Programming with C I

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What is Valgrind?

- **Valgrind is a flexible program for debugging and profiling Linux executables. Most important usage of valgrind is when you try to find memory leaks.**

Download valgrind

```
$ sudo apt-get install valgrind
```

How to use a Valgrind

You can choose what tool you want to use with Valgrind. I explain only memcheck which is mostly used and important to check program errors.

--tool=<toolname> [default: memcheck]

Run the Valgrind tool called toolname,

e.g. **memcheck**, cachegrind, callgrind, helgrind, drd, massif, lackey, none, exp-sgcheck,exp-bbv, exp-dhat, etc.

memcheck

Memcheck is a memory error detector. It can detect the following problems that are common in C programs.

- **Accessing memory you shouldn't:** e.g. overrunning and underrunning heap blocks, overrunning the top of the stack, and accessing memory after it has been freed.
- **Using undefined values:** i.e. values that have not been initialized, or that have been derived from other undefined values.
- **Incorrect freeing of heap memory:** **s**uch as double-freeing heap blocks, or mismatched use of malloc versus free

memcheck

- **Memcheck is a memory error detector. It can detect the following problems that are common in C programs.**

- **Overlapping src and dst pointers in memcpy and related functions.**
- **Passing a fishy (presumably negative) value to the size parameter of a memory allocation function.**
- **Memory leaks.**

Run for a real use case

Memory leak example

```
#include <stdio.h>
#include<stdlib.h>
void uninitialized_read(){
    int *ptr;
    printf("Unitialized value: %d\n", *ptr);
};
void memory_leak(){
    int* ptr =(int*) malloc(10*sizeof(int));
    ptr[10]=0;
};
```

```
int main()
{
    uninitialized_read();
    memory_leak();
    return 0;
}
```

Run for a real use case

Run valigrind to check memory leak

```
$ valgrind --tool=memcheck --leak-check=yes ./a.out
```

THE END

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