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# 敏捷软件交付在谷歌内部实践揭秘和基于容器的技术实现

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最多的 曾经工作过的工作单位



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最大的 从头到脚的距离



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最长的 工作年龄



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最高的 ...





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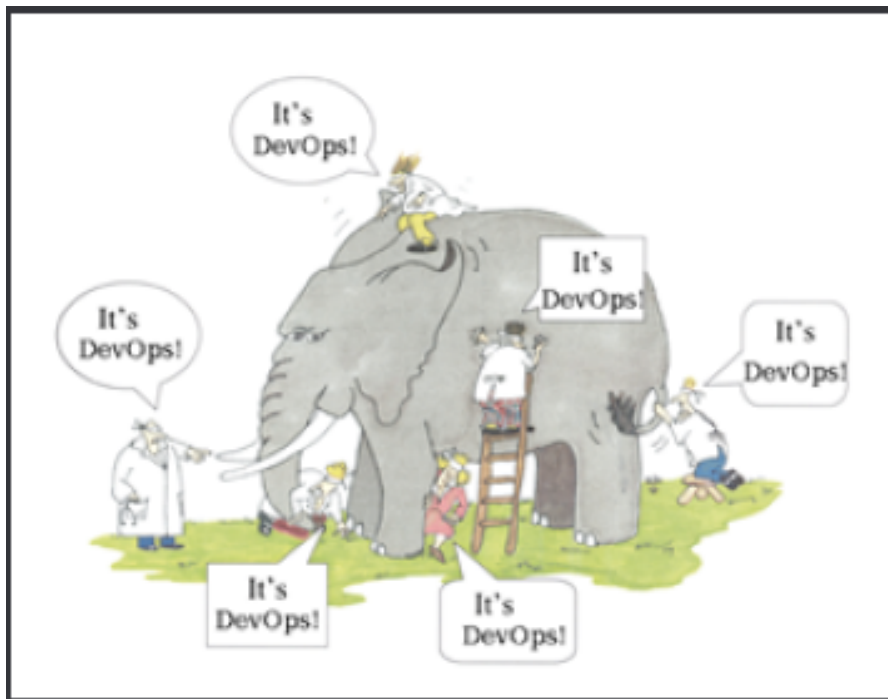


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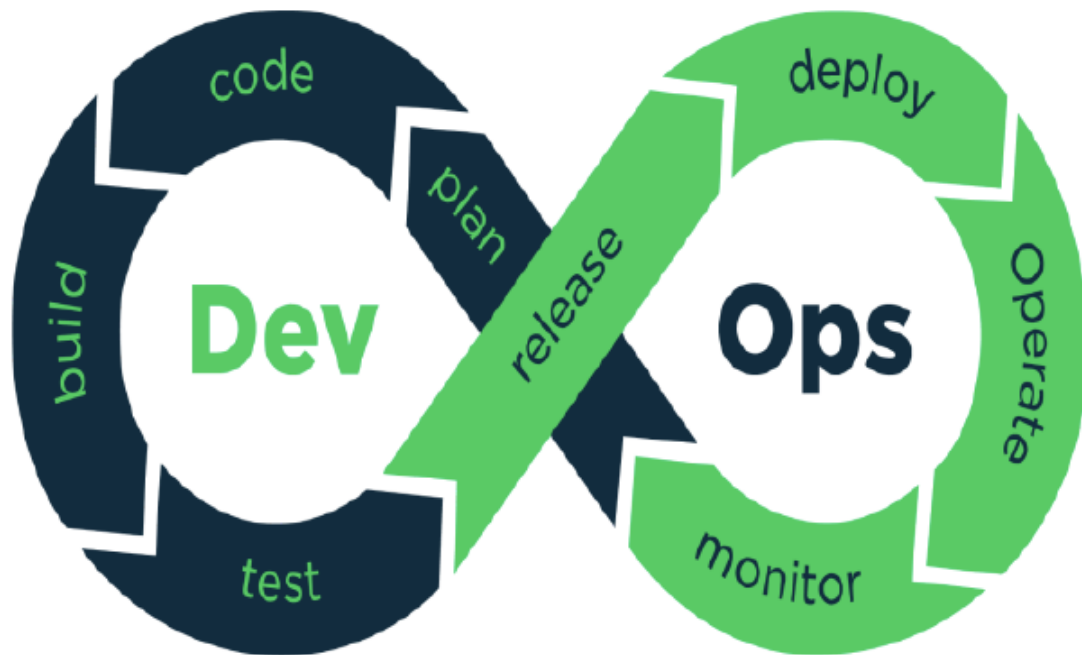
最高的 高音音域

- Devops 简介
- Google CI/CD 实践
- 容器云简介
- 基于容器构建 CI/CD 系统

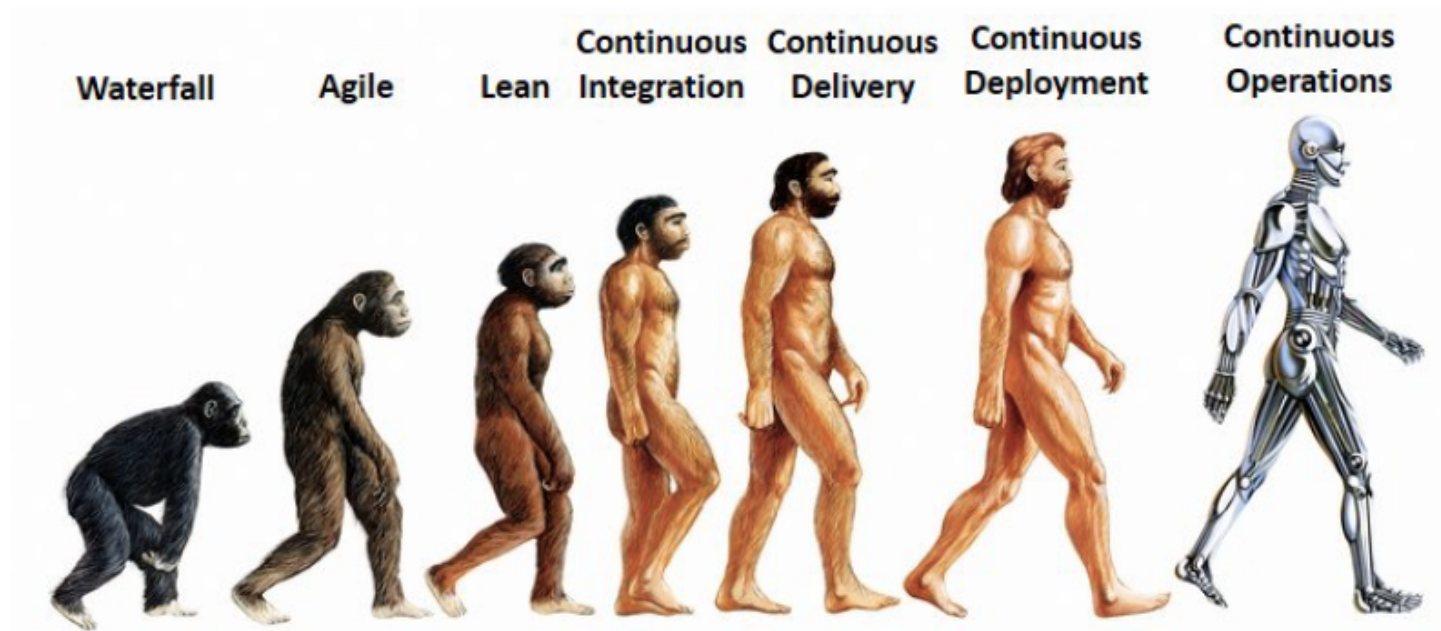




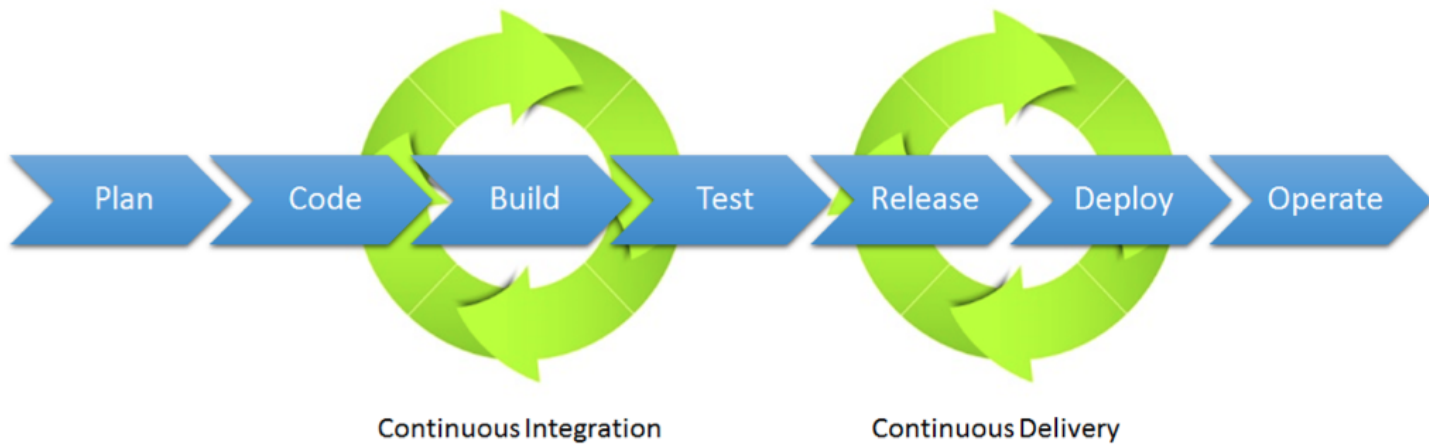
- Devops = 文化 + 流程 + 工具



- 好处
  - 快速业务迭代
  - 敏捷开发
  - 自动化运维
- 落地
  - 打造 Devops 团队
  - 构造 Devops 文化
  - 搭建自动化流程
    - Continuous Integration (CI)
    - Continuous Deployment/Delivery (CD)
    - Continuous Operations (CO)







- 总共的代码行数？
- 总共的测试实例个数？
- 每天构建的次数？

- 总共的代码行数?
  - 2,000,000,000
- How many test cases?
  - 150,000,000
- How many builds per day?
  - 800,000

- 平均每秒一次 commit
- Code submission rate 呈线性增长
- 测试用例数量呈线性增长
- 应对方案: Just in Time Scheduling (JIT)
  - Break a day into a sequence of milestones
  - As frequently as possible, depending on compute resource
  - Typically every 45 minutes
- 挑战?

- 如何减少需要运行的测试案例数量？
  - 150,000,000 → 63,000
    - 150,000,000 all tests to 5,500,000 affected tests
    - 5,500,000 affected tests vs 63,000 “likely to fail tests”
- 如何提炼出对开发者有益的可执行建议？
  - “You are 97% likely to cause a breakage because you are editing a Java source file modified by 15 other developers in the last 30 days”
    - 更多 code review、更多检查、静态分析、更多测试覆盖

- 每一个 commit 称为一个 CL (Change List)
- TAP 定期对 milestone 进行测试, 并通过看板、通知展现结果

The screenshot displays the TAP CI system dashboard. At the top, there are navigation tabs: Current Status, Grid, Test Log, Coverage, Project Maintenance, and Project Health (beta). Below these, there's a search bar and a "History" button. The main area shows a grid of test results for 12 milestones, with a total of 1166 targets. The grid columns represent milestones (e.g., 30805794, 30805731, etc.) and rows represent tests (e.g., tests, theServ, targetTest, etc.). Each cell in the grid contains a status indicator: a green checkmark for passing, a red 'F' for failing, or a red 'C' for a critical error. A summary row at the bottom of the grid shows the overall status for each milestone, such as "Failed: 1", "Passed: 196".

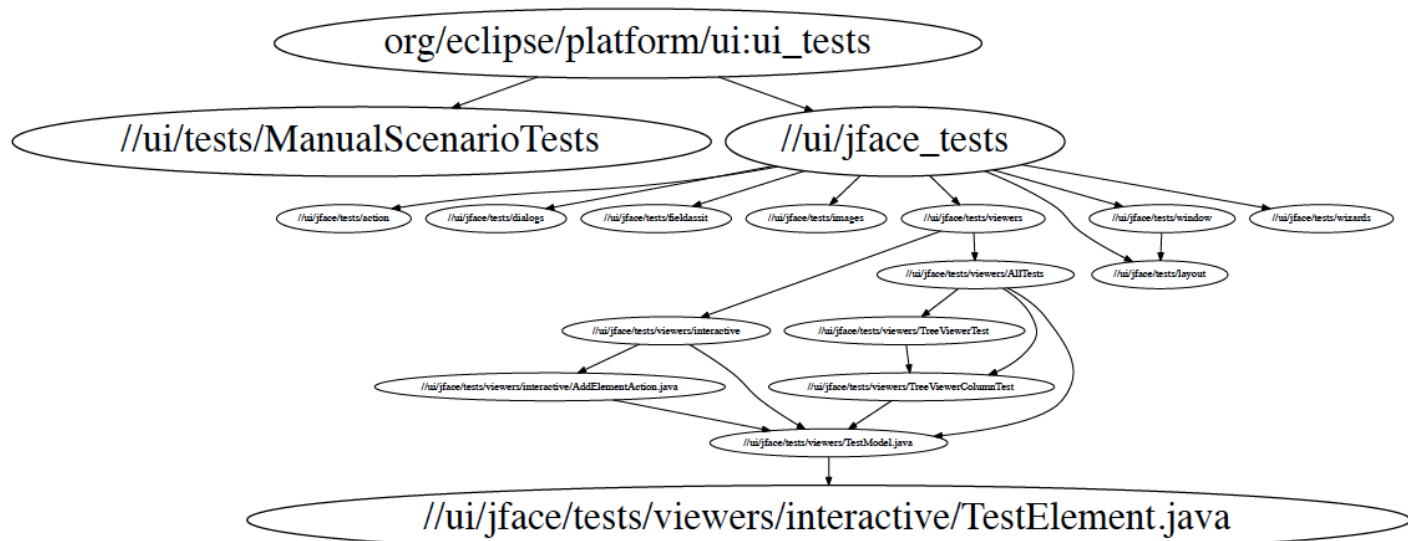
Changelist and submit time:	30805794	30805731	30805729	30805717	30805645	30805570	30805505	30805504	30805495	30805465	30805343	30805322	30805305	30805290	30805278	30805270	30805264	30805233	30805119	30805108	30805099	30805021	30804936	30804921	30804890	...	Pass. Finished	
Project Status:	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	failing	passing	passing	passing	passing	passing	passing	passing	failing	...	
Affected targets:	Failed: 1	Failed: 4	Failed: 2	Failed: 2	Failed: 2	Failed: 1	Passed: 1	Failed: 1	Failed: 2	Failed: 2	Failed: 1	Failed: 1	Failed: 1	Failed: 2	Failed: 1	Failed: 1	Passed: 14	Failed: 2	Passed: 249	Passed: 268	Passed: 1	Passed: 293	Passed: 285	Passed: 250	Passed: 106	Failed: 1	Passed: 273	

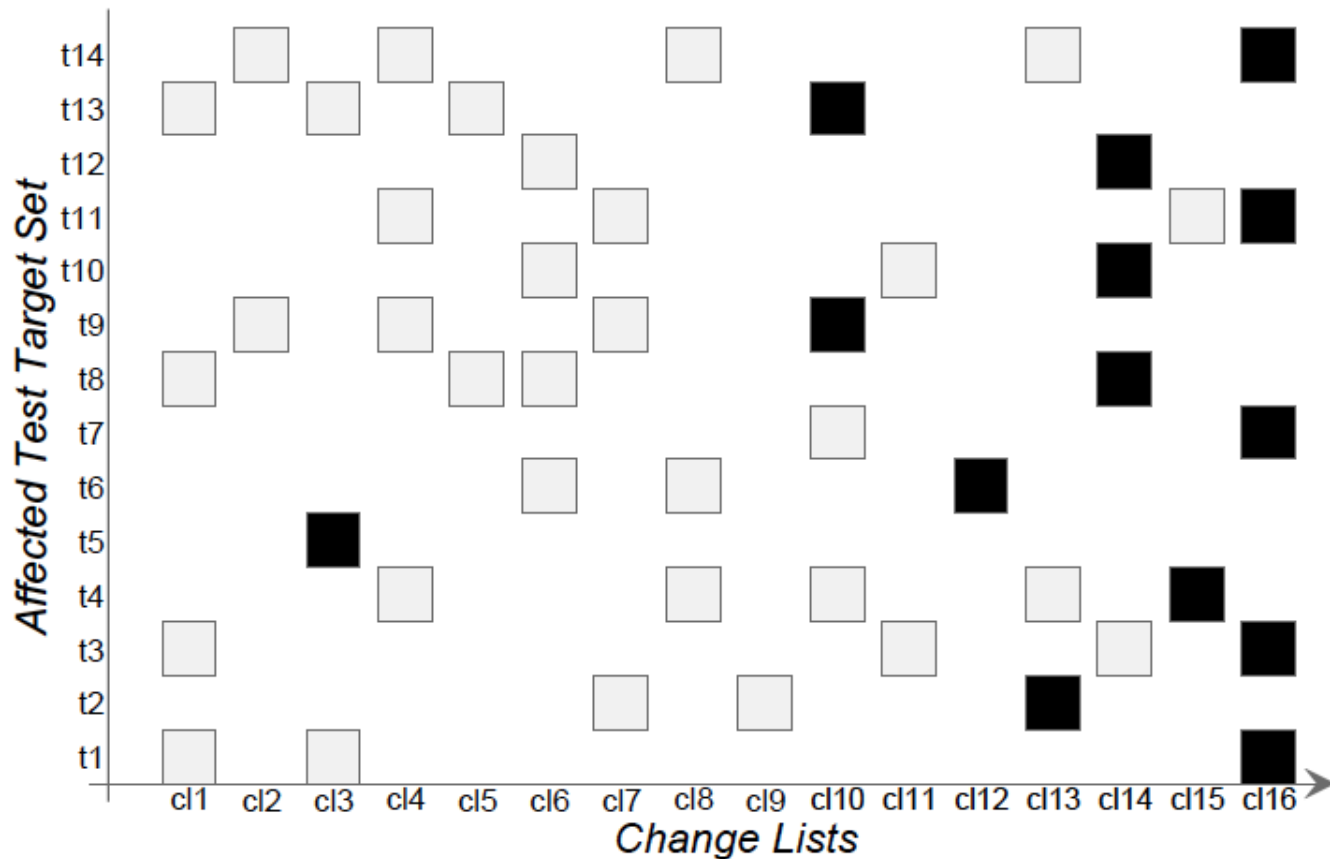


- 每一个测试在BUILD文件中定义
  - Eg. tensorflow/cc/BUILD

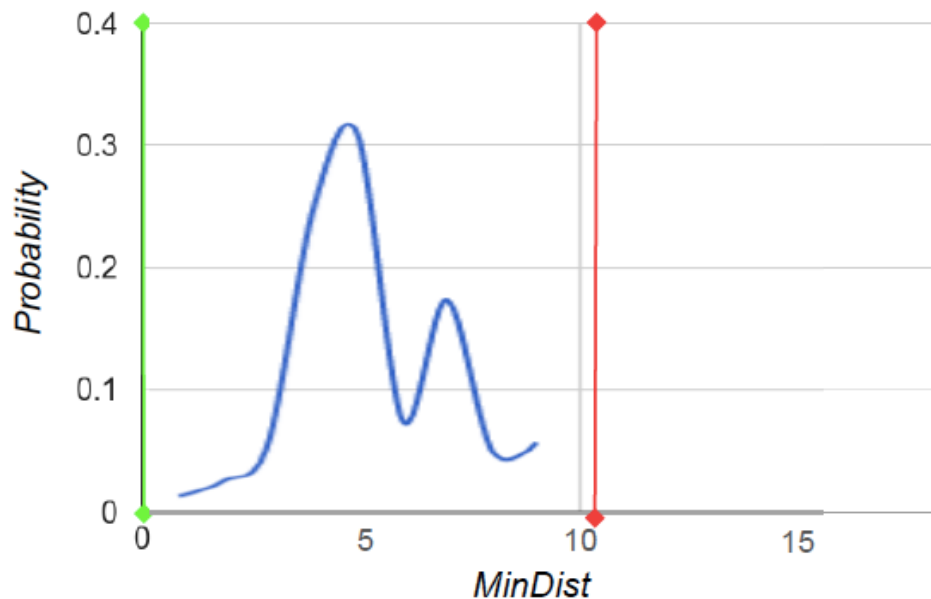
```
package(  
    default_visibility = ["/visibility:public"],  
)  
tf_cc_test(  
    name = "framework_gradients_test",  
    srcs = ["framework/gradients_test.cc"],  
    deps = [  
        ":cc_ops",  
        ":grad_op_registry",  
        ":grad_ops",  
        ":gradients",  
        ":testutil",  
        "//tensorflow/core:all_kernels",  
        "//tensorflow/core:core_cpu_internal",  
        "//tensorflow/core:framework",  
        "//tensorflow/core:test",  
        "//tensorflow/core:test_main",  
        "//tensorflow/core:testlib",  
    ],  
)
```

- Graph 建模
- Reserve dependency 搜索
- Distance: 从代码文件到一个测试用例的最短路长度

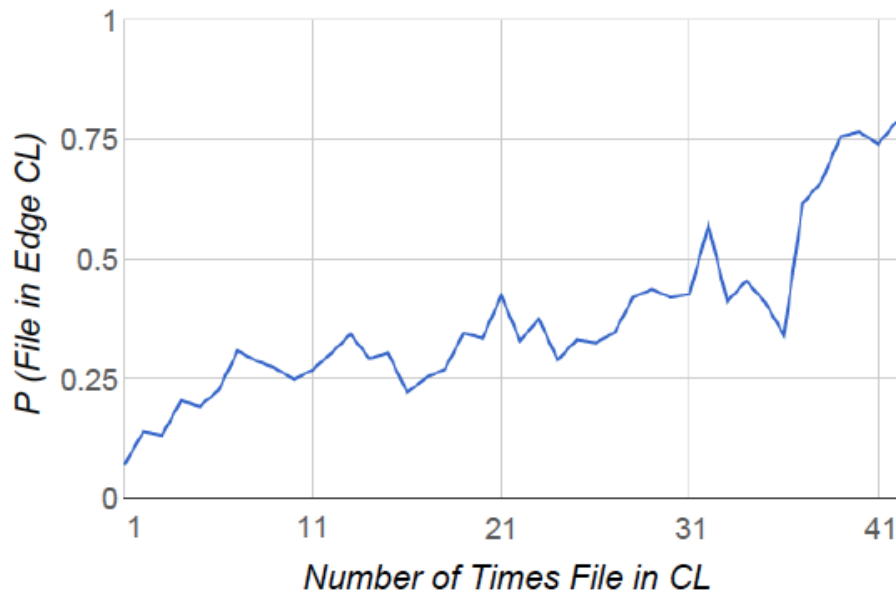




- 谷歌所有测试案例中只有 **1%** 的测试案例在历史上 **FAIL** 过
- 不同的测试案例失败的可能性极其不同
- 不同的 **CL** 特点对测试案例的影响截然不同



- 距离 CL 中修改的源代码文件“10 hop”以上的测试从未break
  - 测试用例的执行频率根据 CL 中被修改源代码文件的距离进行智能调整



- 一个月内代码文件被修改超过30次以上有50%概率会造成测试breakage
  - 开发者提交代码时，根据修改文件的历史修改次数进行警告和更严格的测试

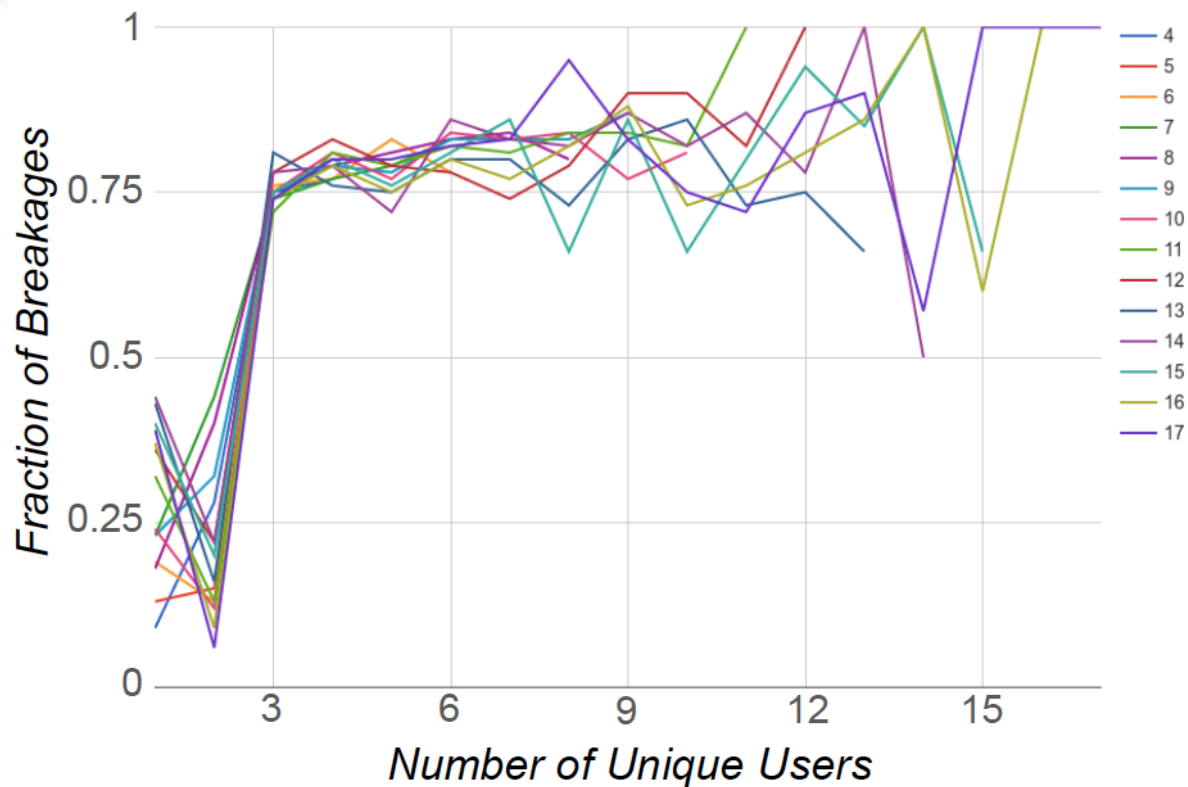


- 猜猜？
- hpp
- mr
- cpp
- cc
- BUILD
- JAVA
- Js
- xml
- 根据 CL 中涉及的不同语言对不同的测试采用不同频率的执行，并给出开发者警告

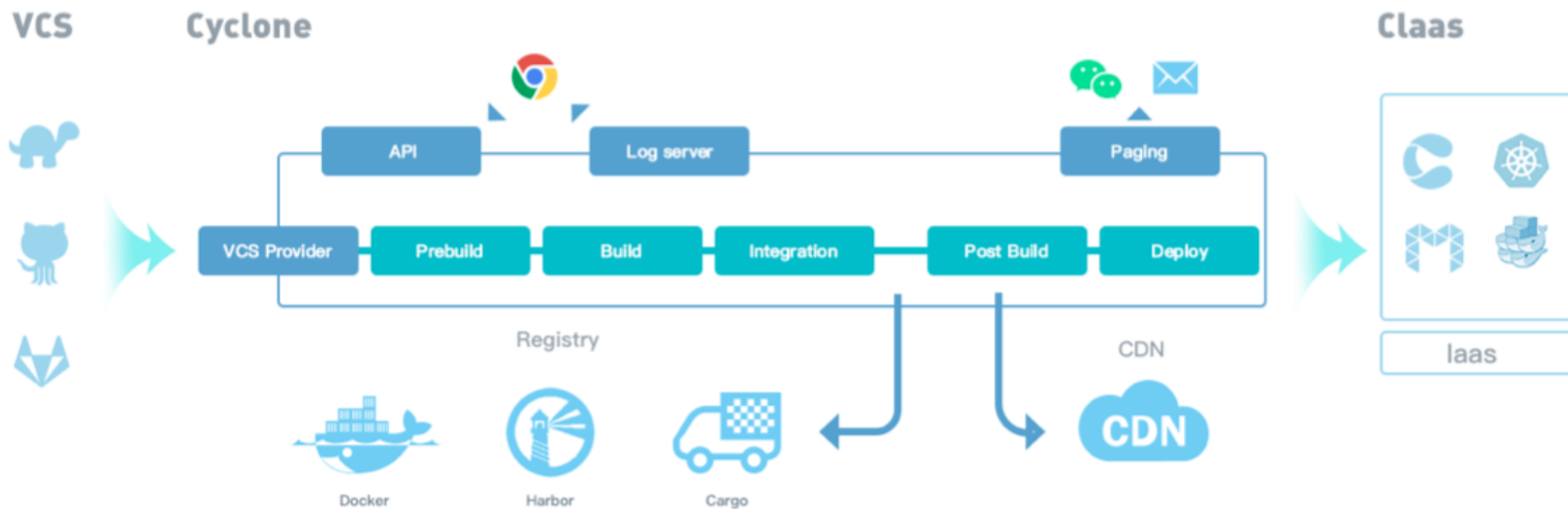
USER ID	Total Commits	Breakages
userabz	182	59 (31.4%)
userabc	1,382	196 (14.2%)
userxyz	1,564	214 (13.7%)
product1-release	42	39 (92.9%)
product2-dev	319	68 (21.3%)
product3-rotation	302	47 (15.6%)
product4-releaser	263	40 (15.2%)
product5-releaser	442	63 (14.3%)
product6-releaser	526	66 (12.5%)
product7-releaser	784	87 (11.1%)
product8-releaser	2,254	226 (10%)

- 不作为绩效考评标准!
- 开发者提交代码时给出对应的警告, 对不同的作者所提交的 CL 采用不同频率的测试

## 思想5: 一个源代码文件被修改的人数不同造成测试 breakage 的概率不同



- 观察?
- 操作?





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Thanks !