



ROBIN

Running Stateful Workloads On Kubernetes: Challenges And Solutions

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Stateful Application

- › Application that saves client data of one session for use in next session or by other applications.
- › e.g mysql, mongodb, cassandra, Key value stores



Spectrum Of Applications

Stateless Applications

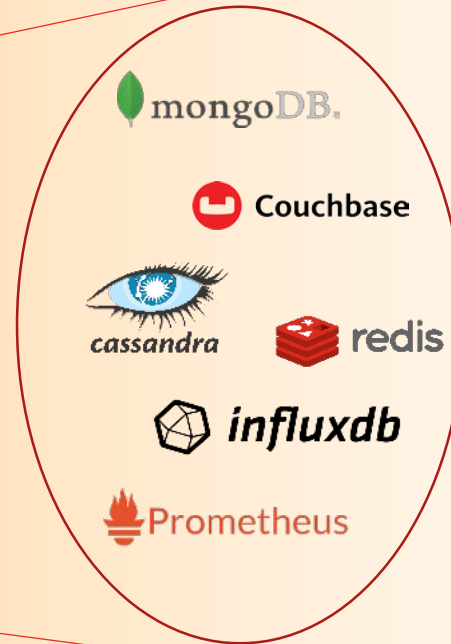


Web Apps

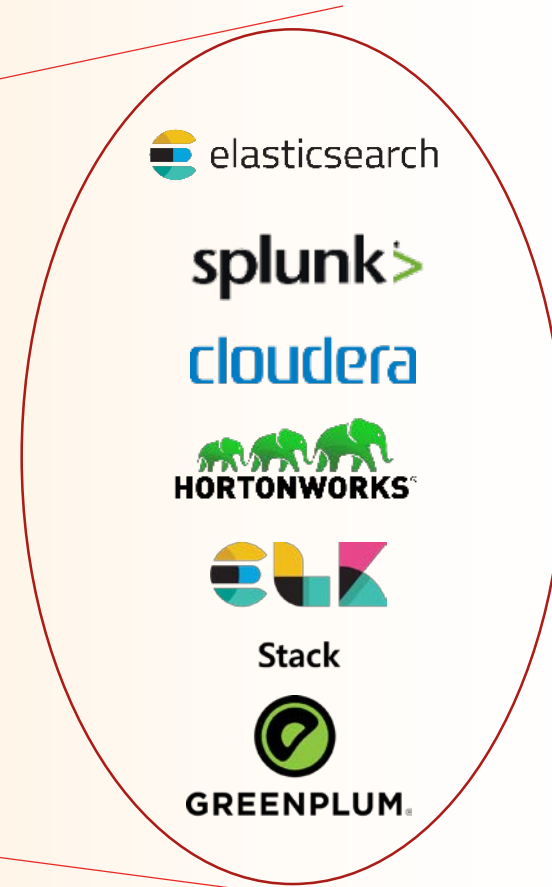
Stateful Applications



SQL Databases



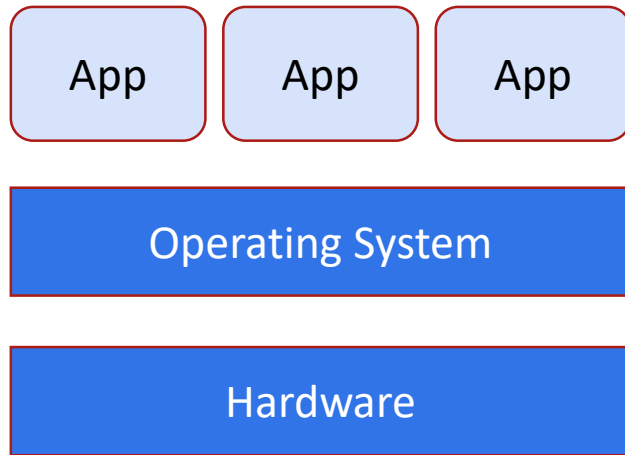
NoSQL Databases



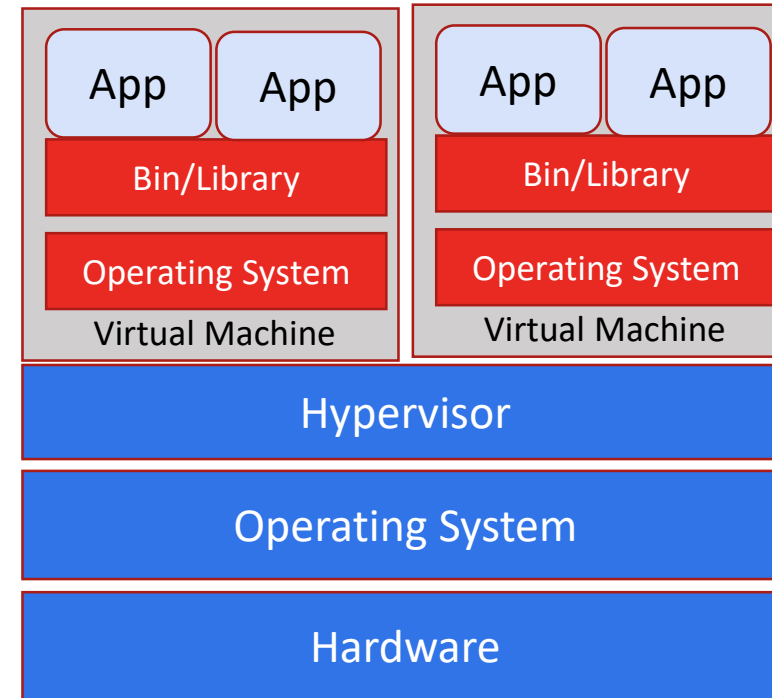
Big Data



Stateful Application Deployment



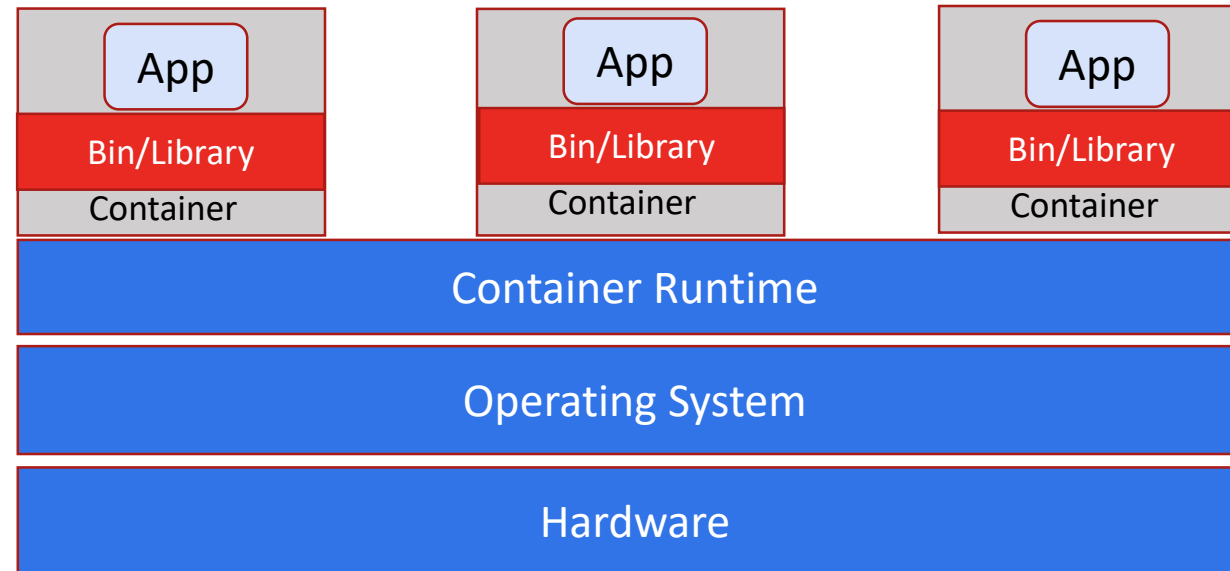
Traditional Deployment



Virtualized Deployment



Containerized Stateful Application Deployment



Container Deployment



Kubernetes

Portable, Extensible, open-source platform for managing containerized workloads and services

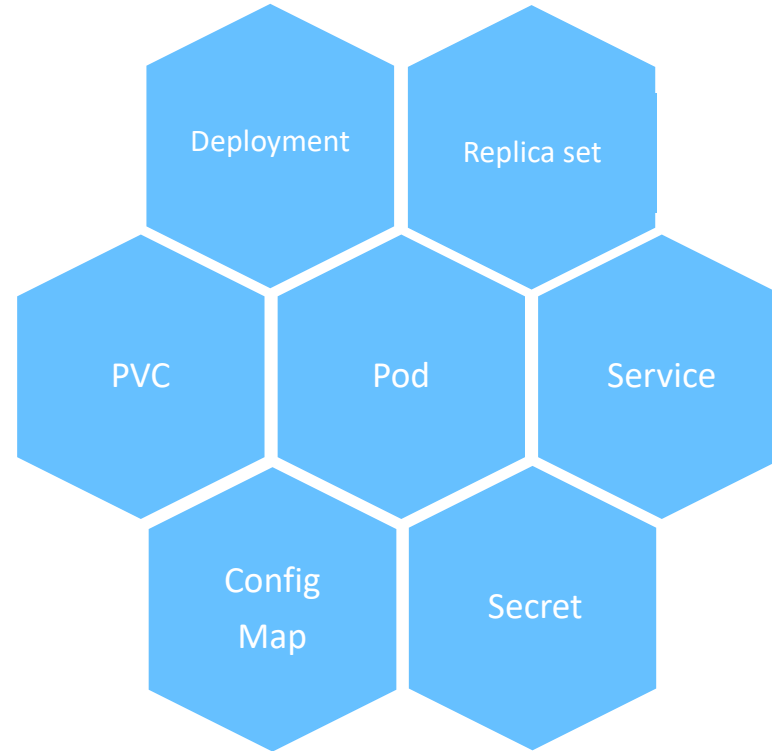
Reduce Costs -> Containerize apps and Consolidate Resources

Agile -> Modularity and Scalability

Life Cycle Management -> Health Checks, Automated Rollouts, Canary deployment, Load Balancing



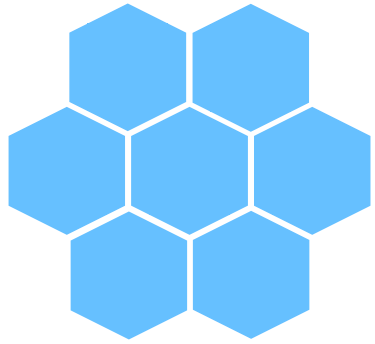
Application Composition



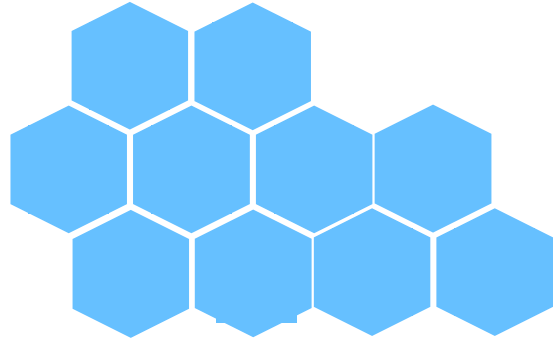
<https://github.com/helm/charts/tree/master/stable/mysql>



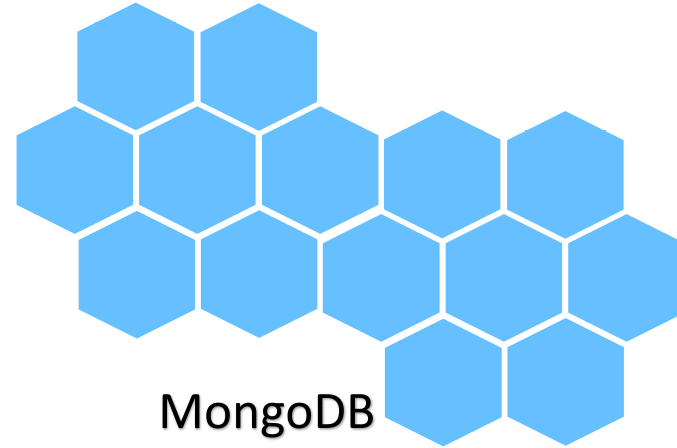
Application Composition .. The Complexity



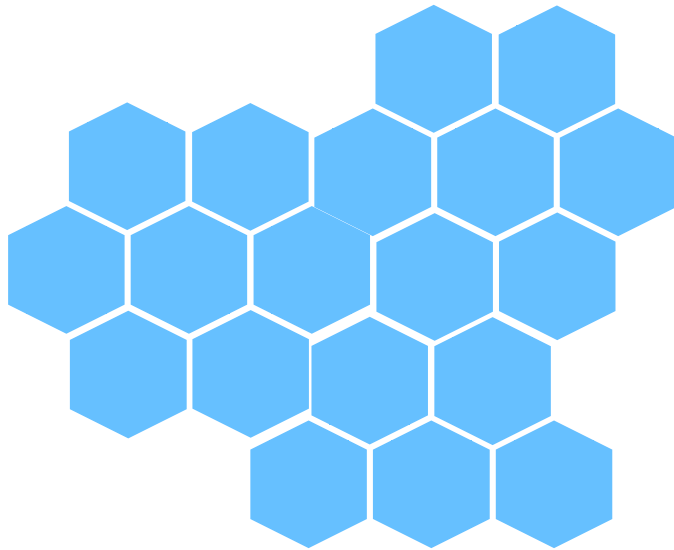
MySQL



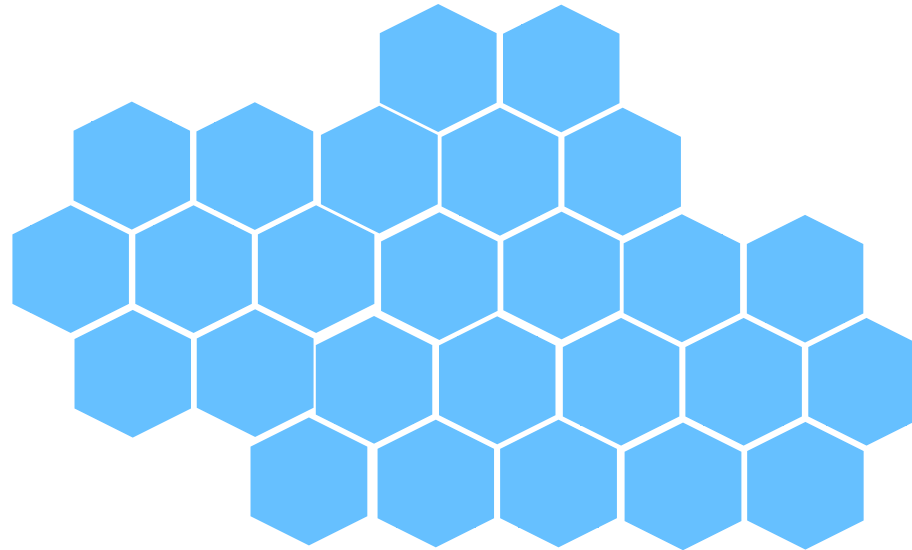
MariaDB



MongoDB



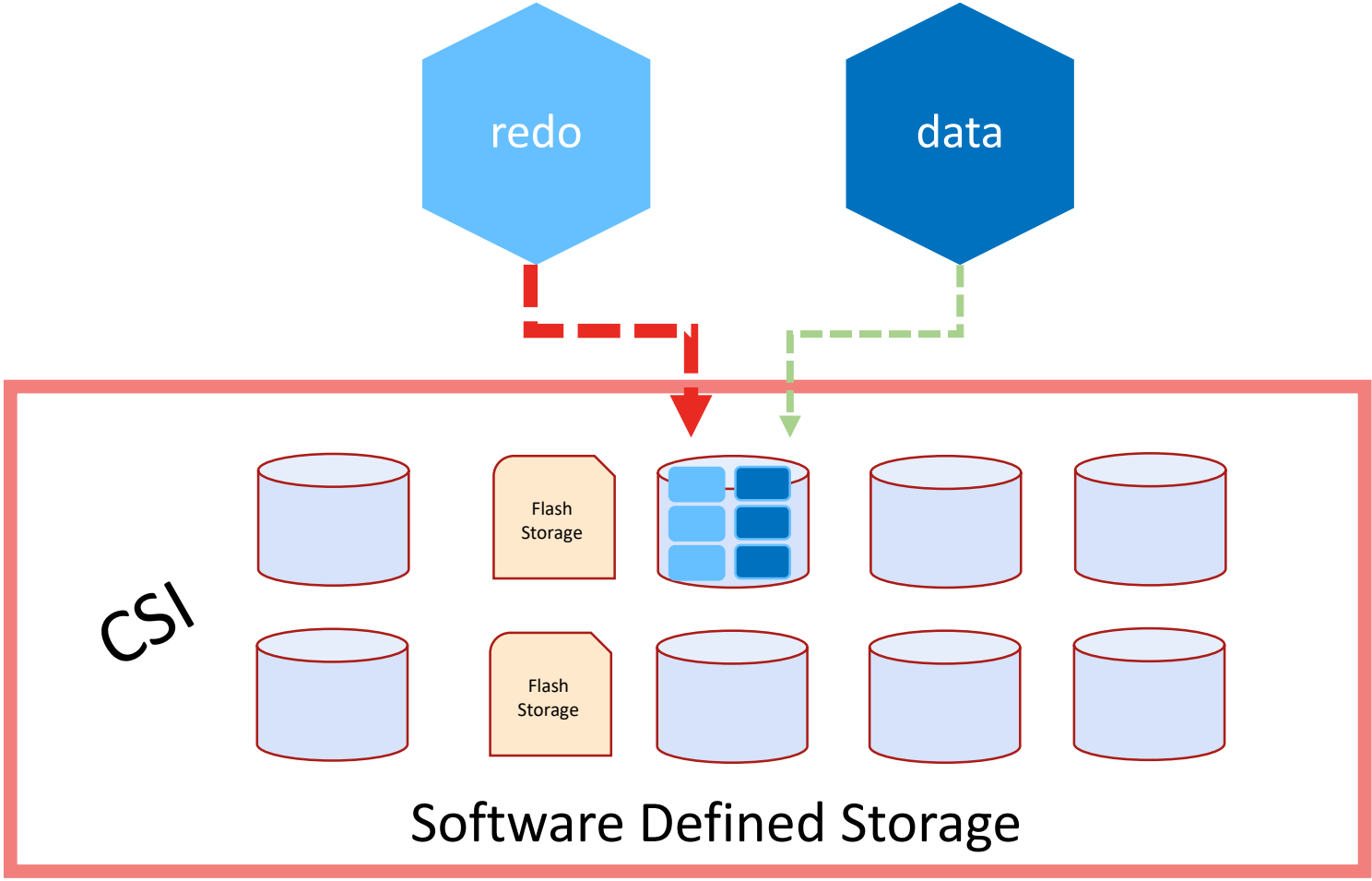
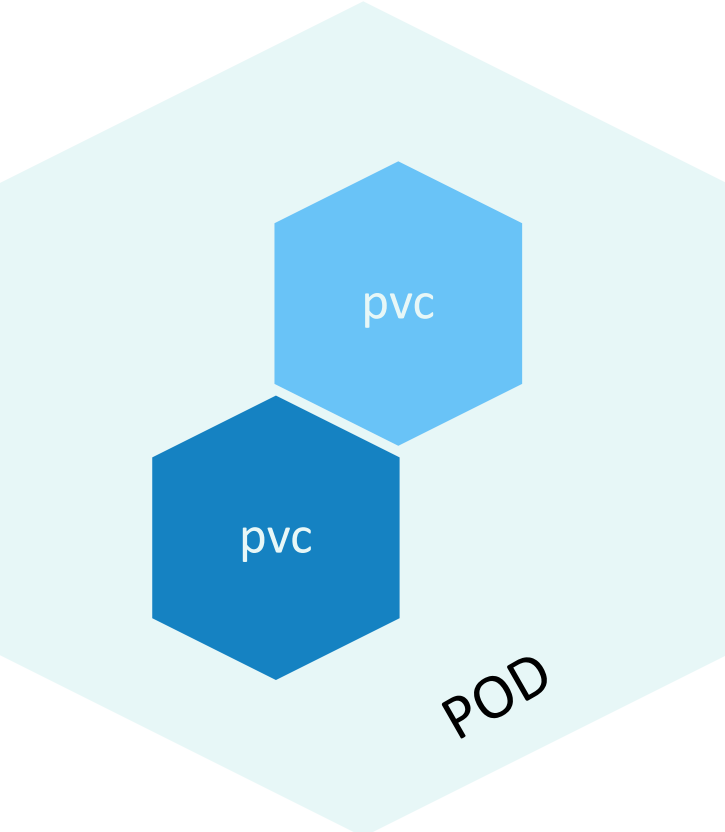
ElasticSearch



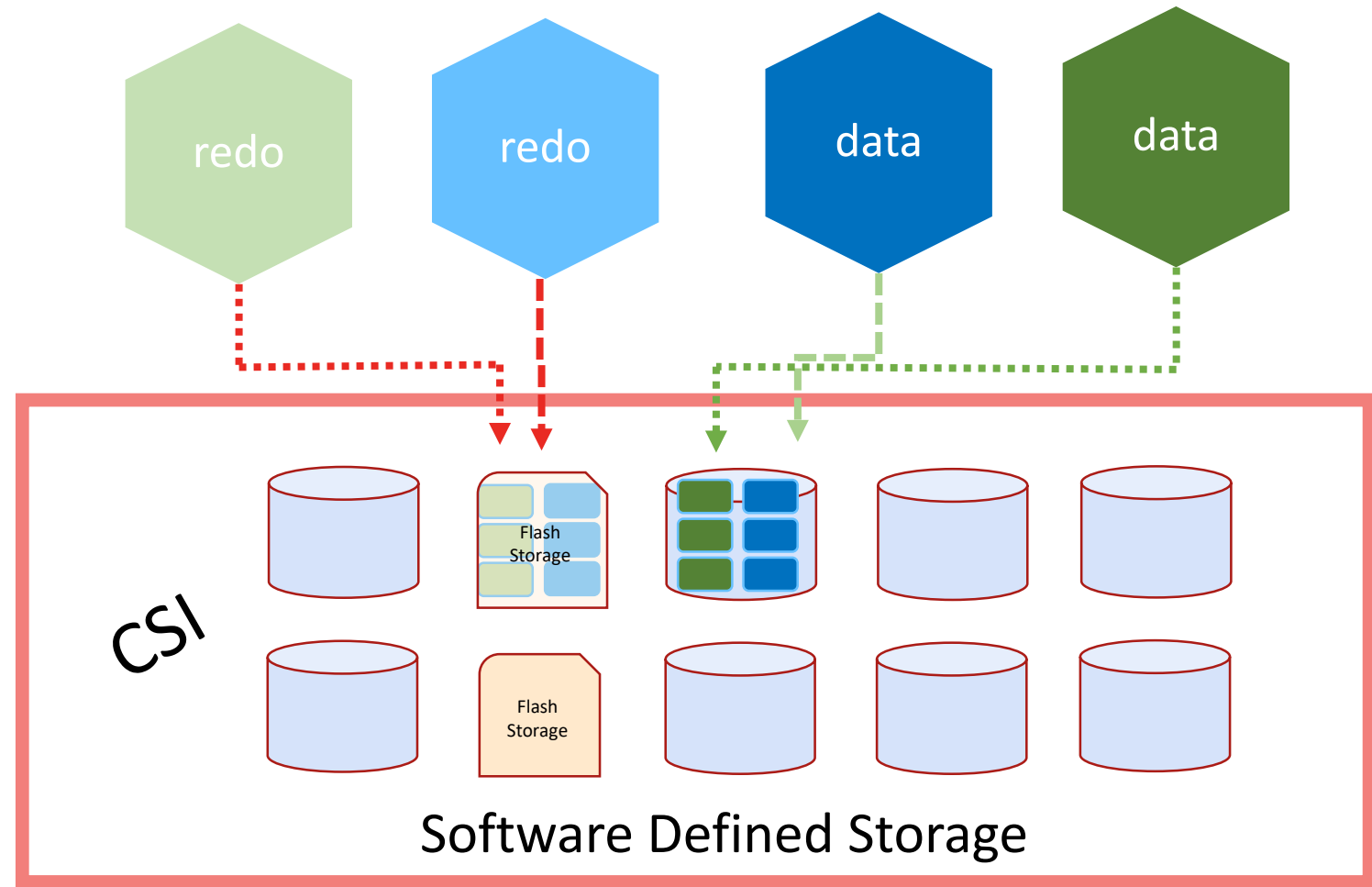
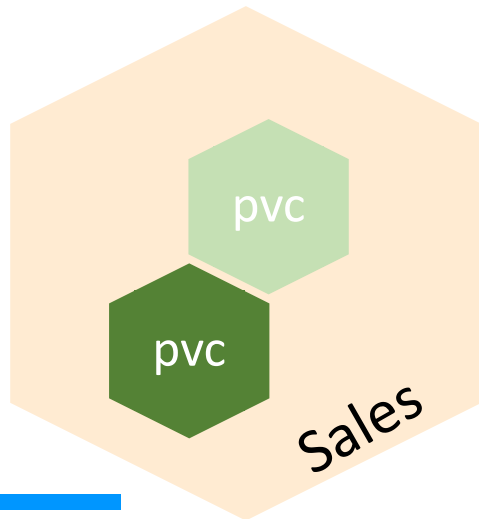
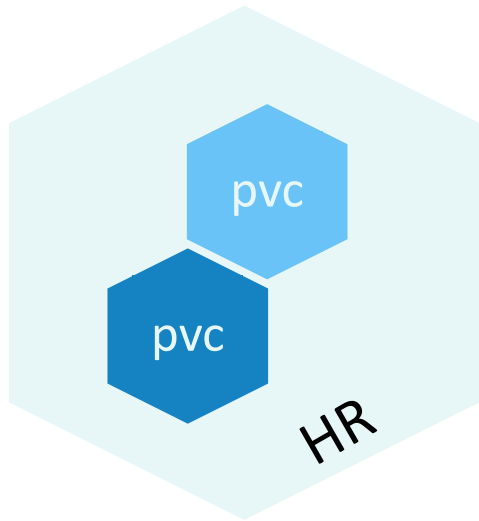
ELK Stack



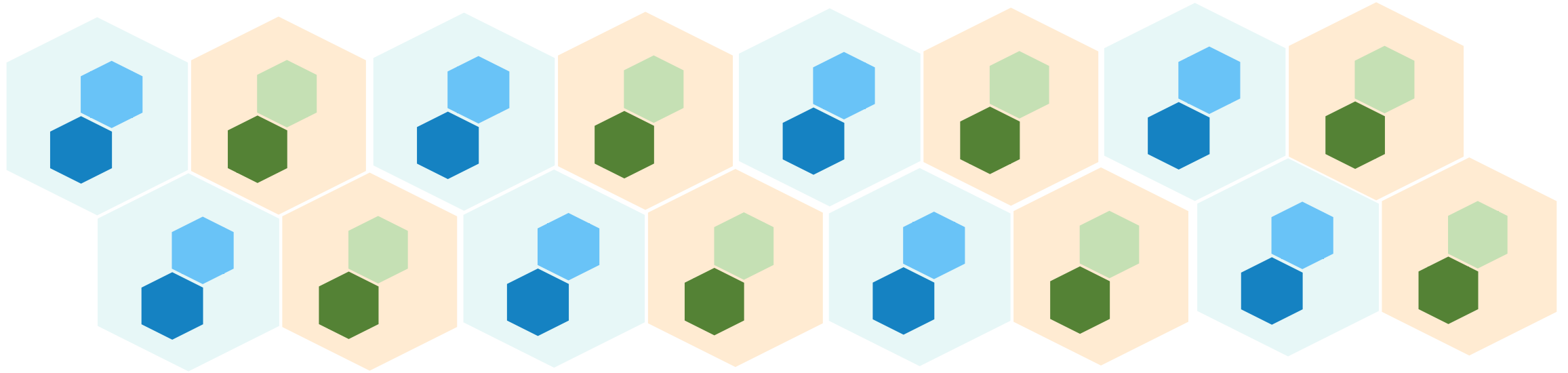
Perils of consolidation ..



Application awareness



Consolidation complexity



Imagine managing 100s of **PODs** and
1000s of **PVCs** allocated from 100s of **Drives**



Challenges of running Stateful Apps on Kubernetes

- › Servers/Disks fail and humans make errors → Apps become unavailable, Data is lost
- › Data must be protected and secured → Expects users to become storage experts
- › Unpredictable performance from sharing resources → Application SLAs are not met, unhappy users

PersistentVolumes are just the first step to running stateful apps in production

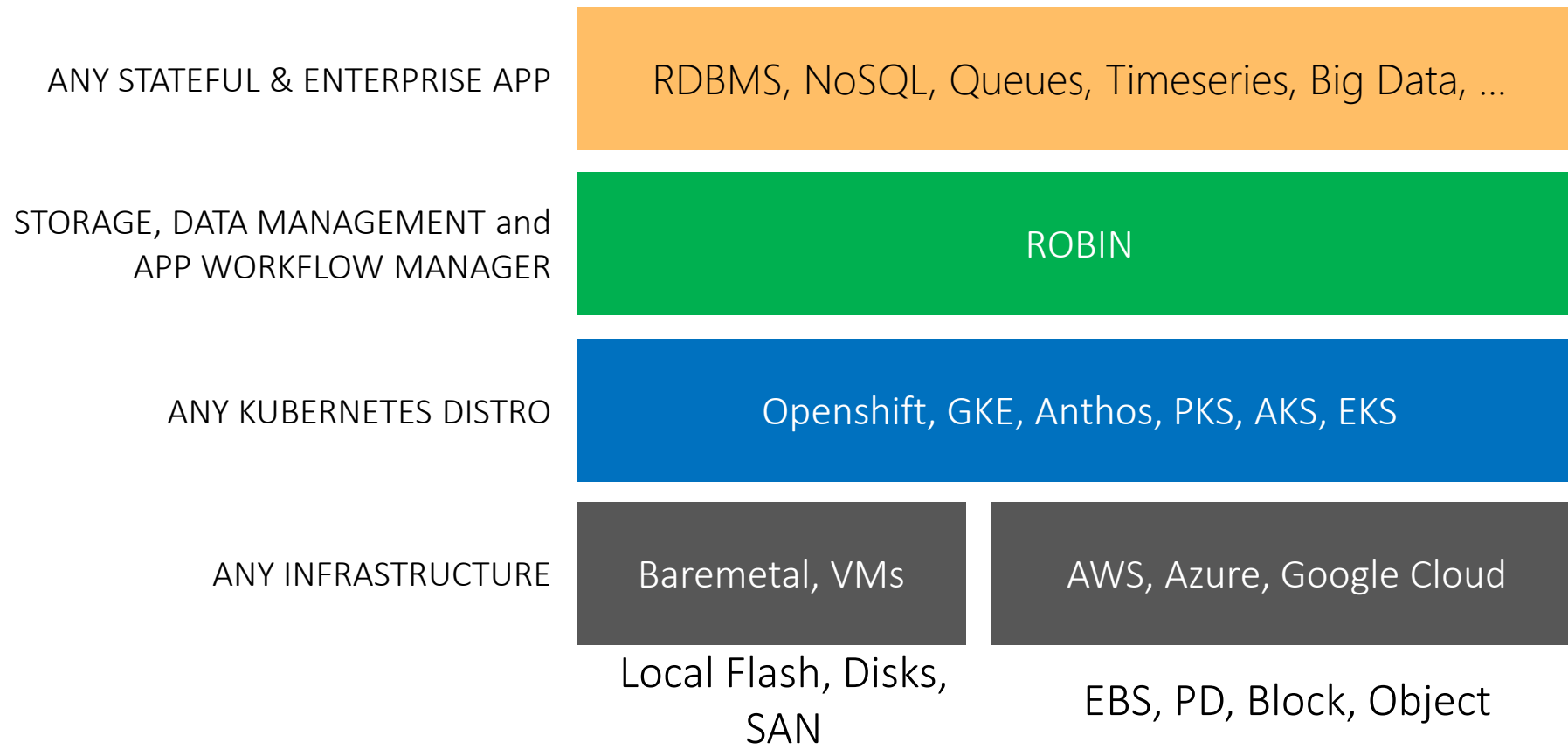


Challenges of running Stateful Apps

- › Unable to share data between prod and dev/test → **Low productivity and slower innovation**
- › Data gravity prevents app mobility across environments → **Cloud or Infrastructure Lock-in**



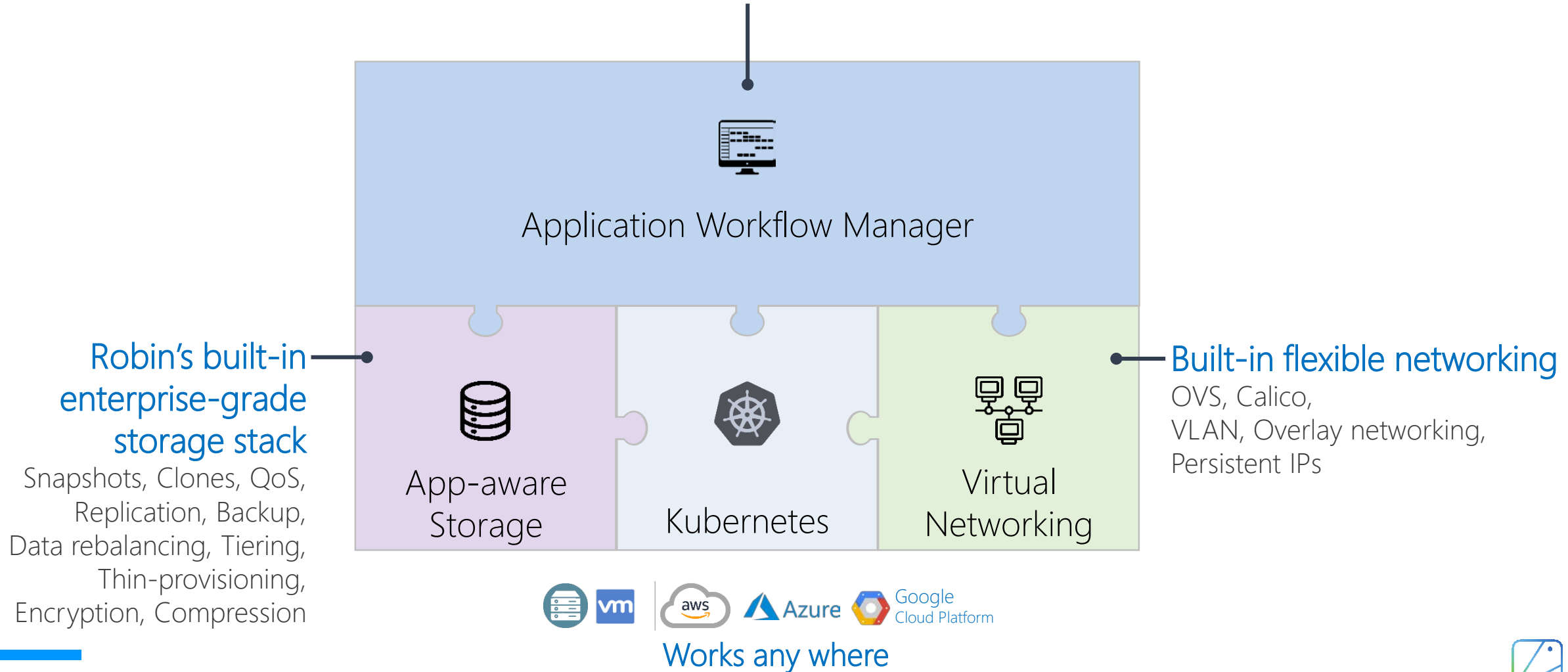
How Robin helps you run stateful apps on Kubernetes



Robin Architecture Overview

1-click application Deploy, Snapshot, Clone, Scale, Upgrade, Backup

Application workflows configure Kubernetes, Storage & Networking



ROBIN Application Aware Provisioning and QoS

- › **Correct binding between storage and application volumes**
- › **Failure tolerance**
 - › Disk, Node, Rack, Data Centre
- › **QoS guarantees**
 - › I/O is tagged all the way to the storage stack.
 - › Min IOPS, Max IOPS
 - › On-demand scale up of resources
 - › Ideal to meet temporary demand
- › **Performance isolation of apps and their Thin Clones**



Storage Provisioning



Just Volume Provisioning



Application Aware Provisioning



Protect And Collaborate

- › **Rock-solid Data Availability and Resiliency**

- › Strictly-consistent Replication, with automatic resync on fall-behind
- › Detects Disk and IO errors
- › Disk and Volume rebuilds

- › **Data Security**

- › Encryption with Key Management Integration

- › **Application Snapshots**

- › **Consistency volume group**
- › Protect against corruption, user errors
- › Rollback to any point

- › **Thin Clones**

- › Quick and Simple to Collaborate



Protect an entire Application, not just Storage Volumes

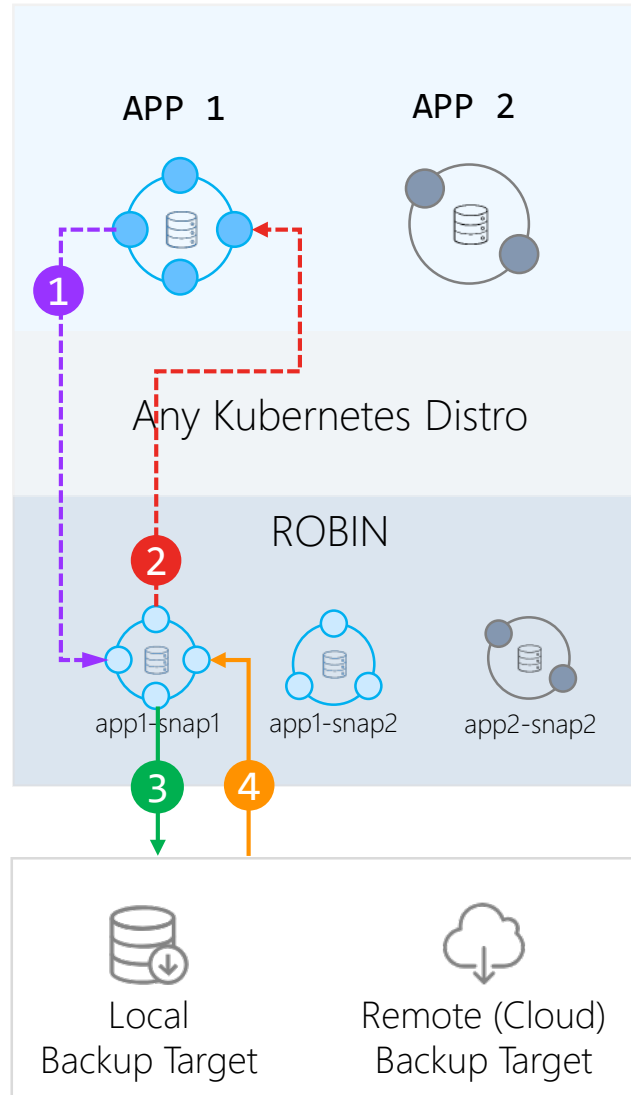
- 1 Maintain periodic checkpoints of your entire app with data

```
$ robin snapshot app1 snap1
```

1	DATA	PersistentVolumeClaims
2	CONFIG	ConfigMap, Secret, Labels, ...
3	METADATA	Pods, StatefulSets, Services, ...

- 2 Rollback entire app+data to healthy state to recover from corruptions or user errors

```
$ robin rollback snap1 app1
```



- 3 Backup entire app+data as into external backup targets

```
$ robin backup snap1 target
```

- 4 Restore entire app+data to healthy state from catastrophic hardware and datacenter failures

```
$ robin restore target snap1
```

› ROBIN Backups are fully self-contained

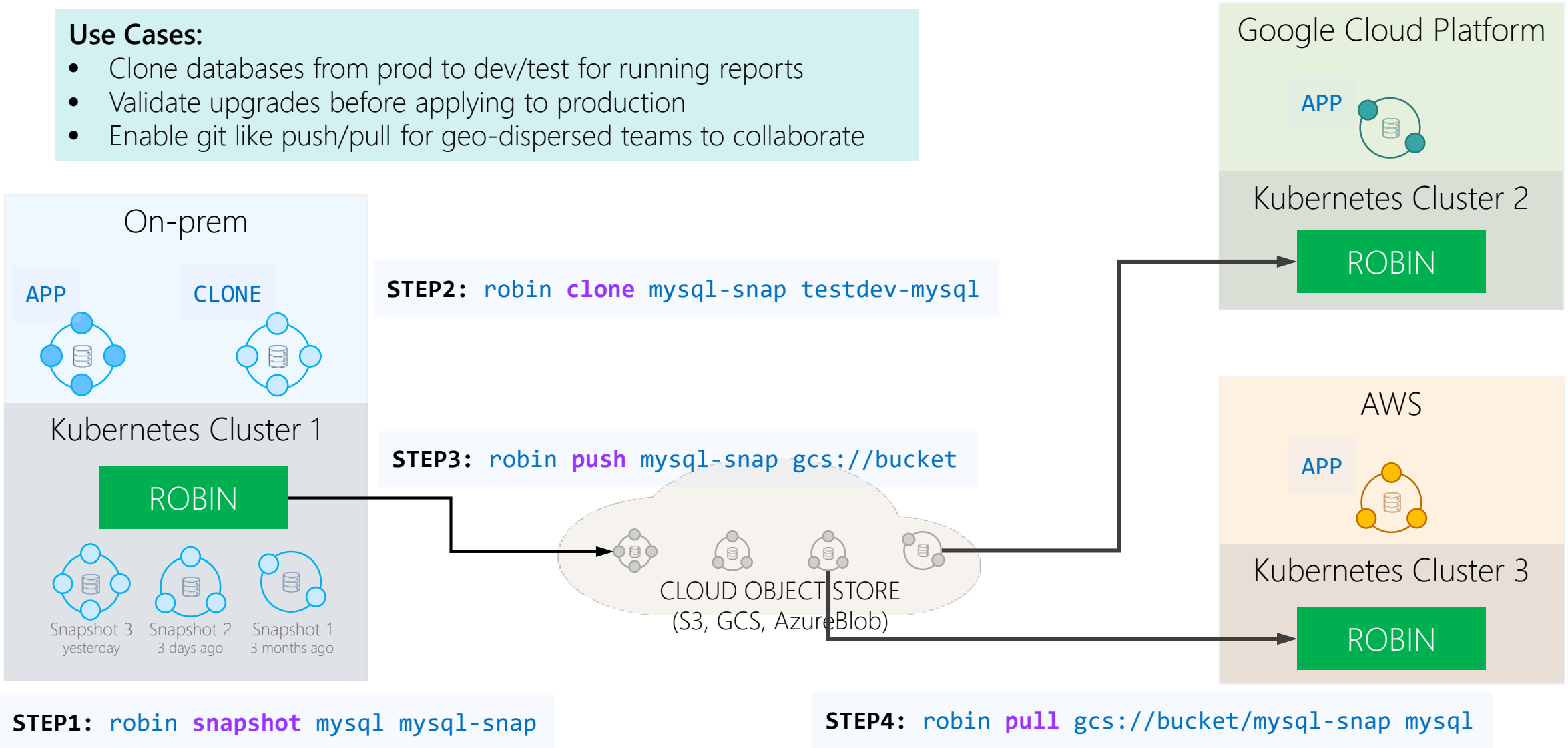
› Entire app resources can be restored in the same or different data center or cloud even if the source is completely destroyed



Make DevOps productive with Stateful Apps

Use Cases:

- Clone databases from prod to dev/test for running reports
- Validate upgrades before applying to production
- Enable git like push/pull for geo-dispersed teams to collaborate





Thankyou

www.Robin.io

Agenda

- › **What is Stateful application**
- › **Why Kubernetes**
- › **Challenges deploying stateful application in Kubernetes**
- › **ROBIN introduction**
- › **Solutions**
- › **Q & A**

