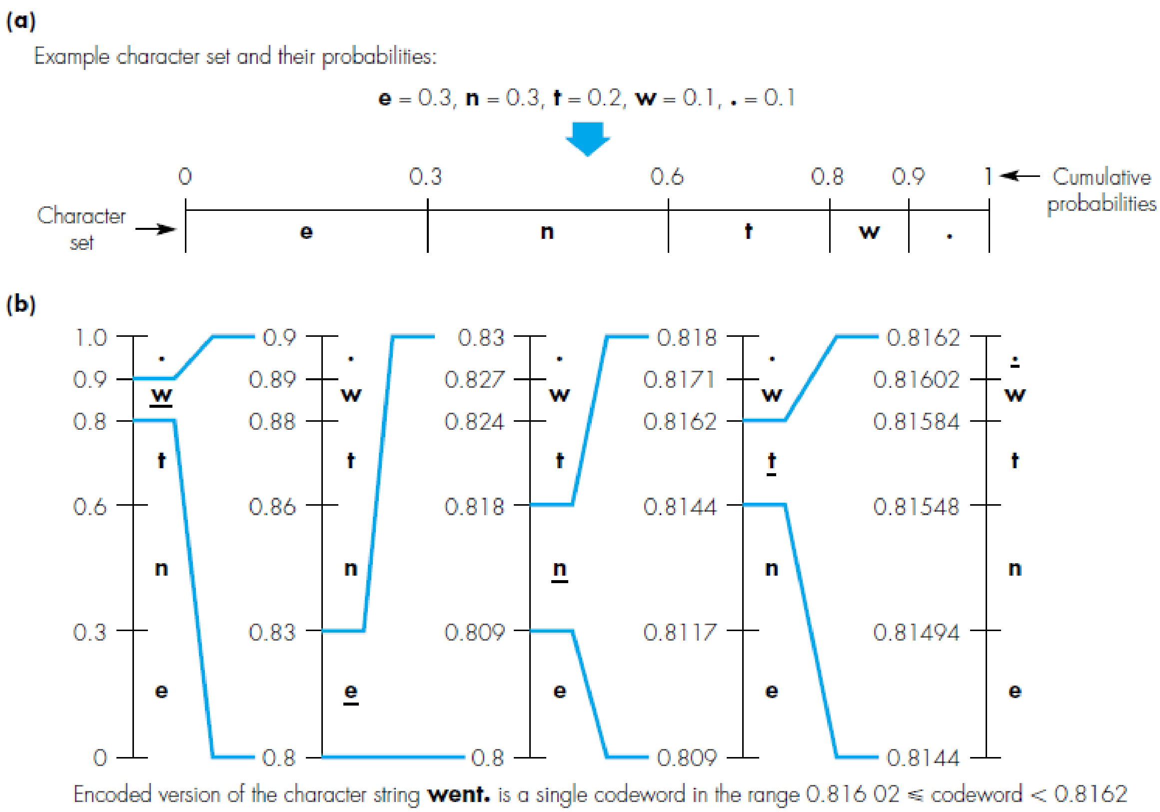
Huffmann Coding:

→ It is an entropy based coding technique.
→ An assumption is made and only one code is encoded at a time.
→ It is an optimal coding method.
→ It has a variable length output.

Arithmetic Coding:

→ It is also an entropy based coding.
→ No assumptions are made and based on probabil[ity] of chances, the codes are encoded.
→ All the codes are encoded with arithmetic values from 0 to 1.
→ It is a much more slower technique than Huffmann coding.
→ The efficiency of arithmetic coding is higher tha[n] Huffmann coding.


(a)
Example character set and their probabilities:
e = 0.3, n = 0.3, t = 0.2, w = 0.1, . = 0.1
0
0.3
0.6
0.8
0.9
1
Cumulative probabilities
Character set
e
n
t
w
.
(b)
1.0
0.9
0.8
0.6
0.3
0
0.9
0.89
0.88
0.86
0.83
0.8
0.83
0.827
0.824
0.818
0.809
0.8
0.818
0.8171
0.8162
0.8144
0.8117
0.809
0.8162
0.81602
0.81584
0.81548
0.81494
0.8144
Encoded version of the character string went. is a single codeword in the range 0.816 02 ≤ codeword < 0.8162

2.

So the Probability of code word in terms of accuracy is,

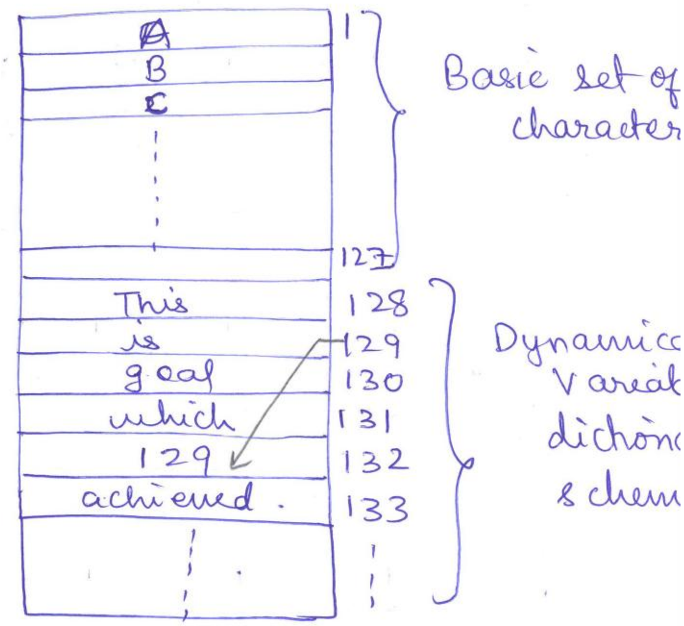
$$0.8160 < \text{codeword} < 0.8162$$

Arithmetic code word.

Q-6 LZW Algorithm

Lempel Ziv Welsch algorithm is desig[...] with a dynamically changing dictionary and is used for compression of images

LZW scheme



$x = 0$
$y = 1$
$z = 2$

→ In this scheme, initially the code words are assigned with values such as $x = 0$, $y = 1$, $z = 2$.

→ S → It is the first character in the string
C → next character in the string.
S = S+C If code word already exists
S = C If code word does not exist.

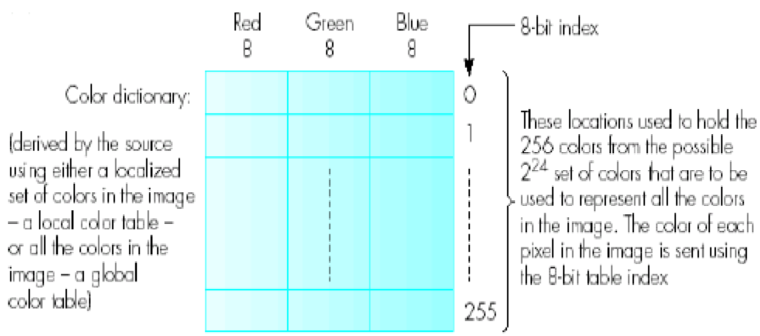
String: XY XYYXYZ XY XY YX.

S	C	o/p	new	string table
X	Y	0	4	XY
Y	X	1	5	YX
X	Y			
XY	Y	4	6	XYY
Y	X			
YX	Y	5	7	YXY
Y	Z	1	8	YZ
Z	X	2	9	ZX
X	Y			
XY	X	4	10	XYX
X	Y			
XY	Y			
XYY	X	6	11	XYYX
X	EOF			

The Output Code for LZW algorithm is 01451246 //

2b.

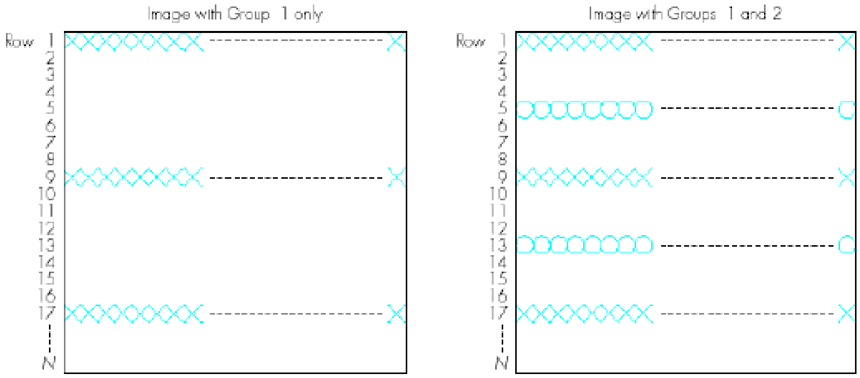
Image Compression – GIF compression Principles



The color dictionary, screen size, and aspect ratio are sent with the set of indexes for he image.

• The graphics interchange format is used extensively with the Internet for the representation and compression of graphical images

Image Compression – GIF interlaced mode



1/8 and 1/8 of the total compressed image

• GIF also allows an image to be stored and subsequently transferred over the network in an ***interlaced mode***; useful over either low bit rate channels or the Internet which provides a *variable transmission rate*

Image Compression – GIF

• Although colour images comprising 24-bit pixels are supported GIF reduces the number of possible colours that are present by choosing 256 entries from the original set of 2^{24} colours that match closely to the original image

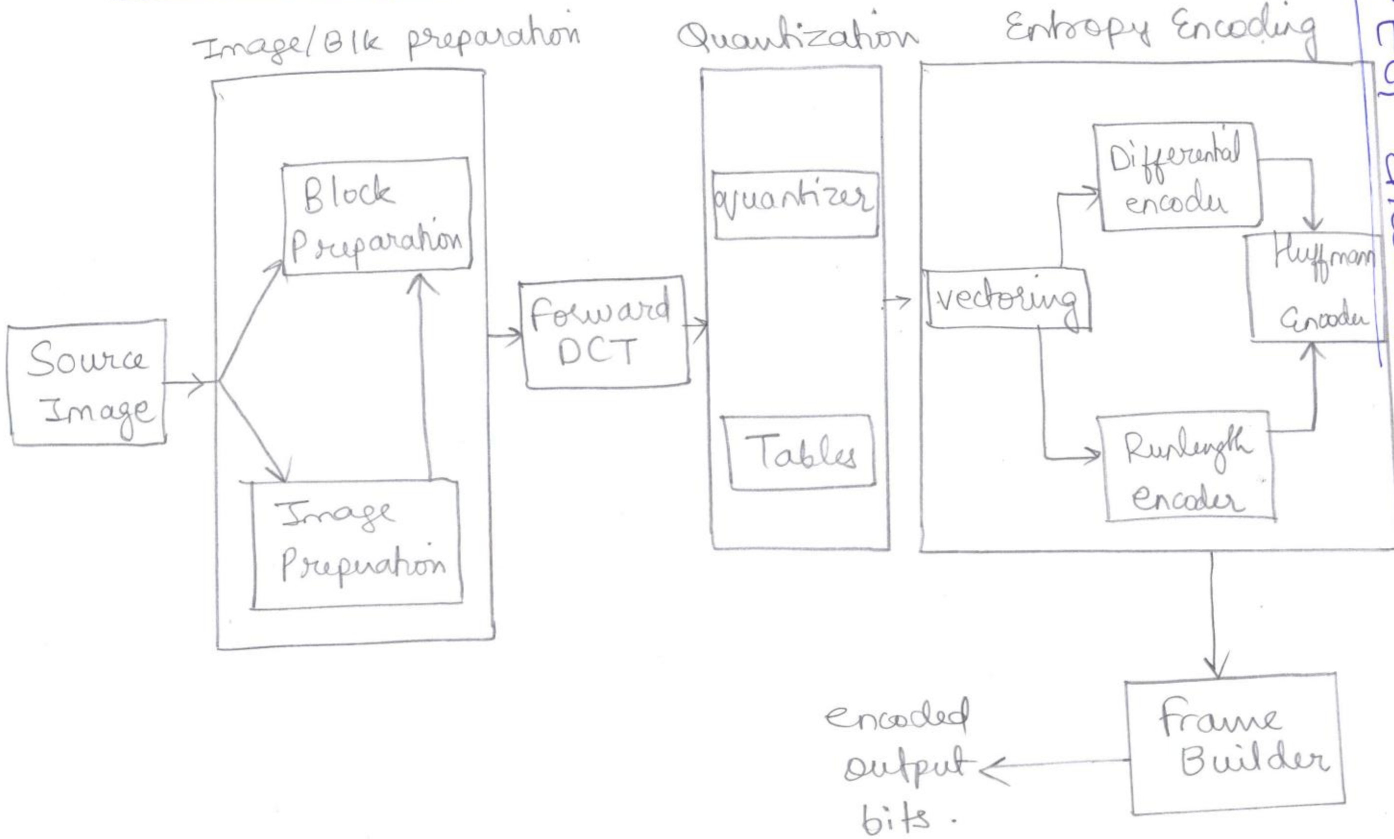
• Hence instead of sending as 24-bit colour values only 8-bit index to the table entry that contains the closest match to the original is sent.This results in a 3:1 compression ratio

• The contents of the table are sent in addition to the screen size and aspect ratio information

•The image can also be transferred over the network using the interlaced mode

Q-1- JPEG Encoder

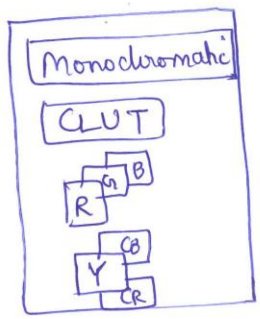
Block Diagram



→ The main components of a JPEG are :

1. Image / Block preparation
2. Forward DCT
3. Quantization
4. Entropy Encoding
5. Frame Building.

(1) Image / Block Preparation :



In this block, the in
about the image s
as CLUT, RGB va
and YC_bC_r is ext
for the preparation

(2) Forward DCT

→ The image data is transformed using t
Forward DCT function.

$$F[i,j] = \frac{1}{4} C(i) C(j) \sum_{x=0}^{7} \sum_{y=0}^{7} P[x,y] . \cos$$

$$. \frac{\cos (2y}{16}$$

where $P[x,y]$ is the input for 8×8
and $F[i,j]$ is the transformed outp

The DCT coefficients are then processed before quan

DCT coefficient	Difference	SSS value
13	13	4
12	−1	1
14	2	2
13	−1	1

The SSS value is the no. of bits used to rep the difference in the DCT coefficients.

(3) Quantisation :

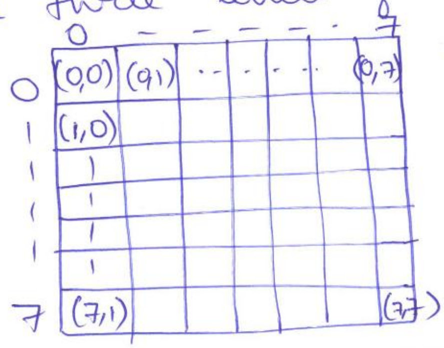
→ The 64 DCT coefficient must be quantised order to get a compressed image.

→ Thus discrete levels are used for quantizat specified in the quantization table.

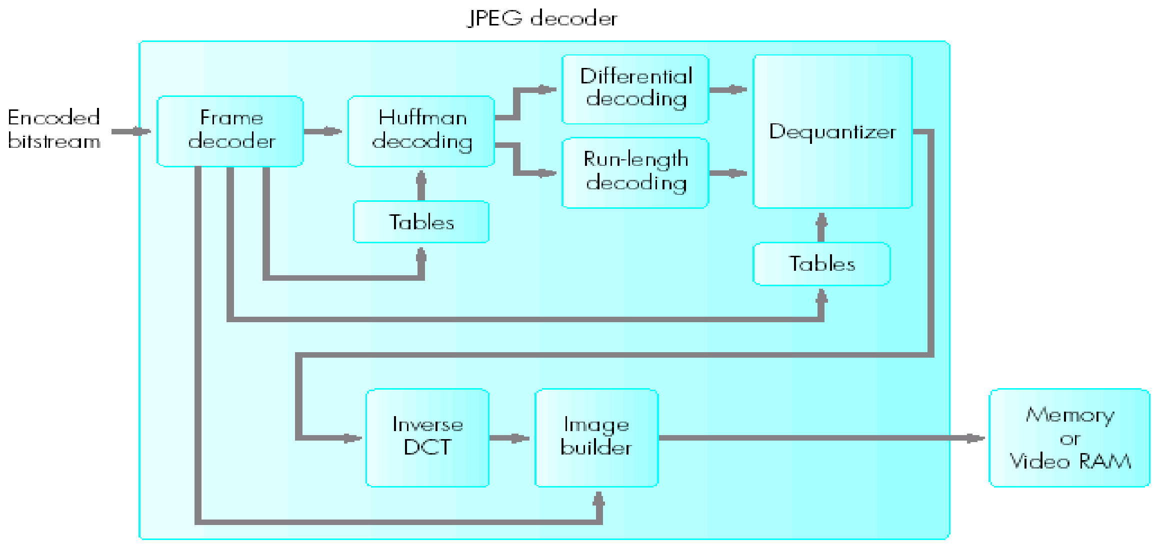
→ After all the coefficients are quantised, it g into the entropy encoding unit.

(4) Entropy Encoding :

Before three levels of encoding, vectoring



vector table with 64 with index running {63, 62, 61 - - - - -



JPEG decoding

• The two decompressed streams containing the DC and AC coefficients of each block are then passed to the differential and run-length decoders

• The resulting matrix of values is then dequantized using either the default or the preloaded values in the quantization table

• Each resulting block of 8X8 spatial frequency coefficient is passed in turn to the **inverse DCT** which in turn transforms it back to their spatial form

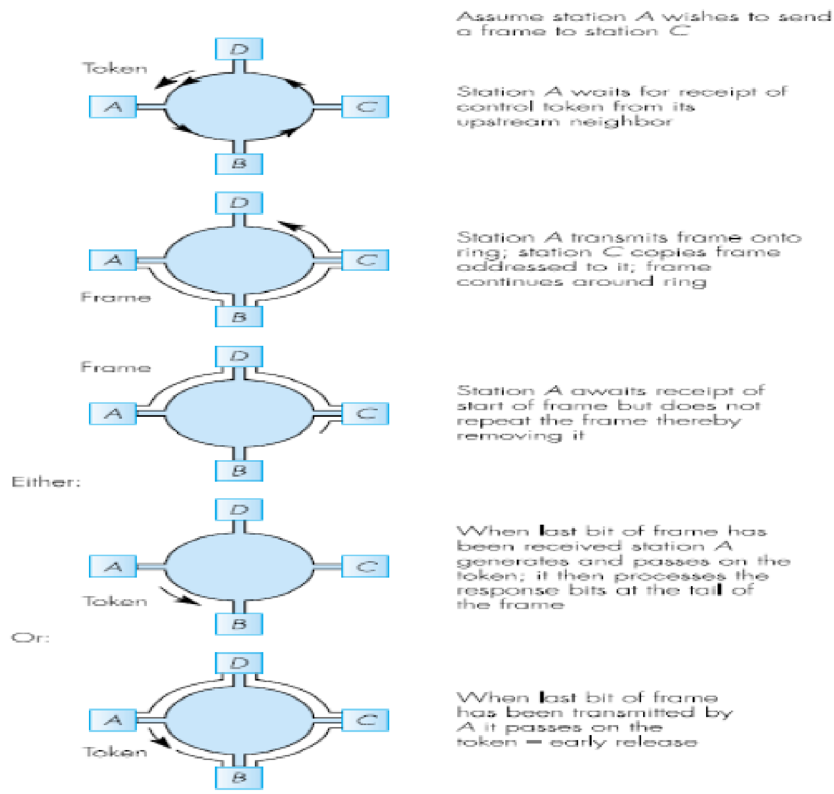
• The image builder then reconstructs the image from these blocks using the control information passed to it by the frame decoder

4.

Token ring

- All the stations are connected together by a set of unidirectional links in the form of a ring and all frame transmissions between any of the stations take place over it by circulating the frame around the ring
- Only one frame transfer can be in progress over the ring at a time

Token ring network operation



Token ring wiring configuration

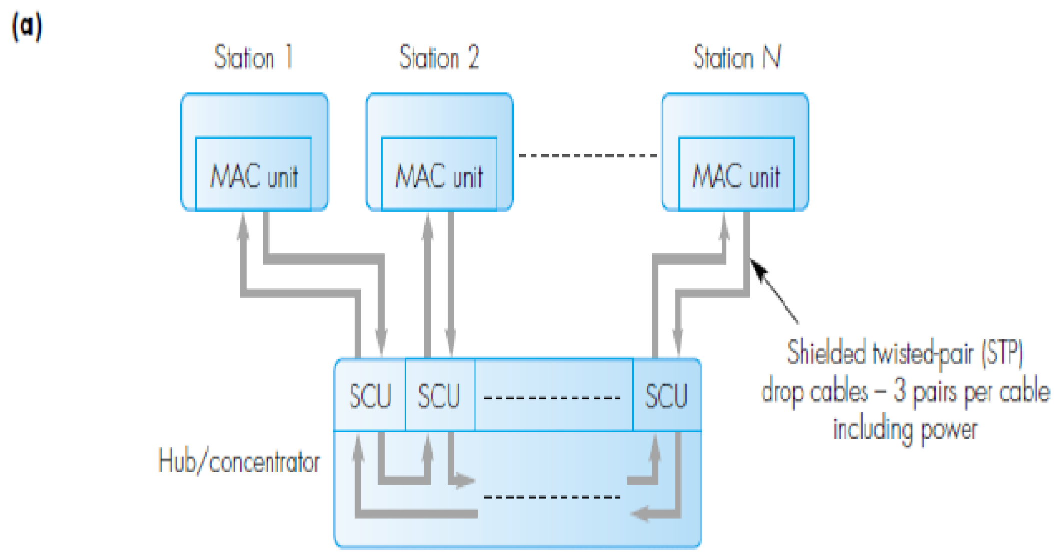
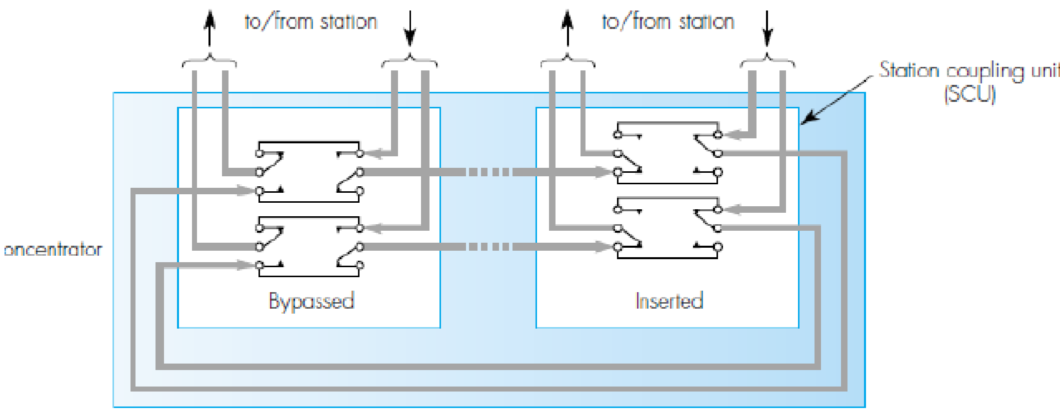
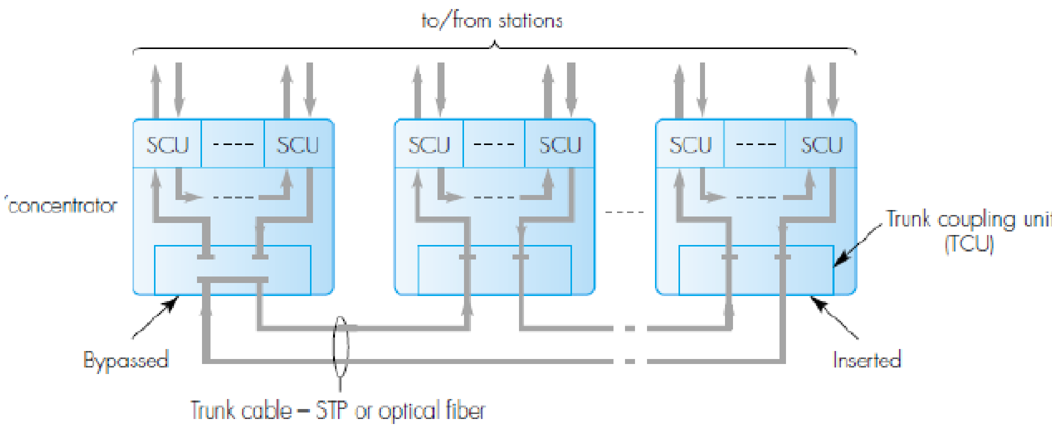


Figure 8.6 Token ring wiring configurations: (a) single hub; (b) station coupling unit; (c) multiple hubs/concentrators.


to/from station
to/from station
Station coupling unit
(SCU)
oncentrator
Bypassed
Inserted

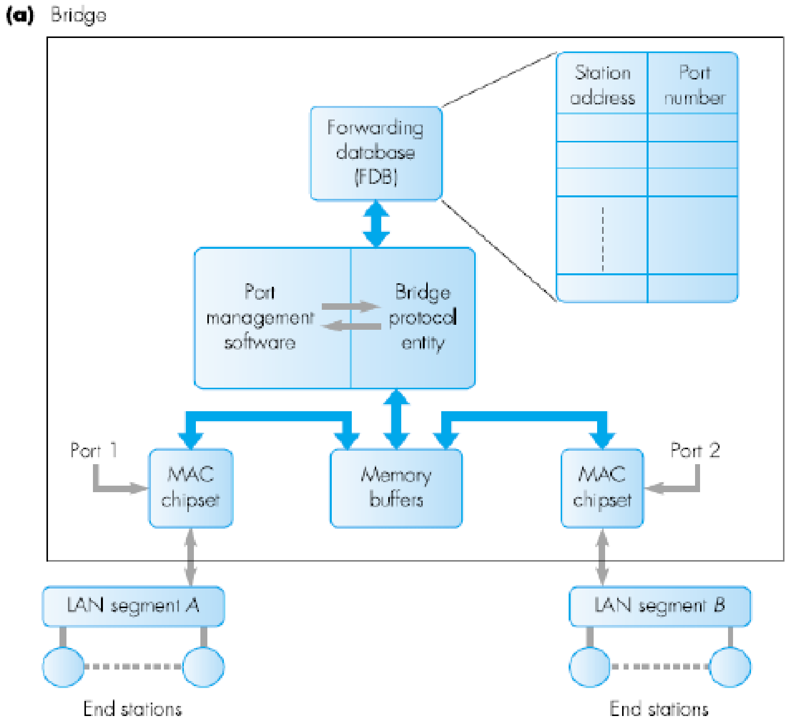

to/from stations
SCU
SCU
SCU
SCU
SCU
SCU
´concentrator
Trunk coupling unit
(TCU)
Bypassed
Inserted
Trunk cable – STP or optical fiber

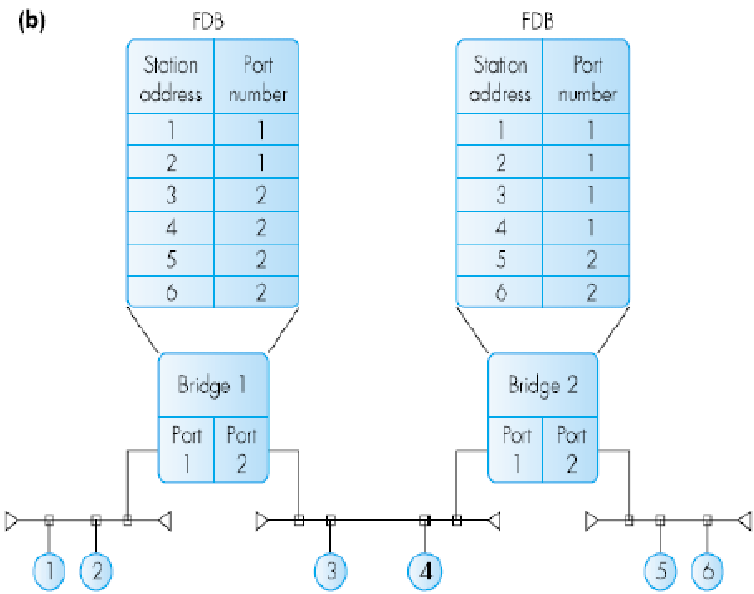
5.

8.5.1:Transparent bridges

- With a transparent bridge, as with a repeater,the presence of one (or more) bridges in a route between two communicating stations is transparent to the two stations . All routing decisions are made exclusively by the bridge(s)
- Fig 8.12
- Two steps- frame forwarding(filtering), learning
- A bridge maintains a forwarding database(routing directory)
- Bridge learning
  - Forwarding database to be created in advance

Figure 8.12 Transparent bridge schematic: (a) architecture; (b) application example.



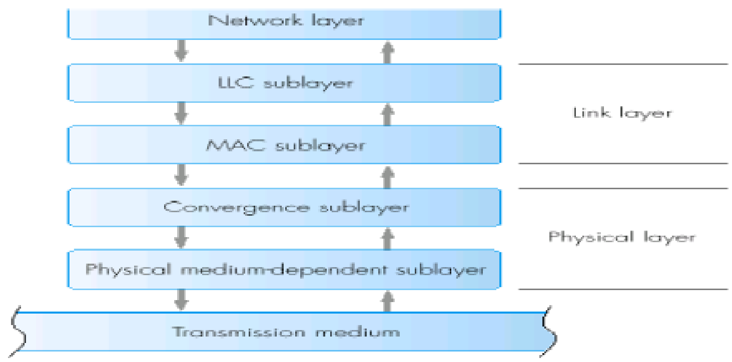

(b)
FDB
Station address
Port number
1 1
2 1
3 2
4 2
5 2
6 2
FDB
Station address
Port number
1 1
2 1
3 1
4 1
5 2
6 2
Bridge 1
Port 1
Port 2
Bridge 2
Port 1
Port 2
1
2
3
4
5
6

6.

8.8:LAN protocol

Figure 8.31 LAN protocols: (a) protocol framework; (b) examples.

(a)

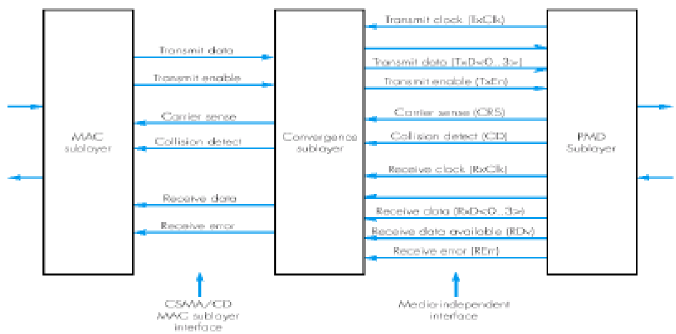


(b)

IEEE	802.1	Station management
	802.1d	Transparent bridges
	802.2	Logical link control (LLC)
	802.3	CSMA/CD (Ethernet) bus
	802.3u	Fast Ethernet
	802.3x	Hop-by-hop switch flow control
	802.3z	Gigabit Ethernet
	802.5	Token ring

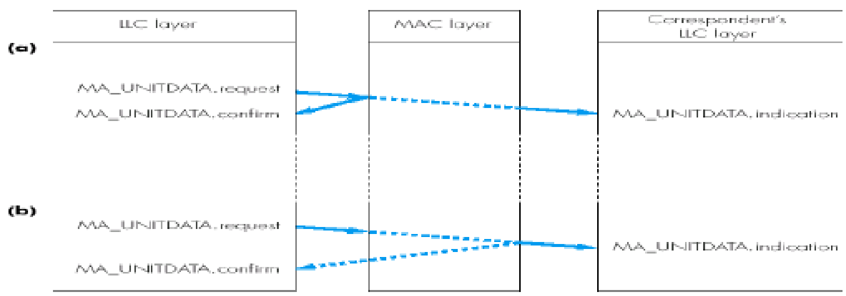
8.8.1:Physical layer

Figure 8.32 Fast Ethernet media-independent interface.



8.8.2:MAC sublayer

Figure 8.33 MAC user service primitives: (a) CSMA/CD; (b) token ring.

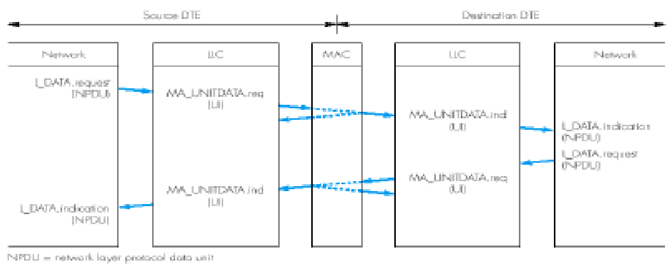


MAC Sub Layer

- Standard service primitives are
- MA_UNITDATA.request - includes required destination address, service data unit and the required class of service
- MA_UNITDATA.indication
- MA_UNITDATA.confirm - includes a parameter that specifies a success or failure of data primitive

8.8.3:LLC sublayer

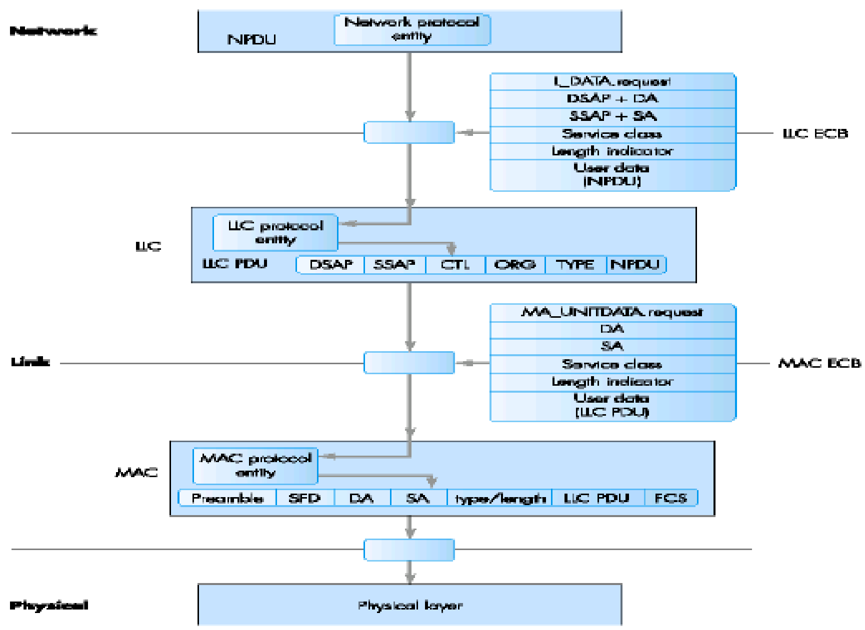
Figure 8.34 LLC/MAC sublayer interactions.



LLC Sub Layer

- LLC protocol is based on high level data link control (HDLC) protocol and supports both connectionless and connection oriented mode
- In the connectionless mode, the service primitive is L_DATA.request and data is transferred in an unnumbered information frame
- The parameters are source and destination address and the user data
- For internet applications, two field form is called subnet access protocol - SNAP header

Figure 8.35 Interlayer primitives and parameters.

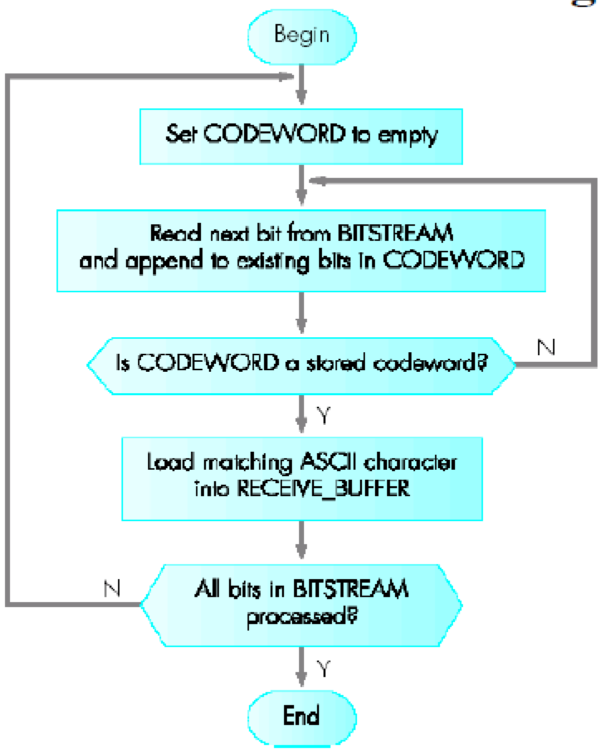


ECB = event control block

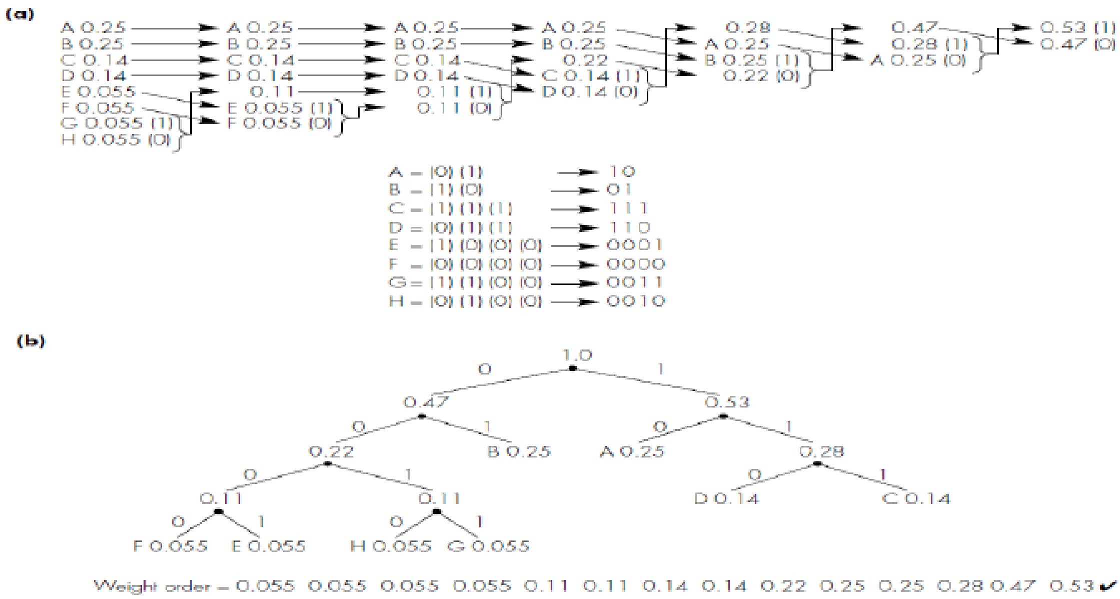
- The interaction between LLC and MAC is shown
- LLC sublayer reads the destination on source LLC service access point address, DSAP an SSAP from event control block ECB and adds at the head of LLC PDU with 8 bit control field, type field + LPDU and passed to MAC sublayer
- The service class used by the MAC sublayer protocol entity defines the priority for the frame
- On receipt of the request, the MAC protocol entity creates a frame ready for transmission on the link

7.

Text Compression – Flow chart of a suitable decoding algorithm



Decoding of received bitstream assuming codewords derived: decoding algorithm



Ex 3.3

AABBCAD

A=2bits

B=2bits

C=3bits

D=3bits

No .of bits = 2x2+2x2+3x1+2x1+3x1

=16bits