CSE 3010 – Data Structures & Algorithms

Lecture #9

What will be covered today

- Dynamic implementation of a list
- Use of `malloc` function
- Types of memory

`malloc` function in C

- Allocates a block of memory on the heap
- Allocated block of memory is accessed using the pointer returned by `malloc`
- Allocated block of memory can be released by passing the pointer to the function `free`

```
int *p;
// Allocate block of memory on heap
p = (int*) malloc(sizeof(int));
// Use p
// Release p
free(p);
```

Types of memory

- Stack
  - Static memory allocation
  - Inside the RAM
  - Known at compile time
  - Access is faster
  - Thread specific
- Heap
  - Dynamic memory allocation
  - Inside the RAM
  - Known at run time
  - Access is slower
  - Program specific

Types of memory – Understanding using an example

```
#include<stdio.h>
#include<stdlib.h>

int main() {
    int *p;

    printf("%p\n",p);
    p = (int*) malloc(sizeof(int));
    printf("%p\n",p);
}
```

Memory for p is allocated on the Stack

Memory for p is now allocated on the Heap

Output of the program:

```
0x7ffee01869c0
0x7f98b7c00620
```

Note the difference in the addresses allocated to p