EAST WEST UNIVERSITY

Department of Computer Science and Engineering

Course Code: CSE325

Course Title: **Operating Systems**

Section: 01

Group No: 10

Mini Project

Submitted By :

Name : Jannat Milky
Id: 2023-1-60-042
Name : Jasmin Akter
Id: 2023-1-60-258
Name : Mahfuz Uddin Ahmed
Id: 2023-1-60-207

Submitted To :

Name : Dr. Md. Nawab Yousuf Ali
Designation : Professor
Department of CSE
East West University

Date of Submission: May 20, 2025

Ted Stories

An Event Planning Company

Introduction:

The project "Ted's Stories" – An Event Planning Company is inspired by Ted Mosby, the romantic architect from *How I Met Your Mother*. It models an event planning company where multiple planners collaborate to organize weddings and proposals while managing limited resources and spontaneous brainstorming sessions.

Objectives

- Simulate concurrent event planning with multiple planners

- Manage shared resources (venues, decorations, AV equipment)

- Ensure synchronization to prevent race conditions and deadlocks

- Log all activities for review and debugging
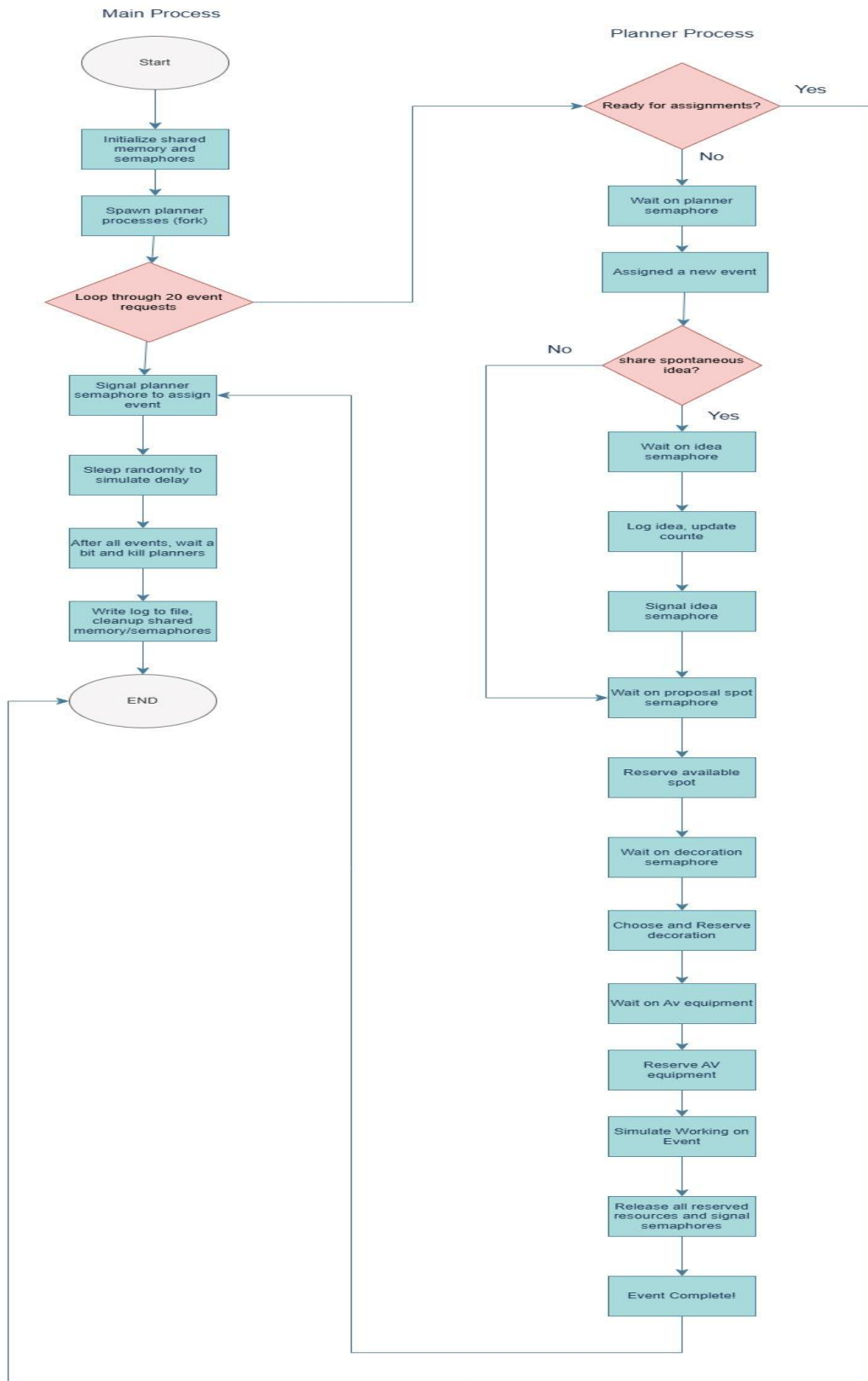
Technologies Used

- C Programming (System calls for IPC)

- Semaphores (Resource locking)

- Shared Memory (Inter-process communication)

- Process Management (fork(), kill())

Problem Statement:

Ted's Stories must handle:

- Multiple concurrent events (up to 20)

- Limited planners (only 5 available)

- Shared resources (3 proposal spots, 3 decoration themes, 3 AV setups)

- Spontaneous idea sharing without conflicts

Flowchart:

Main Process

Start

Initialize shared memory and semaphores

Spawn planner processes (fork)

Loop through 20 event requests

Signal planner semaphore to assign event

Sleep randomly to simulate delay

After all events, wait a bit and kill planners

Write log to file, cleanup shared memory/semaphores

END

Planner Process

Ready for assignments? — Yes

No

Wait on planner semaphore

Assigned a new event

share spontaneous idea? — No

Yes

Wait on idea semaphore

Log idea, update counte

Signal idea semaphore

Wait on proposal spot semaphore

Reserve available spot

Wait on decoration semaphore

Choose and Reserve decoration

Wait on Av equipment

Reserve AV equipment

Simulate Working on Event

Release all reserved resources and signal semaphores

Event Complete!

Main Code:

1. Headers and Constants

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/wait.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <sys/sem.h>
#include <sys/types.h>
#include <time.h>
#include <string.h>

#define MAX_EVENTS 20
#define MAX_PLANNERS 5
#define MAX_RESOURCES 3
#define MAX_IDEAS 5
```

-

Standard headers for I/O, process control, shared memory, and semaphores.
- Constants define system limits:
  - 20 total events to process
  - 5 concurrent planners
  - 3 units of each resource type
  - 5 different creative ideas

2. Shared Data Structure

```
typedef struct {
    char log_buffer[4096];
    int used_proposal_spots[MAX_RESOURCES];
    int used_decorations[MAX_RESOURCES];
    int used_av_equipment[MAX_RESOURCES];
    int idea_in_progress;
    int idea_counter;
} SharedData;
```

Central shared memory structure containing:

- log_buffer: Accumulates all activity logs
- used_* arrays: Track availability of three resource types
- idea_in_progress: Flag for idea-sharing synchronization
- idea_counter: Rotates through available ideas

3. Semaphore Operations

```
union semun {
    int val;
    struct semid_ds *buf;
    unsigned short *array;
};

void sem_wait(int semid, int sem_num) {
    struct sembuf sb = {sem_num, -1, 0};
    semop(semid, &sb, 1);
}

void sem_signal(int semid, int sem_num) {
    struct sembuf sb = {sem_num, 1, 0};
    semop(semid, &sb, 1);
}
```

sem_wait and sem_signal implement P (wait) and V (signal) operations on semaphores.
- Used for:
  - Planner allocation (semaphore 0)
  - Resource management (semaphores 1-3)
  - Idea sharing mutex (semaphore 4)

4. Idea Sharing Mechanism

```
void share_idea(SharedData *shared, int semid, int planner_id) {
    sem_wait(semid, 4);
    shared->idea_in_progress = 1;
        shared->idea_counter++;
    sleep(1);
    shared->idea_in_progress = 0;
    sem_signal(semid, 4);
}
```

Protected by semaphore 4 (mutex)
- Cycles through predefined ideas using modulo arithmetic
- Simulates creative brainstorming with 1-second delay

5. Planner Process Workflow

```
void planner_process(SharedData *shared, int semid, int planner_id) {
    while (1) {
    sem_wait(semid, 0);  // Acquire planner slot

    sem_wait(semid, 1);  // Proposal spots
    sem_wait(semid, 2);  // Decorations
    sem_wait(semid, 3);  // AV equipment

    sleep(2 + rand() % 3);


    sem_signal(semid, 1);
    sem_signal(semid, 2);
    sem_signal(semid, 3);

    sem_signal(semid, 0);  // Release planner slot
   }
}
```

- Wait for available planner slot (semaphore 0)
- Sequentially acquire resources:
  - Proposal locations (semaphore 1)
  - Decor themes (semaphore 2)
  - AV equipment (semaphore 3)
- Simulate event planning work
- Release resources in reverse order
- 50% chance to share spontaneous idea

6. Main Program Structure

```
int main() {
    int shmid = shmget(IPC_PRIVATE, sizeof(SharedData), IPC_CREAT | 0666);
    SharedData *shared = (SharedData *)shmat(shmid, NULL, 0);


    int semid = semget(IPC_PRIVATE, 5, IPC_CREAT | 0666);


    for (int i = 0; i < MAX_PLANNERS; i++) {
        planners[i] = fork();
        if (planners[i] == 0) {
            planner_process(shared, semid, i + 1);
            exit(0);
        }
    }

        for (int i = 1; i <= MAX_EVENTS; i++) {
        sem_signal(semid, 0);  // Release planner slot
        sleep(1 + rand() % 2);
    }

}
```

- Shared Memory Initialization:
  Creates shared memory segment for coordination and initializes all values to zero
- Semaphore Setup:
  Sem 0: Planner slots (MAX_PLANNERS)
  Sems 1-3: Resources (MAX_RESOURCES each)
  Sem 4: Idea mutex (binary)
- Process Management:
  Creates 5 planner processes using fork(), each runs planner_process() with unique ID
- Event Triggering:
  Generates 20 events with random delays, each event releases a planner slot

7. Concurrency Control Strategy
- Planners wait for available slot (sem 0)
- Sequentially acquire resources (sems 1-3)
- Random idea sharing protected by mutex (sem 4)

- Resources released in reverse order
- Planner slot released last

8. Logging System

```c
void write_log(SharedData *shared, const char *msg) {
    printf("%s", msg);
    strcat(shared->log_buffer, msg);
}
```

- Real-time console output
- Persistent buffer for final report
- Thread-safe through semaphore protection
- Captures all planning activities and resource usage

9. Simulation Termination

```c
sleep(15);
for (int i = 0; i < MAX_PLANNERS; i++) {
    kill(planners[i], SIGTERM);
}
```

- 15-second timeout for final events
- Force-terminates planner processes
- Writes accumulated log to file
- Releases shared memory and semaphores

This implementation demonstrates a classic producer-consumer pattern with multiple resource constraints, using System V IPC mechanisms for process synchronization. The code models real-world event planning scenarios where resources are limited and coordination between planners is crucial.

Output:

```
                              jannat@jannat-VirtualBox: ~/Desktop                        ⊟ ⊡ ⊗
File  Edit  View  Search  Terminal  Help
jannat@jannat-VirtualBox:~$ cd Desktop
jannat@jannat-VirtualBox:~/Desktop$ gcc project.c -o project -pthread
jannat@jannat-VirtualBox:~/Desktop$ ./project
=== Ted's Stories Event Planning Simulation ===
Event Planner 1 is ready for new assignments!
Planner 1 is assigned to a new event!
Planner 1 reserves proposal spot: Empire State Building
Planner 1 chooses decoration theme: Vintage Romance
Planner 1 reserves AV equipment: Projector & Screen
Planner 1 is working on the event...
Event Planner 2 is ready for new assignments!
Planner 2 is assigned to a new event!
Planner 2 reserves proposal spot: Central Park Bow Bridge
Planner 2 chooses decoration theme: Modern Elegance
Planner 2 reserves AV equipment: Sound System
Planner 2 is working on the event...
Event Planner 3 is ready for new assignments!
Planner 3 is assigned to a new event!
Planner 3 reserves proposal spot: Brooklyn Heights Promenade
Planner 3 chooses decoration theme: Rustic Charm
Planner 3 reserves AV equipment: Lighting Setup
Planner 3 is working on the event...
Event Planner 4 is ready for new assignments!
Planner 4 is assigned to a new event!
Event Planner 5 is ready for new assignments!
Planner 5 is assigned to a new event!

=== New Event Request Received! (Event 1) ===

=== New Event Request Received! (Event 2) ===
Planner 1 has completed the event!
Planner 1 is assigned to a new event!
Planner 1 shares a spontaneous idea: We could recreate their first date!
Planner 4 reserves proposal spot: Empire State Building
Planner 4 chooses decoration theme: Vintage Romance
Planner 4 reserves AV equipment: Projector & Screen
Planner 4 is working on the event...
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 5 reserves proposal spot: Central Park Bow Bridge
Planner 5 chooses decoration theme: Modern Elegance
Planner 5 reserves AV equipment: Sound System
Planner 5 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
```

```
                              jannat@jannat-VirtualBox: ~/Desktop                        ⊟ ⊡ ⊗
File  Edit  View  Search  Terminal  Help
=== New Event Request Received! (Event 3) ===
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 2 shares a spontaneous idea: A traditional nakshi kantha quilt signing ceremony for the couple
Planner 3 shares a spontaneous idea: A floating lantern ceremony on a pond with terracotta diyas

=== New Event Request Received! (Event 4) ===
Planner 4 has completed the event!
Planner 4 is assigned to a new event!
Planner 2 reserves proposal spot: Empire State Building
Planner 2 chooses decoration theme: Vintage Romance
Planner 2 reserves AV equipment: Projector & Screen
Planner 2 is working on the event...
Planner 4 shares a spontaneous idea: We could create a memory lane with photos from their childhood
Planner 5 has completed the event!
Planner 5 is assigned to a new event!
Planner 3 reserves proposal spot: Central Park Bow Bridge
Planner 3 chooses decoration theme: Modern Elegance
Planner 3 reserves AV equipment: Sound System
Planner 3 is working on the event...
Planner 5 shares a spontaneous idea: What if we surprise them with a flash mob?

=== New Event Request Received! (Event 5) ===
Planner 1 has completed the event!
Planner 1 is assigned to a new event!
Planner 4 reserves proposal spot: Brooklyn Heights Promenade
Planner 4 chooses decoration theme: Rustic Charm
Planner 4 reserves AV equipment: Lighting Setup
Planner 4 is working on the event...

=== New Event Request Received! (Event 6) ===

=== New Event Request Received! (Event 7) ===
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 1 reserves proposal spot: Empire State Building
Planner 1 chooses decoration theme: Vintage Romance
Planner 1 reserves AV equipment: Projector & Screen
Planner 1 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 5 reserves proposal spot: Central Park Bow Bridge
Planner 5 chooses decoration theme: Modern Elegance
```

```
=== New Event Request Received! (Event 7) ===
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 1 reserves proposal spot: Empire State Building
Planner 1 chooses decoration theme: Vintage Romance
Planner 1 reserves AV equipment: Projector & Screen
Planner 1 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 5 reserves proposal spot: Central Park Bow Bridge
Planner 5 chooses decoration theme: Modern Elegance
Planner 5 reserves AV equipment: Sound System
Planner 5 is working on the event...

=== New Event Request Received! (Event 8) ===
Planner 1 has completed the event!
Planner 1 is assigned to a new event!
Planner 1 shares a spontaneous idea: We could recreate their first date!
Planner 2 reserves proposal spot: Brooklyn Heights Promenade
Planner 2 chooses decoration theme: Rustic Charm
Planner 2 reserves AV equipment: Lighting Setup
Planner 2 is working on the event...
Planner 3 reserves proposal spot: Brooklyn Heights Promenade
Planner 3 chooses decoration theme: Rustic Charm
Planner 3 reserves AV equipment: Lighting Setup
Planner 3 is working on the event...
Planner 4 has completed the event!
Planner 4 is assigned to a new event!

=== New Event Request Received! (Event 9) ===

=== New Event Request Received! (Event 10) ===
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 2 shares a spontaneous idea: A floating lantern ceremony on a pond with terracotta diyas
Planner 4 reserves proposal spot: Brooklyn Heights Promenade
Planner 4 chooses decoration theme: Rustic Charm
Planner 4 reserves AV equipment: Lighting Setup
Planner 4 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 5 has completed the event!
```

```
Planner 3 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 5 has completed the event!
Planner 5 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm
Planner 5 reserves AV equipment: Lighting Setup
Planner 5 is working on the event...

=== New Event Request Received! (Event 11) ===
Planner 3 shares a spontaneous idea: We could create a memory lane with photos from their childhood
Planner 4 has completed the event!
Planner 4 is assigned to a new event!
Planner 4 shares a spontaneous idea: A floating lantern ceremony on a pond with terracotta diyas
Planner 2 reserves proposal spot: Brooklyn Heights Promenade
Planner 2 chooses decoration theme: Rustic Charm
Planner 2 reserves AV equipment: Lighting Setup
Planner 2 is working on the event...
Planner 5 has completed the event!
Planner 5 is assigned to a new event!
Planner 3 reserves proposal spot: Brooklyn Heights Promenade
Planner 3 chooses decoration theme: Rustic Charm
Planner 3 reserves AV equipment: Lighting Setup
Planner 3 is working on the event...

=== New Event Request Received! (Event 12) ===
Planner 5 shares a spontaneous idea: A floating lantern ceremony on a pond with terracotta diyas
Planner 1 has completed the event!
Planner 1 is assigned to a new event!
Planner 4 reserves proposal spot: Brooklyn Heights Promenade
Planner 4 chooses decoration theme: Rustic Charm
Planner 4 reserves AV equipment: Lighting Setup
Planner 4 is working on the event...

=== New Event Request Received! (Event 13) ===

=== New Event Request Received! (Event 14) ===
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
```

File   Edit   View   Search   Terminal   Help

Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm
Planner 5 reserves AV equipment: Lighting Setup
Planner 5 is working on the event...

=== New Event Request Received! (Event 15) ===
Planner 4 has completed the event!
Planner 4 is assigned to a new event!
Planner 2 reserves proposal spot: Brooklyn Heights Promenade
Planner 2 chooses decoration theme: Rustic Charm
Planner 2 reserves AV equipment: Lighting Setup
Planner 2 is working on the event...
Planner 1 has completed the event!
Planner 1 is assigned to a new event!
Planner 1 shares a spontaneous idea: A floating lantern ceremony on a pond with terracotta diyas
Planner 3 reserves proposal spot: Brooklyn Heights Promenade
Planner 3 chooses decoration theme: Rustic Charm
Planner 3 reserves AV equipment: Lighting Setup
Planner 3 is working on the event...

=== New Event Request Received! (Event 16) ===
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 2 shares a spontaneous idea: A floating lantern ceremony on a pond with terracotta diyas
Planner 4 reserves proposal spot: Brooklyn Heights Promenade
Planner 4 chooses decoration theme: Rustic Charm
Planner 4 reserves AV equipment: Lighting Setup
Planner 4 is working on the event...
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 5 has completed the event!
Planner 5 is assigned to a new event!
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm

File   Edit   View   Search   Terminal   Help

Planner 5 has completed the event!
Planner 5 is assigned to a new event!
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm
Planner 5 reserves AV equipment: Lighting Setup
Planner 5 is working on the event...

=== New Event Request Received! (Event 17) ===
Planner 3 shares a spontaneous idea: A floating lantern ceremony on a pond with terracotta diyas

=== New Event Request Received! (Event 18) ===
Planner 4 has completed the event!
Planner 4 is assigned to a new event!
Planner 2 reserves proposal spot: Brooklyn Heights Promenade
Planner 2 chooses decoration theme: Rustic Charm
Planner 2 reserves AV equipment: Lighting Setup
Planner 2 is working on the event...
Planner 4 shares a spontaneous idea: A floating lantern ceremony on a pond with terracotta diyas
Planner 3 reserves proposal spot: Brooklyn Heights Promenade
Planner 3 chooses decoration theme: Rustic Charm
Planner 3 reserves AV equipment: Lighting Setup
Planner 3 is working on the event...
Planner 5 has completed the event!
Planner 5 is assigned to a new event!
Planner 5 shares a spontaneous idea: We could recreate their first date!

=== New Event Request Received! (Event 19) ===
Planner 1 has completed the event!
Planner 1 is assigned to a new event!
Planner 4 reserves proposal spot: Brooklyn Heights Promenade
Planner 4 chooses decoration theme: Rustic Charm
Planner 4 reserves AV equipment: Lighting Setup
Planner 4 is working on the event...

=== New Event Request Received! (Event 20) ===
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm
Planner 5 reserves AV equipment: Lighting Setup
Planner 5 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade

File   Edit   View   Search   Terminal   Help

=== New Event Request Received! (Event 20) ===
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm
Planner 5 reserves AV equipment: Lighting Setup
Planner 5 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 4 has completed the event!
Planner 4 is assigned to a new event!
Planner 2 reserves proposal spot: Brooklyn Heights Promenade
Planner 2 chooses decoration theme: Rustic Charm
Planner 2 reserves AV equipment: Lighting Setup
Planner 2 is working on the event...
Planner 1 has completed the event!
Planner 1 is assigned to a new event!
Planner 3 reserves proposal spot: Brooklyn Heights Promenade
Planner 3 chooses decoration theme: Rustic Charm
Planner 3 reserves AV equipment: Lighting Setup
Planner 3 is working on the event...
Planner 5 has completed the event!
Planner 5 is assigned to a new event!
Planner 4 reserves proposal spot: Brooklyn Heights Promenade
Planner 4 chooses decoration theme: Rustic Charm
Planner 4 reserves AV equipment: Lighting Setup
Planner 4 is working on the event...
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm
Planner 5 reserves AV equipment: Lighting Setup
Planner 5 is working on the event...
Planner 4 has completed the event!
Planner 4 is assigned to a new event!

File   Edit   View   Search   Terminal   Help

Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm
Planner 5 reserves AV equipment: Lighting Setup
Planner 5 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 4 has completed the event!
Planner 4 is assigned to a new event!
Planner 2 reserves proposal spot: Brooklyn Heights Promenade
Planner 2 chooses decoration theme: Rustic Charm
Planner 2 reserves AV equipment: Lighting Setup
Planner 2 is working on the event...
Planner 1 has completed the event!
Planner 1 is assigned to a new event!
Planner 3 reserves proposal spot: Brooklyn Heights Promenade
Planner 3 chooses decoration theme: Rustic Charm
Planner 3 reserves AV equipment: Lighting Setup
Planner 3 is working on the event...
Planner 5 has completed the event!
Planner 5 is assigned to a new event!
Planner 4 reserves proposal spot: Brooklyn Heights Promenade
Planner 4 chooses decoration theme: Rustic Charm
Planner 4 reserves AV equipment: Lighting Setup
Planner 4 is working on the event...
Planner 2 has completed the event!
Planner 2 is assigned to a new event!
Planner 1 reserves proposal spot: Brooklyn Heights Promenade
Planner 1 chooses decoration theme: Rustic Charm
Planner 1 reserves AV equipment: Lighting Setup
Planner 1 is working on the event...
Planner 3 has completed the event!
Planner 3 is assigned to a new event!
Planner 5 reserves proposal spot: Brooklyn Heights Promenade
Planner 5 chooses decoration theme: Rustic Charm
Planner 5 reserves AV equipment: Lighting Setup
Planner 5 is working on the event...

Simulation complete.
jannat@jannat-VirtualBox:~/Desktop$

Conclusion:

The simulation successfully demonstrates concurrent event planning with process isolation, ensuring multiple planners can work simultaneously without interference. It achieves deadlock-free resource management by carefully controlling access to limited resources through semaphores. Effective synchronization is maintained using semaphore operations, coordinating planner activities and idea sharing seamlessly. Additionally, the system provides consistent logging by utilizing shared memory to capture and store all planning activities. Overall, this project offers a practical implementation of fundamental operating system concepts such as interprocess communication, process synchronization, and resource allocation.

References

1. Stevens, W. R. (1992). Advanced Programming in the UNIX Environment

2. Semaphore operations - Linux man pages

3. How I Met Your Mother (CBS, 2005-2014)