

# AI4CI

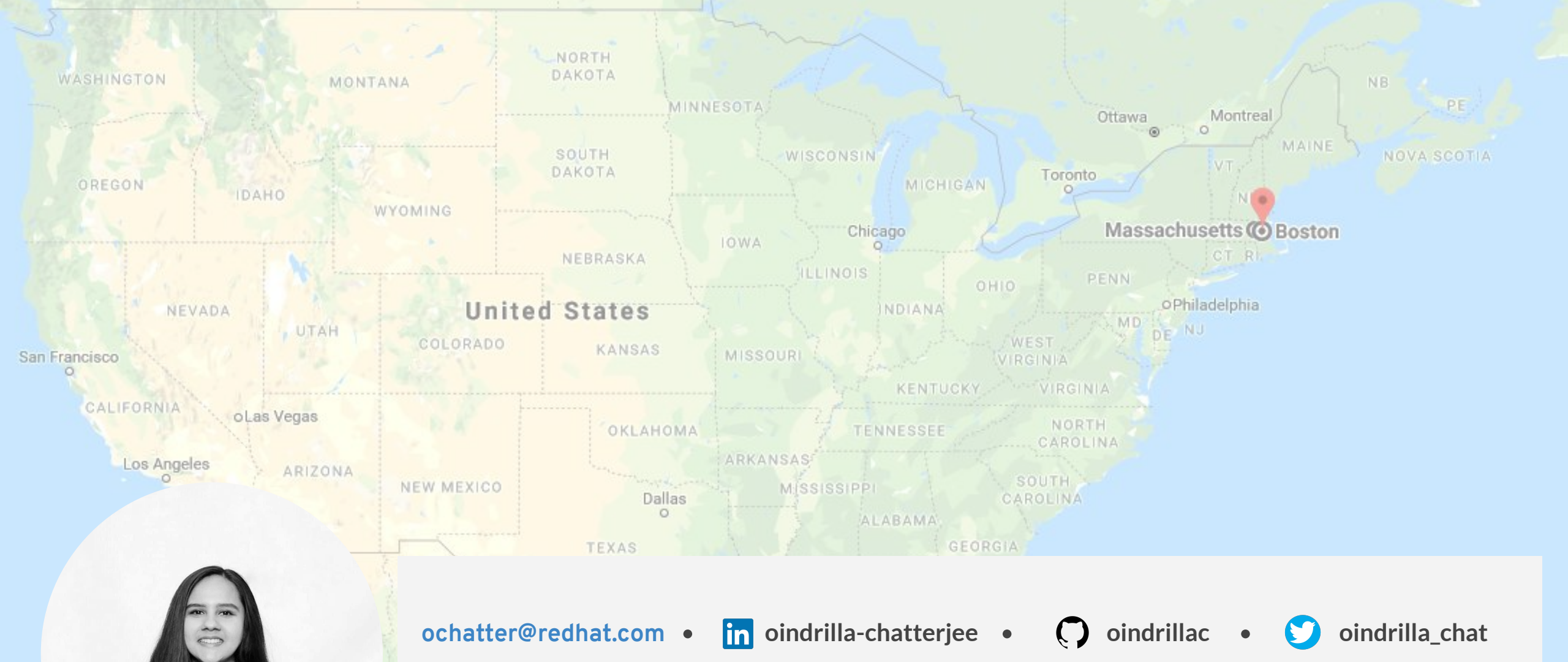
AI for Continuous Integration

Aakanksha Duggal, **Red Hat**  
Oindrilla Chatterjee, **Red Hat**



[aduggal@redhat.com](mailto:aduggal@redhat.com) • [in](#) duggalaakanksha • [GitHub](#) aakankshaduggal • [Twitter](#) duggalaakanksha

Data Scientist at Office of the CTO | AI Center of Excellence |  **Red Hat**  **Boston, United States**



[ochatter@redhat.com](mailto:ochatter@redhat.com) • [in](#) oindrilla-chatterjee • [GitHub](#) oindrillac • [Twitter](#) oindrilla\_chat

Data Scientist at Office of the CTO | AI Center of Excellence |  **Red Hat**  Boston, United States

# Overview

**What is AI4CI?**

**Operate First Cloud**

**Dive Into Open Data Sources**

**TestGrid**

**Prow**

**GitHub**

**Demo**

**Engage**

# Overview

➔ **What is AI4CI?**

**Operate First Cloud**

**Dive Into Open Data Sources**

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# **AI Ops**

AI + DevOps

Artificial Intelligence for IT  
Operations

+

Dev & Ops : **DevOps**

# AIOps

AI + DevOps

# CI/CD

Continuous Integration,  
Continuous Delivery

Artificial Intelligence for IT  
Operations

+

Dev & Ops : **DevOps**

Automating stages of  
app development

**AIOps**

AI + DevOps

+

=

**AI4CI**

*AI for Continuous Integration*

**CI/CD**

Continuous Integration,  
Continuous Delivery




# What is AI4CI?



**Oindrilla Chatterjee**

@oindrilla\_chat



AI4CI = [#AI](#) for [#CI](#) = more visibility  
into builds & intelligent CI/CD  
monitoring 

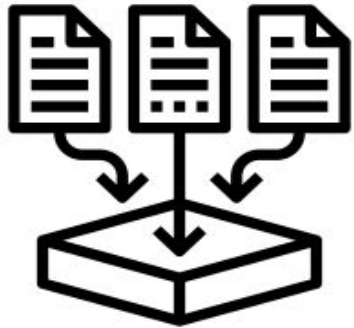
[Translate Tweet](#)

7:54 PM · 8/29/21 · [Twitter for iPhone](#)

# **Our current initiatives**

# Our current initiatives

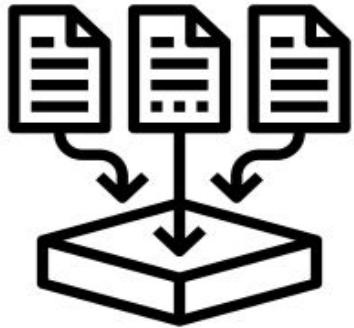
Collecting Data



# Our current initiatives

Collecting Data

Metrics

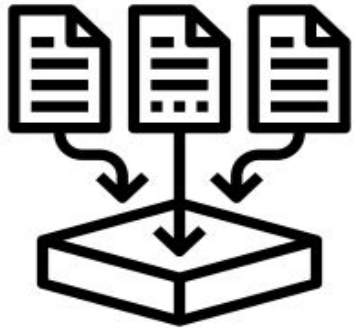


# Our current initiatives

Collecting Data

Metrics

AI/ ML



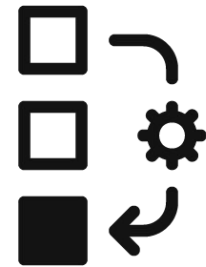
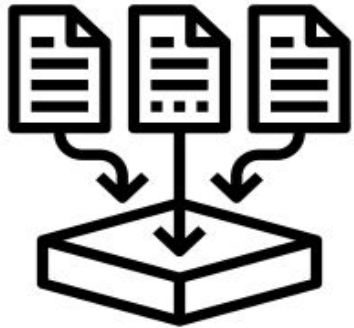
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Collecting Data

Metrics

AI/ ML

E2E Workflow



# Overview

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➔ **Operate First Cloud**

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# Operate First



"A concept to incorporate operational experience into software projects."

*[www.operate-first.cloud](http://www.operate-first.cloud)*



# Operate First



WEBINAR

TUESDAY, OCTOBER 5 • 9:00 AM PDT

## Operate First Community Cloud: A Reference Environment for OSS Workloads and SRE Practitioners

Operate First community cloud - 100% open cloud services, deployments, and SRE work.  
A home for community workloads and aspiring SREs.

Hosted By



**Karsten Wade**  
Senior Community  
Architect, OSPO  
*Red Hat*



**Tom Coufal**  
Principal Software  
Engineer, AIOps  
*Red Hat*



**Marcel Hild**  
Senior Manager,  
Office of the CTO  
*Red Hat*



**Anand Sanmukhani**  
Software Engineer,  
AIOps  
*Red Hat*



**Humair Khan**  
Senior Software  
Engineer, AIOps  
*Red Hat*

Sponsored By



# Overview

**What is AI4CI?**

**Operate First Cloud**

**➡ Dive Into Open Data Sources**

**TestGrid**

**Prow**

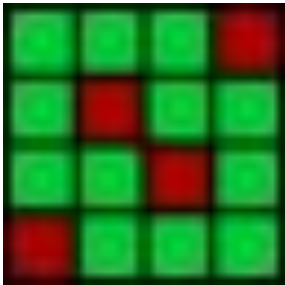
**GitHub**

**Demo**

**Engage**

# Open Data Sources

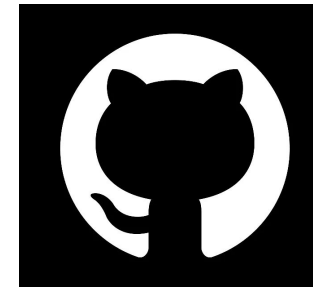
TestGrid



Prow

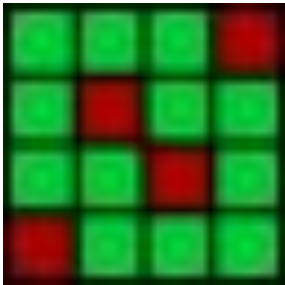


Github



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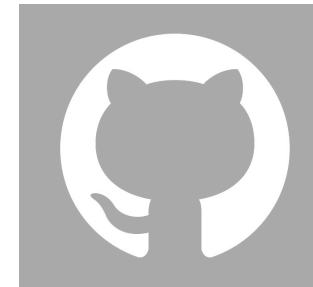
TestGrid



Prow



Github



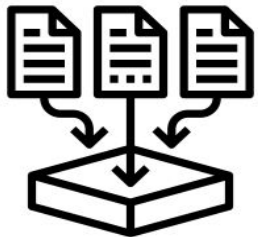
# TestGrid

projob_name: e2e-kops-aws-distro-imagecentos7 projob_config_url: https://git.k8s.io/test-infra/config/jobs/kubernetes/kops/kops-periodics-distros.yaml							
08-12 09:51 PDT @1425862280918077440 -- 05-14 17:50 PDT @1393368069975314432; Served 223344 results in 2.74 seconds							
About	Size	Options	Graph	Local Time: OFF	Display Clustered Failures List		
		08-12		08-11		08-10	
		09:51 PDT	01:51 PDT	17:51 PDT	09:50 PDT	01:50 PDT	17:50 PDT
		14258622809114257414826214256206865514254998177614253790206714252582235214251373692					
		1dae5cda1	adc21d1dd	a4af85bd9	0e01893de	6eab49e05	4a0fa2d10
							c2ff89a4a
Show 29 stale tests (no results in last 10+ runs)							
Overall <a href="#">Changes</a>							
kubetest2.Test <a href="#">Changes</a>		F	F	F	F	F	F
Kubernetes e2e suite.[sig-apps] StatefulSet Basic StatefulSet functionality [StatefulSetBasic] should perform rolling updates and		F	F	F	F	F	F
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: dir-bindmounted] [Testpattern: Pre-provis		F	F	F	F	F	
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: tmpfs] [Testpattern: Pre-provisioned PV (c		F	F	F	F		F
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: dir-bindmounted] [Testpattern: Pre-provis		F	F			F	
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: dir-bindmounted] [Testpattern: Pre-provis		F	F				
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: dir-bindmounted] [Testpattern: Pre-provis		F	F		F		F
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: tmpfs] [Testpattern: Pre-provisioned PV (f		F	F			F	
Kubernetes e2e suite.[sig-apps] StatefulSet Basic StatefulSet functionality [StatefulSetBasic] should provide basic identity		F		F	F	F	F
Kubernetes e2e suite.[sig-network] Networking Granular Checks: Pods should function for node-pod communication: udp [Linux		F					
Kubernetes e2e suite.[sig-network] Services should have session affinity timeout work for NodePort service [LinuxOnly] [Conform		F					
Kubernetes e2e suite.[sig-node] Pods Extended Pod Container Status should never report success for a pending container		F					
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: aws] [Testpattern: Dynamic PV (default fs)] subPath should support		F					F
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: aws] [Testpattern: Dynamic PV (delayed binding)] topology should		F					
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: aws] [Testpattern: Dynamic PV (ext4)] volumes should store data		F					F
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: blockfs] [Testpattern: Pre-provisioned PV		F		F	F		
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: blockfs] [Testpattern: Pre-provisioned PV		F					
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: tmpfs] [Testpattern: Pre-provisioned PV (c		F		F			F
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: dir-link-bindmounted] [Testpattern: Pre-p			F	F		F	F
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: tmpfs] [Testpattern: Pre-provisioned PV (c			F	F		F	
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: local][LocalVolumeType: tmpfs] [Testpattern: Pre-provisioned PV (c			F	F			F
Kubernetes e2e suite.[sig-storage] PersistentVolumes-local [Volume type: dir-link-bindmounted] Two pods mounting a local vol			F	F		F	F
Kubernetes e2e suite.[sig-apps] Deployment should not disrupt a cloud load-balancer's connectivity during rollout			F				
Kubernetes e2e suite.[sig-apps] StatefulSet Basic StatefulSet functionality [StatefulSetBasic] should not deadlock when a pod's			F				F
Kubernetes e2e suite.[sig-cli] Kubectl Port forwarding With a server listening on 0.0.0.0 should support forwarding over websock			F				
Kubernetes e2e suite.[sig-storage] CSI mock volume CSI Volume expansion should not expand volume if resizingOnDriver=off, i			F			F	
Kubernetes e2e suite.[sig-storage] ConfigMap updates should be reflected in volume [NodeConformance] [Conformance]			F				
Kubernetes e2e suite.[sig-storage] Ephemeralstorage When pod refers to non-existent ephemeral storage should allow deletion			F				
Kubernetes e2e suite.[sig-storage] In-tree Volumes [Driver: aws] [Testpattern: Dynamic PV (default fs)] (slowExpansion) volum			F				F

# From **testgrid.k8s.io** to **dashboards**

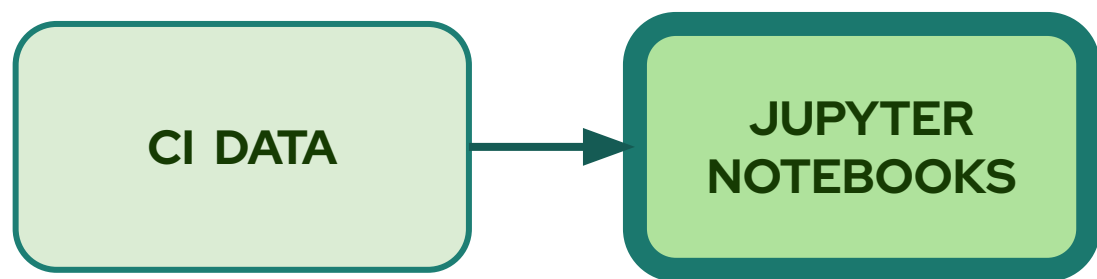
## How?

CI DATA



# From **testgrid.k8s.io** to **dashboards**

## How?



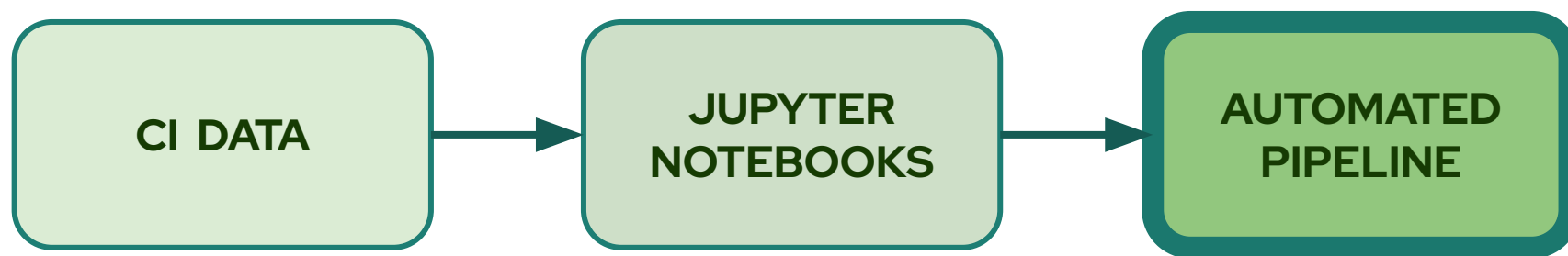
Metrics



ML/ AI

# From **testgrid.k8s.io** to **dashboards**

## How?

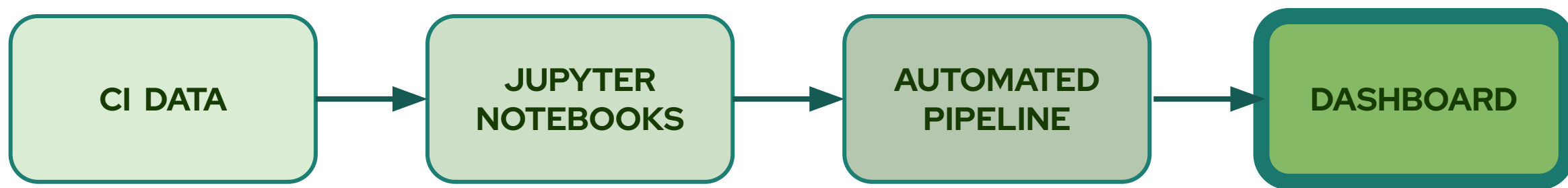


Elyra and Kubeflow  
Pipelines



# From **testgrid.k8s.io** to **dashboards**

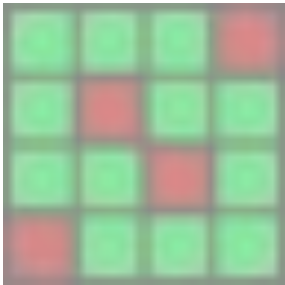
## How?



Superset KPI  
Dashboard

# Open Data Sources

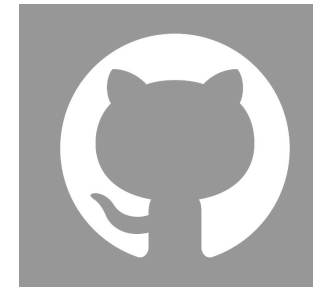
TestGrid



Prow



Github



# Prow

Build Log

Show all hidden linesRaw build-log.txt

```
1 INFO[2021-08-22T14:50:43Z] ci-operator version v20210820-a155604fa-dirty
2 INFO[2021-08-22T14:50:43Z] Loading configuration from https://config.ci.openshift.org for openshift/release#master [ci-4.1]
3 INFO[2021-08-22T14:50:43Z] Resolved SBA missing for master in https://github.com/openshift/release (will prevent caching)
4 INFO[2021-08-22T14:50:43Z] resolved release latest to registry.ci.openshift.org/ocp/release:4.1.0-0.ci-2021-02-04-154232
5 INFO[2021-08-22T14:50:43Z] resolved release initial to registry.ci.openshift.org/ocp/release:4.1.0-0.ci-2021-02-02-193645
6 INFO[2021-08-22T14:50:43Z] Using namespace https://console.build01.ci.openshift.org/k8s/cluster/projects/ci-op-dt5nkrp
7 INFO[2021-08-22T14:50:43Z] Running [input:origin-centos-8], [input:ocp-4.5-upi-installer], [release:latest], [images], e2e-aws
8 INFO[2021-08-22T14:50:44Z] Tagging origin/centos:8 into pipeline:origin-centos-8.
9 INFO[2021-08-22T14:50:44Z] Tagging ocp/4.5upi-installer into pipeline:ocp-4.5-upi-installer.
10 INFO[2021-08-22T14:50:44Z] Importing release image latest.
    skipped 24 lines :
35 level=info msg="Waiting up to 30m0s for the Kubernetes API at https://api.ci-op-dt5nkrp-62e46.origin-ci-int-aws.dev.rhcloud.com:6443..."
36 level=info msg="API v1.13.4+6458880 up"
37 level=info msg="Waiting up to 30m0s for bootstrapping to complete..."
38 level=info msg="Destroying the bootstrap resources..."
39 level=info msg="Waiting up to 30m0s for the cluster at https://api.ci-op-dt5nkrp-62e46.origin-ci-int-aws.dev.rhcloud.com:6443 to initialize..."
40 error=Failed msg="failed to initialize the cluster: Cluster operator monitoring is still updating: timed out waiting for the condition"
41 Setup phase finished, prepare env for next steps
42 Copying log bundle...
43 Removing REDACTED info from log...
44 Copying required artifacts to shared dir
45 ("component":"entrypoint","error":"wrapped process failed: exit status 1","file":"prow/entrypoint/run.go:80","func":"k8s.io/test-infra/prow/entrypoint.Options.Run", "level":"error","msg":"Error executing test process","severity":"error","time":"2021-08-22T15:46:49Z")
46 error: failed to execute wrapped command: exit status 1
47 INFO[2021-08-22T15:47:00Z] Step e2e-aws-ipi-install-install failed after 54m20s.
48 INFO[2021-08-22T15:47:00Z] Running step e2e-aws-gather-core-dump.
49 INFO[2021-08-22T15:47:30Z] Step e2e-aws-gather-core-dump succeeded after 30s.
50 INFO[2021-08-22T15:47:30Z] Running step e2e-aws-gather-aws-console.
51 INFO[2021-08-22T15:47:50Z] Step e2e-aws-gather-aws-console succeeded after 20s.
    skipped 25 lines :
```

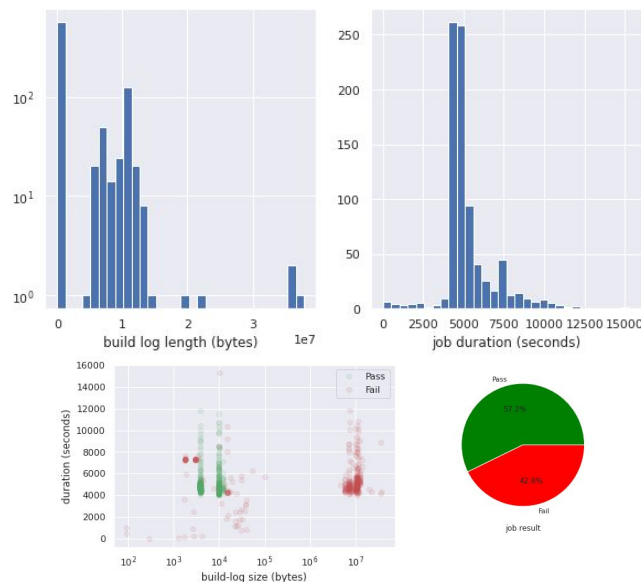
## Build Logs

# Prow

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36 level=info msg="API v1.13.446458880 up"
37 level=info msg="Waiting up to 30m0s for bootstrapping to complete..."
38 level=info msg="Destroying the bootstrap resources..."
39 level=info msg="Waiting up to 30m0s for the cluster at https://api.ci-op-dt5nkrp-62e46.origin-ci-int-aws.dev.rhcloud.com:6443 to initialize..."
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## Build Logs

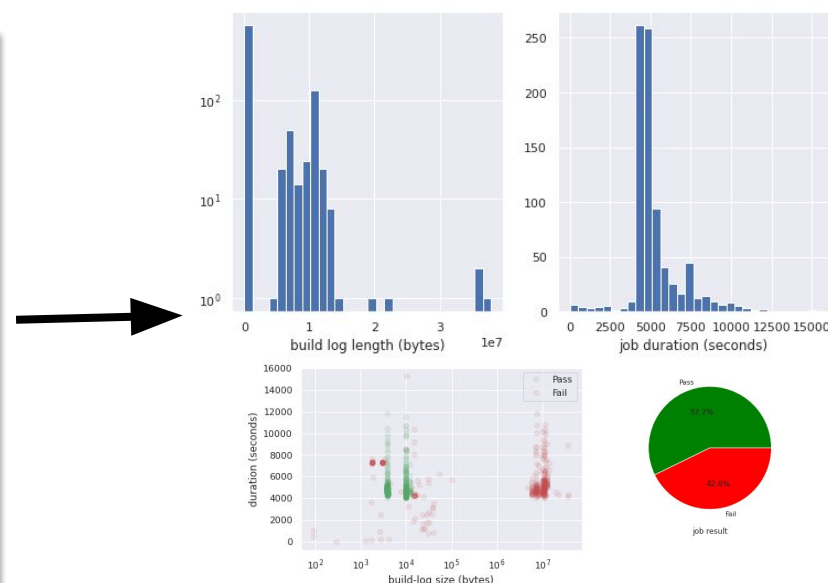
## Log Analyses

# Prow

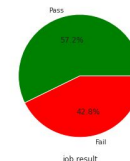
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    skipped 25 lines :
```

Build Logs



Log Analyses



successful builds without provider obfuscation

failures in CI infrastructure (e.g. lack of capacity)

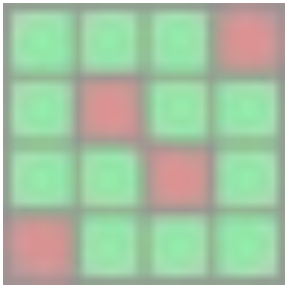
Build failures due to some tests

failures during preparation steps, before tests can be executed

Log Classification

# Open Data Sources

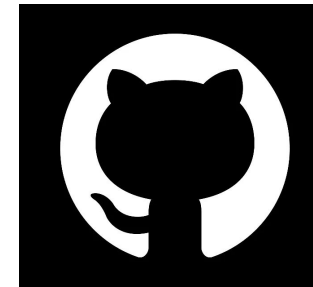
TestGrid



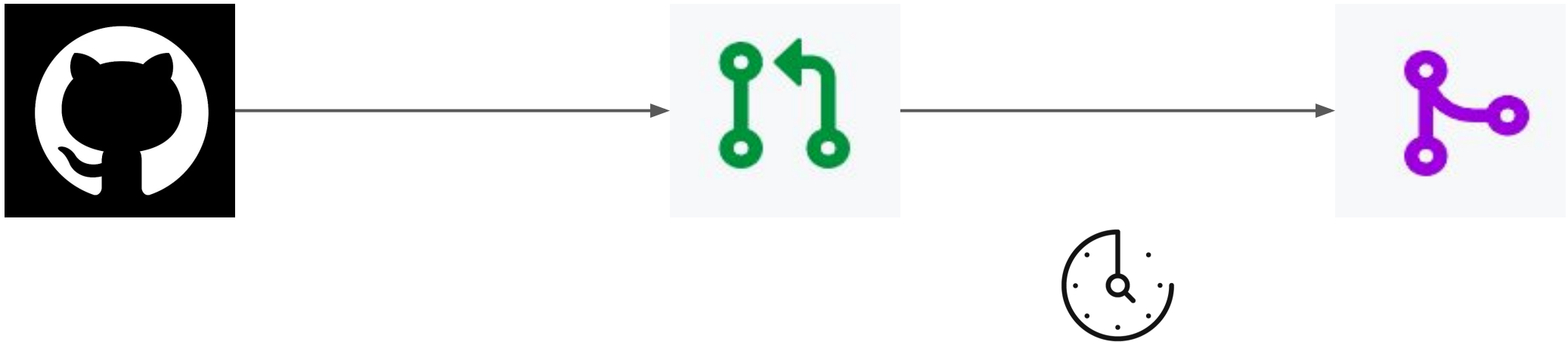
Prow



Github



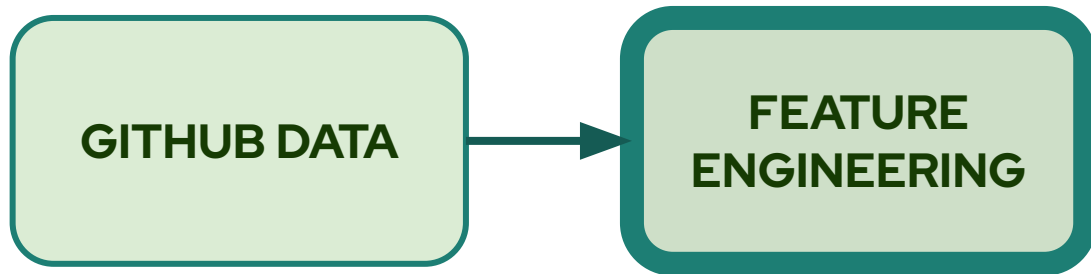
# Time to Merge of a PR



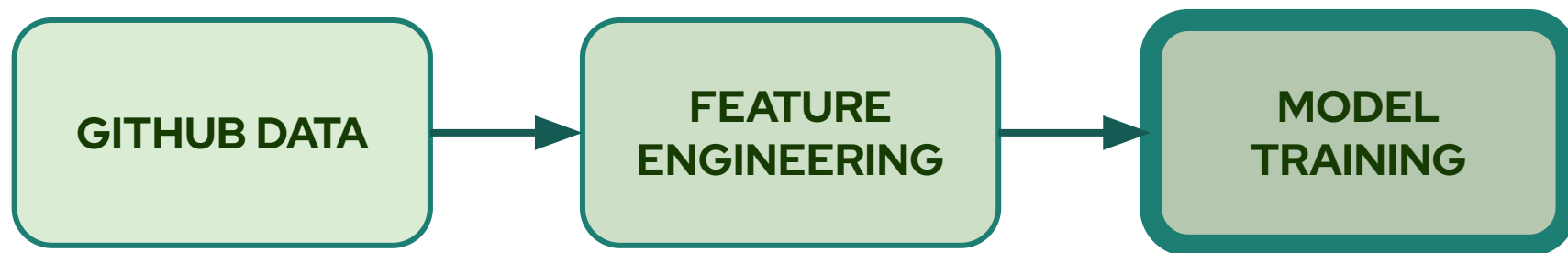
**GITHUB DATA**

 [openshift / origin](#)

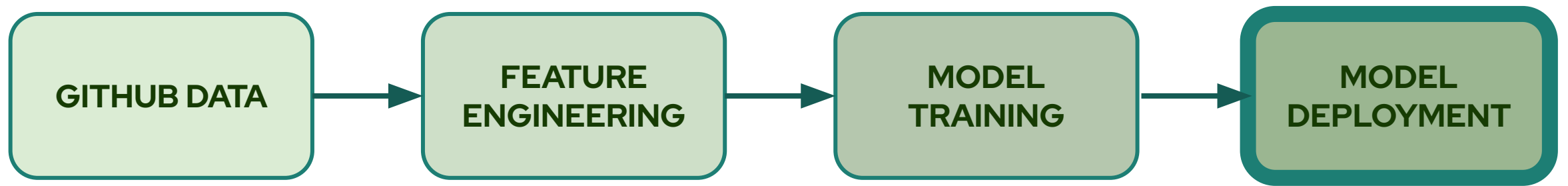




size of the PR,  
types of files in the PR  
description of the PR



Naive Bayes  
XGBoost  
Random Forest  
SVM



# Overview

**What is AI4CI?**

**Operate First Cloud**

**Dive Into Open Data Sources**

**TestGrid**

**Prow**

**GitHub**

**➡ Demo**

**Engage**

# Overview

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**Operate First Cloud**

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**➡ Engage**

# Engage

## Get Started

<https://www.operate-first.cloud/data-science/ai4ci/docs/get-started.md>

Open Data  
Sources



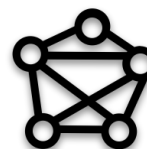
Notebooks



Dashboards



Model Endpoints



Automated  
Workflows



Video Playlist



# Engage

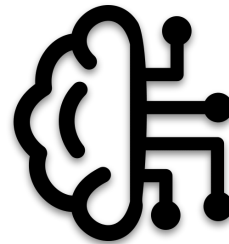
## Contribute

<https://www.operate-first.cloud/data-science/ai4ci/docs/how-to-contribute.md>

KPI Metric



ML Analysis



# Thank you, questions?



<https://github.com/aicoe-aiops/ocp-ci-analysis>



@OperateFirst



<https://tinyurl.com/aiforci>



<https://www.operate-first.cloud/data-science/ai4ci/>



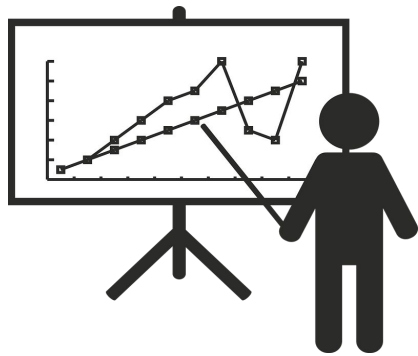


THE LINUX FOUNDATION

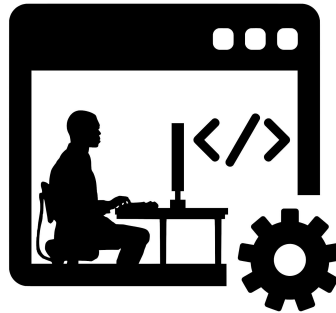
# **S OPEN SOURCE SUMMIT**

Engage!

Data Science Enthusiast



Developer



Kubernetes Contributor

