Scaling DevOps - GitHub’s journey from 500+ to 2000+ people

@jonico January 8th 2021
what's in it for me?
GitHub is the largest developer platform on Earth

<table>
<thead>
<tr>
<th>Developers</th>
<th>Private and public repositories</th>
<th>Top open source communities</th>
<th>Contributions per year</th>
<th>Organizations</th>
<th>Fortune 500 companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>60M+</td>
<td>200M+</td>
<td>1,000s</td>
<td>1B+</td>
<td>3M+</td>
<td>50%</td>
</tr>
</tbody>
</table>

**The most innovative companies**
- stripe
- Spotify
- airbnb
- lyft
- slack
- Uber
- twilio
- shopify
- NETFLIX

**The top open source projects**
- docker
- TensorFlow
- APACHE
- elasticsearch
- npm
- GraphQL

**Leading global enterprises**
- SAP
- DAIMLER
- BMW
- Continental
- Ford
- Qualcomm
- TESLA

**Largest DevOps ecosystem**
- RapidAPI
- percy
- GitKraken
- SENTRY
- ZenHub
- Codecov
- Jira
- HOUND
- HashiCorp
games like *Doom*—which inspired hundreds of clones—have invited even more people to play and create.

Apart from active game development, public source code for some of the most influential games of all time, including *Doom* and *Prince of Persia* are archived in public repositories—which certainly a better fate than being buried in the New Media dustbin.

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GitHub Classroom starts school

GitHub Classroom makes it easier for teachers to distribute starter code and collect assignments on GitHub. Today, students at high schools, universities, and coding bootcamps are learning across 1.8 million Classroom repositories—but these are far from the only educational resources on GitHub.

From lists of resources to massive open online courses (MOOCs) like edX and Udacity, you’ve created thousands of ways to learn software development on GitHub. Courses at that top our list include Ada’s Jumpstart program and Stanford’s TensorFlow Tutorials. STAT535 is teaching thousands of students to wrangle data, while CSS3 is being adopted in classrooms across the United States.

In the last decade, community-driven programs like Django Girls have kicked off online tutorials, hosted in-person events, and broadened learning opportunities for students around the world. Our Census Elmicks are also building tech communities on campuses in more than 10 countries.
GitHub Now vs Then

Repositories
200 M+
vs. 36 M in 2016

Registered users
60 M+
vs. 14 M in 2016

Pull Requests
500 M+
vs. 130 M in 2017

Suggested fixes for security alerts
10 M+
vs. 800 K in 2018
Of software projects use open source
import kiwisolver
import numpy
import kiwisolver
import numpy
import matplotlib
import kiwisolver
import numpy
import matplotlib
One million pull requests
merged with Dependabot
Open Source sei Dank: So fanden Experten eine Schwachstelle im Server der Corona-Warn-App


Alvaro Muñoz' Job beim GitHub Security Lab ist es, Schwachstellen in Open-
Azure DevOps and GitHub share the same leadership, reporting to the GitHub CEO

Bringing the requirements and insights of Azure DevOps customers to GitHub

Standardized tooling for 100k engineers at Microsoft
Reducing time to set up development environments from hours per week to seconds

Powered by web-based version of VS Code, or use with your desktop IDE

Fully integrated into the GitHub developer experience
Test libzengithub package on main platforms
on: push

- test (macOS-10.14)
- test (windows-2016)
- test (windows-2019)
- test (ubuntu-16.04)
- test (ubuntu-18.04)

- Install C and C++ header files
- Install conan & conan package tools

Generating conan user directory and building the solution

```
1027 ZenGitHub/1.0@junico/stable (test package): Running test()
1028
1029 MMM. .MMM
1030   MMMMMMMMMMMMMMMMMMM
1031   MMMMMMMMMMMMMMMMMMM
1032   MMMMMMMMMMMMMMMMMMM
1033   MMMMMMMMMMMMMMMMMMM
1034   MMMMMMMMMMMMMMMMMMM
1035   MMMMMMMMMMMMMMMMMMM
1036   MMMMMMMMMMMMMMMMMMM
1037   MMMMMMMMMMMMMMMMMMM
1038   MMMMMMMMMMMMMMMMMMM
1039   MMMMMMMMMMMMMMMMMMM

1040  MMM: -:----:--:::---:----...:
1041  MMM: - 00----:--00:--:---:
1042   .. MMM: 00:00:00:00:00:00:
1043   MMM: ---:----:----:----:
1044   MMM: ---:----:----:----:
1045   MMM: ---:----:----:----:
1046   MM: ---:----:----:----:
1047   MM: ---:----:----:----:
1048   MM: ---:----:----:----:
1049   MM: ---:----:----:----:
1050   MM: ---:----:----:----:

1051 ...It's not fully shipped until it's fast.
1052 /
```

[HOOK - attribute_checker.py] pre_export(): WANN: ConanFile doesn't have 'description'. It is recommended to add it as attribute

- Complete job
<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>GitHubbers</td>
<td>574</td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td>315</td>
<td>54%</td>
</tr>
<tr>
<td>Currently in SF</td>
<td>256</td>
<td>44%</td>
</tr>
<tr>
<td>New Hires</td>
<td>18</td>
<td>3%</td>
</tr>
</tbody>
</table>
the best way to build and ship software
Avoid use of emails

If there is no link it does not exist
What stayed (and evolved)

Remote First
No Emails

ChatOps
Hubot
What changed heavily

- Architecture
- Languages
- Flaky Test Detection
- Deploy Trains
what's in it for ME?
Focus For Today

Architecture Languages

Flaky Test Detection

ChatOps Hubot
Architecture / Languages
From monolith to micro services

From one Ruby/Rails monolith to many micro services running on Kubernetes, managed by Moda - GitHub's internal service platform
Keynote: Kubernetes at GitHub

Jesse Newland, Principal Site Reliability Engineer, GitHub
KELSEY GILMORE-INNIS
SITE RELIABILITY ENGINEER
GITHUB

INFRASTRUCTURE AS PRODUCT
BUILDING GITHUB'S FUTURE
Paved roads for Ruby, Go, Java, C#

- sponsoring team, loosely moderated environment, staffed and moderated environment, containerized releases available to production, test, and development clients, issue tracking for defects and feature requests, release and deprecation policy, roadmap with a plan for future improvements, style guide, supported by automated validation and formatting tooling, set of guidelines / recommendations for when using this language is appropriate, recommended and supported client libraries and workflows, recommendations for IDEs and plugins, automated and documented development workflow approved by relevant stakeholders, automated and documented CI / CD approach approved by relevant stakeholders, vulnerability detection and patch management workflow approved by relevant stakeholders, sample application designed to serve as a consolidated example of best practices, ...
This page is taking way too long to load.

Sorry about that. Please try refreshing and contact us if the problem persists.

Contact Support  —  GitHub Status  —  @githubstatus
Flaky Test Detection
Confession time

Please raise your hand if you had to deal with flaky tests, i.e. tests that sometimes fail because of:

- side effects of test execution order
- Reliance on external services, e.g. a remote HTTP API or time servers
- Current phase of the lunar cycle, cosmic rays, bad luck/karma, etc.
Let’s assume a single flaky test fails in 1 out of thousand runs.

How big is the like likelihood that an entire test suite run with \( n \) tests of that sort creates at least one intermittent test failure?

\[
P_{\text{fail}}(n) = 1 - 0.999^n
\]
\[ P_{\text{fail}}(n) = 1 - 0.999^n \]

1 test
\[ P_{\text{fail}}(1) = 0.001 \]

10 tests
\[ P_{\text{fail}}(10) = 0.009955 \]

100 tests
\[ P_{\text{fail}}(100) = 0.0952 \]

1000 tests
\[ P_{\text{fail}}(100) = 0.6323 \]
30 percent of builds affected

On 2018-12-06, 167 of 545 times our github-all-features test suite would have failed if it were not for marked flakes.
What’s a flake candidate

• A flake candidate is a test that
  - both passes and fails against the same code (git tree) where less than 50 tests were failing
  - have been experienced by more than 1 user, on more than 1 branch
  - will be automatically captured and logged by the CI system by re-running failed tests

• Each flake candidate, has a SHA as identifier. The SHA is determined by:
  - Test name
  - Test suite
  - The first significant line of the exception stack trace
Flaky tests detection and analysis

Team Destruction

DestroyOperationContext / caf0604f8f7
Test two operations race

- github-all-features / test-make-rails-6-default
  Flake Candidate
  Occurred about 1 hour ago • Built at 2019-08-20 13:20:37 UTC • Built on janky-nunix-

- github-all-features / steves-analytics
  Flake Candidate
  Occurred 4 days ago • Built at 2019-08-18 01:13 UTC • Built on janky-nunix-

- github-all-features / queue-prepare
  Flake Candidate
  Occurred 5 days ago • Built at 2019-08-15 16:28:18 UTC • Built on janky-nunix-

- github-all-features / sponsors-criteria-migration
  Flake Candidate
  Occurred 13 days ago • Built at 2019-08-07 19:50:51 UTC • Built on janky-nunix-

- github-all-features / split-up-get-refs-endpoint
  Flake Candidate
  Occurred 19 days ago • Built at 2019-08-01 14:35:23 UTC • Built on janky-nunix-

Team Destruction

DestroyOperationContext / 93f7a917b0b36583
Test throttle the deletes

- github-all-features / test-make-rails-6-default
  Flake Candidate
  Occurred about 1 hour ago • Built at 2019-08-20 13:20:37 UTC • Built on janky-nunix-

- github-all-features / steves-analytics
  Flake Candidate
  Occurred 4 days ago • Built at 2019-08-18 01:13 UTC • Built on janky-nunix-
What’s a flake

• Flake candidates that are manually inspected by a developer and identified as intermittent test failures can be turned into real flakes (via ChatOps and Janky UI).

• CI builds will still succeed if < 30 flakes failed (and all other tests pass)

• Flakes are identified as issues in github/github with the label of failing-test, multiple flake candidates can belong to the same issue

• All open flake have assigned owners and a deadline (1 week) to fix, else the test should rather be deleted

• Closing a flake is as simple as closing the issue. If an intermittent test failure reappears within 5 days, it will reopen the flake issue.
Flaky test detection allows 30 percent more deployments
Flaky tests detection

Build #15378054 (481472e) of github-build-deploy-tarball-bp/master was successful (437s, queued 3s)

Build #15378045 (481472e) of enterprise/master failed with 8 known flakes - 9 failures (433s, queued 4s)

Build #15378071 (481472e) of github-rails-next/master was successful with 12 known flakes (440s, queued 3s)

latentflip 8:59 AM
.ci flakes add github
186b00f5f68c436c94e0dc4912bc3e80 https://github.com/github/github/issues/109058
THE MOST IMPORTANT STARTUP’S HARDEST WORKER ISN’T A PERSON

Sam Lambert, the director of systems at GitHub, calls Hubot “the hardest working GitHubber.” That’s a company-wide in-joke. Hubot isn’t really a GitHubber. He’s a bit of software that plugs into the GitHub chat system. About five years ago, a guy named Ryan Tomayko built Hubot as an easier way for the company’s engineers to manage and modify all the hardware and software underpinning GitHub.com. Simply by sending a message to Hubot—much as they’d send a message to anyone else from inside the GitHub chat client—engineers could update the operating
brntbeer 6:08 PM
.dgraph -1w cumsum(sum:heaven.deployment.count{app_name:github,environment:{}}.as_count()) (23 kB) 

hubot APP 6:09 PM

brntbeer 1:41 PM
.dash me -1h glb.services --glb-service dotcom

hubot APP 1:41 PM

brntbeer 1:51 PM
.pager trigger github-dotcom-oncall critical <reason>

hubot APP 1:51 PM

Service: notifications
Maintainer: shayfrentd
Team: github/pe-notifications
Escalation Paths:
sev1: .pager trigger github-dotcom-oncall critical <reason>
sev2: https://github.com/github/github/issues
sev3: #pe-notifications

carlosmn 11:47 AM
.instance destroy hostname=gitbackups-maintenance--
WORKED FINE IN DEV

OPS PROBLEM NOW
No one talks to each other
ChatOps as the cultural glue

APPLICATION AUTOMATION

ChatOps

INFRASTRUCTURE AUTOMATION
Jonahberquist 6:46 PM
.mysqlproxy disable github

Hubot BOT 6:46 PM

Disabling github-

github-

disabled server mysql/github-

Show more...

Tomkrouper 6:47 PM
Do we want to re-up durability on a couple replicas to make sure that is fine?

Samlambert 6:47 PM
.status green

Hubot BOT 6:47 PM

Samlambert: Status updated to green

Samlambert: I updated GitHub Chat's status, too.

Zerowidth 6:48 PM
.graph me -1h alias(alpha(secondYAxis(github-

aliasByNode(maximumAbove(github-

Title=Replication+delay+throttling+

MySQL+cluster&hideLegend=false&template=plain&lineMode=staircase

Jnunemaker 6:48 PM
deploying doubling the threshold for user session writes

Hubot BOT 6:48 PM

Graph Me

(30KB)
https://hubot.github.com
Summary
Focus For Today

Architecture Languages

Flaky Test Detection

ChatOps Hubot
Unwrap your GitHub Secret Link

Thank you