# Assignment #8

**Problem 8.1**: address spaces in a paging system

a) The physical memory has 128 frames.
b) The logical address space has 15 bits, and the Physical address space has 18 bits
c) For the page number, there are 4 bits used, and for the offset 11 bits

**Problem 8.2**: paging and page tables

a)

Process P1

| Page | Frame | Additional Bits |
|---|---|---|
| $P_{1,0}$ | 8 | r-x-v |
| $P_{1,1}$ | 6 | r-x-v |
| $P_{1,2}$ | – | rw-d- |
| $P_{1,5}$ | – | rw-d- |
| $P_{1,6}$ | 11 | rw-dw |
| $P_{1,8}$ | 3 | rw-dw |

Process 2

| Page | Frame | Additional Bits |
|---|---|---|
| $P_{2,0}$ | 9 | r-x-v |
| $P_{2,1}$ | 12 | r-x-v |
| $P_{2,4}$ | 4 | rw-dv |
| $P_{2,5}$ | 1 | rw-dv |
| $P_{2,6}$ | – | rw-d- |
| $P_{2,8}$ | – | rw-d- |

b and c)

| Frame | Physical Addresses | Loaded Page |
|---|---|---|
| 0 | 0x000-0x0FF | OS |
| 1 | 0x100-0x1FF | $P_{2,5}$ |
| 2 | 0x200-0x2FF | $P_{1,2}$ |
| 3 | 0x300-0x3FF | $P_{1,8}$ |
| 4 | 0x400-0x4FF | $P_{2,4}$ |
| 5 | 0x500-0x5FF | $P_{1,5}$ |
| 6 | 0x600-0x6FF | $P_{1,1}$ |
| 7 | 0x700-0x7FF | $P_{2,6}$ |
| 8 | 0x800-0x8FF | $P_{1,0}$ |
| 9 | 0x900-0x9FF | $P_{2,0}$ |
| 10 | 0xA00-0xAFF | $P_{1,4}$ $P_{2,2}$ |
| 11 | 0xB00-0xBFF | $P_{1,6}$ |
| 12 | 0xC00-0xCFF | $P_{2,1}$ |
| 13 | 0xD00-0xDFF | |
| 14 | 0xE00-0xEFF | |
| 15 | 0xF00-0xFFF | |