Become a Better Developer With Debugging

SANDCamp 2016

https://www.sandcamp.org/session/become-better-developer-debugging-techniques-drupal-and-more

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Who

- Live in Austin and Boston
- Work in Boston and Austin
- Four Kitchens and Acquia
- A lot of experience debugging and developing !

Outline

1. What is a Bug
2. What is Debugging
3. Why it is Important
4. “Scientific Method” Approach
5. Toolbox
6. Other tricks
7. More reading

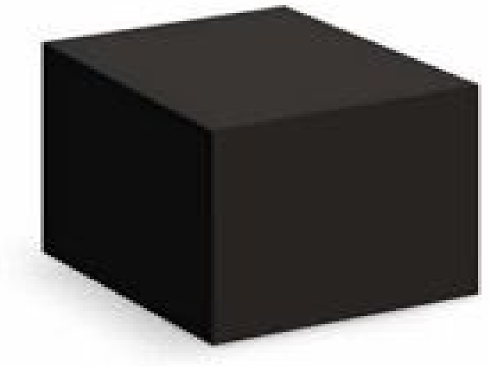
What is a Bug

Your mental model of the code and it’s actual behaviour don’t match.

Usually you typed code that you thought did one thing and in fact it did another - most of the bugs you work on are your own.

Difference from “troubleshooting” . . . .

What is a Bug

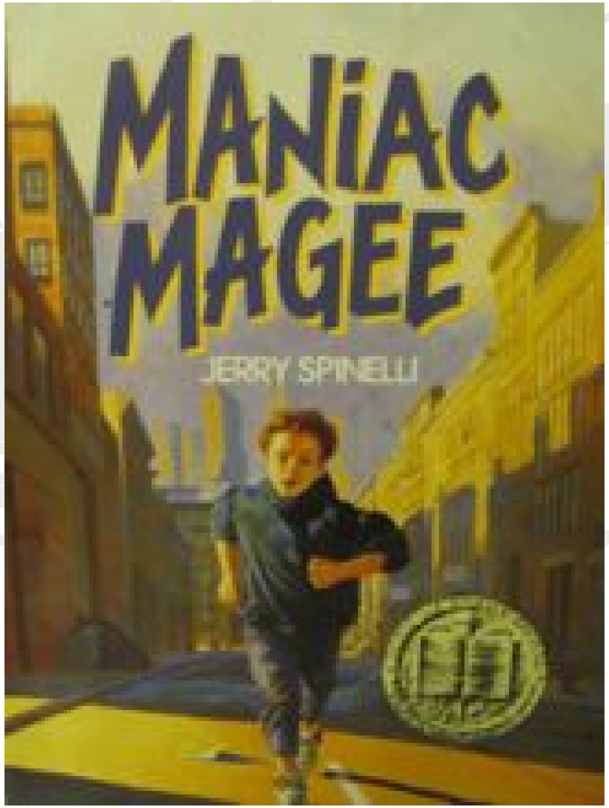


Basic Mental Model of Drupal

What is a Bug

Basic Mental Model of Drupal

What is a Bug



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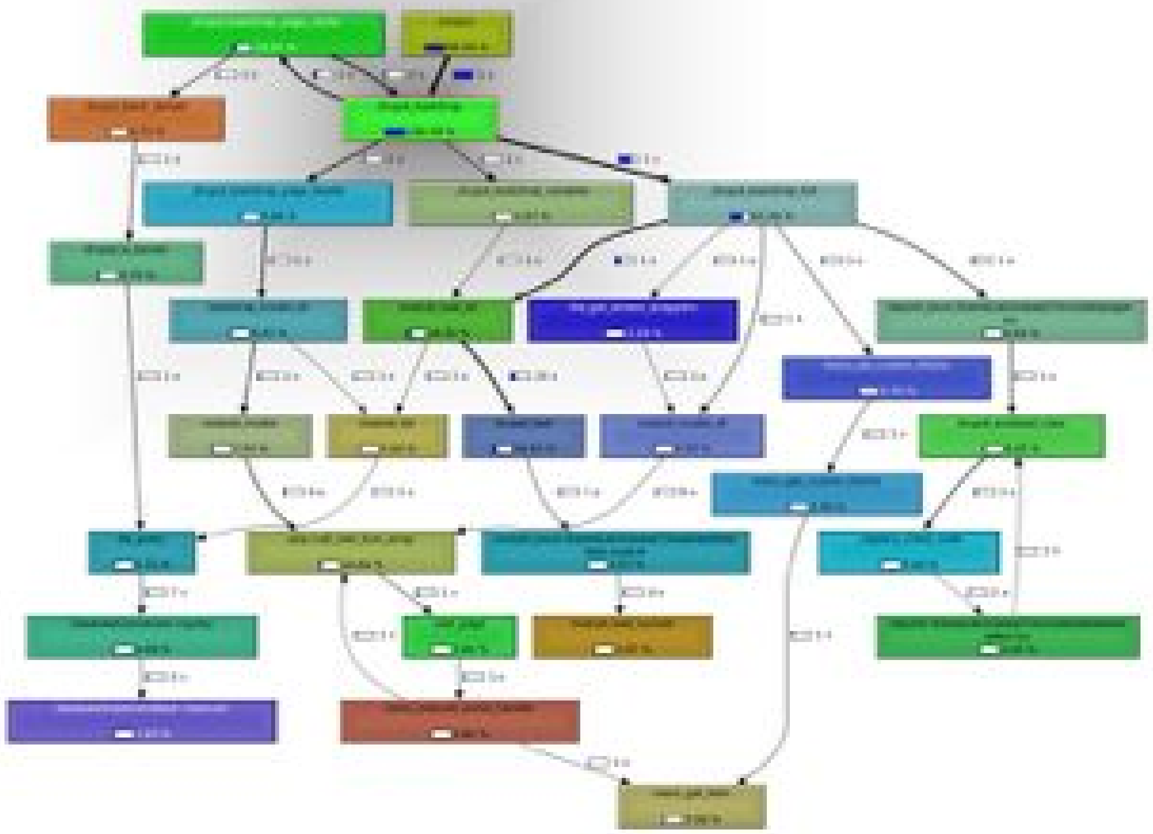
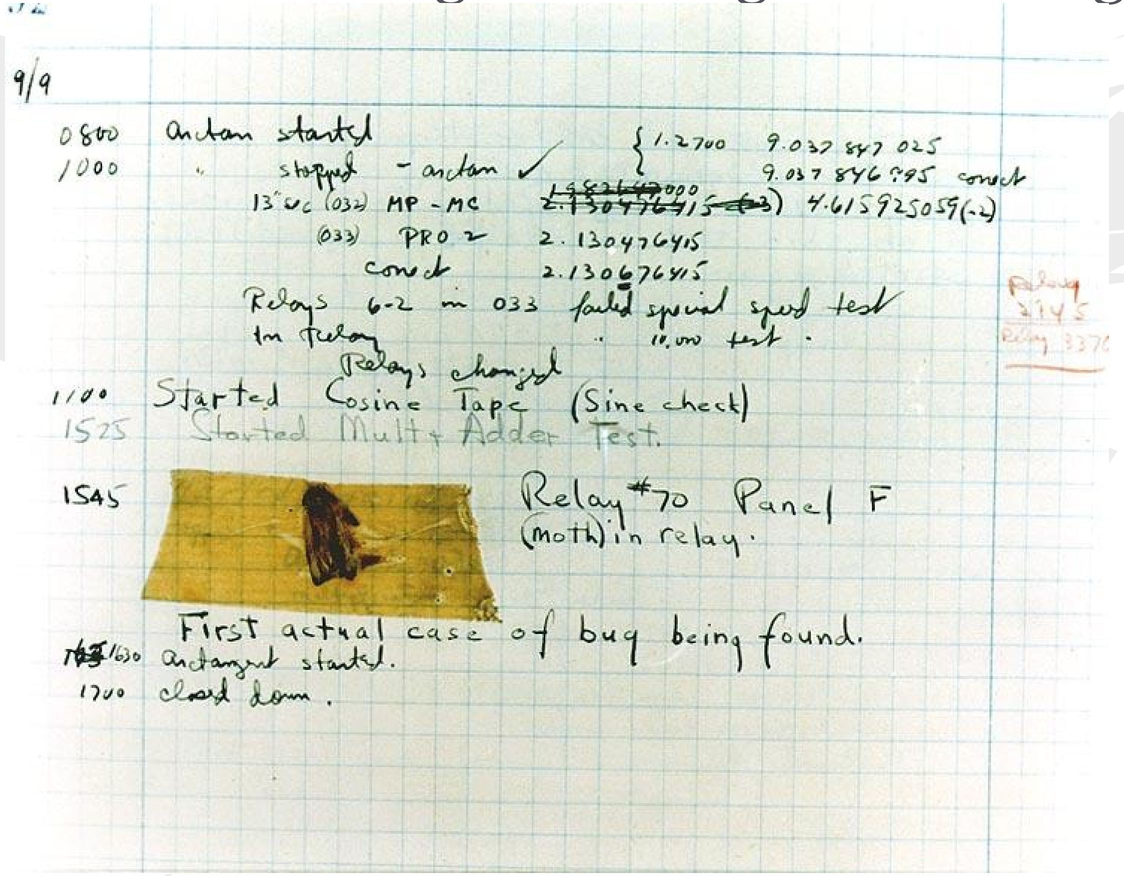


Not So Basic Mental Model of Drupal

What is a Bug - A Divergence on Origin



9/9

0800 antan started
1000 " stopped - antan ✓ {1.2700 9.037 847 025
9.037 846 995 conect
13" uc (032) MP - MC ~~1.982147000~~ 2.130476415 ~~(-3)~~ 4.615925059(-2)
(033) PRO 2 2.130476415
conect 2.130676415
Relays 6-2 in 033 failed special speed test
In relay " 10,000 test .
Relays changed
1100 Started Cosine Tape (Sine check)
1525 Started Mult + Adder Test.
1545 Relay #70 Panel F
(moth) in relay.
First actual case of bug being found.
1630 antangent started.
1700 closed down.

Relay 2145
Relay 3370

https://en.wikipedia.org/wiki/Software_bug#Etymology

Debugging is the Process of Making Your Mental Model Match Reality

- Understanding WHY the bug happened is different from fixing it

Why is Debugging Important ?

You spend more time **debugging** than you do **programming**. Furthermore the time debugging is much harder to estimate.

Why is Debugging Important ?

“As soon as we started programming, we found to our surprise that it wasn't as easy to get programs right as we had thought. Debugging had to be discovered. I can remember the exact instant when I realized that a large part of my life from then on was going to be spent in finding mistakes in my own programs.”

--Maurice Wilkes, 1949, developing the first stored program computer

Why is Debugging Important ?

- You do it more than you realize.
- It’s the source of much uncertainty in estimating and delivery.
- As a distinct thought process / skill, it is possible to become good and more efficient at it.

“Scientific Method” Approach

1. Observe (collect data, as much as possible)
2. Make a testable Hypothesis (change to your mental model)
3. Collect data from the test
4. Adjust understanding (model), goto 1

How does this play out in real life ?

SOMETHING IS BROKEN!

RELAX

Remember Cobble’s Knot

What Exactly is Broken ?

- Is something not showing up ?
  - New content - is it published ? Front end cache ?
  - Old content - permissions set properly, or changed ?
- Is something showing up that shouldn't ?
  - Raw html or javascript in a wysiwyg field ?
- A more complex behavior - workbench or etc - can we state exactly the steps to cause the bug, and why it's not what we expect ?

Note - non technical members of your team have huge impact collecting data at this stage.

Replicate the Bug

- User reports matter
- Worst case is making changes, waiting to see if the customer reports the problem is still there
- Replication can be tedious, but extremely valuable
- Observe and think about your user's operating procedure
- Without being able to replicate the bug, **you can't debug.**

Sometimes figuring out how to replicate the bug is 99% of fixing it.

Work From the Bottom Up

- Log files
  - Know where they are on your systems / environments
- multitail
  - Linux / Mac utility to easily view logs, with more options
- Contextual information - browsers, environments, users

Vacuum up as much information as possible in the first stage.

Where is it Broken ?

- Custom Module
- Theme template.php
- Theme template
- Configuration in database

Potential tests - disable modules, switch themes, re-install clean without live data.

Divide-and-conquer by narrowing down where the mental model breaks.

Debugging as Scientific Method Iteration

- Change **ONE** thing at a time
- Test that change
- Repeat - *Undoing the change if it gave no information*

Better debuggers are generally better at thinking of clever changes and tests.

- “Cheap” tests first (clear caches, etc)
- Test for common problems first
- A good test should narrow the problem scope by eliminating something

Git is your friend

- Save your progress as you work
  - Re-create your Features
  - Quickly un-do unhelpful changes
  - Makes Rabbit Holes manageable

Better debuggers generally take notes and keep a log.

Git diff is your friend

- Remove debug statements
- Ensure you only changed as much as needed
- You only commit dsm(‘Butts’); to master **ONCE**

Better debuggers generally take notes and keep a log.

Git blame is your friend

- Who wrote (committed) offending code
- Should **NOT** be a witch hunt
- **Should** be a chance to understand the context of the code
  - Re-reading the old Jira tickets or other requirements can cause you to re-assess everything

Use "git annotate" in politically sensitive situations.

Make the Future Easier

- Watchdog (D7)
- \Drupal::Logger() (D8)
- syslog module
- http://loggly.com
- Write a test !

Thoughtful instrumentation of your code as it's written the first time can massively pay off later.

“Interaction” Bugs are the Hardest

The hardest bugs are those that only appear when two “bug free” components interact.

- Module weights, order of hook operations
  - Systematically disable modules, change weights
- Theme / module interactions
- External service requests

If your problem resists divide-and-conquer, maybe it’s not in one component or the other, but in how they connect.

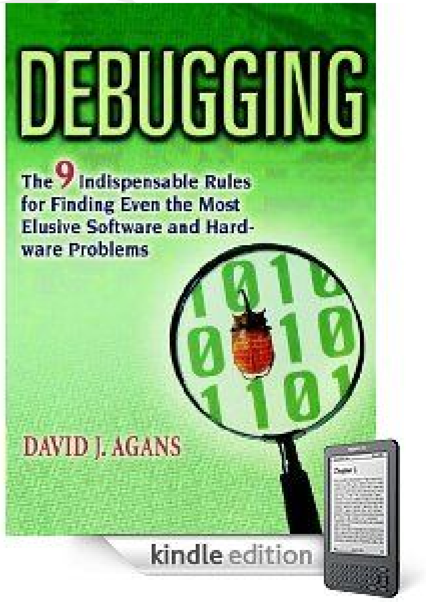
Performance Related Debugging

- Just like other debugging:
- Replicate the problem ! Otherwise you flail at random
  - Apache bench (ab), wget spiders, load generators
- Add headers, log statements, to indicate cache hits / misses
- Different logs often apply - mysql or system logs

Further Reading (and free book!)

“Debugging: The Nine Indespensible Rules” by David J. Agans
http://www.debuggingrules.com/

1. Understand the System
2. Make it Fail
3. Quit Thinking and Look
4. Divide and Conquer
5. Change One Thing at a Time
6. Keep an Audit Trail
7. Check the Plug
8. Get a Fresh View
9. If You Didn't Fix It, It Ain't Fixed


DEBUGGING
The 9 Indispensable Rules for Finding Even the Most Elusive Software and Hardware Problems
DAVID J. AGANS
kindle edition

Conclusions . . . .

- Thinking strategically is more important than applying fancy tools
- The hardest bugs are “Interaction” bugs

Finally . . .

Debugging can be hard to tell someone how to do, but it can be learned if you persist and think about it. Level up !

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