CS2263 Lab 5
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Exercise One

```
[scole4@gaea lab5]$ make
gcc -std=c99 -c Strings.c
Strings.c: In function ‘getfc’:
Strings.c:79:22: warning: cast from pointer to integer of different
             s[n+1] = (char)NULL;
                      ^
[scole4@gaea lab5]$
```

Exercise Two

make

```
[scole4@gaea lab5]$ make
gcc -std=c99 -o stringTest1 -g Strings.o stringTest1.o
[scole4@gaea lab5]$
```

valgrind leak

==6001== Memcheck, a memory error detector
==6001== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==6001== Using Valgrind-3.13.0 and LibVEX; rerun with -h for copyright info
==6001== Command: ./stringTest1 --tool=memcheck –-leak-check=full -–verbose –-log-file=stringTest1.txt
==6001==
==6001== Invalid write of size 1
==6001== at 0x4C2CAB0: strcpy (vg_replace_strmem.c:510)
==6001== by 0x4007CA: duplicateString (Strings.c:28)
==6001== by 0x400A6A: main (stringTest1.c:10)
==6001== Address 0x5203044 is 0 bytes after a block of size 4 alloc'd
==6001== at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6001== by 0x400771: mallocString (Strings.c:13)
==6001== by 0x4007AC: duplicateString (Strings.c:26)
==6001== by 0x400A6A: main (stringTest1.c:10)

```
==6001==
==6001== Invalid write of size 1
==6001==    at 0x4C2CAC3: strcpy (vg_replace_strmem.c:510)
==6001==    by 0x4007CA: duplicateString (Strings.c:28)
==6001==    by 0x400A6A: main (stringTest1.c:10)
==6001==  Address 0x520304f is 11 bytes after a block of size 4 alloc'd
==6001==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6001==    by 0x400771: mallocString (Strings.c:13)
==6001==    by 0x4007AC: duplicateString (Strings.c:26)
==6001==    by 0x400A6A: main (stringTest1.c:10)
==6001==
==6001== Invalid read of size 1
==6001==    at 0x4E82EF9: vfprintf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x400A8F: main (stringTest1.c:11)
==6001==  Address 0x5203044 is 0 bytes after a block of size 4 alloc'd
==6001==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6001==    by 0x400771: mallocString (Strings.c:13)
==6001==    by 0x4007AC: duplicateString (Strings.c:26)
==6001==    by 0x400A6A: main (stringTest1.c:10)
==6001==
==6001== Invalid read of size 1
==6001==    at 0x4EB089D: _IO_file_xsputn@@GLIBC_2.2.5 (in /usr/lib64/libc-2.17.so)
==6001==    by 0x4E82EB2: vfprintf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x400A8F: main (stringTest1.c:11)
==6001==  Address 0x520304e is 10 bytes after a block of size 4 alloc'd
==6001==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6001==    by 0x400771: mallocString (Strings.c:13)
==6001==    by 0x4007AC: duplicateString (Strings.c:26)
==6001==    by 0x400A6A: main (stringTest1.c:10)
==6001==
==6001== Invalid read of size 1
==6001==    at 0x4EB08B4: _IO_file_xsputn@@GLIBC_2.2.5 (in /usr/lib64/libc-2.17.so)
==6001==    by 0x4E82EB2: vfprintf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x400A8F: main (stringTest1.c:11)
==6001==  Address 0x520304d is 9 bytes after a block of size 4 alloc'd
==6001==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6001==    by 0x400771: mallocString (Strings.c:13)
==6001==    by 0x4007AC: duplicateString (Strings.c:26)
==6001==    by 0x400A6A: main (stringTest1.c:10)
==6001==
==6001== Invalid read of size 1
==6001==    at 0x4C30A56: __GI_mempcpy (vg_replace_strmem.c:1525)
==6001==    by 0x4EB07C4: _IO_file_xsputn@@GLIBC_2.2.5 (in /usr/lib64/libc-2.17.so)
```

```
==6001==    by 0x4E82EB2: vfprintf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x400A8F: main (stringTest1.c:11)
==6001==  Address 0x5203044 is 0 bytes after a block of size 4 alloc'd
==6001==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6001==    by 0x400771: mallocString (Strings.c:13)
==6001==    by 0x4007AC: duplicateString (Strings.c:26)
==6001==    by 0x400A6A: main (stringTest1.c:10)
==6001==
==6001== Invalid read of size 1
==6001==    at 0x4C30A48: __GI_mempcpy (vg_replace_strmem.c:1525)
==6001==    by 0x4EB07C4: _IO_file_xsputn@@GLIBC_2.2.5 (in /usr/lib64/libc-2.17.so)
==6001==    by 0x4E82EB2: vfprintf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6001==    by 0x400A8F: main (stringTest1.c:11)
==6001==  Address 0x5203045 is 1 bytes after a block of size 4 alloc'd
==6001==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6001==    by 0x400771: mallocString (Strings.c:13)
==6001==    by 0x4007AC: duplicateString (Strings.c:26)
==6001==    by 0x400A6A: main (stringTest1.c:10)
==6001==
Original: --tool=memcheck, Duplicate: --tool=memcheck
==6001==
==6001== HEAP SUMMARY:
==6001==     in use at exit: 4 bytes in 1 blocks
==6001==   total heap usage: 1 allocs, 0 frees, 4 bytes allocated
==6001==
==6001== LEAK SUMMARY:
==6001==    definitely lost: 4 bytes in 1 blocks
==6001==    indirectly lost: 0 bytes in 0 blocks
==6001==      possibly lost: 0 bytes in 0 blocks
==6001==    still reachable: 0 bytes in 0 blocks
==6001==         suppressed: 0 bytes in 0 blocks
==6001== Rerun with --leak-check=full to see details of leaked memory
==6001==
==6001== For counts of detected and suppressed errors, rerun with: -v
==6001== ERROR SUMMARY: 46 errors from 7 contexts (suppressed: 0 from 0)
```

stringTest1 before fix

```
[scole4@gaea lab5]$ ./stringTest1 test
Original: test, Duplicate: test
[scole4@gaea lab5]$
```

stringTest1 after fix

```
[scole4@gaea lab5]$ make
gcc -std=c99 -o stringTest1 -g Strings.o stringTest1.o
```

```
[scole4@gaea lab5]$ ./stringTest1 test
Original: test, Duplicate: test
```

valgrind output

```
==6262== Memcheck, a memory error detector
==6262== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==6262== Using Valgrind-3.13.0 and LibVEX; rerun with -h for copyright info
==6262== Command: ./stringTest1 --tool=memcheck –-leak-check=full -–verbose –-log-file=stringTest1.txt
==6262==
==6262== Invalid write of size 1
==6262==    at 0x4C2CAB0: strcpy (vg_replace_strmem.c:510)
==6262==    by 0x4007CA: duplicateString (Strings.c:28)
==6262==    by 0x400A6A: main (stringTest1.c:11)
==6262==  Address 0x5203044 is 0 bytes after a block of size 4 alloc'd
==6262==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6262==    by 0x400771: mallocString (Strings.c:13)
==6262==    by 0x4007AC: duplicateString (Strings.c:26)
==6262==    by 0x400A6A: main (stringTest1.c:11)
==6262==
==6262== Invalid write of size 1
==6262==    at 0x4C2CAC3: strcpy (vg_replace_strmem.c:510)
==6262==    by 0x4007CA: duplicateString (Strings.c:28)
==6262==    by 0x400A6A: main (stringTest1.c:11)
==6262==  Address 0x520304f is 11 bytes after a block of size 4 alloc'd
==6262==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6262==    by 0x400771: mallocString (Strings.c:13)
==6262==    by 0x4007AC: duplicateString (Strings.c:26)
==6262==    by 0x400A6A: main (stringTest1.c:11)
==6262==
==6262== Invalid read of size 1
==6262==    at 0x4E82EF9: vfprintf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x400A8F: main (stringTest1.c:12)
==6262==  Address 0x5203044 is 0 bytes after a block of size 4 alloc'd
==6262==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6262==    by 0x400771: mallocString (Strings.c:13)
==6262==    by 0x4007AC: duplicateString (Strings.c:26)
==6262==    by 0x400A6A: main (stringTest1.c:11)
```

```
==6262==
==6262== Invalid read of size 1
==6262==    at 0x4EB089D: _IO_file_xsputn@@GLIBC_2.2.5 (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E82EB2: vfprintf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x400A8F: main (stringTest1.c:12)
==6262==  Address 0x520304e is 10 bytes after a block of size 4 alloc'd
==6262==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6262==    by 0x400771: mallocString (Strings.c:13)
==6262==    by 0x4007AC: duplicateString (Strings.c:26)
==6262==    by 0x400A6A: main (stringTest1.c:11)
==6262==
==6262== Invalid read of size 1
==6262==    at 0x4EB08B4: _IO_file_xsputn@@GLIBC_2.2.5 (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E82EB2: vfprintf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x400A8F: main (stringTest1.c:12)
==6262==  Address 0x520304d is 9 bytes after a block of size 4 alloc'd
==6262==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6262==    by 0x400771: mallocString (Strings.c:13)
==6262==    by 0x4007AC: duplicateString (Strings.c:26)
==6262==    by 0x400A6A: main (stringTest1.c:11)
==6262==
==6262== Invalid read of size 1
==6262==    at 0x4C30A56: __GI_mempcpy (vg_replace_strmem.c:1525)
==6262==    by 0x4EB07C4: _IO_file_xsputn@@GLIBC_2.2.5 (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E82EB2: vfprintf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x400A8F: main (stringTest1.c:12)
==6262==  Address 0x5203044 is 0 bytes after a block of size 4 alloc'd
==6262==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6262==    by 0x400771: mallocString (Strings.c:13)
==6262==    by 0x4007AC: duplicateString (Strings.c:26)
==6262==    by 0x400A6A: main (stringTest1.c:11)
==6262==
==6262== Invalid read of size 1
==6262==    at 0x4C30A48: __GI_mempcpy (vg_replace_strmem.c:1525)
==6262==    by 0x4EB07C4: _IO_file_xsputn@@GLIBC_2.2.5 (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E82EB2: vfprintf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x4E89328: printf (in /usr/lib64/libc-2.17.so)
==6262==    by 0x400A8F: main (stringTest1.c:12)
==6262==  Address 0x5203045 is 1 bytes after a block of size 4 alloc'd
==6262==    at 0x4C29BC3: malloc (vg_replace_malloc.c:299)
==6262==    by 0x400771: mallocString (Strings.c:13)
==6262==    by 0x4007AC: duplicateString (Strings.c:26)
==6262==    by 0x400A6A: main (stringTest1.c:11)
```

```
==6262==
Original: --tool=memcheck, Duplicate: --tool=memcheck
==6262==
==6262== HEAP SUMMARY:
==6262==     in use at exit: 0 bytes in 0 blocks
==6262==   total heap usage: 1 allocs, 1 frees, 4 bytes allocated
==6262==
==6262== All heap blocks were freed -- no leaks are possible
```

stringTest1.c

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


int main(int argc, char** argv)
{
	String dupe;
	if(argc > 1)
	{
		dupe = duplicateString(argv[1]);
		printf("Original: %s, Duplicate: %s\n", argv[1], dupe);
	}
	else
		printf("Please enter a String to be copied!\n");

	free(dupe);
}
```

Exercise Three

```
[scole4@gaea lab5]$ make
gcc -std=c99 -o stringListTest -g Strings.o stringListTest.o
```

```
[scole4@gaea lab5]$ ./stringListTest test1 test2 test3
./stringListTest
test1
test2
test3
```

valgrind output

```
==7722== Memcheck, a memory error detector
==7722== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==7722== Using Valgrind-3.13.0 and LibVEX; rerun with -h for copyright info
==7722== Command: ./stringListTest --tool=memcheck –-leak-check=full -–verbose –-log-
file=stringTest1.txt
==7722==
./stringListTest
--tool=memcheck
–-leak-check=full
-–verbose
–-log-file=stringTest1.txt
==7722==
==7722== HEAP SUMMARY:
==7722==     in use at exit: 0 bytes in 0 blocks
==7722==   total heap usage: 6 allocs, 6 frees, 134 bytes allocated
==7722==
==7722== All heap blocks were freed -- no leaks are possible
==7722==
==7722== For counts of detected and suppressed errors, rerun with: -v
==7722== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
```

stringListTest.c

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


int main(int argc, char** argv)
{
        String* dupel;
        if(argc > 1)
        {
                dupel = duplicateStringList(argv, argc);
                for(int i=0; i<argc; i++)
                        printf("%s\n", dupel[i]);
        }
        else
                printf("Please enter a String to be copied!\n");

        for(int i=0; i<argc; i++)
                free(dupel[i]);
```

```
        free(dupel);
}
```

Exersice Four

```
[scole4@gaea lab5]$ make
gcc -std=c99 -o stringListSortTest -g Strings.o stringListSortTest.
```

```
[scole4@gaea lab5]$ ./stringListSortTest 2 1 3
./stringListSortTest
1
2
3
```

valgrind output

==9008== Memcheck, a memory error detector
==9008== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==9008== Using Valgrind-3.13.0 and LibVEX; rerun with -h for copyright info
==9008== Command: ./stringListSortTest --tool=memcheck –-leak-check=full -–verbose –-log-file=string
==9008==
--tool=memcheck
-–verbose
./stringListSortTest
–-leak-check=full
–-log-file=string
==9008==
==9008== HEAP SUMMARY:
==9008== in use at exit: 0 bytes in 0 blocks
==9008== total heap usage: 6 allocs, 6 frees, 129 bytes allocated
==9008==
==9008== All heap blocks were freed -- no leaks are possible
==9008==
==9008== For counts of detected and suppressed errors, rerun with: -v
==9008== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)

Exercise Five

```
[scole4@gaea cs2263-scole4]$ git status
# On branch master
# Untracked files:
#   (use "git add <file>..." to include in what will be committed)
#
#       lab5/
nothing added to commit but untracked files present (use "git add"
[scole4@gaea cs2263-scole4]$ git add .
[scole4@gaea cs2263-scole4]$ git commit -m "lab5"
[master b350e12] lab5
 13 files changed, 224 insertions(+)
 create mode 100644 lab5/Strings.c
 create mode 100644 lab5/Strings.h
 create mode 100644 lab5/Strings.o
 create mode 100644 lab5/makefile
 create mode 100755 lab5/stringListSortTest
 create mode 100644 lab5/stringListSortTest.c
 create mode 100644 lab5/stringListSortTest.o
 create mode 100755 lab5/stringListTest
 create mode 100644 lab5/stringListTest.c
 create mode 100644 lab5/stringListTest.o
 create mode 100755 lab5/stringTest1
 create mode 100644 lab5/stringTest1.c
 create mode 100644 lab5/stringTest1.o
[scole4@gaea cs2263-scole4]$ git push origin master
Username for 'https://vcs.cs.unb.ca': scole4
Password for 'https://scole4@vcs.cs.unb.ca':
Counting objects: 17, done.
Delta compression using up to 2 threads.
Compressing objects: 100% (16/16), done.
Writing objects: 100% (16/16), 21.19 KiB | 0 bytes/s, done.
Total 16 (delta 5), reused 0 (delta 0)
To https://vcs.cs.unb.ca/git/cs2263-scole4
   dff2485..b350e12  master -> master
```