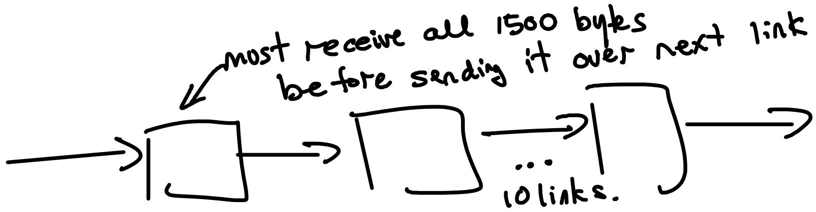
Lecture 13

Exercise 1: How long does it take to transmit a 1500-byte packet over a store-and-forward network with 10 hops at the DS1 rate? At a 1 Gb/s rate? How does this compare to the propagation delay for a 2000 km path?

$$10 \times \frac{1500 \times 8}{1.5 \times 10^6} \approx \frac{1 \times 10^5}{1.5 \times 10^6}$$

$$\approx 75 ms = 75 \times 10^{-3}$$

@ 1 Gb/s delay is ≈ ≈ 100 μs



$$\frac{2 \times 10^6 \, m}{2 \times 10^8 \, m/s} = 1 \times 10^{-2} \, s. \quad 10 ms.$$

conclusion: at 1.5 Mb/s store & forward delay is significant (e.g. comparable to propagation delay)

at 1 Gb/s store & forward delay is negligible.

Exercise 2: What fraction of an ATM frame is overhead? How large does the payload of an Ethernet frame need to be to achieve the same efficiency (an Ethernet frame has a 2×6-byte address field, a 2-byte length/type field and a 4-byte CRC)?

header → $\frac{5}{53}$ ≈ 10 % overhead
frame →

Ethernet header & trailer (overhead):
- 2 X 6 = 12 addresses
- + 2 type/length
- + 4 CRC
- 18 bytes

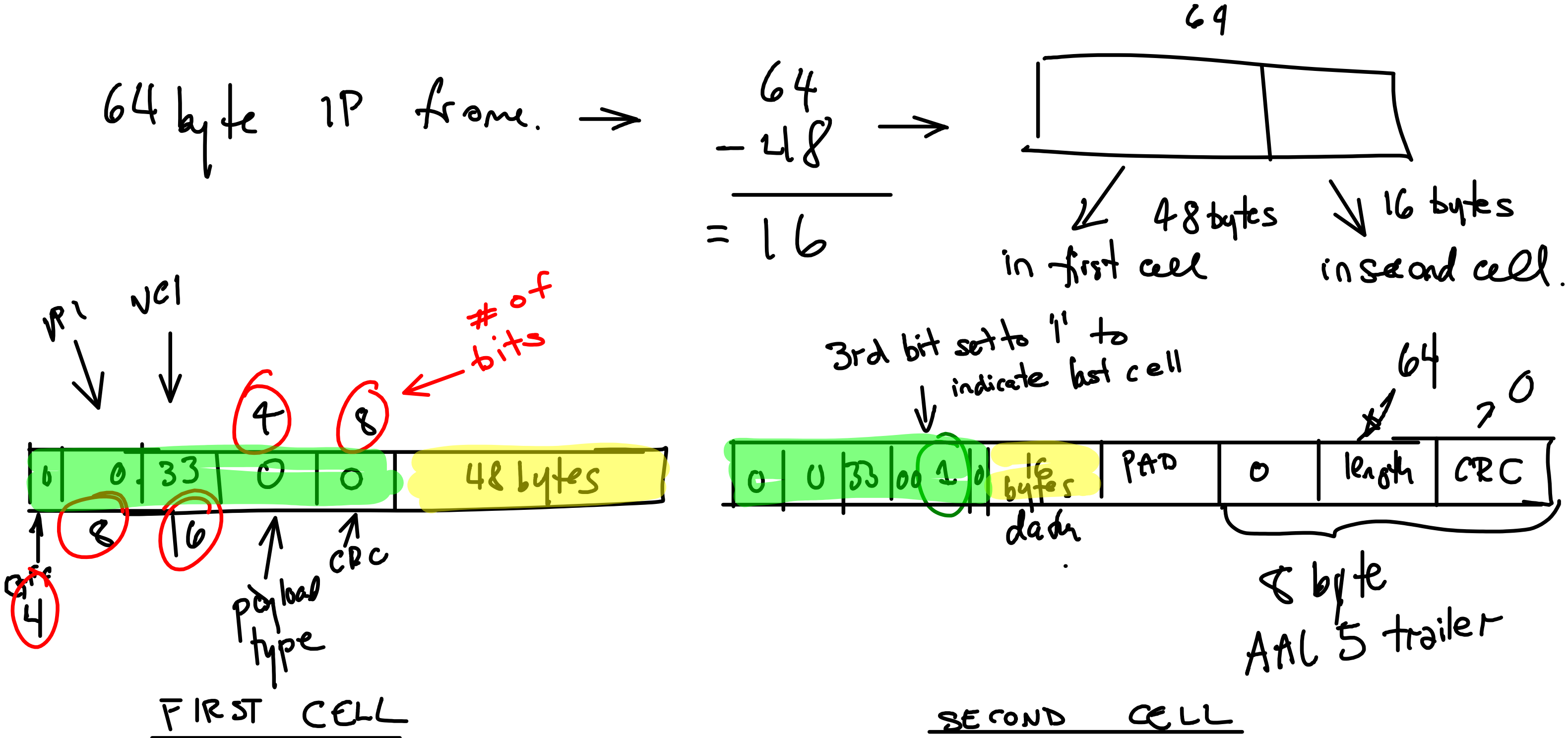
Ethernet overhead is 18 bytes:

for 10% overhead:

$$\begin{array}{r} 180 \text{ bytes} \\ -18 \\ \hline 162 \text{ bytes} \end{array}$$

⇒ Ethernet frames >162 bytes have less overhead than ATM frames.

Exercise 3: A 64-byte IP frame is being transmitted over ATM to VPI/VCI 0.33. Calculate the contents of the ATM cell headers (set the CRCs to zero).



Exercise 4: The diagram below[2] shows the switching tables at each port of a small ATM network. Where do the frames labelled A and C end up?

following the switching tables that define output ports & label swaps:

A → B

C → D