

Assignment 9(a): Semaphores

Implementing semaphores in a C program for process synchronization:

To declare a semaphore:

```
#include <semaphore.h>  
sem_t semaphore;
```

C function used to initialize a semaphore variable:

```
#include <semaphore.h>  
int sem_init(sem_t *sem, int pshared, unsigned int value);  
Here pshared is set to 0 for threads, 1 for processes.
```

C function for wait(mutex) function:

```
int sem_wait(sem_t *sem);
```

C function for signal(mutex) function:

```
int sem_post(sem_t *sem);
```

Sample code:

```
sem_t sem;  
int count;
```

```
void* pth_body(void *args) {  
    int sval;  
    // using semaphore to allow only one thread to execute at one  
time  
    sem_wait(&sem); // decreases sem value by 1  
    // critical section  
    sem_getvalue(&sem, &sval);  
    printf("Semaphore value: %d in thread: %d\n", sval, count);  
    sem_post(&sem); // increases sem value by 1  
    sem_getvalue(&sem, &sval);  
}
```

```

        printf("%d thread, %d semaphore\n\n", count, sval);
    }
int main() {
    count = 0;
    sem_init(&sem, 0, 1); // initializing semaphore value
    /* rest of the main is same as pthread program */
}

```

Output:

```

hp@hp-laptop-15-bs0xx:~/Documents/Operating System$ gcc semaphore_demo.c -o semaphore_demo -lpthread -lrt
hp@hp-laptop-15-bs0xx:~/Documents/Operating System$ ./semaphore_demo
Semaphore value: 0 in thread: 1
1 thread, 1 semaphore

Semaphore value: 0 in thread: 2
2 thread, 1 semaphore

Semaphore value: 0 in thread: 3
3 thread, 1 semaphore

Semaphore value: 0 in thread: 4
4 thread, 1 semaphore

Semaphore value: 0 in thread: 5
5 thread, 1 semaphore

Semaphore value: 0 in thread: 6
6 thread, 1 semaphore

Semaphore value: 0 in thread: 7
7 thread, 1 semaphore

Semaphore value: 0 in thread: 8
8 thread, 1 semaphore

Semaphore value: 0 in thread: 9
9 thread, 1 semaphore

Semaphore value: 0 in thread: 10
10 thread, 1 semaphore

Semaphore value: 0 in thread: 11
11 thread, 1 semaphore

^C
hp@hp-laptop-15-bs0xx:~/Documents/Operating System$

```

Assignment 9(b): Prime Check

Similar to Assignment 8