

## MAXIMUM SIZE OF A PROCESS IN AN OPERATING SYSTEM

Assume that the operating system uses virtual memory

What can be the maximum size of virtual address space of a process?

Depends upon the size of the hardware registers

32 bit system/processor - 32 bit registers



Diagram illustrating the calculation of the maximum value and number of different values for a 4-bit register:

3	2	1	0
1	1	1	1

4 bits

Max value:  $2^0 + 2^1 + 2^2 + 2^3 = 1 + 2 + 4 + 8 = 15 = 2^4 - 1$

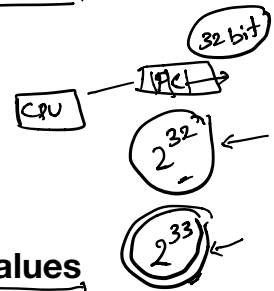
Different values:  $0 - 15 = 2^4$

$2^4 \rightarrow$  how many bits req?  $\rightarrow 4$

N bits

Max value:  $2^N - 1$

Different values:  $2^N$

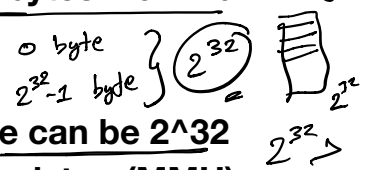


A 32 bit register can hold a maximum of  $2^{32}$  different values

Remember that logical addresses are also stored in registers(program counter)

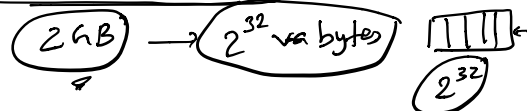
So, the maximum logical address space of a process depends on or is bounded by the size of system registers

32 bit system/processor  $\rightarrow$  32 bit registers  $\rightarrow$   $2^{32}$  bytes maximum process size



Similarly, the maximum physical address space size can be  $2^{32}$  bytes(4GB) since physical address are also stored in registers(MMU)

32 bit processor having 6GB RAM?



64 bit systems/processor  $\rightarrow$  64 bit registers  $\rightarrow$   $2^{64}$

bytes(17,179,869,184)GB) 🤔