Practice Question

64-bit architecture.

16 KB size.

Size of VAS. Virtual address space? \(-2^{64}\) bytes.

How many bits in the address represent:
- byte offset into a page? \(-14\) bits.
- page #? \((64 - 14) = 50\) bits.

How many max. page table entries are there?.

<table>
<thead>
<tr>
<th>bits</th>
<th>(\text{page size})</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 bytes  (2^1)</td>
</tr>
<tr>
<td>2</td>
<td>4 bytes  (2^2)</td>
</tr>
<tr>
<td>3</td>
<td>8 bytes  (2^3)</td>
</tr>
<tr>
<td>4</td>
<td>16 bytes  (2^4)</td>
</tr>
<tr>
<td>5</td>
<td>(1024 \text{ bytes} = 2^{10})</td>
</tr>
<tr>
<td>6</td>
<td>(2^{14})</td>
</tr>
</tbody>
</table>

\[ 16 \text{ KB} = 16 \times 1024 \text{ bytes} = 2^{14} \]

\[ \# \text{of bits} = \log_2 (2^{14}) = 14. \]

\[ 2^{14} = 2^4 \times 2^4 = 1024 \times 16. \]
\[ \text{# of pages} = \frac{\text{size of address space}}{\text{page size}}. \]

\[ = \frac{\text{2}^{64}}{16\text{KB}} = \frac{\text{2}^{64}}{2^{14}} = 2^{50} \text{ pages}. \]

\[ \text{# of bits to address 2^{50} pages} = \log_2(2^{50}). \]

\[ = 50 \text{ bits}. \]
1 process - N address spaces.

Segmentation

SD3  SD2  SD1  SD0

MAX
VA

PP0

Segment #

Segmentation

Overlapping segments
"How OS maps itself to address space of every process."