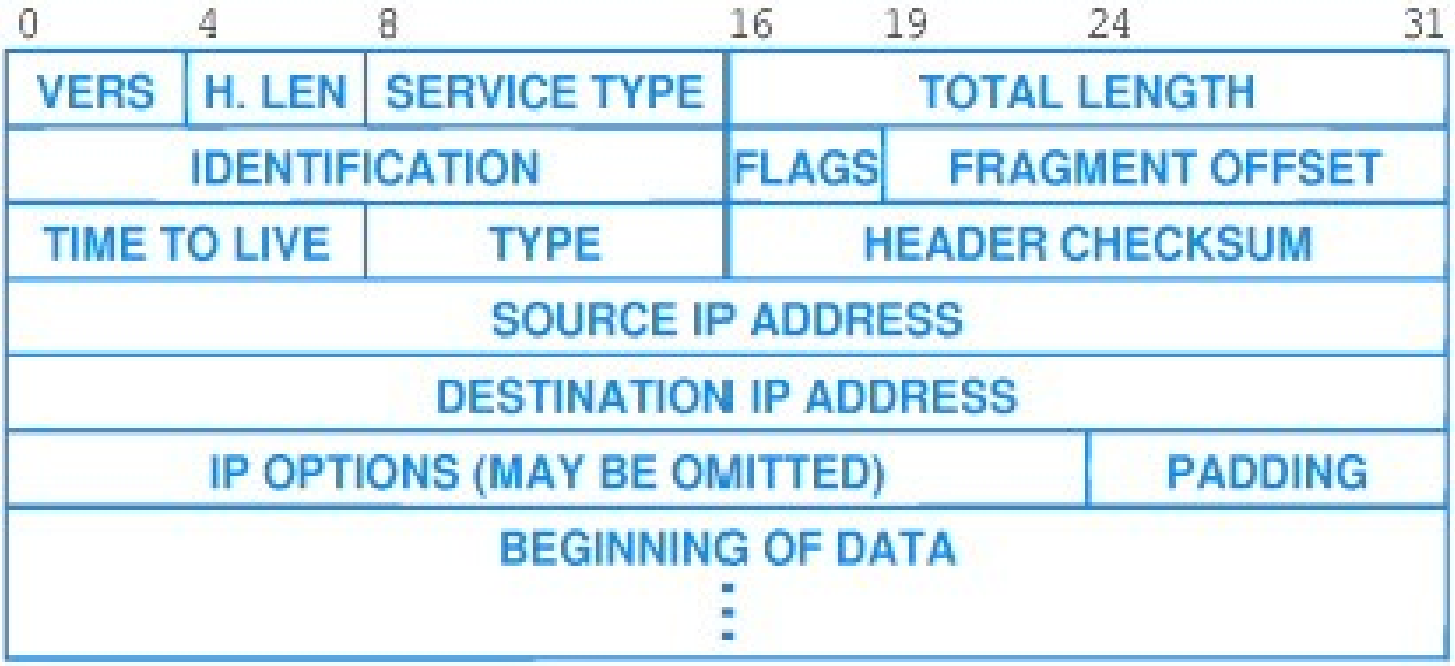
- Connectionless service
  - w/o anything else, its one-way, fire and forget
  - no reliability, performance, security guarantees
- Its relatively simple (its the thin waist remember?)
- You can add some features to it
  - Installed base makes this extremely difficult
- You can easily add features below or above
  - With varying degrees of success/benefit/harm

What does IP do for us?

- Abstracts multiple and various data link nets below
- Provides a common, global, standard format
  - Its glue we can use to put things together
- Hardware, application and packet independence
- Scalable routing (mostly, so far anyway)

The IPv4 datagram

***diagram courtesy of http://www.netbook.cs.purdue.edu**



Inside an IP datagram

- Version field
  - Usually set to binary 0100 (is what in decimal?)
- Header length
  - Length of IP header in 32-bit words (4 octets)
  - Typically set to 5 (as in 5 * 4 octets = 20 bytes)
- Type of Service (Tos) – redefined in newer RFCs
  - An indication of quality/class of service
  - Rarely used with success outside a single AS

Inside an IP datagram...

- Total length
  - total IP datagram length in octets
  - maximum value is 65535, but rarely > 1500
- Identification
  - to identify fragments of a single IP datagram
  - Has had other experimental/research usage
- Flags
  - bit 0 reserved
  - others for fragmentation handling (DF/MF)

Still inside and IP datagram...

- Fragment offset
  - helps piece together fragments
- Time to live (TTL)
  - limts the number of router hops datagram incurs
  - counts down to zero, at zero it is discarded
- Protocol type
  - indicates next (upper?) layer protocol in payload
  - Does it have to be an “upper” layer?

Inside the end of an IP datagram

- Header checksum
  - used to verify header validity at each hop
- Source/Destination address
  - 32-bit addresses
- Options (optional, duh)
  - rarely used, padded to 32-bit boundary if needed
- Payload (which is the next protocol plus it's data)
  - variable length