Connect

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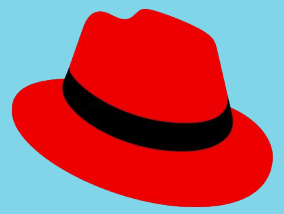

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OpenShift GitOps & Advanced Cluster Management

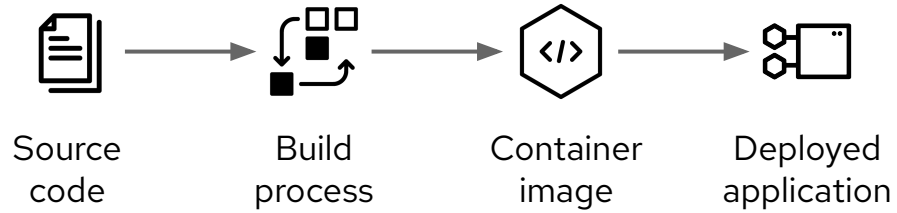
Continuous Delivery *at scale* on OpenShift

Mark Roberts
Principal Solution Architect
Red Hat

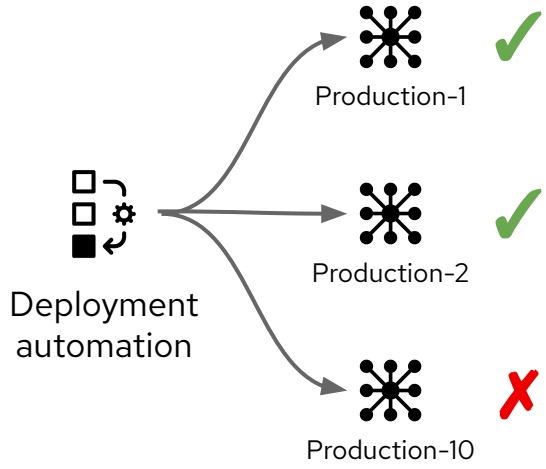
Red Hat

The challenge

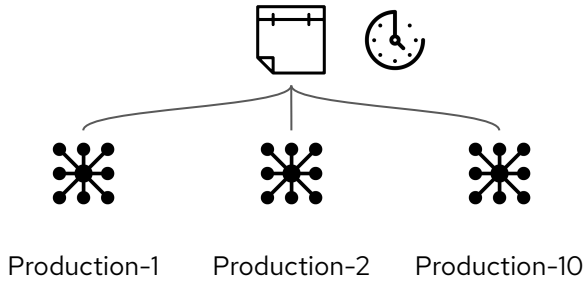
Secure Software Pipelines



Deployment to multiple clusters



Ephemeral clusters



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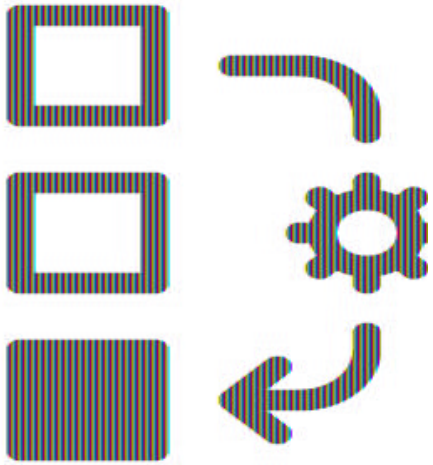

Objective

To create an automated build and deploy process

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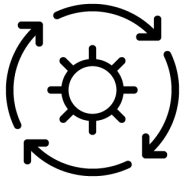
GitOps Principles

The system is described declaratively

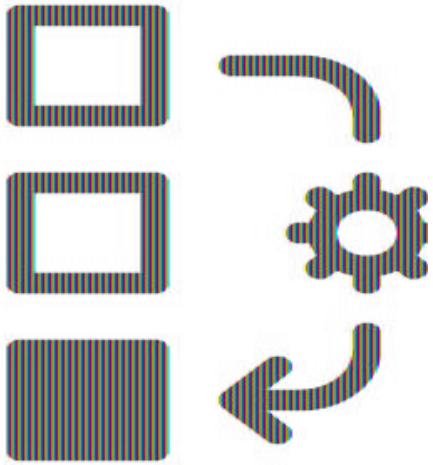
The desired state is versioned in Git



Approved changes can be applied automatically

A controller exists to detect and act on drift

Objective



To create an automated build and deploy process in which the assets are stored in and managed from a Git repository

At scale in an ephemeral environment

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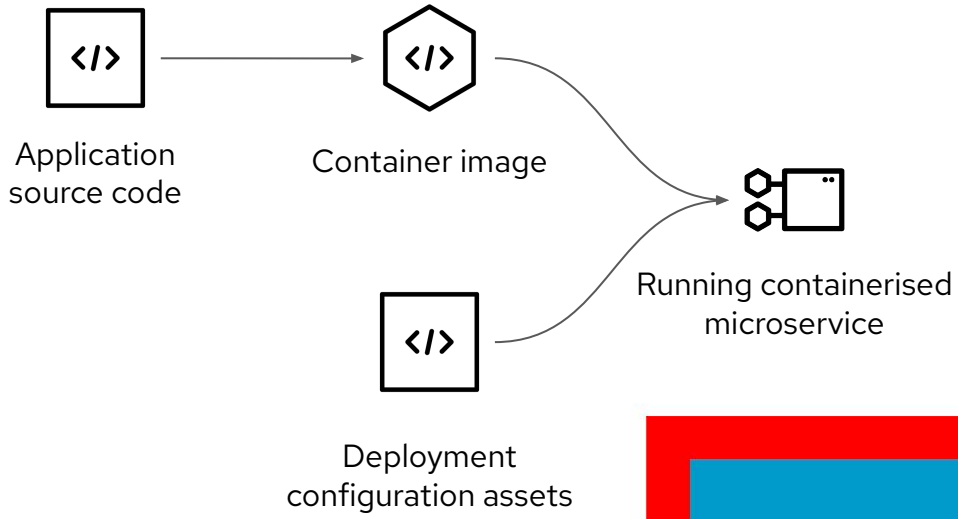
Source content and objectives

- From source content to running microservice
  - Source code of application
  - Container images (both a target and a source asset)
  - Kubernetes resources - services, configuration maps, secrets etc.
- Two major phases
  - Build - Continuous integration
  - Deploy - Continuous delivery



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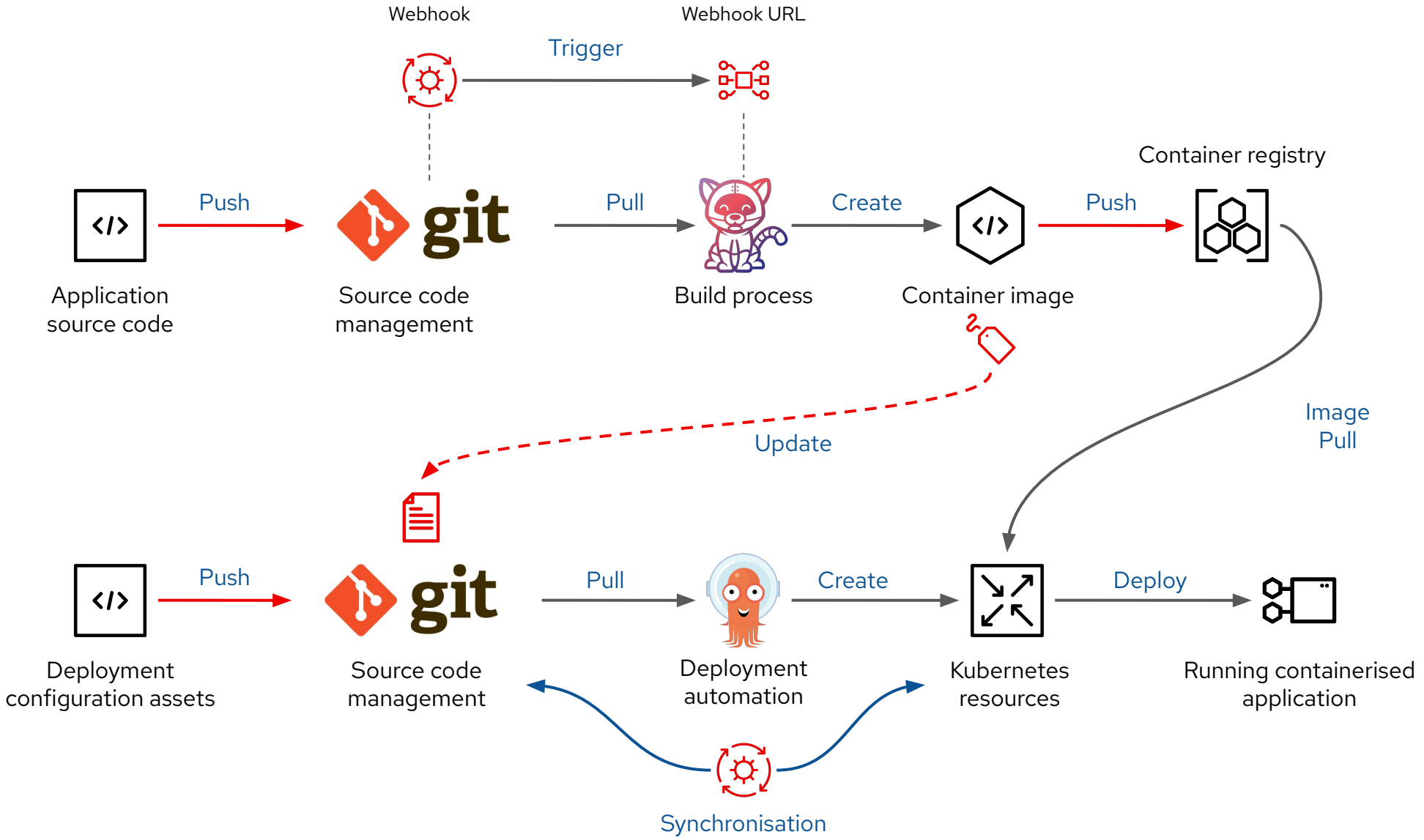
CI / CD Integrated delivery process



OpenShift Pipelines

OpenShift GitOps

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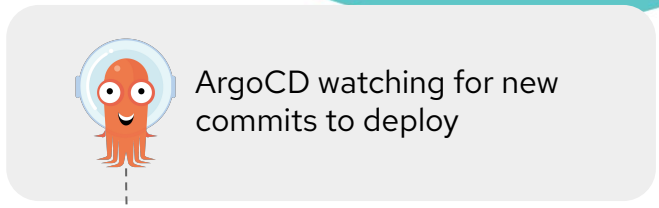
OpenShift Pipelines (ArgoCD)
Application

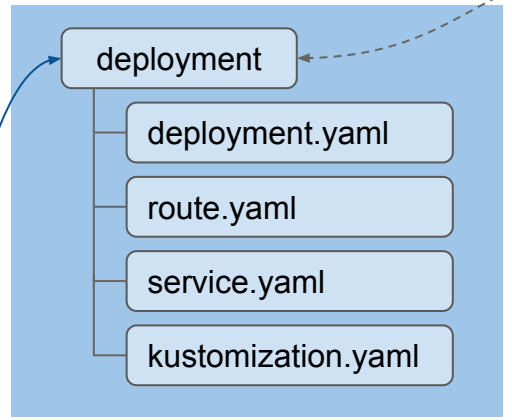
- A definition of a set of content to be deployed together which deliver value
- A simple source ⇒ target relationship
- A series of applications are grouped together in the context of a project

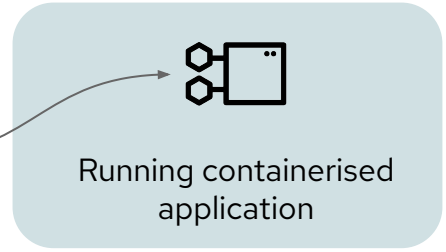



```yaml
apiVersion: argoproj.io/v1alpha1
kind: Application
metadata:
  name: my-app
  namespace: openshift-gitops
spec:
  project: simple-apps
```

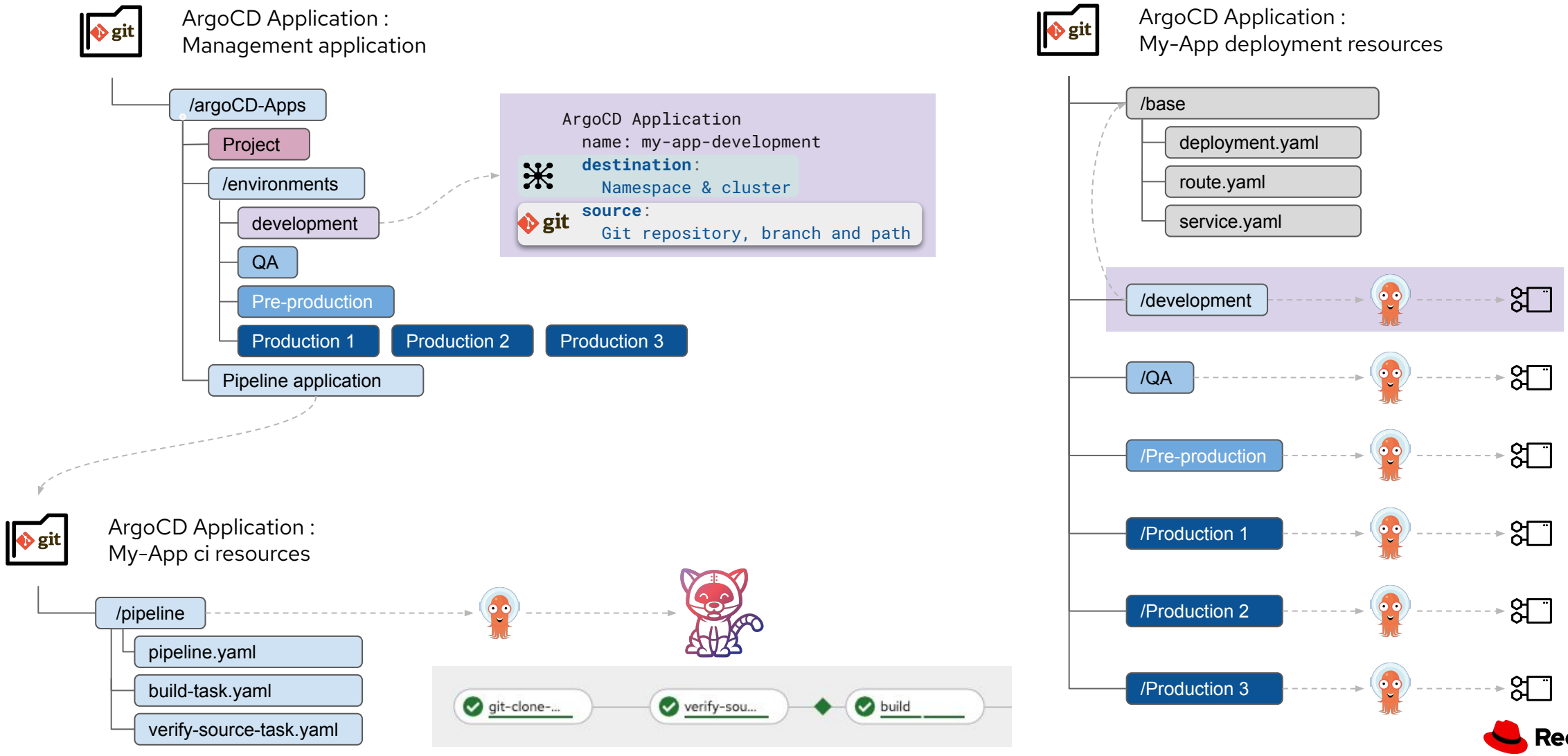
```yaml
destination:
  namespace: simple-pipeline
  server: https://kubernetes.default.svc
```

```yaml
source:
  path: pipelines/simplePipeline/deployment
  targetRevision: main
  repoURL: https://github.com/marrober/simple-apps.git
```





ArgoCD Project and applications



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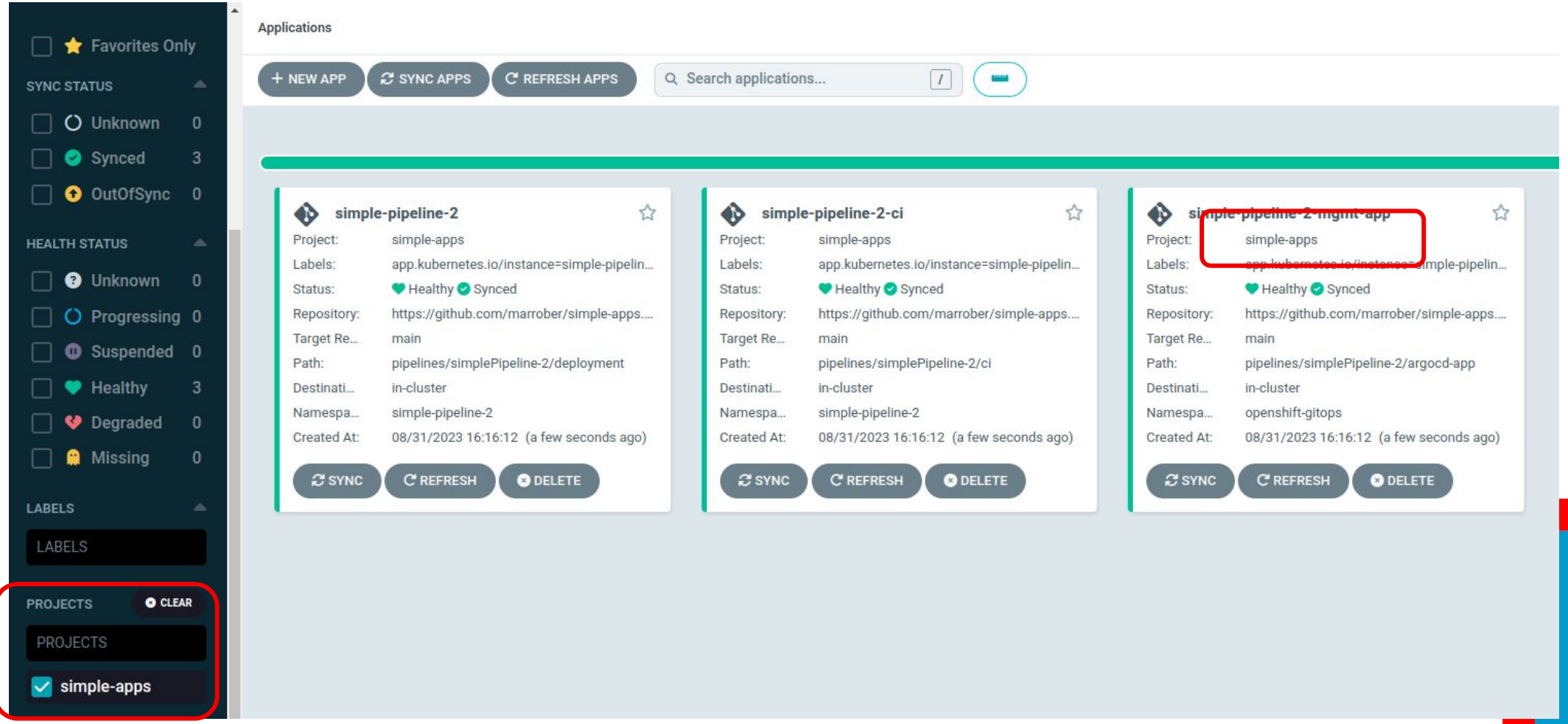
ArgoCD Project and applications

- Project based filtering in the ArgoCD web user interface helps focus on the applications that you need



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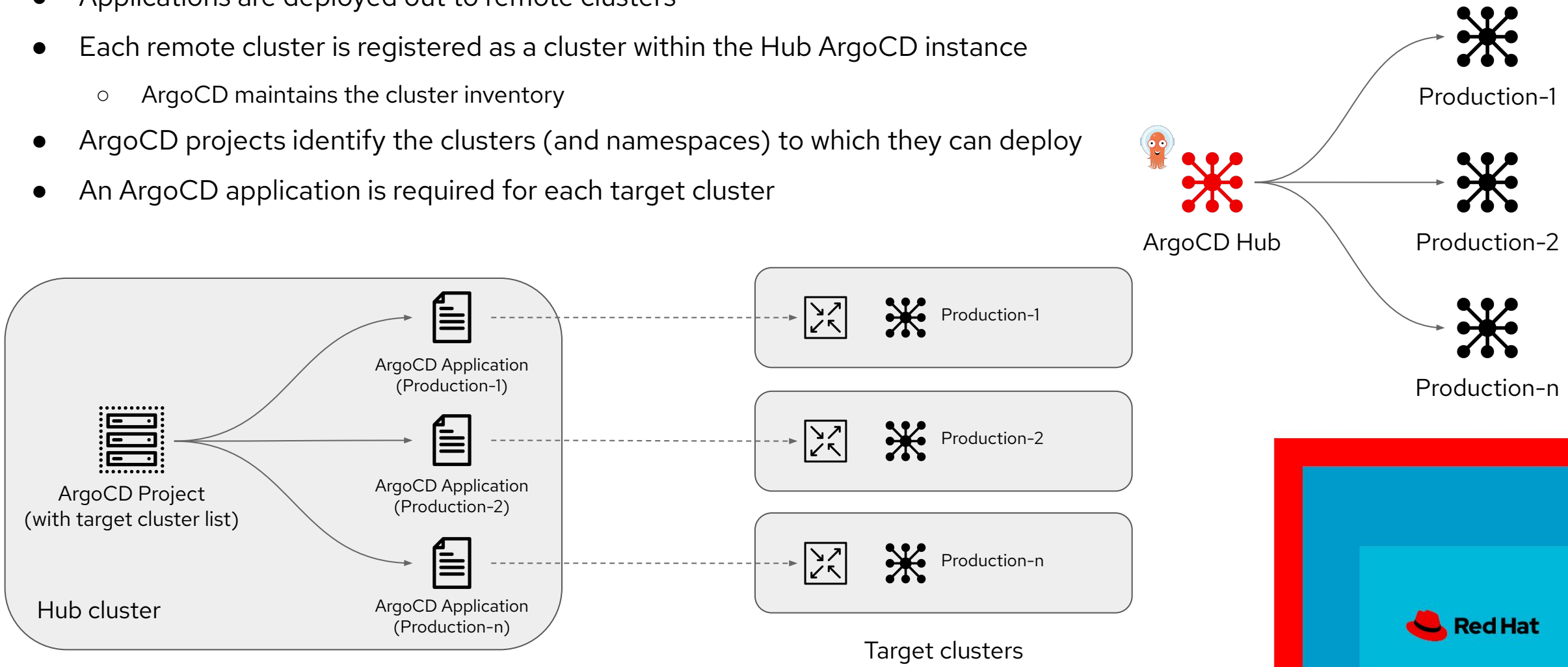
ArgoCD : Push model

- ArgoCD hub targets ArgoCD instance in the receiving clusters
- Applications are deployed out to remote clusters
- Each remote cluster is registered as a cluster within the Hub ArgoCD instance
  - ArgoCD maintains the cluster inventory
- ArgoCD projects identify the clusters (and namespaces) to which they can deploy
- An ArgoCD application is required for each target cluster



ArgoCD Push model

Positives and negatives

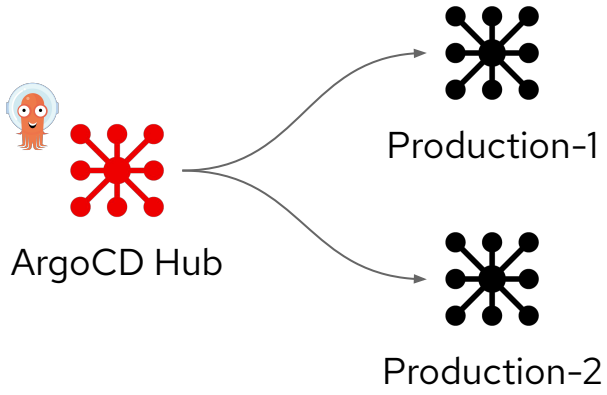
- Positives
  - Simple process to create the assets
  - Kustomize can be used to inject variance into a ‘base’ ArgoCD application to set the destination for each cluster
  - Centralised approach in which deployment automation runs on the hub cluster
- Negatives
  - Large numbers of target clusters can create a proliferation of ArgoCD Applications to manage
  - Could be problematic to maintain the cluster inventory over time
  - Requires direct connectivity from ArgoCD hub to target clusters
  - Hub cluster may be viewed as a single point of failure

ArgoCD deployment to multiple clusters –

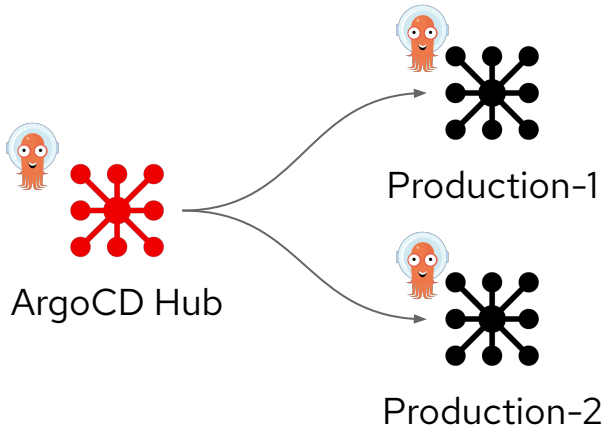
Pull model

- Enhanced by Red Hat Advanced Cluster Management for Kubernetes (ACM)
- The ArgoCD application definition is created on the hub and distributed to the remote cluster
- Status is reported back to the Hub cluster for overall reporting
- Benefits
  - Each remote cluster runs a separate ArgoCD instance and application lifecycle operating on independent schedules
  - Satisfies requirements of security teams : Remote (production) clusters connect to the hub

Push model



Pull model



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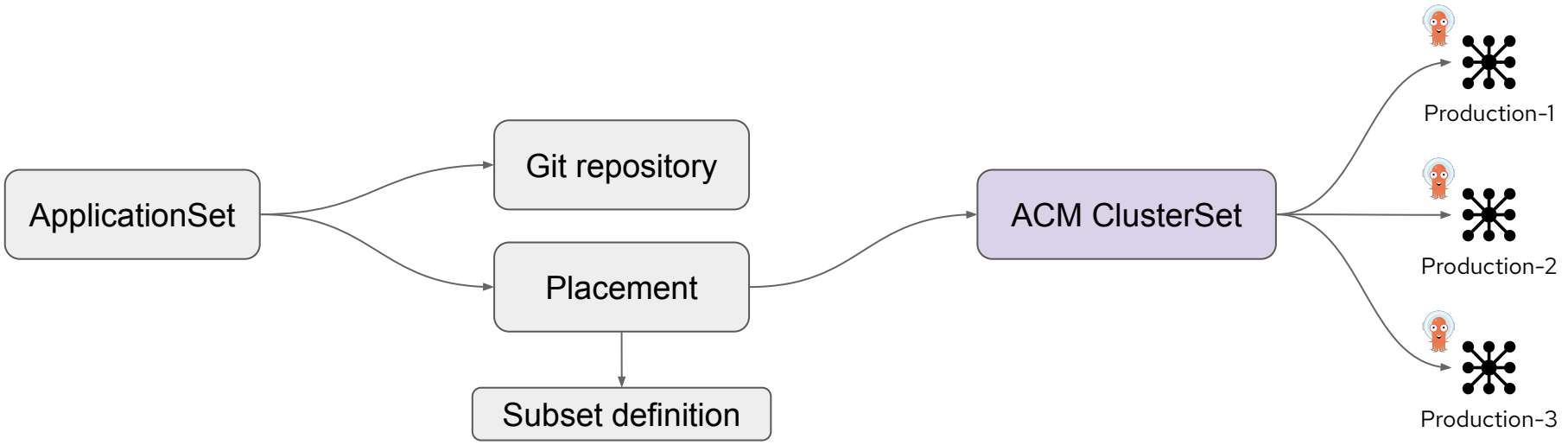
ArgoCD pull model resources

- ApplicationSet object is used to manage an application that is deployed to multiple clusters
  - References the source Git repository of deployable content
  - References a placement policy to select the target clusters
- Placement object identifies a ClusterSet and can select a subset of such clusters if required
- ACM ClusterSet
  - A set of ACM managed clusters that together deliver a function
  - Examples :
    - All production clusters
    - All production clusters in European region etc.



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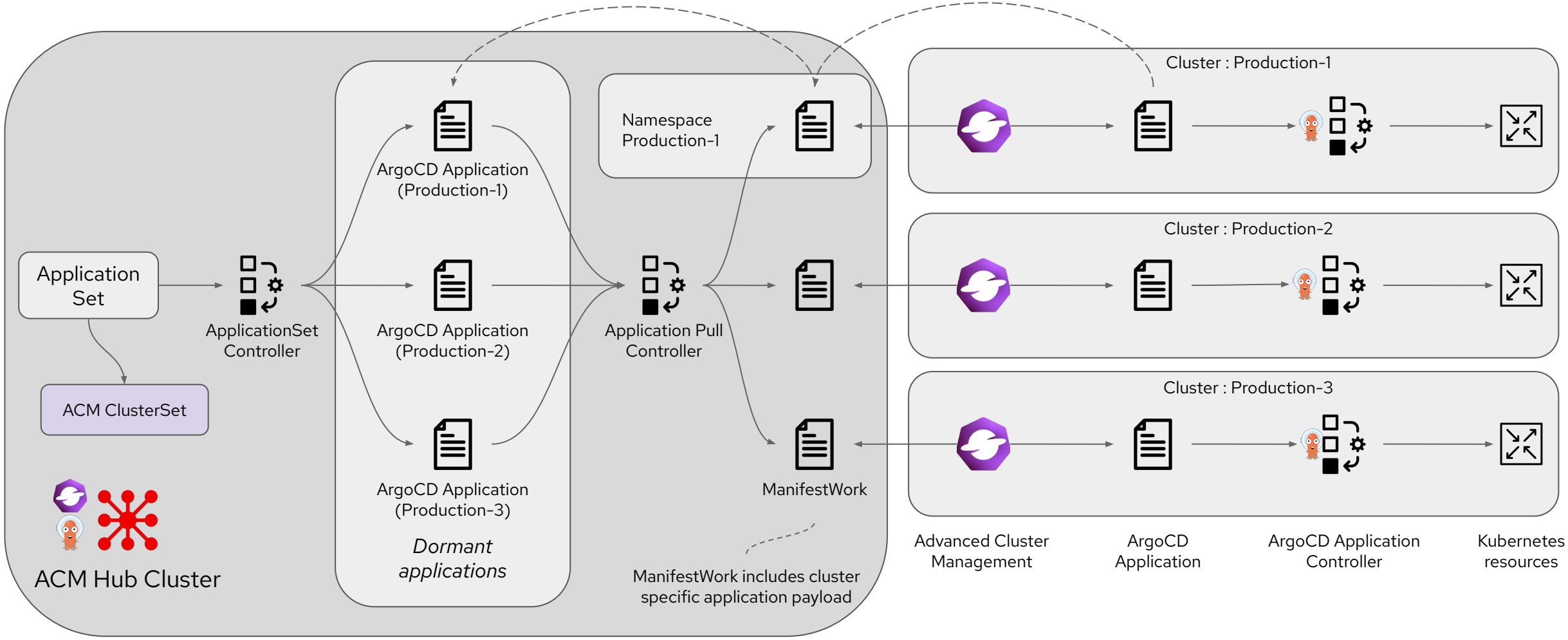
ApplicationSet Controller



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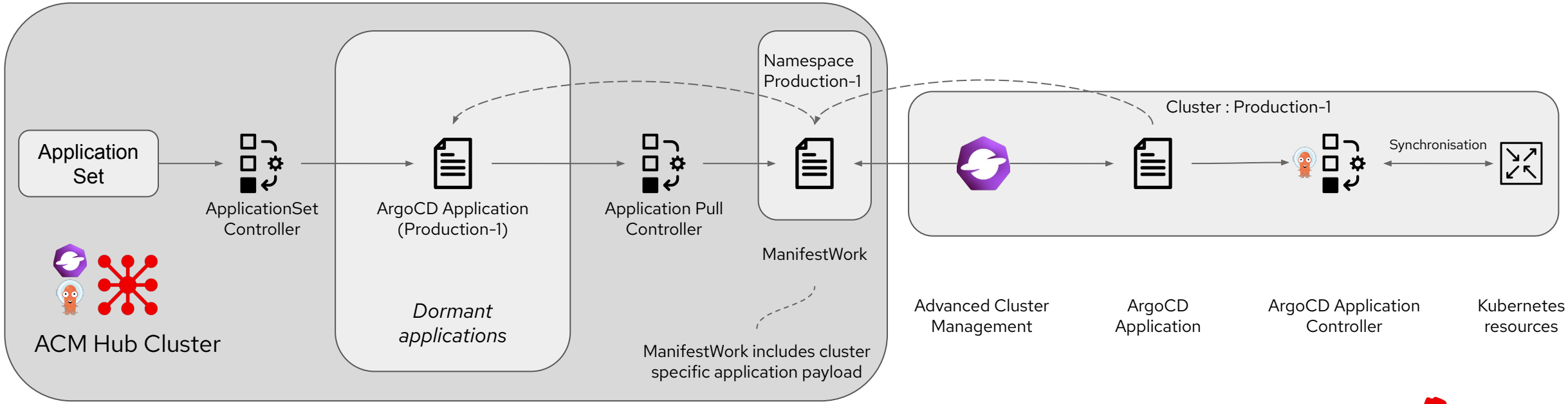
ApplicationSet Controller - details

- *ApplicationSet Controller* creates (dormant) individual ArgoCD applications for each identified target cluster
- *Application Pull Controller* creates manifestWork objects for each target cluster
- manifestWork objects in cluster specific namespace are monitored (in a pull mode)
- Application object is extracted from manifestWork and created on the remote cluster
- Local ArgoCD instance on remote cluster processes the application object to create Kubernetes resources



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OpenShift GitOps Summary

Red Hat
Advanced Cluster Management
for Kubernetes

OpenShift GitOps

- OpenShift GitOps delivers an automated deployment process
  - … in which the assets are stored in and managed from a Git repository
- Reconciliation of manual changes made to Kubernetes resource so that the Git content remains the single source of truth
- Visualisation of application status through the web user interface
- Management of complex multi-component applications through ArgoCD projects
- Control of environmental variance through the use of Kustomize

ArgoCD Push Model

- Independent of Red Hat Advanced Cluster Management for Kubernetes
- Centralised management of application lifecycle
- Supports multiple clusters via ArgoCD cluster registration
- Simpler process than the pull model - less moving parts
- Less content to manage on the remote cluster
- Ideal for more transient remote clusters

ArgoCD Pull Model

- Requires Red Hat Advanced Cluster Management for Kubernetes
- Distribution of ArgoCD applications to remote clusters
- Remote clusters operate the application lifecycle independent of the hub
- Status is reported back to the Hub cluster for overall reporting
- Supports secure connections - remote connect to Hub via ACM
- Less Kubernetes resources to manage

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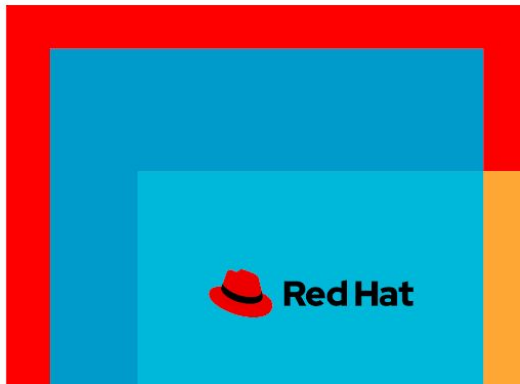
What’s next

- Have a chat today
- Get in touch - mroberts@redhat.com
- Schedule some time - web meeting or face to face
- Search the Red Hat blog site : https://www.redhat.com/en/blog



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References

- Blogs -
  - An introduction to GitOps - link
  - Introducing the Argo CD Application Pull Controller for Open Cluster Management - link
  - An Introduction to ApplicationSets in OpenShift GitOps - link
  - GitOps Deployment and Image Management - link
  - Your Guide to Continuous Delivery with OpenShift GitOps and Kustomize - link
  - A guide to using ArgoCD and GitOps with RBAC - link
  - A Guide to Secrets Management with GitOps and Kubernetes - link
  - A Guide to GitOps and Secret Management with ArgoCD Operator and SOPS - link
  - How to Use HashiCorp Vault and Argo CD for GitOps on OpenShift - link
  - Learn about Progressive Application Delivery with GitOps - link
  - A Guide to Going From Zero to OpenShift Cluster with GitOps - link
  - Understanding GitOps with Red Hat Advanced Cluster Management - link

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