

ASSIGNMENT - VIII

TITLE :

Write a program using semaphores to implement the Readers-Writers problem, ensuring mutual exclusion while allowing multiple readers and one writer to access a shared resource concurrently.

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PROGRAM :

```
#include <pthread.h>
#include <semaphore.h>
#include <stdio.h>
#include <unistd.h>

sem_t wrt, mutex; int data = 0, readcount = 0;

void *reader(void *arg)
{
    int x = *((int *)arg);
    sem_wait(&mutex);
    readcount++;

    if (readcount == 1)
    {
        sem_wait(&wrt);
    }
    sem_post(&mutex);

    printf("Reader %d read the data: %d\n", x, data);
    sleep(1);

    sem_wait(&mutex);
    readcount--;

    if (readcount == 0)
    {
        sem_post(&wrt);
    }
    sem_post(&mutex);
    return NULL;
}
```

```

void *writer(void *arg)
{
    int x = *((int *)arg);
    int input_data;

    sem_wait(&wrt);
    printf("Writer %d, enter data to write: ", x);
    scanf("%d", &input_data);
    data = input_data;
    printf("Writer %d wrote the data: %d\n", x, data);
    sleep(1);
    sem_post(&wrt);
    return NULL;
}

int main()
{
    int i;
    pthread_t reader_t[5], writer_t[5];
    int read_id[5], writer_id[5];

    sem_init(&mutex, 0, 1);
    sem_init(&wrt, 0, 1);

    for (i = 0; i <= 2; ++i)
    {
        writer_id[i] = i + 1;
        pthread_create(&writer_t[i], NULL, writer, &writer_id[i]);
        pthread_join(writer_t[i], NULL);
    }

    for (i = 0; i <= 2; ++i)
    {
        read_id[i] = i + 1;
        pthread_create(&reader_t[i], NULL, reader, &read_id[i]);
        sleep(1);
        pthread_join(reader_t[i], NULL);
    }

    sem_destroy(&mutex);
    sem_destroy(&wrt);

    return 0;
}

```

OUTPUT :

```
● shubham@ShubhsPC:~$ gcc reader.c
● shubham@ShubhsPC:~$ ./a.out
Writer 1, enter data to write: 121
Writer 1 wrote the data: 121
Writer 2, enter data to write: 323
Writer 2 wrote the data: 323
Writer 3, enter data to write: 423
Writer 3 wrote the data: 423
Reader 1 read the data: 423
Reader 2 read the data: 423
Reader 3 read the data: 423
○ shubham@ShubhsPC:~$
```