Bit – n bit has n bit register. I have 2 power n addresses. It can hold n bit data. n/8 bytes

So compatible software should handle n bit hardware.

CPU -> Fetch from RAM from nth address-> CPU can locate 2^32 address space from RAM. For 32 bits

Doubling the memory size i.e 64 bit system

* 32 bit -> 32-bit data
* Adding 64-bit data in 32-bit data
* Heavy task for 32-bit CPU Data-> 32 64
* It will do it in 2 cycles. i.e 0

* + First on right side then on left side

For 64 bit will do it in one go

It will work in one cycles

Here between 32 and 64 we save the no of cycles for calculation in cpu in term of time complexity

Advantages of 64 bit over 32 bit cpu

1. Addressable spaces: -
   1. 32 bit cpu can adresss 2^32 locations
   2. |FF|FF|FF|FF| -> last address in Hex
   3. 64 bit cpu can adresss 2^64 locations
   4. |FF|FF|FF|FF|FF|FF|FF|FF|| -> last address in Hex for 64 bit
   5. |00|00|00|00|00|00|00|01| -> first address
2. Better RAM usage in 64 bit system
3. Performance: All calculations take place in the registers. When you’re performing math in your code, operands are loaded from memory into registers. So, having larger registers allow you to perform larger calculations at the same time. 32-bit processor can execute 4 bytes of data in 1 instruction cycle while 64-bit means that processor can execute 8 bytes of data in 1 instruction cycle. (In 1 sec, there could be thousands to billons of instruction cycles depending upon a processor design)
   1. 1 cycle performs double task
4. Compatibility: 64-bit CPU can run both 32-bit and 64-bit OS. While 32-bit CPU can only run 32-bit OS.
5. Better Graphics performance: 8-bytes graphics calculations make graphics-intensive apps run faster