

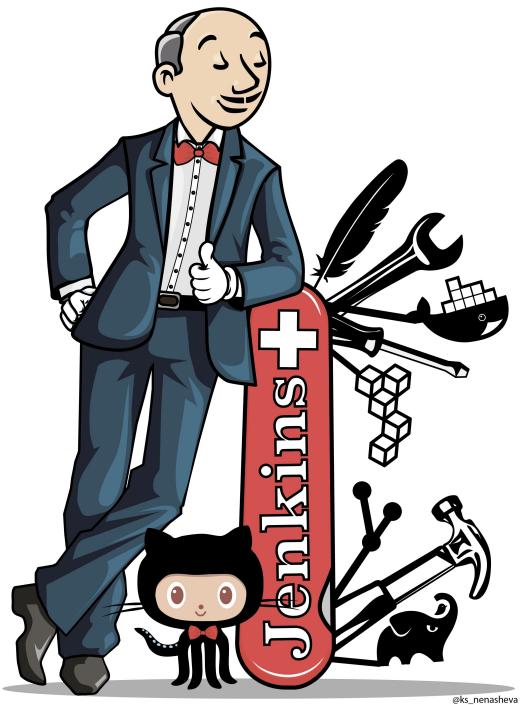


Fastest and Easiest Integration of UI Changes with Jenkins

*And Docker with
Kubernetes*

Emmanuel Joliet
Caltech/IPAC

GRITS X, September 2020

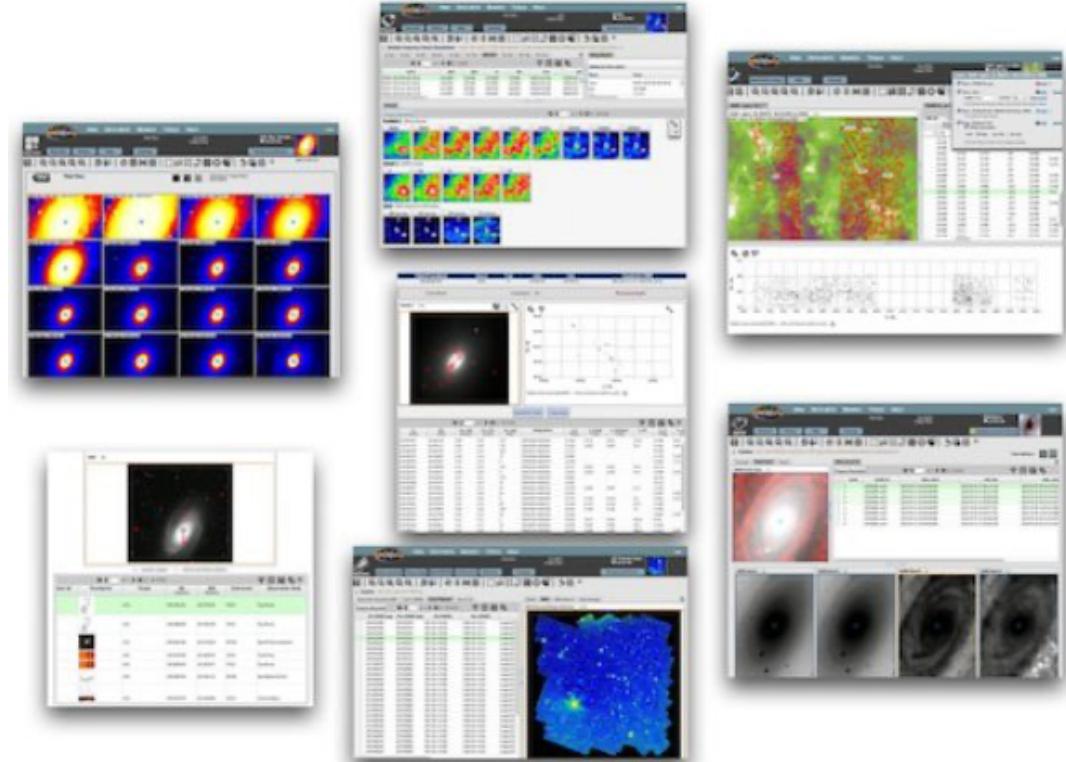


Caltech



Outline

- Jenkins
- UI DevOps
- Use cases

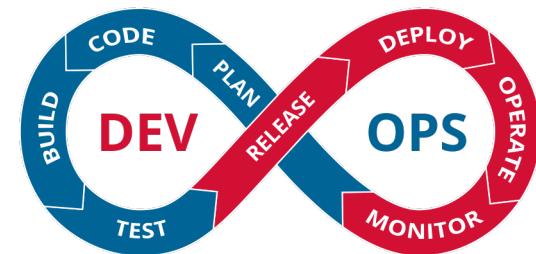




Jenkins

➤ Jenkins for continuous integration and delivery ('DevOps' flow)

- ✓ Web UI to run custom jobs in parallel
- ✓ Pipeline Job ('.jenkinsfile'): build, deploy, test, log and run any existing scripts
- ✓ Relevant for collaborative development
- ✓ Integrates changes
- ✓ Automatic testing (git push triggers)
- ✓ Feedback status, history and reports (QA)
- ✓ Community/plugins: LDAP, JDK, Gradle, NodeJS, test report, 3rd party integration (slack)
- ✓ i.e. Apache projects: <https://builds.apache.org>
- ✓ 2004 (Hudson, Sun Microsystems), since 2011 (Jenkins, Oracle)





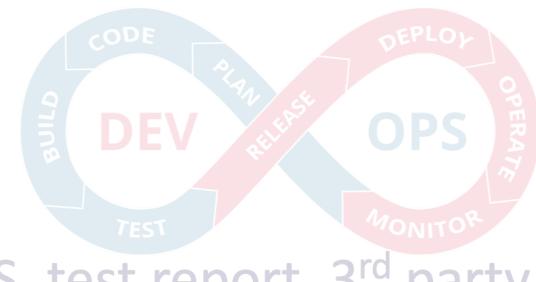
Jenkins + docker + kubernetes

➤ Jenkins for continuous integration and delivery (DevOps flow)

- ✓ Web UI to run custom jobs in parallel
- ✓ Job pipeline (script file): build, deploy, test, log and run any existing source code
- ✓ Relevant for continuous development (agent changes triggers)
- ✓ Integrates with CI/CD tools (github, bitbucket, gitlab)
- ✓ Automatic testing
- ✓ Feedback status, report and history
- ✓ Community/plugins: LDAP, JDK, Gradle, NodeJS, test report, 3rd party integration (slack)
- ✓ i.e. Apache projects: <https://builds.apache.org>
- ✓ 2004 (Hudson, Sun Microsystems), since 2011 (Jenkins, Oracle)



CRUISE CONTROL



➤ Docker containers (deployable image ready to run the software)

➤ Kubernetes to orchestrate the deployments

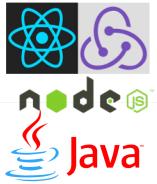
✓ Easier
Easier
& Faster





Firefly software

➤ Caltech/IPAC Open source UI software <https://github.com/Caltech-IPAC/firefly>



- ✓ Framework exposes **library and API** of composable widgets to **build complex GUI** for **astronomical applications** sharing same components such as:
 - Standalone web application (see IRSA GUIs such as WISE, IRSA Viewer, SOFIA or FinderChart)
 - 'static' HTML pages using the JavaScript API (See IRSA, NED and NExSci)
 - Python & Notebooks, etc. using python client (*pip* & *conda*) - See Rubin Observatory ('LSST')
- ✓ **Java server side** for heavier operations, API (+VO) requests, caching and JavaScript **React** client since 2015 migration from **GWT**
- ✓ **Web app Java WAR** runs in *Apache tomcat*
- ✓ Contributors across IPAC

```
<script type="text/javascript"
language='javascript'
src='/firefly/firefly_loader.js'></script>
```



➤ **Gradle** tool automates tasks to compile, build, docs and test but also **build and publish docker image***

- ✓ Images pushed to [docker hub](#)

```
docker pull ipac/firefly:release-2020.2.0
```



➤ **Kubernetes** for **easy deployments** in dev environment

- ✓ **Speed up** dev, test and change integration
- ✓ Recently made dev mode **easier** with docker **without setting local environment**
- ✓ <https://fireflydev.ipac.caltech.edu>



➤ Jenkins runs jobs

***Docker image** = Debian + apache tomcat + WAR (.html + .js + .class + .jar) + software (Java, npm, node, gradle, etc.)



A brief history of Firefly...

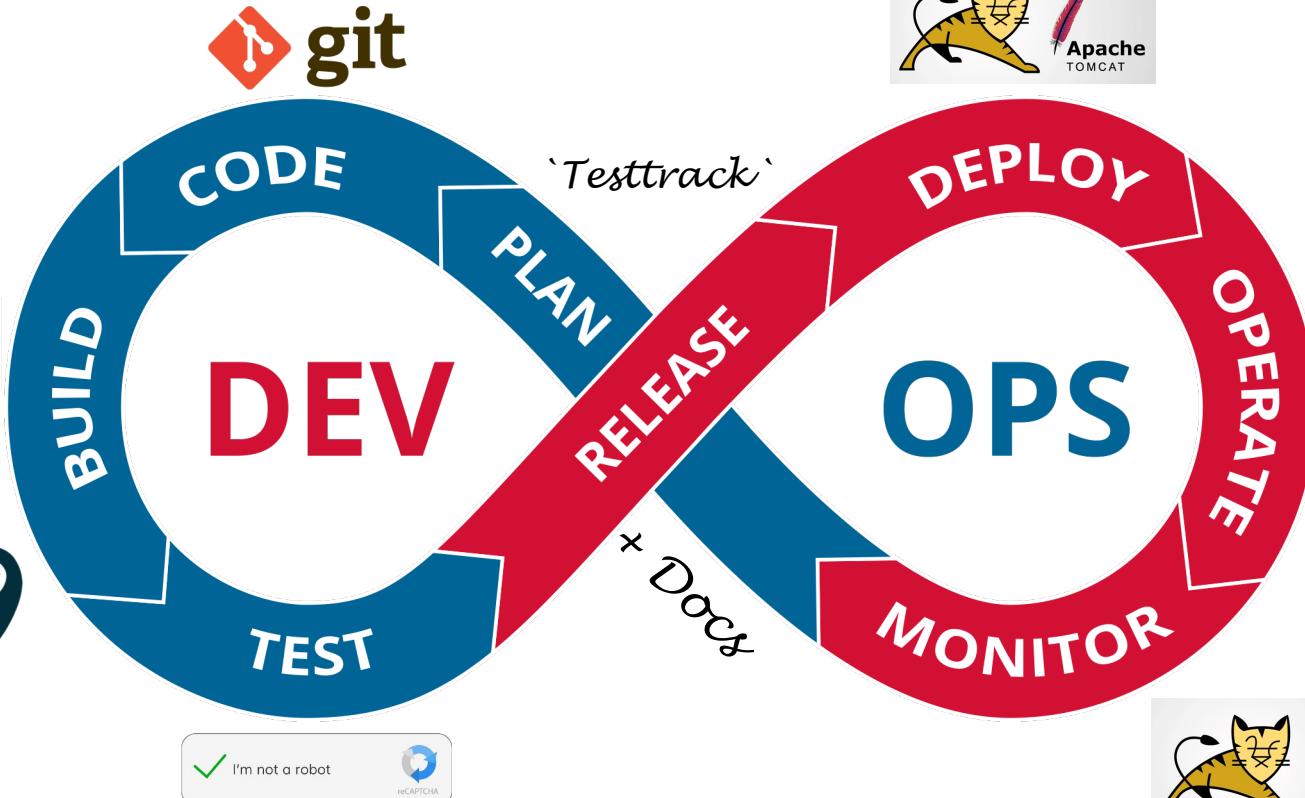


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UI DevOps CI/CD

before
2015

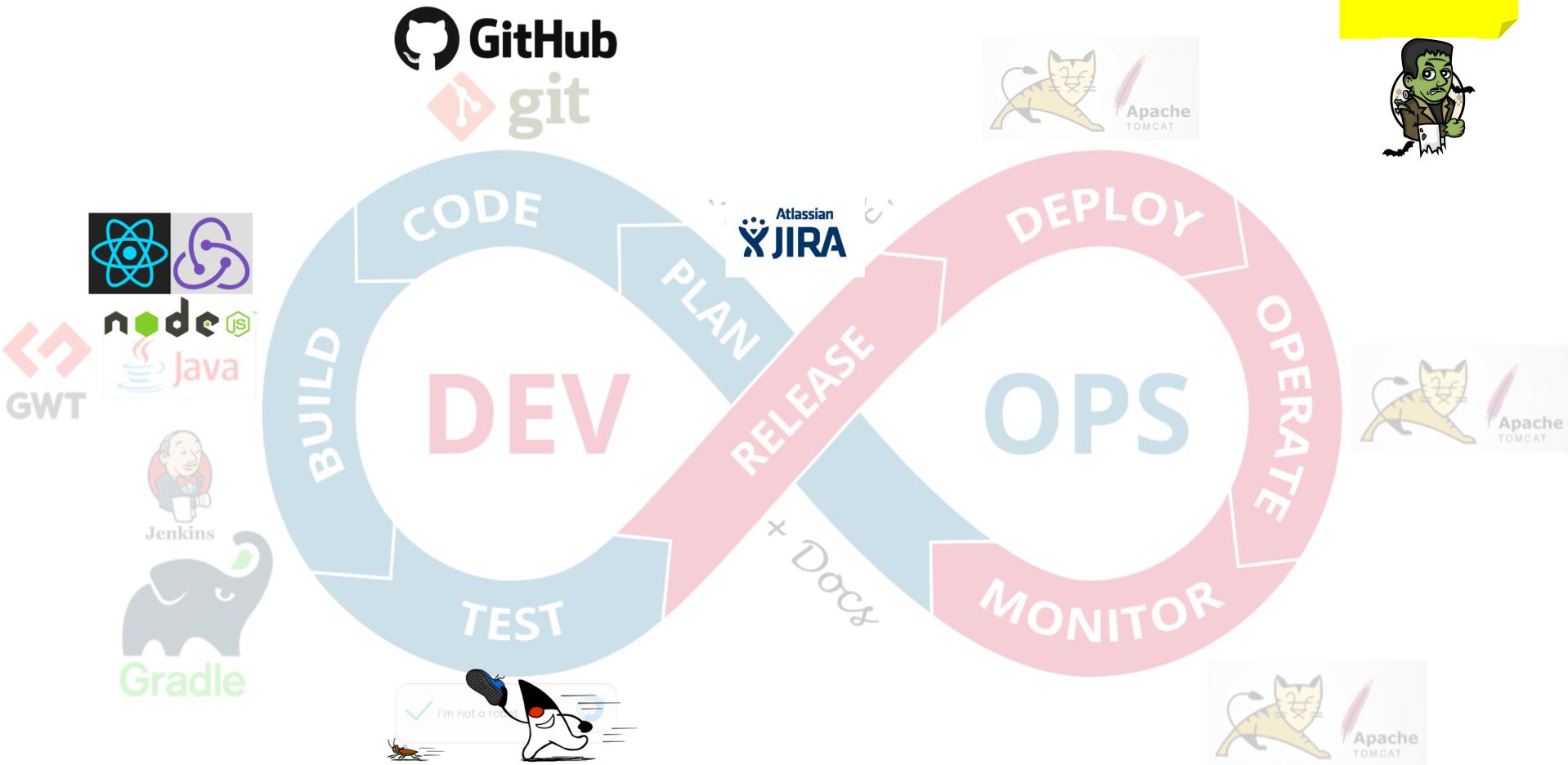


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UI DevOps CI/CD

2015

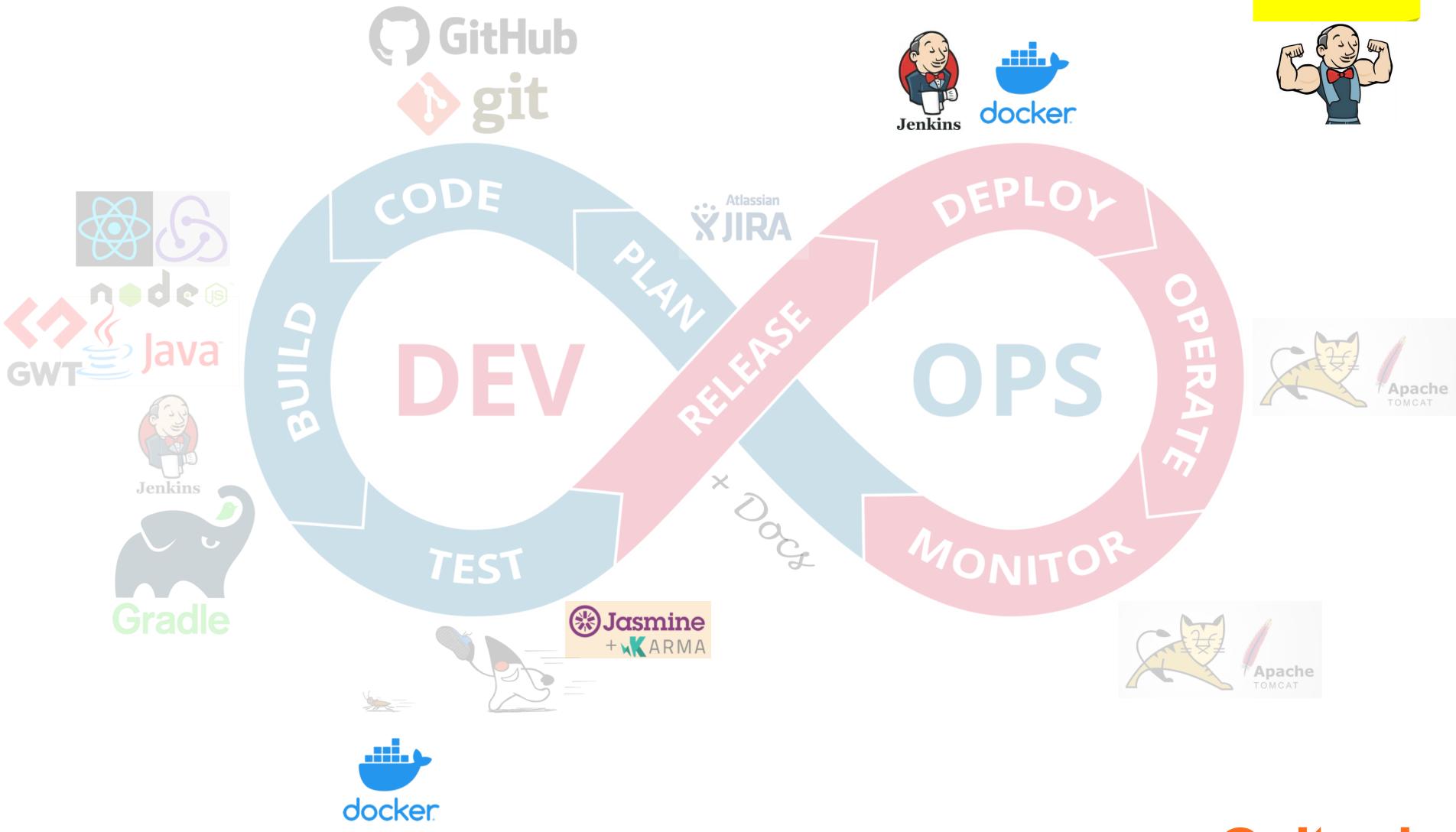


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UI DevOps CI/CD

2017

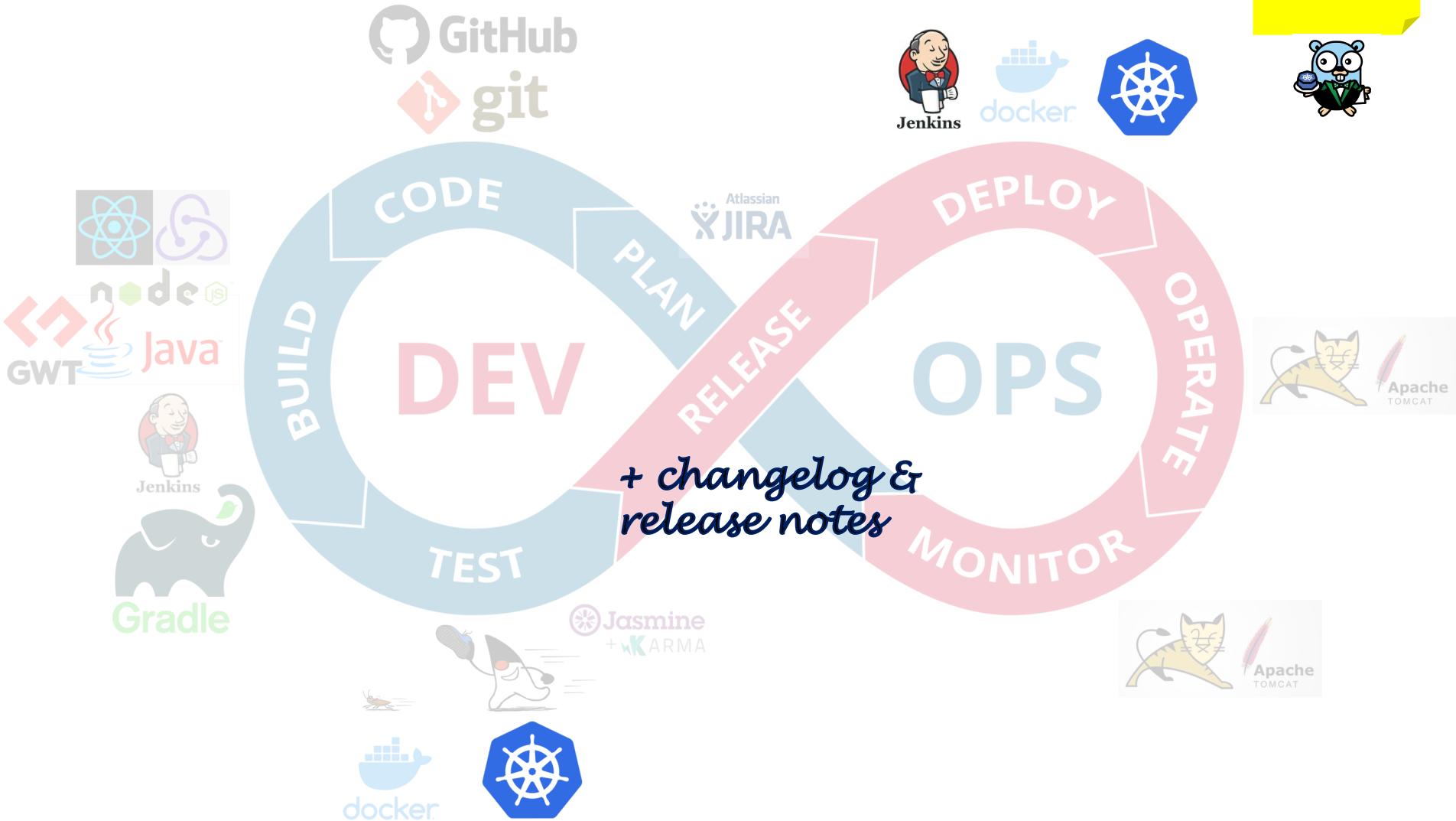


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UI DevOps CI/CD

2018

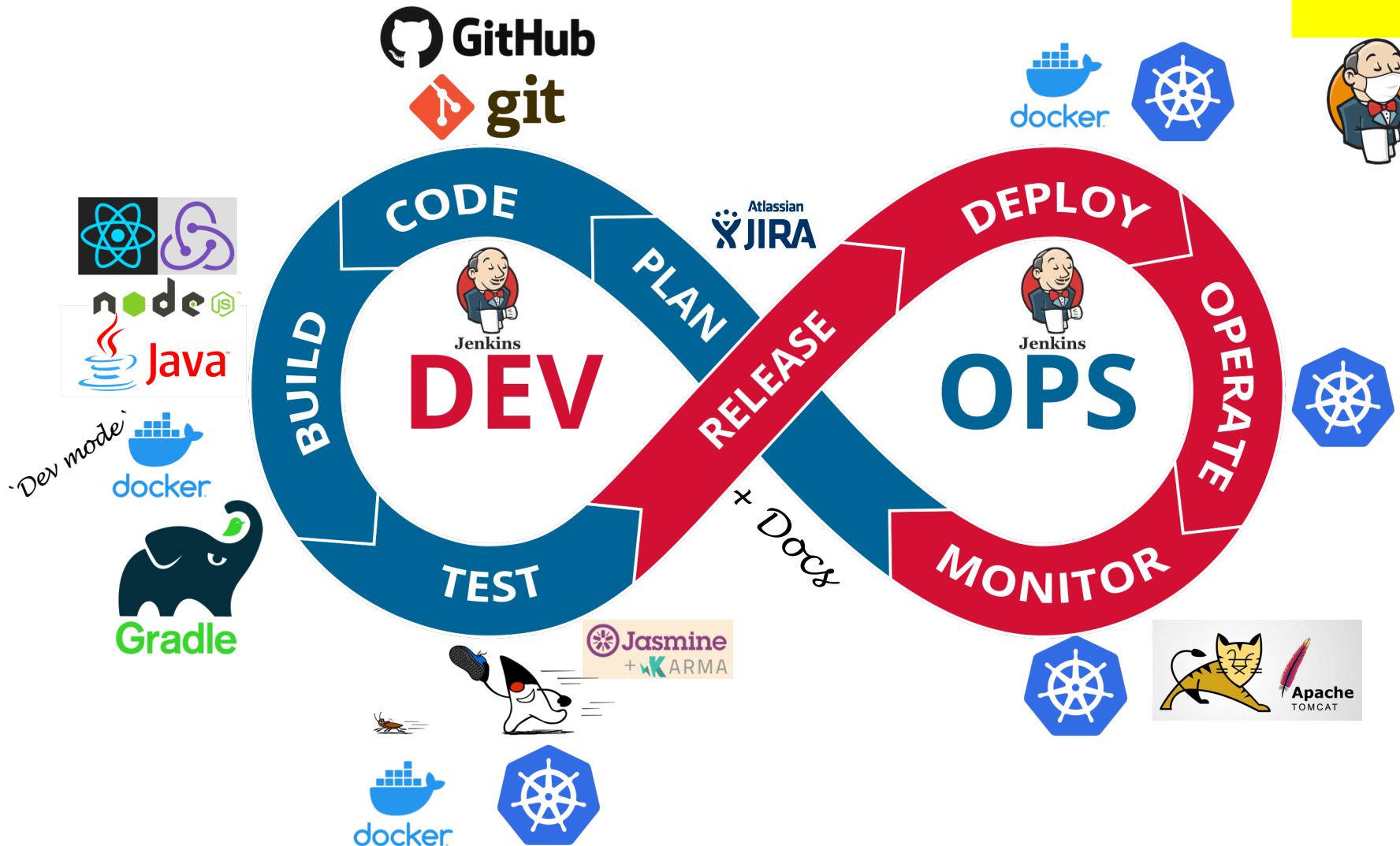


Caltech



UI DevOps CI/CD

2020



Caltech



UI DevOps



➤ Firefly development cycles {~3 months}

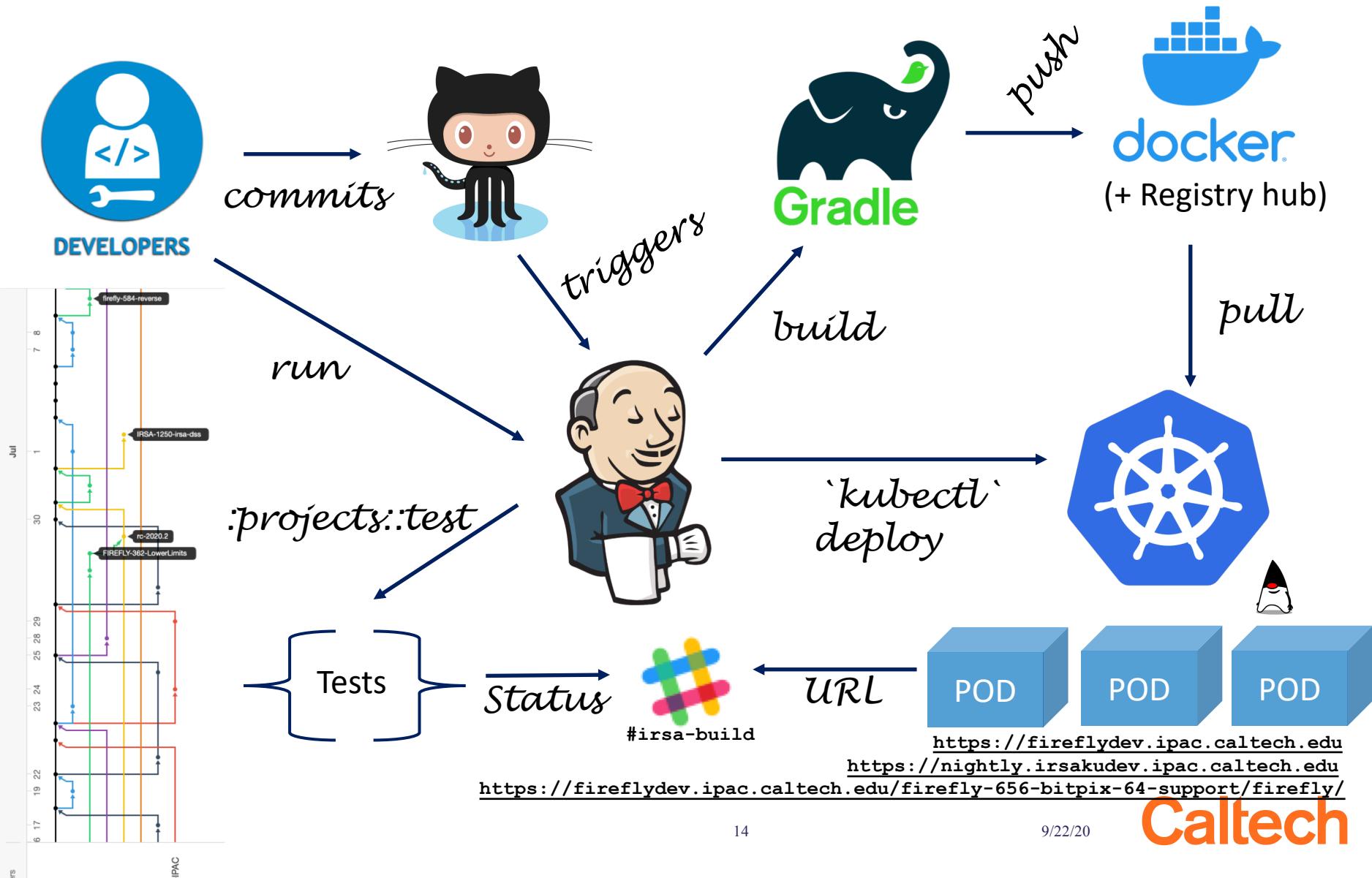
- ✓ Plan & CCB: different projects needs and release timeline
- ✓ Collaborative development with **version control – git**
 - Changes implemented or fixed in different branches
 - Tracking with Jira tickets (branch name, epics/tag for releases)
 - Main master branch (`dev`), GWT and release branches (>2018)
- ✓ Pull request*: **feature branch** compared and ready to be **reviewed, tested**, approved, or reject
- ✓ Build, test and deploy branches
- ✓ Release (delivery) - milestones, changelog & notes, docs
- ✓ Kubernetes for operational environment soon

➤ UI testing and changes integration

- ✓ Unit tests are **automated** and status is **reported** when build fails via email/slack (*Gradle/Jenkins*)
- ✓ **Regression testing and changes approval** are **manual processes**
- ✓ **Visibility** of upcoming changes is key (nightly build)
- ✓ **Kubernetes to test changes within mixed software environment**

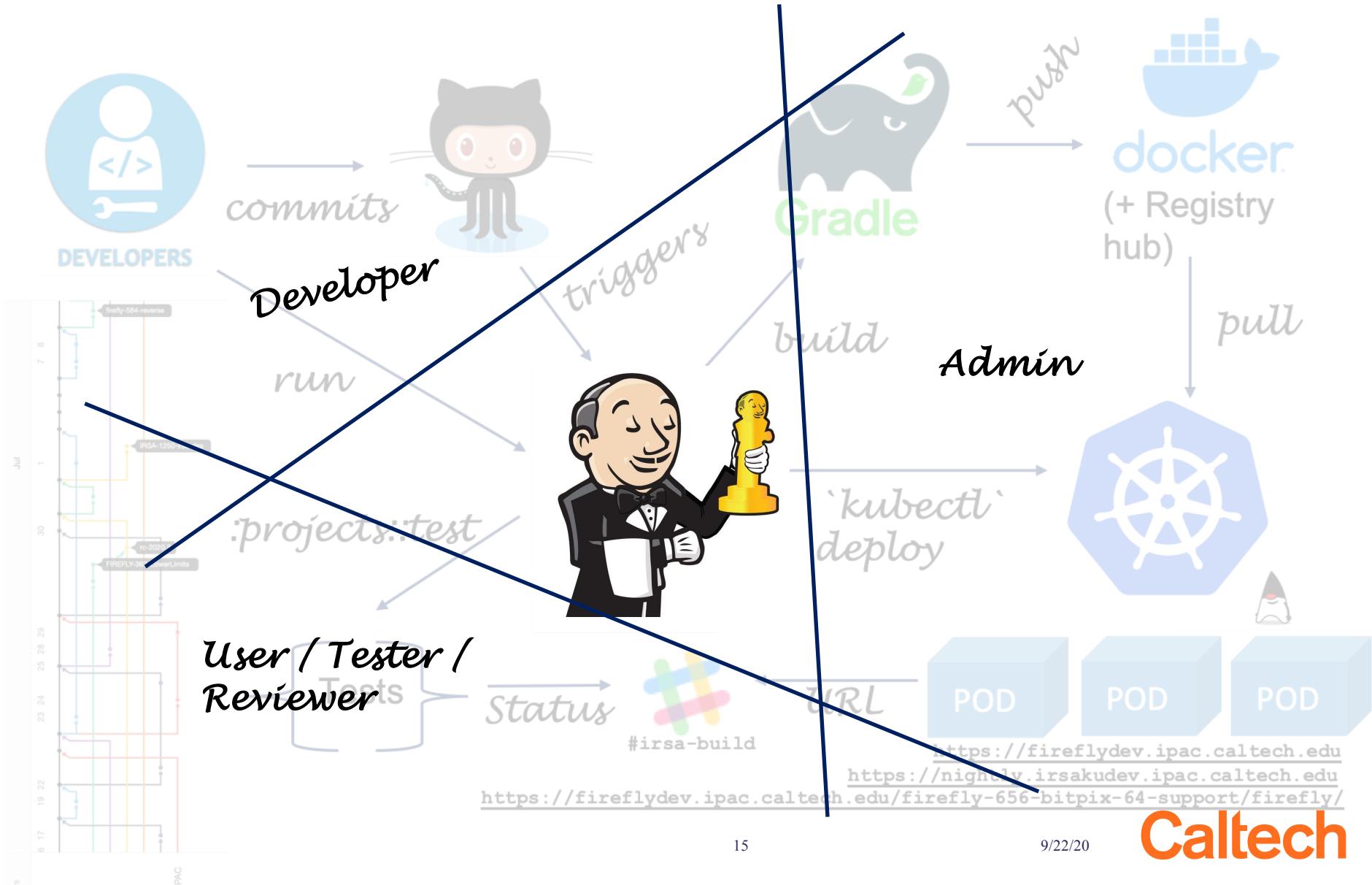


Jenkins + UI





Role made easy





Jenkins Web UI (1/2)

Jenkins > [ENABLE AUTO REFRESH](#)

People

Build History

Project Relationship

Check File Fingerprint

My Views

Lockable Resources

Build Queue No builds in the queue.

Build Executor Status 1 Idle

S	W	Name	Last Success ↑	Last Failure	Last Duration	Actions
●	☀️	ikc_nightly	9 hr 22 min - #183	N/A	47 min	
●	🌤️	CI_test_dev	2 days 17 hr - #507	3 days 14 hr - #505	7 min 30 sec	
●	☀️	ikc_cleanup	2 days 18 hr - #267	N/A	4.3 sec	
●	☀️	ikc_ife	2 days 18 hr - #197	N/A	3 min 0 sec	
●	🌤️	ikc_firefly	4 days 17 hr - #132	4 days 21 hr - #130	4 min 36 sec	
●	☀️	sofia	16 days - #17	N/A	3 min 3 sec	
●	☀️	irsaviewer	16 days - #13	N/A	3 min 7 sec	
●	🔴	firefly	16 days - #37	16 days - #39	2 min 24 sec	
●	☀️	CI_test_gwt	20 days - #39	N/A	12 min	
●	🌧️	ikc_suit	25 days - #3	25 days - #2	4 min 46 sec	
●	🌧️	sandbox	25 days - #403	25 days - #402	5 min 18 sec	
●	🌧️	k8s_suit	1 mo 0 days - #40	1 mo 0 days - #39	3 min 20 sec	
●	☀️	irsa-ife	1 mo 0 days - #32	N/A	2 min 52 sec	
●	☀️	ikc_onlinehelp	1 mo 17 days - #44	N/A	7 min 2 sec	
●	☀️	ikc_queryserver	2 mo 28 days - #5	N/A	9.8 sec	
●	☀️	sandbox-tatiana	4 mo 8 days - #14	N/A	6.6 sec	
●	☀️	irsa-onlinehelp	5 mo 0 days - #72	N/A	42 sec	
●	☀️	k8s_cleanup	5 mo 10 days - #455	N/A	4.8 sec	
●	🌤️	k8s_firefly	5 mo 14 days - #295	5 mo 20 days - #293	4 min 28 sec	
●	🔴	k8s_ife	5 mo 14 days - #225	5 mo 6 days - #228	3 min 51 sec	
●	🌧️	nightly_dev	5 mo 15 days - #400	5 mo 11 days - #404	30 min	

<http://irsawebdev5.ipac.caltech.edu:8100> (non public and LDAP protected)



Jenkins Web UI (2/2)

Job Status

Run Job shortcut

All IRSAs k8s active adhoc scheduled

S	W	Name	Last Success ↑	Last Failure	Last Duration
●	☀️	ikc_nightly	9 hr 22 min - #183	N/A	47 min
●	☁️☀️	CI_test_dev	2 days 17 hr - #507	3 days 14 hr - #505	7 min 30 sec
●	☀️	ikc_cleanup	2 days 18 hr - #267	N/A	4.3 sec
●	☀️	ikc_ife	2 days 18 hr - #197	N/A	3 min 0 sec
●	☁️☀️	ikc_firefly	4 days 17 hr - #132	4 days 21 hr - #130	4 min 36 sec
●	☀️	sofia	16 days - #17	N/A	3 min 3 sec
●	☀️	irsaviewer	16 days - #13	N/A	3 min 7 sec
●	🔴	firefly	16 days - #37	16 days - #39	2 min 24 sec
●	☀️	CI_test_gwt	20 days - #39	N/A	12 min
●	☁️🌧️	ikc_suit	25 days - #3	25 days - #2	4 min 46 sec
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●	☀️	irsa-onlinehelp	5 mo 0 days - #72	N/A	42 sec
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●	☁️☀️	k8s_firefly	5 mo 14 days - #295	5 mo 20 days - #293	4 min 28 sec
●	🔴	k8s_ife	5 mo 14 days - #225	5 mo 6 days - #228	3 min 51 sec
●	☁️	nightly_dev	5 mo 15 days - #400	5 mo 11 days - #404	30 min

ENABLE AUTO REFRESH

Build Queue
No builds in the queue.

Build Executor Status
1 Idle
2 Idle
3 Idle
4 Idle
5 Idle
6 Idle
7 Idle
8 Idle
9 Idle
10 Idle

Active jobs

Weather forecast



Jenkins jobs (1/2)

- Automated job triggered on git changes (dev unit test)
 - ✓ Test result report
 - ✓ `Jenkinsfiles` (Pipeline jobs) are located in private repos [IPAC-SW/irsa-ife-env](#)

- Branch build and deployed job {< 5 mins}.
 - ✓ Pull git changes, build war, docs {< 4 mins}
 - ✓ Build docker and push with tag (usually name of the branch) {< 30 s}
 - ✓ Deploy into kubernetes {< 20 s}

- Release jobs target builds with specific tag

- Kubernetes `kubectl`
 - ✓ Config files are here: <https://github.com/IPAC-SW/irsa-cloud>
 - ✓ Part of the job pipeline steps: [irsa-cloud#kubernetes/docs/jenkins-integration.md](#)

The screenshot shows the Jenkins Pipeline interface for the 'ikc_firefly' pipeline. The pipeline consists of three stages: Preparation, Build, and Deploy. The Preparation stage took 9s, the Build stage took 4min 0s, and the Deploy stage took 16s. The total average stage time was approximately 4 minutes. The build history shows several runs, with the most recent one (#132) being successful. A red box highlights the '2min 15s failed' entry in the history, which corresponds to the failed Deploy stage of build #130.

The screenshot shows the Jenkins Pipeline interface for the 'ikc_ife' pipeline. The pipeline consists of three stages: Preparation, Build, and Deploy. The Preparation stage took 11s, the Build stage took 2min 47s, and the Deploy stage took 3s. The total average stage time was approximately 3 minutes. The build history shows several runs, with the most recent one (#197) being successful. A red box highlights the '2min 58s' entry in the history, which corresponds to the successful Deploy stage of build #193.





Jenkins jobs (2/2)

- IRSA jobs use 2 codebases IFE + Firefly {< 5mins}
 - ✓ Gradle build, image pushed, `kubectl` deploy

➤ Scheduled

- ✓ unit/integration tests {~ 5 mins}
- ✓ Firefly nightly build
- IRSA nightly GUIs job {< 50 mins (GWT & React)}
 - ✓ <https://nightly.irsakudev.ipac.caltech.edu>

- Kubernetes **cleanup** jobs: remove `pod` from cluster #job/ikc_cleanup/

The screenshot shows the Caltech-IPAC Slack interface. The left sidebar lists various channels and projects. The main window is the #irsa-build channel, which has 13 members. A message from the jenkins app at 1:27 AM on Saturday, September 19th, reports that the ikc_nightly job completed successfully. The message includes a link to the Jenkins build summary and a long list of k8s URLs for various applications like planck, ztf, Spitzer, and wise.

This screenshot shows the Jenkins Pipeline ikc_nightly stage view. It features a sidebar with links to Back to Dashboard, Status, Changes, Build Now, and Full Stage View. The main area displays a build history table with recent builds (#184 to #180) and a stage view grid. The stage view grid compares DEV and GWT environments, showing average stage times and full run times. A large blue box labeled "Nightly" is overlaid on the stage view grid.

This screenshot shows the Jenkins Pipeline ikc_cleanup stage view. It follows a similar layout to the previous one, with a sidebar and a stage view grid. The stage view grid shows a single stage with an average stage time of 685ms and a total run time of ~4s. A message at the bottom indicates that no changes were made.



Firefly use case

1. Jira ticket raised for bugfix in `dev` branch
2. Git branch checkout from dev, fix and push when ready for review
 - `git co dev; git co -b FIREFLY-656;...;git push origin FIREFLY-656`
3. Go to Jenkins to run job*
4. Job status for FIREFLY-656
5. Job succeed? war built, docker image published with tag: FIREFLY-656-bitpix-64-support, image deployed in kubernetes, URL access posted (here)
 - Automatically appeared available in Firefly dev kubernetes
 - Without: `docker pull ipac/firefly:FIREFLY-656-bitpix-64-support`
6. Start pull request and request review of the version deployed

#132 Job

* Job = Build software, pack into docker image and publish it, then deploy in kubernetes by pulling the image and kubectl commands



Jenkins Firefly Job

Jenkins

Back to Dashboard Status Changes Build with Parameters Full Stage View

Pipeline ikc_firefly

This build requires parameters:

FIREFLY_BRANCH: dev (selected)

BUILD_ENV: dev (selected)

ACTION: both (selected)

MEMORY_LIMIT: 2Gi (selected)

REPLICAS: 1 (selected)

DEPLOY_ENV: dev (selected)

KBS_PATH: (empty)

DOCKER_TAGS: (empty)

The sub-path to deploy to, i.e. pr-123. Use '/' for root. Defaults to FIREFLY_BRANCH, converting to lower-case and '-' to '_'. Must be less than 64 characters and contains only lowercase alphanumeric characters or '-'.

Build

#132 Sep 16, 2020 4:10 PM
#131 Sep 16, 2020 12:30 PM
#130 Sep 16, 2020 12:24 PM
#129 Sep 15, 2020 2:56 PM
#128 Sep 15, 2020 1:50 PM

RSS for all RSS for failures

#132 Job

Caltech-IPAC

IRSA-build (unread mentions) Add a topic

Build summary: <http://irsawebdev5.ipac.caltech.edu:8100/job/irsa-build/132/> Wednesday, September 16th dev/503/

jenkins APP 3:34 PM CI test_dev started by null completed with status: SUCCESS

Build summary: http://irsawebdev5.ipac.caltech.edu:8100/job/CI_test_dev/504/

jenkins APP 4:15 PM ikc_firefly started by ejollet completed with status: SUCCESS

Build summary: http://irsawebdev5.ipac.caltech.edu:8100/job/ikc_firefly/132/

k8s URL: <https://fireflydev.ipac.caltech.edu/firefly-656-bitpix-64-support/firefly/>

Thursday, September 17th

jenkins APP 1:27 AM ikc_nightly started by sys completed with status: SUCCESS

Build summary: http://irsawebdev5.ipac.caltech.edu:8100/job/ikc_nightly/179/

k8s URL: <https://fireflydev.ipac.caltech.edu/firefly/>

k8s URL: <https://nightly.irsakudev.ipac.caltech.edu/irsaviewer/>

k8s URL: <https://nightly.irsakudev.ipac.caltech.edu/applications/finderchart/>

k8s URL: <https://nightly.irsakudev.ipac.caltech.edu/applications/sofia/>

k8s URL: <https://nightly.irsakudev.ipac.caltech.edu/onlinehelp/>

k8s URL: <https://nightly.irsakudev.ipac.caltech.edu/applications/wise/>

Back to Dashboard Status Changes Build with Parameters Full Stage View

Pipeline ikc_firefly

Recent Changes

Stage View

	Preparation	Build	Deploy
#132	9s	4min 0s	16s
#131	10s	4min 2s	18s
#130	7s	4min 14s	18s
#129	10s	4min 45s	11s
#128	10s	4min 44s	19s

Average stage times: (Average full run time: 57s)

RSS for all RSS for failures

- Last build (#132), 4 days 18 hr ago
- Last stable build (#132), 4 days 18 hr ago
- Last successful build (#132), 4 days 18 hr ago
- Last failed build (#130), 4 days 21 hr ago
- Last unsuccessful build (#130), 4 days 21 hr ago



IRSA use case

- IRSA UI applications are Firefly-based
 - ✓ inherit shared components from Firefly, like SOFIA, IRSA Viewer
 - 2 github repos with different codebase: Firefly and IFE
 - 1. Identify where the fix should go, sometimes could affect both codebase, Jenkins will have 2 inputs for 2 different branches to pull from
 - 2. Make pull request in both with same branch name for sanity
 - 3. Build and deploy with Jenkins: example
 - http://irsawebdev5.ipac.caltech.edu:8100/job/ikc_ife/197/
 - URL Posted for testing
- #197 Job
- IRSA kubernetes multiple domain where the build of a branch is actually integrated with other services to test changes within IRSA context, couple of examples:
 - ✓ Fixing TimeSeries tool and testing integration from Gator
 - ✓ Radar



Jenkins IRSA Job

Jenkins Pipeline ikc_ife

This build requires parameters:

- APP: irsviewer
- FIREFLY_BRANCH: dev
- IFE_BRANCH: (dropdown menu showing options: irsviewer, finderchart, sofia, ztf, ztf-gwt, sha, heritage-gwt, frontpage-gwt, wise, wise-gwt, iwise-gwt, planck-gwt, ptf-gwt)
- BUILD_ENV: dev
- ACTION: both
- MEMORY_LIMIT: 2Gi
- HOSTNAME: (disabled)
- DOCKER_TAGS: (disabled)
- BACKEND: irsadev.ipac.caltech.edu
- BACKEND_PORT: 443

Build button

#197 Job

Jenkins Pipeline ikc_ife

Stage View

	Preparation	Build	Deploy
#197	11s	2min 47s	3s
#196	7s	2min 44s	3s
#195	8s	2min 46s	3s
#194	10s	2min 37s	3s
#193	8s	2min 50s	2s
#192	23s	2min 58s	7s

Permalinks

- Last build (#197) 2 days, 19 hr ago
- Last stable build (#197), 2 days, 19 hr ago
- Last successful build (#197), 2 days, 19 hr ago
- Last completed build (#197), 2 days, 19 hr ago

Caltech-IPAC Chat

#irsa-build

CI_test_dev started by null completed w/ status: SUCCESS Build summary: http://irsawebdev5.ipac.caltech.edu:8100/job/CI_test_dev/506/ Jenkins APP: 3:19 PM

ikc_ife started by zhang completed with status: SUCCESS Build summary: http://irsawebdev5.ipac.caltech.edu:8100/job/ikc_ife/197/ k8s URL: https://irsa-3696-bolocam.irsakudev.ipac.caltech.edu/irsaviewer/ Jenkins APP: 4:19 PM

CI_test_dev started by null completed with status: SUCCESS Build summary: http://irsawebdev5.ipac.caltech.edu:8100/job/CI_test_dev/507/ Jenkins APP: 1:28 AM

ikc_nightly started by sys completed with status: SUCCESS Build summary: http://fireflydev.ipac.caltech.edu:8100/job/ikc_nightly/181/ k8s URL: https://nightly.irsakudev.ipac.caltech.edu/irsaviewer/ k-RE IRI - https://nightly.irsakudev.ipac.caltech.edu/applications/finderchart Jenkins APP: 1:28 AM

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Thanks

