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C

L : 14:00-16:25 (M)

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W 1-12

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O : R 230, C B

E : @ . .

F M

A (50%)
R (30%)

/

F (20%)
A A /R

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1 C ;

2 A , ,

3 A H , LZW; O BWT

4 P

5 FM , ,

6 S O(), BWT

7 XML

8 XML

9 S

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E : BWT

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E : BWT

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E : BWT+RLE

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4 3 10 5 \$

HTTP

HTTP/1.1 200 OK

D : M , 23 M 2005 22:38:34 GMT

S : A /1.3.3.7 (U) (R -H /L)

L -M : W , 08 J 2003 23:11:55 GMT

E : "3 80 -1 6-3 1 03 "

A -R :

C -L : 438

C :

C -T : / ; =UTF-8

C -E :



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F : :// . . / / - / .

S
B
R
N
L
B
L

S

U

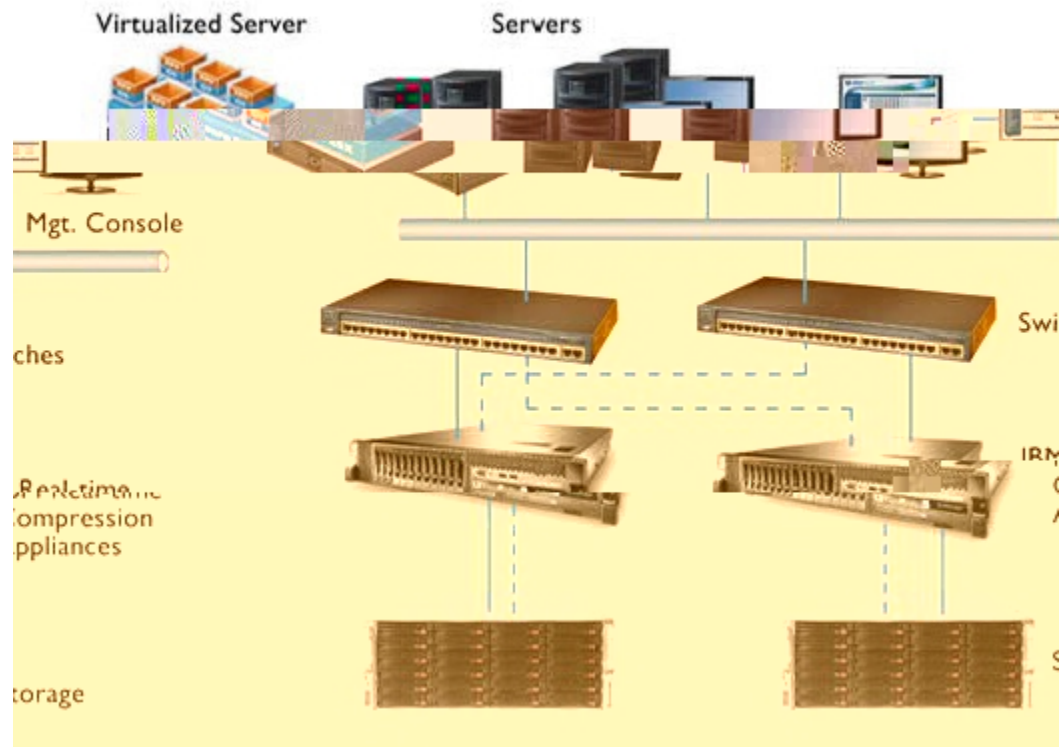
80%

C
E

O

C

,



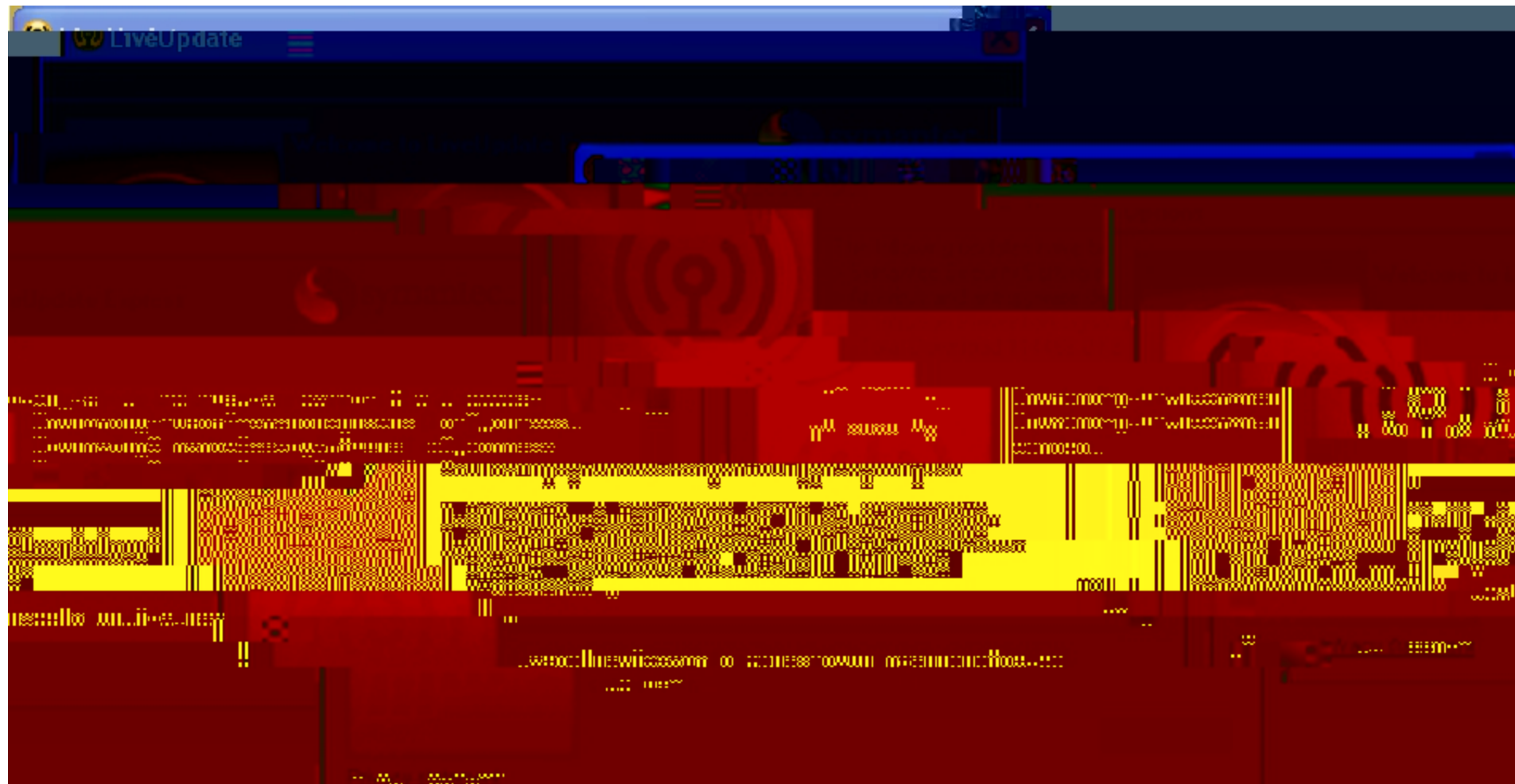
S

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S

. ., R , UI /

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D

. ., RSS

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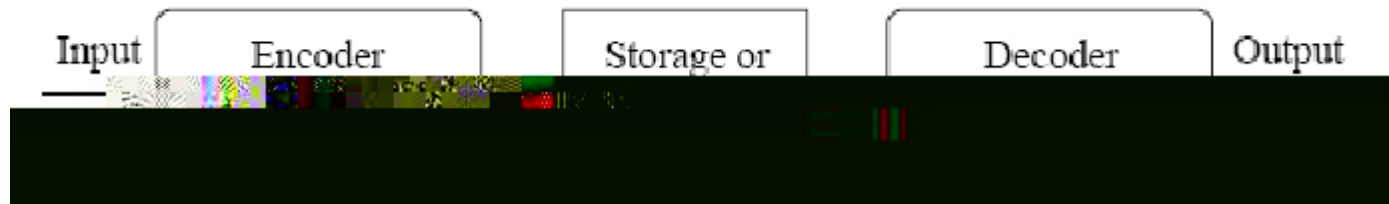
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I

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(I

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C

$$C \quad R = \frac{U \quad S}{C \quad S}$$

$$S \quad S = 1 - \frac{C \quad S}{U \quad S}$$

E

C

10MB

2MB

C

= 5

5:1

S

= 0.8

80%

T

C

(
(S)

(C)

S

()

T

(T)

B -

:

. ., ASCII

B -

:

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:

. ., H

V -

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:

. ., LZW

V -

:

. ., A

T (S)

S

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(. .,

CD-ROM)

D

A

(- -)

E

A: 1

B: 10

C: 11

D: 101

T

ABCD: 11011101

T

11011101: ?

U

U

F

1, 100000, 00

,

E

S	C
	00
	01
	10
	110
	111

E

S	C
	00
	01
	10
	110
	111

0100010011011000

E

S	C
	00
	01
	10
	110
	111

0100010011011000

S

M

E. ., H

D

M

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A

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• •,

H

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A

A

H

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M

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$L \geq 2(N)$

E

: M

5

3

$(L \geq 25)$

V



A

T

E. . H

, A

E

W

?

A

: S

E (H)

$$\sum_{i=1}^n -p(s_i) \log_2 p(s_i)$$

E

A S = A, B
(A) = 0.4; (B) = 0.6

C E (H)
-0.4* 20.4 + -0.6* 20.6 = .97

M (H)

E : ASCII

0 nul	1 soh	2 stx	3 etx	4 eot	5 enq	6 dck	7 bel
8 bs	9 ht	10 nl	11 vt	12 np	13 cr	14 so	15 si
16 dle	17 dc1	18 dc2	19 dc3	20 dc4	21 nak	22 syn	23 etb
24 can	25 em	26 sub	27 esc	28 fs	29 gs	30 rs	31 us
32 sp	33 !	34 "	35 #	36 \$	37 %	38 &	39 '
40 (	41)	42 *	43 +	44 ,	45 -	46 .	47 /
48 0	49 1	50 2	51 3	52 4	53 5	54 6	55 7
56 8	57 9	58 :	59 ;	60 <	61 =	62 >	63 ?
64 @	65 A	66 B	67 C	68 D	69 E	70 F	71 G
72 H	73 I	74 J	75 K	76 L	77 M	78 N	79 O
80 P	81 Q	82 R	83 S	84 T	85 U	86 V	87 W
88 X	89 Y	90 Z	91 [	92 \	93]	94 ^	95 _
96 `	97 a	98 b	99 c	100 d	101 e	102 f	103 g
104 h	105 i	106 j	107 k	108 l	109 m	110 n	111 o
112 p	113 q	114 r	115 s	116 t	117 u	118 v	119 w
120 x	121 y	122 z	123 {	124	125 }	126 ~	127 del

ASCII

E : SPACE 32 00100000.

122 01111010

256

$$P() = 1/256$$

0 1/P()

$$= 256 = 8$$

D A. H

D H

H _____,

_____ . I

M

I

T

(MIT)

F : W

H

1. T

(, ,)

2. C

3. R

E : H

S	F
	30
	30
	20
	10
	10

E

S	F	H
	30	
	30	
	20	
	10	
	10	

30

30

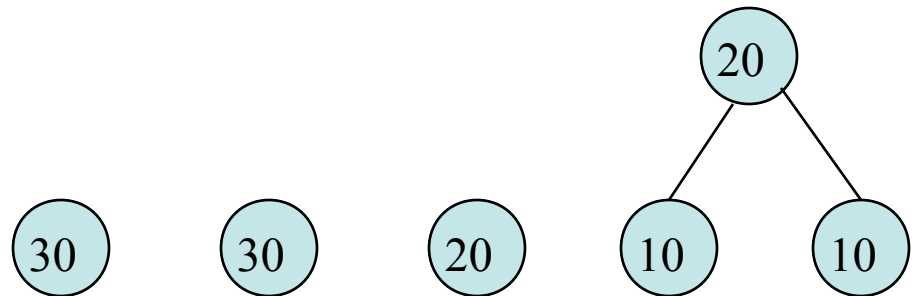
20

10

10

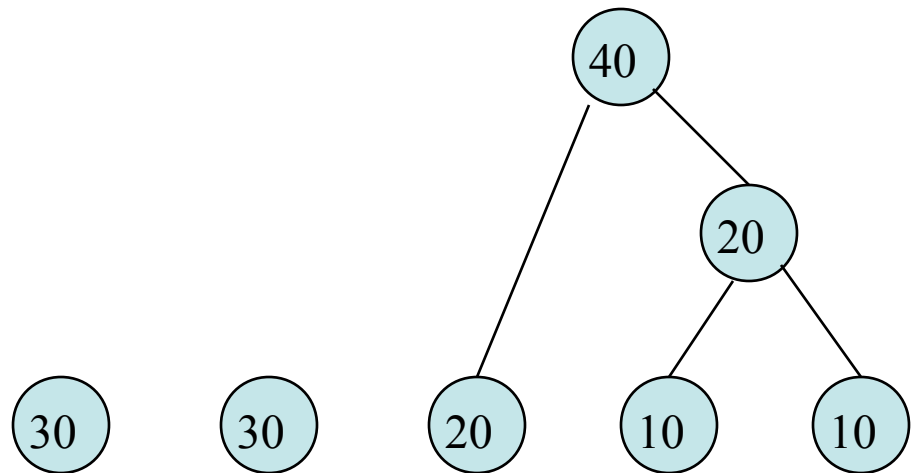
E

S	F	H
	30	
	30	
	20	
	10	
	10	



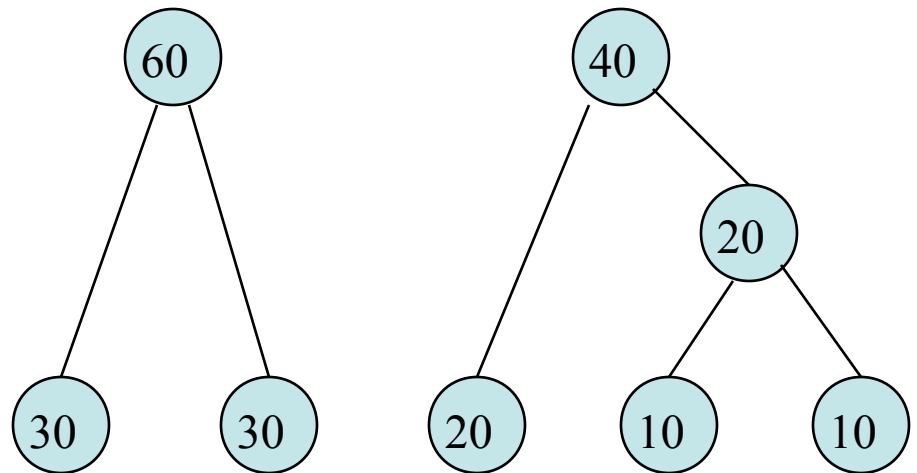
E

S	F	H
	30	
	30	
	20	
	10	
	10	



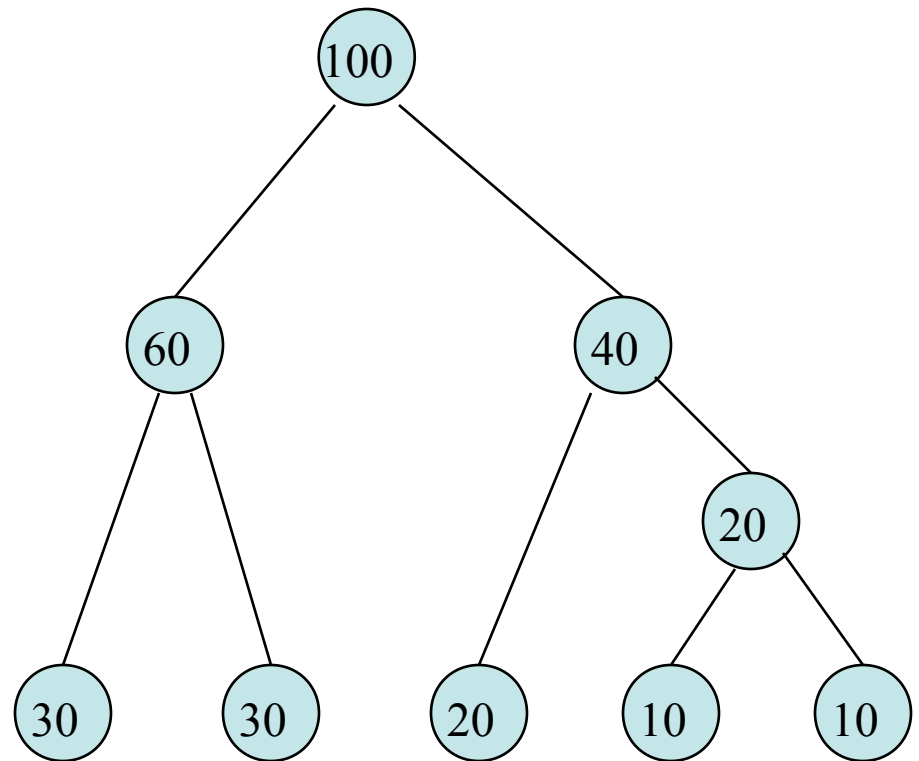
E

S	F	H
	30	
	30	
	20	
	10	
	10	



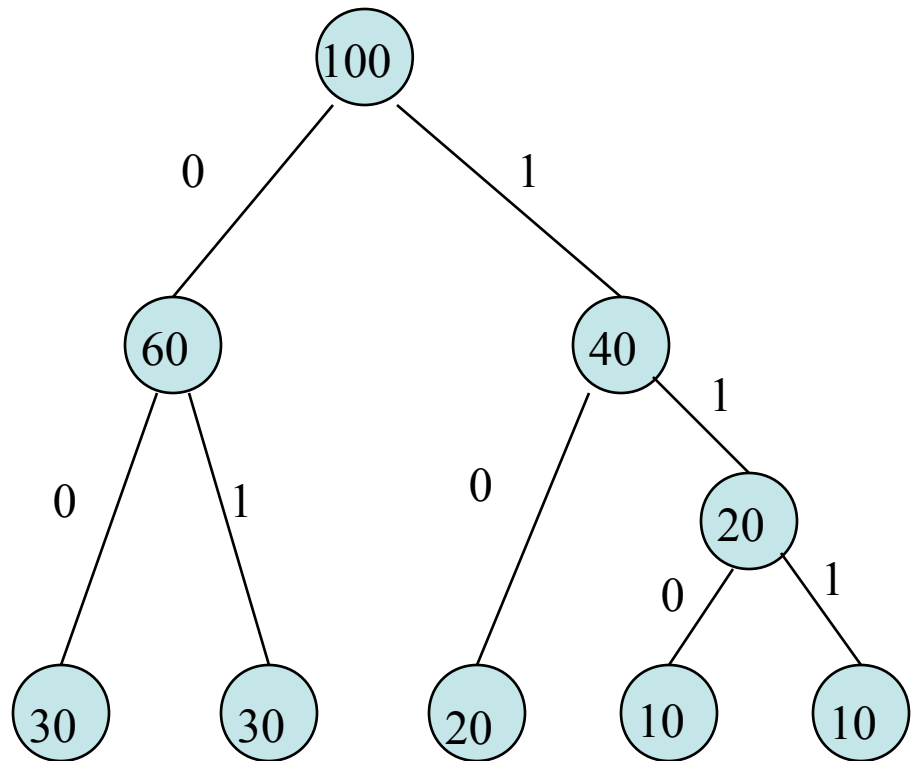
E

S	F	H
	30	
	30	
	20	
	10	
	10	



E

S	F	H
	30	00
	30	01
	20	10
	10	110
	10	111



A

L

$$= (30*2 + 30*2 + 20*2 + 10*3 + 10*3) / 100$$

$$= 220 / 100$$

$$= \underline{\underline{2.2}}$$

A

L

$$= (30*2 + 30*2 + 20*2 + 10*3 + 10*3) / 100$$

$$= 220 / 100$$

$$= \underline{2.2}$$

B

3

5

.

E

$$\begin{aligned}
 H &= -0.3 * \frac{0.3}{10} + -0.3 * \frac{0.3}{10} + -0.2 * \frac{0.2}{5} + -0.1 * \frac{0.1}{10} + -0.1 * \frac{0.1}{10} \\
 &= -0.3 * (-1.737) + -0.3 * (-1.737) + -0.2 * (-2.322) + -0.1 * (-3.322) + -0.1 * (-3.322) \\
 &= 0.3 * \frac{10/3}{10} + 0.3 * \frac{10/3}{10} + 0.2 * \frac{5}{5} + 0.1 * \frac{10}{10} + 0.1 * \frac{10}{10} \\
 &= 0.3 * 1.737 + 0.3 * 1.737 + 0.2 * 2.322 + 0.1 * 3.322 + 0.1 * 3.322 \\
 &= 2.17
 \end{aligned}$$

A

S= , , , 4, 2, 1, 1

H = $4/8^*$ ${}_22 + 2/8^*$ ${}_24 + 1/8^*$ ${}_28 + 1/8^*$ ${}_28$

H = $1/2 + 1/2 + 3/8 + 3/8 = 1.75$

$\Rightarrow 0$ $\Rightarrow 10$ $\Rightarrow 110$ $\Rightarrow 111$

M : $\Rightarrow 0\ 10\ 110\ 111\ 0\ 10\ 0\ 0$

A L = 14 / 8 = 1.75

I , . . , ${}_24 = 2$

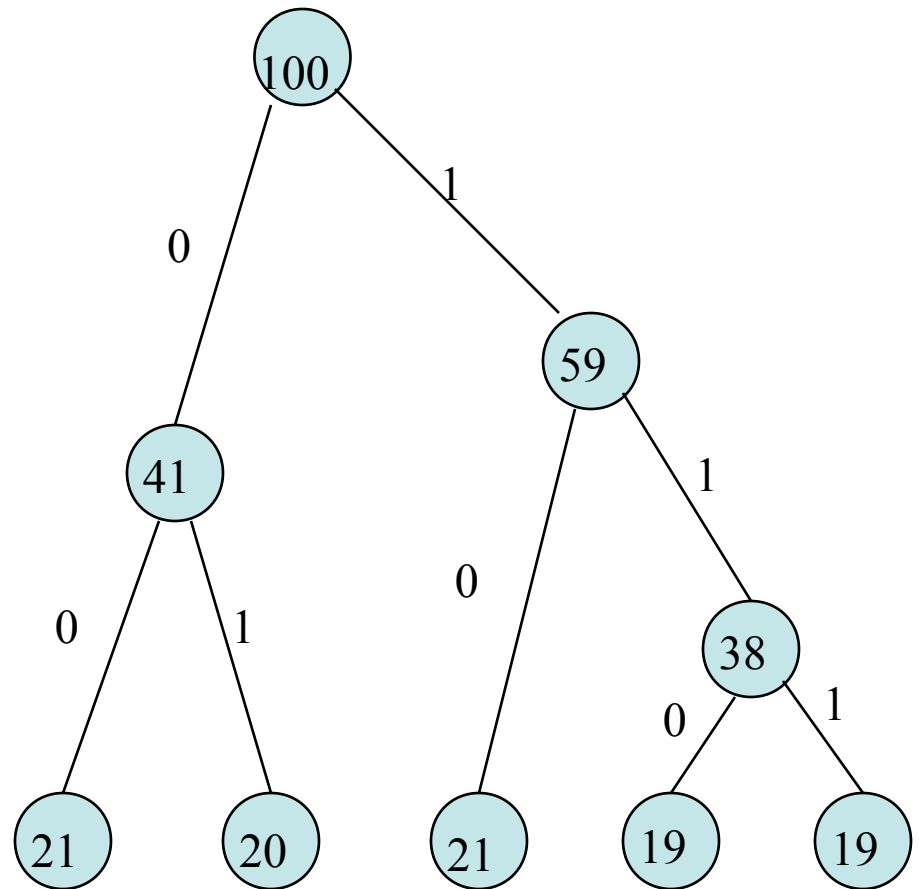
H

S	F	H
	3021	
	3021	
	2020	
	1019	
	1019	

T : 100

H

S	F	H
	21	00
	21	10
	20	01
	19	110
	19	111



H

?

$$\begin{aligned} H &= 0.21 \frac{100/21 + 0.21}{5 + 0.19} + 0.21 \frac{100/21 + 0.2}{100/19} \\ &= 0.21 * 2.252 + 0.21 * 2.252 + 0.2 * 2.322 + \\ &\quad 0.19 * 2.396 + 0.19 * 2.396 \\ &= \underline{2.32} \end{aligned}$$

$$\begin{aligned} L &= (21 * 2 + 21 * 2 + 20 * 2 + 19 * 3 + 19 * 3) / 100 \\ &= \underline{2.38} \end{aligned}$$

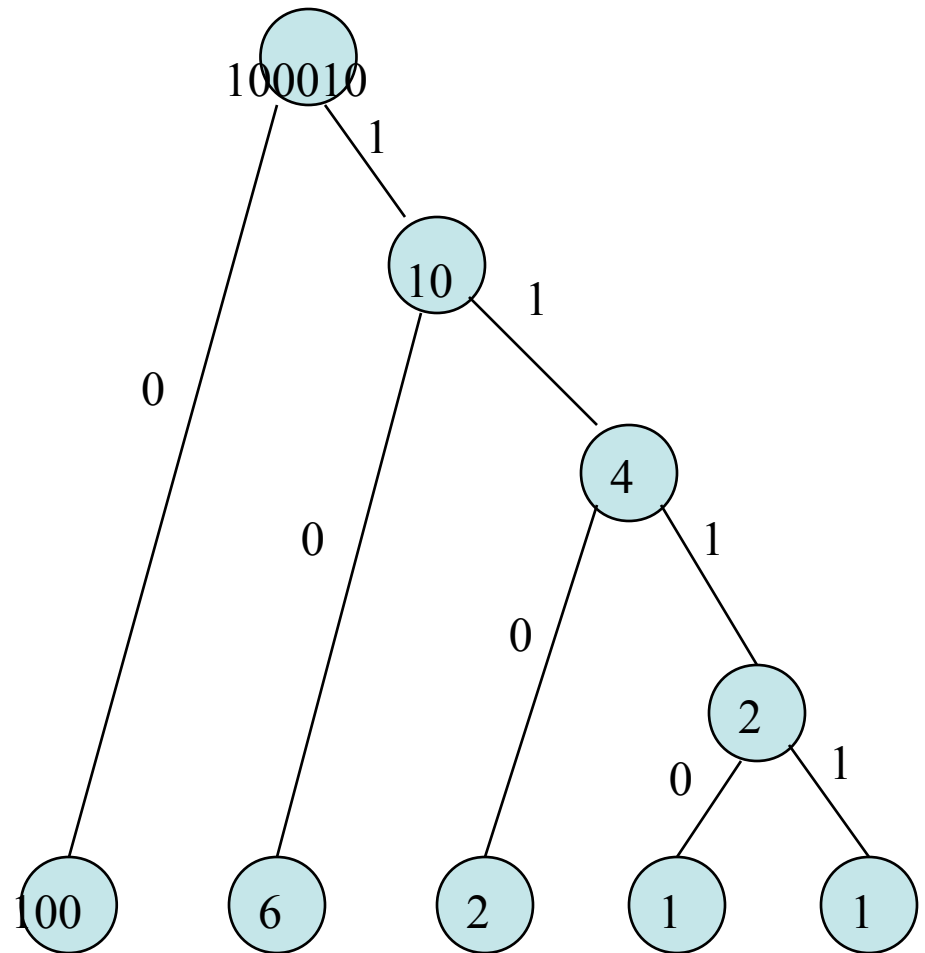
H

S	F	H
	30100000	
	306	
	202	
	101	
	101	

T : 100010

H

S	F	H
	100000	0
	6	10
	2	110
	1	1110
	1	1111



H

?

$$\begin{aligned} H &= 0.9999 \quad 1.0001 + 0.00006 \quad 16668.333 \\ &+ \quad + 1/100010 \quad 100010 \\ &\approx 0.00 \end{aligned}$$

$$\begin{aligned} L &= (100000*1 + \quad)/100010 \\ &\approx 1 \end{aligned}$$

P

H

H

#

.

E. .,

(3) = 1.585

H

2

N

-

.

=> A

A

M :
BILL GATES

Character	Probability

A

Character	Probability	Range
-----	-----	-----
SPACE	1/10	0.00 - 0.10
A	1/10	0.10 - 0.20
B	1/10	0.20 - 0.30
E	1/10	0.30 - 0.40
G	1/10	0.40 - 0.50
I	1/10	0.50 - 0.60
L	2/10	0.60 - 0.70

A

S 0.0

S 1.0

W

=

-

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=

+

*

(

)

=

+

*

(

)

E

W

A

New Character	Low value	High Value
-----	-----	-----
	0.0	1.0
B	0.2	0.3
I	0.25	0.26
L	0.256	0.258
L	0.2572	0.2576
SPACE	0.25720	0.25724
G	0.257216	0.257220
A	0.2572164	0.2572168
T	0.25721676	0.2572168
U	0.257216772	0.257216776
S	<u>0.2572167752</u>	0.2572167756

E

C

L

:

$$= 0.258 \quad 0.256 = 0.002$$

$$= 0.256 + 0.002 * 0.8 = 0.2576$$

$$= 0.256 + 0.002 * 0.6 = 0.2572$$

D



D

=

-

A

Encoded Number	Output Symbol	Low	High	Range
-----	-----	---	----	-----

A	L,	0.72167752.
	L	

$$= 0.6083876$$

A

A : A 90% END 10%

T : AAAAAAAAA



A

A : A 90% END 10%

T : AAAAAAA

New Character	Low value	High Value
-----	-----	-----
	0.0	1.0
A	0.0	0.9
A	0.0	0.81
A	0.0	0.729
A	0.0	0.6561
A	0.0	0.59049
A	0.0	0.531441
A	0.0	0.4782969
A	0.0	0.43046721
END	0.43046721	0.43046721

. ., 0.45

L

R -

S

H

A

D

L

Z

S

A

D

P :

I :

LZ :

U

S ()

N /

LZ77 & LZ78

LZ77:

LZ78:

L

-Z

-W

(LZW) A

A

M

LZ78

V

U

, GIF87

R

://

●

●

/

/LZW

F

—

(12 4096

)

S

LZW C

= NIL;
()

= ;

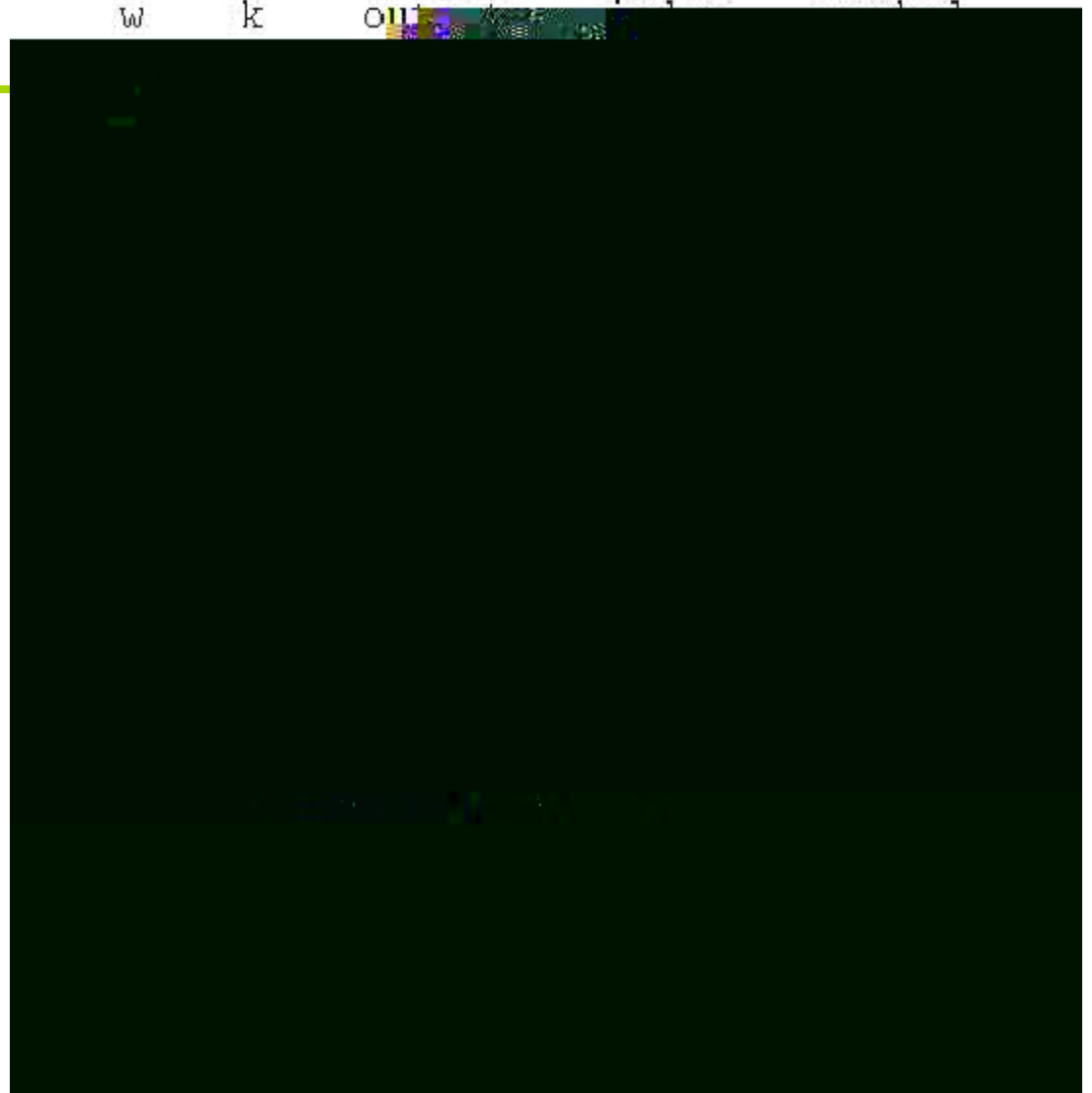
·
;
·
;

= ;

E

I : WED WE WEE WEB WET

```
w=nil
while(read a character k){
  if wk exist in the dic
    w = wk;
  else
    add wk to the dic
    output the code for w
  w=k;
}
```



LZW C

O LZW 4K
 , 256 (0-255) ASCII .
I , 19
 7 & 5 . E
 / 8+ , 9 .
R : T A. W , "A T
 H P D C ,
IEEE C , V . 17, N . 6, 1984, .
8-19.

LZW D

```

                ;
        ;
=   ;
    (           /       )

        =                               ;
                ;
        +       [0]                   ;
=       ;
    
```

E

I : WED<256>E<260><261><257>B<260>T

w	k	output	i	symbol
read a char k;				
output k;				
w=k;				
while(read a char/code k){				
entry = dic entry for k;				
output entry;				
add w+entry[0] to dic;				
w=entry;				
}				

LZW

P

F

M

<http://www.ics.uci.edu/~dan/pubs/DC-Sec1.html>

<http://marknelson.us/1991/02/01/arithmetic-coding-statistical-modeling-data-compression/>

T

W

:

C

P

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H

A

LZW