Operating Systems Lab

Lab-3

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Design Decisions For implementation:

alloc.cpp

It contains the definitions of various methods used for managing allocation and deallocation of memory dynamically.

```
// initialize memory allocation
int init_allocate();
// deallocate memory
int cleanup();
char *alloc(int _size);
void dealloc(char * addr);
```

```
harshraj22 in malloc-code on main [$]
$ make alloc
g++ test_alloc.c alloc.cpp -o alloc

harshraj22 in malloc-code on main [?$]
$ ./alloc
Hello, world! test passed
Elementary tests passed
Starting comprehensive tests (see details in code)
Test 1 passed: allocated 4 chunks of 1KB each
Test 2 passed: dealloc and realloc worked
Test 3 passed: dealloc and smaller realloc worked
Test 4 passed: merge worked
Test 5 passed: merge alloc 2048 worked
```

ealloc.cpp

It contains definitions of various methods used for managing allocation and deallocation of memory dynamically and elastically. It maps the memory from the OS only on demand.

```
void init_alloc();
void cleanup();
char *alloc(int _size);
void dealloc(char *address);
```

In function `cleanup()`, the elastic memory allocator

expands by invoking the mmap system call when allocations are made, but does not return memory back to the OS via munmap

The function `dealloc()` takes a pointer to a previously allocated memory chunk (that was returned by an earlier call to alloc), and frees up the entire chunk.The freed up empty pages are not given back to the OS via the munmap system call.

```
harshraj22 in malloc-code on main [!$]
$ make ealloc
g++ -w test_ealloc.c ealloc.cpp -o ealloc

harshraj22 in malloc-code on main [!?$]
$ ./ealloc

Initializing memory manager

Test1: checking heap expansion; allocate 4 X 4KB chunks
start test 1:VSZ:2560000
should increase by 4KB:VSZ:2560000
should increase by 4KB:VSZ:2564096
should increase by 4KB:VSZ:2568192
should increase by 4KB:VSZ:2572288
should not change:VSZ:2572288
Test1: complete

Test2: Check splitting of existing free chunks: allocate 64 X 256B chunks
start test 2:VSZ:2572288
should not change:VSZ:2572288
should not change:VSZ:2572288
Test2: complete

Test3: checking merging of existing free chunks; allocate 4 X 4KB chunks
start test 3:VSZ:2572288
should not change:VSZ:2572288
should not change:VSZ:2572288
should not change:VSZ:2572288
should not change:VSZ:2572288
should not change:VSZ:2572288
Test3: complete

All tests complete
```