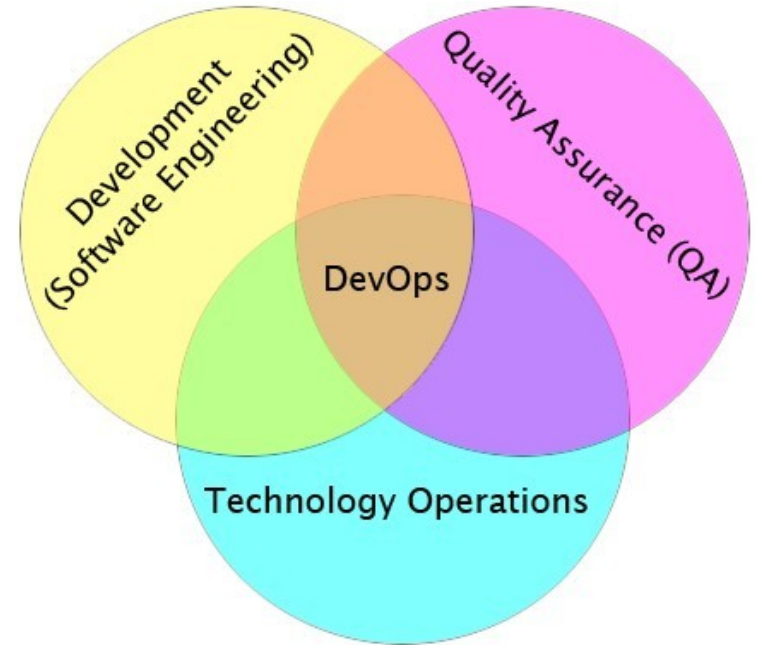# Software Technology 06

DevOps Toolchain

DevOps

– Development & Operations

Collaboration of developers and other IT professionals to automate software delivery and infrastructure changes.

- Traditionally:
    - Developers change
    - Testers reduce risk
    - Operations stabilize processes

Contradicting goals

+ Agile methodologies → DevOps is **cultural change**

DevOps Goals

- Improve:
    - Time-to-Market
    - Feedback loop delay
    - Commit-to-Deploy (bugfix, new feature)
    - Quality
    - Efficiency
- Very frequent releases
- Fully automated release and deployment pipeline
- **Continuous Integration (CI)**
- **Continuous Delivery (& Continuous Deployment)**

DevOps Pipeline

- Code & Review

- Build (CI & status)

- Test

- Package (Artifact Repository, Staging environment)

- Release

- Configure (Infrastructure as Code)

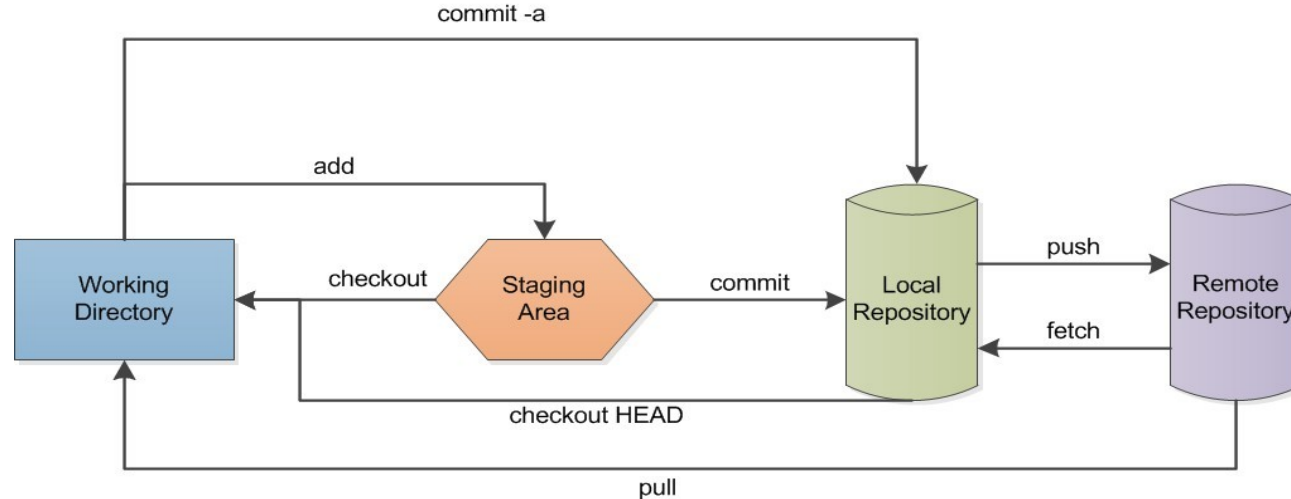- Monitor (Errors, Performance, Statistics, UX)
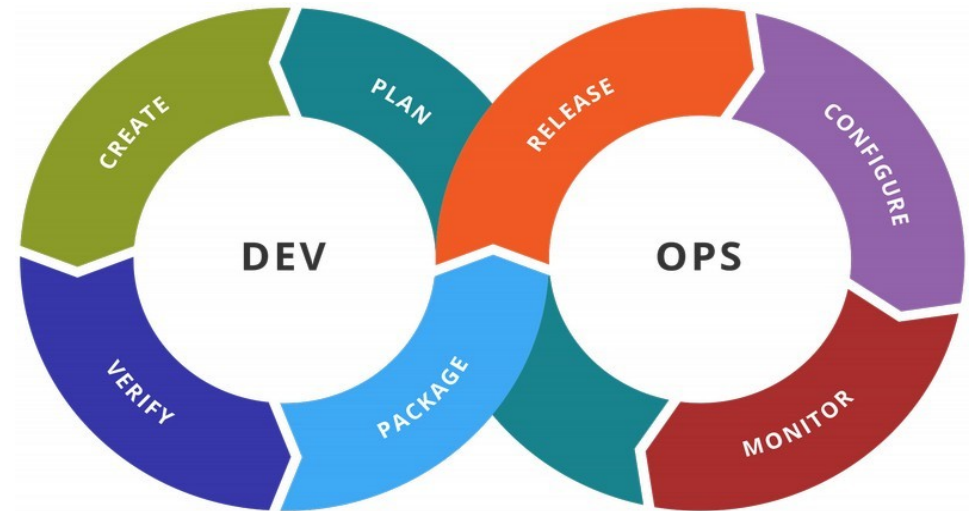
Code & Review

- Version Control Systems (VCS)
  - Organization:
    - Centralized (Subversion (SVN))
    - Distributed (Git, Mercurial, Bazaar)
  - Workflow
    - Branching
    - Merging (Integrating)
    - Tags (Releases)
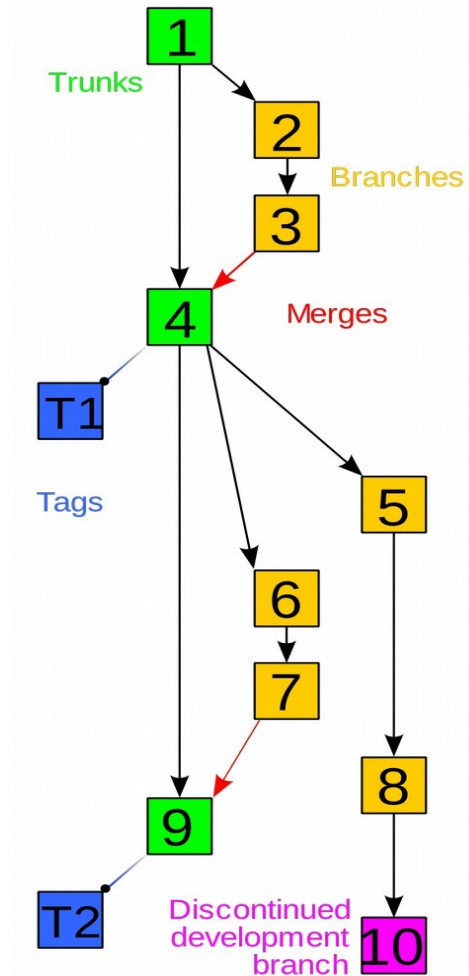
Code & Review

- Distributed VCS (Git) operations

commit -a

add

Working Directory | checkout | Staging Area | commit | Local Repository | push | Remote Repository

fetch

checkout HEAD

pull

commit -a: Directly commit modified and deleted files into the local repository (*no new files!*)
add: Add a file to the staging area.
checkout: Get a file from the staging area.
checkout HEAD: Get a file from the local repository
commit: Commit files from the staging area to the local repository
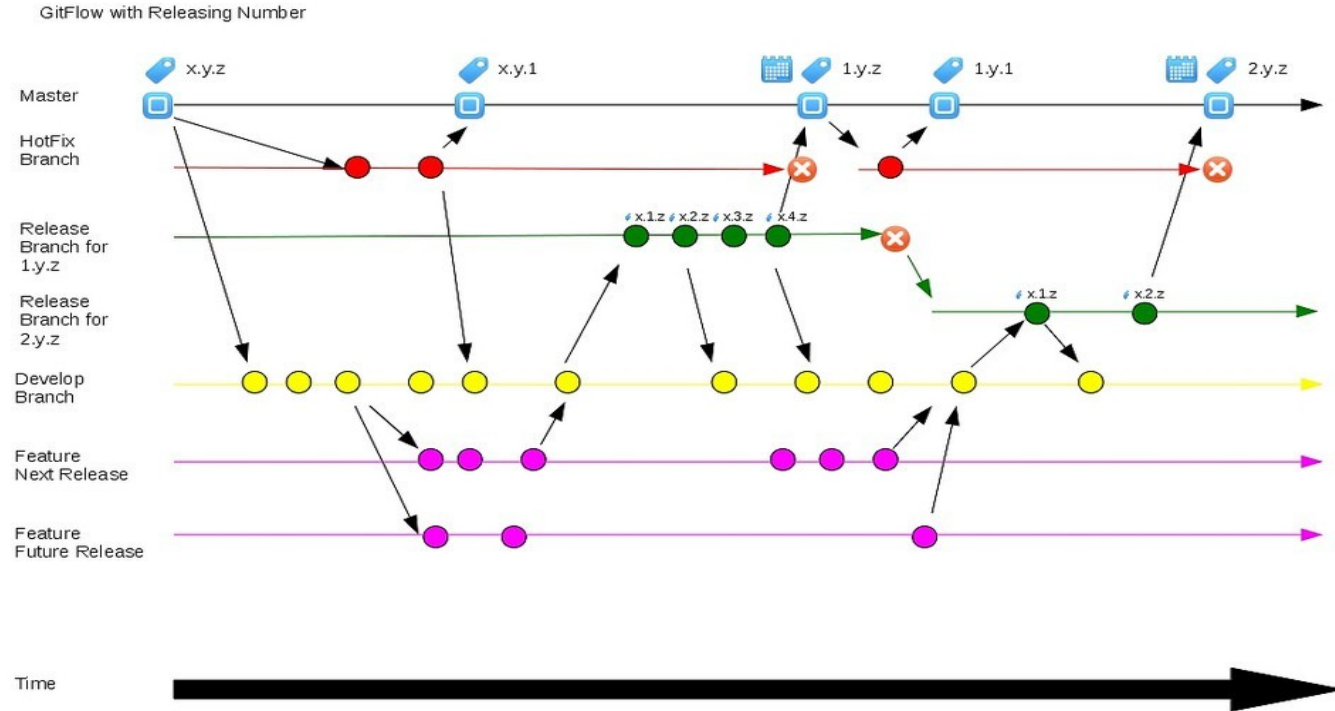push: Send files to the remote repository
fetch: Get files from the remote repository
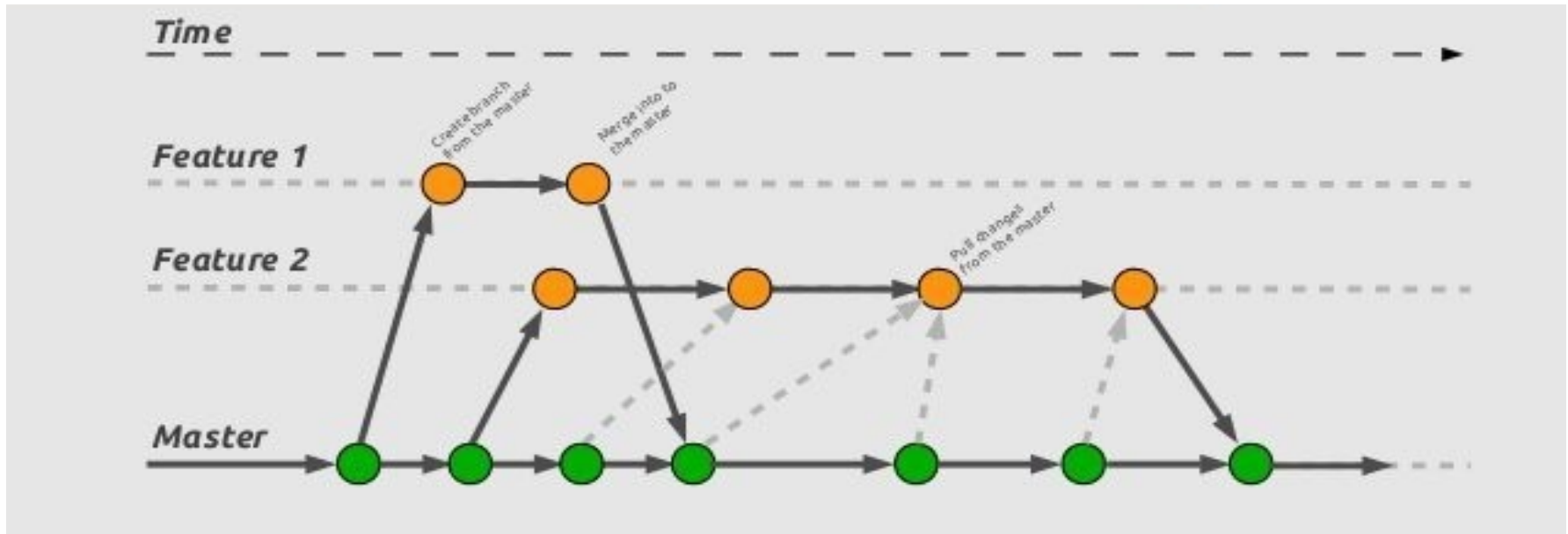pull: Get files from the remote repository and put a copy in the working directory
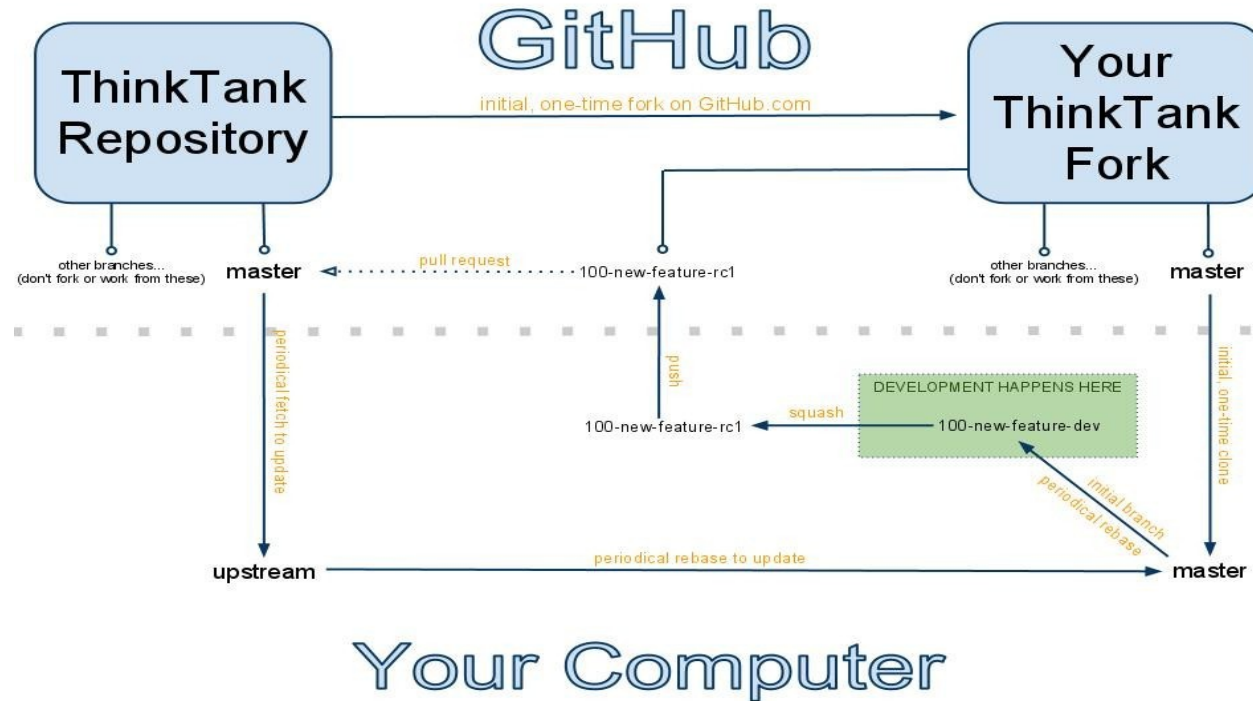
Code & Review

- VCS Branching (Old School)

GitFlow with Releasing Number

Code & Review

- VCS Branching (the CI way: no develop branch!)
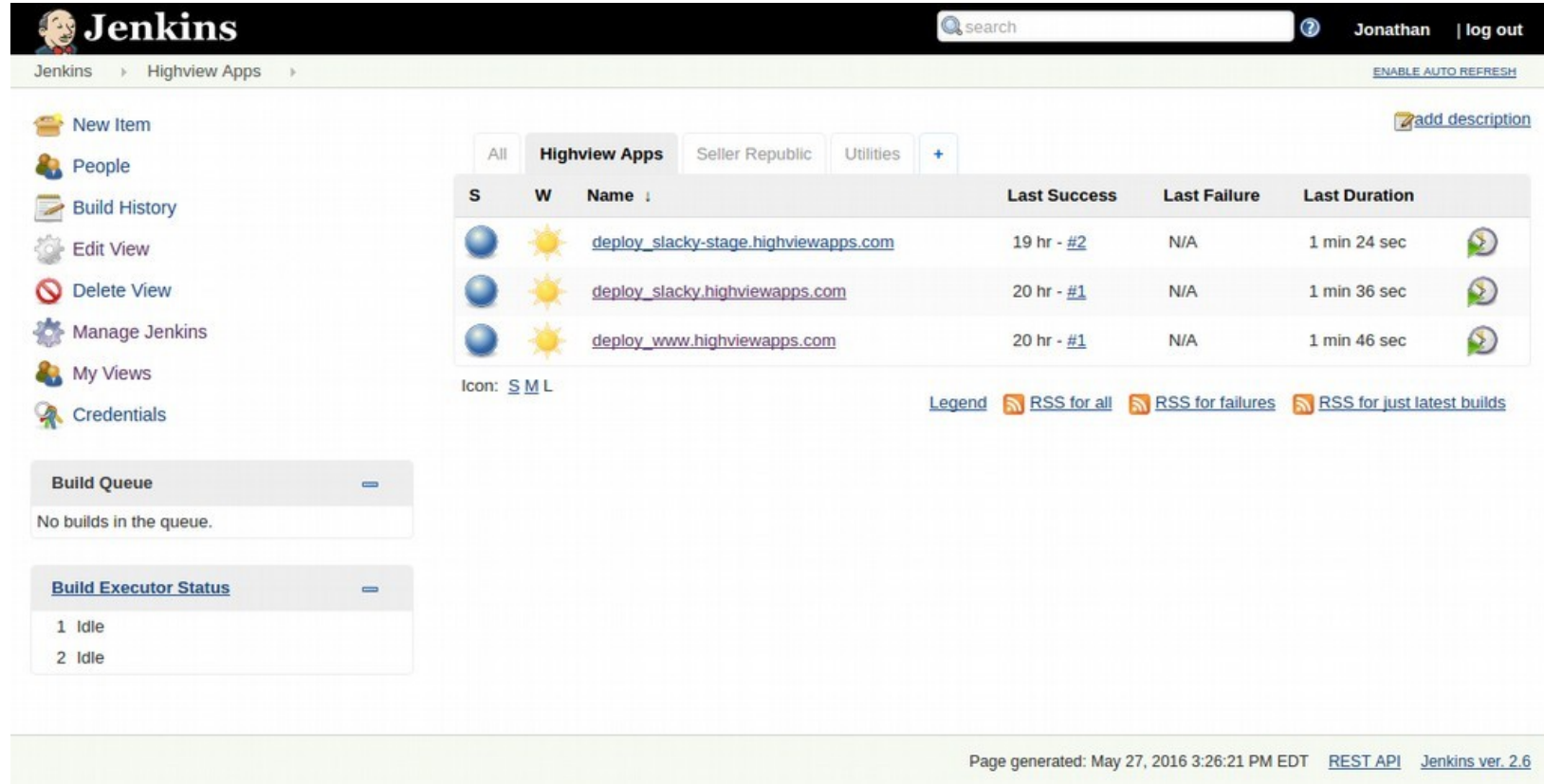
Code & Review

- Merging tools (Github Pull Requests)

Build, Test, Package

- CI Practices
    - Central Code Repository (can be multiple)
    - Automated Build
    - Automated Tests
    - Almost like production testing (Staging or Preprod)
    - Not much branches (everyone is close to trunk / master → short round-trip)
    - Every commit is Built and Tested
    - Automate deployment into Artifact Repository
    - Results: Build Dashboard

Build, Test, Package

- CI Tools (Jenkins)

Build, Test, Package

- *"Earlier it is caught, cheaper to fix"*

- Testing frameworks (Junit, Mockito, Gtest…)

- Build tools (command line)

  - Ant, Maven, Gradle (Ivy, Nexus = Artifact or Binary Repositories)

  - Make (autotools), Ninja, CMake (Cross IDE, Cross Platform)

Build, Test, Package

- Matrix Builds = lot of build artifacts according to different categories

    – Debug / ReleaseWithDebug / Release (+Obfuscation)

    – Free / Commercial / With-extra-feature

    – Release per branch

    – Per platform builds

    – Special builds

        • Coverage

        • Memory checking

        • Thread checking

Build, Test, Package

– *"Earlier it is caught, cheaper to fix"*

- Compiler Errors, Warnings, Warning Levels

- Other verification

    - Coding Convention Enforcement (clang-format, pep8)

    - Code Metrics

    - Static Code Analysis

    example: SonarQube, Lint, clang-format, clang-tidy, clang, Eclipse, FindBugs, PMD, pep8, Pylint, PyCharm

- Coverage

- Profiling (Profiling or Sampling)

Build, Test, Package

Version 6.x - Mon, 26 Jul 2010 13:58 - profile Nemo rules

Lines of code
162,306 ▲
325,036 lines ▲
87,758 statements ▲
1,060 files

Classes
1,447
103 packages
14,271 methods ▲
+1,262 accessors

Comments
26.6%
58,891 lines ▲
59.1% docu. API
5,418 undocu. API
1,164 commented LOCs

Duplications
7.1% ▼
22,998 lines ▼
566 blocks ▲
174 files ▲

Complexity
3.1 / method
30.9 / class
42.2 / file
Total: 44,773 ▲
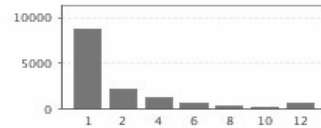
◉ Methods ○ Classes

Events [All ▼]

2010-07-26	Version	6.x
2009-06-07	Version	6.0.x
2009-02-15	Alert	Orange	ⓘ

Key : org.apache:tomcat
Language : java
🔊 Alerts feed

Rules compliance
83.7%
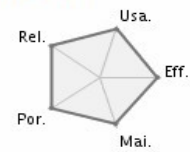
Violations
10,072 ▲
⚠ Blocker   0
⚠ Critical   0
▲ Major   8,794 ▲
▼ Minor   65
▼ Info   1,213

⚠ **Alerts** : Duplicated lines (%) > 5.

SIG Maintain. Model ⓘ
(A)nalysability   -
(C)hangeability   0
(S)tability   --
(T)estability   --
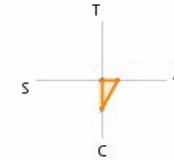
Tags
356
0 mandatory
356 optional

FIXME   TODO   @deprecate   @todo

Technical Debt ⓘ
11.0%
$ 341,563 ▲
683 man days ▲

Duplication   Violations   Comments   Complexity
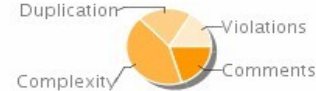
No information available on coverage
No information available on design

Build, Test, Package

Build, Test, Package

Release & Configure

- Deployment scalability → Virtualization
  - Full (KVM, Xen, QEMU, VirtualBox)
  - OS-Level (Docker, LXC / LXD, OpenVZ) - Containerization
- Infrastructure as Code
  - Declarative (functional) vs Imperative (procedural)
  - Push or Pull (towards controller server)
  - Continuous Configuration Automation (CCA) (Chef, Puppet, Vagrant, Ansible)

Monitor

- Application Performance Monitoring
  - Not Profiling
  - General usage statistics
  - UX Monitoring
    - Command chain analysis
    - Time measurement
  - System component monitoring
    - Measure critical times (loading, waiting for network...)
    - Micro measure time spent in subsystems

Monitor

- Application Performance Monitoring
  - Extensive Logging
    - Log levels
    - Log types
    - Log modules
  - Structured Logging
  - Live / Real-time Dashboards
- Monit, Nessus, Kibana (ELK Stack)...

Continuous Delivery
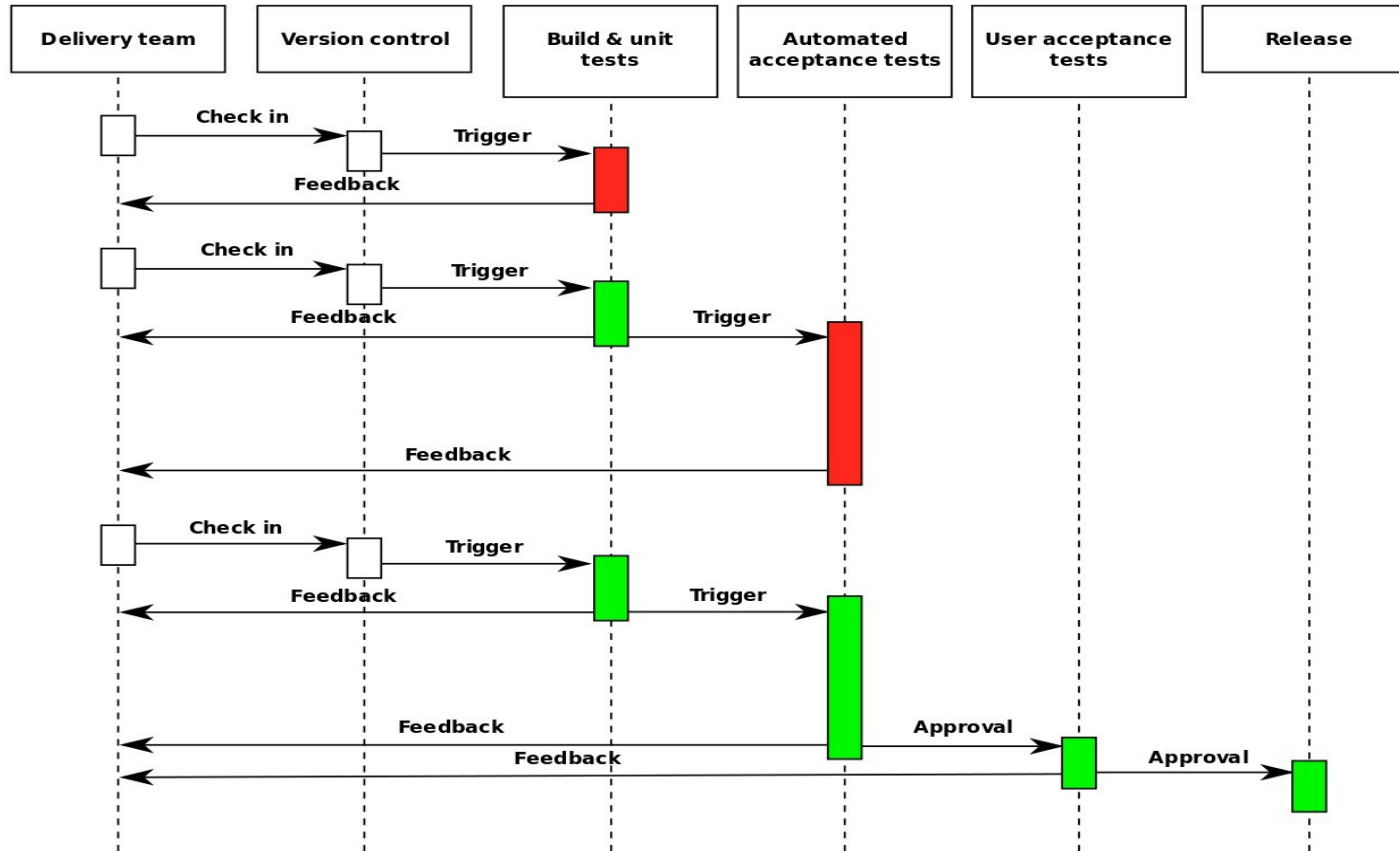
PERIODIC TABLE OF DEVOPS TOOLS (V3)

Legend (symbols):
- Os — Open Source
- Fr — Free
- Fm — Freemium
- Pd — Paid
- En — Enterprise

Categories (colors):
- Source Control Mgmt.
- Database Automation
- Continuous Integration
- Testing
- Configuration
- Deployment
- Containers
- Release Orchestration
- Cloud
- AIOps
- Analytics
- Monitoring
- Security
- Collaboration

#	Symbol	Name	Type
1	Gl	GitLab	Os
2	Sp	Splunk	En
3	Gh	GitHub	Os
4	Dt	Datical	En
5	XLr	XebiaLabs XL Release	En
6	Aws	AWS	Fm
7	Az	Azure	Pd
8	Gc	Google Cloud	En
9	Op	OpenShift	Fm
10	Sg	Sumo Logic	Fm
11	Sv	Subversion	Os
12	Db	DBMaestro	En
13	Dk	Docker	Os
14	Ur	UrbanCode Release	En
15	Af	Azure Functions	Pd
16	Ld	Lambda	Pd
17	Ic	IBM Cloud	Pd
18	Fd	Fluentd	Os
19	Cw	ISPW	En
20	Dp	Delphix	Fm
21	Jn	Jenkins	Os
22	Cs	Codeship	Fm
23	Fn	FitNesse	Os
24	Ju	JUnit	Fr
25	Ka	Karma	Fr
26	Su	SoapUI	Fm
27	Ch	Chef	En
28	Tf	Terraform	Fr
29	XLd	XebiaLabs XL Deploy	En
30	Ud	UrbanCode Deploy	En
31	Ku	Kubernetes	Os
32	Cc	CA CD Director	Fm
33	Pr	Plutora Release	Pd
34	Al	Alibaba Cloud	Pd
35	Os	OpenStack	Os
36	Ps	Prometheus	Os
37	At	Artifactory	Pd
38	Rg	Redgate	Fm
39	Ba	Bamboo	Pd
40	Vs	VSTS	Fm
41	Se	Selenium	Os
42	Jm	JMeter	Fr
43	Ja	Jasmine	Os
44	Sl	Sauce Labs	Pd
45	An	Ansible	Os
46	Ru	Rudder	Os
47	Oc	Octopus Deploy	En
48	Go	GoCD	Os
49	Ms	Mesos	Os
50	Gke	GKE	Pd
51	Om	OpenMake	Fm
52	Cp	AWS CodePipeline	Pd
53	Cy	Cloud Foundry	Pd
54	It	ITRS	En
55	Nx	Nexus	Pd
56	Fw	Flyway	Os
57	Tr	Travis CI	Os
58	Tc	TeamCity	Fm
59	Ga	Gatling	Os
60	Tn	TestNG	Fr
61	Tt	Tricentis Tosca	Fm
62	Pe	Perfecto	Pd
63	Pu	Puppet	Os
64	Pa	Packer	Os
65	Cd	AWS CodeDeploy	Fm
66	Ec	ElectricCloud	En
67	Ra	Rancher	Os
68	Aks	AKS	Pd
69	Rk	Rkt	Os
70	Sp	Spinnaker	Os
71	Ir	Iron.io	En
72	Mg	Moogsoft	Pd
73	Bb	BitBucket	Fm
74	Pf	Perforce	En
75	Cr	Circle CI	Fm
76	Cb	AWS CodeBuild	Pd
77	Cu	Cucumber	Fr
78	Mc	Mocha	Os
79	Lo	Locust.io	Os
80	Mf	Micro Focus UFT	Pd
81	Sa	Salt	Os
82	Ce	CFEngine	Os
83	Eb	ElasticBox	En
84	Ca	CA Automic	En
85	De	Docker Enterprise	En
86	Ae	AWS ECS	Pd
87	Cf	Codefresh	Fm
88	Hm	Helm	Os
89	Aw	Apache OpenWhisk	Os
90	Ls	Logstash	Os
91	XLi	XebiaLabs XL Impact	En
92	Ki	Kibana	Os
93	Nr	New Relic	Fm
94	Dt	Dynatrace	En
95	Dd	Datadog	En
96	Ad	AppDynamics	Fm
97	El	ElasticSearch	Os
98	Ni	Nagios	Os
99	Zb	Zabbix	Os
100	Zn	Zenoss	En
101	Cx	Checkmarx SAST	En
102	Sg	Signal Sciences	En
103	Bd	BlackDuck	En
104	Sr	SonarQube	Os
105	Hv	HashiCorp Vault	Os
106	Sw	ServiceNow	En
107	Jr	Jira	Pd
108	Tl	Trello	Fm
109	Sk	Slack	Fm
110	St	Stride	Fm
111	Cn	CollabNet VersionOne	En
112	Ry	Remedy	En
113	Ac	Agile Central	En
114	Og	OpsGenie	Pd
115	Pd	Pagerduty	Pd
116	Sn	Snort	Os
117	Tw	Tripwire	Fm
118	Ck	CyberArk	En
119	Vc	Veracode	En
120	Ff	Fortify SCA	En

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