ECE 391 Discussion Week 4

Announcements & Reminders

- PS2 has been posted
  - Work in groups of at least 4
  - Due next Tuesday (Sept 20) 5:59 pm

- MP2 posted as well
  - Start early!!!!
  - Read the documentation carefully

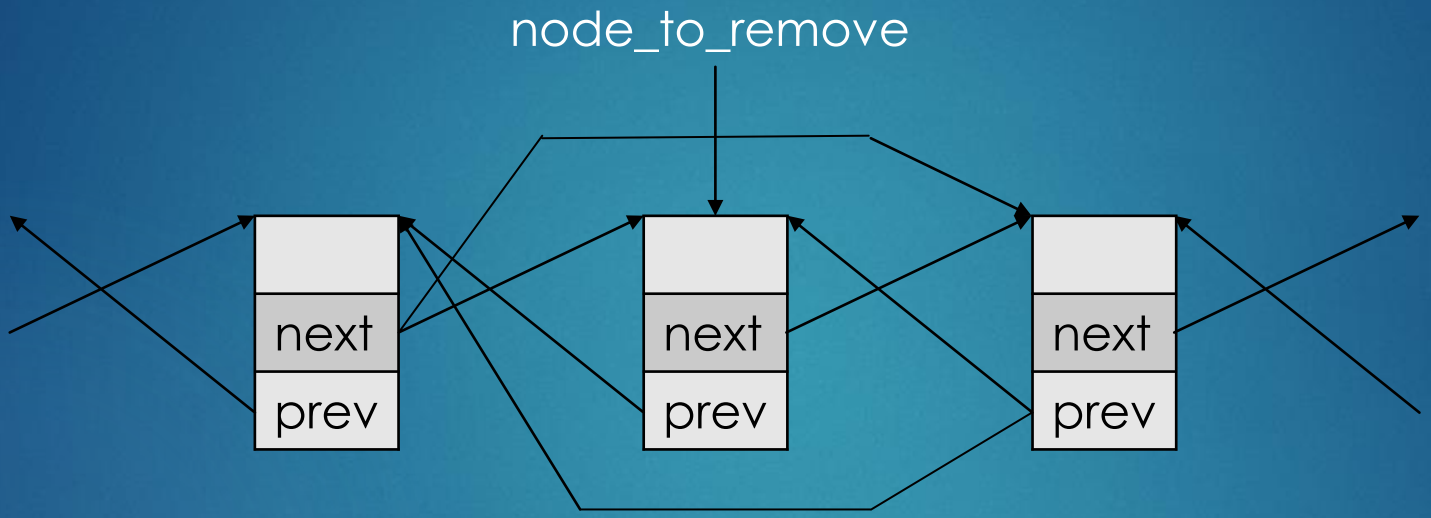
Problem Set 2

- Put everyone's name and NetID on one copy
- Don't be lazy, reading documentation will help you with your MP2
  - The website for VGA is related to checkpoint 1
  - The MTCP header file is related to checkpoint 2
- Don't over think in problem 3
  - Write code in the file provided
  - Test if it works before submission

Linked List

- Given a doubly linked list
  - Process 1 tries to traverse it (interrupt)
  - Process 2 tries to remove a node from it
  - Race condition

Linked List



CLI();

item_to_remove->prev->next = item_to_remove->next;

item_to_remove->next->prev = item_to_remove->prev;

STI();

But CLI/STI is only good for one processor

Synchronization (Atomic Instructions)

```
typedef uint32_t spinlock_t;
void spin_lock(spinlock_t *lock);

(broken)spin_lock:
        movl    4(%esp), %eax
        loop:
                movl (%eax), %edx
                jnz loop
                movl    $1, (%eax)
                ret
```

Spin Lock Implementation

```
typedef uint32_t spinlock_t;
void spin_lock(spinlock_t *lock);

spin_lock:
        movl    4(%esp), %eax
        loop:
                movl    $1, %ecx
                xchgl   %ecx, (%eax)
                cmpl    $1, %ecx
                je              loop
                ret
```

```
void spin_unlock(spinlock_t *lock);

spin_unlock:
        movl    4(%esp), %eax
        movl    $0, (%eax)
        ret
```

Linked List Revisit

```
CLI();
/* critical section code */
STI();
```

→

```
CLI();
spin_lock(spinlock_t *lock);
/* critical section code */
spin_unlock(spinlock_t *lock);
STI();
```

When Using Locks

- Do not protect regions of memory from modification
- Do not mark certain data structures as locked
- Adding a lock to a struct does not magically protect that struct
- Does not matter if lock is in the struct or not
- It is up to the programmer to protect against race conditions