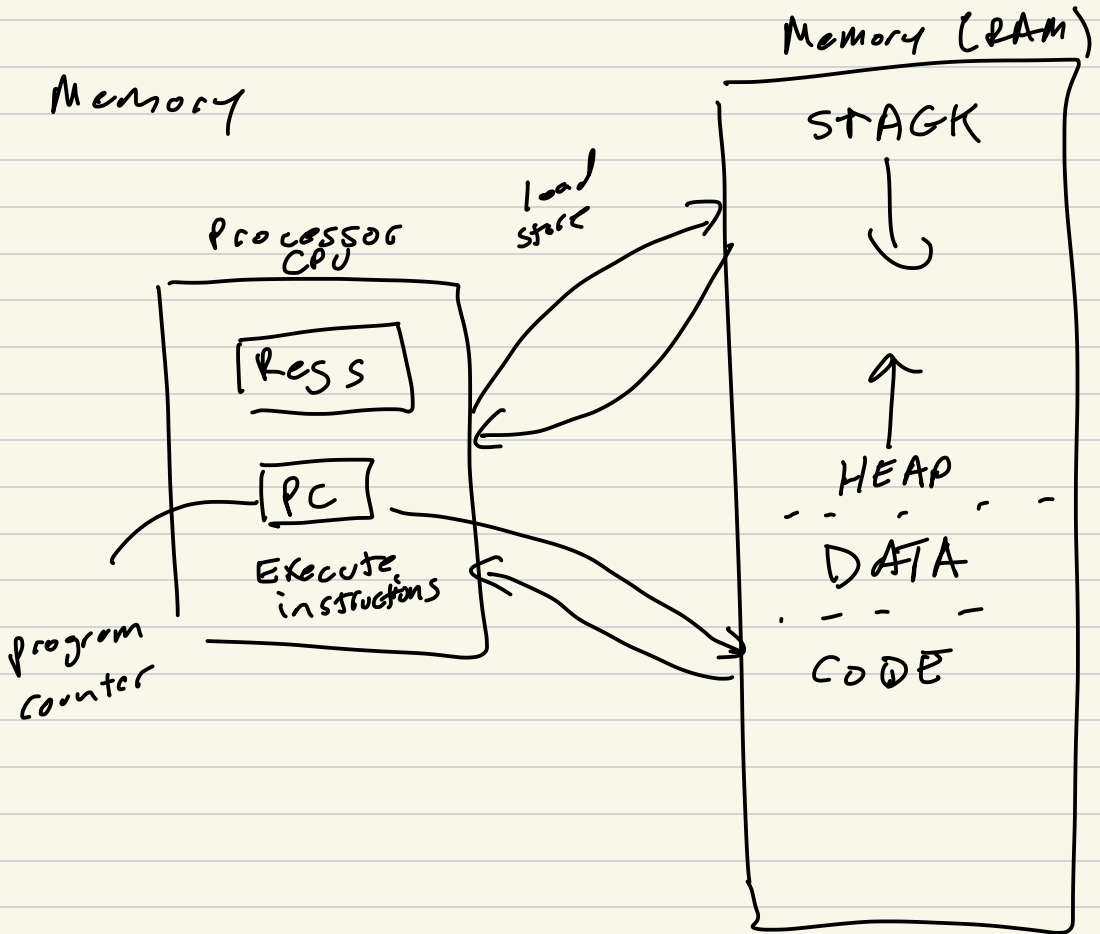


CS315-01 RISC-V Assembly 6

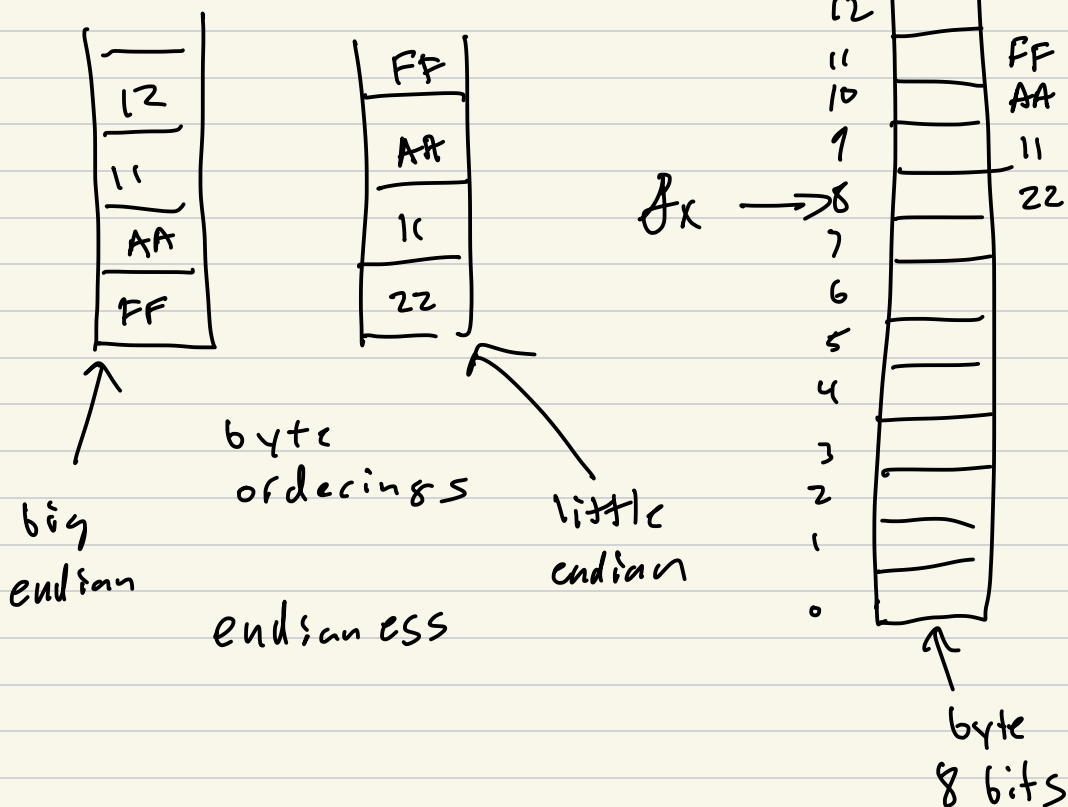
Memory, 2s complement, Strings



Memory $\rightarrow$ Array of bytes

byte addressable

int x = 0xFFAA1122



Binary representation of integers

implied to be signed $\rightarrow$ Two's Complement

4-bit numbers

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

Signed mag

$$\begin{array}{r} \textcircled{1} \quad \begin{array}{cccc} & 1 & 1 & \\ 0 & 1 & 0 & 1 \end{array} (5) \\ + \begin{array}{cccc} 1 & 0 & 1 & 1 \end{array} (-3) \\ \hline 0000 (0) \end{array}$$

2's comp

$$\begin{array}{r} \textcircled{1} \quad \begin{array}{cccc} & 1 & 1 & \\ 0 & 1 & 0 & 1 \end{array} (5) \\ + \begin{array}{cccc} 1 & 1 & 0 & 1 \end{array} (-3) \\ \hline 0010 (2) \end{array}$$

How to get neg representation of a pos value?

$$3 \rightarrow -3$$
$$0011 \quad \boxed{}$$

$$0011 \rightarrow 1100 + 1 \rightarrow \boxed{1101} - 3$$

$$\text{invert}(v) + 1$$

Can also go from neg $\rightarrow$ pos

$$-3$$
$$1101 \rightarrow 0010 + 1 \rightarrow \boxed{10011} 3$$

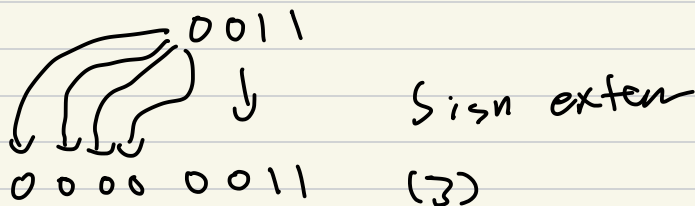
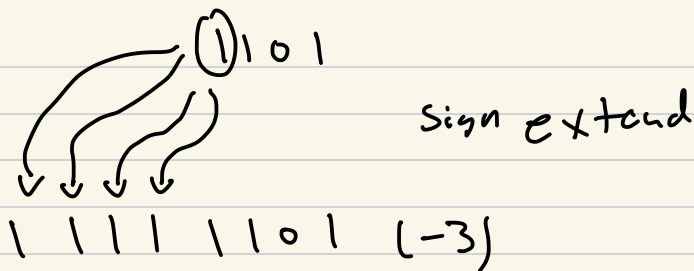
Other things about 2's comp.

$$n \text{ bits} \rightarrow m \text{ bits} \quad \text{where } m > n$$

$$4 \text{ bits} \quad \boxed{1101} \quad (-3)$$

8 bits

$$\begin{array}{r} 00000011 \quad (3) \\ 11111100 \\ \hline 1111\boxed{1101} \quad (-3) \end{array}$$



Strings arrays of characters (bytes)

char *s = "foo";

l w (32 bits)

l d (64 bits)

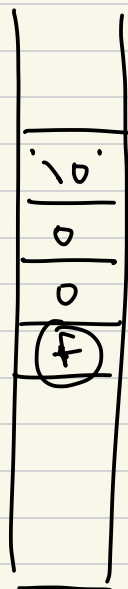
l b (8 bits)

s[3]

s[2]

s[1]

s[0]



l b to, (ao)

↑
lower 2 bits
set to byte value