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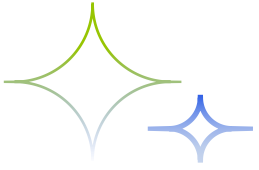
```c
#include <stdio.h>
#include<stdlib.h>
void uninitialized_read(){
    int *ptr;
    printf("Unitialized value: %d\n", *ptr);
};
void memory_leak(){
    int* ptr =(int*) malloc(10*sizeof(int));
    ptr[10]=0;
};
```

```c
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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