

Building, Managing and Automating Clusters at Scale With Prow

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About me.

About Me.

Mike Splain - @mikesplain (@everywhere)

- Cloud Infrastructure Lead @ Sonos
- Previously Barkly, PayPal, OurStage
- Kubernetes kops Maintainer
- Kubernetes Boston Meetup Founder

How we got here.

Infra at Sonos

- Application teams build, deploy and manage their own services in production
- Many deploys per day
- Millions of players around the world
- Duplication of code across teams
- Speed up release times



Enter: Kubernetes

So I start by
building a cluster
right?

Not quite...

Think about “Cluster Concerns”

- CIDR Blocks
- Networking to other resources
- DNS
- Security Configuration
 - User access
 - Automation access
- Alpha and Beta Kubernetes API Features
- Cluster monitoring, logging and alerting
- Autoscaling & Node removal

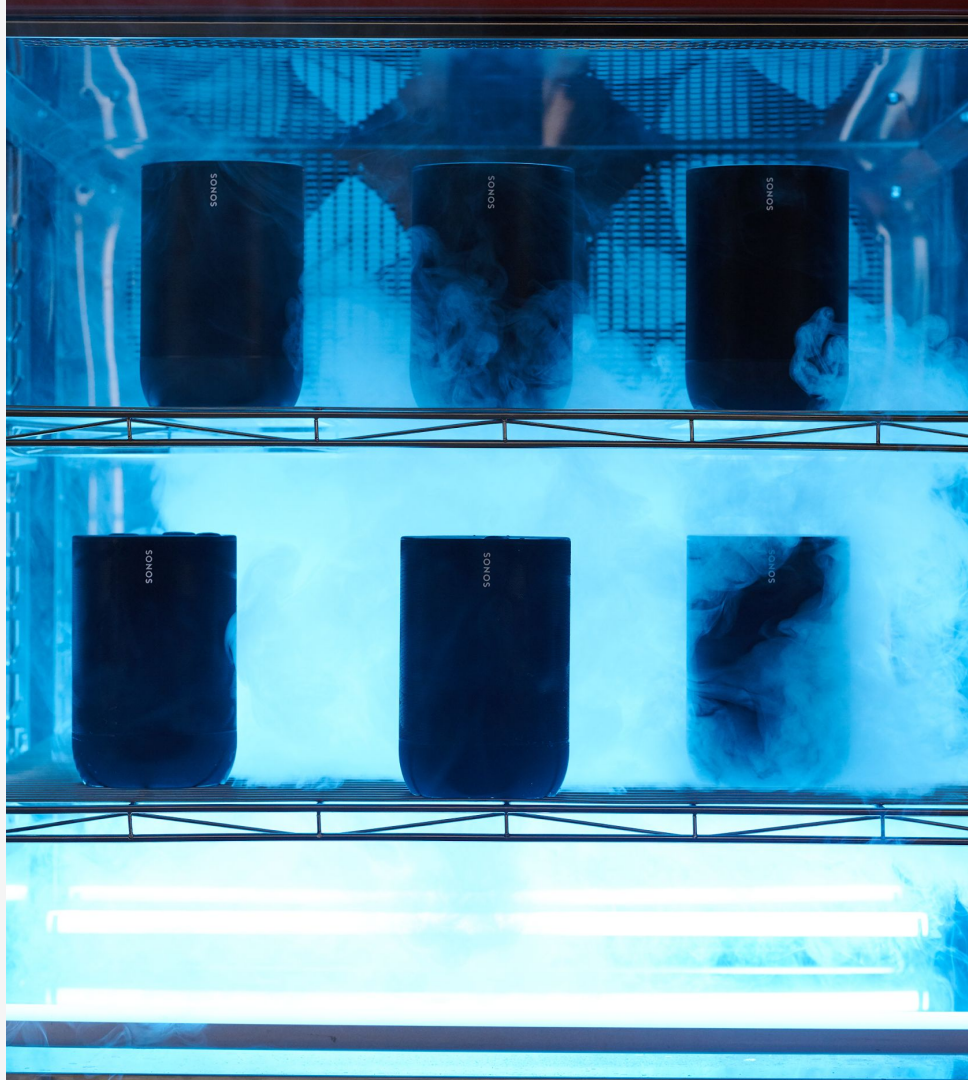
Problems with “building first”

- Clusters become source of truth
- Cloud providers become source of truth
- Not repeatable
- Relies on Humans to decouple and manage

Back to basics:
Our Requirements

Our Requirements

- Cluster configuration in git
 - Idempotent deployment
 - *Almost* identical clusters
 - Independent configuration
 - Embrace fast iteration
-
- Easy Development Experience:
 - Scripts work the same locally or in CI
 - Tools are versioned
 - All changes deployed with code



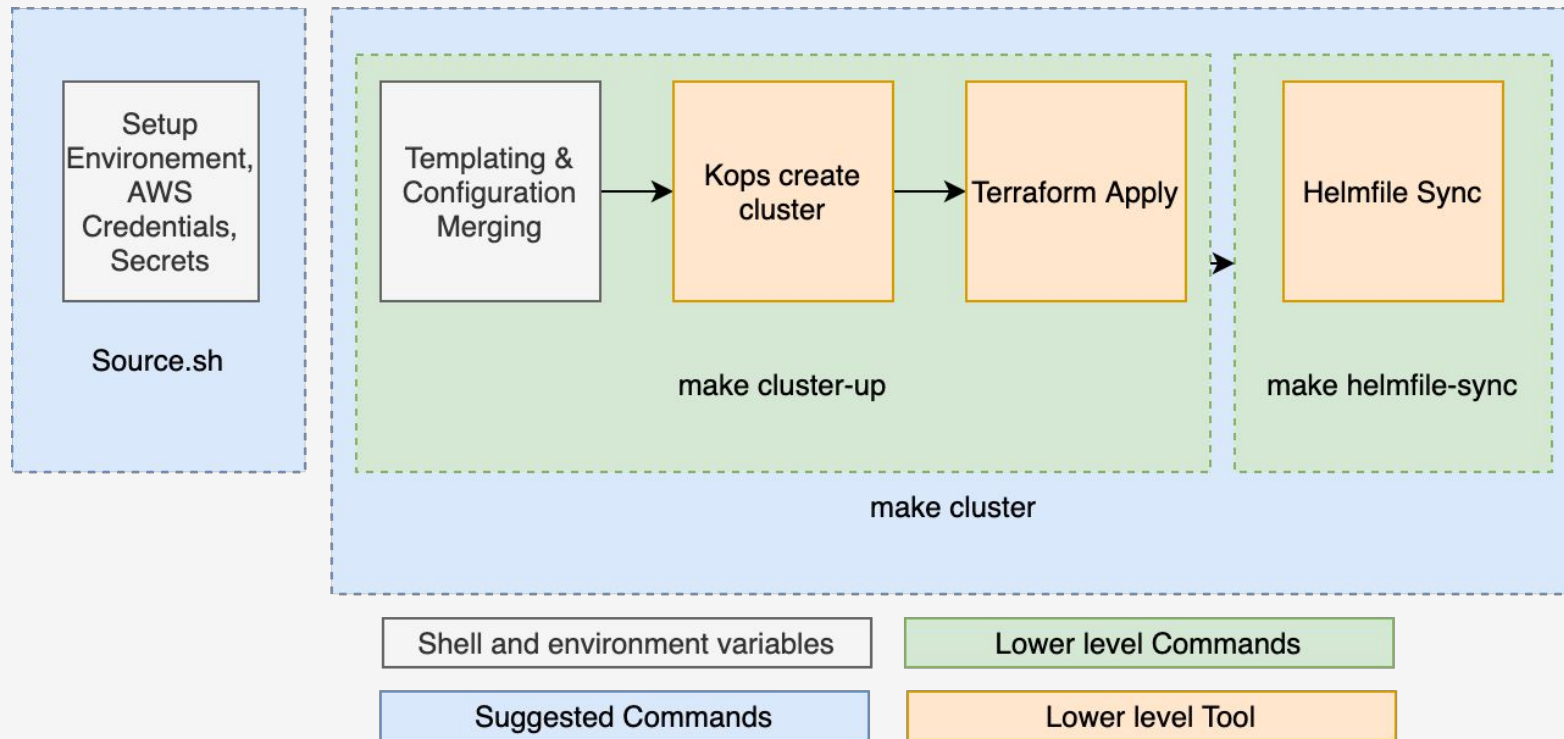
Our Tools

- Kops - Cluster & Cloud Configuration
- Terraform - All other cloud requirements
- Helmfile & Helm - Cluster components
- YQ & Custom Scripting for configuration values

- All tool versions are values

Bringing up a cluster

Cluster Management Workflow



```
# Declare your cluster
```

```
export CLUSTER_NAME=my-cluster-01.us-east-2.k8s.example.com
```

```
# Source for credentials and env config
```

```
source source.sh
```

```
# Bring up cluster
```

```
make cluster
```



```
- name: postsubmit-kubernetes-cluster-update
max_concurrency: 1
run_if_changed: '^(cluster|helmfiles|terraform|tests|tools|Makefile)'
branches:
- ^develop$
spec:
  containers:
  - image: build/base:latest
    imagePullPolicy: Always
    command:
    - make
    - cluster
  env:
  - name: CLUSTER_NAME
    value: my-cluster-01.us-east-2.k8s.example.com
```

Day 2 and beyond?

Updates / Upgrades

New Features

Testing?

Overwhelmed?

We were too!

Git Ops

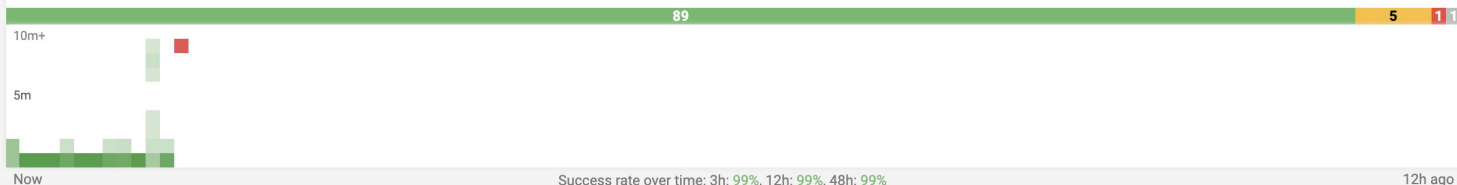
Enter: Prow



Prow Status

Filter **all job types** **all repositories** **>> all pull requests** **all authors** **all states**

Showing 96/96 jobs



	Repository	Revision	Job	Started	Duration
	mikesplain/prowtest	#5 (05104d0) by mikesplain	prowtest	14:56:33	
			tool-versions	14:56:33	
	mikesplain/prowtest	mikesplain-patch-2 (05104d0)	prowtest	14:56:32	
			tool-versions	14:56:32	
			echo-test	14:56:30	7s
	mikesplain/prowtest	#5 (1960f99) by mikesplain	prowtest	14:56:02	7s
	mikesplain/prowtest	mikesplain-patch-2 (1960f99)	tool-versions	14:56:02	
	mikesplain/prowtest	#5 (1960f99) by mikesplain	tool-versions	14:56:02	31s
	mikesplain/prowtest	mikesplain-patch-2 (1960f99)	prowtest	14:56:02	6s
			echo-test	14:55:30	4s



- Job execution similar to Kubernetes
- Plugins and /bot commands in PRs
- Everything lives in Source Control
- In & Out of Repo Job Management
- Fast & Scalable
- Easy HA
- Merge Management

<https://prow.k8s.io>

<https://github.com/kubernetes/test-infra/tree/master/prow>



Types of jobs:

- Presubmits - Jobs run on a Pull Request
- Postsubmits - Jobs run on a branch or “post PR”
- Periodics - Jobs not tied to any repo but run on a cron

Presubmit Job Example

- `name: presubmit-kubernetes-yamllint`
`always_run: true`
`spec:`
 - `containers:`
 - `image: quay.io/kubermatic/yamllint:0.1`
`command:`
 - `yamllint`
 - `-c`
 - `tools/.yamllint.conf`
 - `.prow.yaml`
 - `clusters`

Presubmit Job Example

- `name: presubmit-kubernetes-kind`
 - `labels:`
 - `preset-kind-enabled: "true"`
 - `always_run: true`
 - `spec:`
 - `containers:`
 - `image: build/base:latest`
 - `imagePullPolicy: Always`
 - `env:`
 - `name: CONFIG_REPO_PATH`
 - `value: ./tests/kind-test-cluster-config`
 - `args:`
 - `tests/test-kind.sh`
 - `securityContext:`
 - `privileged: true`



Other presubmit jobs we run:

- Helmfile linter
- Config Linter
- Helmfile upgrade test with diff
- Terraform validation
- More added frequently

PRs

- Tested in about 5-10 minutes
- Once approved, batch merged via Tide

Postsubmit Job Example

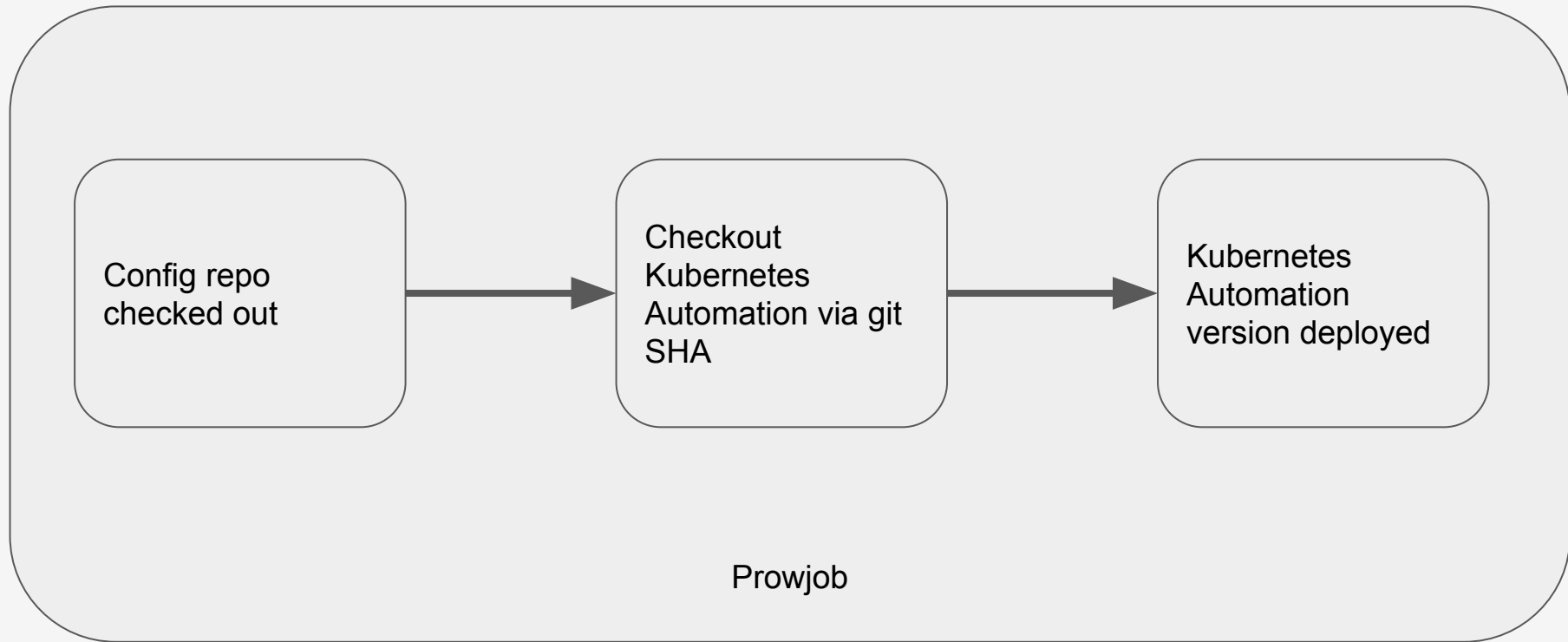
```
- name: postsubmit-kubernetes-cluster-update
  max_concurrency: 1
  run_if_changed: '^(cluster|helmfiles|terraform|tests|tools|Makefile)'
  branches:
    - ^develop$
  spec:
    containers:
      - image: build/base:latest
        imagePullPolicy: Always
        command:
          - make
          - cluster
    env:
      - name: CLUSTER_NAME
        value: my-cluster-01.us-east-2.k8s.example.com
```


Real world example

Separation of Concerns

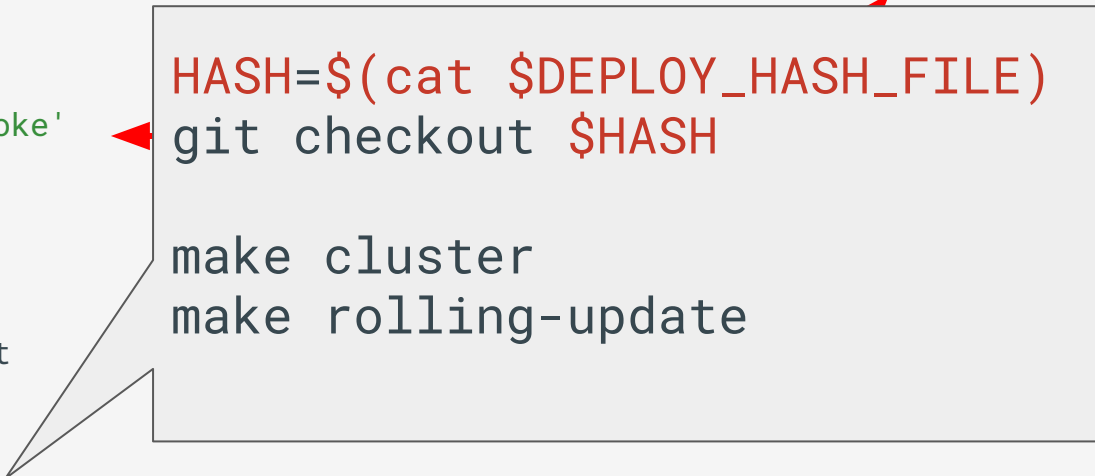
- Repo for Kubernetes Automation tooling and scripts
- Repo for Cluster Configs
- Cluster configs contain specific versions of Kubernetes automation

Decouple automation from configs



Postsubmit Job Example

```
- name: postsubmit-kubernetes-deploy-my-cluster-cluster
  max_concurrency: 1
  run_if_changed: 'environments/my-cluster-01.us-east-2.k8s.example.com/(.*.yaml|.*SHA)'
  branches:
    - main
  reporter_config:
    slack:
      channel: '#something-broke'
      job_states_to_report:
        - failure
        - error
  spec:
    containers:
      - image: build/base:latest
        imagePullPolicy: Always
        args:
          - ci/cluster-update.sh
    env:
      - name: CLUSTER_NAME
        value: my-cluster-01.us-east-2.k8s.example.com
      - name: DEPLOY_HASH_FILE
        value:
environments/my-cluster-01.us-east-2.k8s.example.com/deployedKubernetesRepoSHA
  - name: DEBUG
    value: "true"
```



A callout box with a light gray background and a black border contains the following text:

```
HASH=$(cat $DEPLOY_HASH_FILE)
git checkout $HASH


make cluster
make rolling-update
```

Arrows from the callout box point to the following parts of the configuration:

- A red arrow points from the top right of the box to the `run_if_changed` field.
- A red arrow points from the middle of the box to the `channel` field under `slack`.
- A black arrow points from the bottom left of the box to the `args` field under the `containers` section.

And the glue:
Test-Infra
Autobumper

Autobumper

 [kubernetes](#) / [test-infra](#)

Watch ▾

127

Star


2.4k

Fork


1.6k


<> Code


! Issues 200

 Pull requests 105

▶ Actions


 Projects 2


 Security

 Insights


Update prow to v20201016-11cb57d364, and other images as necessary. #19608


Open with ▾


 Open


 k8s-ci-robot wants to merge 1 commit into [kubernetes:master](#) from [k8s-ci-robot:autobump](#) 


Conversation 2

 Commits 1

 Checks 0

 Files changed 23

+60 -60 

 **k8s-ci-robot** commented yesterday · edited ▾



Contributor 😊 ⋮



Prow changes: [deb1bd1...11cb57d](#) (2020-10-15 → 2020-10-16)

No test-image changes.



No Boskos changes.

/cc @e-blackwelder

  **k8s-ci-robot** requested a review from **e-blackwelder** yesterday

  **k8s-ci-robot** added [cncf-cla: yes](#) [size/L](#) labels yesterday

Reviewers

 **e-blackwelder** 

Assignees

No one assigned

Labels

[area/config](#) [area/jobs](#) [area/label_sync](#) [area/prow/bump](#) [cncf-cla: yes](#) [sig/testing](#) [size/L](#)

Projects

16 config/jobs/kubernetes/test-infra/fejta-bot-periodics.yaml		Viewed	...
@@ -9,7 +9,7 @@ periodics:			
9	testgrid-tab-name: api-review-help	9	testgrid-tab-name: api-review-help
10	spec:	10	spec:
11	containers:	11	containers:
12	- image: gcr.io/k8s-prow/commenter:v20201015-deb1bd1036	12	+ image: gcr.io/k8s-prow/commenter:v20201016-11cb57d364
13	command:	13	command:
14	- /app/robots/commenter/app.binary	14	- /app/robots/commenter/app.binary
15	args:	15	args:
@@ -55,7 +55,7 @@ periodics:			
55	testgrid-tab-name: cla	55	testgrid-tab-name: cla
56	spec:	56	spec:
57	containers:	57	containers:
58	- image: gcr.io/k8s-prow/commenter:v20201015-deb1bd1036	58	+ image: gcr.io/k8s-prow/commenter:v20201016-11cb57d364
59	command:	59	command:
60	- /app/robots/commenter/app.binary	60	- /app/robots/commenter/app.binary
61	args:	61	args:
@@ -94,7 +94,7 @@ periodics:			
94	testgrid-tab-name: close	94	testgrid-tab-name: close
95	spec:	95	spec:
96	containers:	96	containers:
97	- image: gcr.io/k8s-prow/commenter:v20201015-deb1bd1036	97	+ image: gcr.io/k8s-prow/commenter:v20201016-11cb57d364
98	command:	98	command:
99	- /app/robots/commenter/app.binary	99	- /app/robots/commenter/app.binary
100	args:	100	args:
@@ -134,7 +134,7 @@ periodics:			
134	description: Automatically /retest for approved PRs that failed retesting	134	description: Automatically /retest for approved PRs that failed retesting
135	spec:	135	spec:
136	containers:	136	containers:
137	- image: gcr.io/k8s-prow/commenter:v20201015-deb1bd1036	137	+ image: gcr.io/k8s-prow/commenter:v20201016-11cb57d364

Update prowReleaseVersion to 5d51208, for release to test. #45

[Edit](#)[Open with](#) ▼

bot wants to merge 1 commit into `master` from `autobump-test-release`

[Conversation](#) 1[Commits](#) 1[Checks](#) 0[Files changed](#) 1+1 -1 

bot commented 9 days ago • edited ▼



Auto bump for prowReleaseVersion changes:

[Sonos/kubernetes-automation@ ac9c3a6...5d51208](#)

This is an automatically generated job that periodically occurs when we merge into develop in the kubernetes-automation repo. Instead of automatically deploying to the test cluster, the job waits for a PR like this to trigger a deploy to test. Please approve and merge this PR when ready to deploy to test!



bot commented 9 days ago

[Author](#)

[APPROVAL NOTIFIED] This PR is NOT APPROVED

Reviewers



No reviews—at least 1 approving review is required.

Still in progress? Convert to draft

Assignees



No one—assign yourself

Labels

[release](#)[size/XS](#)[tier/tier2](#)

- Extended Autobumper to look for successful prowjob deploys
- Open PR with new git SHA if it's changed

<https://github.com/kubernetes/test-infra/tree/master/experiment/autobumper>

Add more commits by pushing to the **autobump-test-release** branch on **Sonos/kubernetes-config**.



Review required

[Add your review](#)

At least 1 approving review is required by reviewers with write access. [Learn more](#).



Some checks haven't completed yet

[Hide all checks](#)

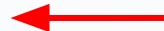
1 pending and 4 successful checks



tide Pending — Not mergeable. Needs approved, lgtm labels.



presubmit-sonos-kubernetes-config-cluster-template-lint — Job succeeded.



[Details](#)



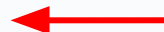
presubmit-sonos-kubernetes-config-terraform-validate — Job succeeded.



[Details](#)



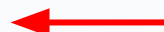
presubmit-sonos-kubernetes-config-yamllint — Job succeeded.



[Details](#)



pull-devops-kubernetes-config-validate-prow-yaml — Job succeeded.



Required

[Details](#)



Merging is blocked

Merging can be performed automatically with 1 approving review.

Our Autobumper

- Jobs run as periodics a few times a day
- Jobs look at other successful deploys
- PRs are opened and updated automatically
- Humans approve PRs, triggering cluster updates.

Future Goals

- Improve and contribute autobumper changes
- Testgrid to view our test results and deploy progress through clusters
- Additional Slack integration - announce upgrade windows
- Job templater to auto generate prowjobs
- Better contents for Upgrade PRs

Resources

- Prow in the wild: prow.k8s.io
- Prow Code:
<https://github.com/kubernetes/test-infra>
- ProwUp:
<https://github.com/mikesplain/prowup>
- Useful Prow Talks:
<https://github.com/kubernetes/test-infra/tree/master/prow#useful-talks>



Thank you!

Questions?

@mikesplain