

Illustration of the algorithm with examples:

1. Let Sender side IP address = 216.3.128.12 and
Receiver side IP address = 192.1.168.43

Encryption

2. $G(x) = 3x - 4$ (Generator)
 $P(x) = x^2 - x + 1$ (Producer)
3. The iterator $x = (216 - 192) + (3 - 1) + (128 - 168) + (12 - 43)$
 $= -45$
4. Substitute values from Euler's constant 2.7182818284.... Decimal places in Euler's constant are indexed from 0 to 9. Then, $-45 = -81$ (4th decimal value in Euler's constant and 5th decimal value in Euler's constant)
New iterator = -81
5. $G(1) = G(-81) = -247$.
 $P(1) = P(G(1)) = P(-247) = 61257$
6. Computing for 26 values corresponding to alphabets a to z,
 $G(2) = G(G(1)) = G(-247) = -745$
 $P(2) = P(G(2)) = P(-745) = 555771 = 55577$ (taking first 5 digits)
 $G(3) = G(G(2)) = G(-745) = -2239$

$$P(3) = P(G(3)) = P(-2239) = 5015361 = 50153 \text{ (taking first 5 digits).}$$

The cipher table (Constructed only for alphabets from a-z) is as shown in Table S1.

7. If the message is 'dogs' then the cipher is 45178141833294993060. If this length is to be reduced follow the next step.
8. Construct the Complex Cipher table to match the digital pair to the corresponding ASCII character as shown in Table S2.

Group the cipher for "dogs" as pairs and substitute from the complex cipher table.

45 17 81 41 83 32 94 99 30 60

J h - F = w ; \ u Y

So the ciphertext for the message "dogs" becomes

Jh-F=w;\uY.

Decryption

1. Received message: Jh-F=w;\uY
2. Form the complex decipher table (it is the reverse of the complex cipher table) at the receiver side, obtain the string of digits as 45178141833294993060.
3. Group this message as group of 5 digits

45178 14183 32949 93060

Use decipher table (it is the reverse of the cipher table) at the receiver side to get the plaintext as "dogs".

Another illustration for the transfer of message "cat":

Sender Side:

1. Message “cat” after passing through cipher table is: 501536125783754
2. Message “50 15 36 12 57 83 75 4” after passing through complex cipher table is: OfAcV=%4.
(Note: the last 4 is retained as it is)

Receiver Side:

1. Message OfAcV=%4 is passed through complex decipher table and the obtained message is:
501536125783754

When 501536125783754 is passed through the decipher table, the message is “cat”.

Table S1 Cipher table.

Alphabets	Producer Polynomial	Value
a	P(1)	61257
b	P(2)	55577
c	P(3)	50153
d	P(4)	45178
e	P(5)	40672
f	P(6)	36609
g	P(7)	32949
h	P(8)	29654
i	P(9)	26689
j	P(10)	24020
k	P(11)	21618
l	P(12)	19456
m	P(13)	17510
n	P(14)	15759
o	P(15)	14183

p	P(16)	12765
q	P(17)	11488
r	P(18)	10340
s	P(19)	93060
t	P(20)	83754
u	P(21)	75378
v	P(22)	67840
w	P(23)	61056
x	P(24)	54951
y	P(25)	49455
z	P(26)	44510

Table S2 Complex cipher table.

Digit pair	ASCII character
00	9
01	8
02	7
03	6
04	5
05	4
06	3
07	2
08	1
09	0
10	a
11	b
12	c
13	d
14	e
15	f

16	g
17	h
18	i
19	j
20	k
21	l
22	m
23	n
24	o
25	p
26	q
27	r
28	s
29	t
30	u
31	v
32	w
33	x
34	y
35	z
36	A
37	B
38	C
39	D
40	E
41	F
42	G
43	H
44	I
45	J
46	K
47	L

48	M
49	N
50	O
51	P
52	Q
53	R
54	S
55	T
56	U
57	V
58	W
59	X
60	Y
61	Z
62	1
63	2
64	3
65	4
66	5
67	6
68	7
69	8
70	9
71	!
72	@
73	#
74	\$
75	%
76	^
77	&
78	*
79	(

80	)
81	-
82	+
83	=
84	—
85	<
86	>
87	?
88	/
89	.
90	,
91	:
92	“
93	‘
94	;
95	{
96	}
97	[
98	]
99	\
