

# Internet Engineering

241-461

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## Other Network Layer requirements

- ◊ Error Detection (some)
    - Checksum
      - Header only
      - Ensure packet delivered to correct destination
        - With unaltered source address
      - No verification of packet contents
  - ◊ Link Layer Interface
    - Deal with link layer restrictions
  - ◊ Packet Length
    - Header field
  - ◊ Protocol Identification
    - Header field
  - ◊ Packet Lifetime
    - Header field
      - Number of seconds packet can live
      - 8 bits - maximum value 255
- $4\frac{1}{4}$  minutes

## IPv4 header (simplified)

Vers	H.L.	Total Length
TTL	Protocol	Header Checksum
Source Address		Destination Address
Options		

- ◊ Vers - IP version (4)
  - 4 bit field, values 0 .. 15
- ◊ HL - Header Length
  - 4 bit field, values 0 .. 15 words
    - That is 0 .. 60 bytes
    - Including fixed part of IP header
      - So minimum value is 5 (20 bytes)
- ◊ Total Length - packet size
  - 16 bit field (0 .. 65535)
    - Includes IP header
      - Note limit on UDP datagram size

## IPv4 header (simplified) (2)



- ◇ **TTL - Time To Live**
  - 8 bit field, values 0 .. 255
    - Seconds remaining before packet destroyed
- ◇ **Protocol**
  - 8 bit field, values 0 .. 255
    - Protocol that is data in IP packet
    - Heards that follows IP header (and is options)
  - List of numbers and protocols exists
    - 6 --> TCP
    - 17 --> UDP
    - 1 --> ICMP (later...)

## IPv4 header (simplified) (3)



- ◇ **Header Checksum**
  - 16 bit field
    - Checksum of the IP header (and nothing else)
    - Verifies addresses & protocol unchanged
      - Must be updated as TTL changes
- ◇ **Source Address**
- ◇ **Destination Address**
  - IP addresses (32 bits) of sender and recipient(s)
- ◇ **Options**
  - Extra stuff needed in header
    - Rarely used today

## Dealing with Link Layer

- ◇ **Link Layer**
  - Has its own addressing
  - Has packet size limits
    - maximum packet size (usually)
    - minimum packet size (sometimes)
- ◇ **IP must cope with this**
  - Minimum packet size
    - Easy
      - if IP packet is too small  
original source, make it big enough
      - receiver knows original length  
from IP header and packet list
      - repeated for each link crossed  
reassembly and fragmentation