[CS200]-STNT II **Fall 2020-21**

Assignment: IV

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1.1 2A-SOLUTION

Given Code-
1. #include<stdlib.h>
2. #include<stdio.h>
3. #include<time.h>
4 .const int SIZE = 1000;
5. int main()
6. {
7. int *iArray = malloc(sizeof(int) * SIZE);
8. for (int i=0; i < SIZE; i++)
9. {
10. iArray[i] = i;
11.}
12.srand(time(NULL));
13.int randNum = rand() % SIZE;
14.printf("iArray[%d]: %d", randNum, iArray[randNum]);
15.return 0;
16.}
ERROR-Definitely Lost

```
santaz@santazhp:~/Desktop$ valgrind --leak-check=yes ./2a
==6393== Memcheck, a memory error detector
==6393== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==6393== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==6393== Command: ./2a
==6393==
iArray[134]: 134
==6393==
==6393== HEAP SUMMARY:
==6393==     in use at exit: 4,000 bytes in 1 blocks
==6393==   total heap usage: 2 allocs, 1 frees, 5,024 bytes allocated
==6393==
==6393== 4,000 bytes in 1 blocks are definitely lost in loss record 1 of 1
==6393==    at 0x483B7F3: malloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==6393==    by 0x1091E7: main (in /home/santaz/Desktop/2a)
==6393==
==6393== LEAK SUMMARY:
==6393==    definitely lost: 4,000 bytes in 1 blocks
==6393==    indirectly lost: 0 bytes in 0 blocks
==6393==      possibly lost: 0 bytes in 0 blocks
==6393==    still reachable: 0 bytes in 0 blocks
==6393==         suppressed: 0 bytes in 0 blocks
==6393==
==6393== For lists of detected and suppressed errors, rerun with: -s
==6393== ERROR SUMMARY: 1 errors from 1 contexts (suppressed: 0 from 0)
santaz@santazhp:~/Desktop$
```

This can be solved by adding free(iarray) in between line numbers 14 and 15 in a new line

1.2 2B-SOLUTION

Given Code-

```
1. #include <stdlib.h>
2. #include <stdint.h>
3. struct _List
4. {
5. int32_t* data;
6. int32_t length;
7. };
8. typedef struct _List List;
9. List* resizeArray(List* array)
10{
11.int32_t* dPtr = array->data;
12.dPtr = realloc(dPtr, 15 * sizeof(int32_t));
13.return array;
14.}
15.int main()
16.{
17. List* array = calloc(1, sizeof(List));
18.array->data = calloc(10, sizeof(int32_t));
19.array = resizeArray(array);
20.free(array->data);
21.free(array);
22.return 0;
23.}
```

ERROR-There are 2 errors as we can see

```
santaz@santazhp:~/Desktop$ valgrind --leak-check=yes ./2b
==6884== Memcheck, a memory error detector
==6884== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==6884== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==6884== Command: ./2b
==6884==
==6884== Invalid free() / delete / delete[] / realloc()
==6884==    at 0x483CA3F: free (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==6884==    by 0x109215: main (in /home/santaz/Desktop/2b)
==6884==  Address 0x4a50090 is 0 bytes inside a block of size 40 free'd
==6884==    at 0x483DFAF: realloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==6884==    by 0x1091B4: resizeArray (in /home/santaz/Desktop/2b)
==6884==    by 0x109202: main (in /home/santaz/Desktop/2b)
==6884==  Block was alloc'd at
==6884==    at 0x483DD99: calloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==6884==    by 0x1091EC: main (in /home/santaz/Desktop/2b)
==6884==
==6884==
==6884== HEAP SUMMARY:
==6884==     in use at exit: 60 bytes in 1 blocks
==6884==   total heap usage: 3 allocs, 3 frees, 116 bytes allocated
==6884==
==6884== 60 bytes in 1 blocks are definitely lost in loss record 1 of 1
==6884==    at 0x483DFAF: realloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==6884==    by 0x1091B4: resizeArray (in /home/santaz/Desktop/2b)
==6884==    by 0x109202: main (in /home/santaz/Desktop/2b)
==6884==
==6884== LEAK SUMMARY:
==6884==    definitely lost: 60 bytes in 1 blocks
==6884==    indirectly lost: 0 bytes in 0 blocks
==6884==      possibly lost: 0 bytes in 0 blocks
==6884==    still reachable: 0 bytes in 0 blocks
==6884==         suppressed: 0 bytes in 0 blocks
==6884==
==6884== For lists of detected and suppressed errors, rerun with: -s
==6884== ERROR SUMMARY: 2 errors from 2 contexts (suppressed: 0 from 0)
santaz@santazhp:~/Desktop$
```

1.This error can be resolved by deleting 20th line

2.This error can be resolved by adding line free(dPtr) between lines 12 and 13 in a newline

1.3 2C-SOLUTION

Given Code-
1. #include <stdlib.h>
2. #include <stdint.h>
3. int main()
4. {
5. char* dest = calloc(35, sizeof(char));
6. char* source = malloc(34 * sizeof(char));
7. for(int i = 0; i < 35; i++)
8.{
9. *(dest + i) = *(source + i);
10. }
11.return 0;
12.}
ERRORS-there are 3 errors as we can see

```
santaz@santazhp:~/Desktop$ valgrind --leak-check=yes ./2c
==7033== Memcheck, a memory error detector
==7033== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==7033== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==7033== Command: ./2c
==7033==
==7033== Invalid read of size 1
==7033==    at 0x1091B9: main (in /home/santaz/Desktop/2c)
==7033==  Address 0x4a500d2 is 0 bytes after a block of size 34 alloc'd
==7033==    at 0x483B7F3: malloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==7033==    by 0x109191: main (in /home/santaz/Desktop/2c)
==7033==
==7033==
==7033== HEAP SUMMARY:
==7033==     in use at exit: 69 bytes in 2 blocks
==7033==   total heap usage: 2 allocs, 0 frees, 69 bytes allocated
==7033==
==7033== 34 bytes in 1 blocks are definitely lost in loss record 1 of 2
==7033==    at 0x483B7F3: malloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==7033==    by 0x109191: main (in /home/santaz/Desktop/2c)
==7033==
==7033== 35 bytes in 1 blocks are definitely lost in loss record 2 of 2
==7033==    at 0x483DD99: calloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==7033==    by 0x109183: main (in /home/santaz/Desktop/2c)
==7033==
==7033== LEAK SUMMARY:
==7033==    definitely lost: 69 bytes in 2 blocks
==7033==    indirectly lost: 0 bytes in 0 blocks
==7033==      possibly lost: 0 bytes in 0 blocks
==7033==    still reachable: 0 bytes in 0 blocks
==7033==         suppressed: 0 bytes in 0 blocks
==7033==
==7033== For lists of detected and suppressed errors, rerun with: -s
==7033== ERROR SUMMARY: 3 errors from 3 contexts (suppressed: 0 from 0)
santaz@santazhp:~/Desktop$
```

1.This error is because we are reading an inaccessible location.
2.This error is because we are not deleting the dest allocation and loosing the pointer.
3.This error is because we didn't delete the source allocation and loosing the pointer.

After suppressing the first error only 2 errors remain as we can see below

```
santaz@santazhp:~/Desktop$ valgrind --leak-check=yes --suppressions=s1.supp ./2c
==8639== Memcheck, a memory error detector
==8639== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==8639== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==8639== Command: ./2c
==8639==
==8639==
==8639== HEAP SUMMARY:
==8639==     in use at exit: 69 bytes in 2 blocks
==8639==   total heap usage: 2 allocs, 0 frees, 69 bytes allocated
==8639==
==8639== 34 bytes in 1 blocks are definitely lost in loss record 1 of 2
==8639==    at 0x483B7F3: malloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==8639==    by 0x109191: main (in /home/santaz/Desktop/2c)
==8639==
==8639== 35 bytes in 1 blocks are definitely lost in loss record 2 of 2
==8639==    at 0x483DD99: calloc (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64-linux.so)
==8639==    by 0x109183: main (in /home/santaz/Desktop/2c)
==8639==
==8639== LEAK SUMMARY:
==8639==    definitely lost: 69 bytes in 2 blocks
==8639==    indirectly lost: 0 bytes in 0 blocks
==8639==      possibly lost: 0 bytes in 0 blocks
==8639==    still reachable: 0 bytes in 0 blocks
==8639==         suppressed: 0 bytes in 0 blocks
==8639==
==8639== For lists of detected and suppressed errors, rerun with: -s
==8639== ERROR SUMMARY: 2 errors from 2 contexts (suppressed: 1 from 1)
santaz@santazhp:~/Desktop$
```