

Lecture 9 - ATM

$$(193 \times 8 \text{ kb/s})$$

$$\downarrow$$

$$24 \times 8 + 1$$

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?

$$\left(\frac{1500 \times 8}{1.544 \text{ Mb/s}} \times 10 \right) \approx 78 \text{ ms}$$

$$@ 1 \text{ Gb/s} \rightarrow 120 \mu\text{s}$$

$$\text{delay} = \frac{2000 \times 10^3}{3 \times 10^8}$$

$$\approx 6.7 \text{ ms}$$

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 two 6-byte address fields, a 2-byte length/type field and a 4-byte CRC)?

$$\text{ATM}$$

$$\frac{5}{53} = \frac{(6 + 6 + 2 + 4)}{18 + X}$$

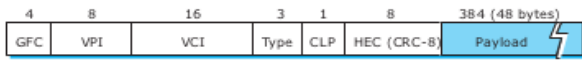
$$(48 + 5)$$

$$X = \frac{53}{5} \frac{18}{1} - 18$$

$$\approx 173 \text{ bytes}$$

Exercise 3: A 96-byte Ethernet frame is being transmitted over ATM to VPI/VCI 0.33. How many ATM cells are required to transmit this frame? Calculate the contents of the ATM cell headers and contents of the final cell (set GFC, Type/CLP and CRCs to zero).

need 3 cells 48 + 48 + 0 bytes.



The meanings of the fields are:

- GFC: used for flow control, typically set to zero. →
- VPI, VCI: virtual path (8/12 bits) and circuit (16 bit) identifiers: the destination address. All packets on the same virtual path flow through the same sequence of ATM switches. →
- Payload Type: flag bits, the third bit is set to '1' to indicate that this is the last ATM frame of a higher-level frame. →
- CLP: Cell Loss Priority bit. Indicates the cell is lower priority and can be dropped if the network is congested. →
- HEC: header error check, an 8-bit CRC on the header only. →

FIRST
2 CELLS

0
0.33
0
0
0

LAST
CELL

0
0.33
1
0
0
0
0
0
0
0

0000
0x0 0x0021
0 1
0 0
0 0
0 0

Exercise 4: The diagram below² shows the switching tables at each port of a small ATM network. Where do the frames labelled A and C end up?