

# Week7

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## Compilers

1. Overview of Compilers: gcc, clang, msvc, icc...
2. An absolute minimum for all C/C++ programmers: `-Wall -Werror -Wextra -Wpedantic -Wconversion`
  - Wall: all the warnings?
  - Werror: treat warnings as errors
  - Wextra: some extra warnings
  - Wpedantic: no language extension
  - Wconversion: no implicit conversion that loses information
3. Some extra warnings that I recommend: `-Wshadow -Wunused`
4. A useful place to inspect your code: Compiler Explorer
  - Benefits of using multiple compilers

## Debugger

1. vscode debugging
2. gdb and lldb
3. How to use gdb
  - How to start your program
  - How to abort and resume
  - How to set/delete a break point
  - How to view stack/register
  - How to disassemble a function

## System Call Debugger

1. strace in Linux
2. dtrace in Mac
  - I'm still trying to figure out how to use this one

## Static Analysis

1. clang-tidy
  - `clang-tidy filename`
  - `.clang-tidy`

## Profiling

### CPU Profiler

1. There are a bunch of tools for profiling
  - perf
  - callgrind

- VTune
  - gperftools (our focus)
2. gperftools
    - What is it?
    - How to install?
    - How to use it?

## Memory Profiler

1. **sanitizer**
  - Address Sanitizer (detect memory issue: leaks, dangling pointers)
  - Undefined Behavior Sanitizer
  - Thread Sanitizer (useful for detecting data races)
2. **leaks** in MacOS
  - MallocStackLogging
3. **valgrind** in Linux

## Code Coverage

1. **gcov** + **lcov** + **genhtml**

## Benchmarking

1. Hyperfine
  - Compare different programs
2. Write your own benchmark
  - Compare different functions

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