Binary, Hexadecimal, and Base64

5m intro

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what are we gonna learn today?

what are we gonna learn today?

how to recognize common encodings that come up a lot in programming/CTFs

binary

hexadecimal

base64

1s and 0s

0

1

0 1 2 ... 7 8 9

base 10

we have 10 fingers

9 -> 10

base 10

1s and 0s

what if we just had two fingers?

0 -> 1

1 -> 10

1 -> 2

1 -> 10 ->11

1 -> 2 -> 3

how would you write 4 in binary?

11?

how would you write 4 in binary?

11?

100,

how would you write 4 in binary?

11?

100,

^ one 4, zero 2's, zero one's

1011

^ one 8, ^ zero 4's

^ one 2, one 1

There are only 10 types of people in the world: Those who understand binary, and those who don't.

Binary	Decimal
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	10
1011	11
1100	12
1101	13
1110	14
1111	15

Binary	Decimal
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	10
1011	11
1100	12
1101	13
1110	14
1111	15

pretend you have 16 fingers

Binary	Decimal	Hex
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F

789ABCDEF

7 8 9 10 11 12 13 14 15

F -> 10

15 -> 16

10 -> 11 -> 12

16 -> 17 -> 18 in base10

Binary	Decimal	Hex
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F

```
Desktop — ianklatzco@ian-mbp — ~/desktop — zsh — Solarized Dark — 80×24

000a1190:  01011001 00101000 00010100 00001010 10000101 01000010   Y(...B
000a1196:  10100001 01010000 00101000 01010100 11010000 01011001   .P(T.Y
000a119c:  00101000 00010100 00001010 10000101 01000010 10100001   (...B.
000a11a2:  01010000 10101000 10100000 10110011 01010000 00101000   P...P(
000a11a8:  00010100 00001010 10000101 01000010 10100001 01010000   ...B.P
000a11ae:  10101000 10100000 10110011 01010000 00101000 00010100   ...P(.
000a11b4:  00001010 10000101 01000010 10100001 01010000 01000001   ..B.PA
000a11ba:  01100111 10100001 01010000 00101000 00010100 00001010   g.P(..
000a11c0:  10000101 01000010 10100001 10000010 11001110 01000010   .B...B
000a11c6:  10100001 01010000 00101000 00010100 00001010 10000101   .P(...
000a11cc:  01000010 10100001 10000010 11001110 01000010 10100001   B...B.
000a11d2:  01010000 00101000 00010100 00001010 10000101 01000010   P(...B
000a11d8:  00000101 10011101 10000101 01000010 10100001 01010000   ...B.P
000a11de:  00101000 00010100 00001010 10000101 00001010 00111010   (....:
000a11e4:  00001011 10000101 01000010 10100001 01010000 00101000   ..B.P(
000a11ea:  00010100 00001010 10000101 00001010 00111010 00001011   ....:.
000a11f0:  10000101 01000010 10100001 01010000 00101000 00010100   .B.P(.
000a11f6:  00001010 00010101 01110100 00010110 00001010 10000101   ..t...
000a11fc:  01000010 10100001 01010000 00101000 00010100 00001010   B.P(..
000a1202:  00110011 11111100 11111111 10110010 11010000 01111001   3....y
000a1208:  11111100 01010101 10000110 00010101 10110111 00000000   .U....
000a120e:  00000000 00000000 00000000 01001001 01000101 01001110   ...IEN
000a1214:  01000100 10101110 01000010 01100000 10000010             D.B`.
→  desktop █
```

```
Desktop — ianklatzco@ian-mbp — ~/desktop — zsh — Solarized Dark — 80×24

000a10b0: 4559 7522 af0c 5fd1 4ee7 2862 0175 ca7b   EYu".._.N.(b.u.{
000a10c0: a2bd b870 e1c2 f9f3 e77b 0f5d bf7e 9d15   ...p.....{.].~..
000a10d0: e2dd 4bed 93c0 5bcb 9bf8 0877 c44a 0b19   ..K...[....w.J..
000a10e0: bfbb 0b97 2f5f 5644 c28a ef62 25ef 3d97   ..../_VD...b%.=.
000a10f0: dbed 98f7 7254 2814 168b 6224 2a14 0a85   ....rT(...b$*...
000a1100: 42a1 5028 2c1d 7f56 2628 140a 8542 a150   B.P(,..V&(...B.P
000a1110: 2854 d059 2814 0a85 42a1 50a8 a0b3 5028   (T.Y(...B.P...P(
000a1120: 140a 8542 a150 a8a0 b350 2814 0a85 42a1   ...B.P...P(...B.
000a1130: 5041 67a1 5028 140a 8542 a182 ce42 a150   PAg.P(...B...B.P
000a1140: 2814 0a85 42a1 82ce 42a1 5028 140a 8542   (...B...B.P(...B
000a1150: 059d 8542 a150 2814 0a85 4205 9d85 42a1   ...B.P(...B...B.
000a1160: 5028 140a 850a 3a0b 8542 a150 2814 0a15   P(....:..B.P(...
000a1170: 7416 0a85 42a1 5028 140a 1574 160a 8542   t...B.P(...t...B
000a1180: a150 2814 2ae8 2c14 0a85 42a1 5028 54d0   .P(.*.,...B.P(T.
000a1190: 5928 140a 8542 a150 2854 d059 2814 0a85   Y(...B.P(T.Y(...
000a11a0: 42a1 50a8 a0b3 5028 140a 8542 a150 a8a0   B.P...P(...B.P..
000a11b0: b350 2814 0a85 42a1 5041 67a1 5028 140a   .P(...B.PAg.P(..
000a11c0: 8542 a182 ce42 a150 2814 0a85 42a1 82ce   .B...B.P(...B...
000a11d0: 42a1 5028 140a 8542 059d 8542 a150 2814   B.P(...B...B.P(.
000a11e0: 0a85 0a3a 0b85 42a1 5028 140a 850a 3a0b   ...:..B.P(....:.
000a11f0: 8542 a150 2814 0a15 7416 0a85 42a1 5028   .B.P(...t...B.P(
000a1200: 140a 33fc ffb2 d079 fc55 8615 b700 0000   ..3....y.U......
000a1210: 0049 454e 44ae 4260 82                    .IEND.B`.
→  desktop ▊
```

E42Q+sQGtkRNUXIy8tAAidw/3Trhlu5zIrmOytOzaDViLnbKOArC9Mt9S2ItiqRE8s80wGNntXxOyeVG
HGn6+GUY2sgqSRtNgGQCM4xD9qu248av0vKZOLLYiH0xTruVWKbGea3snCxJJrPExuKrieFMtwqSEDWJ
Ea2vmXHsjFyOCoXCbg06/bBjemFdXxTbEcQQFU3hmBliOdJRlSHlNXRHXjdqCU7GI6eRo/HQvLwp6Wji
6YnsMrrcswRC9pwYsW2dHolZBLGEkhae6JFemIGZQ1fwFLm6OZpUukAwEzmKfJT9aiYptUnjopBILaWL
LfDBgwesrBAnJaaoIeIo31qYx4X2ct/SS9IzZMZeap9eRhkHzTZ4J0Z54403En/MyAM+5Ef9p4ygKU8M
U5+2Vuol9KLAEHdUjLB7GzhC1ITkIf6ktMcOnxhxIrnOvO+DKv64dOkS0eeQDRE+NMCH6IW44NjlpjvS
+PiNRk4ESENnjXdcr3f1jizfAG9Iu5VYpkZ4rTzu4gC0WZJHtQxnEqh7hjaIHLlmRsq0QqGwp4LOeDHS
+IeqW9cRPhPpHiUF0eVAF0ddDqA3hJRoQ46ZEZYjyuiqRJpAqoOTY4jgxHpugn5jItPPECJPj7Y165td
RpqYqGYiPVJa44mIzD0qJmnqC4li0U174FBJT5a5fJvLJ/HKxLiH7zbMmRQ5iugjM7jQ12qdqtMkR7E0
JUgHNUfWIDyNLDhSO/71ygdLdyzHRg1ZecJtevu3lzxmJO2oGWWkPO8fq13vvPMOntA9yo/V8sdsGEqm
MnHgeJ3SjETdo4w79uRWyRErjRN6tdxR46Q+8YaqGyVqmpLbNTl87NZIrsPFQa2Ww6RwLZnLwRlNYBl1
JIfo+ABv+ZySy420saWbGhq/ycgTc+JOJP2KPtOOrHTfMtKbiWVqnNdKQ5vh3waOqbFcnRLDGYNX8gno
4wqor5lx7Ejn9DpHoVDYPmwDHVHciCQckK/84Q9/aEl04CyZzjEzxHLUSy5iWpFegp0oZyIsiQ3p5Tea
yPRD4Sm8RJHupZcIZ4QeaUjJZFXaaLVbOUmUq2t5ZXxK0rzlKEpqx/IKg/7zP/+z7XET/CTh6e/f/d3f
0aKWsQlRly5dGiJwStwwbnUvtU9ilEleFxl9Rvoo2aSXU6elt3FhqJh6KYh6R9wUK/USekUWqMgd1Y7f
kQYmoqaW1ycZecMBkq4AUY1eUqiWwIn9glxO/jzUKZHpJw7w3s6Kvd+63IgjTRy/40bupf5Ck5a8bcpV
upeSbUParZEeGee12tAsvQxnSGipy2JJj532clQoFJ4URqLV1dXEbe2HZbwe101mjpmdiUVZdSKvDF/R
TucoYgF1ynuivbhw4cL58+d7D12/fp0V4t1L7ZPAW8ub+Ah3xEoLGb+7C5cvX1ZEworvYiXvPZfb7Zj3
clQoFBaLYiQqFAqFQqFQKCwdf1YmKBQKhUhUKhUChU0FkoFAqFQqFQqKCzUCgUCoVCooLNQKFQqFQ
KBQKFXQWCoVCoVAoFAoVdBYYKhUKhUKgqKgsFAqFQqFQKFTQWSgUCoVCoVAoVNBZKBQKhUKhUKigs1Ao
FAqFQqFQqKCzUCgUCoVCoVBBZ6FQKBQKhUKhgs5CoVAoFAqFQqGCzkKhUCgUCoVCBZ2FQqFQKBQKhQo6
C4VCoVAoFAqFCjoLhUKhUCgUChV0FgqFQKBQKM/z/stB5/FWGFbcAAAAASUVORK5CYII=

→ **desktop**

Challenge   39 Solves   ✕

what is base (2^6)
50

answer: a very common encoding format in ctf

Q1RGe2Jhc2VkX29mX3RoZV82NHRofQ==

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< DECODE >   UTF-8   (You may also select input charset.)

VGhlIGZsYWcgaXMgIndob29waW5nIGNvdWgi==