

Mask Netw.

A	"22"	128.192.32.0	F	1	3
B	"16"	128.192.0.0	F	2	4

"22" = 255.255.252.0

ifconfig gives A as FFFFFe00

So, any destination address that fits in A also fits in B!

Those: route A. A has prefix length ₂₂.
"longest prefix". B has prefix length ₁₆

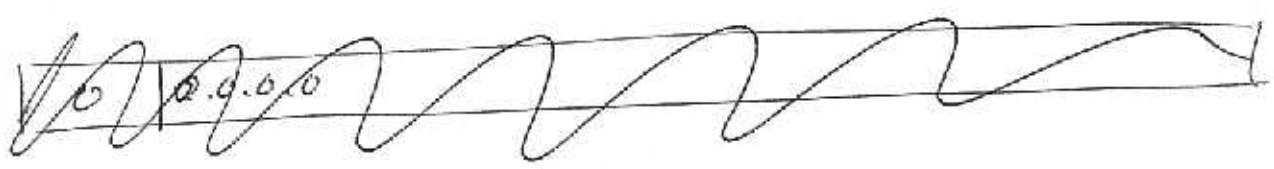
In words, we could describe B as:

128.192.0.0/16, unless bits ~~16-21~~ 16-21
are 001000

Longest prefix routing is a nuisance!

But one redeeming feature.

Default Route becomes easier.



Mask

"0"	0.0.0.0	default route.
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Mask "0" : 0.0.0.0.

(zero ones followed by 32-0 = 32 zeros)

Any destination address causes a fit!

OK if there is any other fit, that one is "longer".

Any fit has priority over default route

Sizes of Forwarding Tables.

In the backbone

(ATT, Sprint, MCI (WORLDWIDE)),

Routers have Forwarding Tables of

100 k - 200 k entries.

("Routes").

Note a sequential search!

Who has taken CIS 435?

(Data Structures and Algorithms).

1/ "at most ~~one~~ one fit":
use hash functions.

2/ "Longest Prefix":
use Trie (data structure).
(Cormen, p. 169,
don't worry).

Finally!

The IP Packet.

IP datagram.

Cornet, ch. 7.

IP packet header:

IPv4

0	34	78	15 16	31
Vers		HLLEN	TOS	Total Length
Identification			Flags	Fragmentation offset
Time to Live		Protocol	Header Checksum	
Source IP Address				
Dest. IP Address				
Options (if any).				

Version: Version of IP. 4 bits 63

IPv4: 4 0100

IPv6: Has different header format!
but also starts with a 4-bit
Version Field. ($= 6 = 0110$).

IPv4 and IPv6 are both currently in use.

We do IPv4:

HLEN Header Length. 4 bits.

Length of Header in ~~bits~~
32-bit words.

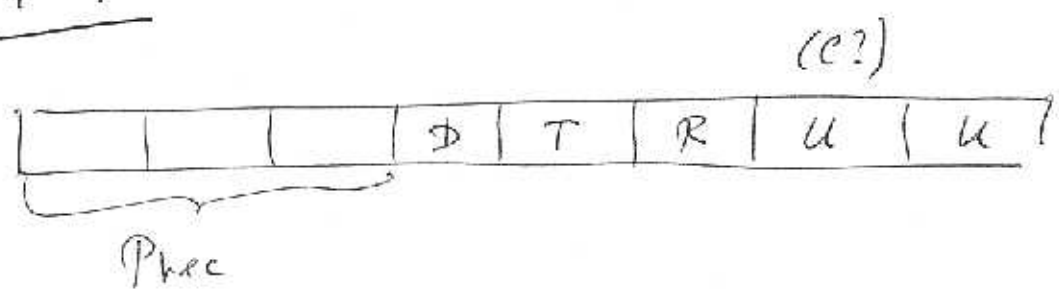
including options.

No option: HLEN = 5 = 0101

Q: How many words of options
can there be?
(max: $15 - 5 = 10$).

Type of Service ToS
Service Type.

W/e s :



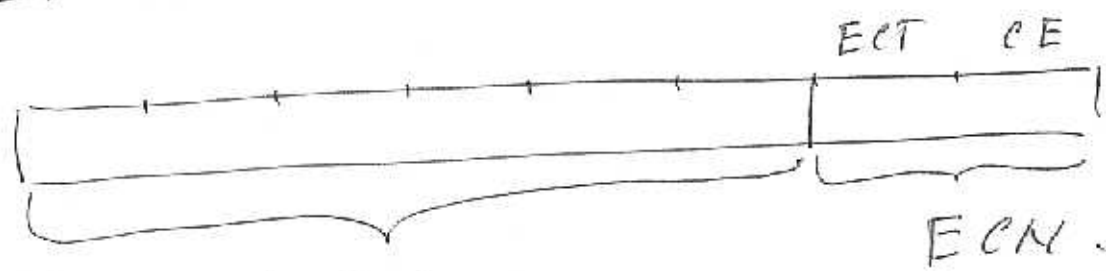
Prec: normal = 000 = 0
 netw. control = 111 = 7.

D T R C

Delay (per packet)

Throughput }
 Bandwidth } never used?
 Reliability }
 Cost (never used!)

Now. (Some ~ 2001?)



Diff Serv

ECN

Explicit
Congestion
Notification

Differentiated Services

Diff Serv

Differentiated Services Code Point.

ECT: "ECN Capable Transport"

CE: "Congestion Experienced"

Diff Serv

Replaces (?) Int Serv.

Integrated Services.

Various kinds of traffic, different needs.

Priorities.

SLAs Service Level Agreement.

Total Length: in Bytes
16 bits. Header + Data

Max: $2^{16} - 1 = 65535$

Max packet size ever
(in IP v4).

Many networks (LANs) do not allow
that size!

Ethernet: max 1526
 $8 + \underbrace{6 + 6 + 2} + 1500 + 4$

$26 = 8 + 6 + 6 + 2 + 4$

$14 = 6 + 6 + 2$

MTU = 1500

Maximal Transfer Unit.

Largest data part in frame.

Identification:
16 bits.

Ident-Fies datagram

IP Source:
increase identification by 1 for
every p. datagram sent,
regard less of "flow".
(not rule, but custom).

Flags: 3 bits
Fragmentation
Offset: 13 bits } later
(later today?)

Time to Live 8 bits
TTL.

Used to be: seconds.

Now: Hopcount.

Every router:

packet comes in.

decrease TTL (TTL--).

if TTL=0: discard.

(& send warning)

Then do "forwarding" etc

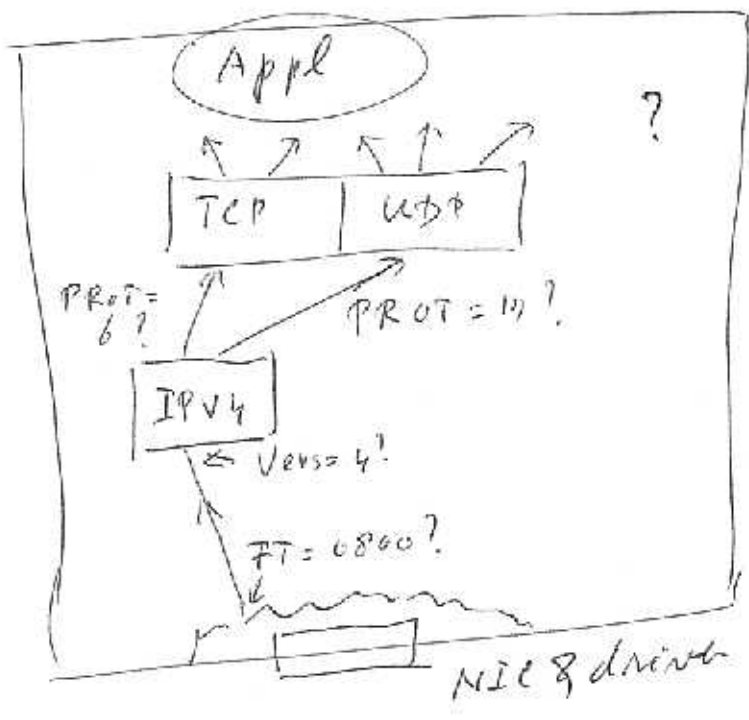
Protocol. 8 bits.

"Next higher protocol"

"What is in the data"

TCP: 6 = 0000 0110

UDP: 17 = 0001 0001



Redundancy!

Header Checksum. 16 bits

"like CRC". but different.

Header only.

Source IP address 32 bits

Dest IP address 32 bits.

Back to Fragmentation.

