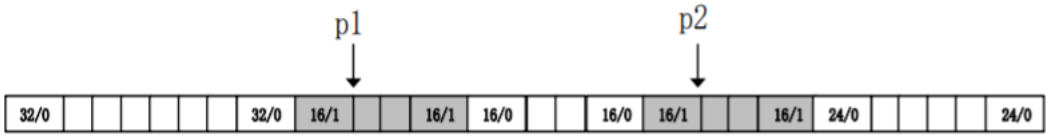
ICS Homework 12

May 18, 2022

1 Organization

1.1 Dynamic Memory Allocation

The figure simulates the initial status of memory at a certain time. Allocated blocks are shared, and free blocks are blank (each block represents 4 bytes). The allocator maintains double-word alignment. Given the execution sequence of memory allocation operations (malloc() or free()) from 1 to 4.




```
1:  P3 = malloc(4);
2:  P4 = malloc(10);
3:  free(P1);
4:  P5 = malloc(16);
```

Assume **first-fit** algorithm is used to find free blocks and coalesce immediately. Please draw the status of memory and mark with variables after the **2nd** and **4th** operation is executed.

2 System Software

2.1

Using the progress graph in Figure 12-21 of file "badcnt.c", draw the following trajectories out and point out the value of `cnt` after the execution (assume the value of `cnt` is 0 initially for each trajectory).

1. H1,L1,H2,L2,U2,U1,S2,T2,S1,T1
2. H2,L2,U2,H1,S2,L1,T2,U1,S1,T1
3. H1,L1,U1,H2,L2,S1,U2,S2,T1,T2
4. H1,H2,L1,U1,S1,L2,U2,T1,S2,T2

2.2

```c
#include "csapp.h"
#define N 4

void *thread(void *vargp) {
    int myid = *((int)vargp);
        printf("in thread %d\n", myid);
        return NULL;
}

int main() {
    pthread_t tid[N];
        int *ptr;

        for (int i = 0; i < N; i++) {
        ptr = malloc(sizeof(int));
        *ptr = i;
        // create a thread running
        // with argument ptr
        // your code here

        free(ptr);
        }
    // Join all threads
    // Your code here
}
```

1. Complete the previous code according to the comment.
2. Is there any race condition in the previous code? Why or why not?