Consider a machine with 64 MB physical memory and a 32 bit virtual address space. If the page size is 4 KB, what is the approximate size of the page table?

Given- Size of main memory = 64 MB

- Number of bits in virtual address space = 32 bits
- Page size = 4 KB
- We will consider that the memory is byte addressable.

Number of Bits in Physical Address

If size of main memory = 2^X Bytes, then

number of bits in physical address = X bits

Size of main memory = 64 MB = 2^26 Bytes

Thus, Number of bits in physical address = 26 bits

Number of Frames in Main Memory

If number of frames in main memory = 2^X , then number of bits in frame number = X bits

Number of frames in main memory

= Size of main memory / Frame size

= 64 MB / 4 KB

= 2^26 B / 2^12 B

= 2^14

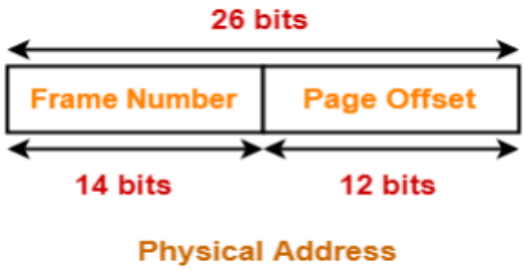
Thus, Number of bits in frame number = 14 bits

Number of Bits in Page Offset

We have, Page size = 4 KB = 2^12 B

Thus, Number of bits in page offset = 12 bits

So, Physical address is-



Process Size-

If process size = 2^X bytes, then number of bits in virtual address space = X bits

Number of bits in virtual address space = 32 bits

Thus,

Process size

= 2^{32} Bytes

= 4 GB

Number of Entries in Page Table-

Number of pages the process is divided

= Process size / Page size

= 4 GB / 4 KB

= 2^{20} pages

Page Table Size-

Page table size

= Number of entries in page table x Page table entry size

= Number of entries in page table x Number of bits in frame number

= 2^{20} x 14 bits

= 2^{20} x 16 bits (Approximating 14 bits ≈ 16 bits)

= 2^{20} x 2 bytes

= 2 MB