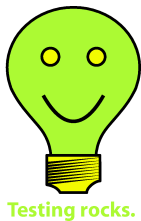


Debugging
sucks.



Testing rocks.

Testing on the Toilet

The Invisible Branch

May 29, 2008

Full statement coverage may be necessary for good testing coverage, but it isn't sufficient. Two places where statement coverage will be inadequate are branches and loops. In this episode, we'll look at branches, and specifically the differences between **statement coverage** and **branch coverage**.

Let's consider a case where branch coverage and statement coverage aren't the same. Suppose we test the following snippet. We can get complete statement coverage with a single test by using a berserk EvilOverLord:

```
bool DeathRay::ShouldFire(EvilOverLord& o, Target& t) {
    double accumulated_rage = 0.0;

    if (o.IsBerserk())
        accumulated_rage += kEvilOverlordBerserkRage;

    accumulated_rage += o.RageFeltTowards(t);
    return (accumulated_rage > kDeathRayRageThreshold);
}
```

But what if `DeathRay` should fire at this `Target` even with a non-berserk `Overlord`? Well, we need another test for that. What should the test be? Let's rewrite the code a little bit. We would never see code like this in the real world, but it'll help us clarify an important point.

```
bool DeathRay::ShouldFire(EvilOverLord& o, Target& t) {
    double accumulated_rage = 0.0;

    if (o.IsBerserk()) {
        accumulated_rage += kEvilOverlordBerserkRage;
    } else {
    }

    accumulated_rage += o.RageFeltTowards(t);
    return (accumulated_rage > kDeathRayRageThreshold);
}
```

Why do we add an *else* clause if it doesn't actually **do** anything? If you were to **draw a flowchart** of both snippets (left as an exercise – and we recommend against using the paper provided), the flowcharts would be identical. The fact that the *else* isn't there in the first snippet is simply a convenience for us as coders – we generally don't want to write code to do nothing special – but **the branch still exists..** Put another way, **every if has an else.** Some of them just happen to be invisible.

When you're testing, then, it isn't enough to cover all the statements – you should **cover all the the edges in the control flow graph** – which can be even more complicated with loops and nested *ifs*. In fact, part of the art of large-scale white-box testing is finding the minimum number of tests to cover the maximum number of paths. So the lesson here is, just because you can't see a branch doesn't mean it isn't there – or that you shouldn't test it.

More information, discussion, and archives:

<http://googletesting.blogspot.com>



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