

The Recipe for the World's Largest Rails Monolith

Akira Matsuda



Cheers!



日本



Ruby



:sushi:



:sake:



me

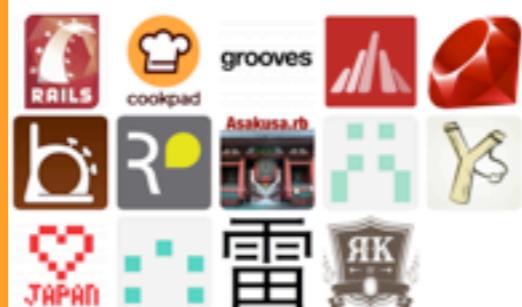


Akira Matsuda
amatsuda

Freelance
 Tokyo, Japan
 ronnie@dio.jp
 https://twitter.com/a_matsuda
 Joined on May 25, 2008

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Followers **431**
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- | | |
|---|---------|
| kaminari | 4,681 ★ |
| A Scope & Engine based, clean, powerful, cu... | |
| active_decorator | 404 ★ |
| ORM agnostic truly Object-Oriented view hel... | |
| traceroute | 328 ★ |
| A Rake task gem that helps you find the dead... | |
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| minimalist's tiny and ultra-fast database cleaner | |
| i18n_generators | 194 ★ |
| A pack of Rails generators gem plugin that g... | |

Public contributions



Summary of Pull Requests, issues opened, and commits. [Learn more.](#)

Contributions in the last year
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Mar 5, 2014 – Mar 5, 2015

Long

13

August 25

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Akira



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Matsuda (÷ MAZDA)



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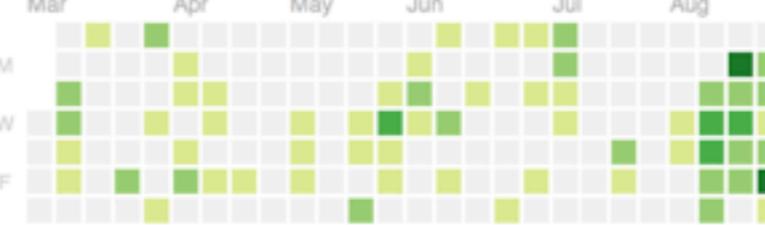
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twitter.com/a_matsuda



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active_decorator



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Gems

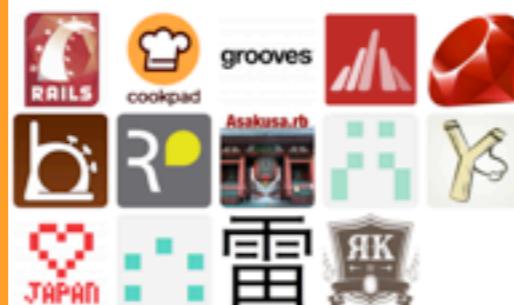


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Contribution activity



Ruby on Ales 2012

Akira Matsuda's GitHub profile page is shown against a red header and orange background. The profile picture is a black and white portrait of a young man with dark hair. The name "Akira Matsuda" and handle "amatsuda" are displayed below the photo. Key statistics include 985 Followers, 431 Starred, and 160 Following. The "Repositories" tab is highlighted with a green circle. Below it, the "Contributions" and "Public activity" tabs are visible. The "Popular repositories" section lists "kaminari", "active_decorator", "traceroute", "database_rewinder", and "i18n_generators". The "Public contributions" section features a heatmap showing activity over time, with a summary for the last year showing 682 total contributions from March 5, 2014, to March 5, 2015.

Contributions Repositories Public activity

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RUBY on ALES

Ruby

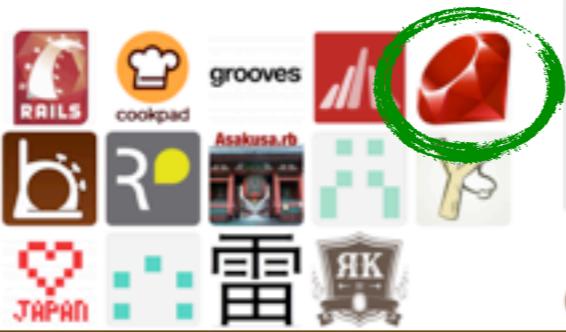


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Rails

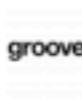


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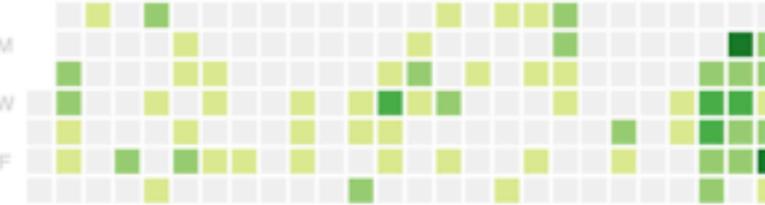
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CarrierWave (new)

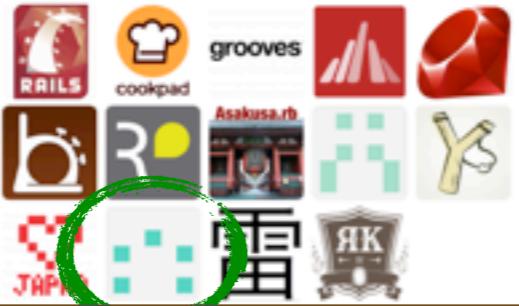


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Tokyo, Japan



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Asakusa.rb



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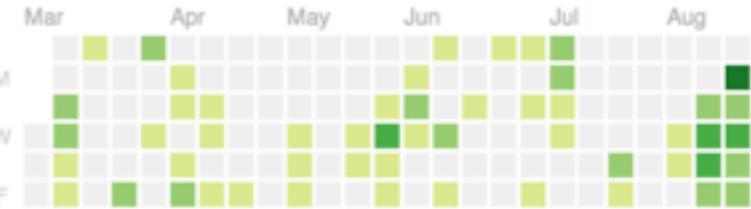
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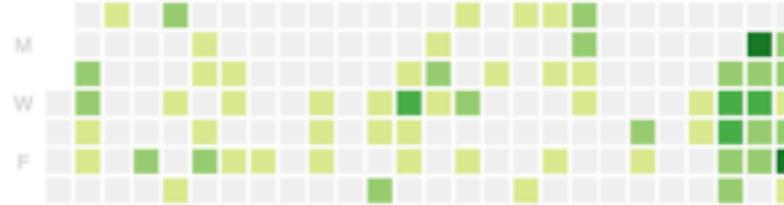
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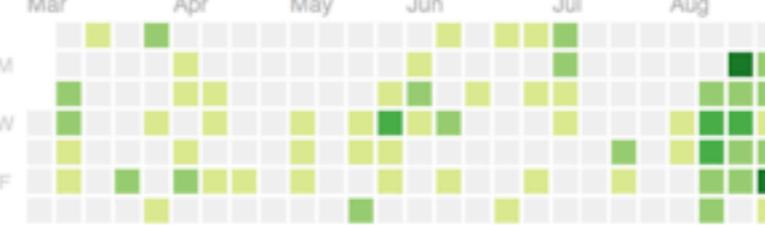
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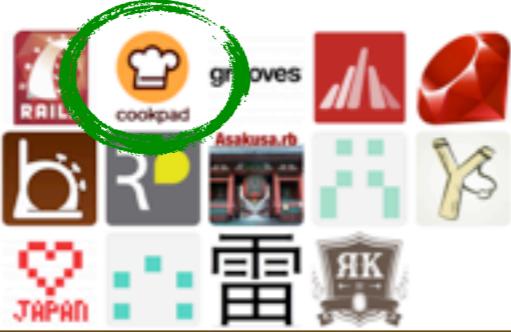


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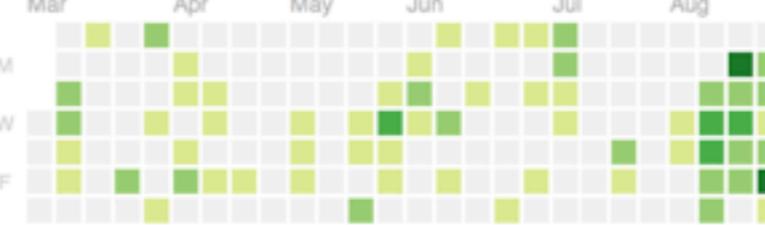


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begin



% rake stats

Name	Lines	LOC	Classes	Methods	M/C	LOC/M
Controllers	48552	39075	518	3941	7	7
Helpers	14660	12012	14	1390	99	6
Models	95193	74916	1732	8489	4	6
Mailers	2197	1757	44	204	4	6
Workers	593	501	20	31	1	14
Chanko units	11816	9732	6	247	41	37
Libraries	2781	2213	134	290	2	5
Feature specs	43536	35864	0	196	0	180
Request specs	36432	31235	0	16	0	1950
Routing specs	639	516	0	0	0	0
Controller specs	60543	50042	7	123	17	404
Helper specs	4195	3436	1	10	10	341
Model specs	75517	62368	4	72	18	864
Worker specs	862	715	0	1	0	713
Chanko unit specs	11636	9411	0	24	0	390
Library specs	22983	19202	27	131	4	144
Total	432135	352995	2507	15165	6	21



Number of Bundled Gems



% bundle show | wc -l

#=> 276



Unique Users / Month



50 million UU / month



Requests Per Seconds



15,000 req / sec



Number of Rails Servers



300 Servers



Databases

🍺 config/database.yml:
1141 lines

🍺 Connecting to 30
different databases in
production



Tests

 We have 20000+
RSpec examples



Number of Developers Working on This Rails App



50 developers



Number of Commits / Month

🍺 % git log --oneline --since="1 month ago" |
wc -l
#=> 2000



Number of Deploys / Day



10+ times / day



What Is cookpad.com?



<http://cookpad.com/>



**cookpad.com is a
cooking recipe sharing site**

 **Users can post their
own recipes**

 **Users can search
recipes**



Number of Recipes



1.98 million



**cookpad.com is available
only in Japanese ATM**

🍺 **For English recipes, please
see: <https://cookpad.com/en>**

🍺 **It's a different site from
the main Cookpad app
though**



Unique Users / Month



50 million UU / month



For Happy User Experience



**The application must
run fast**



Cookpad's Performance Requirement

🍺 **HTML: <= 200 msec**

🍺 **API: <= 80 msec**



Q. How do we achieve that speed?



I heard that a huge
monolith doesn't scale

🍺 Are we splitting the
app into several
lightweight
components?



Nope.



Our Solution

 We just let Rails
dynamically scale



How do we handle such huge number of requests?

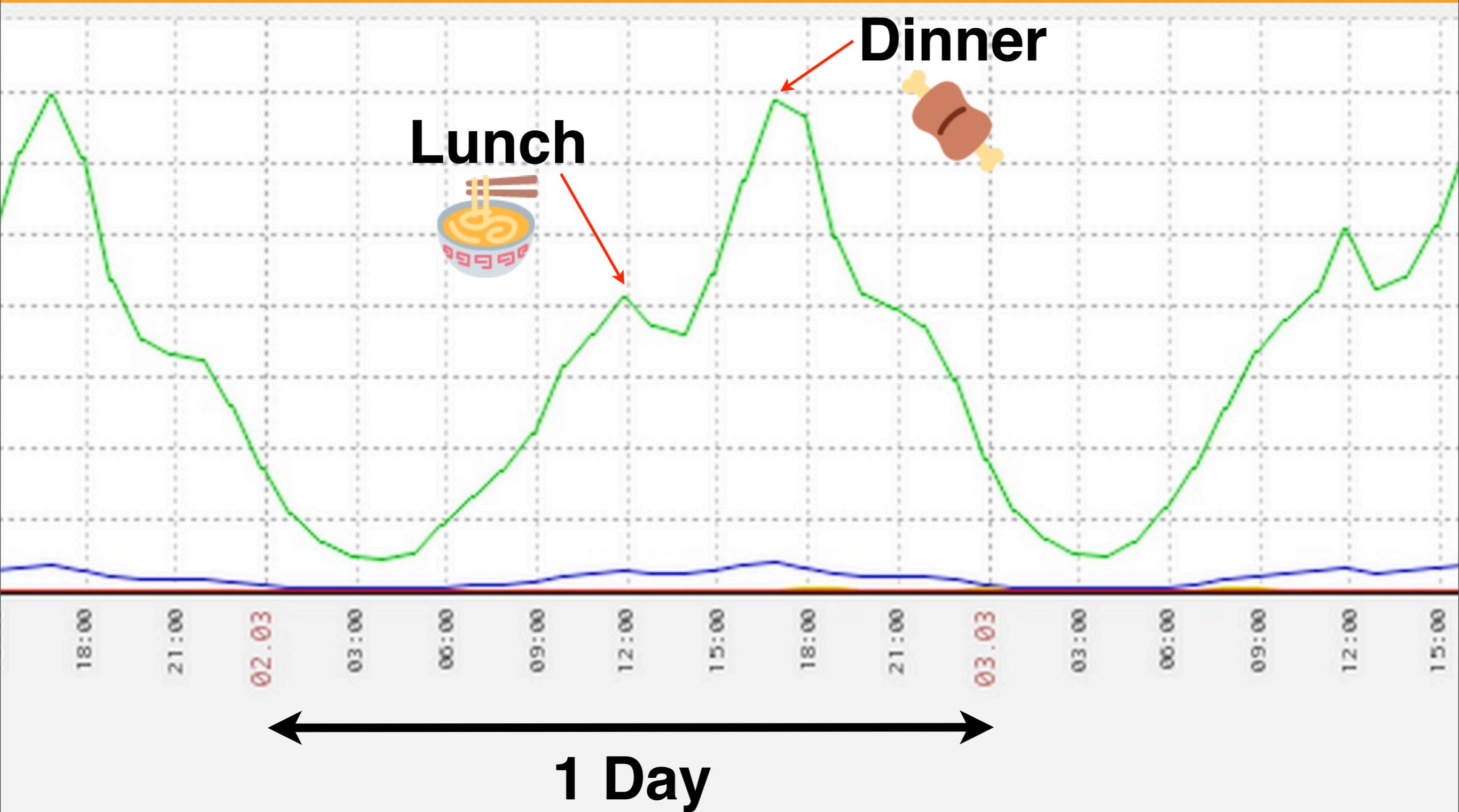
🍺 We build as many servers as we need

🍺 Only when the traffic spikes

🍺 Because the site is not always busy



Number of Requests in a Day



Number of Rails Servers

- 🍺 **300 servers (maximum, before the dinner time)**
- 🍺 **We do not always need 300 servers**



Our Solution

 We made our own
scaling mechanism



“cookpad-autoscale”



cookpad-autoscale

- 🍺 **Similar to Amazon AutoScaling**
- 🍺 **We don't want to see different versions running on different servers**
- 🍺 **Locks auto-scaling when deploying**
- 🍺 **Locks deployment when auto-scaling**



Let the servers scale automatically!

🍺 **Disposable Linux images**

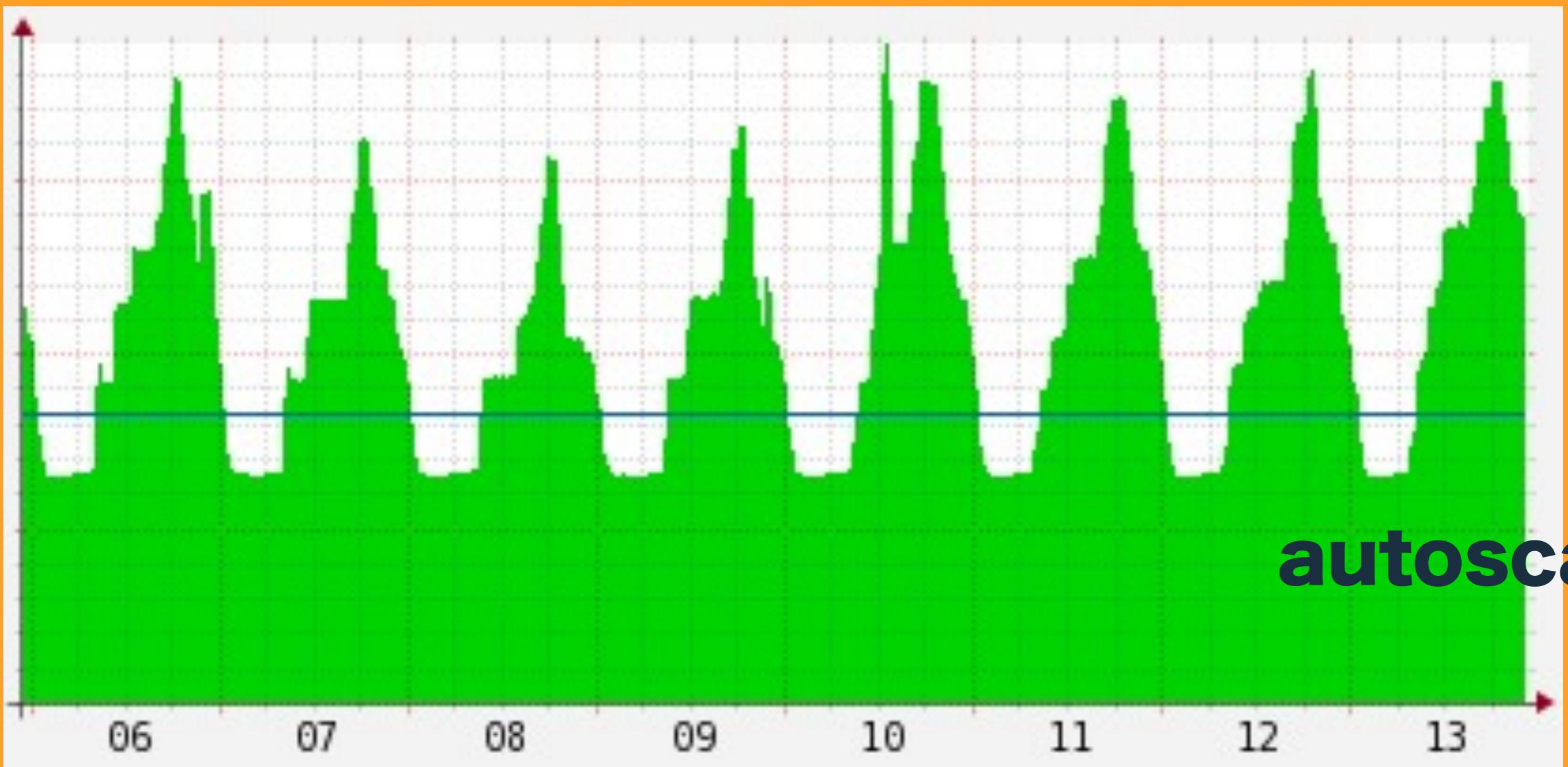
🍺 **"Immutable
Infrastructure"**

🍺 **More servers on more traffic**

🍺 **Less servers on less traffic**



Number of Servers



We control the way Rails scales

🍺 So the users will never experience heavy load

🍺 To reduce the server fee



Number of Rails Servers



300 servers



And we continuously deploy the app



10+ times / day



People say deploying a huge app to many servers is hard

🍺 Are we dividing the app into small independent products?



Nope.



Then Capistrano?



% cap deploy ?



Nope.



Problems with Capistrano

- 🍺 **Capistrano is too slow**
- 🍺 **Because SSH protocol is slow**
- 🍺 **Cap used to take 15...20 min to deploy**
- 🍺 **Capistrano sometimes fails to deploy**
- 🍺 **Because of too many SSH connections**



Our Solution

 We made our own
deployer





sorah/mamiya



mamiya

- 🍺 **Uses Serf for orchestration**
- 🍺 **Gossip protocol instead of SSH**
- 🍺 **Collaborates with the repo, the CI server, and the auto-scaler**



With mamiya,

 **Everything finishes in
a minute or so**

 **More than 10x faster
than Cap**



For More Details



The author's
presentation at
RubyKaigi & RubyConf



<https://speakerdeck.com/sorah/scalable-deployments-how-we-deploy-rails-app-to-150-plus-hosts-in-a-minute>



The Author



@sorah

🍺 The youngest Ruby committer

🍺 Ruby committer since 14

🍺 Joined Cookpad when he was
15

🍺 Became 18 years old last
month



Our DBs

🍺 config/database.yml:

1141 LOC

🍺 Connecting to 30
different databases in
production



I heard Rails can't deal with multiple DBs

🍺 Are we running 30
Rails apps then?



Nope.



ActiveRecord has
`establish_connection` method

🍺 Simply
`establish_connection`
from each AR model?

🍺 There are 1000+ models

🍺 => DB will die :boom:



Not Just Connecting to Multiple DBs

🍺 **read / write splitting**

🍺 **Sharding**

🍺 **Parallel execution**



What We Need Is

🍺 **read / write splitting**

🍺 **Sharding**

🍺 **Parallel execution**



How do we do Read / Write splitting?



Our Solution



We made our own
ActiveRecord adapter





eagletmt/switch_point



switch_point

🍺 **Very simple master / slave connection switch**

🍺 **Less monkey-patching to ActiveRecord core**

🍺 **So the plugin should work for 3.x, 4.x, and future versions of AR**



Architecture

🍺 Create a dummy AR
“abstract” model class per
each DB

🍺 Hold both “readonly”
connection and “writable”
connection there



Usage

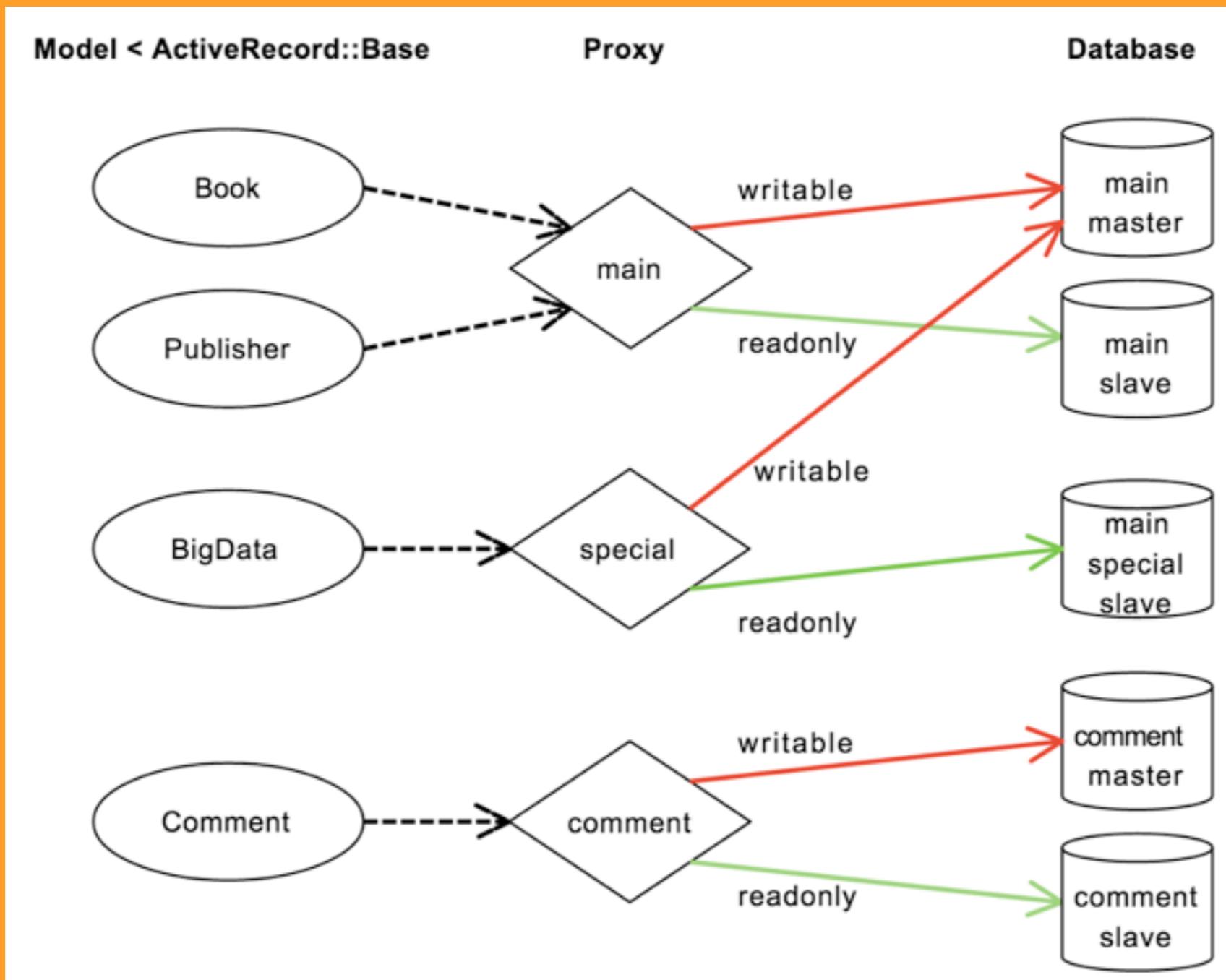
```
SwitchPoint.configure do |config|
  config.define_switch_point :main,
    readonly: "#{Rails.env}_main_slave",
    writable: "#{Rails.env}_main_master"
end

class Recipe < ActiveRecord::Base
  use_switch_point :main
end

Recipe.with_READONLY { Recipe.find(id) }
Recipe.with_WRITABLE { Recipe.create! }
```



Internally



The Author



@eagletmt



1st year as a
Cookpadder



A fresh graduate



Made the first version of
this gem in 1 day



Tests

🍺 20000+ RSpec
examples



♥ Capybara



How long does it Take to run All the tests?

🍺 % time rake spec

#=> 5 hours

🍺 On my MBP Retina, Core
i7, SSD



Our 10 minutes rule

 **Tests should finish
within 10 minutes.**



Q: How do we run 5 hours tests in 10 min?



They say the app size matters

🍺 Should we shrink the
app?



Nope.



Our Solution

🍺 We made our own
distributed RSpec
executor



The initial version

🍺 scp the local source code to a powerful remote test runner

🍺 Run them in parallel

🍺 10-20x faster than local

`rake spec`

🍺 Named `remote_spec`



remote_spec

🍺 Created by @eudoxa

🍺 Maintained by

@mrkn



The Author



@eudoxa

🍺 A genius

🍺 Working for Cookpad since 5
years ago

🍺 Invented so many life-
changing hacks for the
company





cookpad/rrrspec



rrrspec

🍺 **Open-sourced version of
remote_spec**

🍺 **Totally rewritten from scratch**

🍺 **Created by @draftcode, an intern
student**

🍺 **We use this for both CI execution
and `rake spec` alternative**



Strategy

🍺 **Distributed**

🍺 **Optimization of the
test execution order**

🍺 **Highly fault-tolerant**



Servers

🍺 EC2 spot instance
c3.8xlarge x 6

🍺 Not always up



EC2 c3.8xlarge

C3

Features:

- High Frequency Intel Xeon E5-2680 v2 (Ivy Bridge) Processors

	Model	vCPU	Mem (GiB)	SSD Storage (GB)
• Support for Enhanced Networking	c3.large	2	3.75	2 x 16
• Support for clustering	c3.xlarge	4	7.5	2 x 40
• SSD-backed instance storage	c3.2xlarge	8	15	2 x 80
	c3.4xlarge	16	30	2 x 160
	c3.8xlarge	32	60	2 x 320

<http://aws.amazon.com/ec2/instance-types/>



Imagine It Would Cost?



rrrspec uses spot instances



Total cost is very cheap



Another Plobлем with Testing



`database_cleaner` is unusable

- 🍺 Because we have 1000+ tables
- 🍺 `database_cleaner` executes “`TRUNCATE TABLE`” or “`DELETE FROM`” 1000+ times per each test
- 🍺 $20000 \text{ examples} * 1000 = 20\,000\,000 \text{ DELETE queries}$
- 🍺 This is EXTREMELY slow...



Our Solution

 We made our own
database cleanup
strategy



Delete from inserted tables only

🍺 We do not use all 1000
tables in a test case

🍺 Why do we have to
DELETE FROM all of
these per each test?





amatsuda/

database_rewinder

🍺 monkey-patch AR and count

“INSERT” SQL

🍺 Memorize the inserted table names

🍺 DELETE only FROM those tables

🍺 DELETE FROM 10 tables is 100x
faster than DELETE FROM 1000
tables



The “Quick Deletion” Strategy

🍺 Originally devised by

@eudoxa

🍺 I just baked it into a
gem, and maintaining it



How do we run DB Migrations?



We don't use AR::Migration

- 🍺 **The app connects to 30 databases, and AR::Migration doesn't support multiple DB connections**
- 🍺 **We change the DB schema everyday**
- 🍺 **If we use AR::Migration, we would have millions of migration files, which would take forever to execute**



Our Solution

🍺 We made our own DB
migrator





winebarrel/ridgepole

🍺 AR::Migration compatible Ruby DSL

🍺 Doesn't create a new migration file
but updates the existing schema
file per each schema change

🍺 Cleverly builds `CREATE TABLE` or
`ALTER TABLE` when executed

🍺 Idempotent like chef / puppet



Q. How do we keep growing rapidly?



50 Developers Working on One Big Rails App

🍺 If that many developers edit
“recipe.rb” simultaneously,
the code would easily
conflict

🍺 How do we avoid that
situation?



Our Solution

🍺 We made our own
prototyping
framework



cookpad/chanko



A framework that
helps rapid
prototyping on Rails



Created by @eudoxa





cookpad/chanko

- 🍺 **With chanko, you can create a “unit”**
- 🍺 **“unit” is something like Engine, or Component**
- 🍺 **A “unit” contains the whole MVC**
- 🍺 **“units” are mixed into the main app dynamically**
- 🍺 **Each “unit” has its own access control (user targeting)**
- 🍺 **Errors inside “units” will be ignored in production**
- 🍺 **We use this for prototyping new features**

The structure



**app/units/some_unit/
put the whole MVC
into this single directory**



How do we avoid being “Legacy”?

🍺 **The app was born in
2007**

🍺 **Since Rails 1.x**



We keep upgrading!

🍺 Currently running on

Rails 4.1

🍺 I'm working on 4.2

branch



How do we safely upgrade?



Internet Says



Microservices FTW!



Nope.



Our Solution

🍺 We made our own
response verification
tools



Strategies

- 🍺 We run the actual user requests on shadow servers
- 🍺 We compare response body HTMLs created in the tests





cookpad/kage

🍺 **HTTP shadow proxy server**

🍺 **Duplex requests to the master (production)**

server and shadow servers



kage

- 🍺 **We put this proxy in the real production server**
- 🍺 **Process the real user requests on a new-version server without returning the response to the clients**
- 🍺 **Check the logs and see whether the new-version server is correctly working**



Comparing Response Body HTMLs in RSpec

🍺 Save all HTML bodies
processed in integration /
controller specs

🍺 Do this before and after the
Rails upgrade, then `diff`



We do something like this

```
RSpec.configure do |config|
  config.include(
    Module.new do
      def save_response_body
        target = defined?(response) ? response : page
        if target.body.present?
          pathname = Rails.root.join("tmp/SOME_DIRECTORY/
#{example.location.gsub(?, ?-)}.html")
          pathname.parent.mkpath
          pathname.open('w') {|file| file.puts target.body }
        end
      end
    end
  )
  config.after(type: :controller) { save_response_body }
  config.after(type: :request) { save_response_body }
  config.after(type: :feature) { save_response_body }
end
```



#<Module: 0x007f899d063af0>

🍺 This tool has no name

🍺 Just a tiny anonymous
Module

🍺 But a really great way of
black-box testing the
application behaviour



Open Source



We are aggressively open-sourcing our tools and hacks



**Also, we contribute to Ruby,
Rails, and tons of other projects**



Ruby Committers in Cookpad

🍺 @mineroaoki

🍺 @mrkn

🍺 @sorah



Gems that I patched (PRed) only for upgrading the app from 3.2 to 4.1

- 🍺 **rails (rails)**
- 🍺 **rails-observers (rails)**
- 🍺 **sprockets-rails (rails)**
- 🍺 **actionpack-action_caching (rails)**
- 🍺 **turbolinks (rails)**
- 🍺 **haml (haml)**
- 🍺 **kaminari (amatsuda)**
- 🍺 **chanko (cookpad)**
- 🍺 **guard_against_physical_delete (cookpad)**
- 🍺 **activerecord-mysql-index-hint (mirakui)**
- 🍺 **activerecord-mysql-reconnect (winebarrel)**
- 🍺 **weak_parameters (r7kamura)**
- 🍺 **rescue_tracer (r7kamura)**
- 🍺 **jpmobile (rust)**
- 🍺 **jquery-rjs (amatsuda fork)**
- 🍺 **acts_as_list**
- 🍺 **activerecord-import**
- 🍺 **letter_opener**
- 🍺 **rack-mini-profiler**
- 🍺 **awesome_print**
- 🍺 **(and more...)**



Conclusion



monolith -> microservices?

🍺 **Everyone is talking about
microservices today**

🍺 **People say they need
microservices because
their app became too large**



But,

🍺 Did you know that
the world's largest
(AFAIK) Rails app is
still a monolith?



Rails is great

- 🍺 Rails is a really great framework that scales
- 🍺 Monolithic architecture works for us so far
- 🍺 With a little bit of (sometimes crazy) handmade tools



I'm not saying that microservices are always wrong

- 🍺 **Actually, we're planning to try the architecture if it works for us**
- 🍺 **It can be a solution in some cases**
- 🍺 **But it's not the silver bullet**

what We Really Should Do Is

🍺 loop do

🍺 Find a problem

🍺 Solve it in a proper way

🍺 end



Conclusion

 **Think before start
splitting your service**



end

