

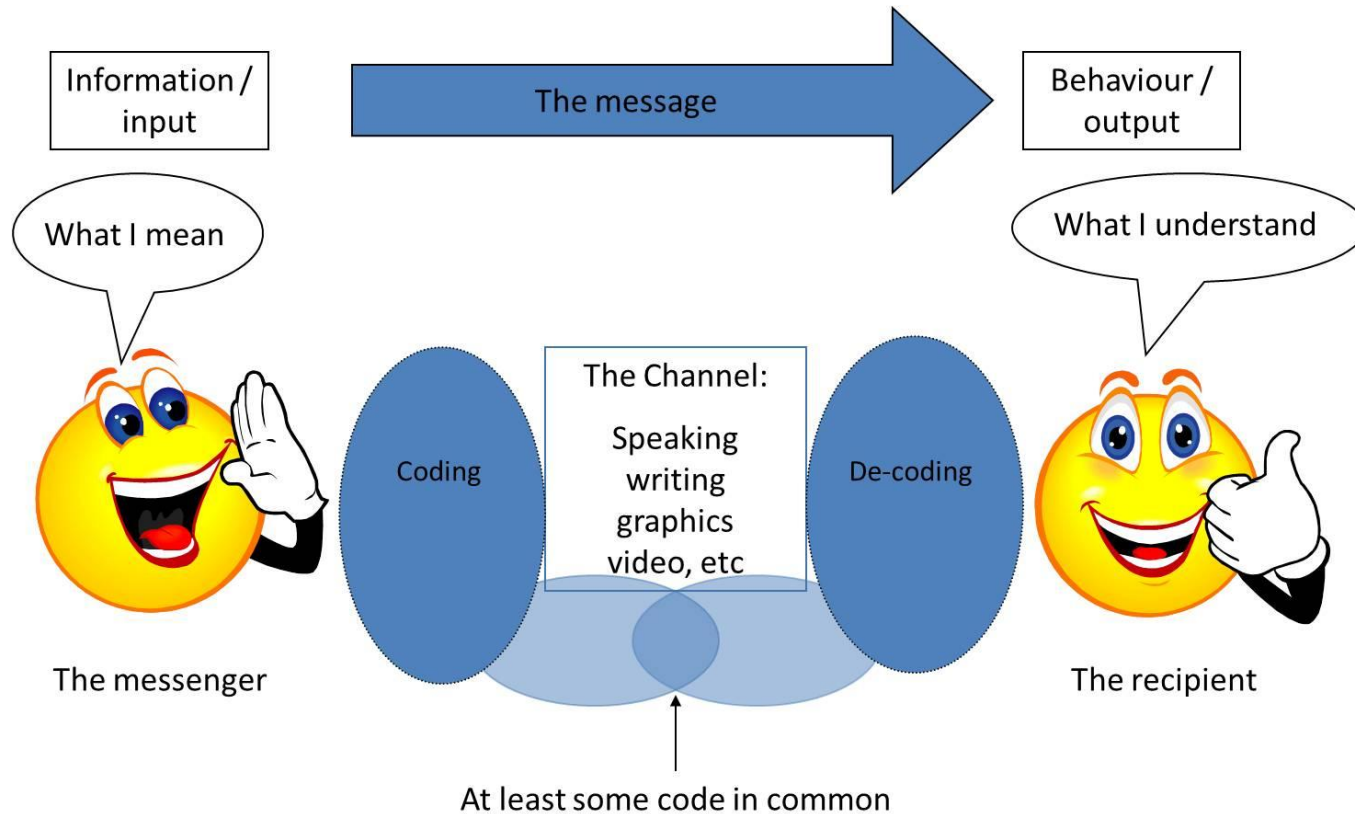
Base64 encoding

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Encoding - Decoding



What is Base64?

- $2^6 = 64$
- 64 bits can represent ASCII text
- Standard base64 index table on next page



ASCII text – index table

Value	Encoding	Value	Encoding	Value	Encoding	Value	Encoding
0	A	17	R	34	i	51	z
1	B	18	S	35	j	52	0
2	C	19	T	36	k	53	1
3	D	20	U	37	l	54	2
4	E	21	V	38	m	55	3
5	F	22	W	39	n	56	4
6	G	23	X	40	o	57	5
7	H	24	Y	41	p	58	6
8	I	25	Z	42	q	59	7
9	J	26	a	43	r	60	8
10	K	27	b	44	s	61	9
11	L	28	c	45	t	62	+
12	M	29	d	46	u	63	/
13	N	30	e	47	v		
14	O	31	f	48	w	(pad)	=====
15	P	32	g	49	x		
16	Q	33	h	50	y		

What base64 encoding is not...

ENCRYPTION = NOT!

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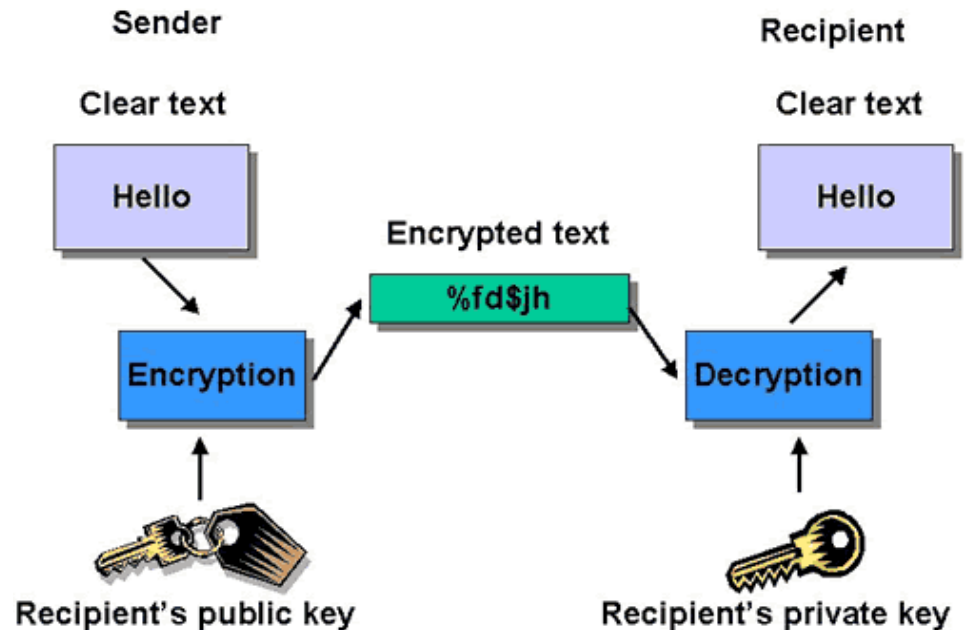
ENCRYPTION = NOT!

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Encoding does not use a key, encryption does



Why base64?

- http – text
 - Email – text
 - Base64 uses 64 characters to encode strings. ‘A-Z’, ‘a-z’, ‘0-9’, ‘+’, and ‘/’ are the 63 real characters (without the “, of course), and the ‘=’ sign is the padding.
 - Binary-to-text encoding
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- How to send non ASCII text data then???
 - Binary data, images, executables, etc.

Base64 Encoding

1) Start with data to encode (can be binary)

– Example data = “food”

2) Convert data to 8-bit binary

f	o	o	d
01100110	01101111	01101111	01100100

Base64 Encoding

3) Convert to 6-bit binary

```
f           o           o           d
01100110 01101111 01101111 01100100 // 8 bit binary
01100110011011110110111101100100 // Bit Stream
011001 100110 111101 101111 011001 00 // 6 bit binary
```


Calculate 6bit binary value

f o o d

01100110 01101111 01101111 01100100 // 8 bit binary

01100110011011110110111101100100 // bit stream

011001 100110 111101 101111 011001 00 // 6 bit binary

25 38 61 47 25 0

Convert 6 bit to ASCII text

f	o	o	d			
01100110	01101111	01101111	01100100			
01100110011011110110111101100100						
11001	100110	111101	101111	011001	000000	
25	38	61	47	25	0	// index
Z	m	9	v	Z	A	// base64 encoded

Zm9vZA = ASCII text string for the value "food"

Additional Base64 Info

- Note we went from 4 characters to 6
- All base64 encoded strings must be built on 4 character string blocks
- Since our result is not a multiple of 4 chars
- Padding is required to bring up to 4
- Correctly encoded base64 result is Zm9vZA==

Base64 decoding

- Reverse the previous encoding steps!
- Remember to strip any pad characters “=”

Base64 – miscellaneous

Email servers - some limited to 72 chars per line

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