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**Part1 - How to build and use**

**1.1 How to build**

**yufanxue$ make**

**gcc -c -o semaphore\_support.o semaphore\_support.c -Wall -g**

**gcc -o pirates-ninjas -Wall -g -pthread -lm pirates-ninjas.c semaphore\_support.o**

**yufanxue$ make clean**

**rm -f pn \*.o**

**rm -f -rf \*.dSYM**

**1.2 How to use**

**yufanxue$ ./pirates-ninjas 7 2 3**

**yufanxue$ ./pirates-ninjas 7 2**

**yufanxue$ ./pirates-ninjas 7**

**First parameter : Time to run in seconds. Required argument**

**Second parameter : Number of Pirates. Optional, default 5**

**Third Parameter : Number of Ninjas. Optional, default 5**

**Part2 - Examples and Test cases**

**2.1 Example**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 1 2 3**

**Time to Live (seconds) : 1**

**Number of Pirates : 2**

**Number of Ninjas : 3**

**-------------------------------**

**Pirate 0 | Waiting**

**Pirate 0 | Costume preparation**

**Pirate 1 | Waiting**

**Pirate 1 | Costume preparation**

**Ninja 0 | Waiting**

**Ninja 1 | Waiting**

**Ninja 2 | Waiting**

**Pirate 1 | Leaving**

**Pirate 1 | Waiting**

**Pirate 0 | Leaving**

**Ninja 0 | Costume preparation**

**……………**

**Pirate 1 | Leaving**

**Ninja 0 | Costume preparation**

**Ninja 0 | Leaving**

**-------------------------------**

**Pirate 0 : Entered 136 / Left 136**

**Pirate 1 : Entered 137 / Left 137**

**Ninja 0 : Entered 137 / Left 137**

**Ninja 1 : Entered 137 / Left 137**

**Ninja 2 : Entered 136 / Left 136**

**2.2 Test cases**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 10 5 5**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 10 12 13**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 15 12 13**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 100 22 33**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 150 50 33**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 200 100 100**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 300 2 3**

**yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 350 150 200**

**Result: All test cases upon passed without deadlock**

**Part3 - Pseudo Code**

**3.1 Precondition**

**1) Here I use P() as wait(), V() as signal()**

**2) Initially,**

**semaphore\_t** mutex\_Register **= 1;**

**semaphore\_t** mutex\_NinjaCount **= 1;**

**semaphore\_t** mutex\_PirateCount **= 1;**

**semaphore\_t** mutex\_Depratment **= 1;**

**semaphore\_t** mutex\_Team **= 2;**

**3.2 Pseudo code**

|  |  |
| --- | --- |
| Ninja  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  P(mutex\_Register)  P(mutex\_NinjaCount)  NinjaCount++;  If(NinjaCount == 1)  P(mutex\_Depratment)  V(mutex\_NinjaCount)  V(mutex\_Register)  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  P(mutex\_Team)  *Do something here*  V(mutex\_Team)  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  P(mutex\_NinjaCount)  NinjaCount--;  If(NinjaCount == 0)  V(mutex\_Depratment)  V(mutex\_NinjaCount) | Pirate  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  P(mutex\_Register)  P(mutex\_PirateCount)  PirateCount++;  If(PirateCount == 1)  P(mutex\_Depratment)  V(mutex\_PirateCount)  V(mutex\_Register)  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  P(mutex\_Team)  *Do something here*  V(mutex\_Team)  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  P(mutex\_PirateCount)  PirateCount--;  If(PirateCount == 0)  V(mutex\_Depratment)  V(mutex\_PirateCount) |

Thanks a lot !