SOLID TUMOR TRANSLATIONAL RESEARCH
MAKING PRECISION ONCOLOGY POSSIBLE

circleci passing

ONCOSCAPE
https://oncoscape.sttrcancer.org

Continuous Integration & Delivery Example

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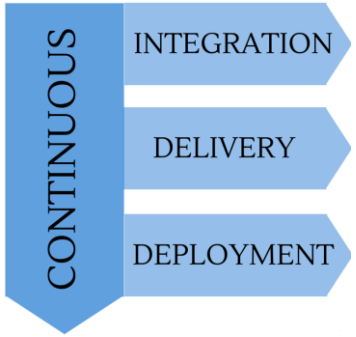
Center IT

Continuous Integration, Delivery and Deployment



*"**Continuous Integration** is a software development practice where members of a team integrate their work frequently; usually each person integrates at least daily – leading to multiple integrations per day." --Martin Fowler*

*"**Continuous Delivery** is a software development discipline where you build software in such a way that the software can be released to production at any time" --Martin Fowler*

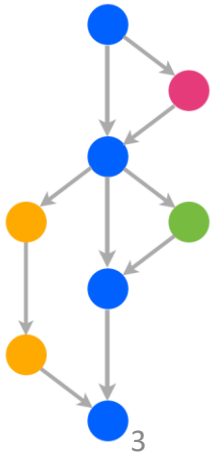
***Continuous Deployment** is a third term that's sometimes confused with Continuous Delivery. Where Continuous Delivery provides a process to create frequent releases but not necessarily deploy them, Continuous Deployment means that every change you make automatically gets deployed through the deployment pipeline.*

Oncoscape

- **Project Overview:** Oncoscape is a web application that hosts an integrated suite of analysis tools for users to explore hypotheses related to molecular and clinical data in order to better understand cancer biology and treatment options
  - **Technology stack**: JavaScript, R, Angular.js, Node.js, Docker, AWS
  - **Team**: 4 internal developers, 1 part time IT engineer and external developers

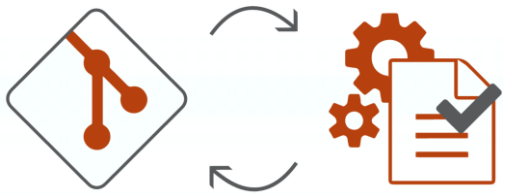
- **Source Code Management**
  - GitHub: https://github.com/FredHutch/Oncoscape
  - Public repository for external collaboration

- **Development Workflow**
  - Two long running branches "**master**" and "**develop**" with a transient number of feature branches
  - Using "GitHub Flow"
  - **Internal workflow**:
    - Create a feature branch off of the develop branch
    - Commit changes to the feature branch
    - Create a "pull request" (PR) targeting the development branch
    - Merge PR after it passes CI tests and team review
    - Delete feature branch after integration is complete



Oncoscape Continuous Integration and Delivery

- **Development Workflow (continued)**



  - **External workflow**:
    - Create a fork of the Oncoscape repository
    - Create a feature branch
    - Commit changes to the feature branch
    - Create a “pull request” (PR) targeting the development branch
    - Merge PR after it passes CI tests and team review
    - Delete feature branch after integration is complete

- **Continuous Integration**
  - Using CircleCI: https://circleci.com/
  - CircleCI integrated with GitHub via Webhooks
  - Any commits, merges or pull requests trigger the CI pipeline
  - Oncoscape is automatically built, run and tested on CircleCI
  - Merges to Master and Develop branches create and register deployable containers
  - Passing CI tests on Master and Develop branches trigger deployment

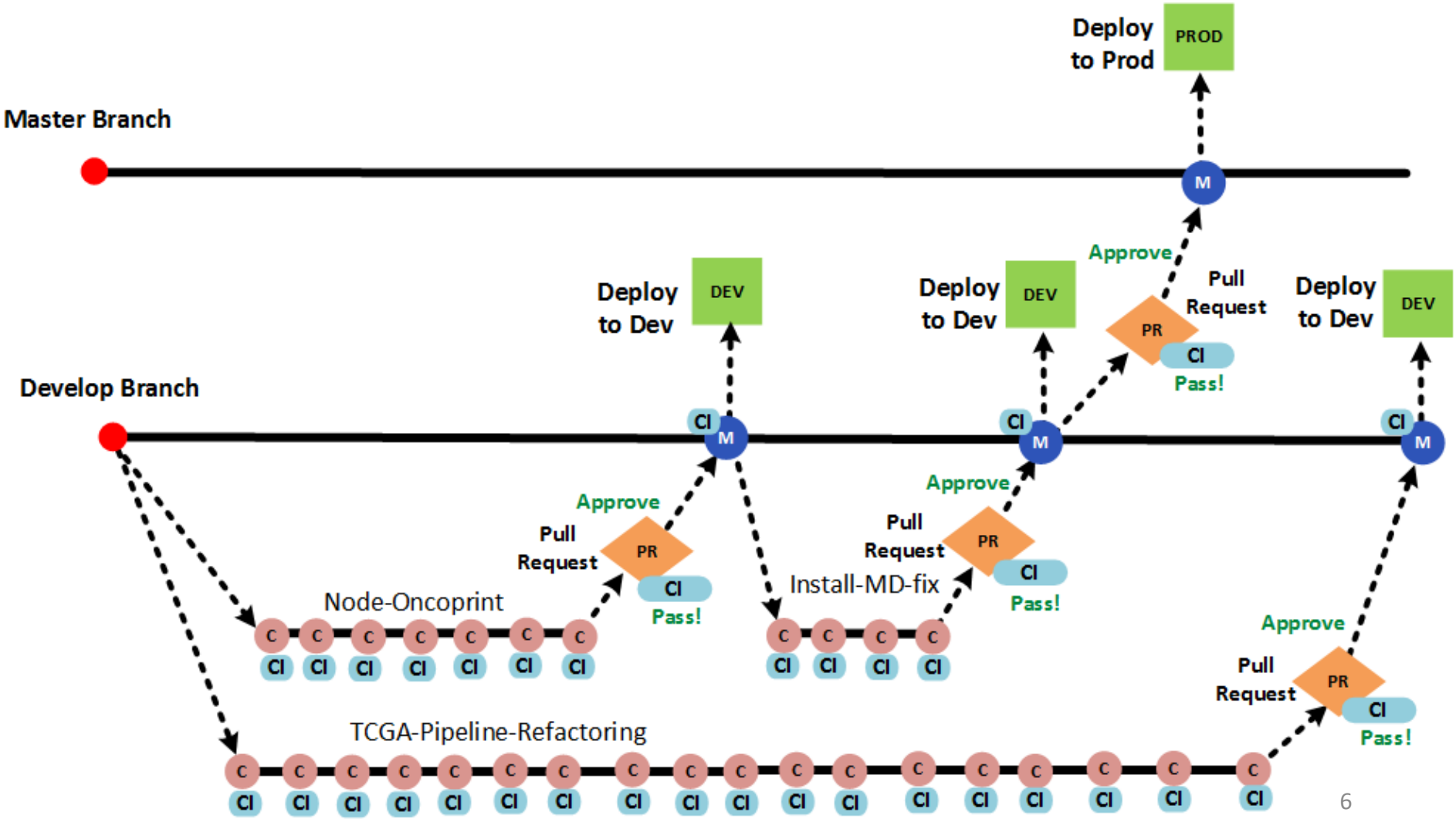
Oncoscape Continuous Integration and Delivery

- **Continuous Deployment**
  - Circle CI triggers deployment services defined in Docker Cloud service
  - Docker Cloud service pulls new container image from registry and deploys it to AWS
  - The deployment is sequential so only one application server is updated at a time

- **Event Notification**
  - Slack pushes notifications to smart phones
  - STTR team notified of every CI event (pass or fail)
  - Notifications of service redeployments
  - Notifications of service health / recovery status

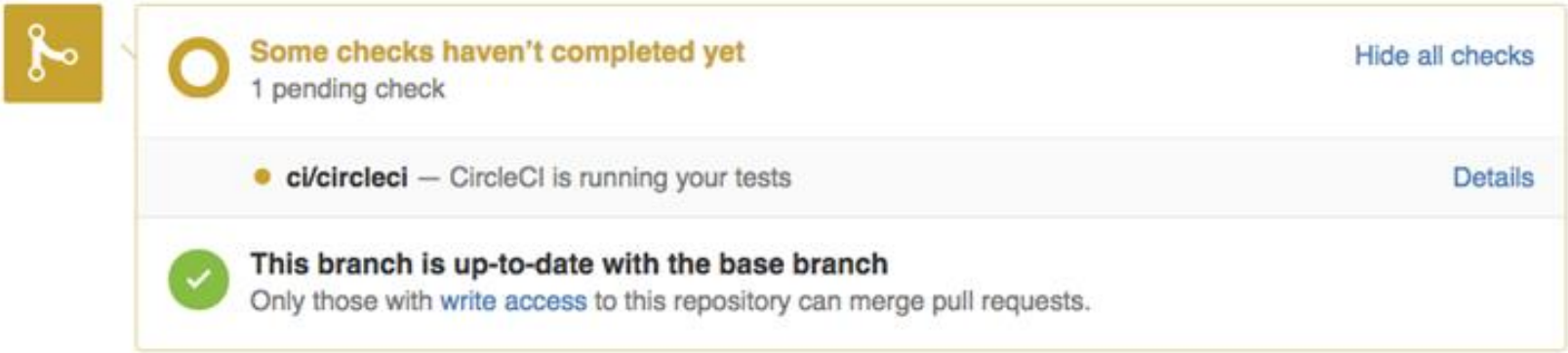
Oncoscape Integration and Deployment Workflow

- All work (commits) happens on feature branches off of the “develop” branch
- Every pushed commit is tested via the CI system
- Feature branches are merged to the “develop” branch via PR workflow
- The “develop” branch is merged to “master” branch via PR workflow

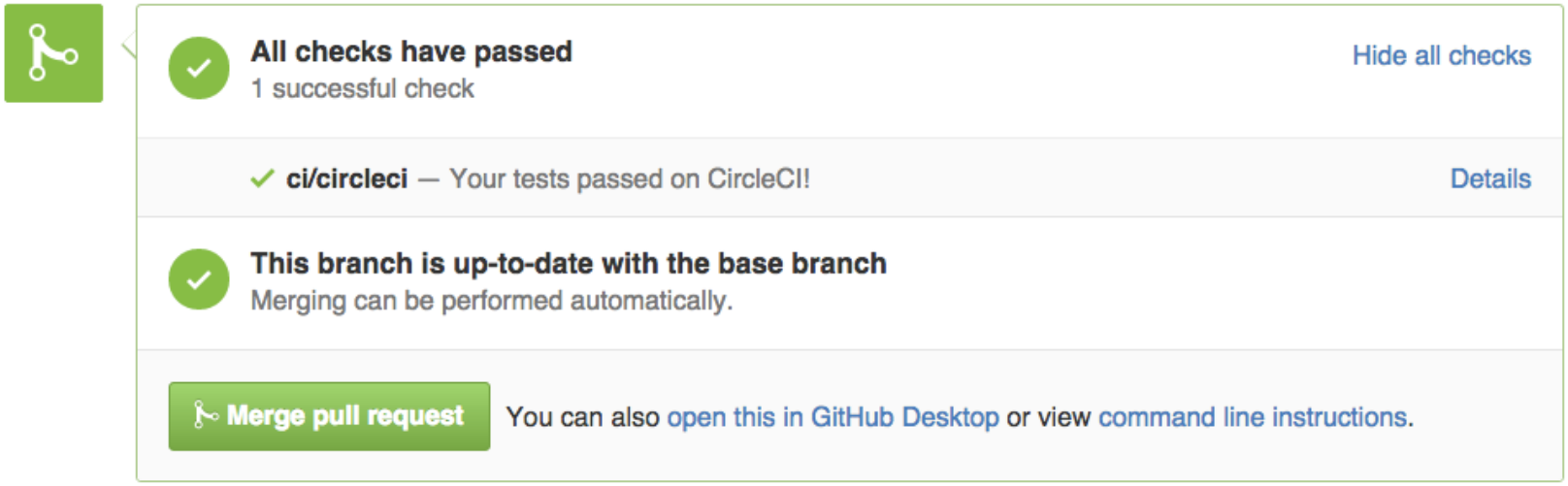


CI and SCM Integration

- Pull request status while CI testing is in progress:

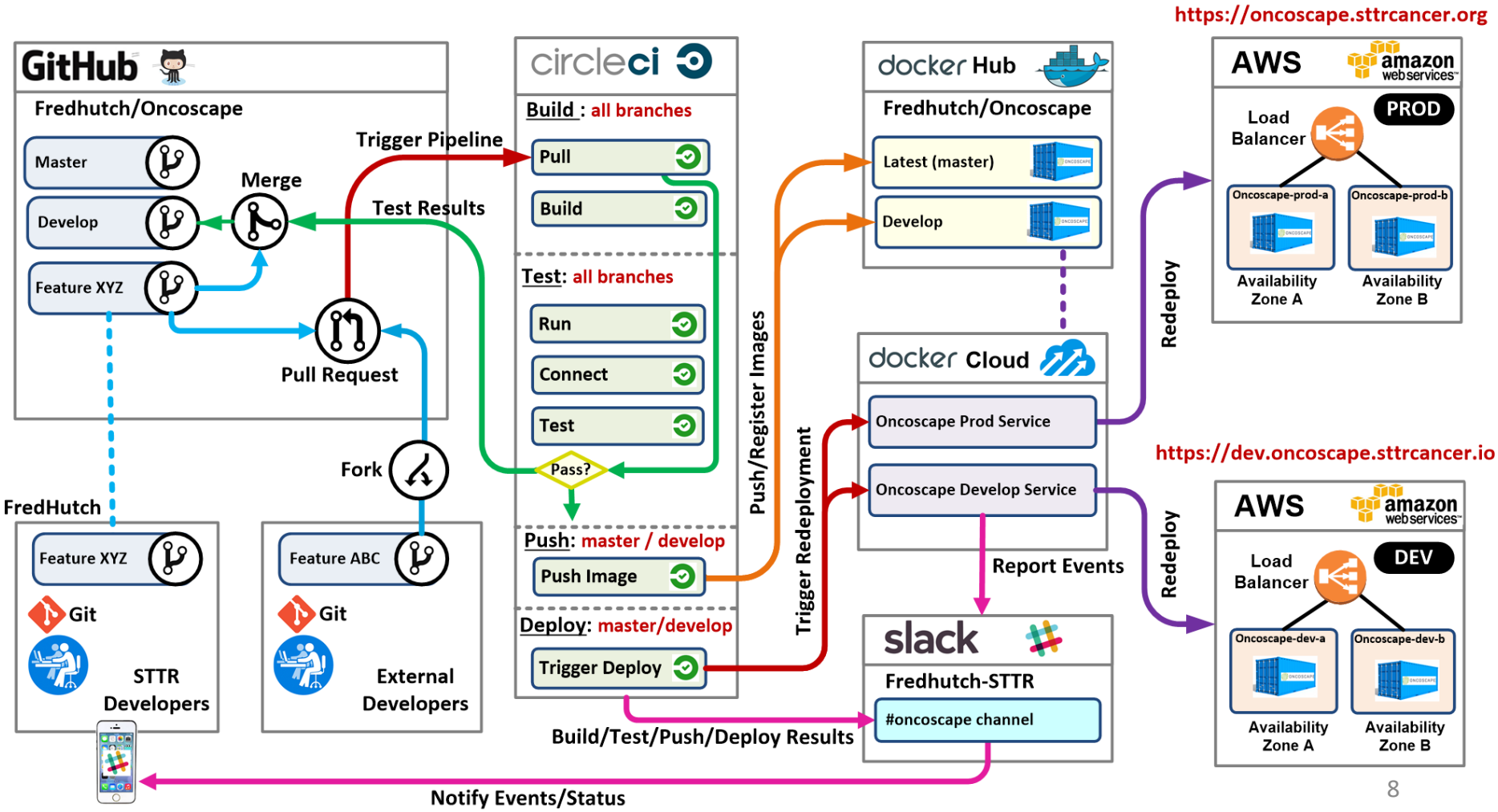


- Pull request status after CI testing is complete; ready to merge without fear



Oncoscape Integration and Delivery Pipeline

- Fully Automated
- Commits/merges to any branch trigger build and testing
- Commits/merges to **Develop** or **Master** branches trigger deployment



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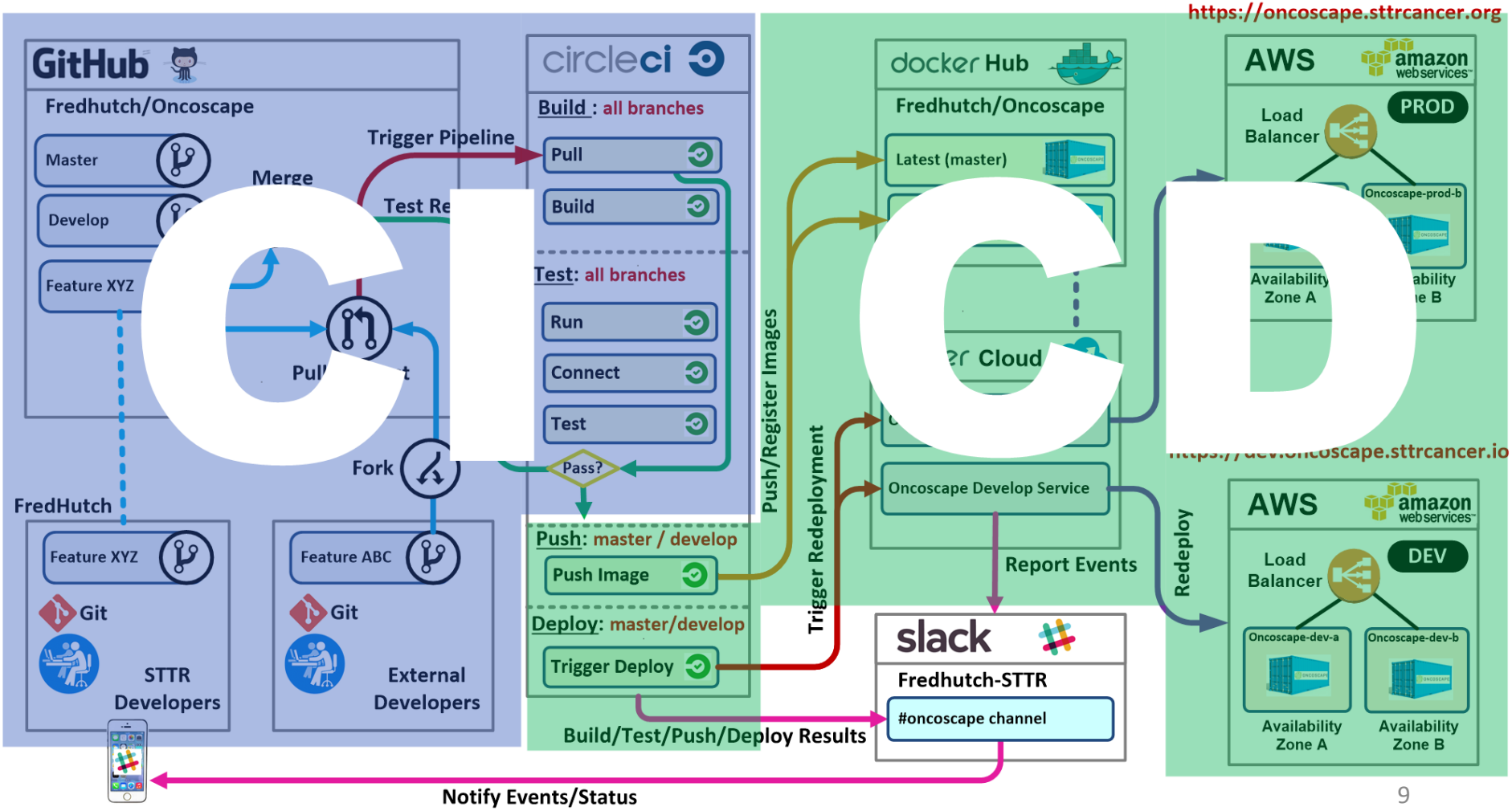

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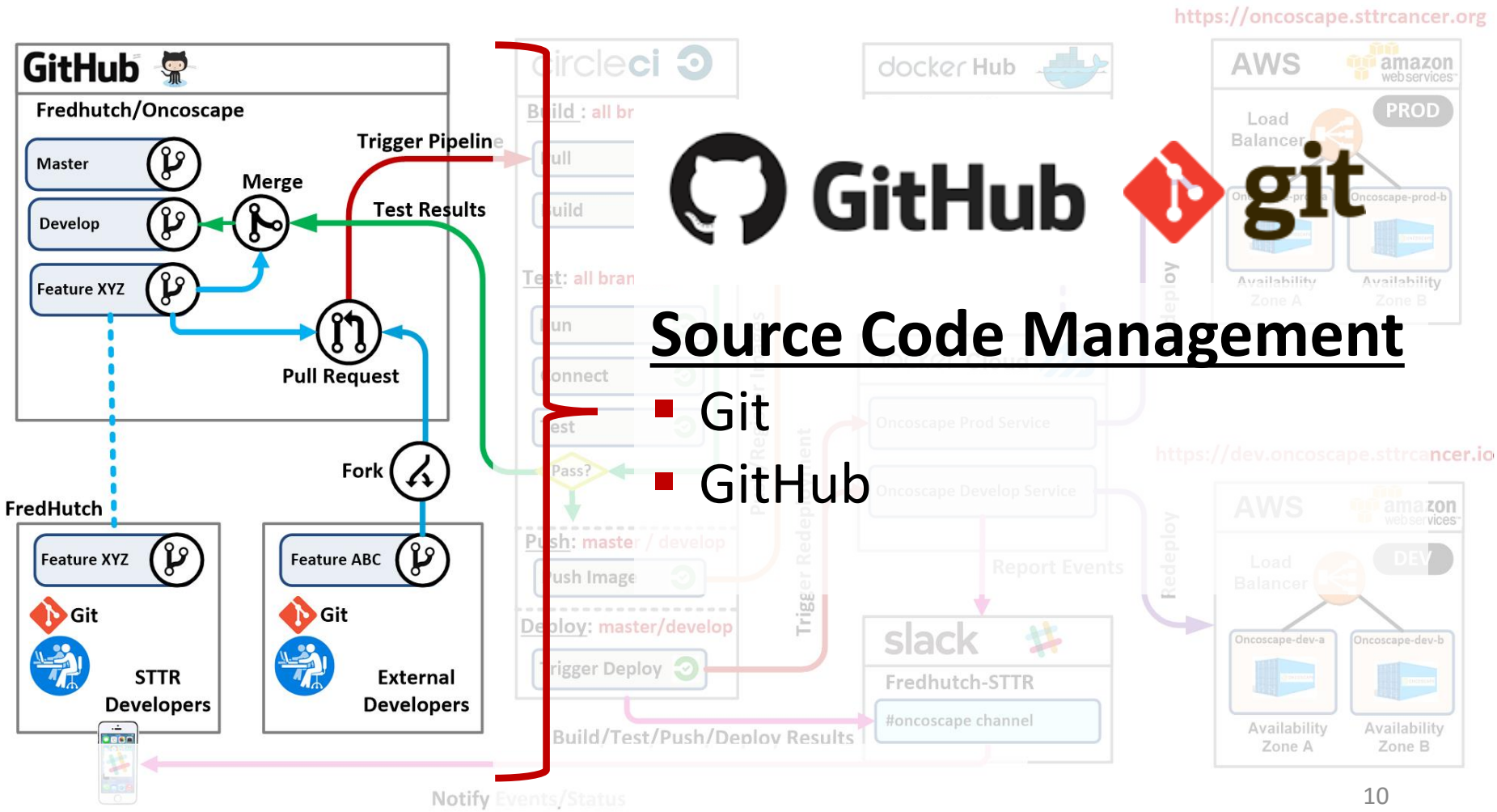

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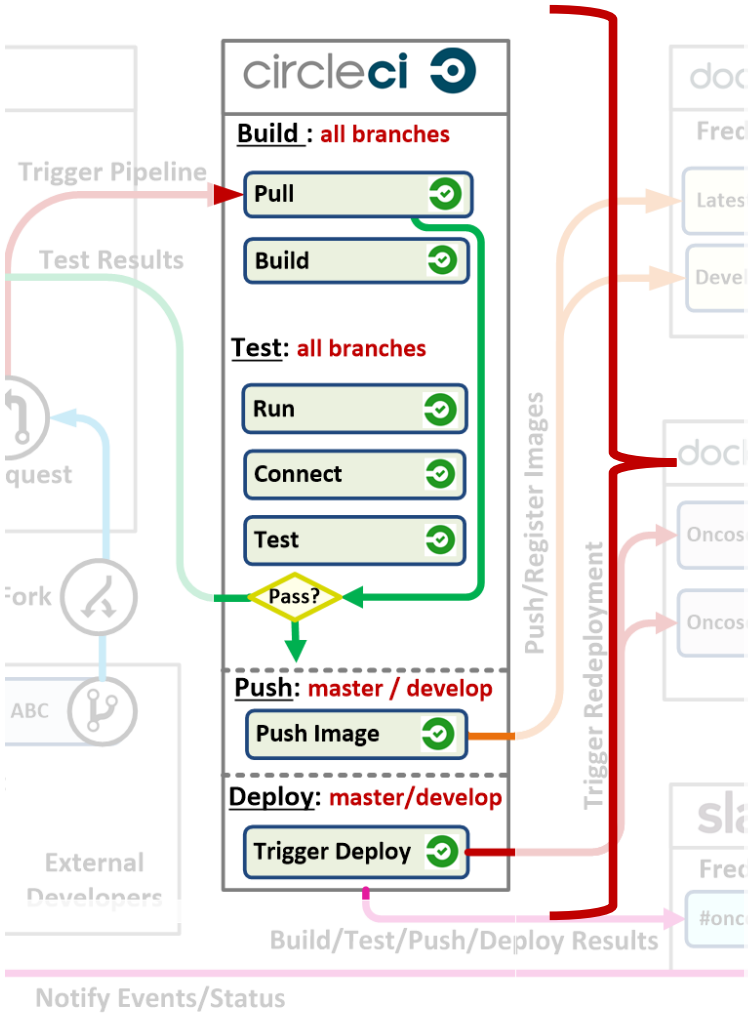


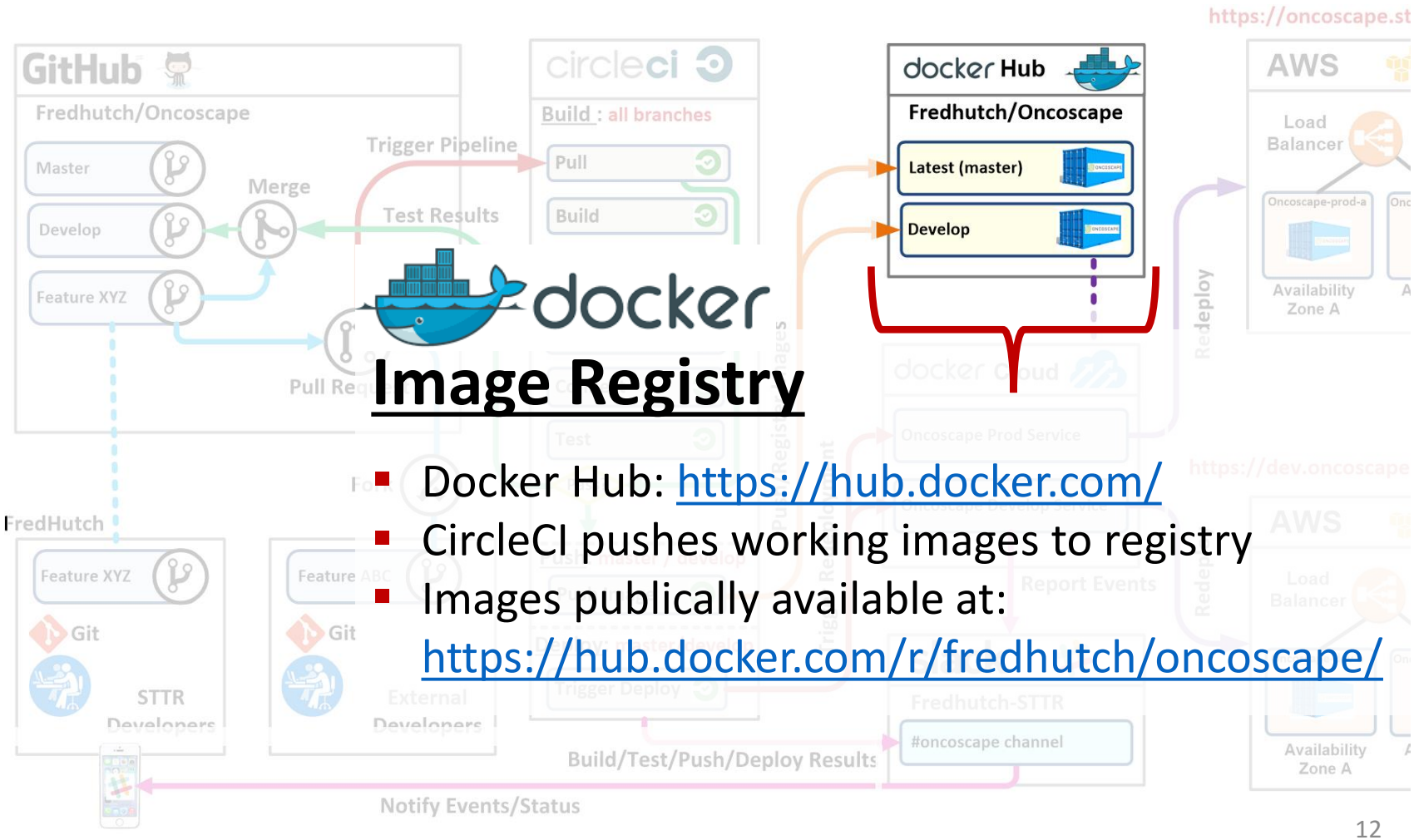
CI Tool

- CircleCI: https://circleci.com/
- Triggered via GitHub webhooks
- Clones repository
- Builds app inside a container
- Runs container
- Connects to Oncoscape application
- Tests Oncoscape application
- Notifies team via Slack of the results

PASS? Master or Develop?

- Push container image to registry
- Trigger deployment
- Notify team via Slack of the status

Oncoscape Integration and Delivery Pipeline

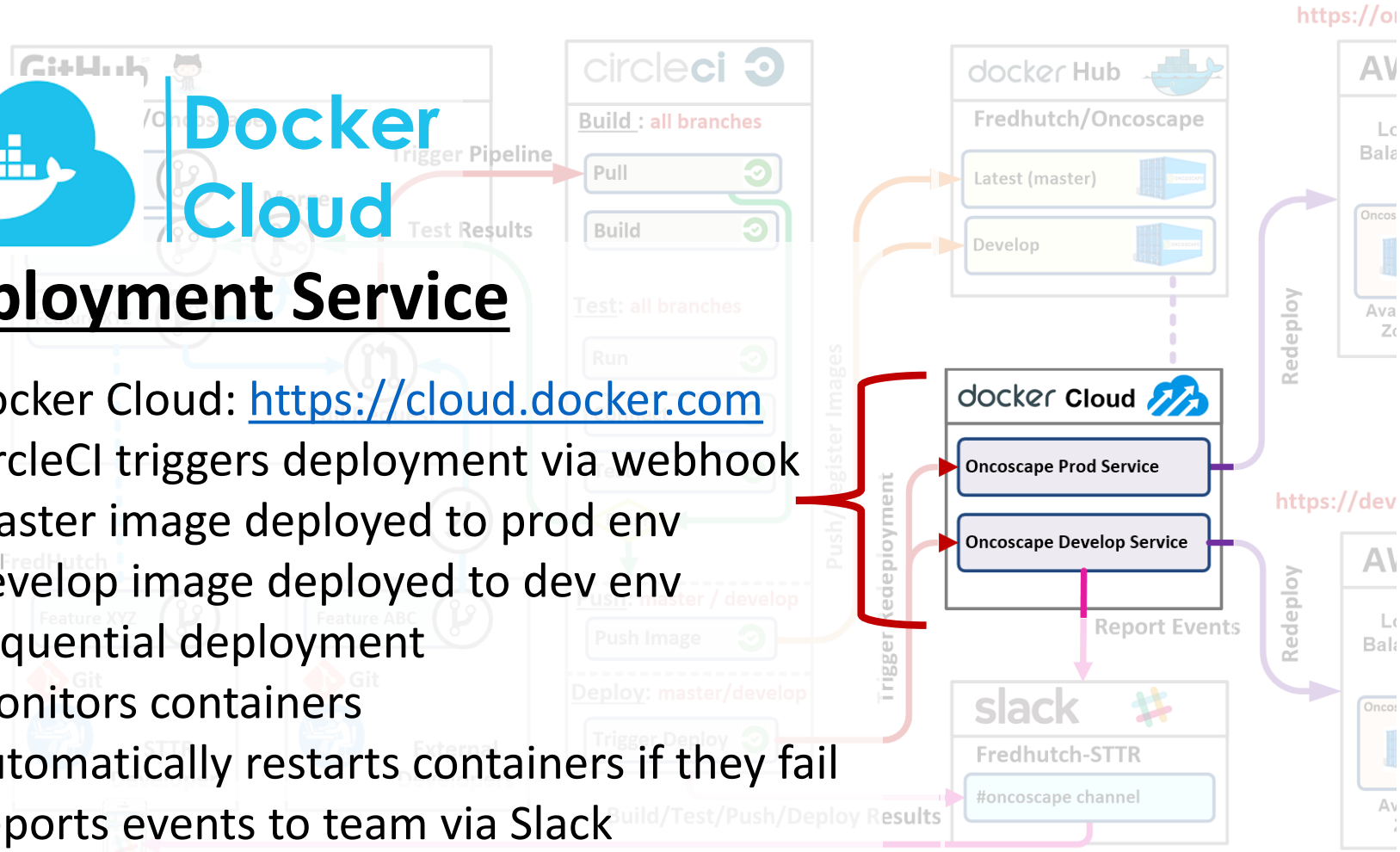


- Docker Hub: https://hub.docker.com/
- CircleCI pushes working images to registry
- Images publically available at: https://hub.docker.com/r/fredhutch/oncoscape/

Oncoscape Integration and Delivery Pipeline

Docker Cloud Deployment Service

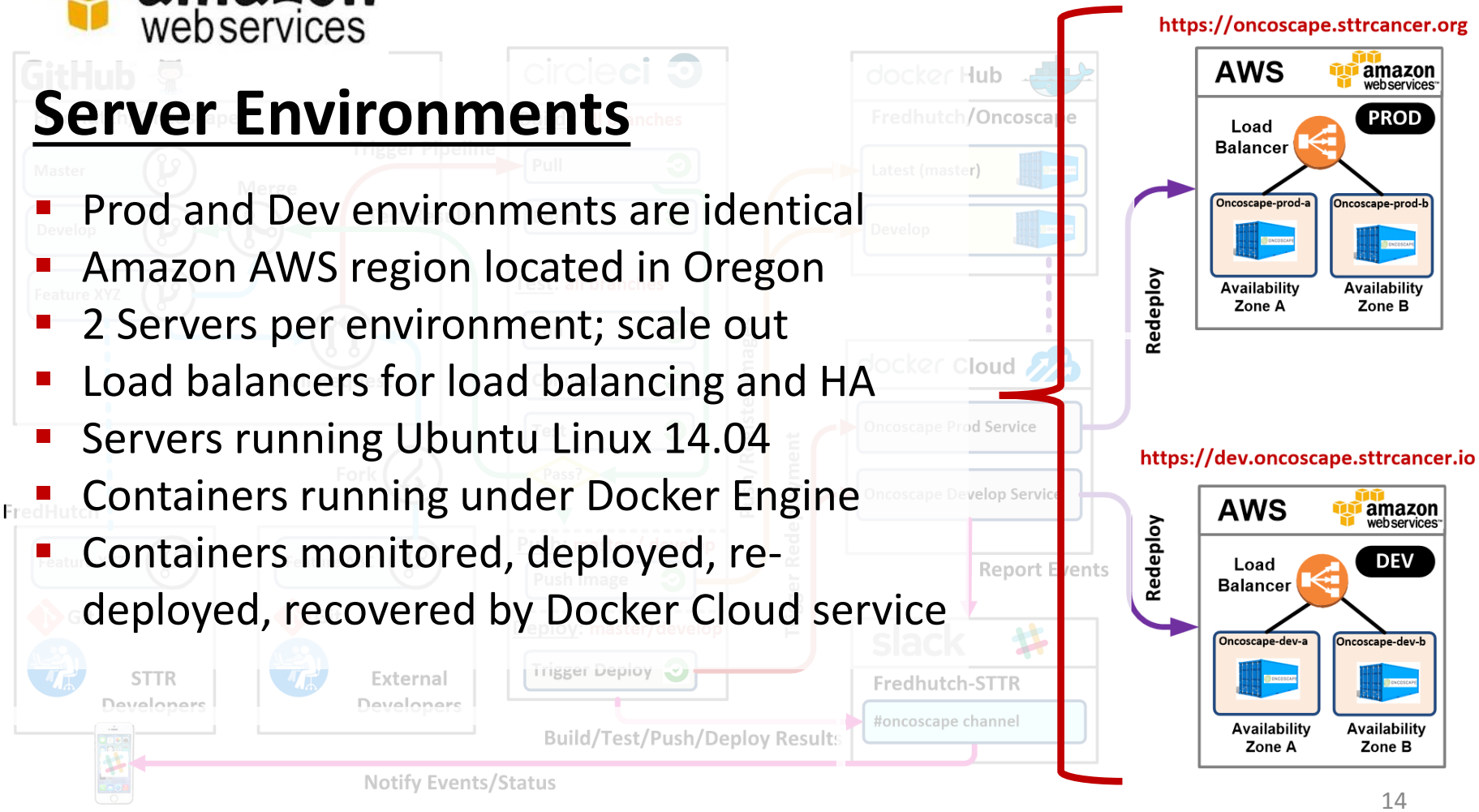
- Docker Cloud: https://cloud.docker.com
- CircleCI triggers deployment via webhook
- Master image deployed to prod env
- Develop image deployed to dev env
- Sequential deployment
- Monitors containers
- Automatically restarts containers if they fail
- Reports events to team via Slack



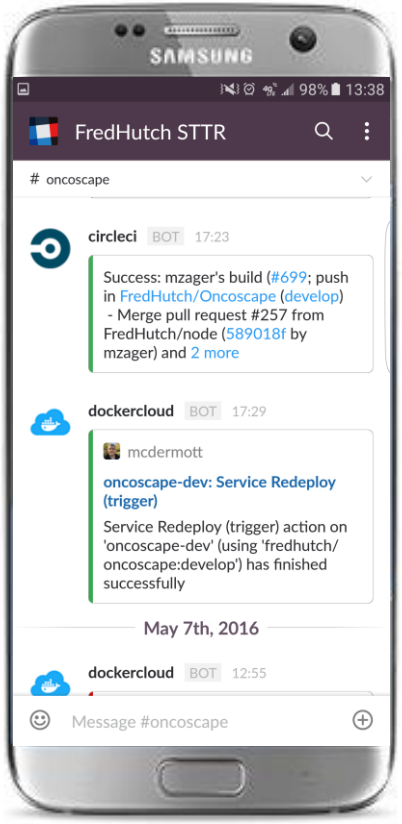
Oncoscape Integration and Delivery Pipeline

Server Environments

- Prod and Dev environments are identical
- Amazon AWS region located in Oregon
- 2 Servers per environment; scale out
- Load balancers for load balancing and HA
- Servers running Ubuntu Linux 14.04
- Containers running under Docker Engine
- Containers monitored, deployed, re-deployed, recovered by Docker Cloud service



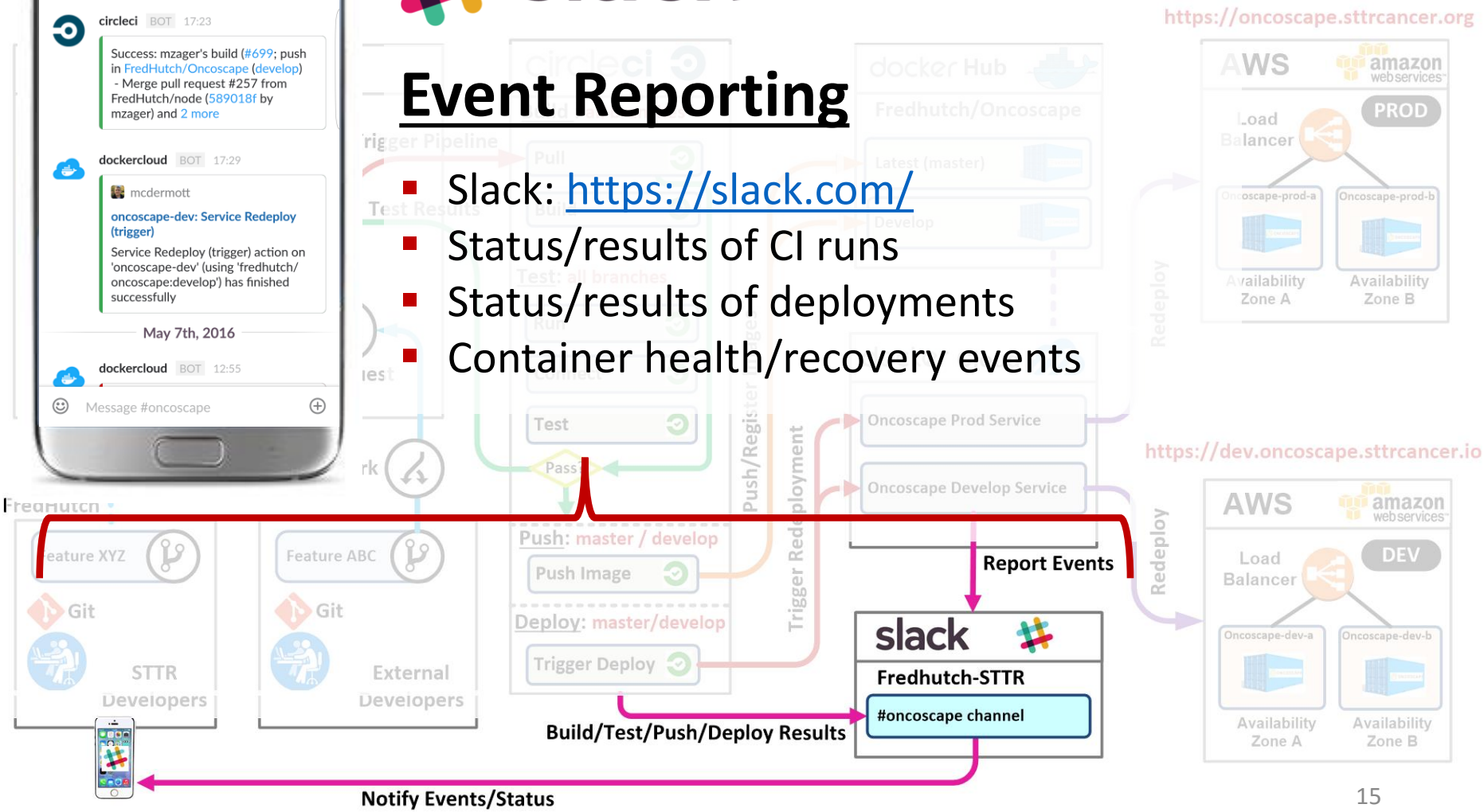
Oncoscape Integration and Delivery Pipeline



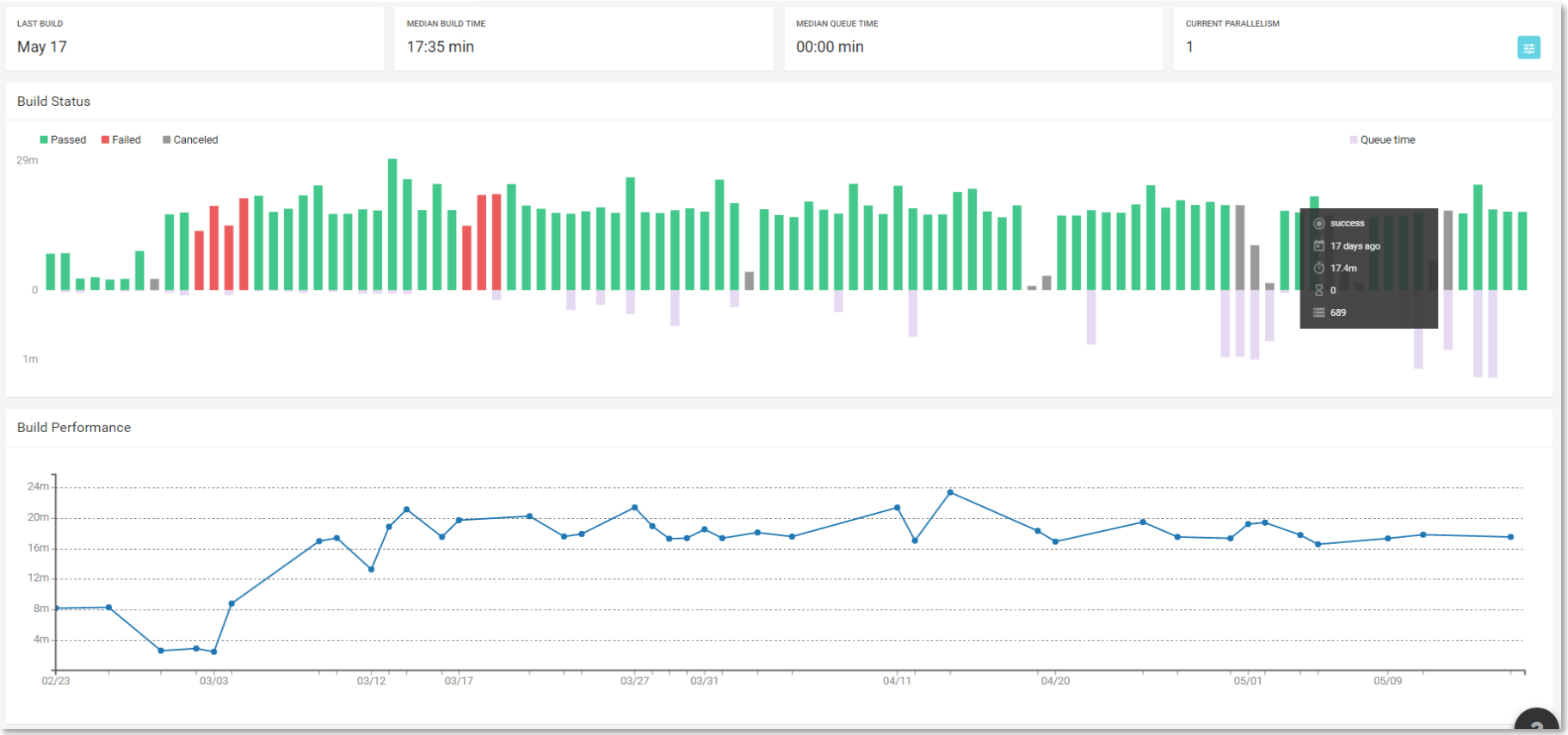
slack

Event Reporting

- Slack: https://slack.com/
- Status/results of CI runs
- Status/results of deployments
- Container health/recovery events

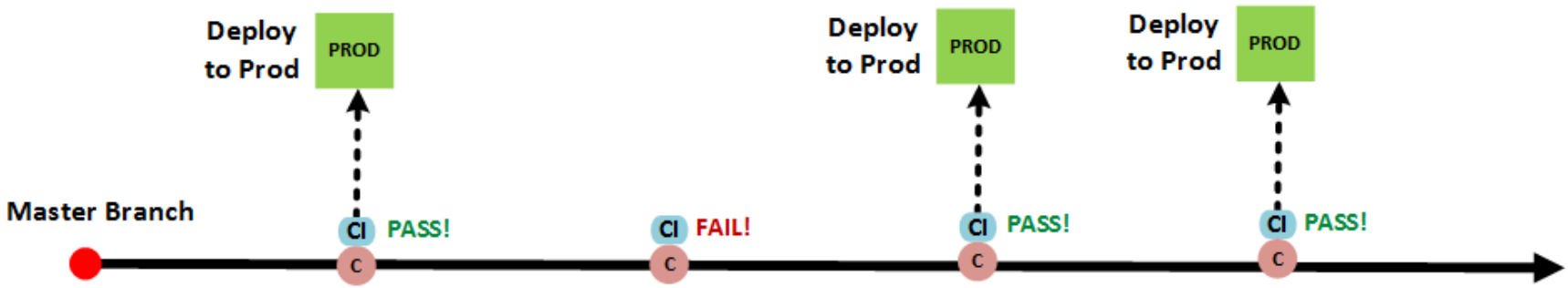


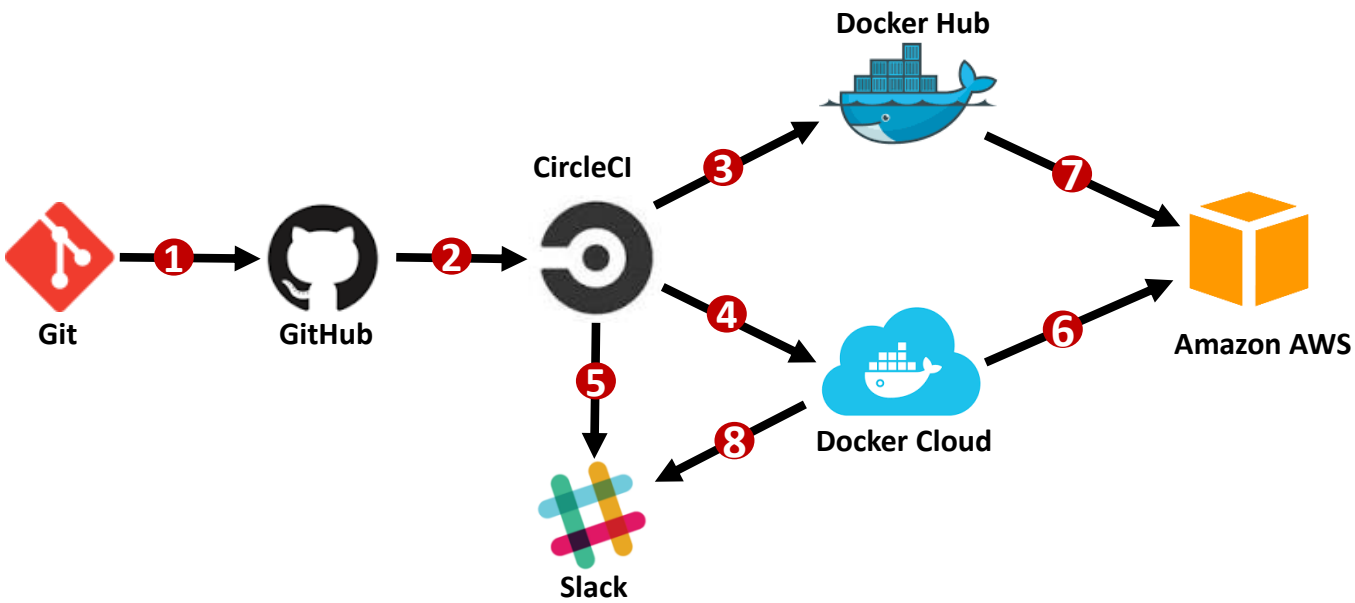
CI Build, Test and Deployment Metrics



Live Demo

- Single environment
- Single branch
- Continuous deployment





Continuous Integration Tool Options

Solution	Site	SCM Support
Travis CI	https://travis-ci.org	GitHub
Circle CI	https://circleci.com	GitHub
CodeShip	https://codeship.com	GitHub, Bitbucket
Drone.io	https://drone.io	GitHub, Bitbucket
Shippable	https://app.shippable.com	GitHub, Bitbucket
Appveyor	http://www.appveyor.com	GitHub, Bitbucket, VSTS (visual studio online)
Distelli	https://www.distelli.com	GitHub, Bitbucket
Jenkins	https://jenkins.io/	SVN, GitHub, Bitbucket, CVS, Perforce, TFS, …

Travis CI

circleci

CODESHIP

distelli

Jenkins

Shippable

AppVeyor

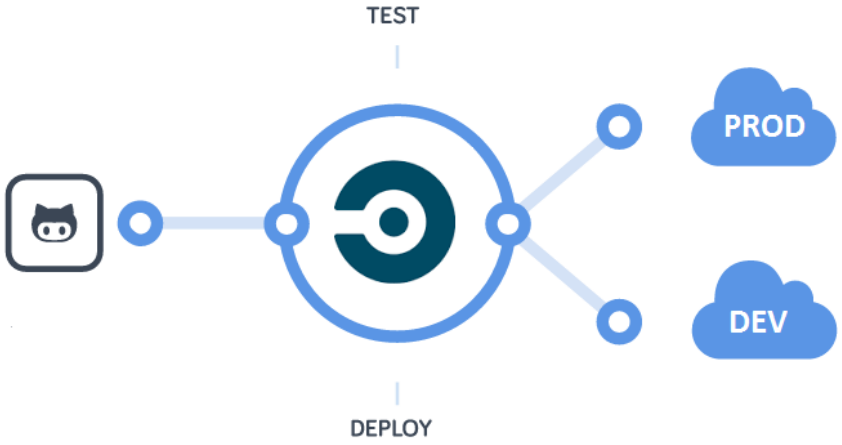
drone.io

SIGN UP WITH GITHUB

CI & CD Principles

- Automate everything: build, test and deployment
- Keep everything in a source code management system (use GitHub)
- Keep ***absolutely*** everything in a source code management system
- Use a CI tool that integrates tightly (webhooks) with your source code repository
- Commit your code to the repository frequently
- Don’t commit directly to a delivery branch; use a feature branch and PR workflow
- Don’t ignore failing CI tests even on feature branches
- Don’t merge broken code to a delivery branch; it must pass the CI system first
- Deploy the same way to every environment
- No-downtime deployments; stateless frontend, load balancer and sequential deployment
- Automated feedback on the entire process
- Use a container technology (Docker) if possible as makes deployment simple
- If the process is painful, you’re doing it wrong

Thank You!



To learn more about Oncoscape:

- **Home page:** http://www.sttrcancer.org/en/biotools/oncoscape.html
- **Code repository:** https://github.com/FredHutch/Oncoscape
- **Application:** https://oncoscape.sttrcancer.org