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How to Preview and Diff Your Argo CD Deployments

Argo Con 2023

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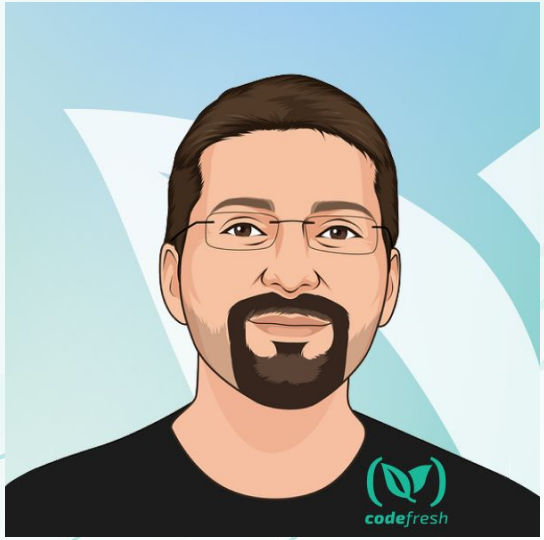
- Codefresh is the Enterprise Platform for Argo
- Co-author of GitOps certification with Argo -> http://learning.codefresh.io



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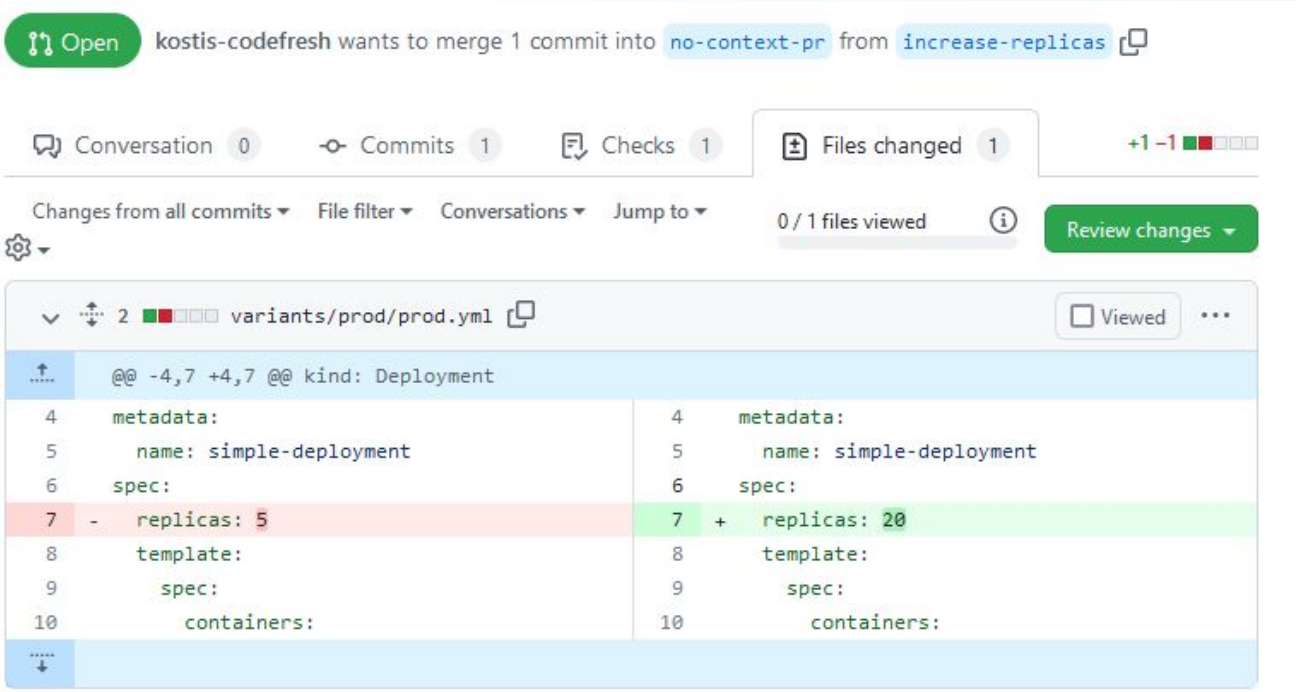
Let's set the stage

Problem statement

No Context Diff



https://github.com/kostis-codefresh/argocd-preview-diff/pull/3

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Diffs without context

- You merge this and ….nothing happens
- Typical scenario of many Kustomize overlays
- Same issue with hierarchy of Helm values

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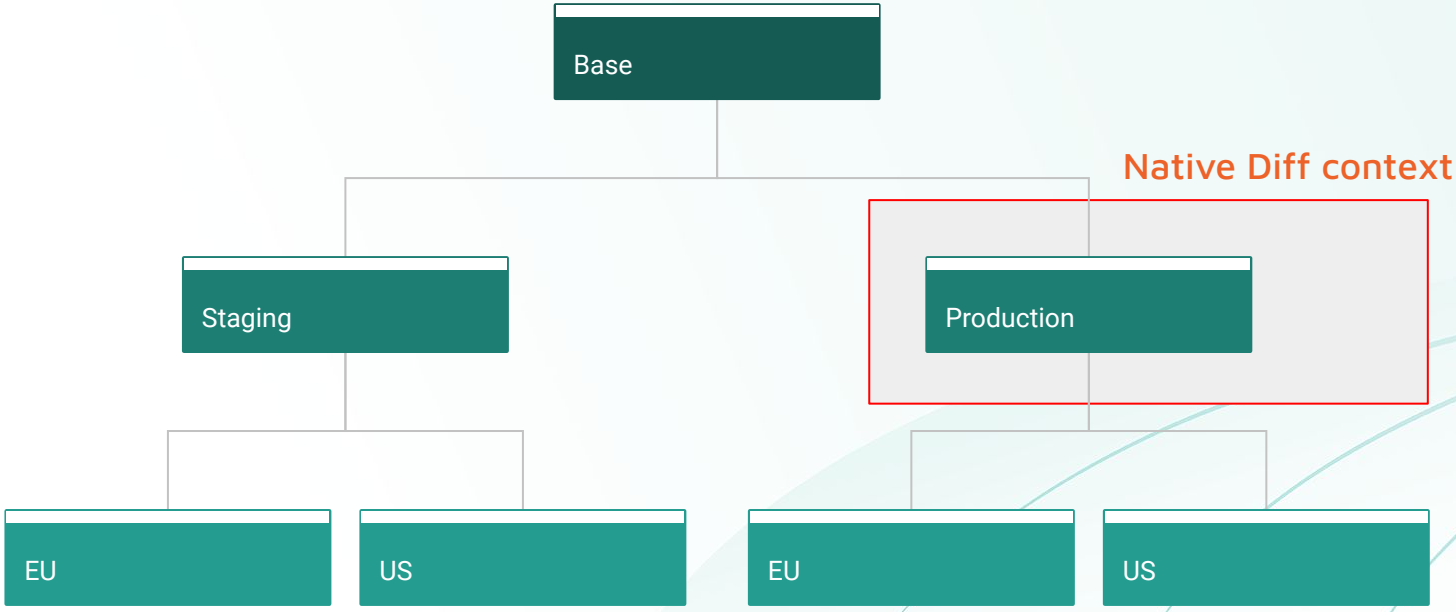
Hierarchy of Overlays/value files



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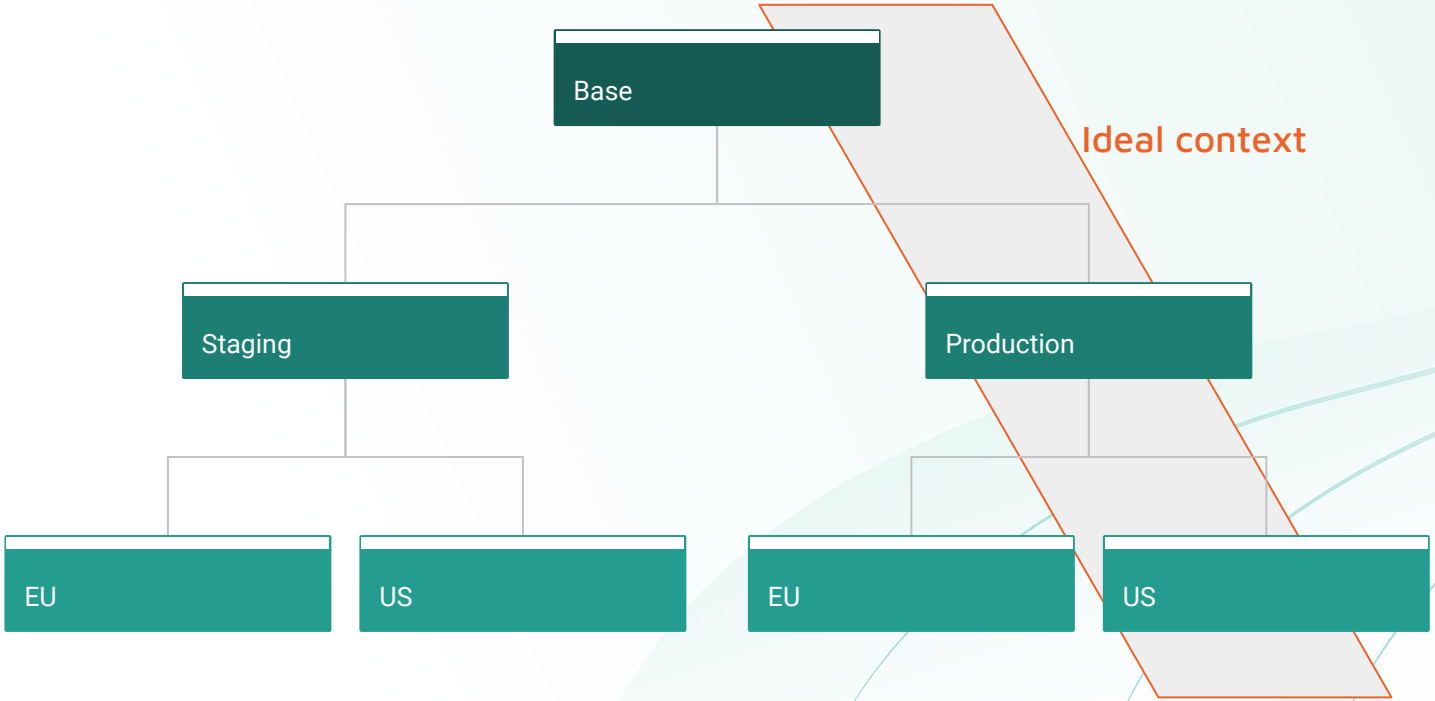
Hierarchy of Overlays/value files



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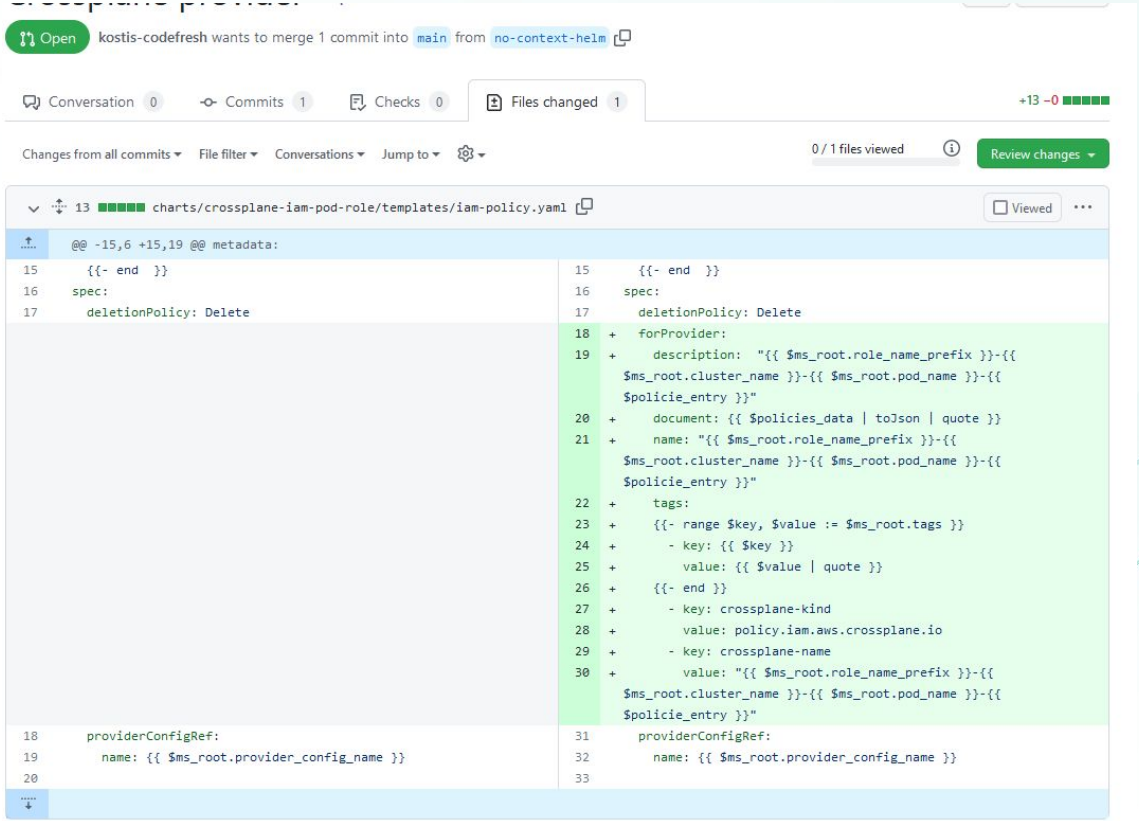
No Context Helm Diff



Open kostis-codefresh wants to merge 1 commit into main from no-context-helm

Conversation 0 · Commits 1 · Checks 0 · Files changed 1 · +13 −0

Changes from all commits · File filter · Conversations · Jump to · 0 / 1 files viewed · Review changes

13 charts/crossplane-iam-pod-role/templates/iam-policy.yaml · Viewed

```
@@ -15,6 +15,19 @@ metadata:
    {{- end  }}
  spec:
    deletionPolicy: Delete
+   forProvider:
+     description:  "{{ $ms_root.role_name_prefix }}-{{ $ms_root.cluster_name }}-{{ $ms_root.pod_name }}-{{ $policie_entry }}"
+     document: {{ $policies_data | toJson | quote }}
+     name: "{{ $ms_root.role_name_prefix }}-{{ $ms_root.cluster_name }}-{{ $ms_root.pod_name }}-{{ $policie_entry }}"
+     tags:
+     {{- range $key, $value := $ms_root.tags }}
+       - key: {{ $key }}
+         value: {{ $value | quote }}
+     {{- end }}
+       - key: crossplane-kind
+         value: policy.iam.aws.crossplane.io
+       - key: crossplane-name
+         value: "{{ $ms_root.role_name_prefix }}-{{ $ms_root.cluster_name }}-{{ $ms_root.pod_name }}-{{ $policie_entry }}"
    providerConfigRef:
      name: {{ $ms_root.provider_config_name }}
```

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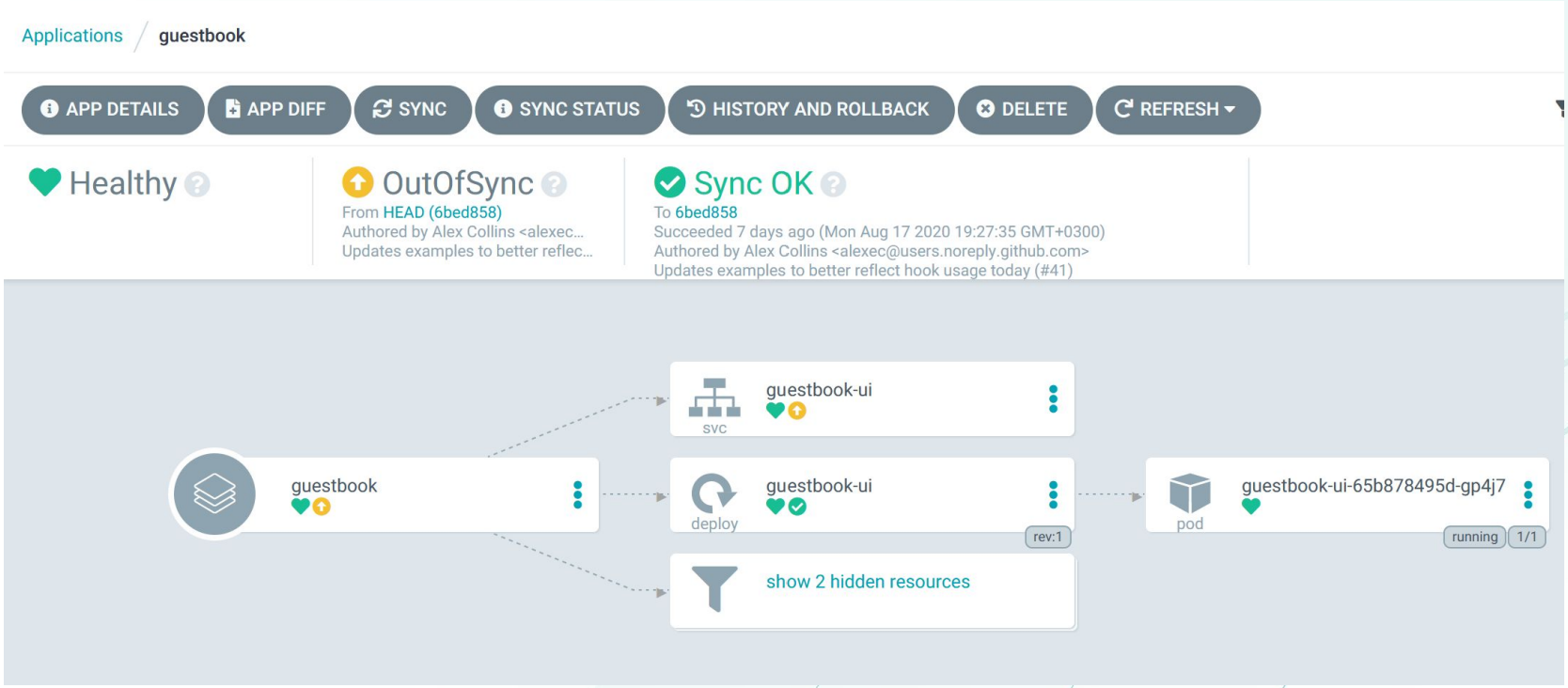
Possible solutions

2. Use Argo CD diff in UI

Argo CD UI Diff



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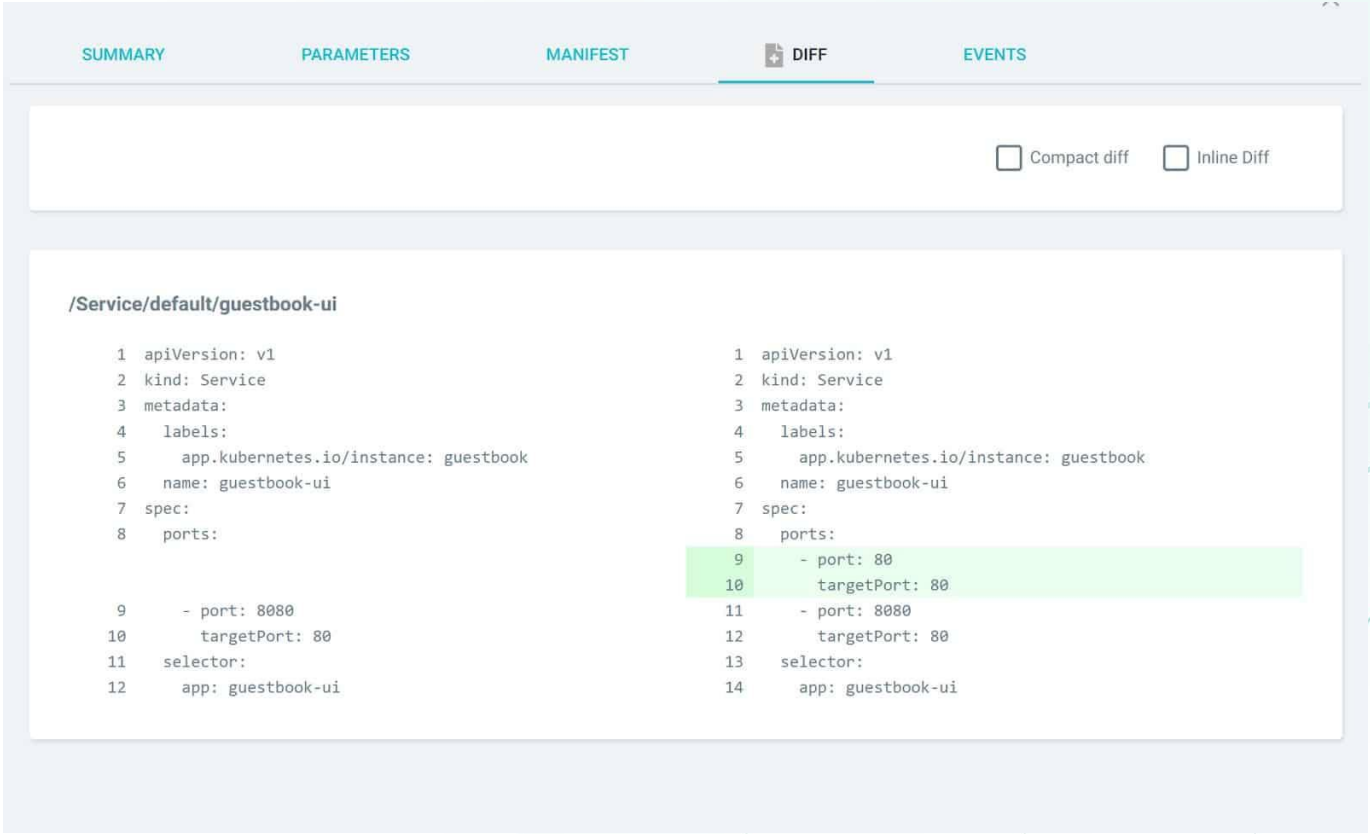
Argo CD UI Diff



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Argo CD UI Diff

✅ - Preview with full context
✅ - Built into Argo CD
✅ - Zero setup/maintenance
✅ - Support for Kustomize/Helm
❌ - Doesn’t work with auto-sync
❌ - Only show changes after push
❌ - Diff is shown too late in the process

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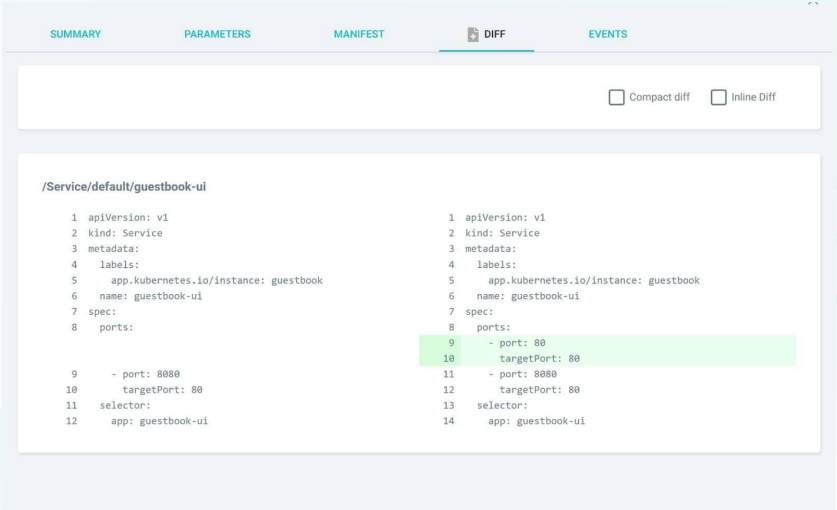
Argo CD UI Diff Recommendation

Could be used for sanity checking in production environments



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Possible solutions

3. Use Argo CD Local diff

Argo CD local diff

- The Argo CD CLI allows you to diff an application between the cluster and local manifests
- Native support for Kubernetes/Helm

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Argo CD local diff

```
root@kubernetes-vm:~/workdir/gitops-cert-level-2-examples/environment-promotion# argocd app diff qa --local envs/qa
INFO[0000] kustomize build envs/qa                       dir= execID=08403
INFO[0000] Trace                                         args="[kustomize build envs/qa]" dir= operation_name="exec

===== /Service qa/qa-simple-service ======
60c60
<     nodePort: 31000
---
>     nodePort: 31001

===== apps/Deployment qa/qa-simple-deployment ======
153c153
<   replicas: 3
---
>   replicas: 5
190c190
<           value: non-prod-user
---
>           value: new-non-prod-user
192c192
<           value: non-prod-password
---
>           value: new-non-prod-password
```

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Argo CD local diff in CI

1. Open a Pull request with suggested changes
2. Have the CI system checkout the PR
3. Run in a CI pipeline “argocd diff –local” against the cluster where the PR is destined
4. Present the diff to the user in order to view the full context

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Argo CD Local Diff

✅ - Built into Argo CD
✅ - Zero setup/maintenance
✅ - Support for Kustomize/Helm
✅ - Preview with full context
✅ - No need to commit/push anything
❌ - Need direct access to Argo CD cluster
❌ - Needs network setup rules
❌ - Not scalable for multiple clusters
❌ - Problematic for Edge/Remote setups

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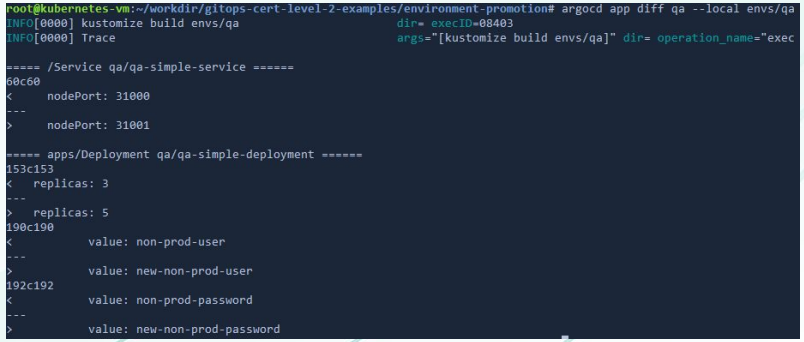
Argo CD Local Diff Recommendation

Great for local experimentation and quick ad-hoc checks.

Not recommended for other uses



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Possible solutions

4. Pre-render Manifests

Pre-Render manifests in second Git repo

1. Use 2 GitOps repositories for each application/cluster
2. First Git repository has unprocessed files (e.g. charts/overlays)
3. Second Git repository has final rendered manifests
4. Argo CD is pointed at the second Git repository
5. An automated process renders manifests and commits them to the second repository

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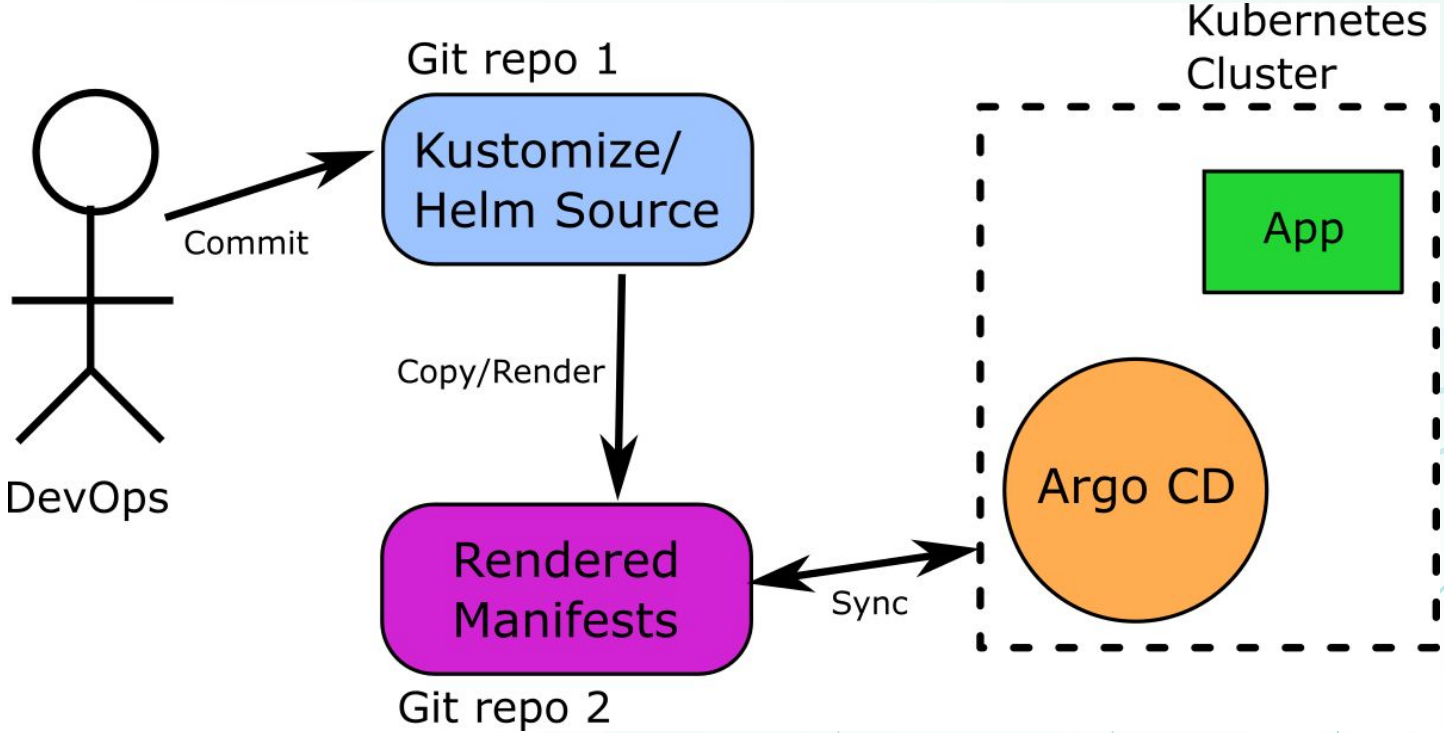
Pre-Render manifests in second Git repo



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Pre-Render manifests in second Git repo

1. A human creates a PR on “source” Git repo
2. A “copy” process takes content and renders manifests (using Helm/Kustomize)
3. A second PR is opened automatically in the “Rendered” Git repo
4. A human sees diff in the second repo
5. If PR is approved it is merged in both repos
6. Argo CD always monitors the “Rendered” Git repo

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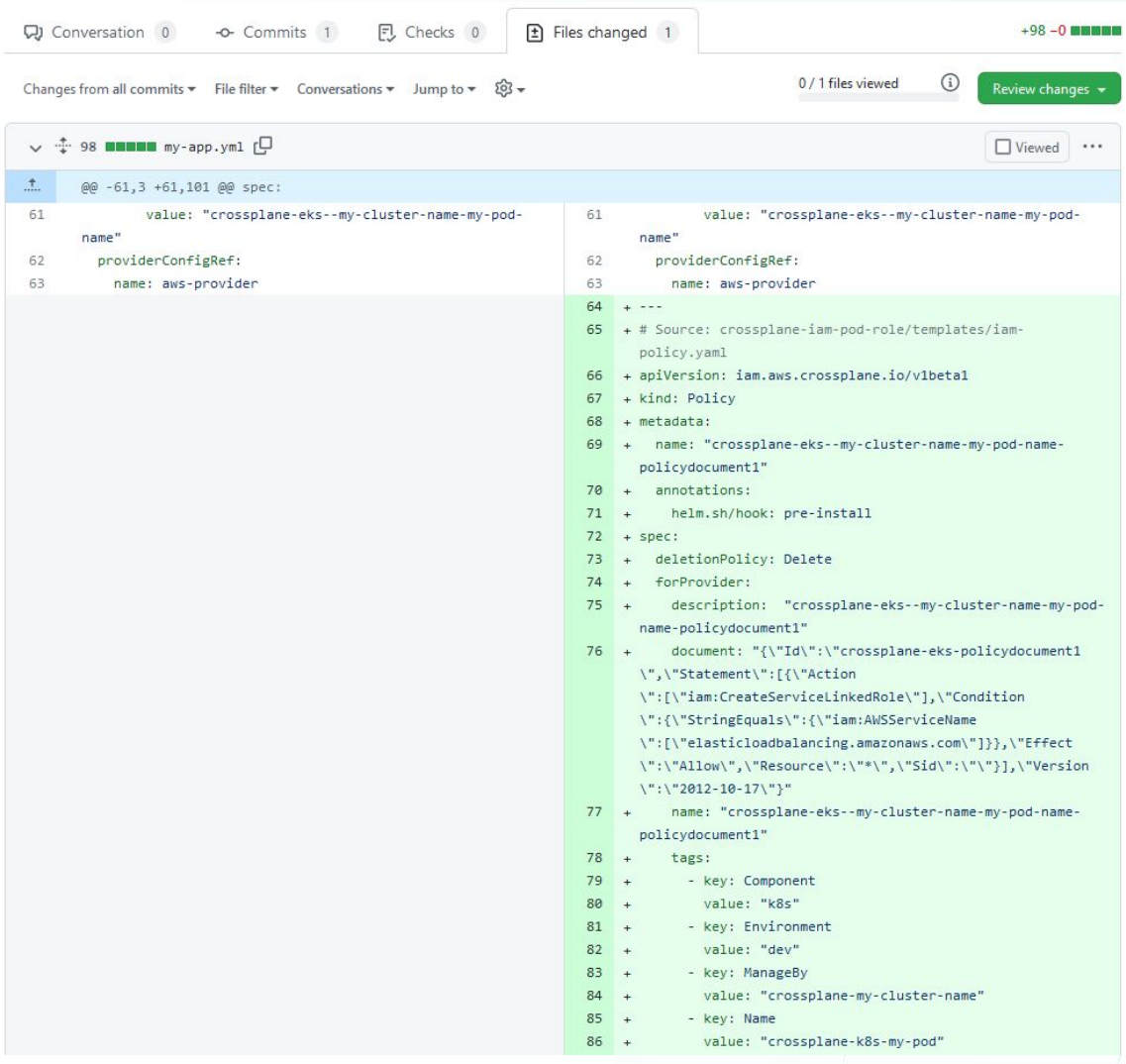

Get full context of everything
Great for Helm apps

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Pre-Render manifests in second Git repo

✅ - Preview with full context
✅ - Use native Git diff
✅ - Perfect fit for Helm apps
❌ - Needs setup/maintenance
❌ - More moving parts/Harder to debug
❌ - CI becomes a point of failure
❌ - Bypasses Argo CD support for Helm/Kustomize
❌ - Doubles number of Git repositories
❌ - Caution not to commit final manifests

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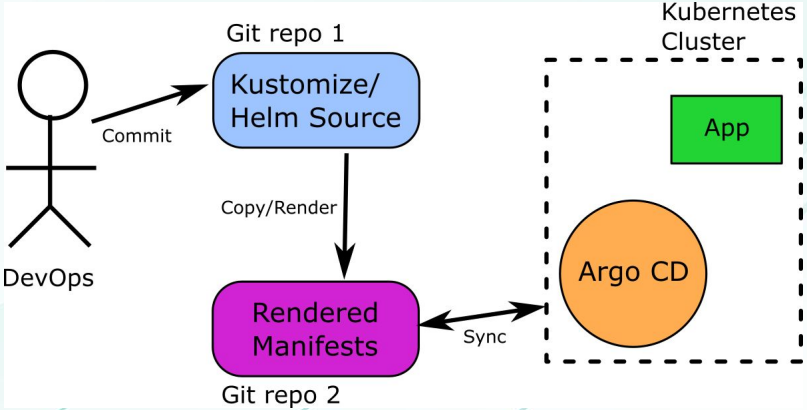
Pre-Render manifests Recommendation

Several companies use this with success. Needs well disciplined teams and has more moving parts



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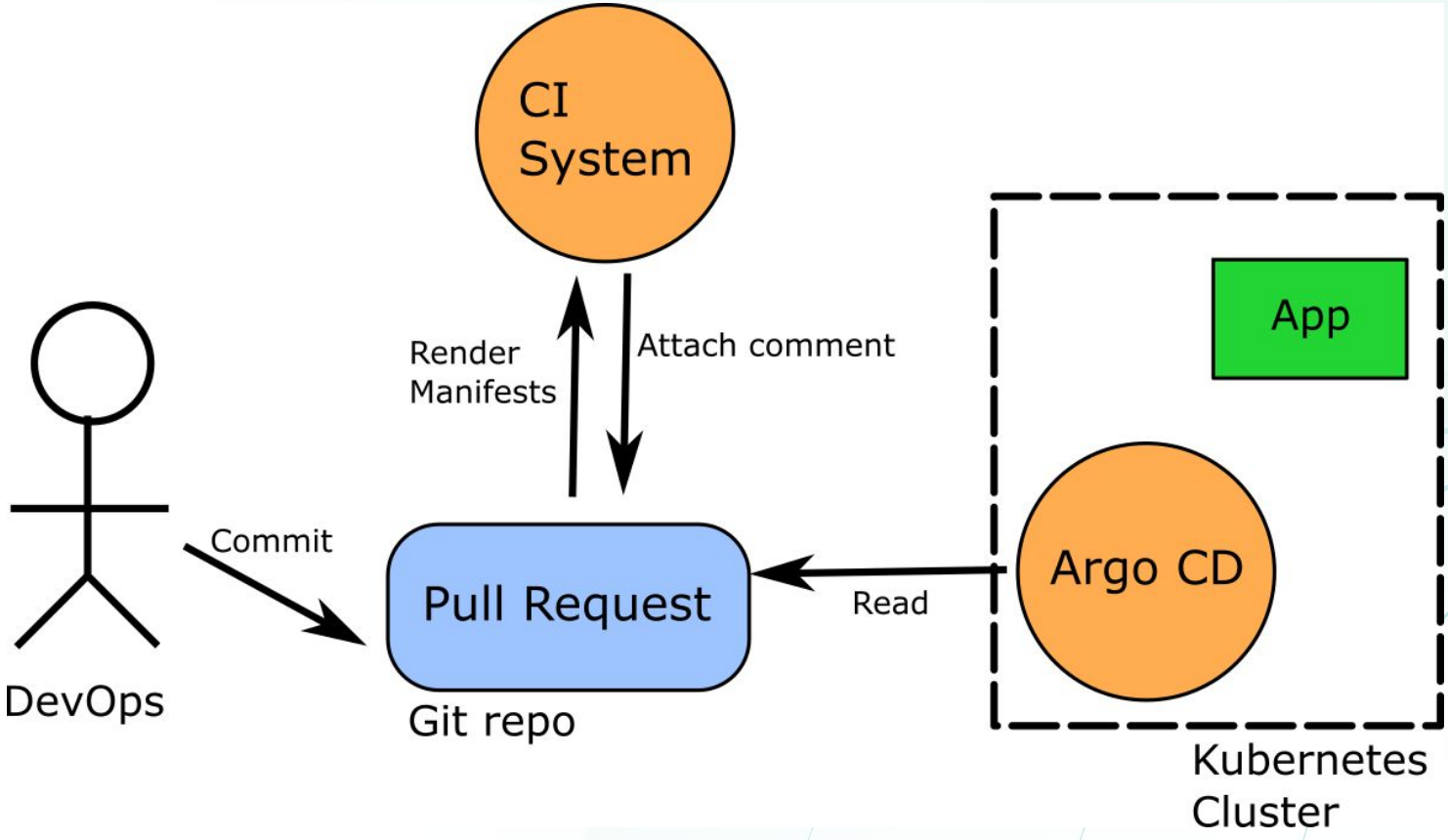
Render manifests on the fly

Render manifests on the fly

- Current Git state has what is in the cluster
- PR state has proposed changes to the cluster
- Run a diff between those two

Render manifests on the fly



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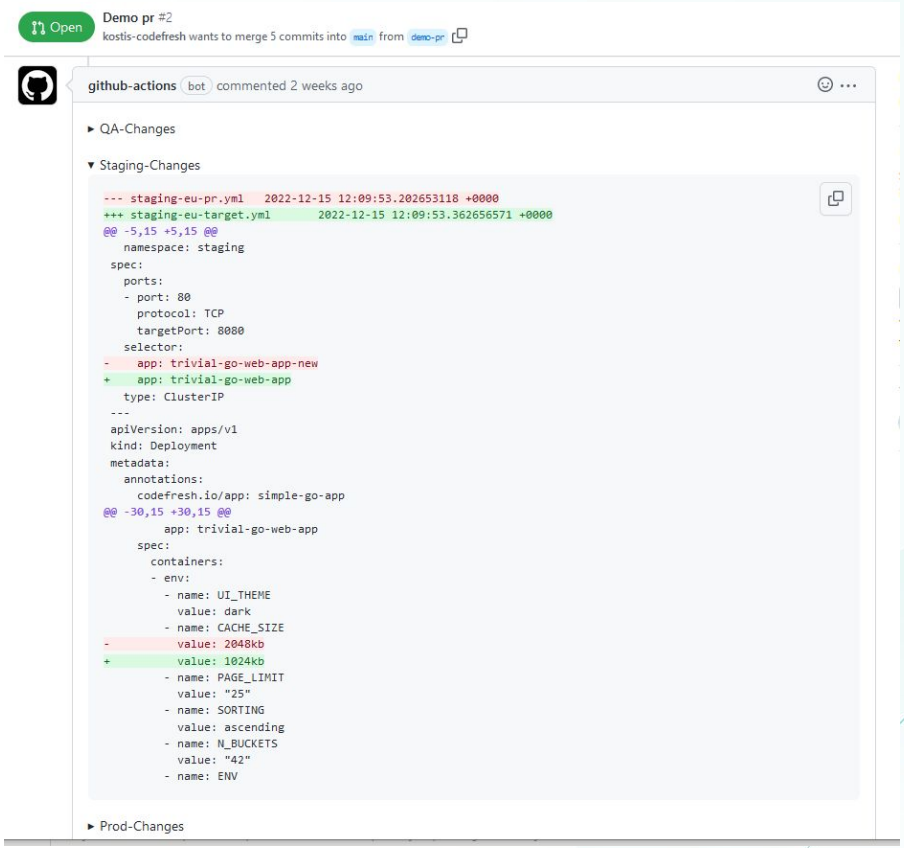
Render manifests on the fly

1. A human opens a PR on the manifest repo
2. We checkout out the PR and run Kustomize/Helm
3. We checkout the target of the PR and run Kustomize/Helm again
4. We run a diff between the final rendered manifests
5. We present the diff to the human

Render manifests on the fly



Open Demo pr #2

kostis-codefresh wants to merge 5 commits into main from demo-pr

github-actions bot commented 2 weeks ago

▸ QA-Changes

▾ Staging-Changes

```
--- staging-eu-pr.yml   2022-12-15 12:09:53.202653118 +0000
+++ staging-eu-target.yml       2022-12-15 12:09:53.362656571 +0000
@@ -5,15 +5,15 @@
   namespace: staging
 spec:
   ports:
   - port: 80
     protocol: TCP
     targetPort: 8080
   selector:
-    app: trivial-go-web-app-new
+    app: trivial-go-web-app
   type: ClusterIP
 ---
 apiVersion: apps/v1
 kind: Deployment
 metadata:
   annotations:
     codefresh.io/app: simple-go-app
@@ -30,15 +30,15 @@
         app: trivial-go-web-app
     spec:
       containers:
       - env:
         - name: UI_THEME
           value: dark
         - name: CACHE_SIZE
-          value: 2048kb
+          value: 1024kb
         - name: PAGE_LIMIT
           value: "25"
         - name: SORTING
           value: ascending
         - name: N_BUCKETS
           value: "42"
         - name: ENV
```

▸ Prod-Changes

▾ Prod-Changes

```
--- prod-us-pr.yml      2022-12-15 12:09:52.898646558 +0000
+++ prod-us-target.yml  2022-12-15 12:09:53.050649838 +0000
@@ -5,26 +5,26 @@
   namespace: prod
 spec:
   ports:
   - port: 80
     protocol: TCP
     targetPort: 8080
   selector:
-    app: trivial-go-web-app-new
+    app: trivial-go-web-app
   type: ClusterIP
 ---
 apiVersion: apps/v1
 kind: Deployment
 metadata:
   annotations:
     codefresh.io/app: simple-go-app
   name: prod-us-simple-deployment
   namespace: prod
 spec:
-  replicas: 12
+  replicas: 10
   selector:
     matchLabels:
       app: trivial-go-web-app
   template:
     metadata:
       labels:
         app: trivial-go-web-app
```

https://github.com/kostis-codefresh/argocd-preview-diff/pull/2

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Render manifests on the fly

✅ - Preview with full context
✅ - Based only on Git files
✅ - No access needed to Argo CD API
✅ - Works with any topology
✅ - Uses Argo CD support for Helm/Kustomize
✅ - No confusion over raw/final manifests
✅ - GitOps tool agnostic (could work with Flux)
❌ - Needs setup/maintenance
❌ - Might miss some corner cases

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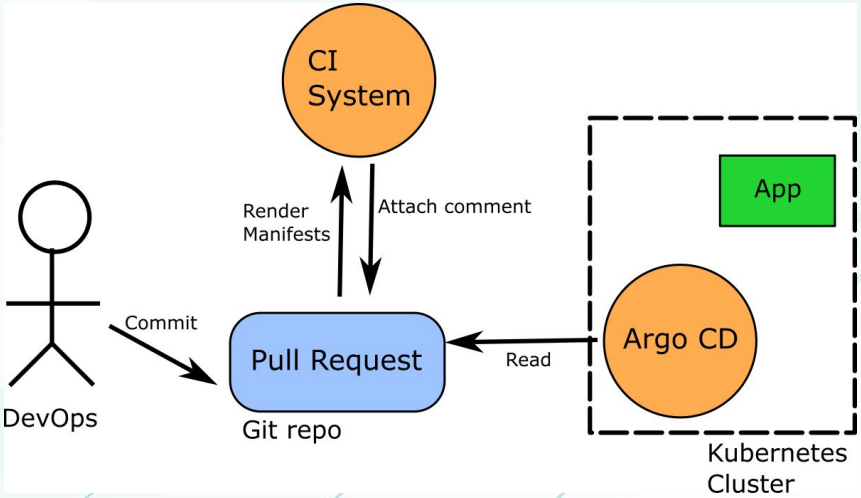
Render manifests on the fly recommendation

It is simple, robust and scalable. Use it!



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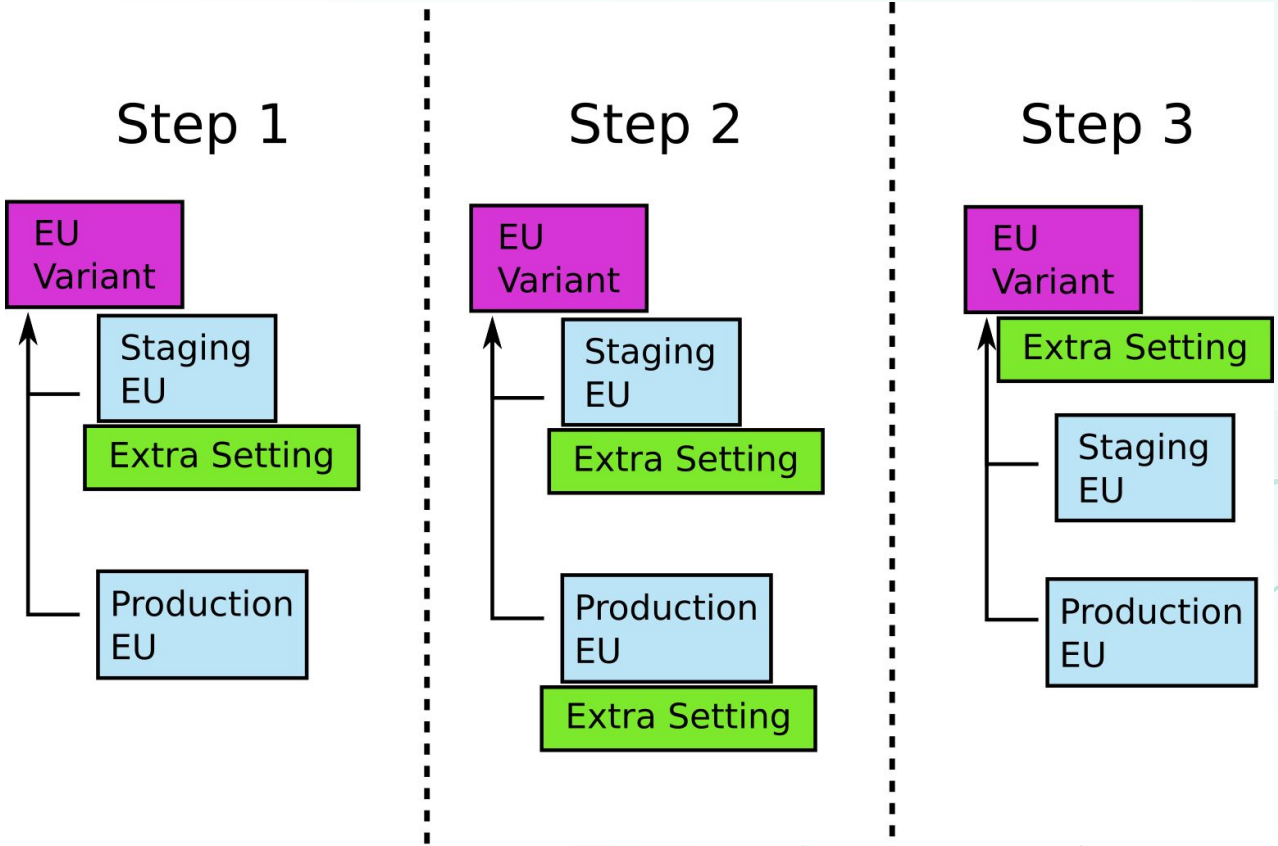
Bonus: Enforce zero changes

Kustomize refactoring



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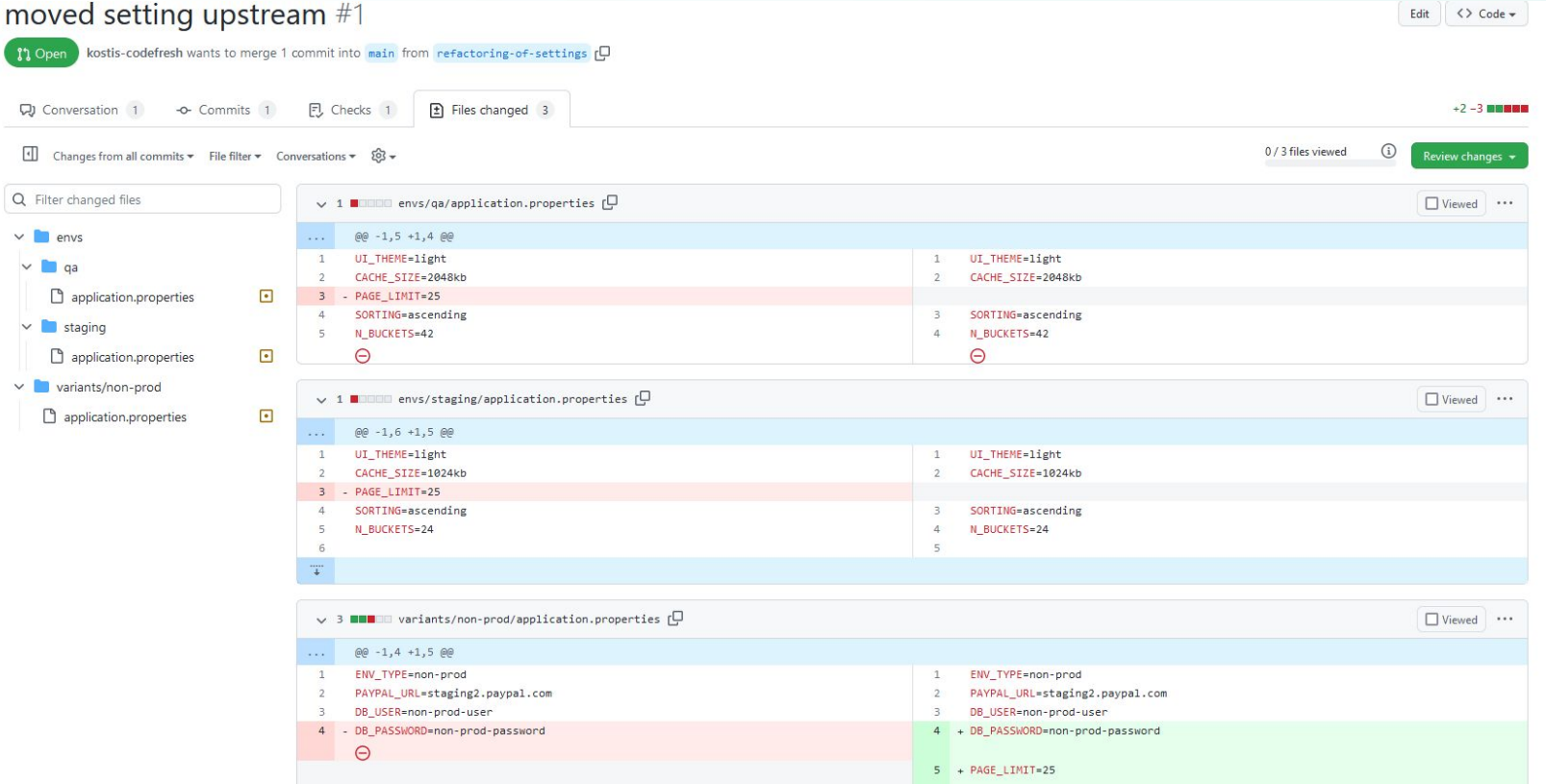
Kustomize refactoring



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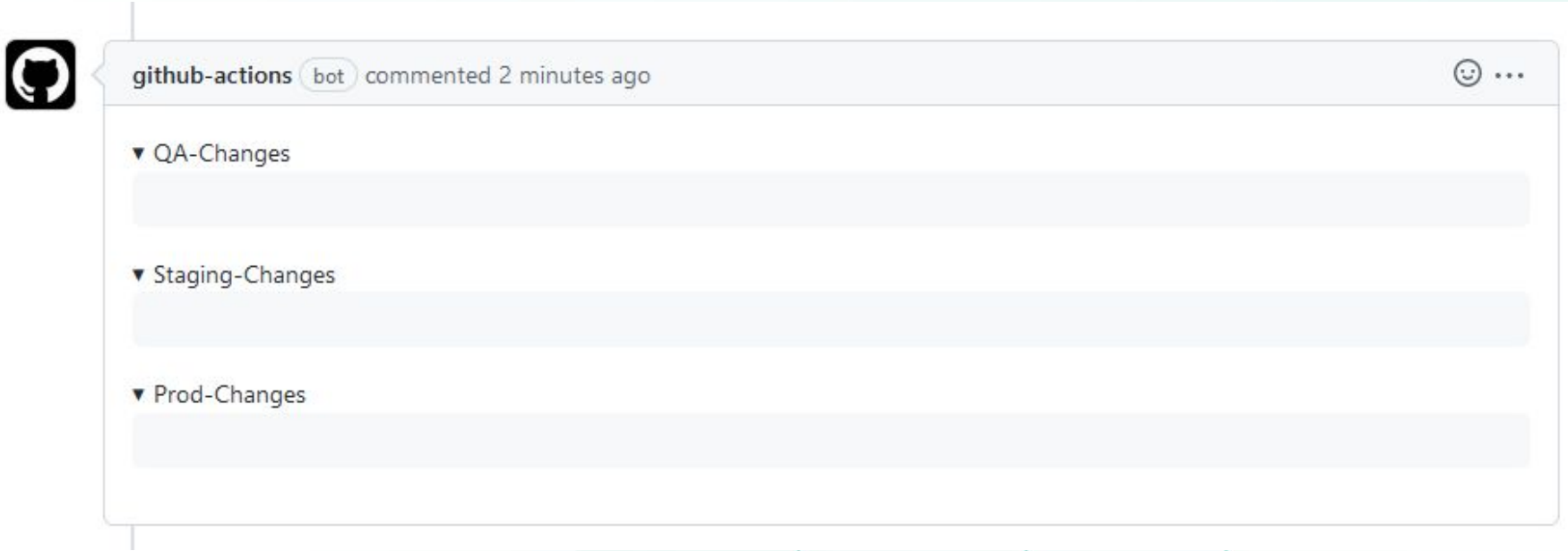
Argo CD will not do anything at all



https://github.com/kostis-codefresh/manifest-refactoring/pull/1

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5 ways to understand the context of Manifest changes

1. Native Git diff
2. Argo CD UI Diff
3. Argo CD CLI Local Diff
4. Pre-render manifests on second Git repo
5. Render manifests on the fly 

Resources

- https://codefresh.io/blog/argo-cd-preview-diff/
- https://www.runatlantis.io/
- http://learning.codefresh.io (Argo CD certification)

Intermission: Terraform plans

Terraform plan

Get a preview on what will change

```
team@Azure:~/infrastructure$ terraform plan
Refreshing Terraform state in-memory prior to plan...
The refreshed state will be used to calculate this plan, but will not be
persisted to local or remote state storage.


------------------------------------------------------------------------

An execution plan has been generated and is shown below.
Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  + azurerm_resource_group.production-america
      id:       <computed>
      location: "westus2"
      name:     "production-america"
      tags.%:   <computed>

  + azurerm_resource_group.production-europe
      id:       <computed>
      location: "westeurope"
      name:     "production-europe"
      tags.%:   <computed>


Plan: 2 to add, 0 to change, 0 to destroy.

------------------------------------------------------------------------

Note: You didn't specify an "-out" parameter to save this plan, so Terraform
can't guarantee that exactly these actions will be performed if
"terraform apply" is subsequently run.

team@Azure:~/infrastructure$
```

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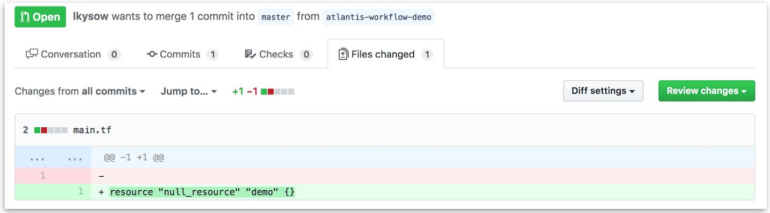
STEP 1 Open a Terraform pull request



STEP 2 Atlantis automatically runs `terraform plan` and comments back on the pull request

atlantisbot commented

Ran Plan in dir: `.` workspace: `default`

```
Refreshing Terraform state in-memory prior to plan...
The refreshed state will be used to calculate this plan, but will not be
persisted to local or remote state storage.


------------------------------------------------------------------------

An execution plan has been generated and is shown below.
Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

+ null_resource.demo
      id: <computed>
Plan: 1 to add, 0 to change, 0 to destroy.
```

- To **apply** this plan, comment:
  - `atlantis apply -d .`
- To **delete** this plan click here
- To **plan** this project again, comment:
  - `atlantis plan -d .`

- To **apply** all unapplied plans, comment:
  - `atlantis apply`

runatlantis.io

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