

IP Packet Format

0

this host

0 | Host

A host in this
network

1 1 1 1 | 1 1 1 1 1 1

Broadcast on
local LAN

Network | 1 1 1 1 1 1 1

Broadcast on
distant LAN

127 | Anything

Incoming packet
testing!

Lowest IP: 0.0.0.0 used by m/c while booting up

Highest IP address: 255.255.255.255

0 & -1 special meaning

IP Address Format

- IP address assignment:
 - Network Information Centre
- A, B, C, D together allows:
 - A – 126 network with 16 million hosts
 - B – 16382 networks upto 64 K hosts
 - C – 2 million networks upto 254 hosts each
 - D – Multicast
 - E – 11110 – Reserved for the future

IP Packet Format

All hosts in a network must have the same network number

C.S Department: 144.16.241.1.....254

EE Department: 144.16.251.1.....254

IP packet format:

Version	IHL	TOS	Total length		
Fragment ID			D F	M F	Fragment Offset
IML	IML	IML			
Source address					
Destination address					
Option					

IP Packet Format

- **Version:** Version of protocol the DG belongs to (IPV 4, IPV6)
- **IHL – Header length in 32 bit words**
 - **minimum - 5,**
 - **maximum – 60**
- **TOS – 3 bit precedence, three flag D, T,R, unused bits (Delay, Thruput, reliability)**
- **Total length – Header + data**
 - **Maximum 64 K bytes**
- **ID – If Network Layer fragments DG, fragment ID**
- **DF - 1 – don't fragment**
- **MF – 1 – more fragment, 0 on last fragment**

IP Packet Format

- IP – Another big advantage
 - Hierarchical addresses
 - Bridges – addresses flat
 - Some hierarchy in the Internetwork
- Network part
 - Identifies the Network to which the host is attached

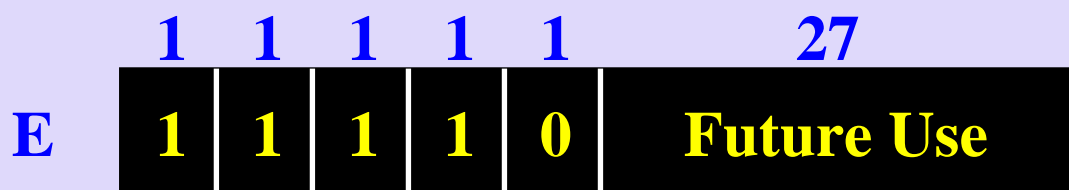
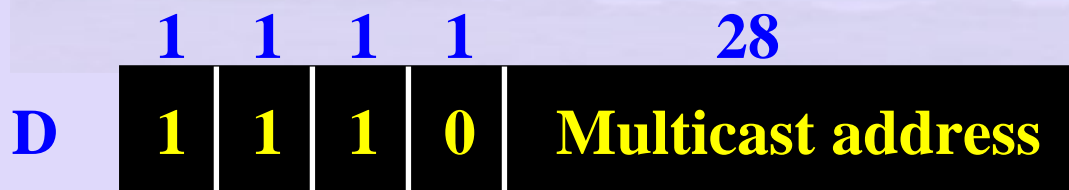
IP Packet Format

- Host part
 - Uniquely identifies host in a Network
- Enables Networks of vastly different sizes to be accomodated
- Every IP packet contains
 - Source and destination addresses
 - Network part of an IP address uniquely identifies a single Physical Network

IP Packet Format

- All hosts and routers that connect to the same Network have the same Network part
- - Every Physical Network has atleast one Router, that is by definition connected to one other Physical Network

Network Wide Addresses



Network Wide Addresses

Class A - 1.0.0.0 → 127.255.255.255

Class B - 128.0.0.0 → 191.255.255.255

Class C - 192.0.0.0 → 223.255.255.255

Class D - 224.0.0.0 → 239.255.255.255

Class E - 240.0.0.0 → 247.255.255.255

Version of IP: IPv4

HLen – header length in 32 bit words (no options)

HLen – 5 in words (32 bit)

TOS - Type of service of field

- Enables packets to be treated differently
- Example Special Queue low delay

Network Wide Addresses

- Length
 - Length DG – includes header – in bytes
- Maximum size
 - 64 K
 - However physical network may not support
 - IP must support fragmentation and reassembly
- TTL
 - Time to live field
 - Catch/ quench packets that have been going around for long

Network Wide Addresses

- TTL
 - Originally seconds
 - Too long
 - Hop count!
 - Default 64

Network Wide Addresses

- Protocol field
 - Demuxing key
 - Identifies higher level protocol to which this packet should be passed e.g TCP (6) UDP(7)

Network Wide Addresses

- Checksum: Internet Checksum
 - Entire IP header (16 bit words address using ones complement and taking ones complement of result)
 - Not as robust as CRC

Fragmentation and Reassembly

- Ethernet – Maximum transmission unit: 1500 bytes
- FDDI – Maximum transmission unit: 4500 bytes
- IP
 - Enables fragmentation and reassembly
 - Every Network has MTU
 - Maximum transmission unit
 - Target IP datagram that it can carry
 - Smaller than frame size since IP packets is payload

Fragmentation and Reassembly

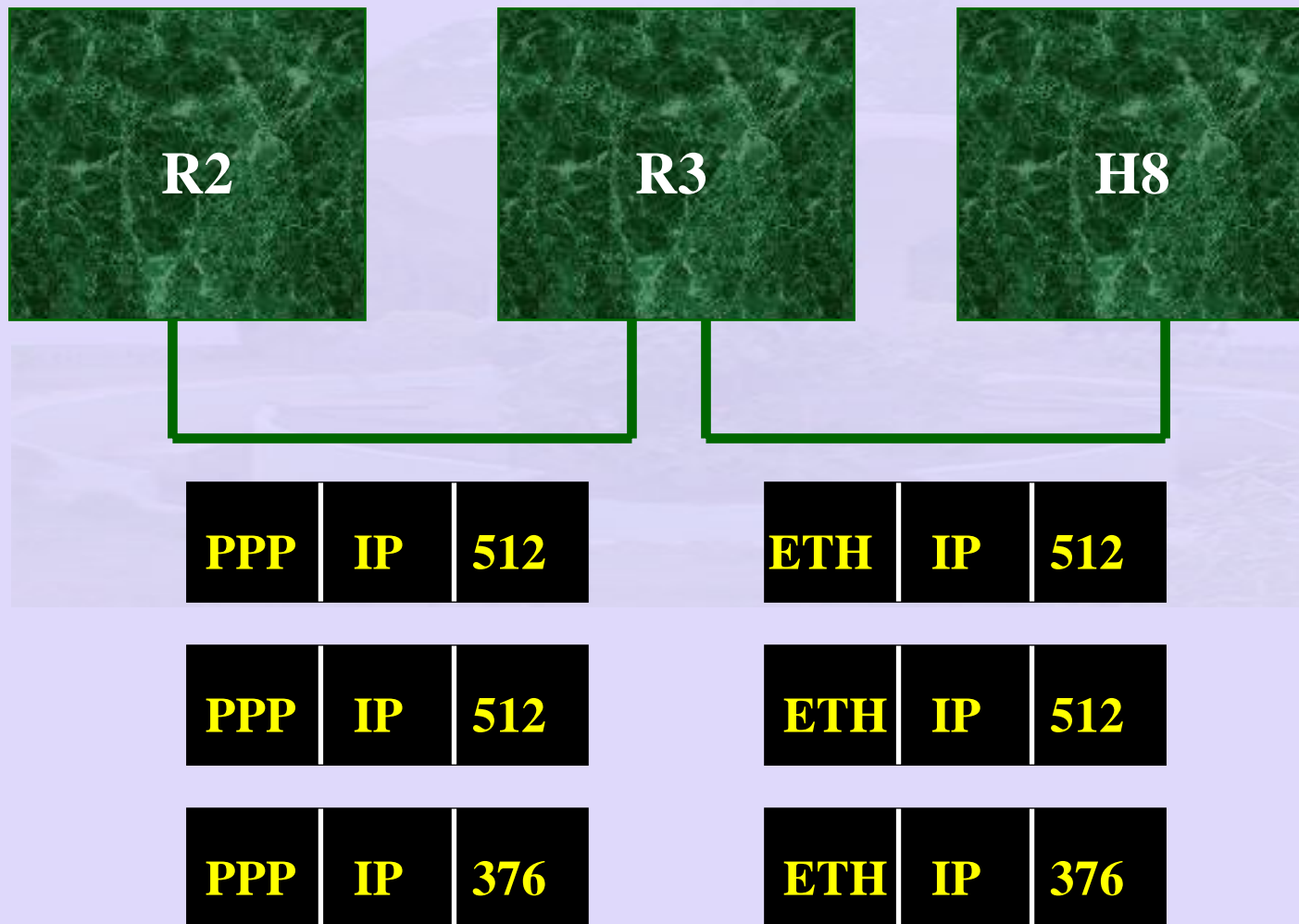
- Hosts send IP packet
 - choose any size
 - MTU of Network
 - Fragmentation required only if path to destination involves a lower MTU Network

IP Format support for Fragmentation and Reassembly

- **Receiving host:**
 - **- Reassembles packets with same flag ID**
- **If h1 – h8 – 1420 byte DG**
 - **Ethernet 1500 bytes**
 - **FDDI 4500 bytes**
 - **Point – Point 532 bytes**
 - **Ethernet and FDDI - no flag from R2 – R3**
 - **Fragmentation into 3 parts**
 - **R3 – H8 – 3 parts**
 - **Host reassembles packets**

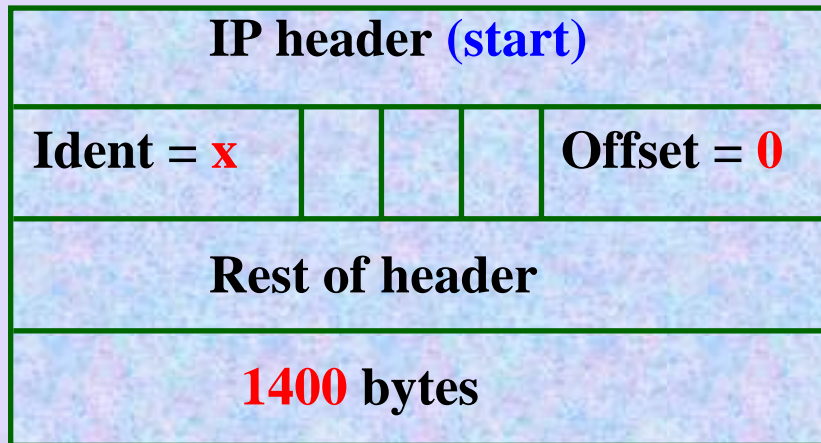
Fragmentation and Reassembly

– A Example

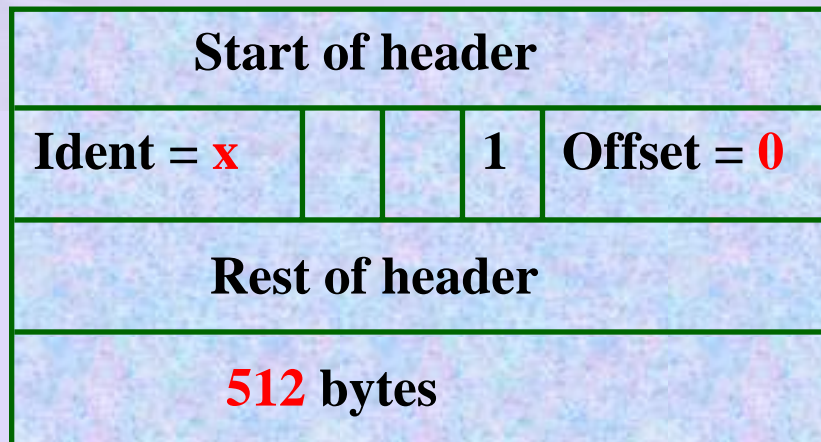


Fragmentation and Reassembly

– A Example



Unfragmented



Fragmented

Fragmentation and Reassembly

– A Example

