601.220 Intermediate Programming

More linked lists

Additional linked list operations

- `clear` - deallocates all nodes in the list, sets head pointer to null
- `add_front`
- `clear_list` (free all nodes)
- `remove_after`
- `remove_front`
- `remove_all` (remove all occurrences of a particular data value)

Pointers are passed by value

```c
// pointer_pv.c:
#include <stdio.h>

void fun1(int * ip) {
  *ip = 10;
  ip += 1; // increment the address
}
int main() {
  int a = 12;
  int * p = &a;
  printf("p points to address %p with value %d\n", (void *)p, *p);
  fun1(p); // pass p by value; changes to p will NOT affect p
  printf("p points to address %p with value %d\n", (void *)p, *p);
  return 0;
}
```

```
$ gcc -std=c99 -pedantic -Wall -Wextra pointer_pv.c
$ ./a.out
p points to address 0x7ffd035fc3dc with value 12
p points to address 0x7ffd035fc3dc with value 10
```

Pass a pointer by reference

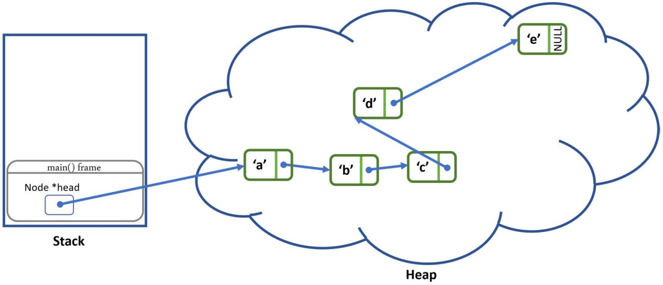
```
// pointer_pv.c:
#include <stdio.h>

void fun1(int ** ip) {
  *ip += 1; // increment the address
}
int main() {
  int a = 12;
  int * p = &a;
  printf("p points to address %p with value %d\n", (void *)p, *p);
  fun1(&p); // pass p by value; changes to p will NOT affect p
  printf("p points to address %p with value %d\n", (void *)p, *p);
  return 0;
}
```

```
$ gcc -std=c99 -pedantic -Wall -Wextra pointer_pv.c
$ ./a.out
p points to address 0x7ffc6ca8dd6c with value 12
p points to address 0x7ffc6ca8dd70 with value 1823006064
```

Linkedlist head

- The linked list *head* should be passed by reference if it needs to be updated

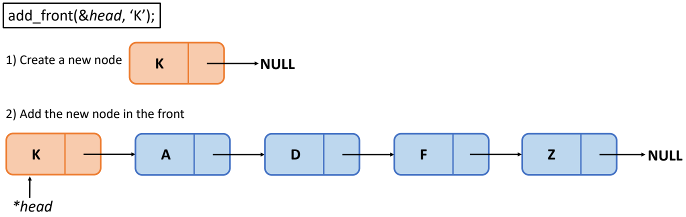


add_after vs. add_front

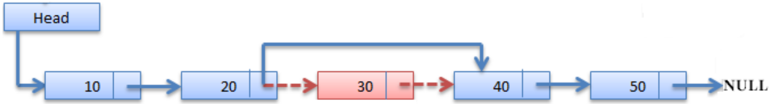
- `void add_after(Node * node, char val);`
- `void add_front(Node ** list_ptr, char val);`
  - needs ability to modify actual head pointer (not a copy), so call with `&head` as argument

Example add_front call: `add_front(&head, value);`

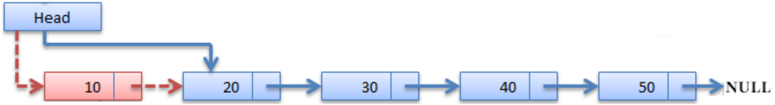
```
void add_front(Node ** list_ptr, char val) {
     Node * n = create_node(val);
     n->next = *list_ptr;  //new node's next gets address of old first node
     *list_ptr = n;  //head pointer gets address of new node
}
```



Remove Operations



```
char remove_after(Node * node);
```



```
char remove_front(Node ** list_ptr);
```

Zoom poll!

Defintion of a `Node` data type:

```
typedef struct node_ {
  char data;
  struct node_ *next;
} Node;
```

Consider the following function:

```
void mystery(Node **list_ptr) {
  Node *head = *list_ptr;
  list_ptr = list_ptr->next;
  free(head);
}
```

What does this function do?

A. Correctly removes the first node for any list

B. Correctly removes the first node of any non-empty list

C. Has no effect

D. The code does not compile

E. None of the above