



Debugging

The why, where && WTF
behind your error messages...

Topics Covered

- History
- Reading Error messages
- Different Debugging Strategies
- Tools
- Cleanup some code (maybe)
- Ten most common errors with examples

History

Photo # NH 96566-KN (Color) First Computer "Bug", 1947

92

9/9

0800 Antran started
1000 .. stopped - antran ✓
13" uc (032) MP - MC { 1.2700 9.037 847 025
 2.130476415 (033) 9.037 846 995 correct
 (033) PRO 2 2.130476415
 correct 2.130476415

Relays 6-2 in 033 failed special speed test
in relay .. 10.00 test.

Relay
2145
Relay 3371

1100 Started Cosine Tape (Sine check)
1525 Started Multi Adder Test.

1545



Relay #70 Panel F
(moth) in relay.

1630 Antran started.
1700 closed down.

First actual case of bug being found.

Why you care

- 80% of your time as a dev is spent READING CODE
 - 60% of that time is spent DEBUGGING
 - Good Debugging skill is one of the things that will keep you sane in this job...
- * All times estimated... ☺



Definitions:



BUG: Whenever a program/system is not behaving the way we expect.

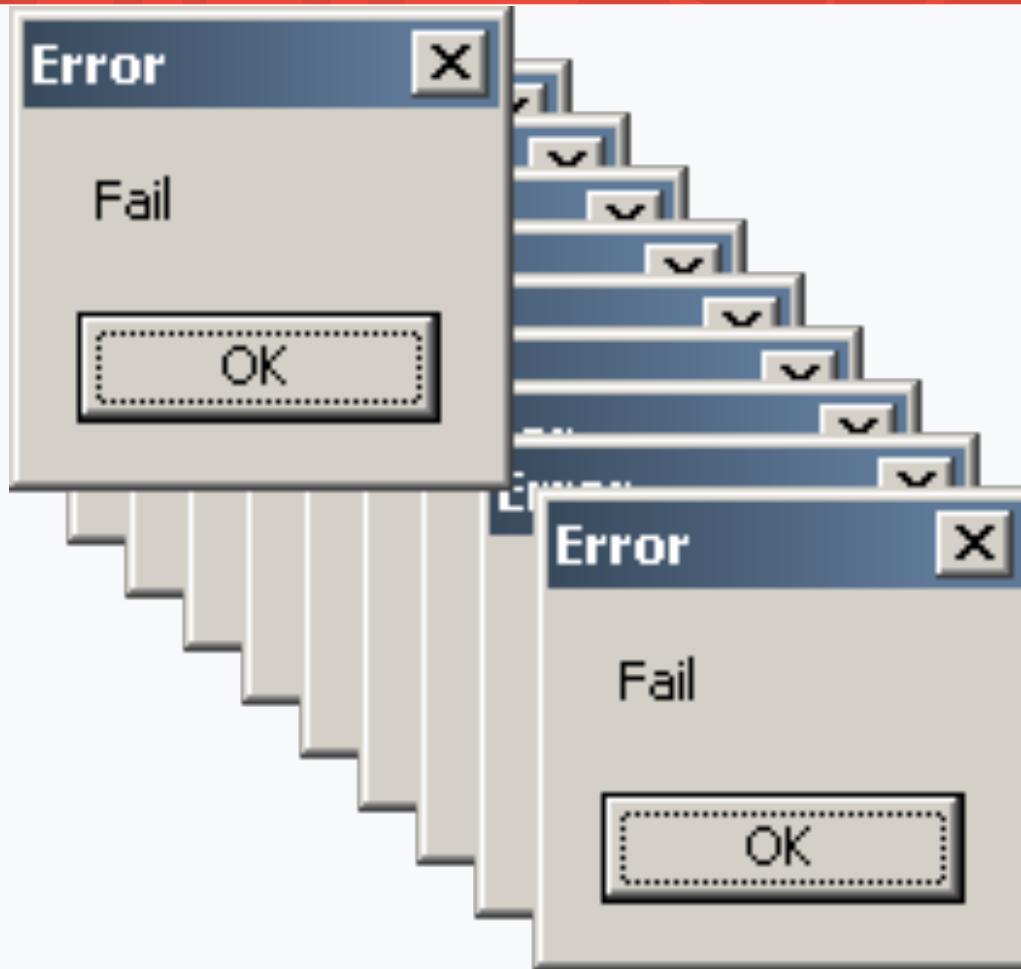
- **DEBUGGING**: Any systematic approach undertaken in the understanding and elimination of a BUG.



Gen Knowledge

- Debugging is the process of figuring out the source of the error and fixing it.
- Think of it as the disconnect between your assumptions and what the code is actually doing.
- It's a skill, so you'll need to practice it.
- FYI: Helping peers == super great way to improve.

Error Messages



Stack Trace

Stack Trace (aka stack backtrace or stack traceback) is a report of the active stack frames upon error condition during a program's execution.

We follow this path back to find the offending code segment and correct it.

Ruby Exception Classes

Exception

- fatal *used internally by Ruby*
- NoMemoryError
- ScriptError
 - LoadError
 - NotImplementedError
 - SyntaxError
- SecurityError
- SignalException
 - Interrupt
- StandardError
 - ArgumentError
 - FiberError
 - IndexError
 - KeyError
 - StopIteration
 - IOError
 - EOFError
 - LocalJumpError
 - NameError
 - NoMethodError
 - RangeError
 - FloatDomainError
 - RegexpError
 - RuntimeError
 - SystemCallError
 - *system-dependent exceptions (Errno::xxx)*
 - ThreadError
 - TypeError
 - ZeroDivisionError
- SystemExit
- SystemStackError

Error Messages

The First rule of debugging:

Error Messages

The First rule of debugging:

- Read the error message!

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The Second rule of debugging:

Error Messages

The First rule of debugging:

- Read the error message!

The Second rule of debugging:

- Read the error message!

Errors are your friends!

- Don't freak when you see an error
- Analyze the error:
 - What are the line number(s)?
 - What type of error is it?
 - What specific message did you get?

Debugging Workflow

- Read your error messages!
- SPECIFICS: type, line #, error msg & filename
- Know what your expected behavior is.
- Shitcan your assumptions.
- Verify and understand the input(s).
- Verify the program / variable state.
- Make small incremental changes.

Strategies

- Debug “inline”
- Use the REPL (irb | | pry)
- Guess && Check

Debugging “inline”

- Use p statements to quickly show variable's value
`p @some_variable`
- Quickly determine if you are reaching a method
- `def some_method`
 `p "HIT: some_method"`
`end`

Debugging “inline”

- Terrific way to determine flow control around conditional statements

```
if num = 1
    p "inside if"
else
    p "inside else"
end
```

Debugging “inline”

- Use “signaling code” to easily flag your spot in conjunction with a variable check

```
p “~” * 80
```

```
p “var: #{var}”
```

```
p “~” * 80
```

Tip: Use different signal characters when looking at multiple points in your code.

- This is very useful in larger applications or when p-ing to a busy server console.

Tools



awesome_print

```
gem install awesome_print
```

```
require 'awesome_print'  
ap some_array  
ap some_hash
```

PRY – The IRB Alternative

Pry is a REPL (Read-Eval-Print-Loop) much like IRB but with 3 additional key features:

- Syntax Highlighting
- Built in methods
- A Debugger
- Tabbed completion

PRY – Install

gem install pry

gem install pry-doc

gem install pry-byebug

rbenv rehash

PRY – terminal commands

ls (list methods)

_ (the last output)

? (show-doc)

. (send command to bash)

cat filename (displays the given file)

wtf? (wtf.....)

pry-byebug

```
gem install pry-byebug
```

```
require "pry-byebug"
```

To stop execution and enter the REPL insert
binding.pry
as a breakpoint at the spot you wish to examine.

pry-byebug commands

step: Step execution into the next line or method. Takes an optional numeric argument to step multiple times.

next: Step over to the next line within the same frame. Also takes an optional numeric argument to step multiple lines.

finish: Execute until current stack frame returns.

continue: Continue program execution and end the Pry session.

up: Moves the stack frame up. Takes an optional numeric argument to move multiple frames.

down: Moves the stack frame down. Takes an optional numeric argument to move multiple frames.

PRY#show-doc

```
[7] pry(main)> show-doc Array#each\_with\_index
```

From: enum.c (C Method):

Owner: Enumerable

Visibility: public

Signature: each_with_index(*arg1)

Number of lines: 11

Calls **block** with two arguments, the item and its index, for each item in **enum**. Given arguments are passed through to **#each()**.

If no block is given, an enumerator is returned instead.

```
hash = Hash.new
%w(cat dog wombat).each_with_index { |item, index|
  hash[item] = index
}
hash  #=> {"cat"=>0, "dog"=>1, "wombat"=>2}
[8] pry(main)> []
```

Exceptions

- An instance of the Exception class
- A raised exception will propagate through each method in the call stack until it is stopped or reaches the point where the program started
- Exceptions can be **Raised && Rescued**

Debugging Wrapup

Questions?

Sweet Links

Pry Usage (youtube)

Replace IRB with PRY

Final Thought

Don't like debugging...

A Strong test suite
will greatly reduce the
amount of debugging
you do.

A close-up, profile shot of a man in a flight suit, looking thoughtfully to the side. He has his hand near his chin. The background is dark and out of focus.

What now...