

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?

1. 16 MB
2. 8 MB
3. 2 MB
4. 24 MB

Solution-

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-

Size of main memory

= 64 MB

= 2^{26} B

Thus, Number of bits in physical address = 26 bits

Number of Frames in Main Memory-

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-

Number of bits in virtual address space = 32 bits

Thus,

Process size

= 2^{32} B

= 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

Thus, Number of entries in page table = 2^{20} entries

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

= $2^{20} \times 14$ bits

= $2^{20} \times 16$ bits (Approximating 14 bits \approx 16 bits)

= $2^{20} \times 2$ bytes

= 2 MB

Thus, Option (C) is correct.