Speed up your test suite by throwing computers at it

RailsConf 2021
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https://xkcd.com/303/

GOCARDLESS

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Not sponsored by any CI provider

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Ideas not specific to any particular CI provider

Find all the code and slides at:

https://bit.ly/faster-ci

Not a step-by-step roadmap

Your mileage WILL vary. Unfortunately :(

How do we parallelism?

How to parallelize your CI suite

- Manually, along logical boundaries
- Automatically, within each boundary

How to parallelize your CI suite

- Manually, along logical boundaries
- Automatically, within each boundary

How to parallelize your CI suite

First, Manually

✔ rubylang/ruby:master-nightly-focal	Ran in 1m 33s	Waited 1m 14s	buildkite-i-0f32c38ef45de70d...
✔ actioncable (2.7) `rake test`	Ran in 53s	Waited 1s	buildkite-i-0a566a7df21068b6...
✔ actionmailbox (2.7) `rake test`	Ran in 1m 3s	Waited 12s	buildkite-i-0925ef406985bfff...
✔ actionmailer (2.7) `rake test`	Ran in 57s	Waited 18s	buildkite-i-021341f5a9ea7fc77...
✔ actionpack (2.7) `rake test`	Ran in 1m 33s	Waited 15s	buildkite-i-0f32c38ef45de70d...
✔ actiontext (2.7) `rake test`	Ran in 1m 3s	Waited 25s	buildkite-i-01d343de9cce3b1...
✔ actionview (2.7) `rake test`	Ran in 57s	Waited 42s	buildkite-i-06e7137a4cbd270...
✔ activejob (2.7) `rake test`	Ran in 1m 22s	Waited 1m 2s	buildkite-i-0f994a041b93b9d...
✔ activemodel (2.7) `rake test`	Ran in 21s	Waited 55s	buildkite-i-0a566a7df21068b6...
✔ activerecord mysql2 (2.7) `rake db:mysql:rebuild mysql2:test`	Ran in 4m 13s	Waited 55s	buildkite-i-098b18589bc618d...
✔ activerecord postgresql (2.7) `rake db:postgresql:rebuild postgresql:test`	Ran in 4m 27s	Waited 1m 0s	buildkite-i-05570e368d0ce7e...

How to parallelize your CI suite

First, Manually

How to parallelize your CI suite

First, Manually

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First, Manually

How to parallelize your CI suite

First, Manually

Ideally don't do this:

```
- rspec spec/models
- rspec spec/controllers
- rspec spec/integration
```

How to parallelize your CI suite

First, Manually

Do this instead:

```
- rspec spec/models
- rspec spec/controllers
- ~~rspec spec/integration~~
- rspec $(find spec/**/* | grep -v "spec/models" | grep -v "spec/controllers")
```

How to parallelize your CI suite

- Manually, along logical boundaries ✅
- Automatically, within each boundary

How to parallelize your CI suite

- Manually, along logical boundaries
- Automatically, within each boundary

How to parallelize your CI suite

Then, Automatically

Instead of:

```
rspec spec/unit
```

Do:

```
rspec $(find spec/unit -name "*_spec.rb")
```

How to parallelize your CI suite

Then, Automatically

How to parallelize your CI suite

Helpful CI Providers

circleci

```
circleci tests glob "spec/unit/**/*_spec.rb" | circleci tests split
```

How to parallelize your CI suite

Helpful CI Providers

circleci

```
circleci tests glob "spec/unit/**/*_spec.rb" | circleci tests split
```

CODESHIP

```
- type: parallel
  steps:
  - command: BOX_COUNT=2 BOX_INDEX=0 rspec $(...i'll explain soon...)
  - command: BOX_COUNT=2 BOX_INDEX=1 rspec $(...i'll explain soon...)
```

How to parallelize your CI suite

Helpful CI Providers

circleci

```
circleci tests glob "spec/unit/**/*_spec.rb" | circleci tests split
```

CODESHIP

```
- type: parallel
  steps:
  - command: BOX_COUNT=2 BOX_INDEX=0 rspec $(...i'll explain soon...)
  - command: BOX_COUNT=2 BOX_INDEX=1 rspec $(...i'll explain soon...)
```

Buddy

```
rspec $BUDDY_SPLIT_1
```

How to parallelize your CI suite

Abusing the Build Matrix

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How to parallelize your CI suite

Abusing the Build Matrix

```yaml
jobs:
  rspec_unit:
    strategy:
      matrix:
        os: ["ubuntu-latest", "macos-latest", "windows-latest"]
        ruby: [2.6, 2.7, 3.0]
        gemfile: ["Gemfile.rails-5.2.0", "Gemfile.rails-6.1.0"]
    runs-on: ${{ matrix.os }}
    env:
      GEMFILE:  ${{ matrix.gemfile }}

  steps:
    ...
```

How to parallelize your CI suite

Abusing the Build Matrix

```yaml
jobs:
  rspec_unit:
    strategy:
      matrix:
       box_index: [0, 1, 2, 3]
    env:
      BOX_INDEX:  ${{ matrix.box_index }}
      BOX_COUNT: 4
```

How to parallelize your CI suite

Abusing the Build Matrix

```
find . | sort | awk "NR % $BOX_COUNT == $BOX_INDEX"
```

How to parallelize your CI suite

Abusing the Build Matrix

```
rspec $(find spec/unit -name "*_spec.rb" | sort | awk "NR % $BOX_COUNT == $BOX_INDEX")
```

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Startup and Setup Times

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Video: Epic Slow Mo
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Startup and Setup Times

A typical CI setup script

```yaml
rspec:
  docker:
    - image: ruby:2.7.2
    - image: postgres
    - image: redis
  steps:
    - git checkout
    - bundle install
    - yarn install
    - rails db:create db:structure:load
    - rspec
```

Startup and Setup Times

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  docker:
    - image: ruby:2.7.2
    - image: postgres
    - image: redis
  steps:
    - git checkout
    - bundle install
    - yarn install
    - rails db:create db:structure:load
    - rspec
```

Waste of time and money
🔥💸🔥

Actual Useful Work

Startup and Setup Times

A typical CI setup script

Spin up environment	41s
Checkout code	5s
Restoring cache	8s
Bundle Install	1s
Configure database	13s
Run specs	4m 2s

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Startup and Setup Times

Things we can improve

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Startup and Setup Times

Things we can improve

1. Installing your gems (`bundle install` and gem caches)
2. Checking out your code (`git clone`)
3. Container spin up time

Startup and Setup Times

Installing your gems

Spin up environment	41s
Checkout code	5s
Restoring cache	8s
Bundle Install	1s
Configure database	13s
Run specs	4m 2s

Startup and Setup Times

Installing your gems

```
bundle install --jobs=4 --retry=3
```

Startup and Setup Times

Installing your gems

```
- restore gems cache
- bundle config set path 'vendor/bundle'
- bundle install --jobs=4 --retry=3
- save gems cache
```

Startup and Setup Times

Installing your gems

```
- restore gems cache
- bundle config set path 'vendor/bundle'
- bundle config set clean 'true'
- bundle install --jobs=4 --retry=3
- save gems cache
```

Startup and Setup Times

Speeding up Git Checkout

Startup and Setup Times

Speeding up Git Checkout

Travis CI

```
git:
  depth: 3
```

GitHub Actions

`fetch-depth` parameter on their `checkout` v2 action

circleci

Use the `guitarrapc/git-shallow-clone` orb

Startup and Setup Times

Speeding up Container Init

Startup and Setup Times

Speeding up Container Init

```
688fbe3a: Pulling fs layer
a56ac645: Waiting fs layer
a56ac645: Download complete  ================>                          ]  32.39MB/
1831b69: Extracting [=>                                                 ]  294.
c490a3c: Pull complete ========>                                         ]  50.
72fff960: Downloading [=================>                               ]  92
f46f8c3: Extracting [==================================>               ]   36.
72fff960: Downloading [=============================================>     ]  234
2447ff6: Extracting [====>                                              ]   15.6
2447ff6: Extracting [=============>                                     ]  50.14M
2447ff6: Extracting [==================>                                ]  70.75M
2447ff6: Extracting [==============================>                    ]  115.9M
2447ff6: Extracting [========================================>          ]  154.3MB
2447ff6: Extracting [==================================================> ]  189.4MB
71142fe: Extracting [=====>                                             ]  2.523MB/
c02c3e5: Extracting [>                                                  ]  557.1kB/
c02c3e5: Extracting [======================>                            ]  32.87MB/
a56ac645: Extracting [>                                                 ]  32.77kB/
dbc4e0ec: Pull complete ==================================================>]     240B/
72fff960: Extracting [====>                                             ]  26.18MB/266MB
72fff960: Extracting [=============>                                    ]  74.09MB/266MB
72fff960: Extracting [=====================>                            ]    112MB/266MB
72fff960: Extracting [==============================>                   ]    156MB/266MB
72fff960: Extracting [=====================================>            ]  197.8MB/266MB
72fff960: Extracting [=============================================>    ]    229MB/266MB
72fff960: Extracting [==============================================>   ]  246.8MB/266MB
72fff960: Extracting [==================================================>]    266MB/266MB
ed4569a3: Extracting [=====================================>            ]  35.39MB/47.31MB
```

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Startup and Setup Times

Speeding up Container Init

```
# Start from a tiny Linux
FROM alpine:3.12

# Install Ruby
RUN apt-get install (a bunch of necessary dependencies)
RUN (magic incantantions to install or compile Ruby)
RUN gem install bundler --version 2.2.15

WORKDIR /app

# Install our Gems
COPY Gemfile Gemfile.lock /app/
RUN bundle install --jobs=4 --retry=3

# Install our app
COPY . /app

# Run
ENV RAILS_ENV=production
EXPOSE 80
CMD ["bundle", "exec", "unicorn", "-c", "config/unicorn.rb"]
```

Startup and Setup Times

Speeding up Container Init

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Startup and Setup Times

Speeding up Container Init

```yaml
rspec:
  docker:
    - image: circleci/ruby:2.7.2-node-browsers
    - image: postgres
    - image: redis
  steps:
    - git checkout
    - bundle install
    - yarn install
    - rails db:create db:structure:load
    - rspec
```

Startup and Setup Times

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```

Takes FOREVER
Never changes

Takes a while
Changes sometimes

Pretty fast
Changes every time

Startup and Setup Times

Speeding up Container Init

https://www.metricfire.com/blog/how-to-build-optimal-docker-images

Startup and Setup Times

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EXPOSE 80
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```

Startup and Setup Times

Speeding up Container Init

```
688fbe3a: Pulling fs layer
a56ac645: Waiting fs layer
a56ac645: Download complete  ================>                          ]  32.39MB/71.61MB
1831b69: Extracting [=>                                                ]  294.9kB/7.831MBB
c490a3c: Pull complete ========>                                        ]  50.77MB/266MBBB
72fff960: Downloading [=================>                              ]  92.41MB/266MBBB
f46f8c3: Extracting [==================================>              ]   36.7MB/51.83MB
72fff960: Downloading [=============================================>      ]  234.6MB/266MBB
2447ff6: Extracting [====>                                             ]   15.6MB/192.3MB
2447ff6: Extracting [=============>                                    ]  50.14MB/192.3MB
2447ff6: Extracting [==================>                               ]  70.75MB/192.3MB
2447ff6: Extracting [==============================>                   ]  115.9MB/192.3MB
2447ff6: Extracting [=========================================>        ]  154.3MB/192.3MB
2447ff6: Extracting [==================================================> ]  189.4MB/192.3MB
71142fe: Extracting [=====>                                            ]  2.523MB/22.89MB
c02c3e5: Extracting [>                                                 ]  557.1kB/71.61MB
c02c3e5: Extracting [======================>                           ]  32.87MB/71.61MB
a56ac645: Extracting [>                                                ]  32.77kB/2.525MB
dbc4e0ec: Pull complete ==================================================>]     240B/240B7kB
72fff960: Extracting [====>                                            ]  26.18MB/266MB
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72fff960: Extracting [=====================>                            ]    112MB/266MB
72fff960: Extracting [==============================>                   ]    156MB/266MB
72fff960: Extracting [=====================================>            ]  197.8MB/266MB
72fff960: Extracting [=============================================>      ]    229MB/266MB
72fff960: Extracting [==============================================>     ]  246.8MB/266MB
72fff960: Extracting [==================================================>]    266MB/266MB
ed4569a3: Extracting [=====================================>            ]  35.39MB/47.31MB
```

Startup and Setup Times

Speeding up Container Init

```
11.10: Pulling from library/postgres

303ade7f: Already exists
b2de3667: Already exists
14680dbf: Already exists
c85c9c8e: Already exists
da79a978: Already exists
0ef2cddb: Already exists
02e60b45: Already exists
93af0b23: Already exists
9d75e1a9: Already exists
bb5625c2: Already exists
fc1148be: Already exists
4204a3cc: Already exists
5eb38a53: Pulling fs layer
Digest: sha256:bb024e990f4fb09af7b5cb65452156ee16bc466d0dda836650bd1db984129015
Status: Downloaded newer image for postgres:11.10
  pull stats: N/A
  time to create container: 105ms
  using image postgres@sha256:bb024e990f4fb09af7b5cb65452156ee16bc466d0dda836650bd1db
```

Startup and Setup Times

Speeding up Container Init

```
688fbe3a: Pulling fs layer
a56ac645: Waiting fs layer
a56ac645: Download complete  ================>                          ]  32.39MB/71.61MB
1831b69: Extracting [=>                                                ]  294.9kB/7.831MBB
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2447ff6: Extracting [=============>                                    ]  50.14MB/192.3MB
2447ff6: Extracting [==================>                               ]  70.75MB/192.3MB
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```

Startup and Setup Times

Speeding up Container Init

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Startup and Setup Times

Speeding up Container Init

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Startup and Setup Times

Speeding up Container Init

Release Version	Release Date
Ruby 3.0.0	2020-12-25
Ruby 2.7.2	2020-10-02
Ruby 2.7.1	2020-03-31
Ruby 2.6.6	2020-03-31
Ruby 2.5.8	2020-03-31
Ruby 2.4.10	2020-03-31
Ruby 2.7.0	2019-12-25
Ruby 2.4.9	2019-10-02
Ruby 2.6.5	2019-10-01
Ruby 2.5.7	2019-10-01
Ruby 2.4.8	2019-10-01
Ruby 2.6.4	2019-08-28
Ruby 2.5.6	2019-08-28
Ruby 2.4.7	2019-08-28

Startup and Setup Times

Speeding up Container Init

Postgres Docker Images

- latest
- 9.6.7
- 9.6.4
- 9.6.20
- 9.6.18
- 9.6.15
- 9.6.12
- 9.6
- 9.5.7
- 9.5.24
- 9.5.21
- 9.6.9
- 9.6.6
- 9.6.3
- 9.6.2
- 9.6.17
- 9.6.14
- 9.6.11
- 9.5.9
- 9.5.6
- 9.5.23
- 9.5.20
- 9.6.8
- 9.6.5
- 9.6.21
- 9.6.19
- 9.6.16
- 9.6.13
- 9.6.10
- 9.5.8
- 9.5.25
- 9.5.22

Startup and Setup Times

Speeding up Container Init

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Startup and Setup Times

Speeding up Container Init

Ruby Docker Images

- latest
- 3
- 2.7.0
- 2.6.5
- 2.6.2
- 2.6
- 2.5.6
- 2.5.3

- 3.0.0
- 2.7.2
- 2.7
- 2.6.4
- 2.6.1
- 2.5.8
- 2.5.5
- 2.5.1

- 3.0
- 2.7.1
- 2.6.6
- 2.6.3
- 2.6.0
- 2.5.7
- 2.5.4

Startup and Setup Times

Speeding up Container Init

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Startup and Setup Times

Speeding up Container Init

Way too risky

- latest
- 3
- 2.7.0
- 2.6.5
- 2.6.2
- 2.6 👍
- 2.5.6
- 2.5.3

Ruby Docker Images

- 3.0.0
- 2.7.2
- 2.7 👍
- 2.6.4
- 2.6.1
- 2.5.8
- 2.5.5
- 2.5.1

Too specific.
Less likely to be cached
over time

- 3.0 👍
- 2.7.1
- 2.6.6
- 2.6.3
- 2.6.0
- 2.5.7
- 2.5.4

Startup and Setup Times

Speeding up Container Init

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Startup and Setup Times

Things we can improve

1. Installing your gems (`bundle install` and gem caches)
2. Checking out your code (`git clone`)
3. Container spin up time

MAERSK
MAERSK SEALAND
BEACON
BEACON
CRONOS
UASC
MAERSK
Hapag-Lloyd
MAERSK
CHINA SHIPPING
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Startup and Setup Times

Things we can improve... with Docker

1. Installing your gems... with Docker
2. Checking out your code... with Docker
3. Container spin up time... with Docker?

Startup and Setup Times

Building your own CI docker image

Dockerfile (for production)

```
# Start from a tiny Linux
FROM alpine:3.12

# Install Ruby and other dependencies
RUN (...)

# Install our Gems
COPY Gemfile Gemfile.lock /app/
RUN bundle install --jobs=4 --retry=3


# Install our app
COPY . /app

# Run
ENV RAILS_ENV=production
EXPOSE 80
CMD ["bundle", "exec", "unicorn",(...)]
```

Dockerfile.ci (for CI)

```
# Start from your CI's Ruby image so it's cached
FROM circleci/ruby:2.7-node-browsers




# Install our gems
COPY Gemfile Gemfile.lock /app/
RUN bundle config set path 'vendor/bundle'
RUN bundle install --jobs=4 --retry=3

# Git Clone instead of copy
# (because you'll need to `fetch` on branches)
RUN git clone git@github.com:your_repo

# Nothing to Run, CI takes care of that.
```

Startup and Setup Times

Building your own CI docker image

```
rspec:
  docker:
    - image: circleci/ruby:2.7.2-node-browsers
    - image: postgres
    - image: redis
  steps:
    - git checkout
    - bundle install
    - yarn install
    - rails db:create db:structure:load
    - rspec
```

```
rspec:
  docker:
    - image: your_company/project_repo:ci
    - image: postgres
    - image: redis
  steps:
    - git fetch branch
    - bundle install
    - yarn install
    - rails db:create db:structure:load
    - rspec
```

Startup and Setup Times

Building your own CI docker image

1. Installing gems in your image
2. Checking out your code in your image
3. Optimizing your layers for startup speed

Startup and Setup Times

Installing gems in your image

Startup and Setup Times

Installing gems in your image

```
- restore gems cache
- bundle config set path 'vendor/bundle'
- bundle install --jobs=4 --retry=3
- save gems cache
```

Startup and Setup Times

Installing gems in your image

- ~~restore gems cache~~
- bundle config set path 'vendor/bundle'
- bundle install --jobs=4 --retry=3
- ~~save gems cache~~

Startup and Setup Times

Installing gems in your image

- ~~restore gems cache~~
- bundle config set path 'vendor/bundle'
- bundle install --jobs=4 --retry=3
- ~~save gems cache~~

You still need to run
Bundle Install in CI!

Startup and Setup Times

Installing gems in your image

```
- bundle config set path 'vendor/bundle'
- bundle config set clean 'true'
- bundle install --jobs=4 --retry=3
```

Startup and Setup Times

Installing gems in your image

```
RUN bundle config set no-cache 'true' \
    && bundle config set path 'vendor/bundle' \
    && bundle install --jobs=4 --retry=3 \
    && rm -rf root/.bundle/cache \
    && rm -rf vendor/bundle/ruby/2.7.0/cache
```

Startup and Setup Times

Cloning your repo in your image

Startup and Setup Times

Optimizing your layers

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Startup and Setup Times

Optimizing your layers

```
Using default tag: latest
latest: Pulling from library/node
16cf3fa6cb11: Extracting [==============================================>     ]  41.75MB/45.38MB
3ddd031622b3: Download complete
69c3fcab77df: Download complete
a403cc031cae: Download complete
b900c5ffbaf4: Downloading [============>                                       ]  52.01MB/214.3MB
f877dc3acfca: Download complete
dd90c29890c7: Downloading [=======================>                            ]  15.53MB/33.74MB
5d739305453c: Downloading [================================>                   ]  1.547MB/2.38MB
64b469d11365: Waiting
```

Startup and Setup Times

Optimizing your layers

```
RUN apk add --n
  && curl -fsSL
  && curl -fsSL
  && gpg --batc
  && mkdir -p /
  && tar -xzf y
  && ln -s /opt
  && ln -s /opt
  && rm yarn-v$
  && apk del .b
  && yarn --ver
```

Startup and Setup Times

Optimizing your layers

```
RUN bundle config set no-cache 'true' \
    && bundle config set path 'vendor/bundle' \
    && bundle install --jobs=4 --retry=3 \
    && rm -rf root/.bundle/cache \
    && rm -rf vendor/bundle/ruby/2.7.0/cache
```

Startup and Setup Times

Optimizing your layers

Docker history

```
$ docker history 4d032a7b0ca9
IMAGE          CREATED      CREATED BY                                      SIZE
4d032a7b0ca9   3 days ago   /bin/sh -c #(nop)  CMD ["node"]                 0B
<missing>      3 days ago   /bin/sh -c #(nop)  ENTRYPOINT ["docker-entry…   0B
<missing>      3 days ago   /bin/sh -c #(nop) COPY file:238737301d473041…   116B
<missing>      3 days ago   /bin/sh -c set -ex   && for key in     6A010…   7.76MB
<missing>      3 days ago   /bin/sh -c #(nop)  ENV YARN_VERSION=1.22.5      0B
<missing>      3 days ago   /bin/sh -c ARCH= && dpkgArch="$(dpkg --print…   92.8MB
<missing>      3 days ago   /bin/sh -c #(nop)  ENV NODE_VERSION=15.12.0     0B
<missing>      9 days ago   /bin/sh -c groupadd --gid 1000 node   && use…   333kB
<missing>      9 days ago   /bin/sh -c set -ex;  apt-get update;  apt-ge…   561MB
<missing>      9 days ago   /bin/sh -c apt-get update && apt-get install…   141MB
<missing>      9 days ago   /bin/sh -c set -ex;  if ! command -v gpg > /…   7.82MB
<missing>      9 days ago   /bin/sh -c set -eux;  apt-get update;  apt-g…   24MB
<missing>      9 days ago   /bin/sh -c #(nop)  CMD ["bash"]                 0B
<missing>      9 days ago   /bin/sh -c #(nop) ADD file:5f8ab4280b54d9147…   101MB
$
```

Startup and Setup Times

Optimizing your layers

Dive: https://github.com/wagoodman/dive

```
[Layers]
Cmp Image ID                    Size  Command
    sha256:cd7100a72410606589  4.1 MB  FROM sha256:cd7100a72410606589
    sha256:f03b1ccbacace8c82e  2.1 kB  #(nop) ADD file:63d4894bd0857354b
    sha256:d2a26525cdac6c4358     0 B  mkdir /root/example
    sha256:9f50561518484bb62a  2.1 kB  cp /somefile.txt /root/example/so
    sha256:edf209d09263ab03c7  2.1 kB  cp /somefile.txt /root/example/so
    sha256:bb70c7aab83602e8a6  2.1 kB  cp /somefile.txt /root/example/so
    sha256:b0a712d3d00bc83c48  2.1 kB  mv /root/example/somefile3.txt /r
    sha256:05e8660b8f90e77b93     0 B  rm -rf /root/example/

[Image & Layer Details]

Layer Command
/bin/sh -c cp /somefile.txt /root/example/somefile3.txt

Image efficiency score: 99 %
Potential wasted space: 6.2 kB

Count   Total Space  Path
    2        4.2 kB  /root/example
    2        2.1 kB  /root/example/somefile3.txt
```

```
[● Aggregated Layer Contents]
Permission     UID:GID       Size  Filetree
drwxr-xr-x         0:0     805 kB  ├─⊕ bin
drwxr-xr-x         0:0        0 B  ├── dev
drwxr-xr-x         0:0     251 kB  ├─⊕ etc
drwxr-xr-x         0:0        0 B  ├── home
drwxr-xr-x         0:0     2.7 MB  ├─⊕ lib
drwxr-xr-x         0:0        0 B  ├── media
drwxr-xr-x         0:0        0 B  │   ├── cdrom
drwxr-xr-x         0:0        0 B  │   ├── floppy
drwxr-xr-x         0:0        0 B  │   └── usb
drwxr-xr-x         0:0        0 B  ├── mnt
dr-xr-xr-x         0:0        0 B  ├── proc
drwx------         0:0     6.2 kB  ├── root
drwxr-xr-x         0:0     6.2 kB  │   └── example
-rw-r--r--         0:0     2.1 kB  │       ├── somefile1.txt
-rw-r--r--         0:0     2.1 kB  │       ├── somefile2.txt
-rw-r--r--         0:0     2.1 kB  │       └── somefile3.txt
drwxr-xr-x         0:0        0 B  ├── run
drwxr-xr-x         0:0     213 kB  ├─⊕ sbin
-rw-rw-r--         0:0     2.1 kB  ├── somefile.txt
drwxr-xr-x         0:0        0 B  ├── srv
drwxr-xr-x         0:0        0 B  ├── sys
drwxrwxrwx         0:0        0 B  ├── tmp
drwxr-xr-x         0:0     176 kB  ├─⊕ usr
drwxr-xr-x         0:0        0 B  └─⊕ var
```

Startup and Setup Times

Optimizing your layers

```
RUN bundle config set no-cache 'true' \
    && bundle config set path 'vendor/bundle' \
    && bundle install --jobs=4 --retry=3 \
    && rm -rf root/.bundle/cache \
    && rm -rf vendor/bundle/ruby/2.7.0/cache
```

```
● Layers
Cmp   Size  Command
     63 MB  FROM 8bf067b107a6f74
    745 B   set -xe         && echo '#!/bin/sh' > /usr/sbin/policy-rc.d     && echo 'exit 101' >>
      7 B   mkdir -p /run/systemd && echo 'docker' > /run/systemd/container
     83 MB  set -x       && apt-get update       && apt-get --no-install-recommends -y dist-upgra
    1.7 MB  locale-gen "en_US.UTF-8" && update-locale LANG="en_US.UTF-8" LANGUAGE="en_US:"
     29 B   #(nop) COPY file:85784cfc8788797f551c3434ae6b2bd6f3b7872c679c67fb596928c9576b4971 in
     63 B   #(nop) COPY file:1b8694c7824b0c5c30743f5d89ddfb4cee1aeee4e1b35ce2971ad9e4083d0ba9 in
    539 B   #(nop) COPY file:0a25508d24b792dde884f46b6d85ba631d5e15fc814d8416b050f9f31cfaae6f in
    809 B   #(nop) COPY file:777ccd8376b55ba7cc02a503ad29a82ee2df4ae67a1a15b17df37b8468519f33 in
    392 B   mkdir -p /root/.ssh/ && ssh-keyscan github.com > /root/.ssh/github.pub
    392 B   [ "$(ssh-keygen -lf /root/.ssh/github.pub | awk '{print $2}')" = "SHA256:nThbg6kXUpJW
    392 B   cp -r /root/.ssh/ /etc/skel/
    437 kB  groupadd -g 1100 app && useradd -u 1100 -m -d /srv/app -g app app
    361 MB  set -x       && apt-get update       && apt-get install --no-install-recommends -y
    9.7 MB  set -x       && git clone https://github.com/jemalloc/jemalloc /tmp/jemalloc       &&
    4.0 MB  set -x       && git clone https://github.com/rbenv/rbenv.git /rbenv       && mkdir -v
      6 B   #(nop) ADD file:46a5d627b11e0b2f20ed91e20299042733fb38d10e2b5063f78e5701867d1a31 in /
    120 MB  set -x   && apt-get update   && apt-get install --no-install-recommends -y build-esse
     65 MB  set -x       && apt-get update       && apt-get install --no-install-recommends -y
    9.7 MB  set -x       && git clone https://github.com/jemalloc/jemalloc /tmp/jemalloc       &&
     42 kB  curl --silent https://www.postgresql.org/media/keys/ACCC4CF8.asc | apt-key add - &&
    429 MB  apt-get update &&   apt-get install -y --no-install-recommends libicu-dev libpq-dev l
     89 MB  export checksum="9a85134512b32ba612735a89eca1bfffc34f5ec527af377bb694f98a83dbce2b" &&
    3.3 MB  gem install bundler:2.1.4
     42 kB  #(nop) COPY multi:88e12c2f82c57fcbfa7e4489037666414e66287a1ef6a759c1f4b36b8d97a873 in
    531 MB  set -x &&     bundle config set clean 'true' &&     bundle config set cache_all 'fals
    416 MB  #(nop) COPY --chown=appdir:6ef144b96a3f220325d32992dfbc353b91c67a66a93456979a466ea082
     26 MB  bundle exec rake -T

Layer Details

Tags:   (unavailable)
Id:     5ae6e34ebd343050ef32a738e3fac25964d7b4f71aa0a811d43aa854beeff534
Digest: sha256:a17aefeed47cbe168143c931639c380794dde940f976cd199d90ea8975826dba
Command:
set -x &&     bundle config set clean 'true' &&     bundle config set cache_all 'false' &&     bu

Image Details

Image name: 6a928a926b44
Total Image size: 2.2 GB
Potential wasted space: 153 MB
Image efficiency score: 96 %

Count   Total Space  Path
    2        7.3 MB  /usr/local/lib/libjemalloc_pic.a
    2        7.2 MB  /usr/local/lib/libjemalloc.a
```

```
Current Layer Contents
Permission     UID:GID       Size  Filetree
drwxr-xr-x         0:0       39 B  ├── .bundle
-rw-r--r--         0:0       39 B  │   └── config
-rw-r--r--         0:0        6 B  ├── .ruby-version
-rw-r--r--         0:0       11 kB ├── Gemfile
-rw-r--r--         0:0       30 kB ├── Gemfile.lock
drwxr-xr-x         0:0      5.1 MB ├── bin
-rwxr-xr-x         0:0      1.1 MB │   ├── bash
-rwxr-xr-x         0:0       35 kB │   ├── bunzip2
-rwxr-xr-x         0:0        0 B  │   ├── bzcat → bin/bunzip2
-rwxrwxrwx         0:0        0 B  │   ├── bzcmp → bzdiff
-rwxr-xr-x         0:0      2.1 kB │   ├── bzdiff
-rwxrwxrwx         0:0        0 B  │   ├── bzegrep → bzgrep
-rwxr-xr-x         0:0      4.9 kB │   ├── bzexe
-rwxrwxrwx         0:0        0 B  │   ├── bzfgrep → bzgrep
-rwxr-xr-x         0:0      3.6 kB │   ├── bzgrep
-rwxr-xr-x         0:0        0 B  │   ├── bzip2 → bin/bunzip2
-rwxr-xr-x         0:0       14 kB │   ├── bzip2recover
-rwxrwxrwx         0:0        0 B  │   ├── bzless → bzmore
-rwxr-xr-x         0:0      1.3 kB │   ├── bzmore
-rwxr-xr-x         0:0       35 kB │   ├── cat
-rwxr-xr-x         0:0       64 kB │   ├── chgrp
-rwxr-xr-x         0:0       60 kB │   ├── chmod
-rwxr-xr-x         0:0       68 kB │   ├── chown
-rwxr-xr-x         0:0      142 kB │   ├── cp
-rwxr-xr-x         0:0      121 kB │   ├── dash
-rwxr-xr-x         0:0      101 kB │   ├── date
-rwxr-xr-x         0:0       76 kB │   ├── dd
-rwxr-xr-x         0:0       85 kB │   ├── df
-rwxr-xr-x         0:0      134 kB │   ├── dir
-rwxr-xr-x         0:0       72 kB │   ├── dmesg
-rwxrwxrwx         0:0        0 B  │   ├── dnsdomainname → hostname
-rwxrwxrwx         0:0        0 B  │   ├── domainname → hostname
-rwxr-xr-x         0:0       35 kB │   ├── echo
-rwxr-xr-x         0:0       28 B  │   ├── egrep
-rwxr-xr-x         0:0       31 kB │   ├── false
-rwxr-xr-x         0:0       28 B  │   ├── fgrep
-rwxr-xr-x         0:0       65 kB │   ├── findmnt
-rwxr-xr-x         0:0      220 kB │   ├── grep
-rwxr-xr-x         0:0      2.3 kB │   ├── gunzip
-rwxr-xr-x         0:0      5.9 kB │   ├── gzexe
-rwxr-xr-x         0:0      102 kB │   ├── gzip
-rwxr-xr-x         0:0       18 kB │   ├── hostname
-rwxr-xr-x         0:0       27 kB │   ├── kill
-rwxr-xr-x         0:0      171 kB │   ├── less
-rwxr-xr-x         0:0       10 kB │   ├── lessecho
-rwxrwxrwx         0:0        0 B  │   ├── lessfile → lesspipe
-rwxr-xr-x         0:0       20 kB │   ├── lesskey
```

```
^C Quit | Tab Switch view | ^F Filter | ^L Show layer changes | ^A Show aggregated changes
```

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Final thoughts

1. Observability
2. Flaky tests
3. Uneven distribution of tests
4. Too much of a good thing
5. Critical Paths

Final thoughts

Observability

Final thoughts

Observability

PIPELINE	STATUS	WORKFLOW	BRANCH / COMMIT	START	DURATION
anony 320	Success	tests	master ae77194	3mo ago	1m 3s
anony 318	Success	tests	master	3mo ago	1m 0s
anony 316	Success	tests	master	3mo ago	28s
anony 313	Success	tests	master	3mo ago	51s
anony 306	Success	tests	master b776496	4mo ago	32s
anony 300	Success	tests	master 5188a48	7mo ago	54s
anony 298	Success	tests	master d2d8dfb	7mo ago	1m 9s
anony 295	Success	tests	master a0165b6	8mo ago	55s
anony 292	Success	tests	master 061d7ee	9mo ago	47s
anony 290	Success	tests	master e92c5d0	9mo ago	41s

Final thoughts

Observability

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Final thoughts

Flaky Tests

Final thoughts

Flaky Tests

```ruby
RSpec.configure do |c|
  c.example_status_persistence_file_path = "tmp/rspec_examples.txt"
end
```

```
bundle exec rspec --only-failures
```

Final thoughts

Flaky Tests

```
example_id                          | status | run_time        |
----------------------------------- | ------ | --------------- |
./spec/lib/something2_spec.rb[1:1]  | passed | 0.00087 seconds |
./spec/lib/something2_spec.rb[1:2]  | passed | 0.00036 seconds |
./spec/lib/something_spec.rb[1:1]   | passed | 0.00006 seconds |
./spec/lib/something_spec.rb[1:2]   | passed | 0.00004 seconds |
./spec/lib/something_spec.rb[1:3]   | passed | 0.00004 seconds |
./spec/lib/something_spec.rb[1:4]   | passed | 0.00004 seconds |
./spec/lib/something_spec.rb[1:5]   | failed | 0.0105 seconds  |
./spec/lib/something_spec.rb[1:6]   | failed | 0.00026 seconds |
```

Final thoughts

Flaky Tests

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Final thoughts

Flaky Tests

```ruby
RSpec.configure do |c|
  c.example_status_persistence_file_path = "tmp/rspec_examples.txt"
end
```

```
bundle exec rspec
cp tmp/rspec_examples.txt tmp/rspec_examples_first.txt
bundle exec rspec --only-failures
```

Final thoughts

Flaky Tests

tmp/rspec_examples_first.txt

example_id	status	run_time
./spec/lib/something2_spec.rb[1:1]	passed	0.00087 seconds
./spec/lib/something2_spec.rb[1:2]	passed	0.00036 seconds
./spec/lib/something_spec.rb[1:1]	passed	0.00006 seconds
./spec/lib/something_spec.rb[1:2]	passed	0.00004 seconds
./spec/lib/something_spec.rb[1:3]	passed	0.00004 seconds
./spec/lib/something_spec.rb[1:4]	passed	0.00004 seconds
./spec/lib/something_spec.rb[1:5]	failed	0.0105 seconds
./spec/lib/something_spec.rb[1:6]	failed	0.00026 seconds

tmp/rspec_examples.txt

example_id	status	run_time
./spec/lib/something2_spec.rb[1:1]	passed	0.00087 seconds
./spec/lib/something2_spec.rb[1:2]	passed	0.00036 seconds
./spec/lib/something_spec.rb[1:1]	passed	0.00006 seconds
./spec/lib/something_spec.rb[1:2]	passed	0.00004 seconds
./spec/lib/something_spec.rb[1:3]	passed	0.00004 seconds
./spec/lib/something_spec.rb[1:4]	passed	0.00004 seconds
./spec/lib/something_spec.rb[1:5]	failed	0.0105 seconds
./spec/lib/something_spec.rb[1:6]	passed	0.00026 seconds

❄️ Flake!

Final thoughts

Flaky Tests

```
grep "| failed" rspec_examples_first.txt \
| cut -d" " -f1 \
| xargs -I{} grep -F {} rspec_examples.txt \
| grep "| passed" \
| cut -d"[" -f1 \
| uniq \
| xargs -I{} echo "Flaky ${SUITENAME} spec: {}" \
| xargs -I{} jira create (...)
```

Find the whole thing, documented, at:

https://bit.ly/faster-ci

Final thoughts

Flaky Tests

Final thoughts

Uneven distribution of tests

Final thoughts

Uneven distribution of tests

The dream

Final thoughts

Uneven distribution of tests

The reality

Final thoughts

Uneven distribution of tests

The nightmare

Final thoughts

Uneven distribution of tests

circleci

```
circleci tests glob "spec/unit/**/*_spec.rb" | circleci tests split
```

Final thoughts

Uneven distribution of tests

https://knapsackpro.com

Final thoughts

Uneven distribution of tests

Knapsack

Final thoughts

Uneven distribution of tests

Roll your own?

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Final thoughts

Too much of a good thing

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Final thoughts

Too much of a good thing

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Final thoughts

Critical paths

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Final thoughts

Critical paths

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Final thoughts

Critical paths

Final thoughts

Critical paths

Final thoughts

Critical paths

Recap

- Parallelize a lot, but optimize your startup times
  - Save time on Bundle Install, Git Checkout, and Container Spin up.
- Build your own images for absolute control on 👆
  - Keep those layers tight!
- Optimize your dependencies, improving your critical path
- Keep an eye on your runtimes over time
- Get rid of flakies by putting them in your backlog.

vodafone
OLYMPUS
FIAT
24
BRIDGESTONE
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Thank you

Speed up your test suite by throwing computers at it

RailsConf 2021
April 12-15

Details, code, slides and more info at:
https://bit.ly/faster-ci

Daniel Magliola
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