



@mr_foto

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WHOIS



@mr_foto

💻 Software Developer

!

Ruby Slovenia organizer

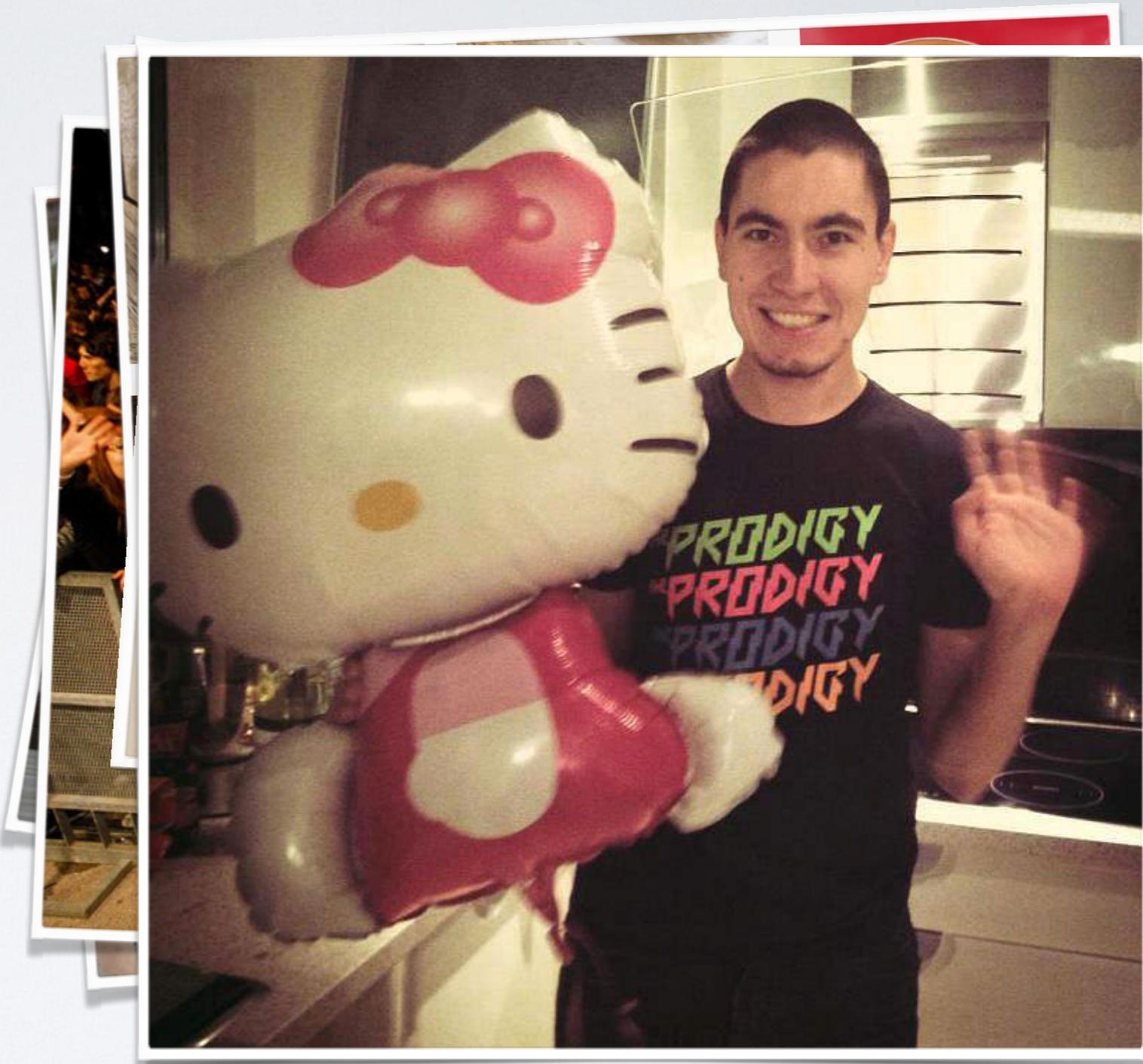
🏃 Long Distance Runner

📷 Event Photographer

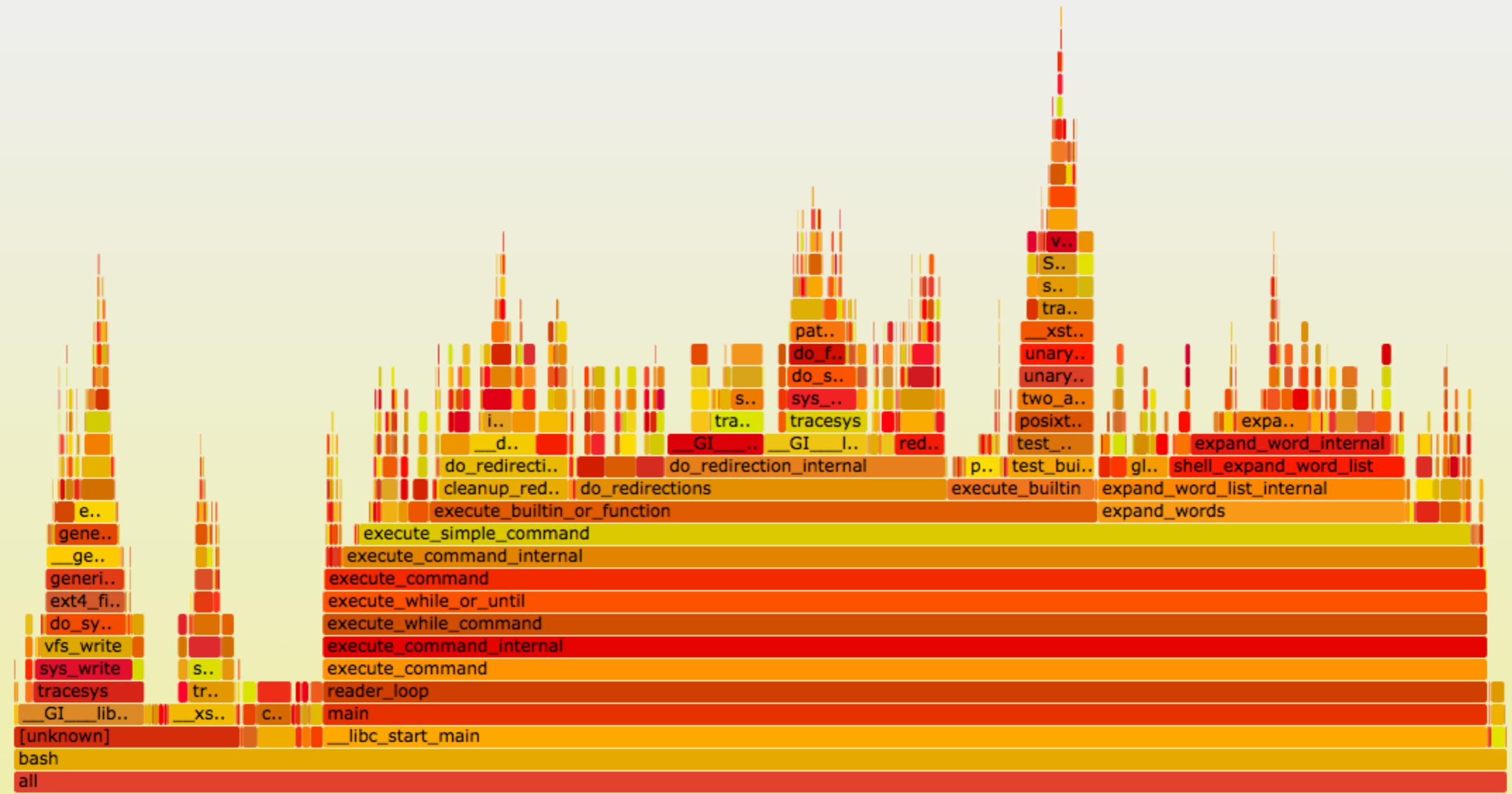
☕ Coffee Connoisseur

⌨️ Keyboard Enthusiast

🦄 Special



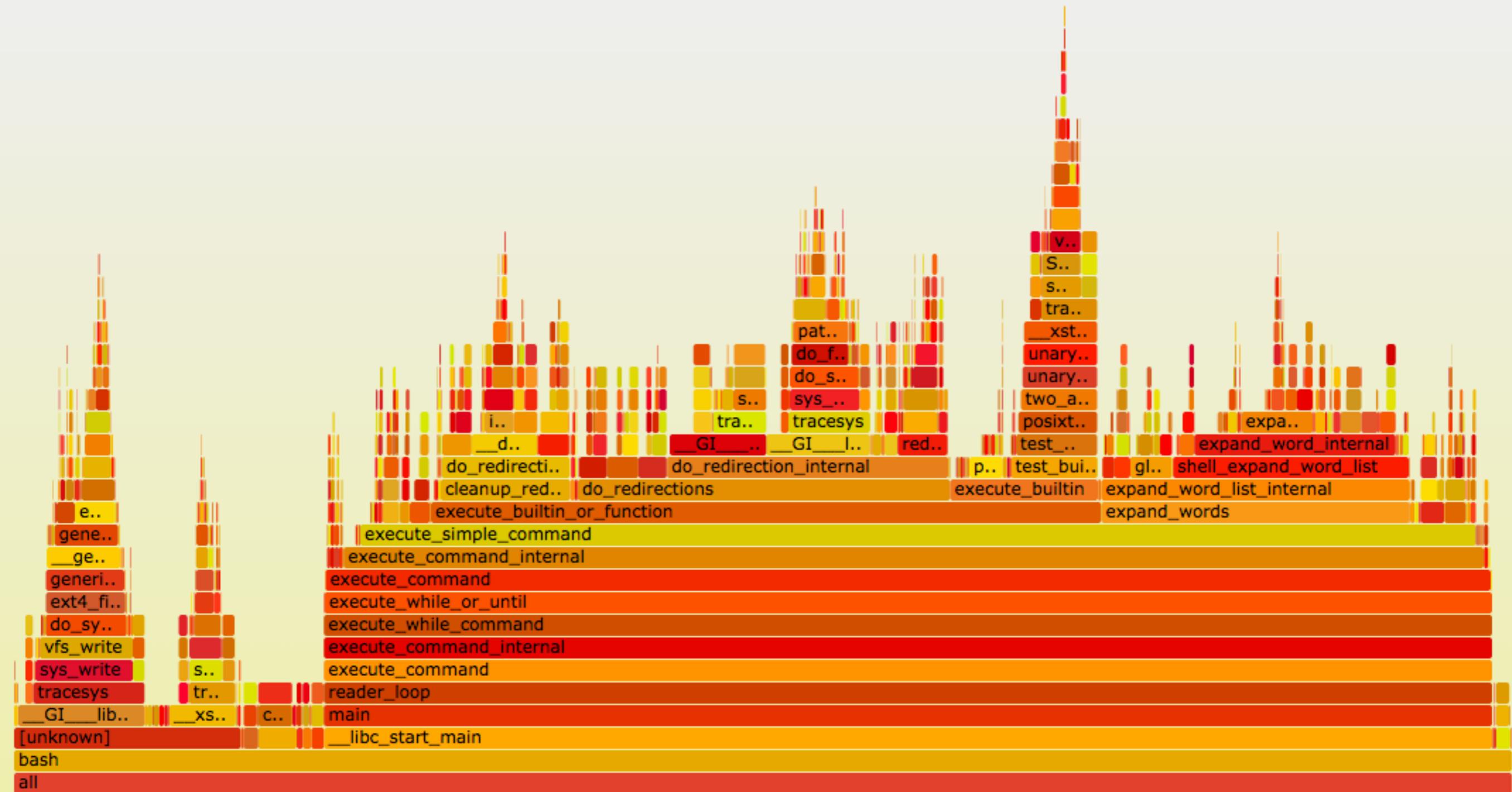
FLAME GRAPHS



WHY AND WHAT

- Interactive visualization of stack traces
- From beginners to experts
- Can be used for many things
- How SW is consuming CPU
- Brendan Gregg

A detailed phylogenetic tree diagram, likely a maximum likelihood or Bayesian tree, showing the evolutionary relationships between a large number of samples. The tree is rooted at the top and branches into several main clades. Internal nodes are labeled with small numbers and letters, such as '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32', '33', '34', '35', '36', '37', '38', '39', '40', '41', '42', '43', '44', '45', '46', '47', '48', '49', '50', '51', '52', '53', '54', '55', '56', '57', '58', '59', '60', '61', '62', '63', '64', '65', '66', '67', '68', '69', '70', '71', '72', '73', '74', '75', '76', '77', '78', '79', '80', '81', '82', '83', '84', '85', '86', '87', '88', '89', '90', '91', '92', '93', '94', '95', '96', '97', '98', '99', '100', '101', '102', '103', '104', '105', '106', '107', '108', '109', '110', '111', '112', '113', '114', '115', '116', '117', '118', '119', '120', '121', '122', '123', '124', '125', '126', '127', '128', '129', '130', '131', '132', '133', '134', '135', '136', '137', '138', '139', '140', '141', '142', '143', '144', '145', '146', '147', '148', 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AWESOME.

FLAME GRAPHS EXPLAINED

- each box represents a function (a merged stack frame)
- y-axis (vertical) shows stack depth
 - top function led directly to the profiling event
 - everything beneath it is ancestry (explains why)
- x-axis (horizontal) shows the sample sorted alphabetically
- box width shows the total time it was on-CPU

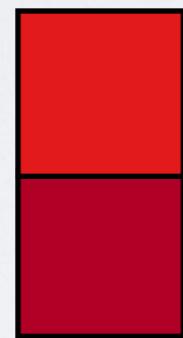
A woman with short brown hair, wearing a white lab coat over a light-colored top, stands in a laboratory setting. She is positioned behind a counter covered with various pieces of scientific equipment, including a large cylindrical apparatus, a blue container, and several glass flasks. Behind her, there are shelves filled with more equipment and supplies. The background is a plain, light-colored wall.

TOO MUCH SCIENCE

SAMPLING

- Time interval
- Observe what's going on
- Which action caused current action
- Real-world example

SAMPLING



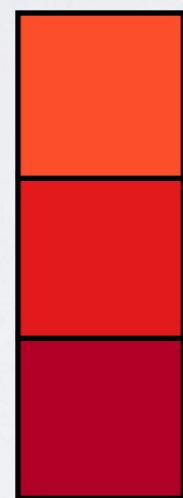
Reading Emails



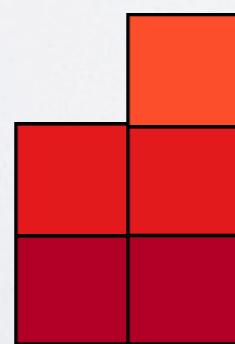
My Day



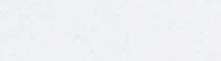
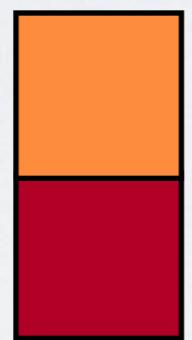
SAMPLING



← Replying to Emails
← Reading Emails
← My Day



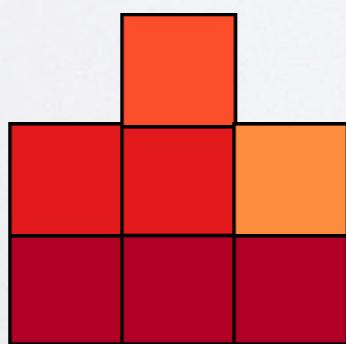
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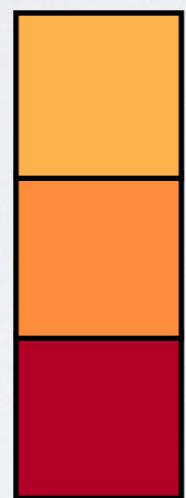
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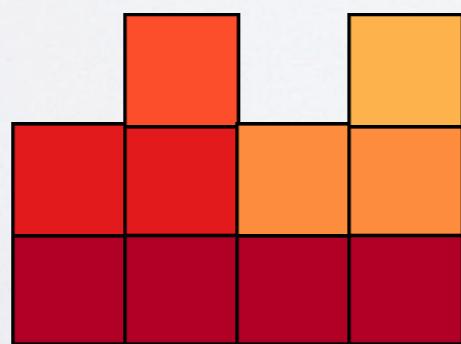
My Day



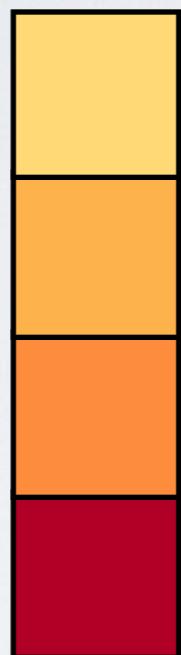
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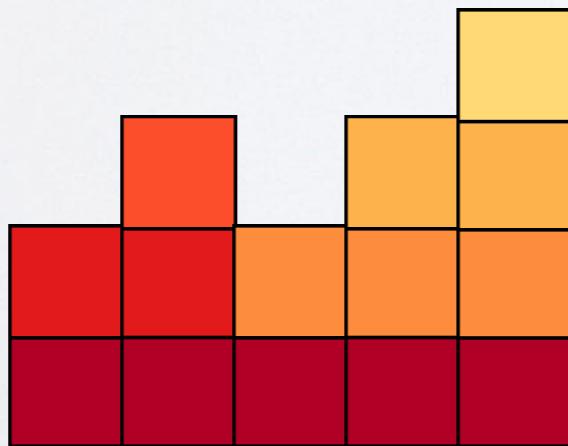
← Writing Tests
← Writing Code
← My Day



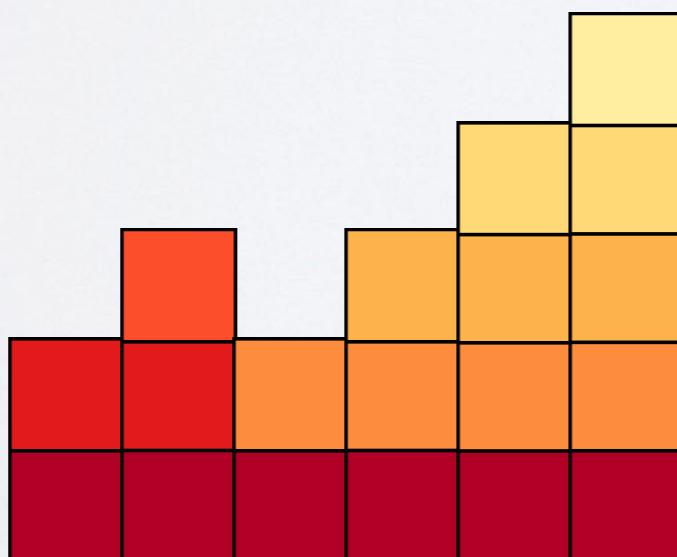
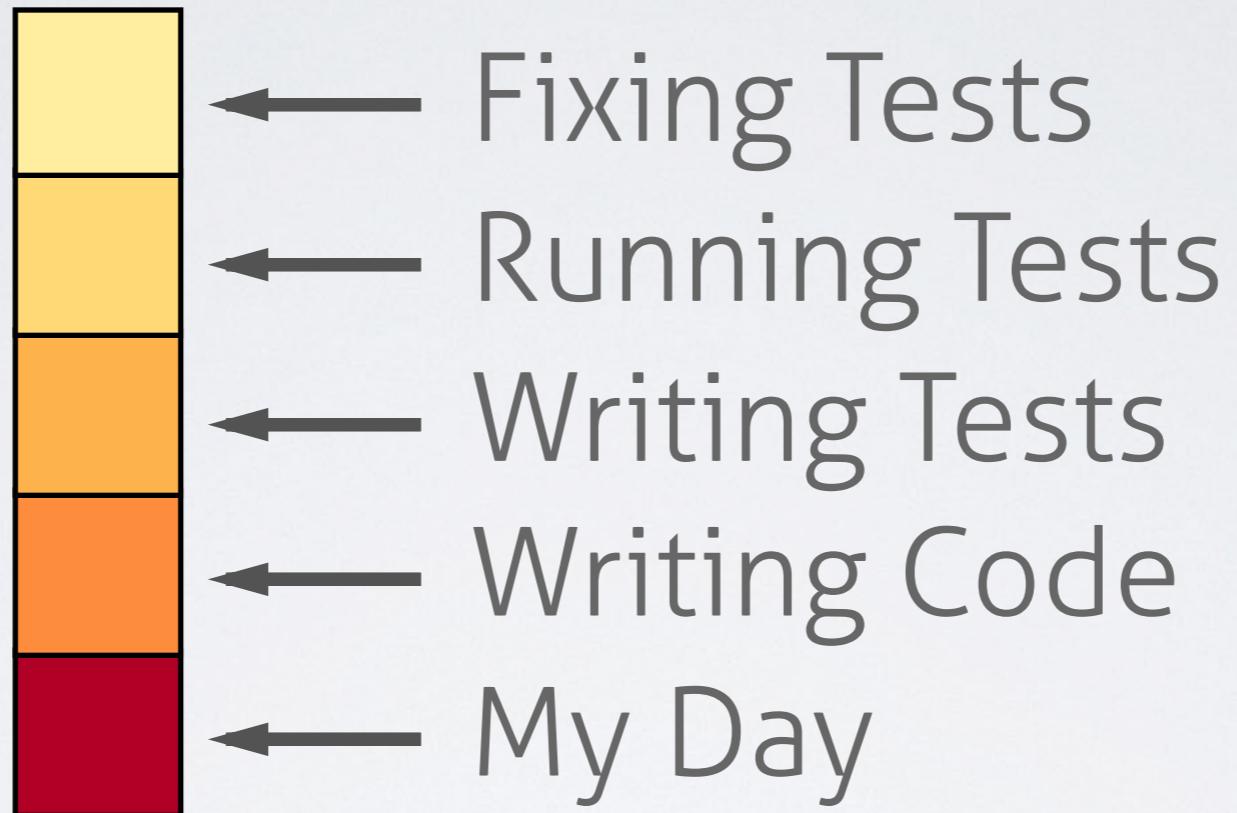
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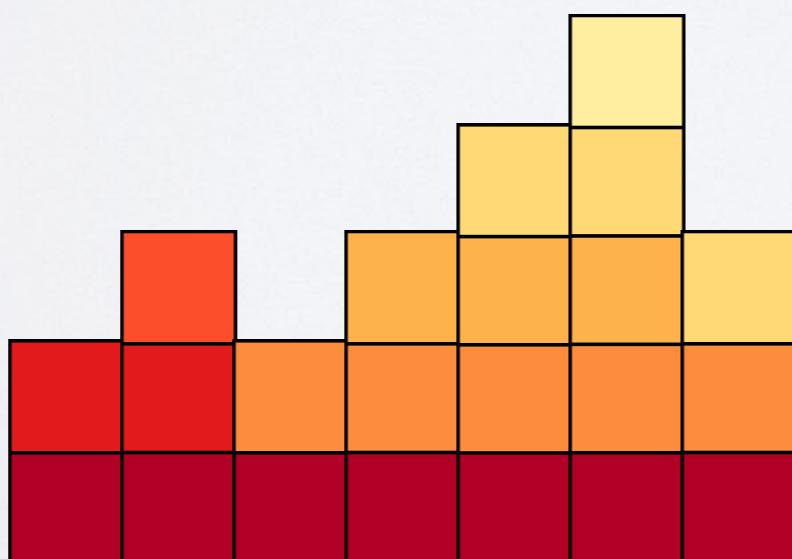
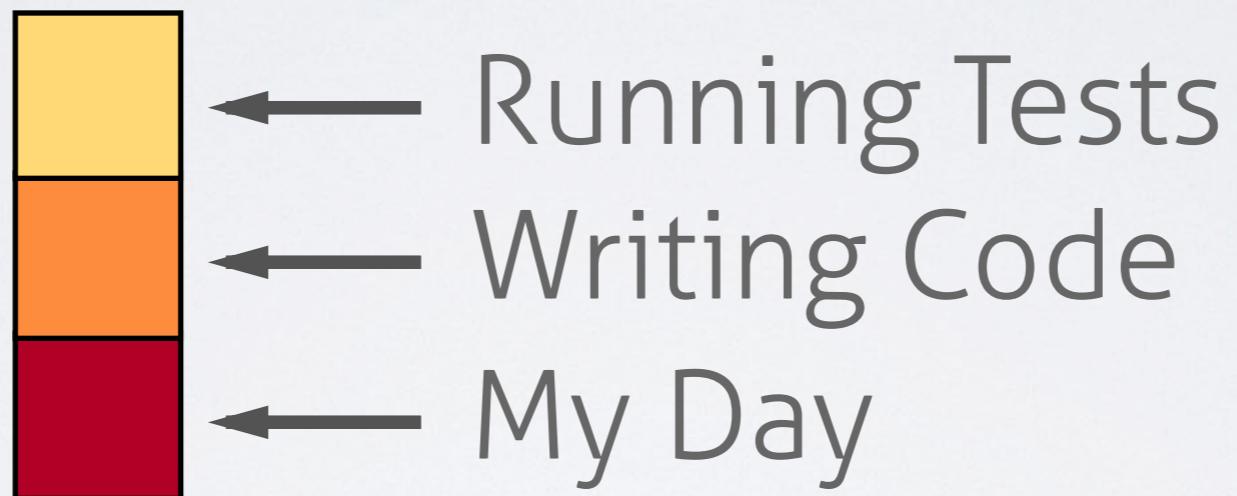
← Running Tests
← Writing Tests
← Writing Code
← My Day



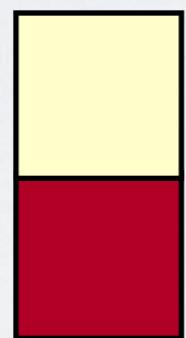
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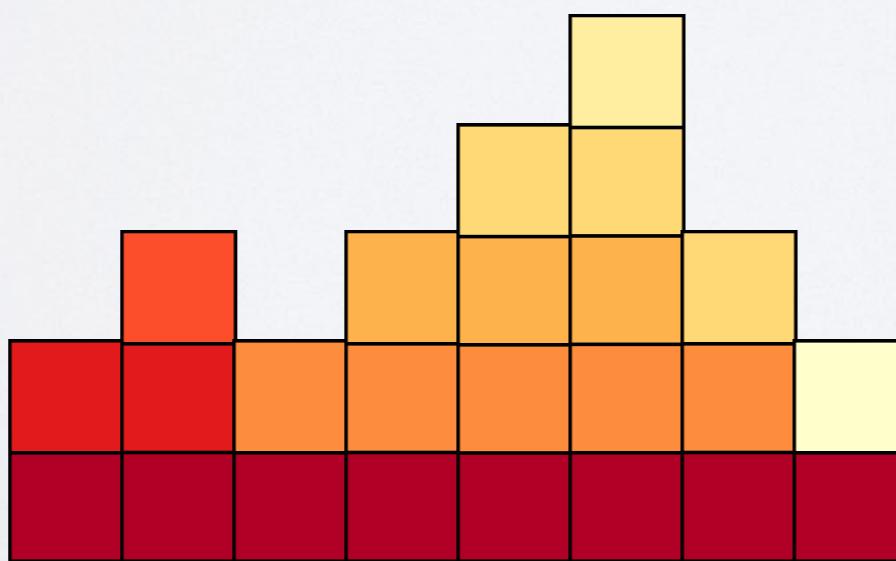
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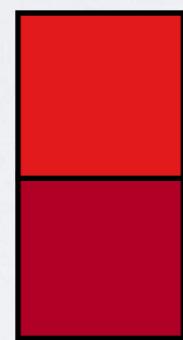
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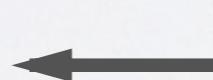
Making Espresso
My Day



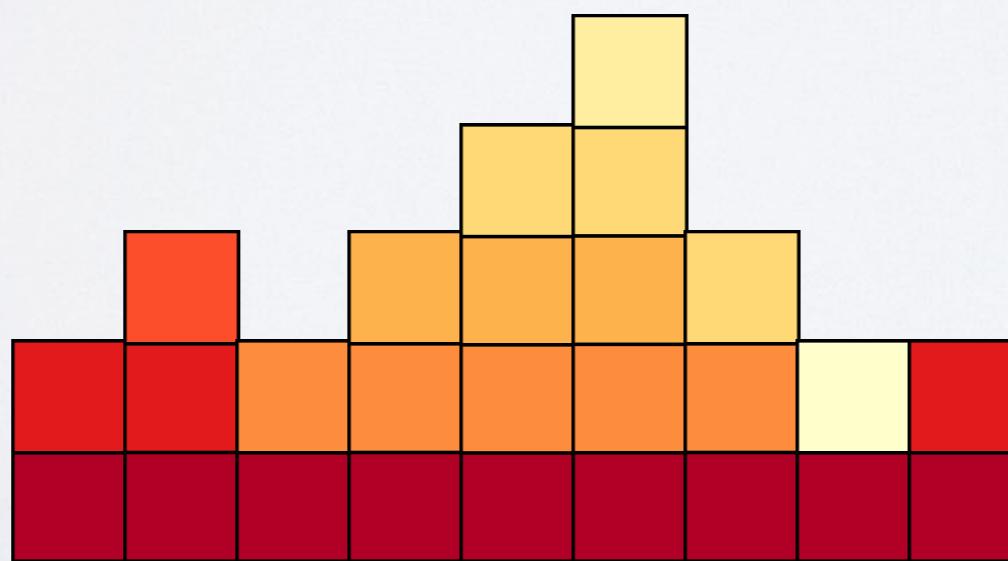
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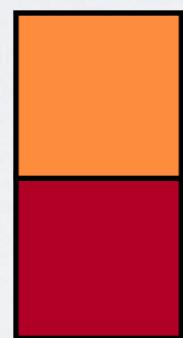
Reading Emails



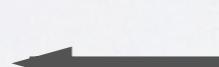
My Day



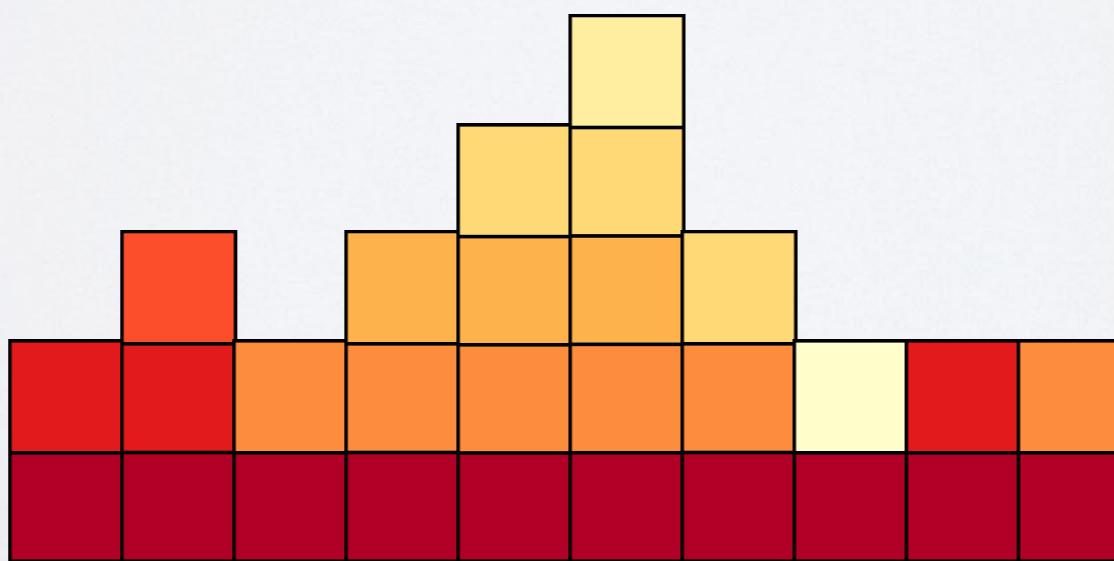
SAMPLING



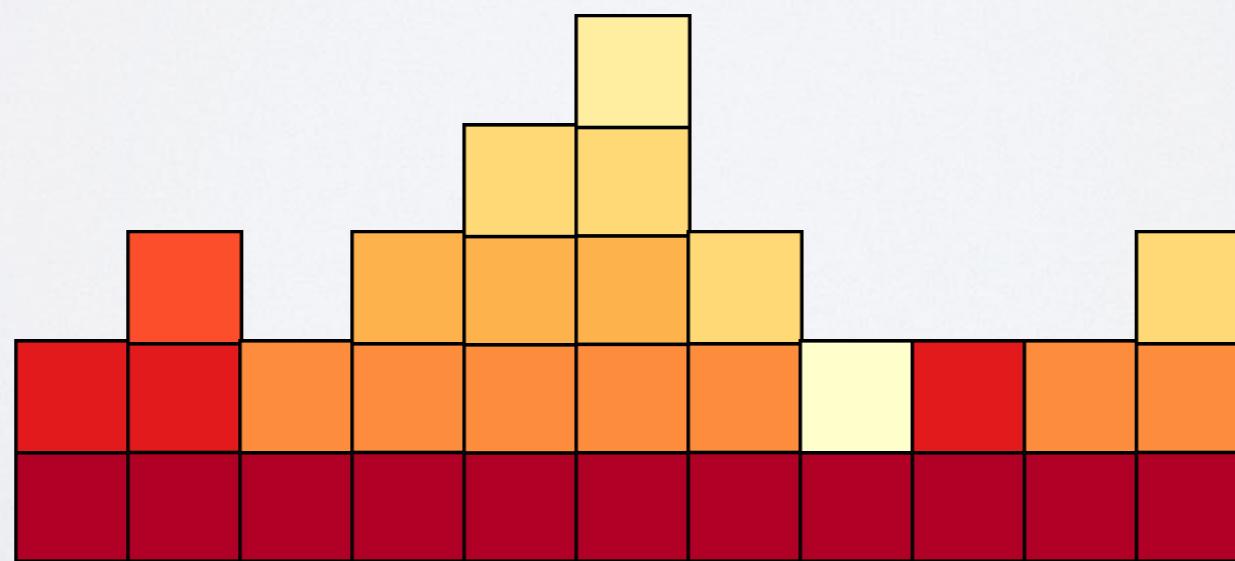
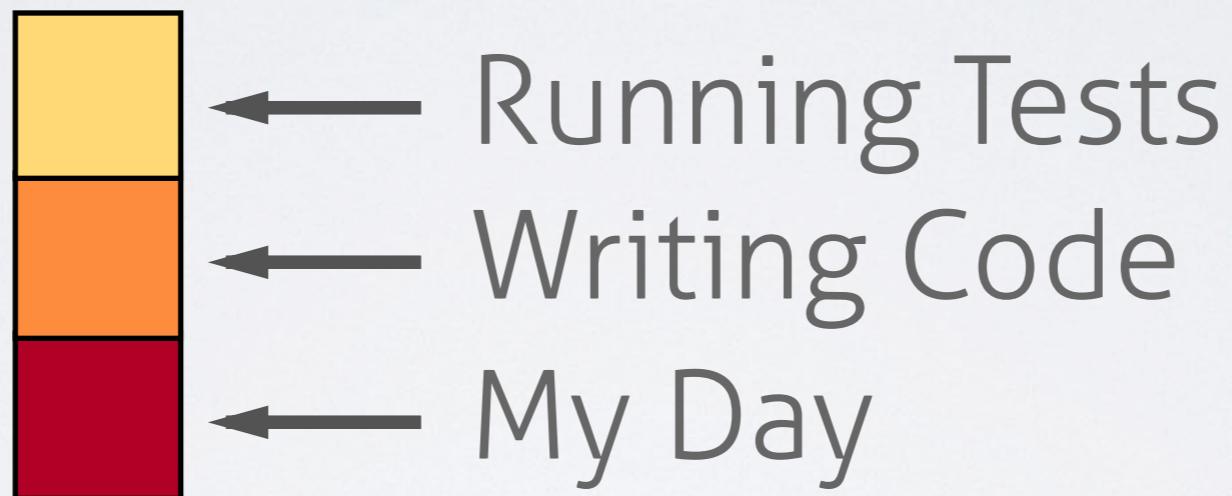
Writing Code



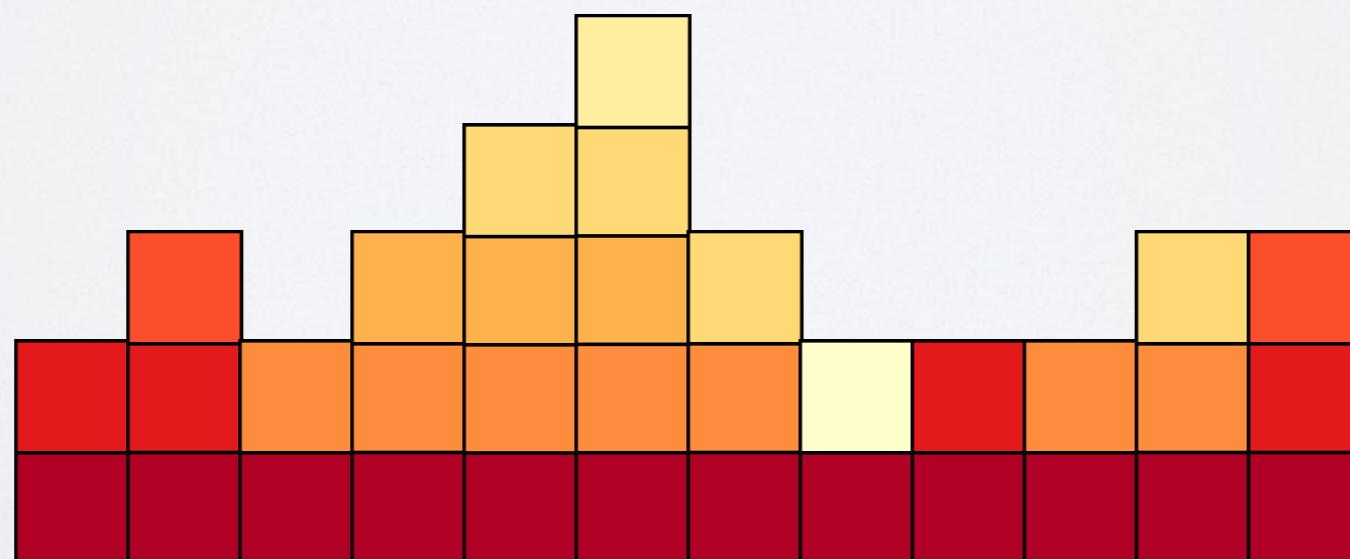
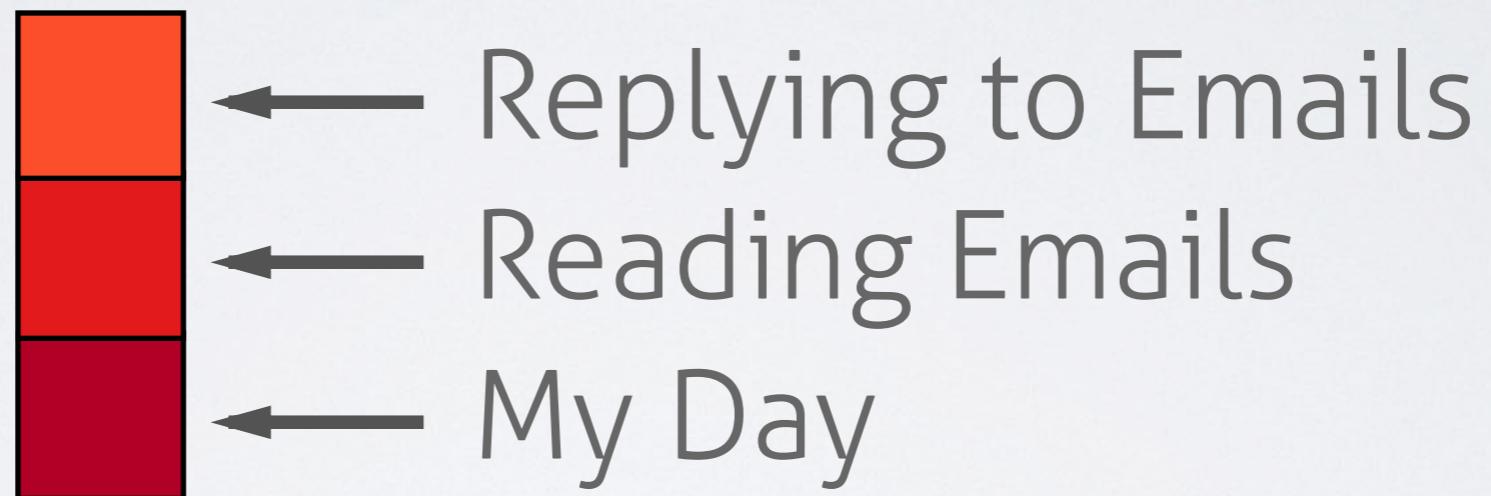
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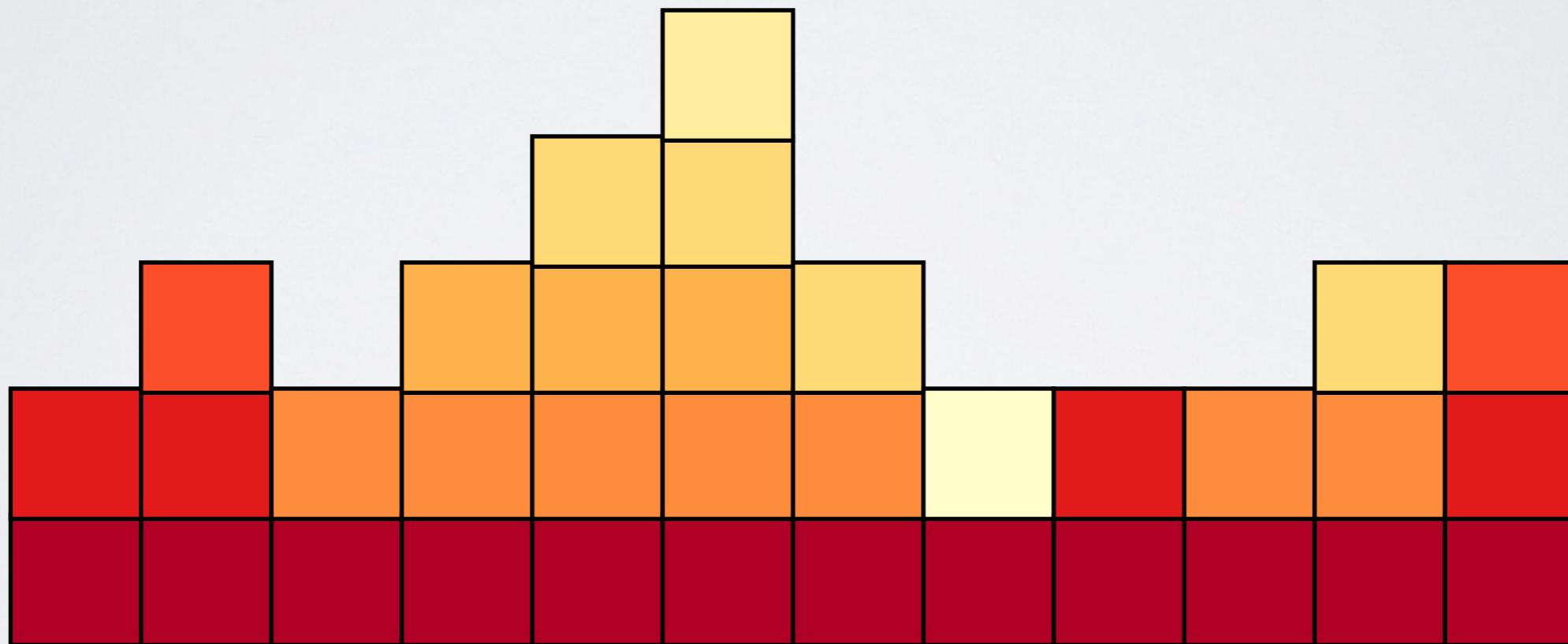
SAMPLING



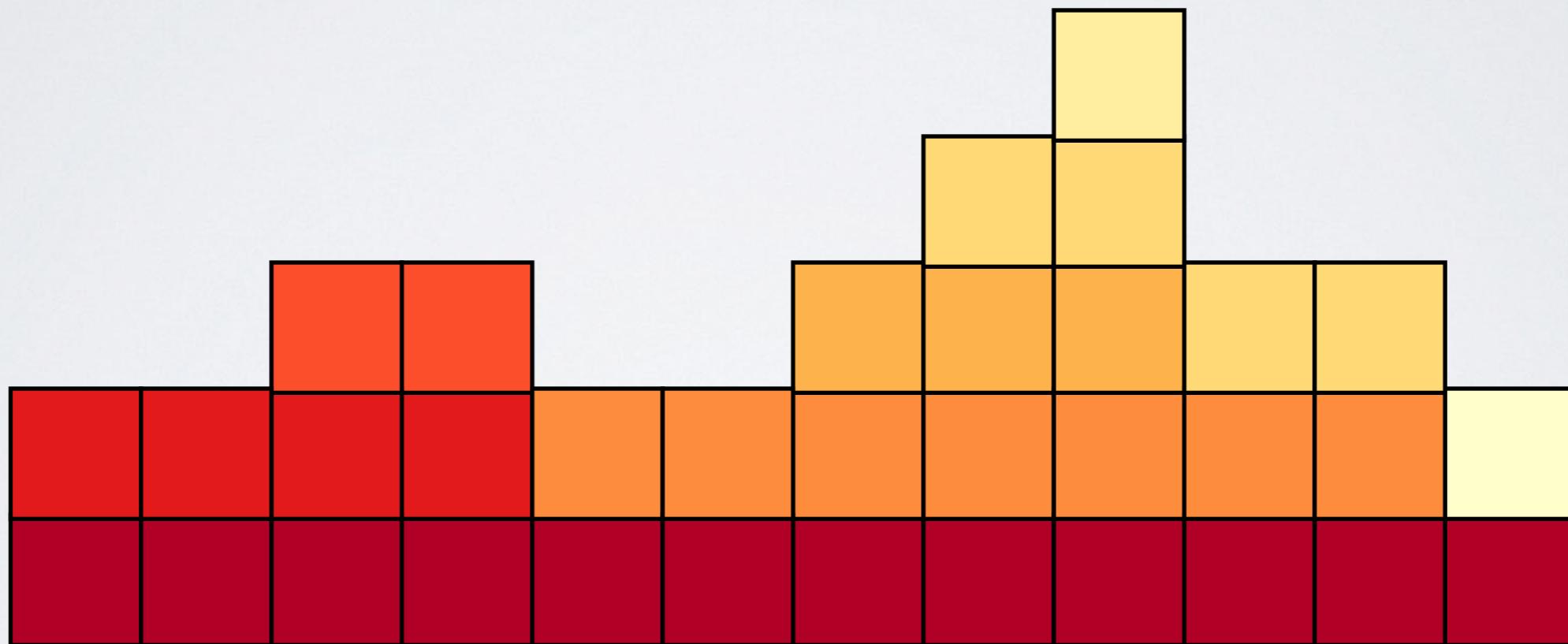
SAMPLING



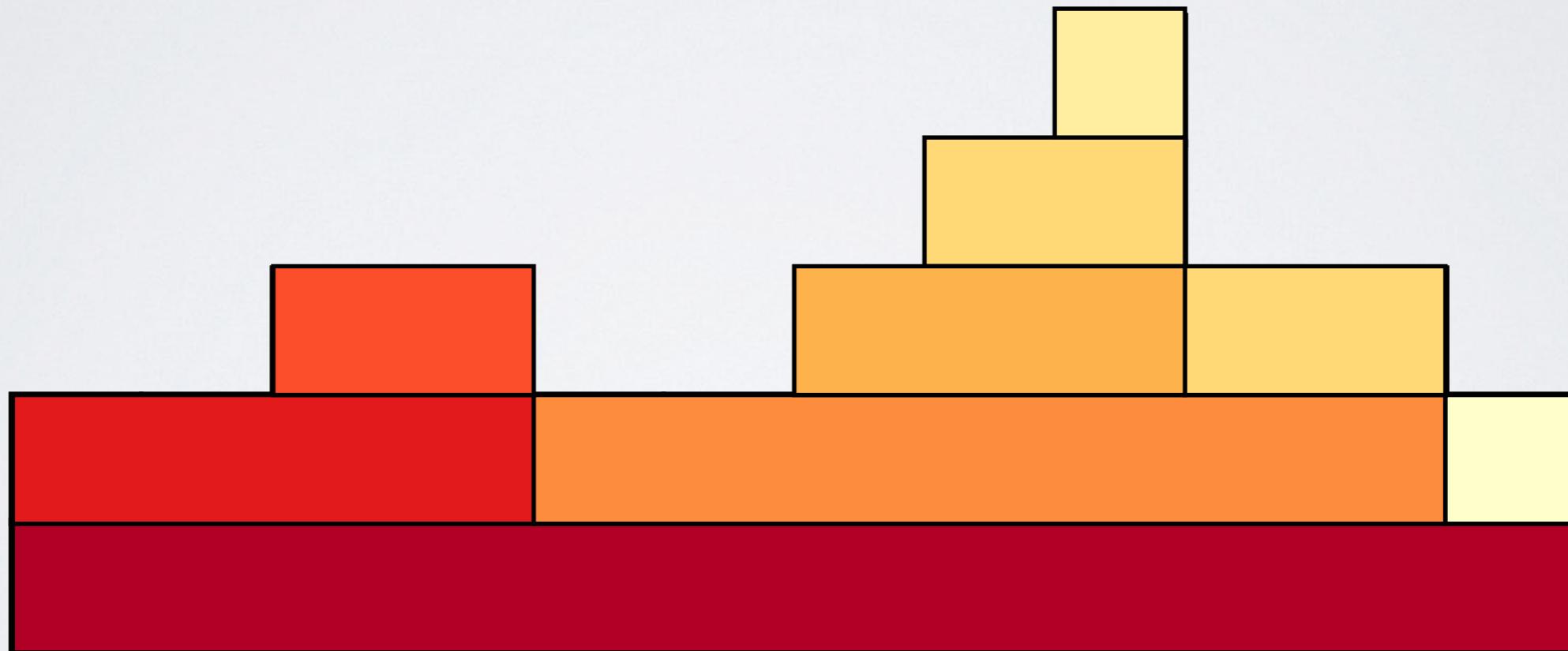
SAMPLING



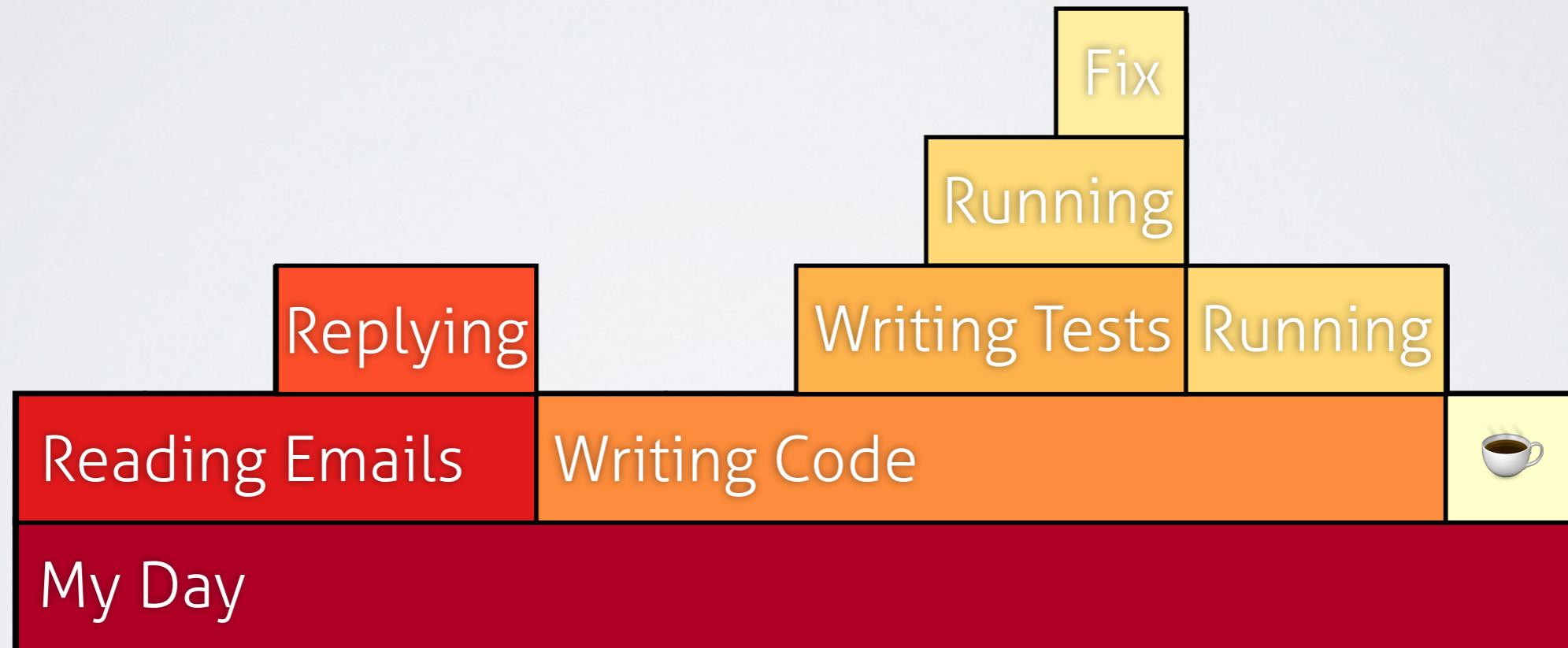
GROUPING



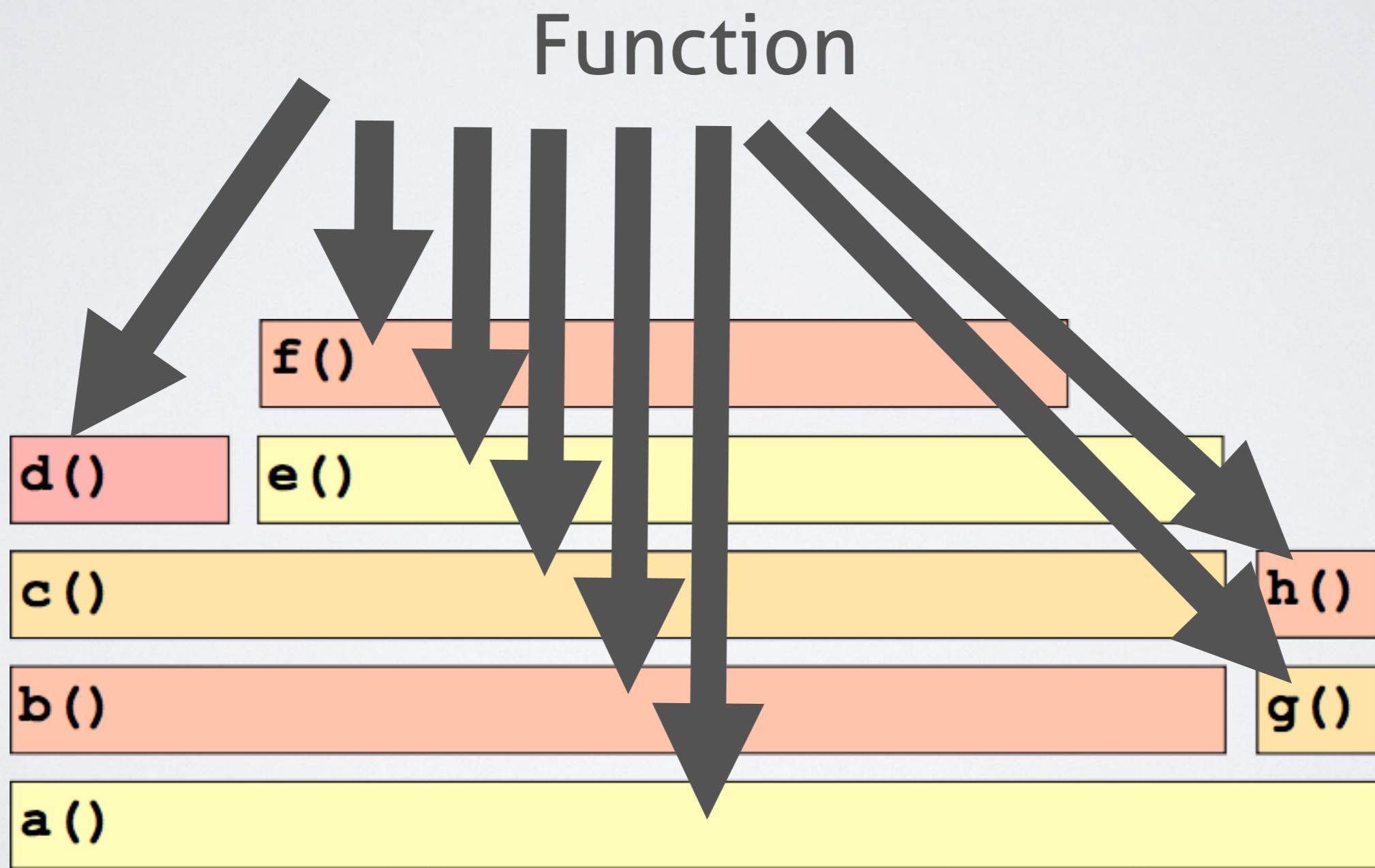
GROUPING



GROUPING

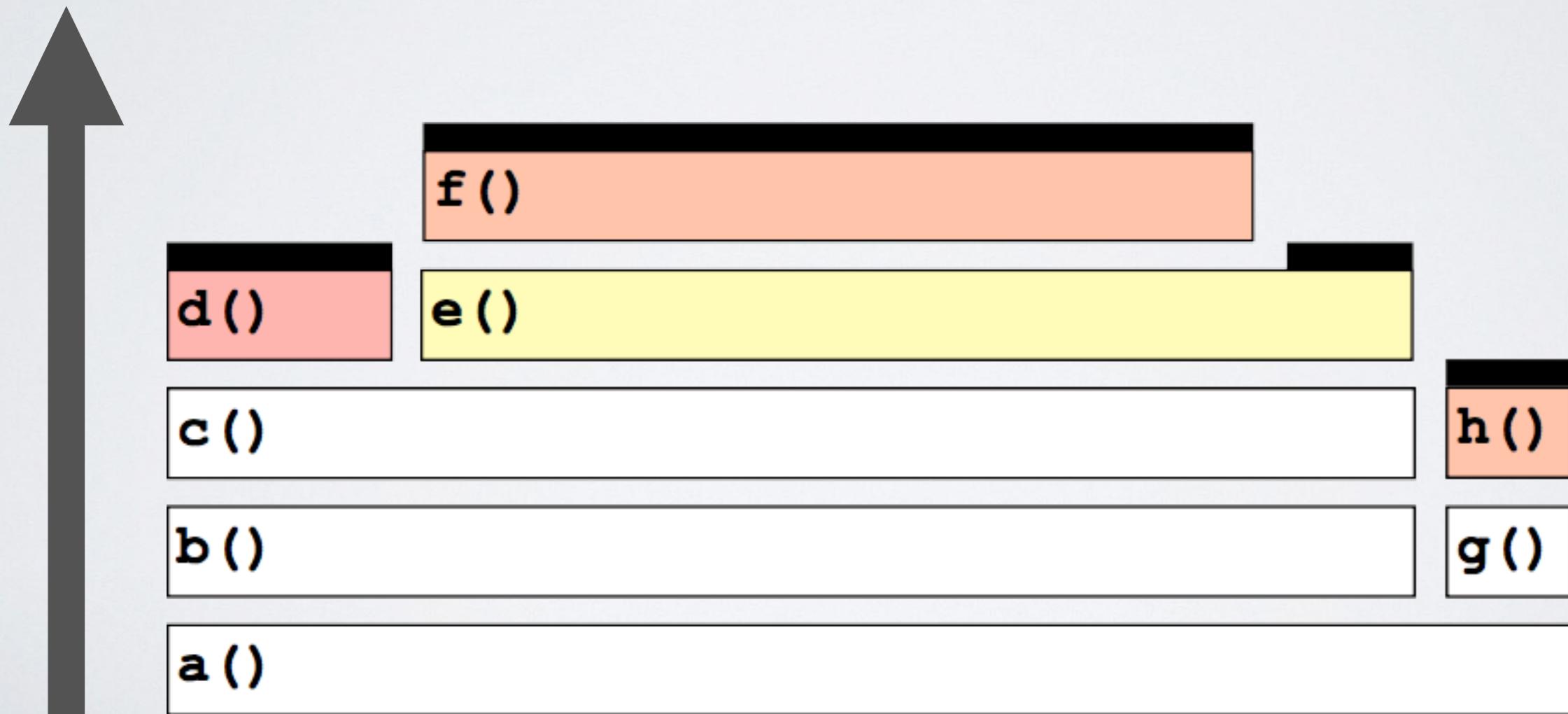


MOAR EXPLAINING



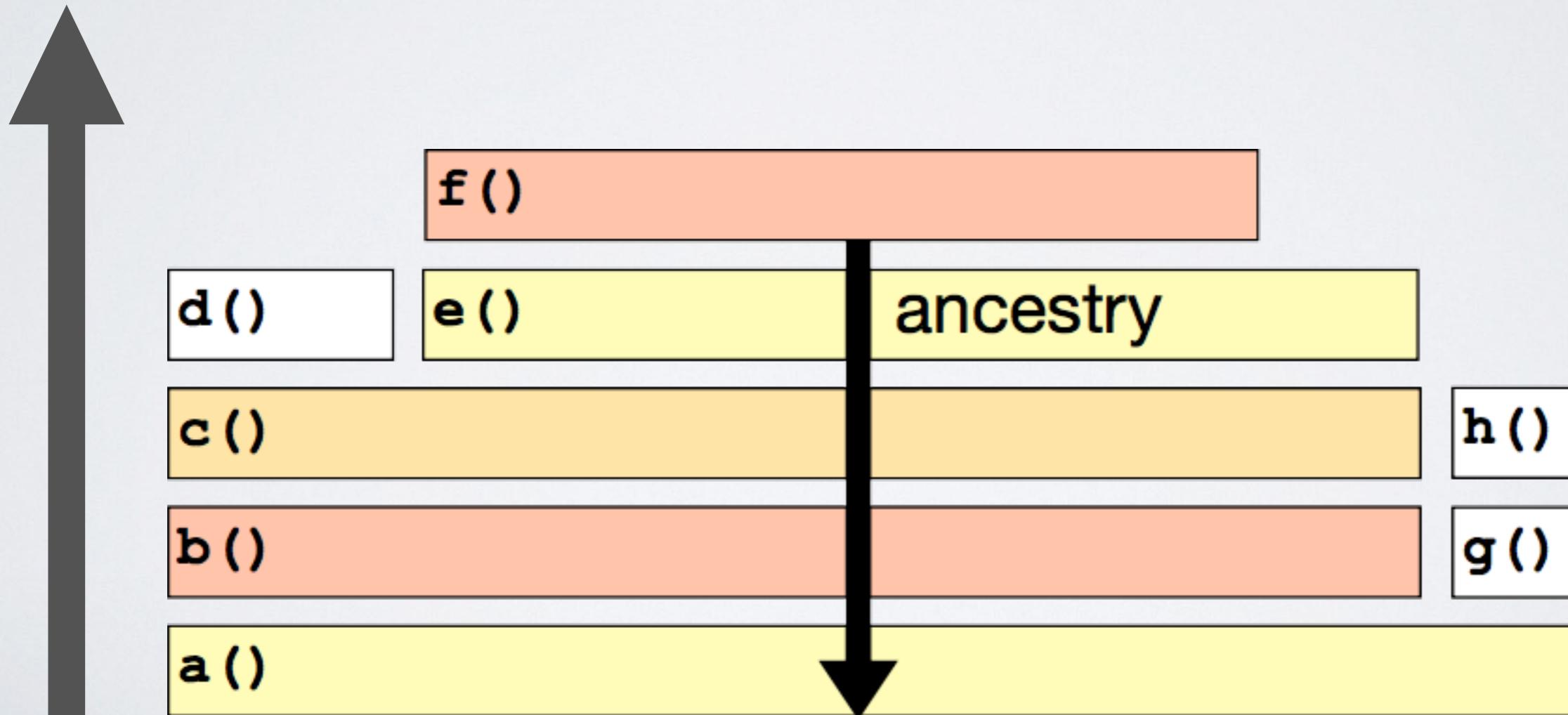
MOAR EXPLAINING

Stack Depth



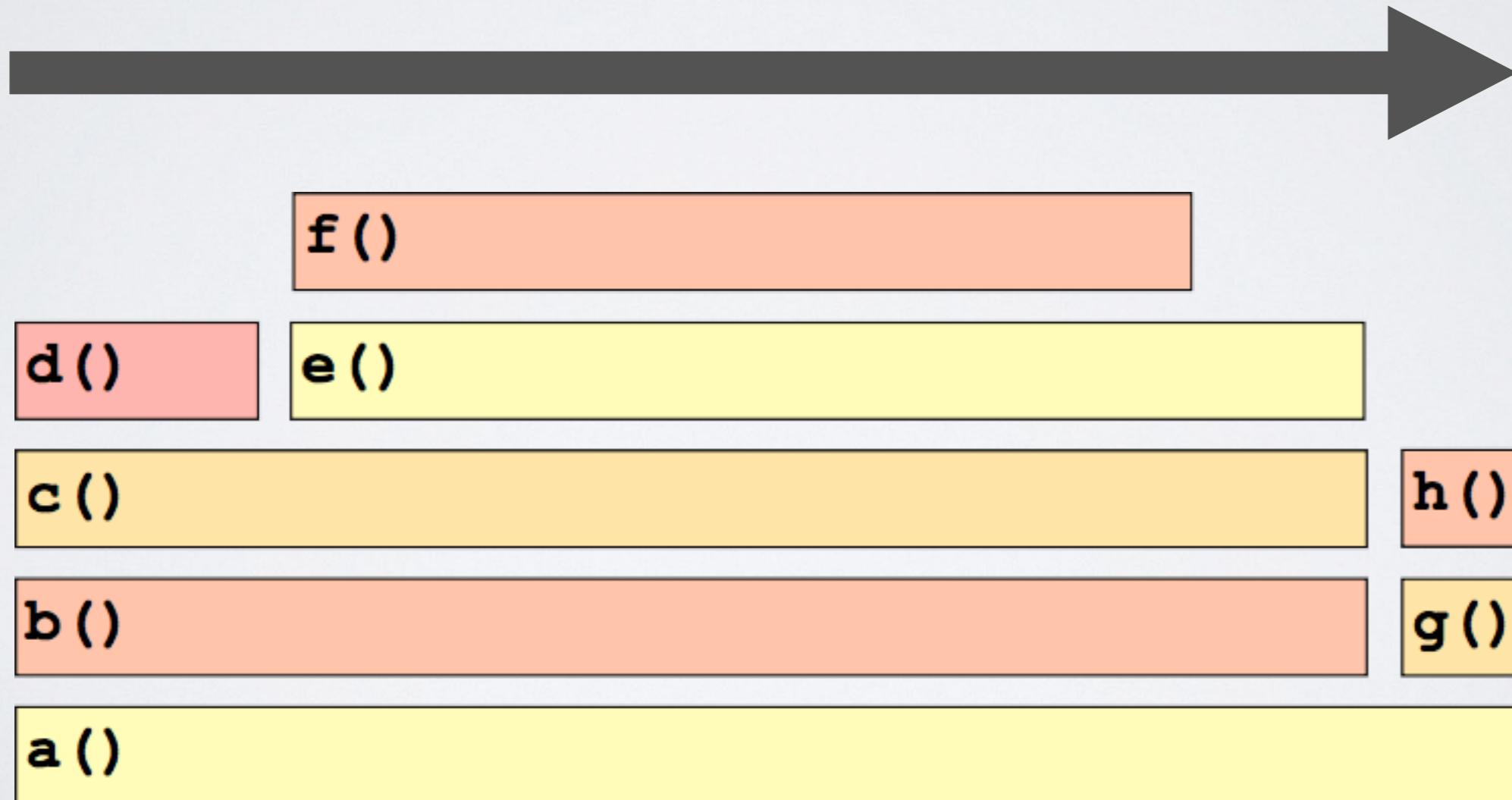
MOAR EXPLAINING

Stack Depth



MOAR EXPLAINING

Ordered by Alphabet



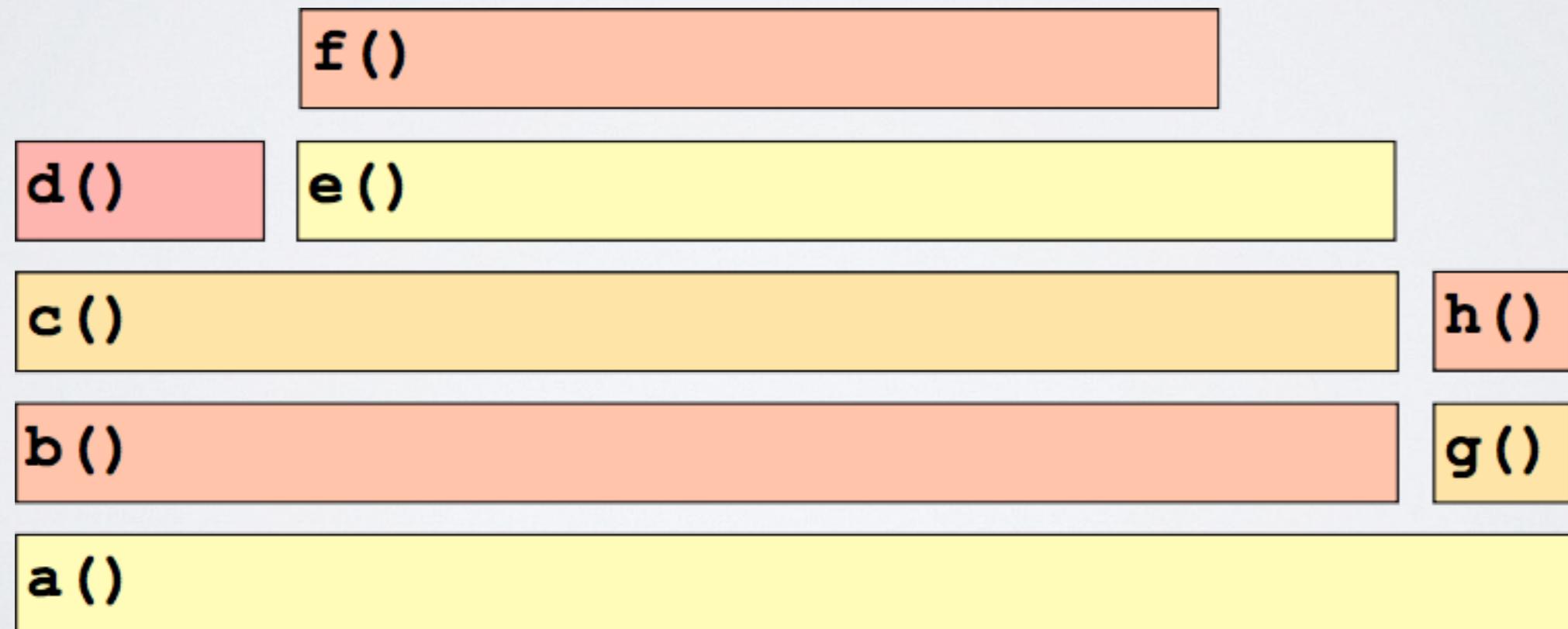
MOAR EXPLAINING

Total Time on CPU



Q&A

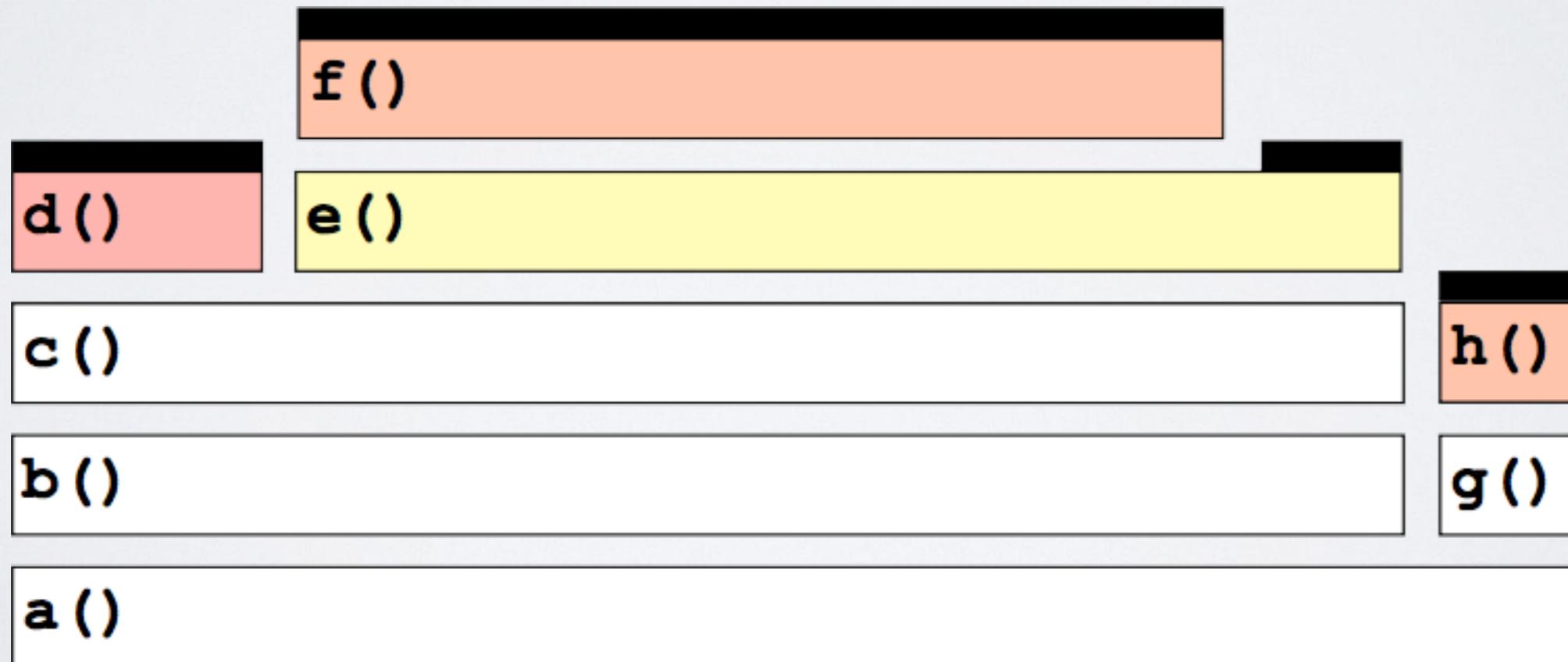
Q: Which function is on CPU the most?



Q&A

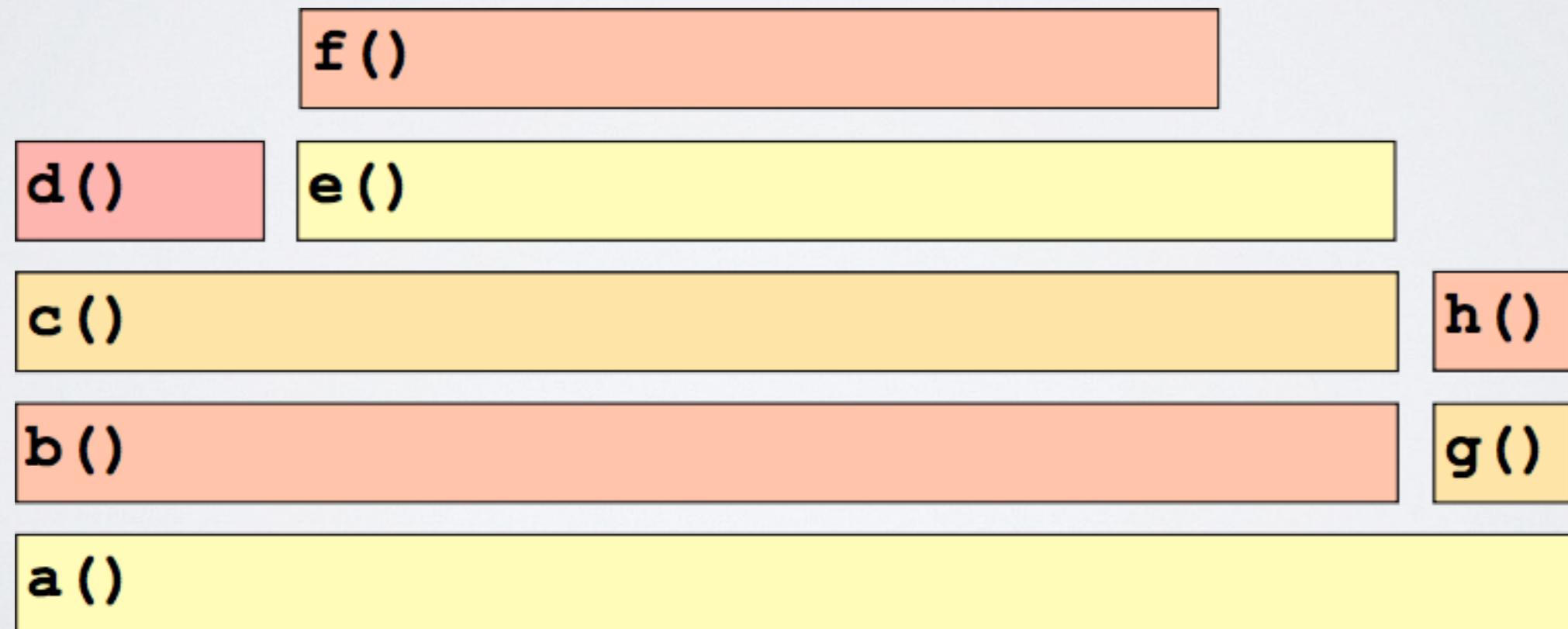
A: f()

top edge shows what is on CPU directly



Q&A

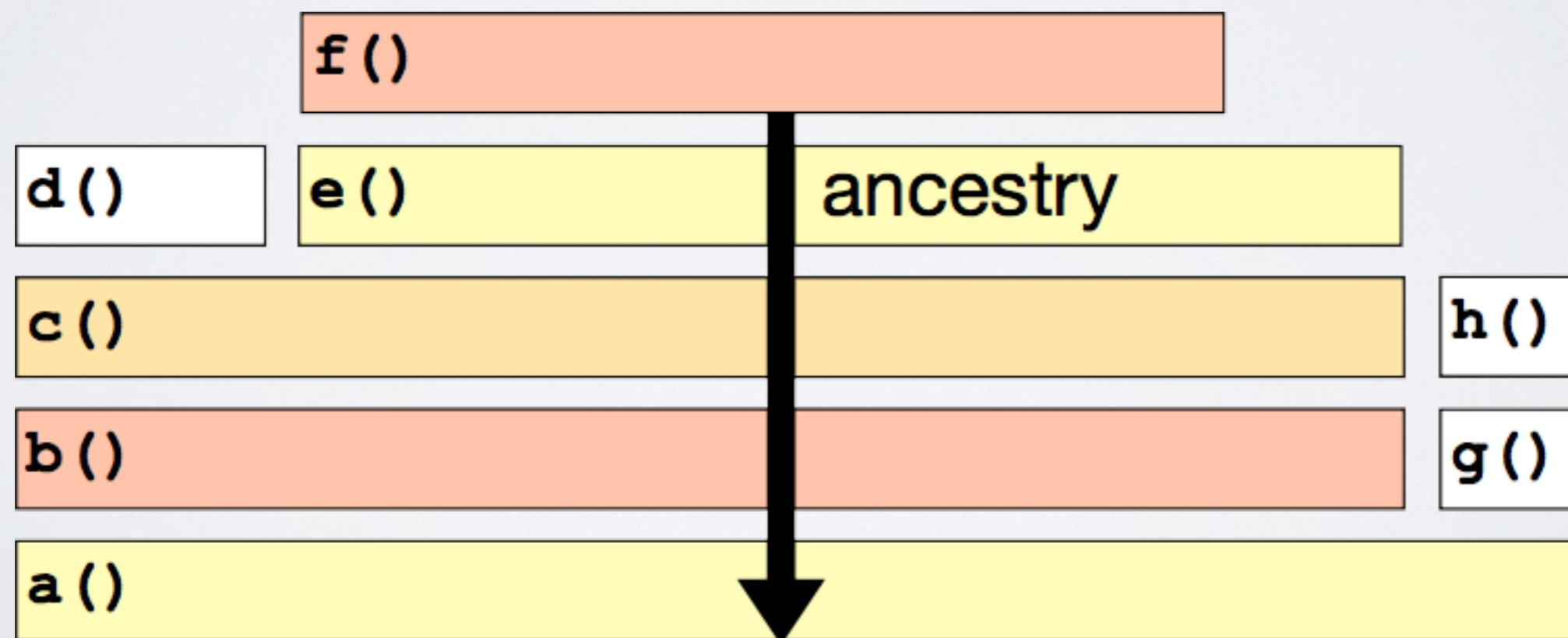
Q: Why is f() on CPU?



Q&A

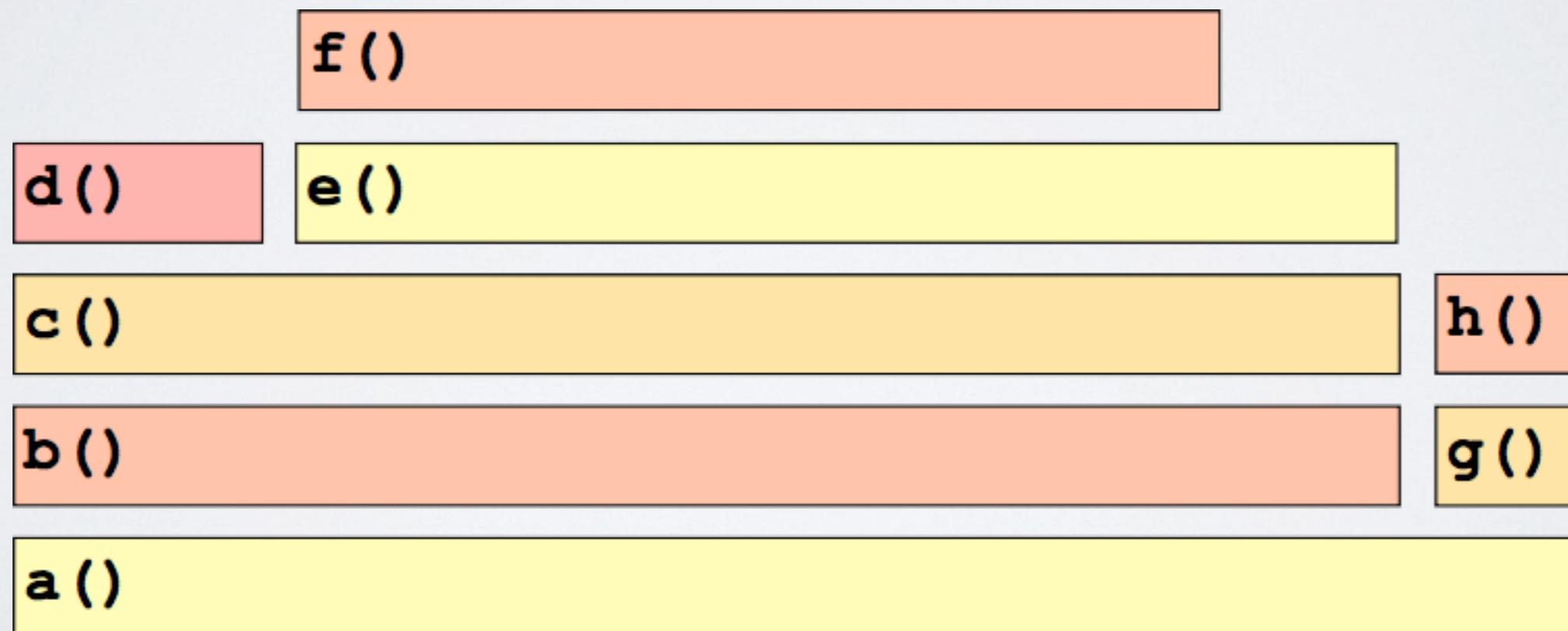
A: $a() \rightarrow b() \rightarrow c() \rightarrow e() \rightarrow f()$

$f()$ was called by $e()$, $e()$ was called by $c()$, ...



Q&A

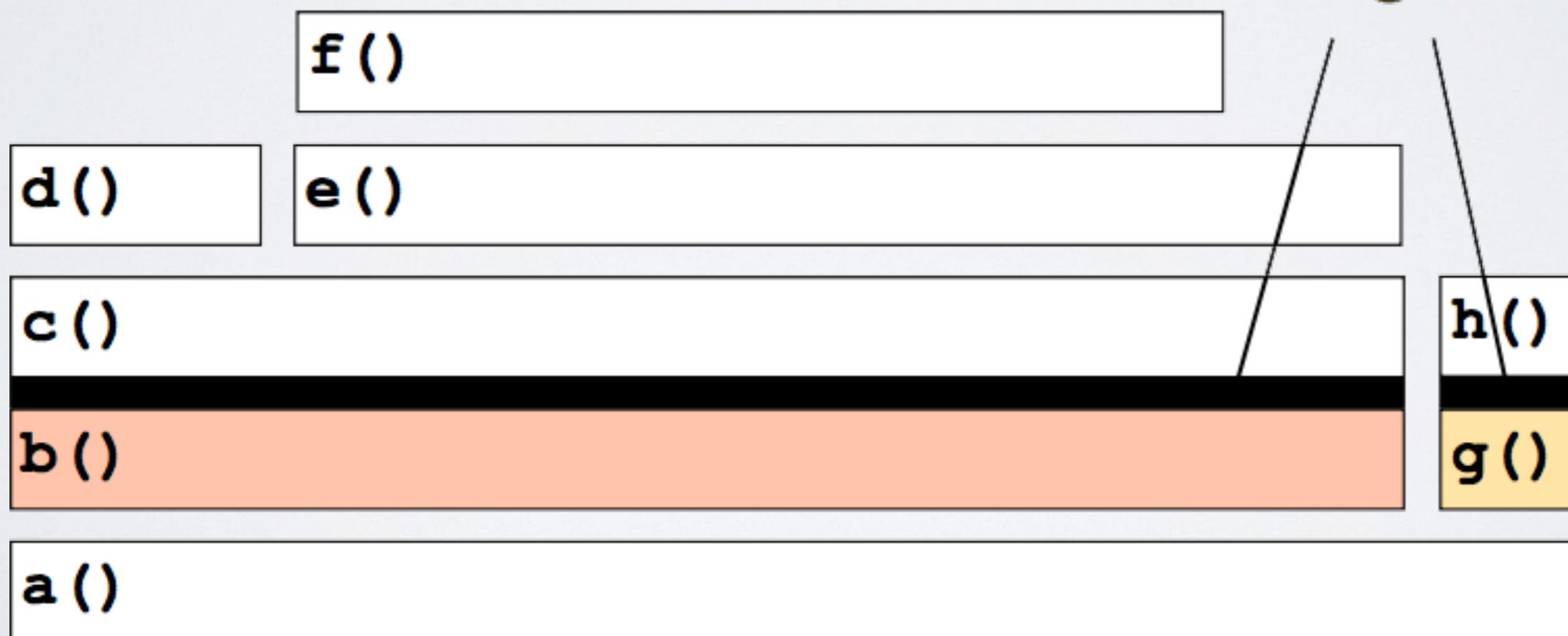
Q: How does b() compare to g()?



Q&A

A: b() looks like it is running (present) about 10 times more often than g()

visually compare
lengths



Q&A

Q: Why are we running f()?

f()

d()

e()

c()

h()

b()

g()

a()

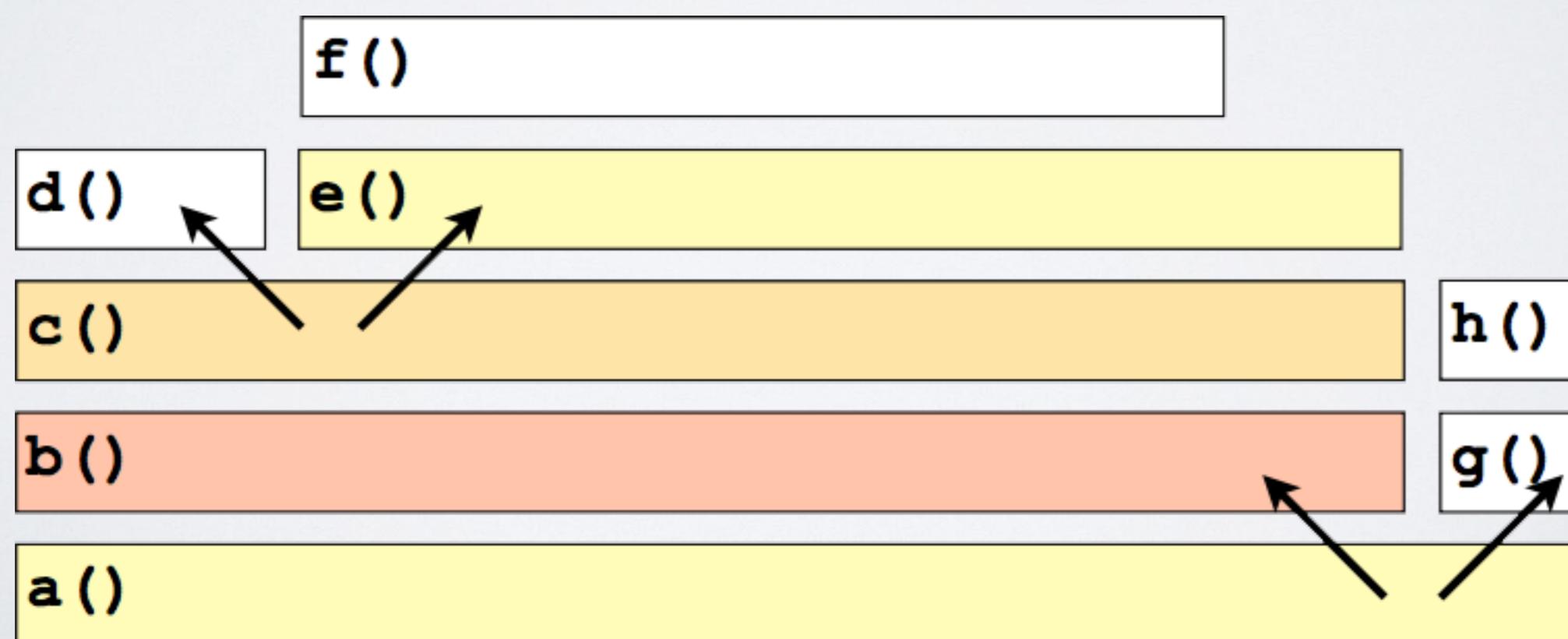
Q&A

A: code path branches can reveal key functions:

a() choose the b() path

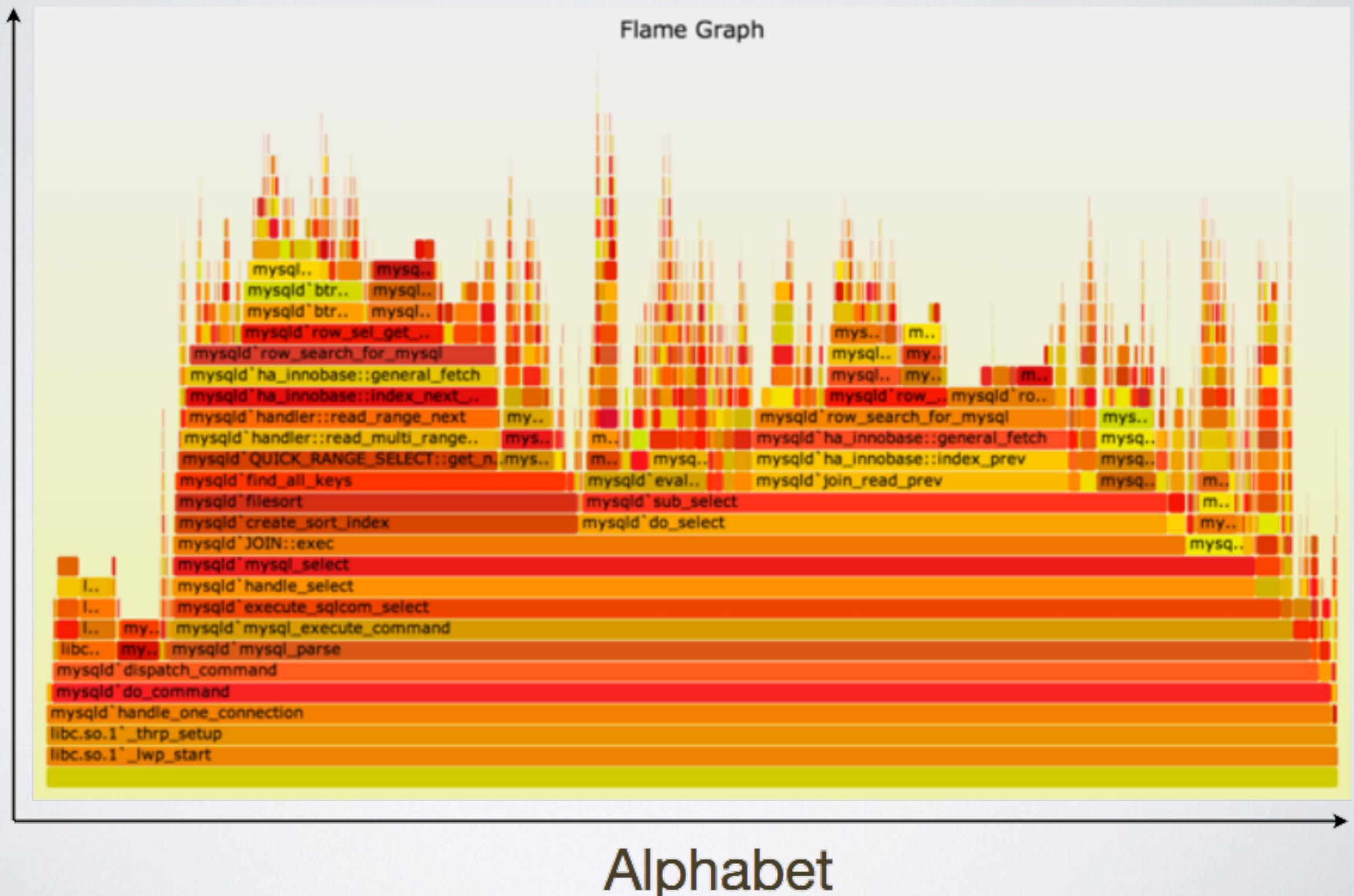
c() choose the e() path

look for branches



FOR REAL

Stack
Depth



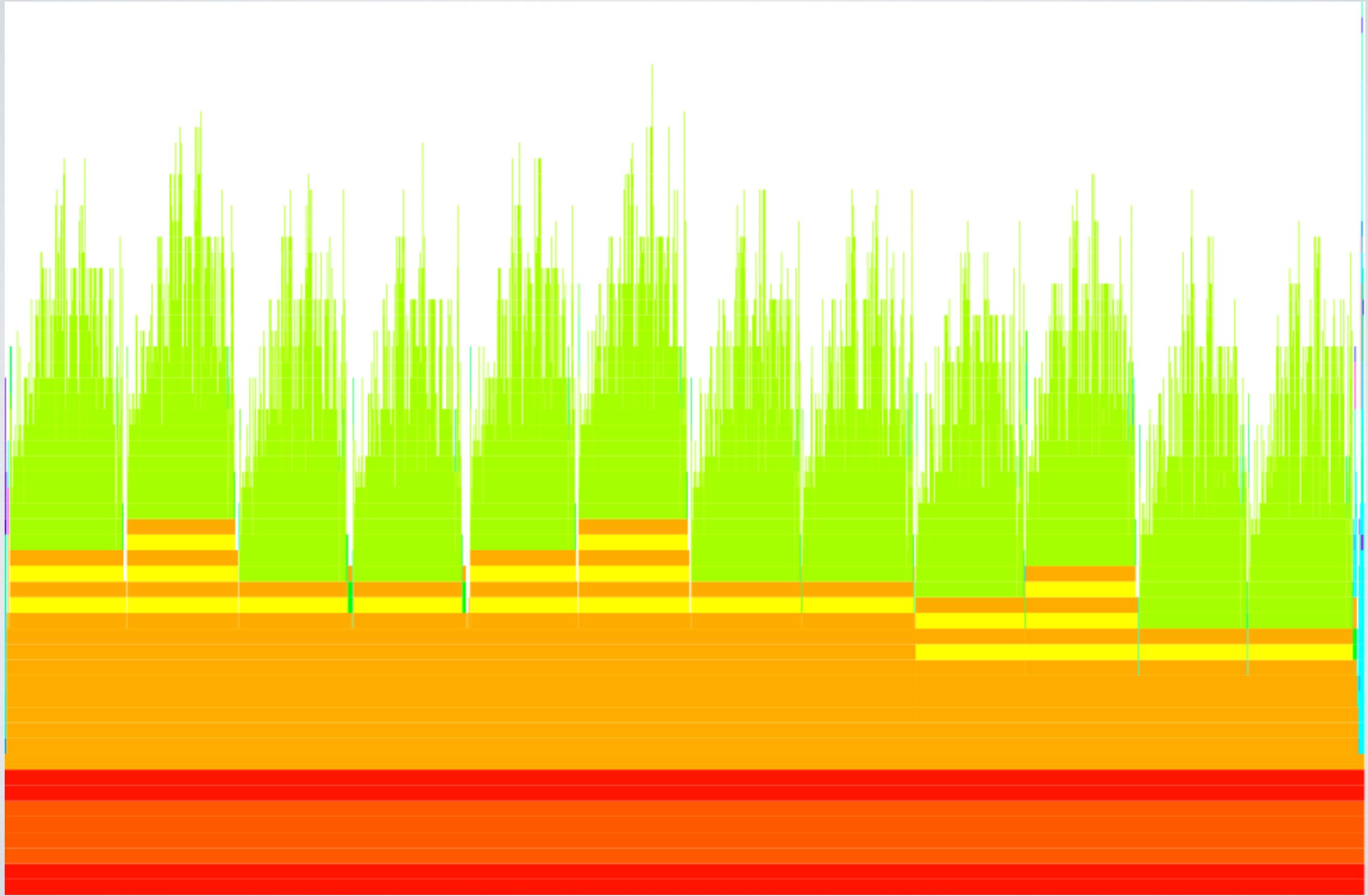
REAL WORLD EXAMPLE

- Sam Saffron
- gem 'flamegraph'

```
Flamegraph.generate(filename) do
  # your work here
end
```

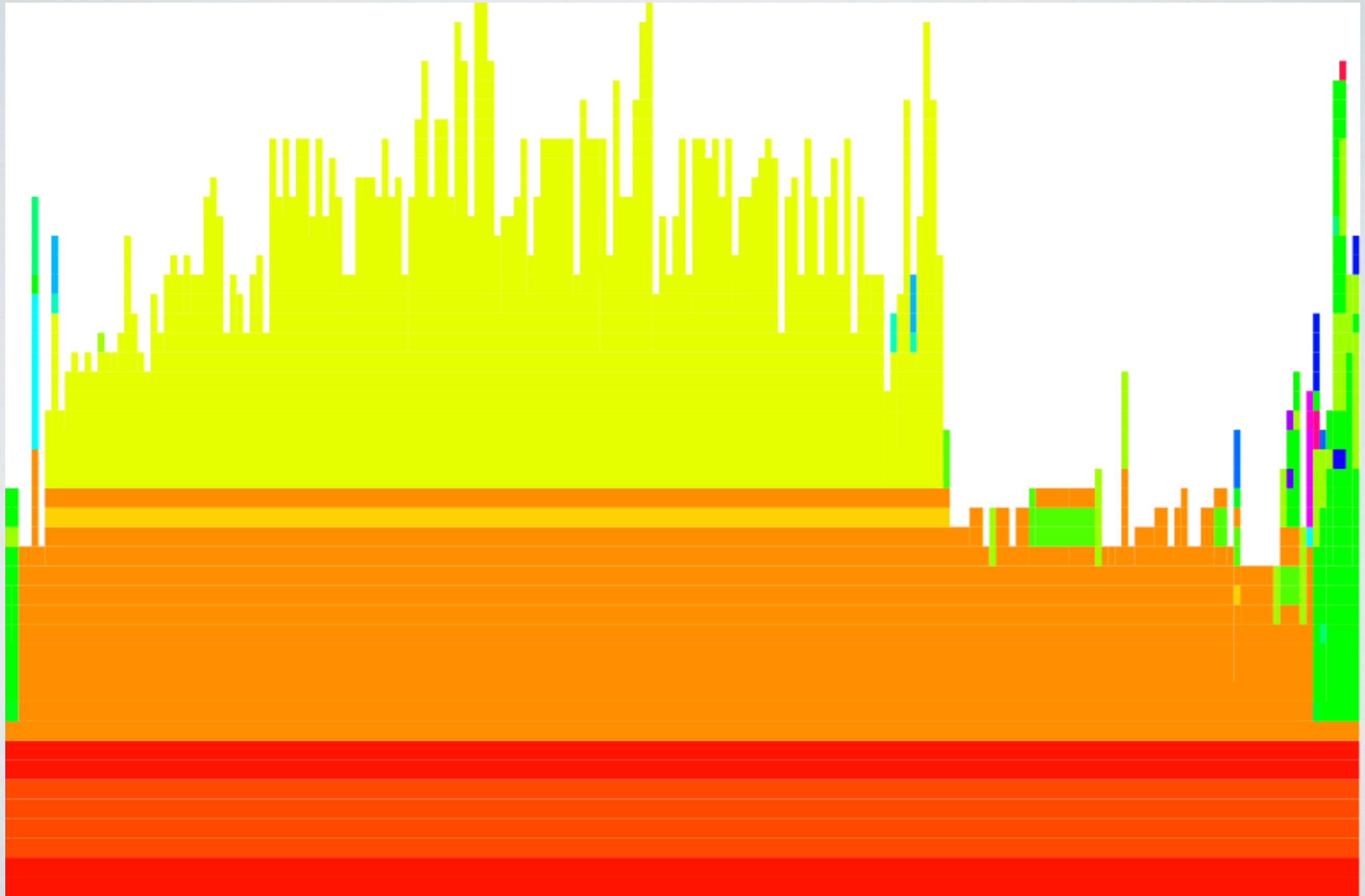
ORIGINAL

1.083 (\pm 0.0%) i/s - 33.000 in 30.861265s



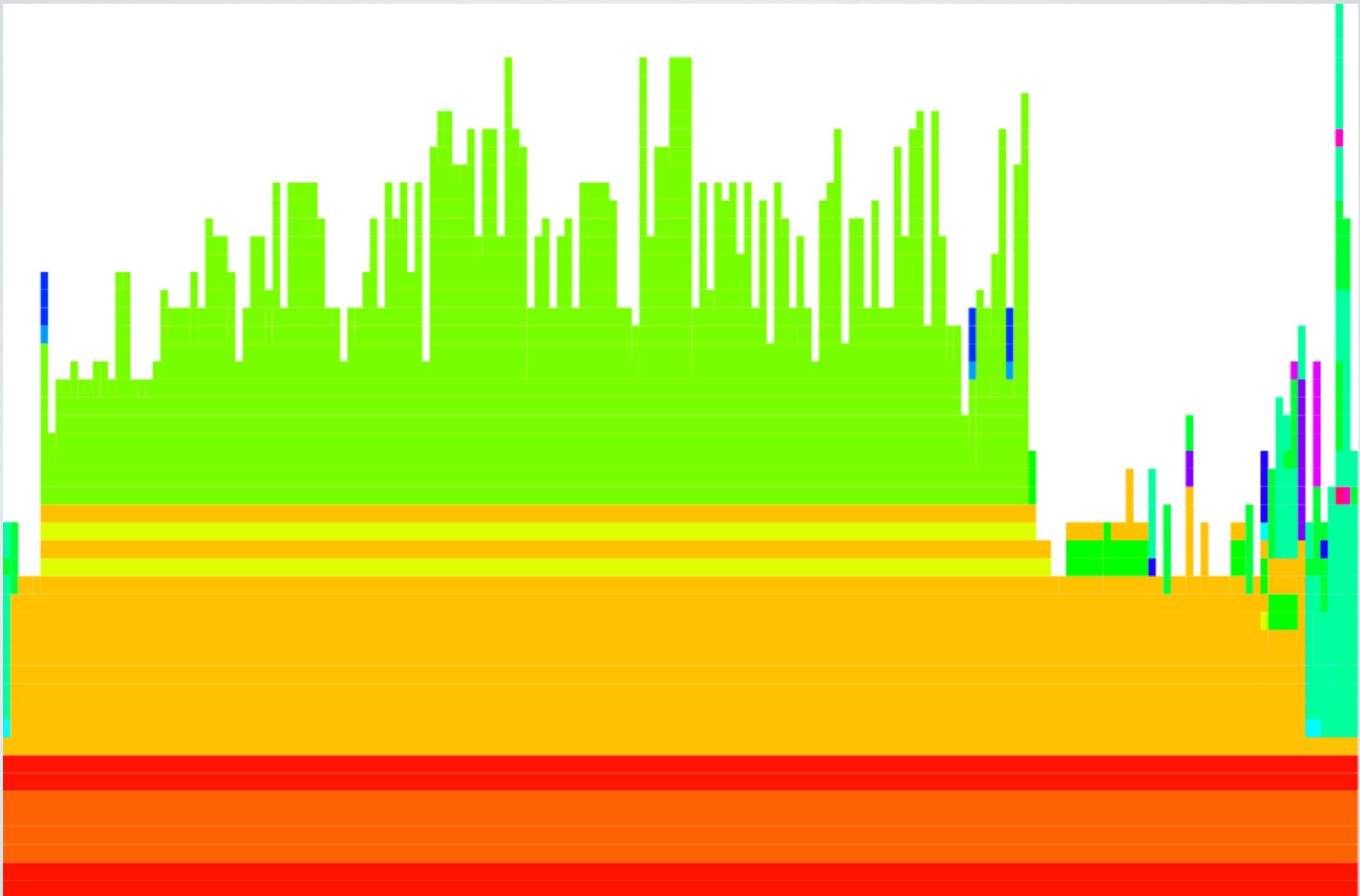
CACHE KRAMDOWN

8.368 ($\pm 12.0\%$) i/s - 244.000 in 30.037836s | 7.5x improvement



MEMOIZATION & CO.

10.140 (\pm 9.9%) i/s - 292.000 in 30.025553s | 9.4x improvement

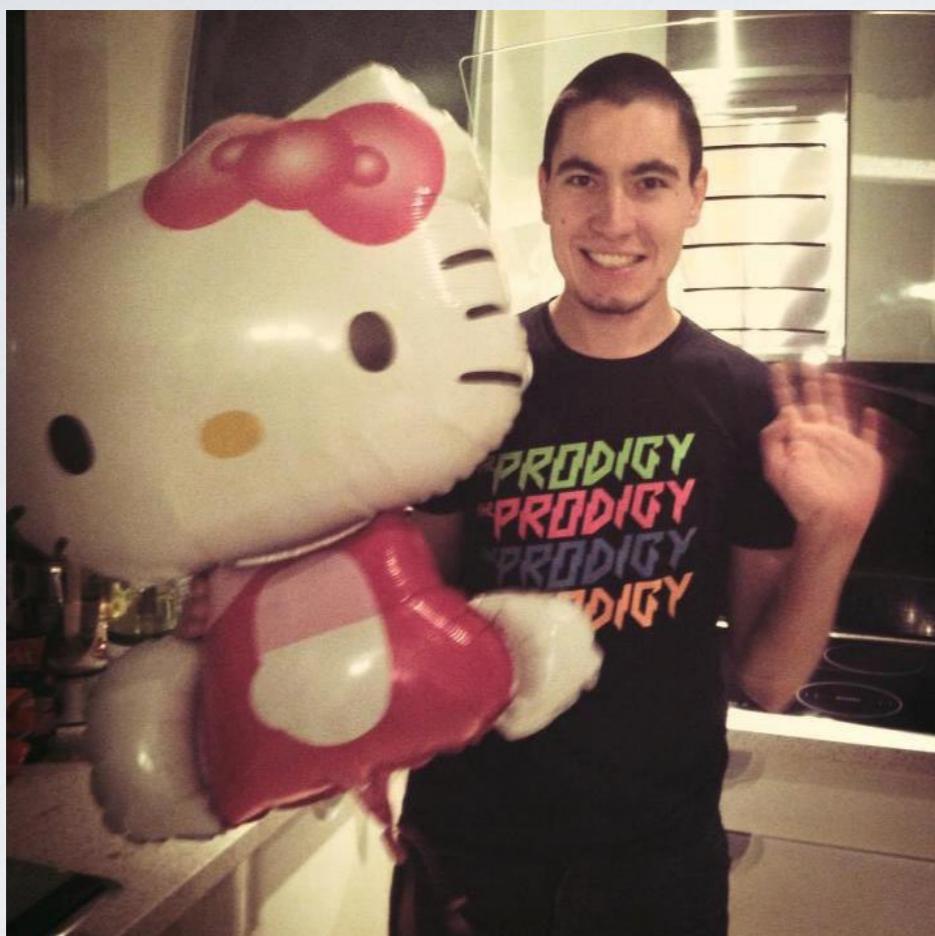


NOW WHAT?

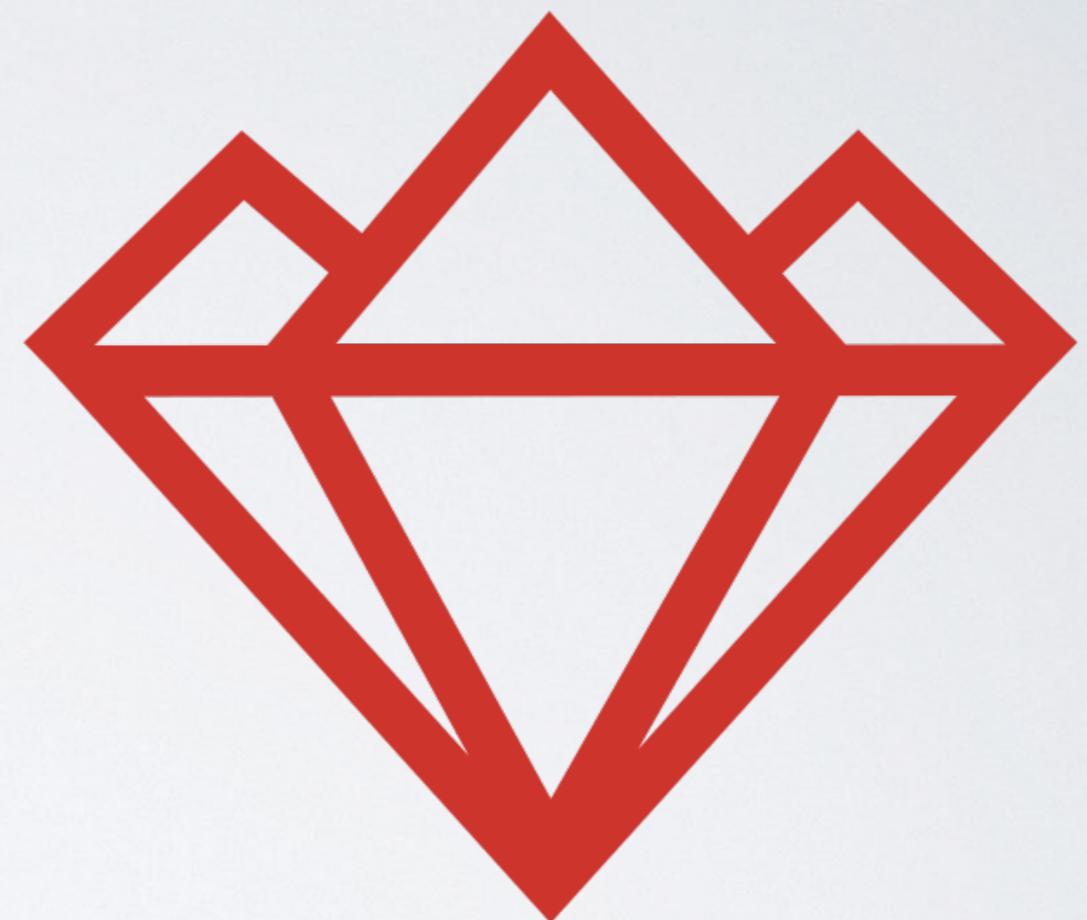
- You're here
- Ask me
- ~~Ask someone smarter than me~~
- Ask anyone else
- Read/watch blog posts/videos



THANK YOU



<http://mr.si/>
 @mr_foto



<http://rug.si/>
 @RubySlovenia