CSE306 Software Quality in Practice

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Heeba mentioned not everyone finished last step.

A future LEX will revisit makefiles.
blackbox vs whitebox testing
blackbox testing

Code is treated as a "black box", one which you cannot peek inside.
Tests are written without regard to how code is written.
Tests are meant to capture the intended behavior of the system (the requirements/specifications): **WHAT** the code should do.
blackbox testing

- In Test Driven Development (TDD) tests are written before the code is, and so qualifies as black-box testing.
In TDD, think of tests written to capture specifications as executable specifications.
whitebox testing

Tests are written taking into consideration **HOW** the code is written.

```java
if (x < y) {
    z = f(x, y);
} else {
    z = g(x, y, z);
}
```
whitebox testing

- Use a code coverage tool to ensure that tests exercise **ALL** possible computation paths.

```java
if (x < y) {
    z = f(x, y);
} else {
    z = g(x, y, z);
}
```
whitebox testing

- Use a code coverage tool to ensure that tests exercise **ALL** possible computation paths.

```java
if (x < y) {
    z = f(x,y);
} else {
    z = g(x,y,z);
}
```
Code coverage

- We will use gcov as our coverage tool.

- Compile with,

  -fprofile-arcs
  -ftest-coverage
  -lgcov

- as in:

  gcc $(CFLAGS) -fprofile-arcs -ftest-coverage -L /util/CUnit/lib -I /util/CUnit/include/CUnit/ $(OBJECTS) tests.c -o tests -lcunit -lgcov
-fprofile-arcs

Instrument arcs during compilation. For each function of your program, GCC creates a program flow graph, then finds a spanning tree for the graph.

https://gcc.gnu.org/onlinedocs/gcc-2.95.2/gcc_2.html#SEC9
-ftest-coverage

Create data files for the gcov code-coverage utility (see section gcov: a GCC Test Coverage Program).

https://gcc.gnu.org/onlinedocs/gcc-2.95.2/gcc_2.html#SEC9
-llibrary

Search the library named library when linking.

It makes a difference where in the command you write this option; the linker searches/processes libraries and object files in the order they are specified. Thus, `foo.o -lz bar.o' searches library `z' after file `foo.o' but before `bar.o'. If `bar.o' refers to functions in `z', those functions may not be loaded.

[...]

The directories searched include several standard system directories plus any that you specify with `-L'.
using gcov to verify test coverage

- compile test code with extra flags
  - this instruments code to gather coverage information

- run tests
  - this runs your tests and allows the instrumentation to collect coverage data that shows what parts of the implementation were exercised by the tests

- run gcov on the source file (e.g. source.c) whose coverage you're interested in exploring

- Look at the file produces by gcov (e.g. source.c.gov)
Classroom example