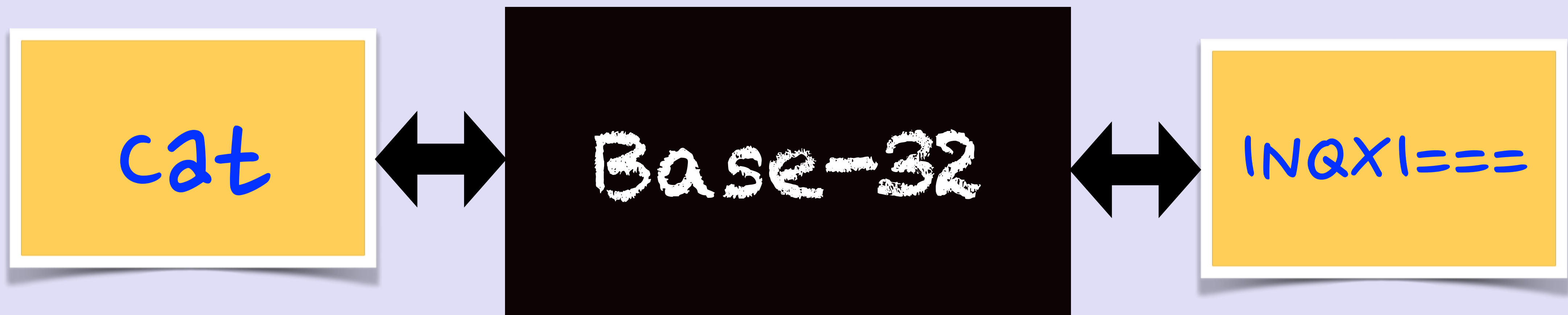


BLOCKCHAIN TUTORIAL 3 I

Base-32 encoding



INTRO

- In this tutorial I will explain how the base-32 encoding works.

BASE-32 (RFC 4648)

- Base-32 is basically a way of encoding arbitrary binary data in ASCII text. A base-32 encoded value only contains uppercase letters, digits and the equal sign as padding.
- Such a value (excluding padding) can be included in an URL without encoding any characters.
- Base-32 encoding schemes uses the 26 uppercase letters A–Z, and the digits 2–7. This encoding scheme is defined in RFC 4648, see: <https://tools.ietf.org/html/rfc4648>
The 0 and 1 are skipped due to their similarity with the letters O and I.

BASE-32 ENCODING

- For example lets base-32 encode the word "Cat".
Cat in ASCII decimal values = [67, 97, 116]
Cat in binary format = [01000011, 01100001, 01110100]
- Step 1: Convert an input byte stream into a group of 5 bytes.
If there are less than 5 bytes, at the end, pad additional empty bytes.
Group = [01000011, 01100001, 01110100, xxxxxxxx, xxxxxxxx]
- Step 2. Divide this group into 8 chunks of 5 bits.
Chunks = [01000, 01101, 10000, 10111, 0100x, xxxxx, xxxxx, xxxxx]

BASE-32 ENCODING

- Step 3. If a chunk has both actual bits and empty bits, replace the empty bits with 0's.
 Chunks = [01000, 01101, 10000, 10111, 01000, xxxxx, xxxxx, xxxxx]
- Step 4. Convert each 5 bits chunk to its decimal value (0-31).
 If a 5 bits chunk contains empty bits replace with character '='.
 Chunks = [8, 13, 16, 23, 8, =, =, =]
- Step 5. In the base-32 symbol chart, map each decimal value to its corresponding character.
 Chunks = [I, N, Q, X, I, =, =, =]
- Step 6. The word "**Cat**" base-32 encoded is "**INQXI===**"

BASE-32 SYMBOL CHART

- On the right is the base-32 symbol chart.
- Lookup the decimal value in the chart and find its corresponding character in the map.
- Decimal values: 8, 13, 16, 23, 8 corresponds to:
INQXI

Value	Char	Value	Char
0	A	16	Q
1	B	17	R
2	C	18	S
3	D	19	T
4	E	20	U
5	F	21	V
6	G	22	W
7	H	23	X
8	I	24	Y
9	J	25	Z
10	K	26	2
11	L	27	3
12	M	28	4
13	N	29	5
14	O	30	6
15	P	31	7

padding symbol =