



Testing on the Toilet

Finding Data Races in C++

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If you've got some **multi-threaded code**, you may have **data races** in it. Data races are **hard to find and reproduce** – usually they will not occur in testing but will fire once a month in production.

For example, you ask each of your two interns to bring you a bottle of beer. This will usually result in your getting two bottles (perhaps empty), but in a rare situation that the interns collide near the fridge, you may get fewer bottles.

```
4 int bottles_of_beer = 0;
5 void Intern1() { bottles_of_beer++; } // Intern1 forgot to use Mutex.
6 void Intern2() { bottles_of_beer++; } // Intern2 copied from Intern1.
7 int main() {
8     // Folks, bring me one bottle of beer each, please.
9     ClosureThread intern1(NewPermanentCallback(Intern1)),
10                          intern2(NewPermanentCallback(Intern2));
11     intern1.SetJoinable(true); intern2.SetJoinable(true);
12     intern1.Start();           intern2.Start();
13     intern1.Join();            intern2.Join();
14     CHECK_EQ(2, bottles_of_beer) << "Who didn't bring me my beer!";
15 }
```

Want to **find data races in your code**? Run your program under **Helgrind**!

```
$ helgrind path/to/your/program
Possible data race during read of size 4 at 0x5429C8
  at 0x400523: Intern2() tott.cc:6
  by 0x400913: _FunctionResultCallback_0_0<false, void>::Run() ...
  by 0x4026BB: ClosureThread::Run() ...
  ...
Location 0x5429C8 has never been protected by any lock
Location 0x5429C8 is 0 bytes inside global var "bottles_of_beer"
declared at tott.cc:4
```

Helgrind will also detect **deadlocks** for you.

Helgrind is a tool based on **Valgrind**. Valgrind is a binary translation framework which has other useful tools such as a memory debugger and a cache simulator. Related TotT episodes will follow.

No beer was wasted in the making of this TotT.

More information, discussion, and archives:
<http://googletesting.blogspot.com>



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