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CSCE 313-508

PA0 Report

Steps taken to debug:

1. Compile program using g++.
```
$ g++ buggy.cpp -g -o buggy
```

2. Run program to check any compile errors.
```
$ ./buggy
```

3. Add correct include statements.
4. Make node class variables public.
5. Correct pointer value accessing method.
```
mylist[i].val      ← NO
mylist[i]->val     ← YES
```

6. Compile program again.
7. Run program.
8. Run program using gdb.
```
$ gdb buggy
$ gdb) run
```

9. Find line number that is causing segfault.
10. Add a break point.
```
$ gdb) break 17
```

11. Run program in gdb.
12. Print content of array.
```
$ gdb) print mylist
$ $1 = std::vector of length 3, capacity 3 = {0x0, 0x0, 0x0}
```

13. Fix array elements not being initialized properly.
```
mylist[i] = new node();
```

14. Run program using gdb.
15. Find line number that is causing segfault.
16. Add a break point.
17. Run program in gdb.

18. Step in gdb until segfault reached.
    ```
    $ gdb) step
    ```

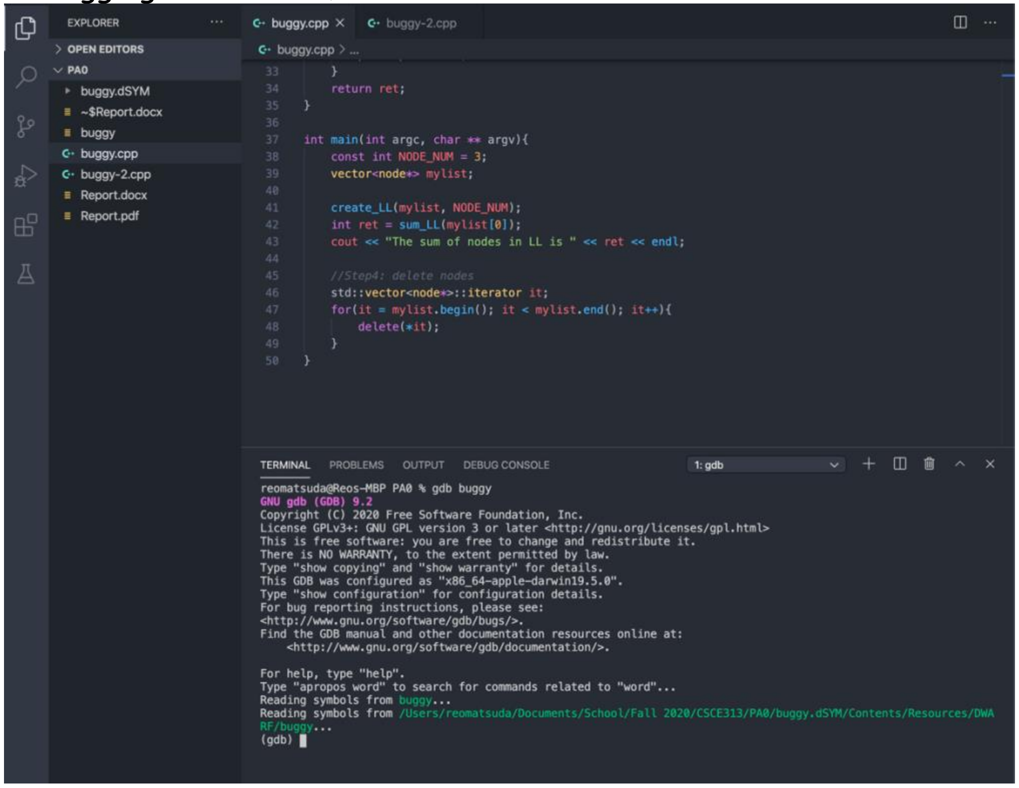
19. Fix bugged linkedlist creation.

    Explanation for segfault:
    When the linked list was created from the vector, the last node's next pointer was assigned to an element of the vector that was outside the index. Because of this the last node's next pointer was assigned to a garbage value, for me this was 0x21.

20. Compile program again but adding -fsanitize flag, this uses AddressSanitizer.
21. Run program.
    ```
    $ ==4388==ERROR: LeakSanitizer: detected memory leaks
    ```

22. Make sure all allocated node pointers are deleted at the end of program.
    Use an iterator to iterate through the vector and delete allocated node pointer.

Debugging within IDE, Visual Studio Code



```cpp
    }
    return ret;
}

int main(int argc, char ** argv){
    const int NODE_NUM = 3;
    vector<node*> mylist;

    create_LL(mylist, NODE_NUM);
    int ret = sum_LL(mylist[0]);
    cout << "The sum of nodes in LL is " << ret << endl;

    //Step4: delete nodes
    std::vector<node*>::iterator it;
    for(it = mylist.begin(); it < mylist.end(); it++){
        delete(*it);
    }
}
```

```
reomatsuda@Reos-MBP PA0 % gdb buggy
GNU gdb (GDB) 9.2
Copyright (C) 2020 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
Type "show copying" and "show warranty" for details.
This GDB was configured as "x86_64-apple-darwin19.5.0".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
    <http://www.gnu.org/software/gdb/documentation/>.

For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from buggy...
Reading symbols from /Users/reomatsuda/Documents/School/Fall 2020/CSCE313/PA0/buggy.dSYM/Contents/Resources/DWA
RF/buggy...
(gdb) 
```