

Mutual Exclusion I

```
Boolean flag[2];  
flag[0]=false, flag[1]=false;
```

```
//Thread T0  
while (true) {  
    while (flag[0]==flag[1]);  
    //Critical section  
    flag[0]=flag[1];  
}
```

```
//Thread T1  
while (true) {  
    while (flag[0]!=flag[1]);  
    //Critical section  
    flag[0]=!flag[1];  
}
```

- Does it achieve one of more of the correctness properties of a concurrent program:
 - Mutual exclusion: Only one thread in critical section at a time
 - Progress (deadlock-free): If several simultaneous requests, must allow one to proceed
 - Bounded waiting (starvation-free): Must eventually allow each waiting thread to enter
- Does it need the TestAndSet() instruction for atomic execution like the previous slide “Locks: Loads/Stores”?
- What is its major flaw?
- ANS:

Mutual Exclusion II

```
Boolean flag[2];  
flag[0]=false, flag[1]=false;
```

```
//Thread T0  
while (true) {  
    flag[0] = true;  
    while (flag[1]==true);  
    /* Critical Section */  
    flag[0] = false;  
}
```

```
//Thread T1  
while (true) {  
    flag[1] = true;  
    while (flag[0]==true);  
    /* Critical Section */  
    flag[1] = false;  
}
```

- Does it achieve one or more of the correctness properties of a concurrent program:
 - Mutual exclusion: Only one thread in critical section at a time
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- ANS:

Mutual Exclusion III (Peterson's Solution)

```
Boolean flag[2];  
flag[0]=false, flag[1]=false;  
int turn = 0;
```

```
//Thread T0  
while (true) {  
    flag[0] = true;  
    turn = 1;  
    while (flag[1]==true && turn==1);  
    /* Critical Section */  
    flag[0] = false;  
}
```

```
//Thread T1  
while (true) {  
    flag[1] = true;  
    turn = 0;  
    while (flag[0]==true && turn==0);  
    /* Critical Section */  
    flag[1] = false;  
}
```

- Does it achieve one of more of the correctness properties of a concurrent program:
 - Mutual exclusion: Only one thread in critical section at a time
 - Progress (deadlock-free): If several simultaneous requests, must allow one to proceed
 - Bounded waiting (starvation-free): Must eventually allow each waiting thread to enter
- ANS: