

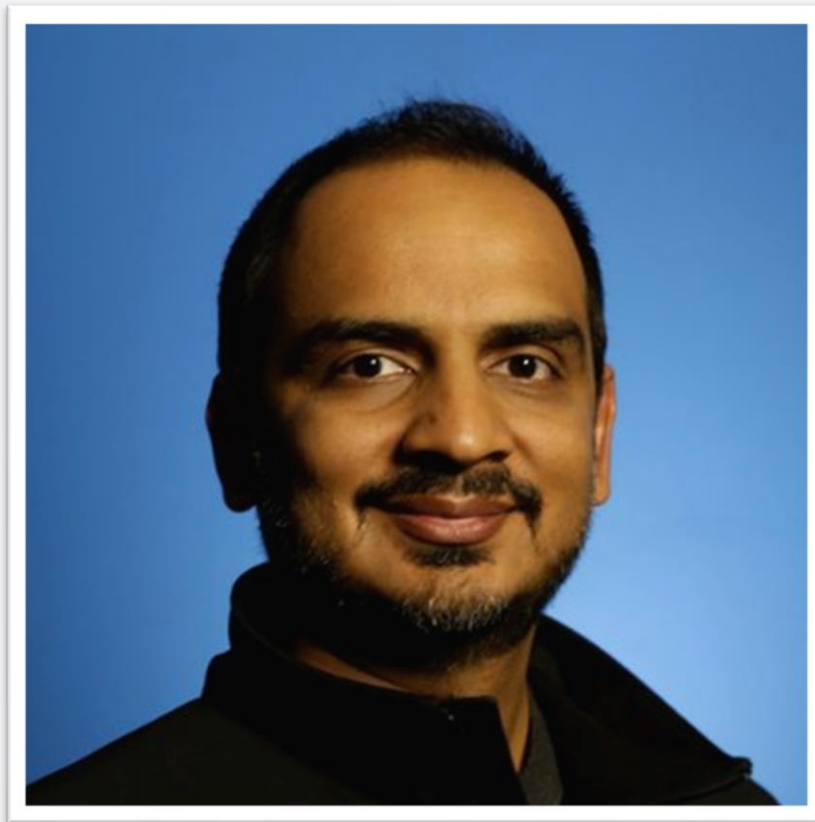


# Data Protection in a Kubernetes-Native World



@nirajtolia  
CEO, Kasten





## Niraj Tolia

**Co-founder & CEO @ Kasten**

Leading Kubernetes Backup Platform

Using Kubernetes since 2015

**Industry and Academic Storage Experience**

(20+ patents filed, ~3000 citations)

**3<sup>rd</sup> SNIA SDC Talk**

Dell EMC Data Protection (Cloudboost)

Maginatics (Distributed File Systems)

HP Labs (Next Gen Storage)

Carnegie Mellon (BS, MS, PhD on Deduplication)



# Kubernetes

## Container Orchestration: Automated Deployment, Scaling, & Management

# talk agenda

## kubernetes today, futures, providers



### Kubernetes Today

Where is Kubernetes today? Why is it important? How big is it?



### Kubernetes Futures

Looking ahead. How has Kubernetes changed application deployment and ops?



### Kubernetes Storage

Is Kubernetes storage ready? Are people using it in production? How do we protect it?

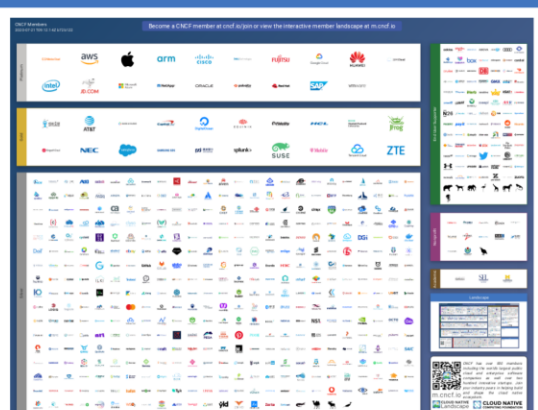




**Kubernetes Is  
The Next Wave Of  
Infrastructure!**

## Provisioning

## Members



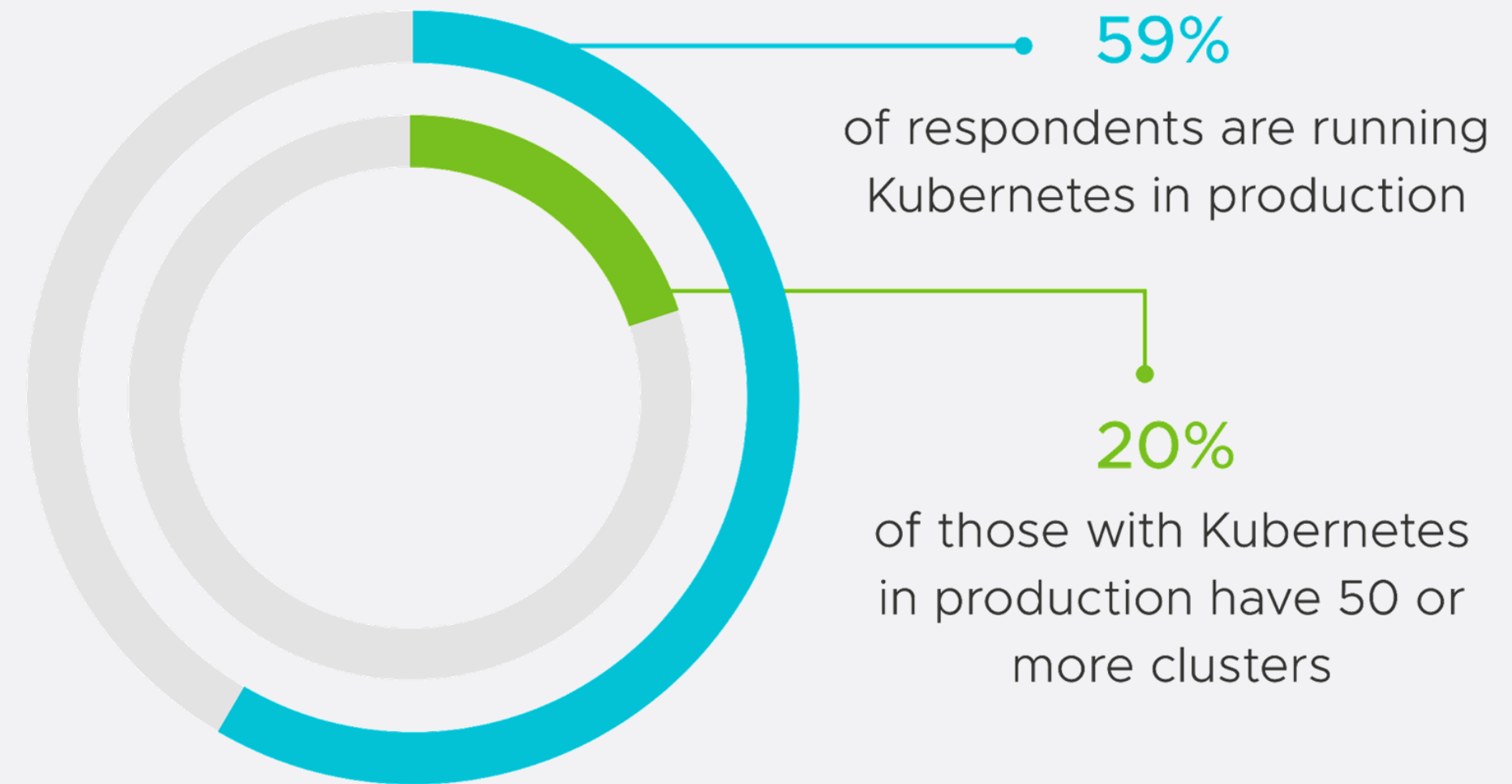
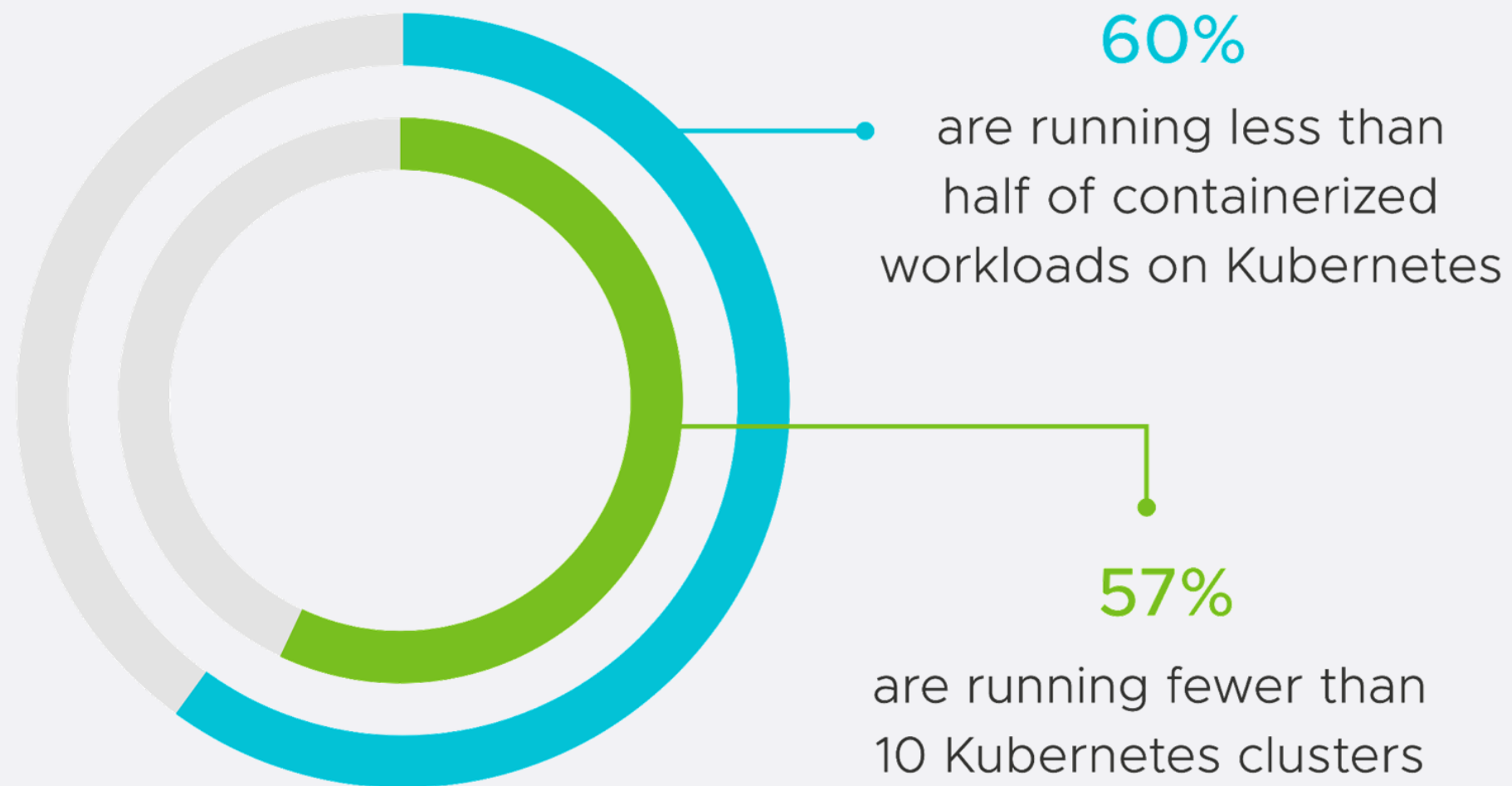
*This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.*

# Things are Shaking Out

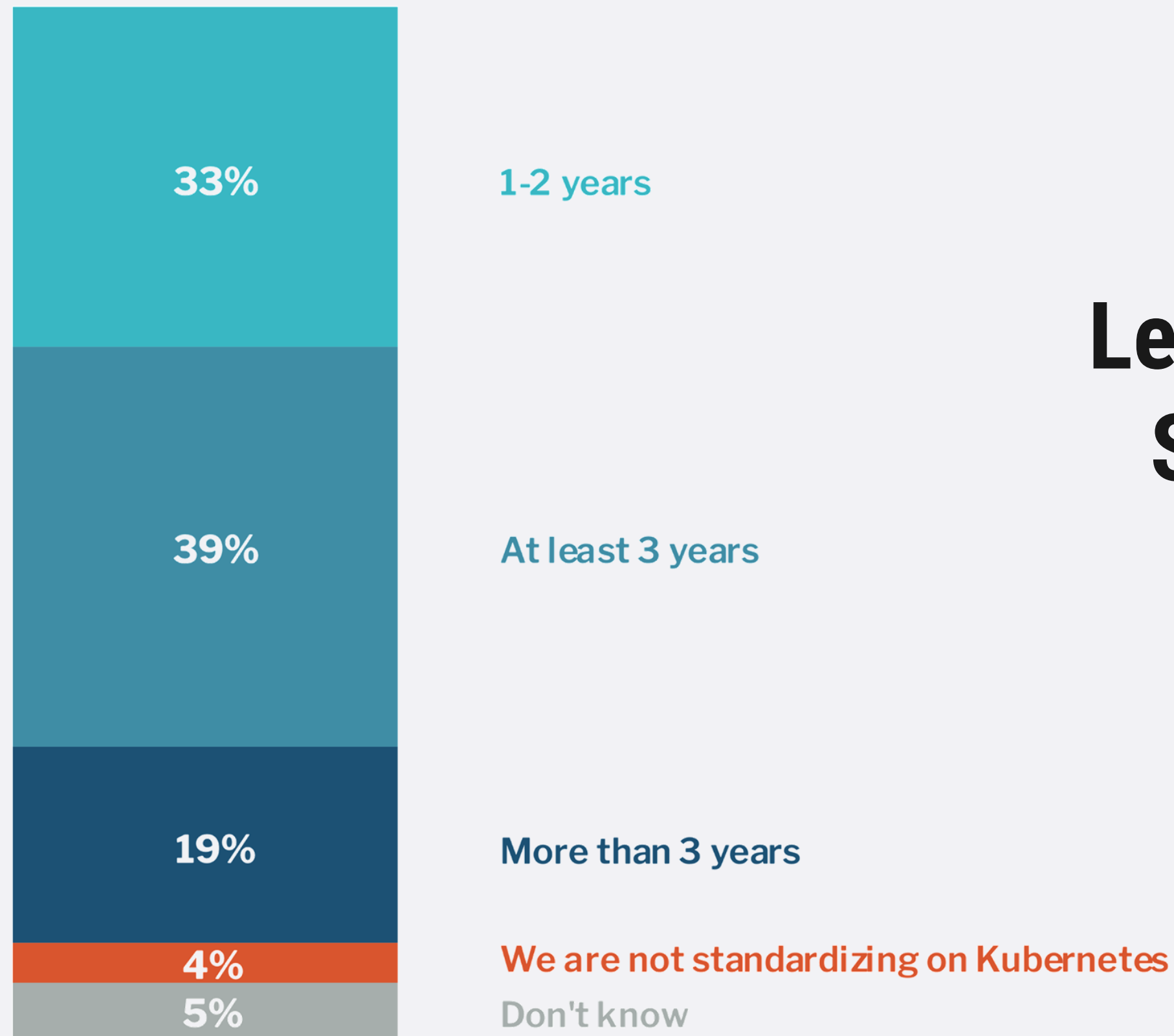
[illegible]

# kubernetes adoption

## it's still early but it feels like



# kubernetes standardization coming faster than one might think...



## Length of Time To Standardize on Kubernetes



| **developer adoption**  
**they are the key influencers today**

**6.5M**

**Cloud-Native Developers**  
**Driving Digital Transformation**

**2.7M**

**Kubernetes Developers**  
**Influencing Buying Decisions**



# Kubernetes “Day 1” is winding down

**The initial challenges to provision, install and  
roll out Kubernetes have been addressed**

This is visible in the ongoing consolidation for  
companies that tackle Day 1 problems

01

# Kubernetes “Day 2” is the focus now

Day 2 challenges include operationalizing  
production deployments at scale

Important areas here include **data management**,  
security, observability

02



# Kubernetes: Storage and Data Management

## Exploding Day 2 Use Case

# 50%

---

of Top 10  
containers running  
in Kubernetes are  
stateful

# 57%

---

of monitored  
Kubernetes clusters  
are running  
StatefulSets

# 70+

---

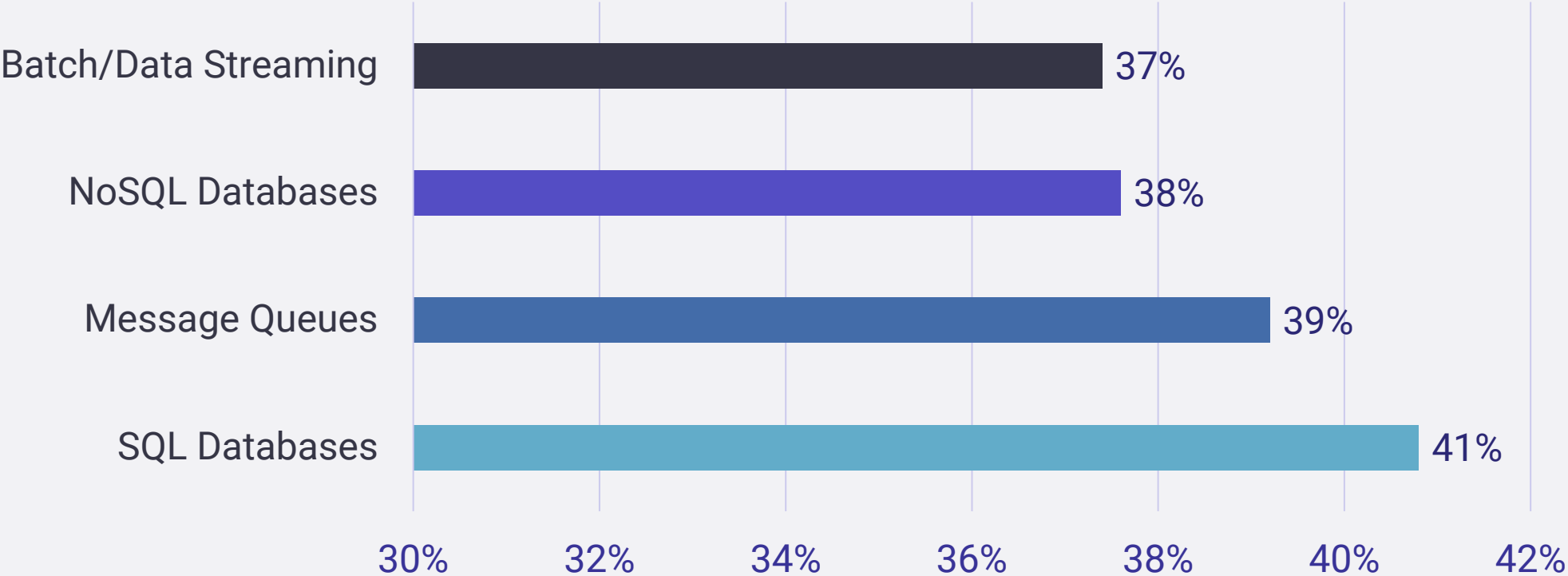
Kubernetes  
storage drivers  
available for use  
today!

2020  
Data

55%

of organizations indicate that **half or more** of their container applications are stateful (451 Research)

Stateful Application Type Deployed on Kubernetes

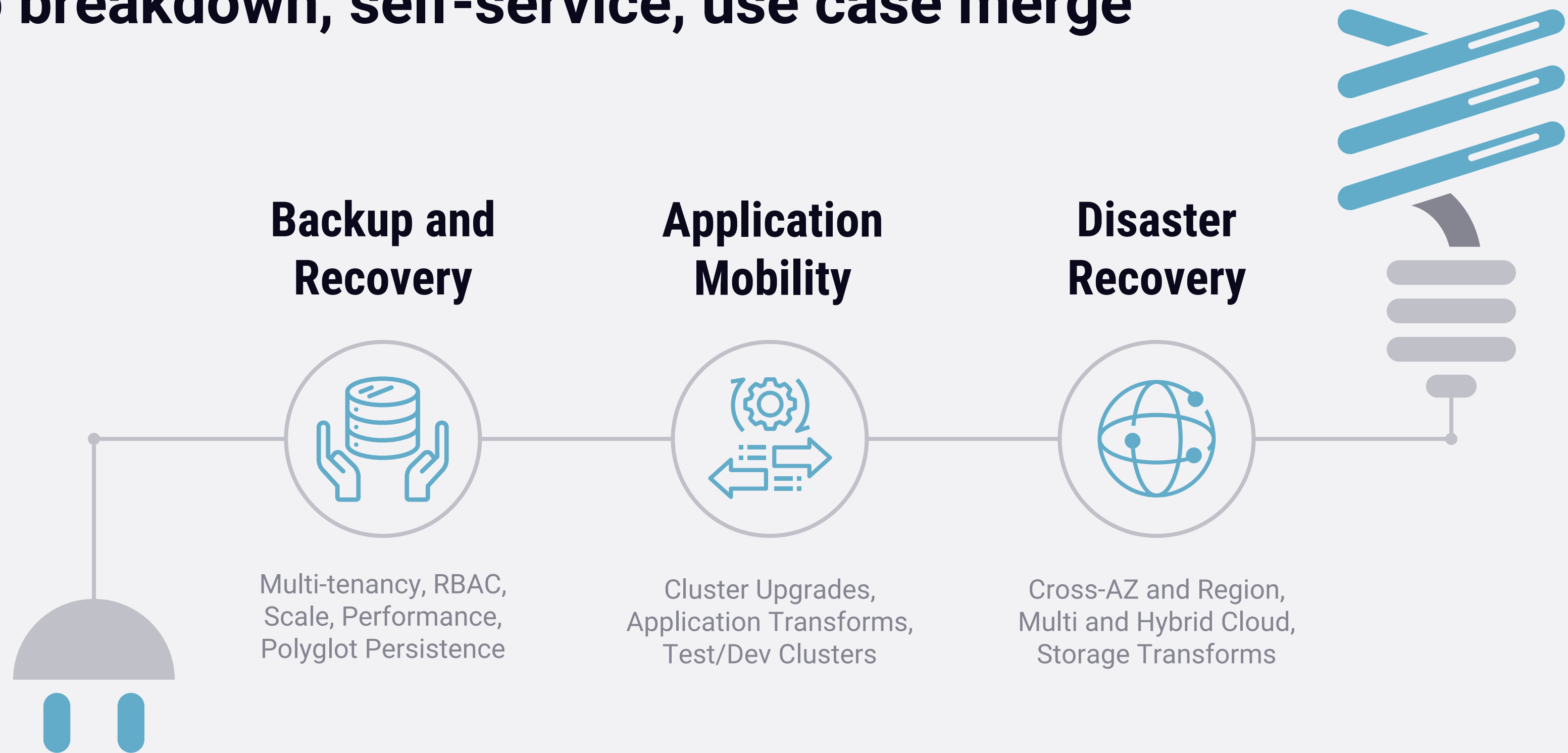




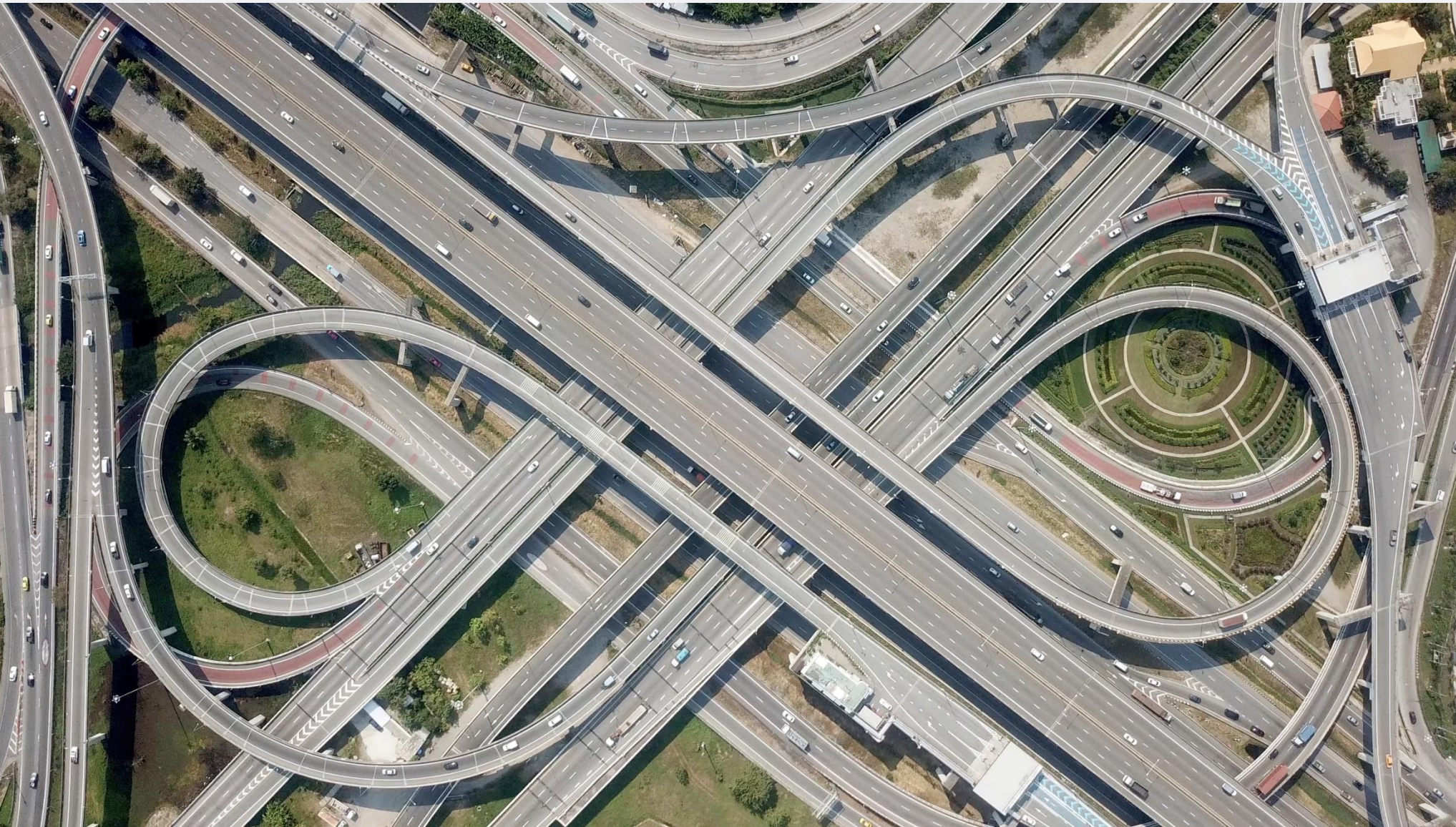
**Talk Colored By  
Shifting Dev and  
Ops Roles**

# kubernetes-native data management

## silo breakdown, self-service, use case merge



# what's different? deployment patterns

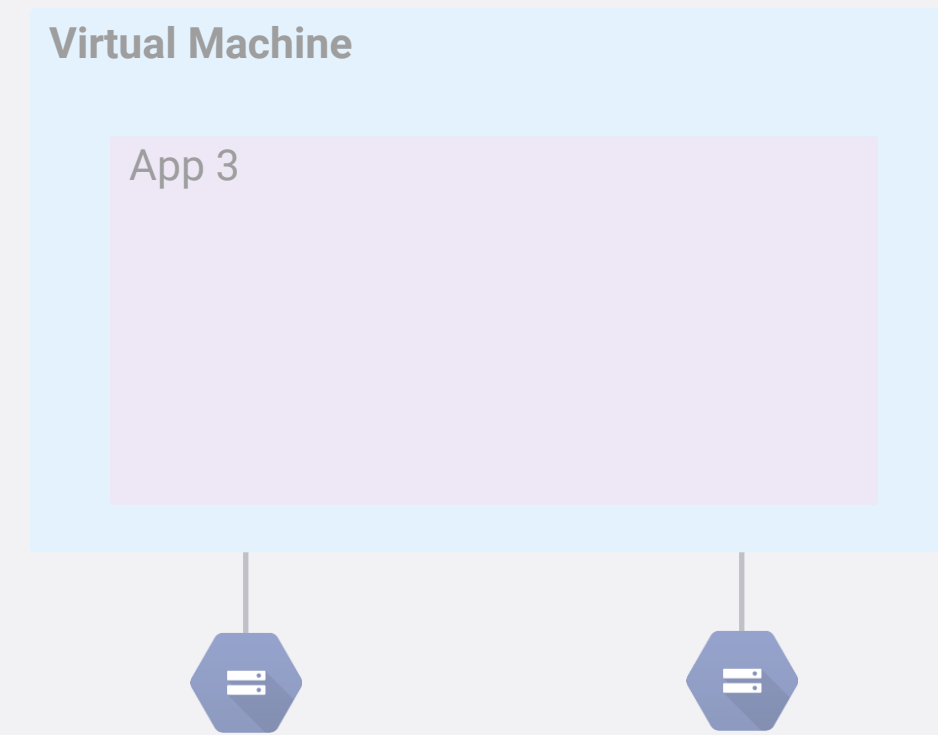
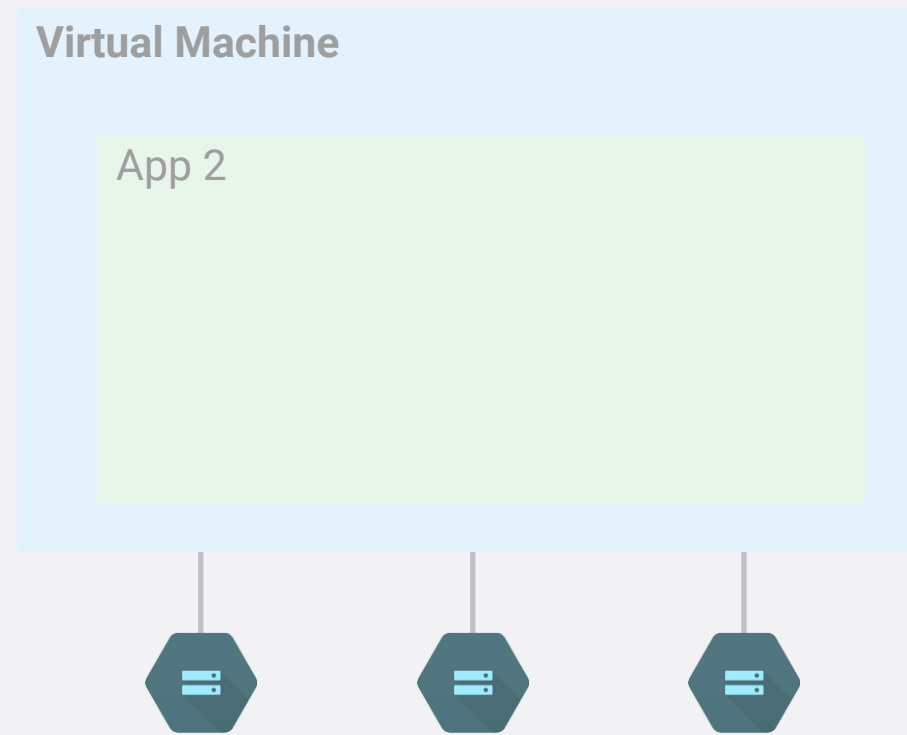
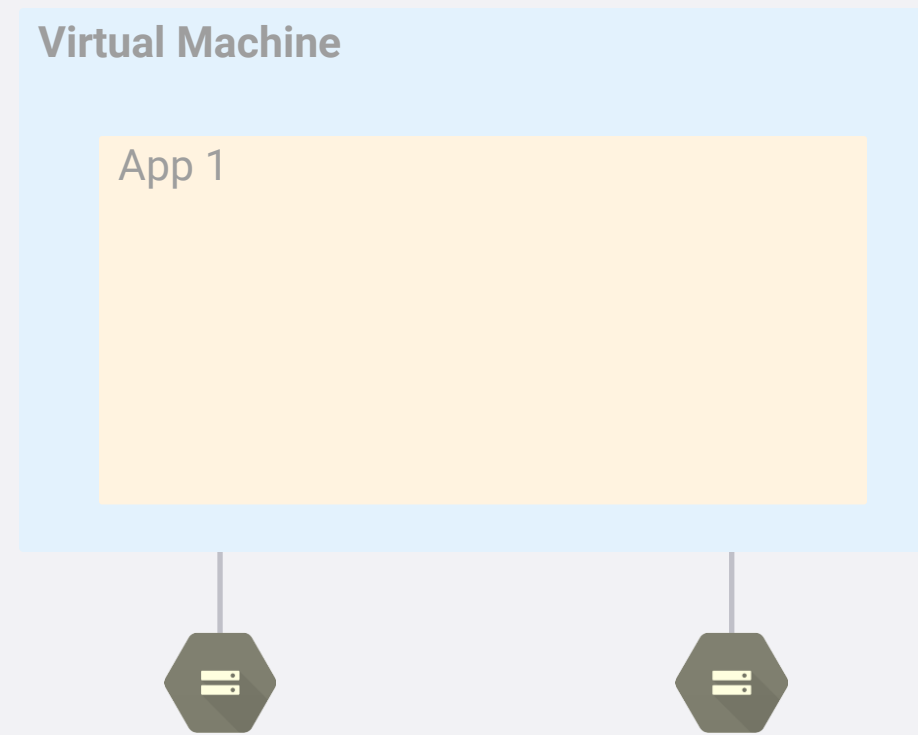


## Kubernetes Deployment Patterns

- No VM  $\leftrightarrow$  Application Mapping
- Dynamic Rescheduling
- Constant Redeployments
- Multi-Tenant Clusters

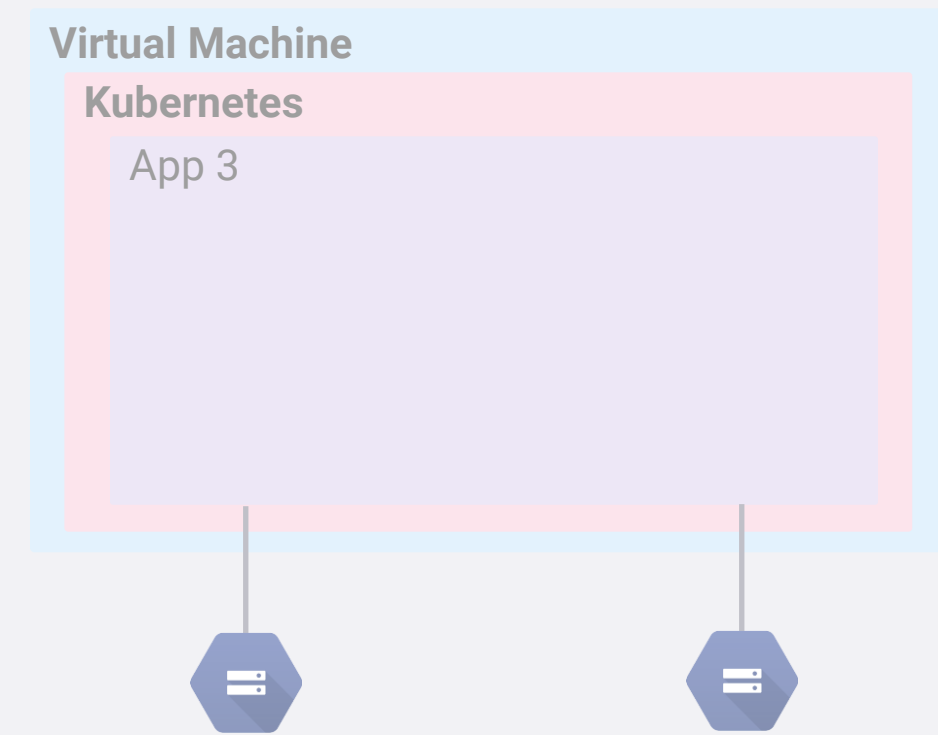
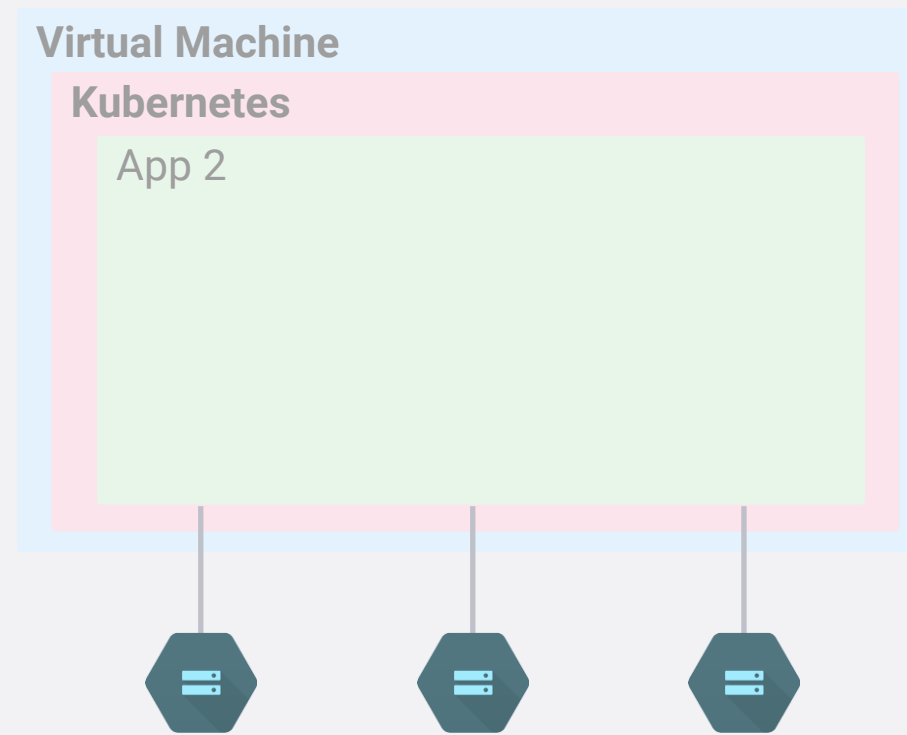
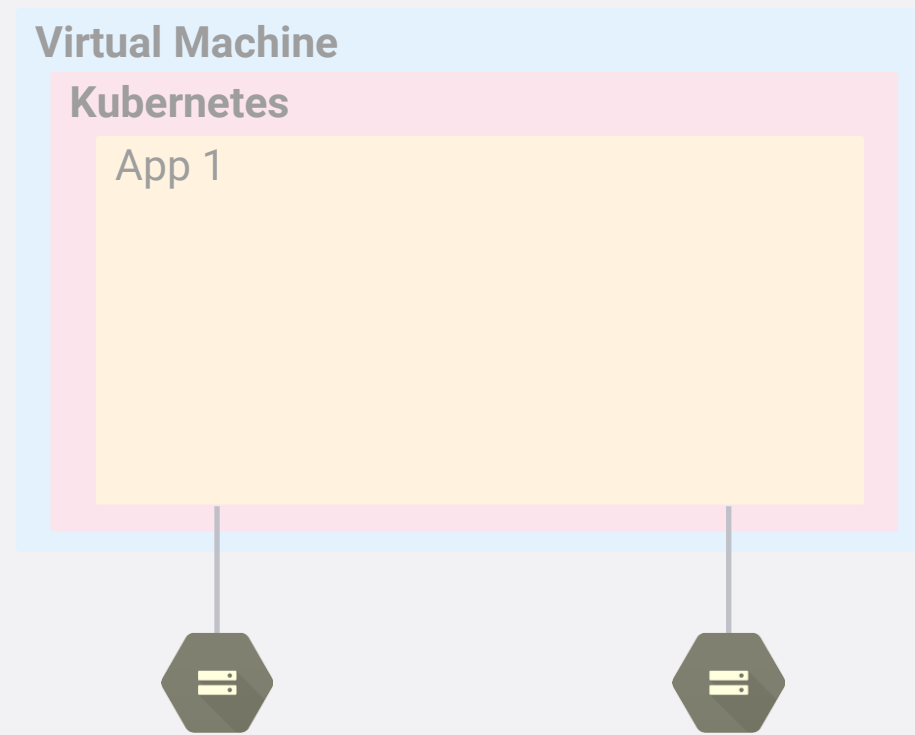
# where does vm-based backup fall short?

## a high-level walkthrough



# where does vm-based backup fall short?

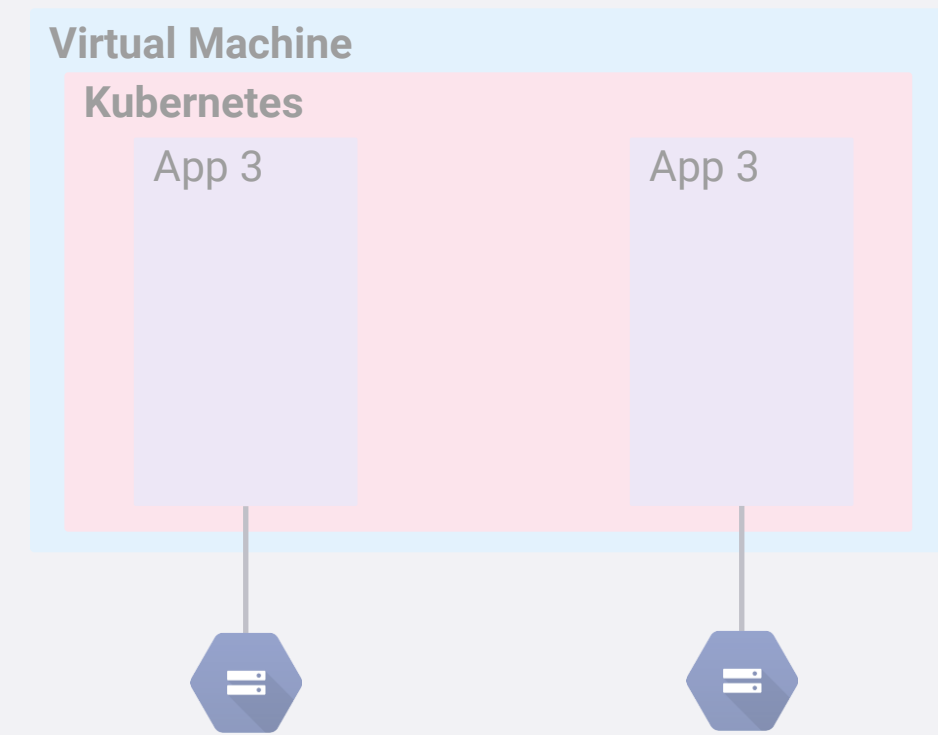
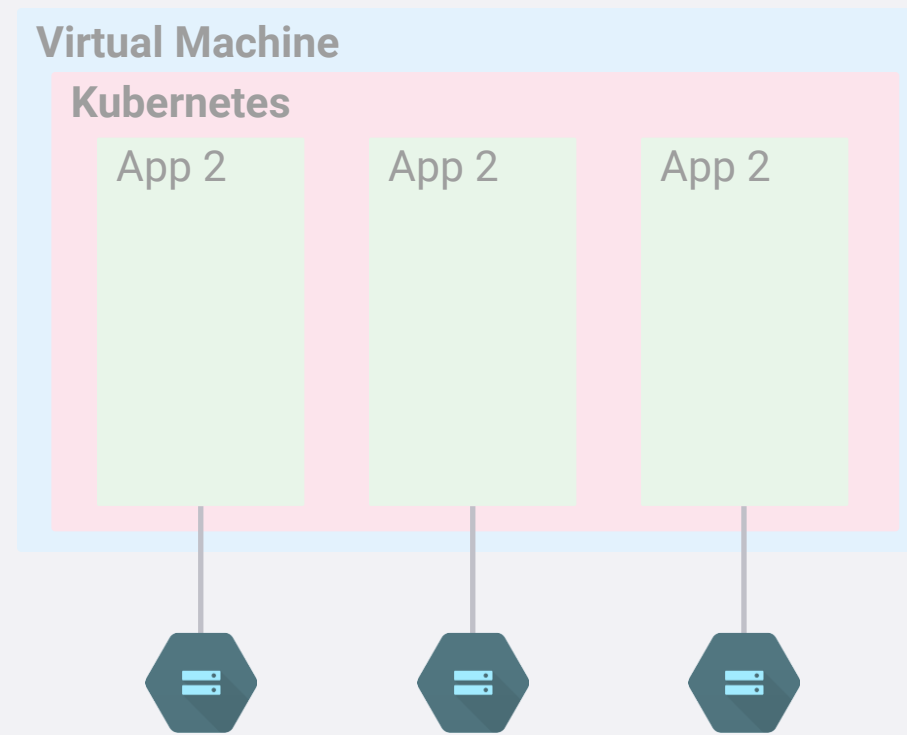
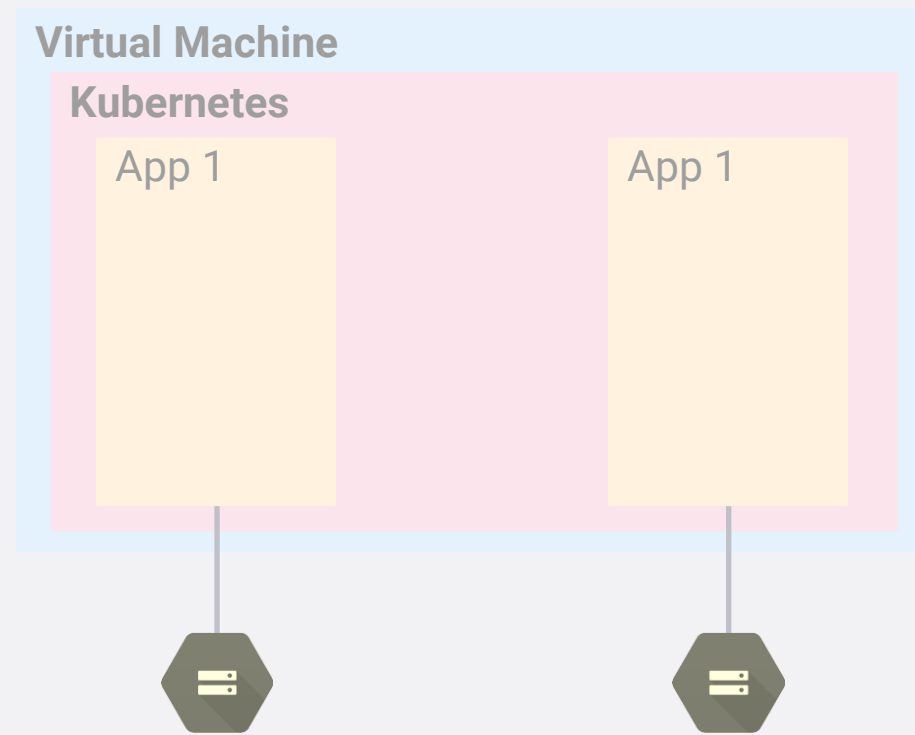
## a high-level walkthrough



VM-based solutions loses application visibility  
with the introduction of Kubernetes

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## a high-level walkthrough



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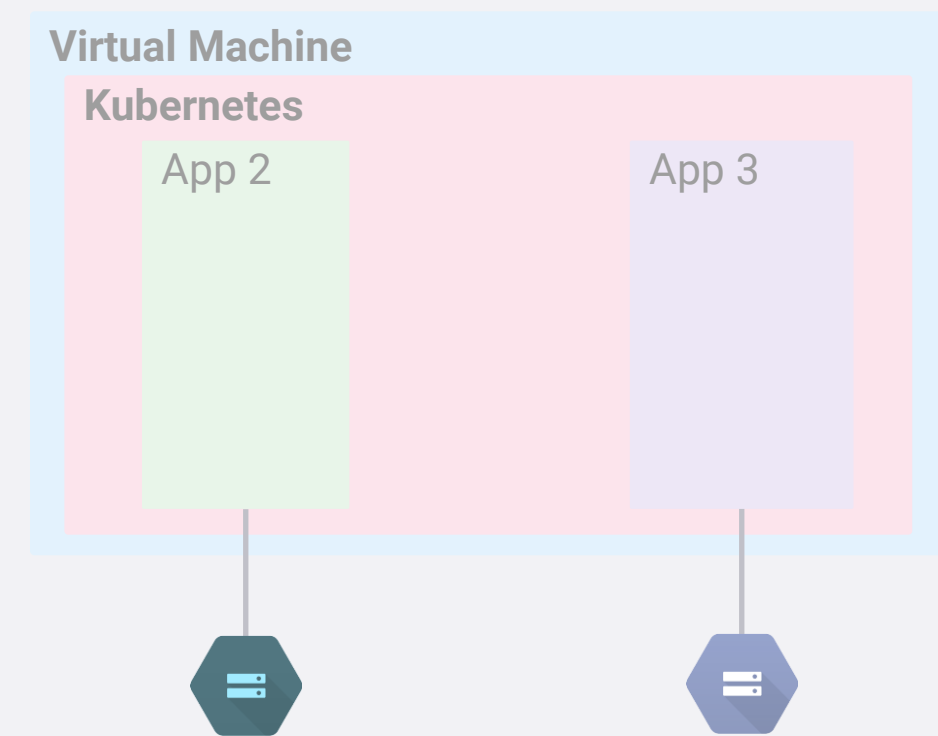
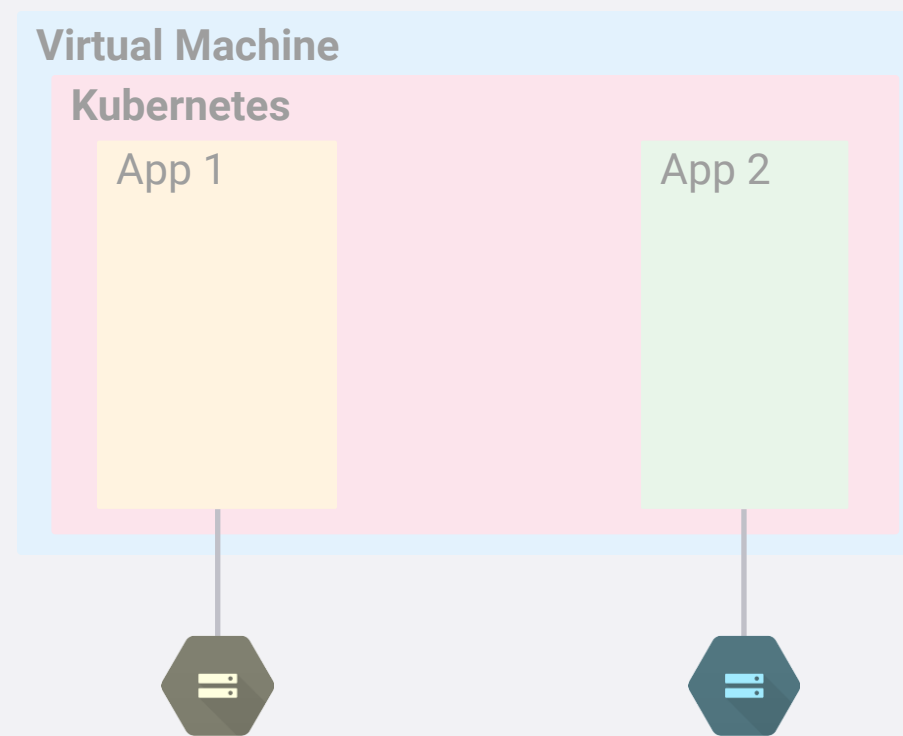
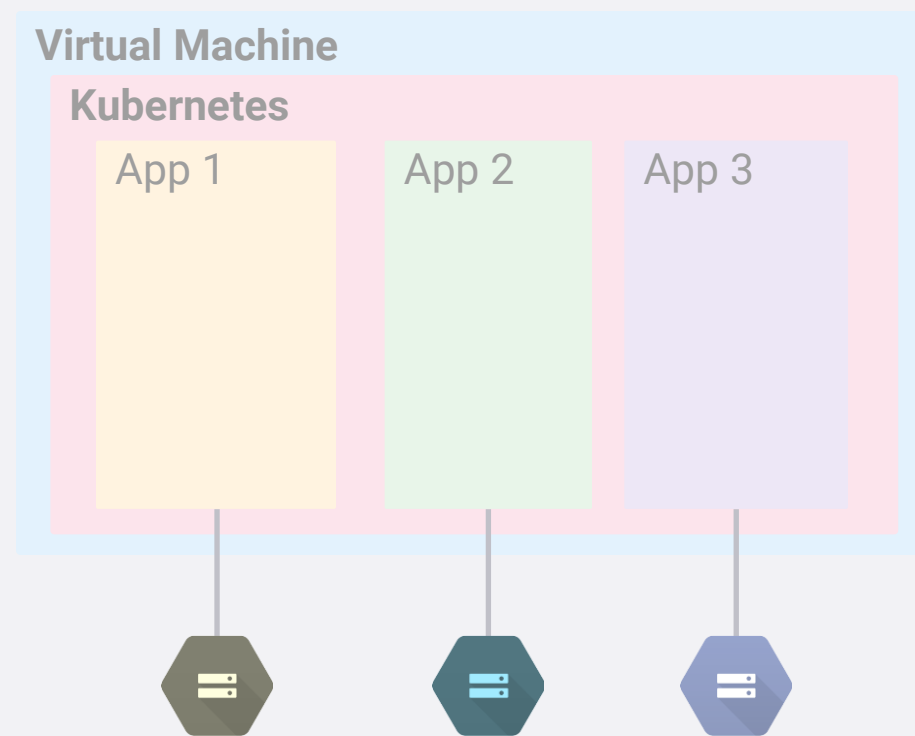


Transition to microservices increases scale by 100X with Kubernetes



# where does vm-based backup fall short?

## a high-level walkthrough



VM-based solutions loses application visibility with the introduction of Kubernetes



Transition to microservices increases scale by 100X with Kubernetes

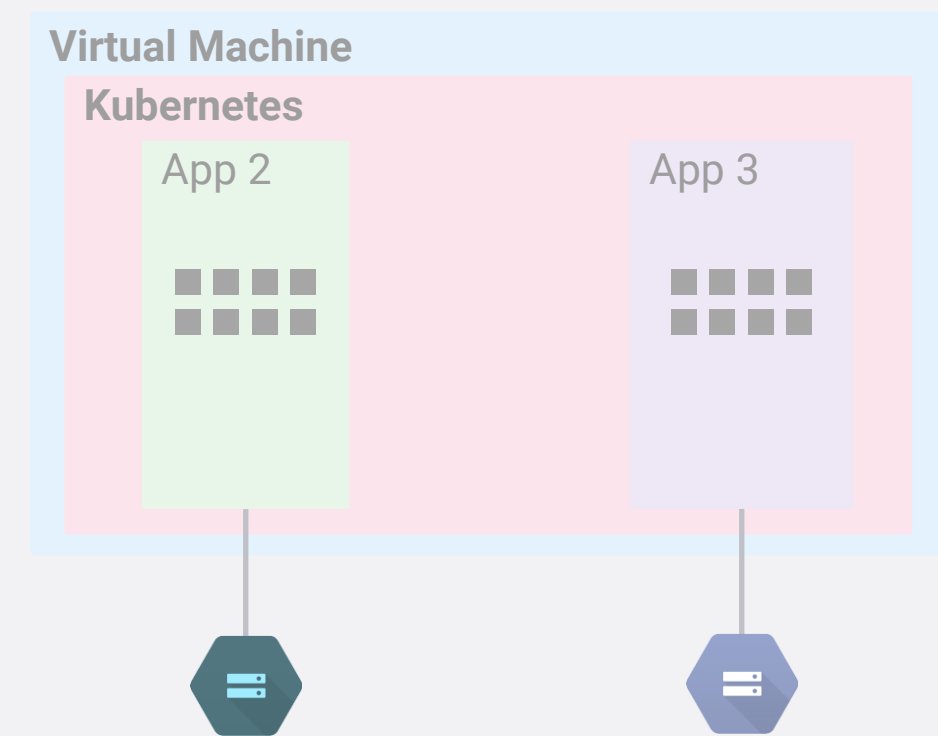
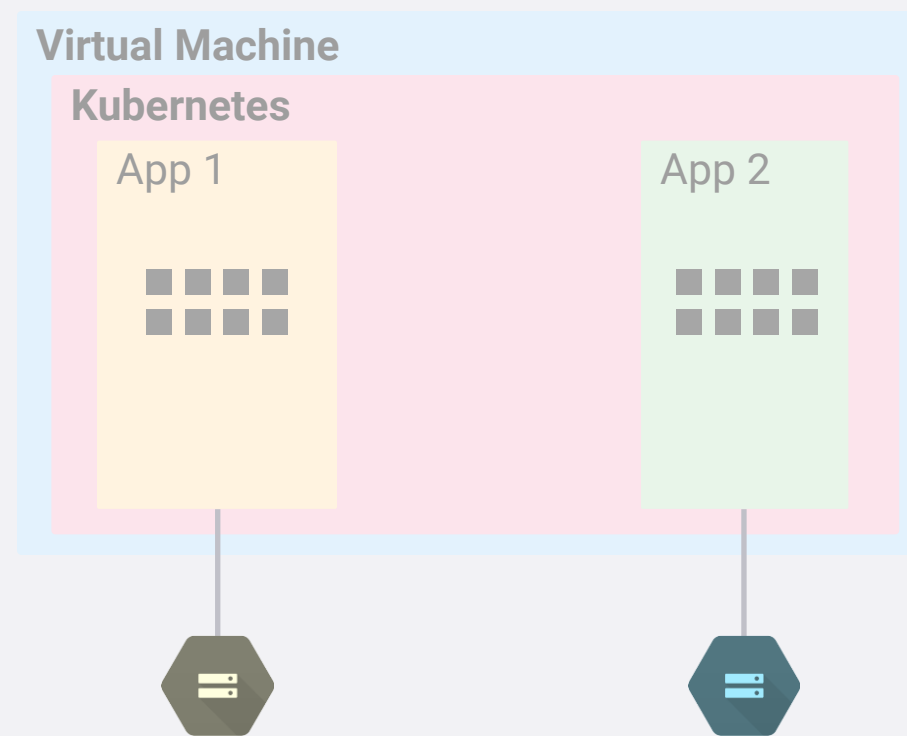
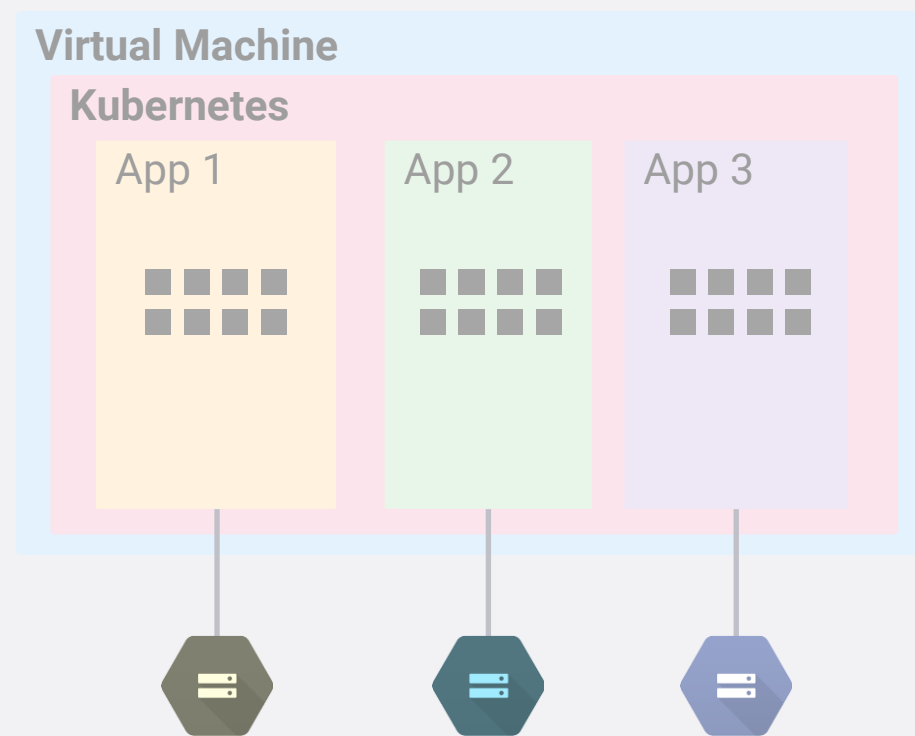


No single VM has a complete application and breaks VM-based protection platforms



# where does vm-based backup fall short?

## a high-level walkthrough



VM-based solutions loses application visibility with the introduction of Kubernetes



Transition to microservices increases scale by 100X with Kubernetes



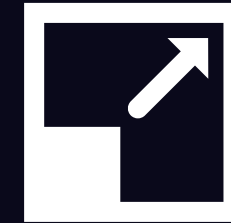
No single VM has a complete application and breaks VM-based protection platforms



95% of application components are now Kubernetes resources and not on disk



# what's different? scale

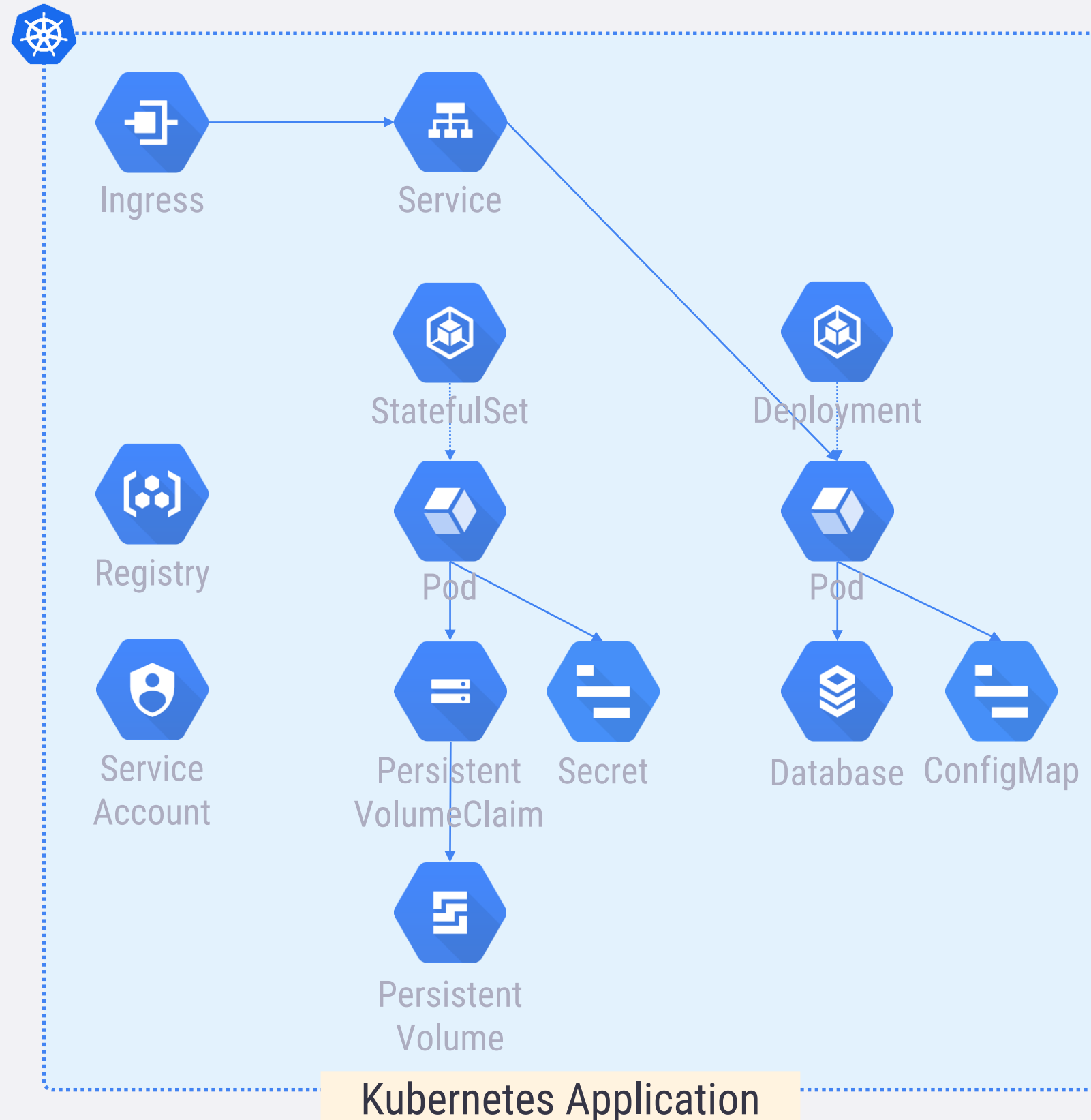


## Application Scale

- Explosion in Application Components
- Dynamic Autoscaling (Clusters and Applications)
- Polyglot Persistence
- Multi-Cluster Use Exploding

# required approach: focus on complete application

## kubernetes resources and persistent state



### Applications as the operational unit

#### Automatic and complete application capture

Consistent data and application resources capture  
Namespaced objects + non-namespaced dependencies

#### Abstract underlying infrastructure

Seamless support for storage and data services within  
and across clusters, regions, and clouds

#### Perform coordinated operations

Proper sequencing of resource and data operations  
Meaningful applications cannot be restored as-is

# kubernetes-native backup must be battle hardened for day 2 scale

sopra  steria  
Top 3 French IT Firm



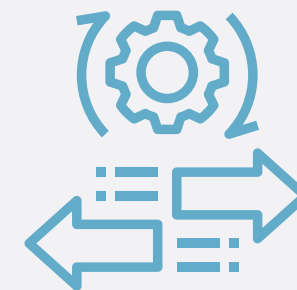
54 nodes, 216 CPUs, 1.7 TB RAM  
173 Applications/Projects  
Multi-Vendor Storage: 415 Volumes, Multi-TB

| Number | Component (subset)      |
|--------|-------------------------|
| 2,126  | Pods (1,380 workloads)  |
| 3,166  | Secrets                 |
| 1,411  | Services                |
| 3,483  | Image Information       |
| 768    | Service Accounts        |
| 915    | Configuration           |
| 3,484  | Role Bindings           |
| 5,137  | Other Components        |
| 18,393 | Total (average 112/app) |



## DEVOPS RUN

700 dev:2 ops ratio  
100% transparent to developers



## USE CASE DIVERSITY

Backup  
Disaster Recovery  
Application Mobility

## APPLICATION DIVERSITY



# what's different?

## rise of devops and “shift left”

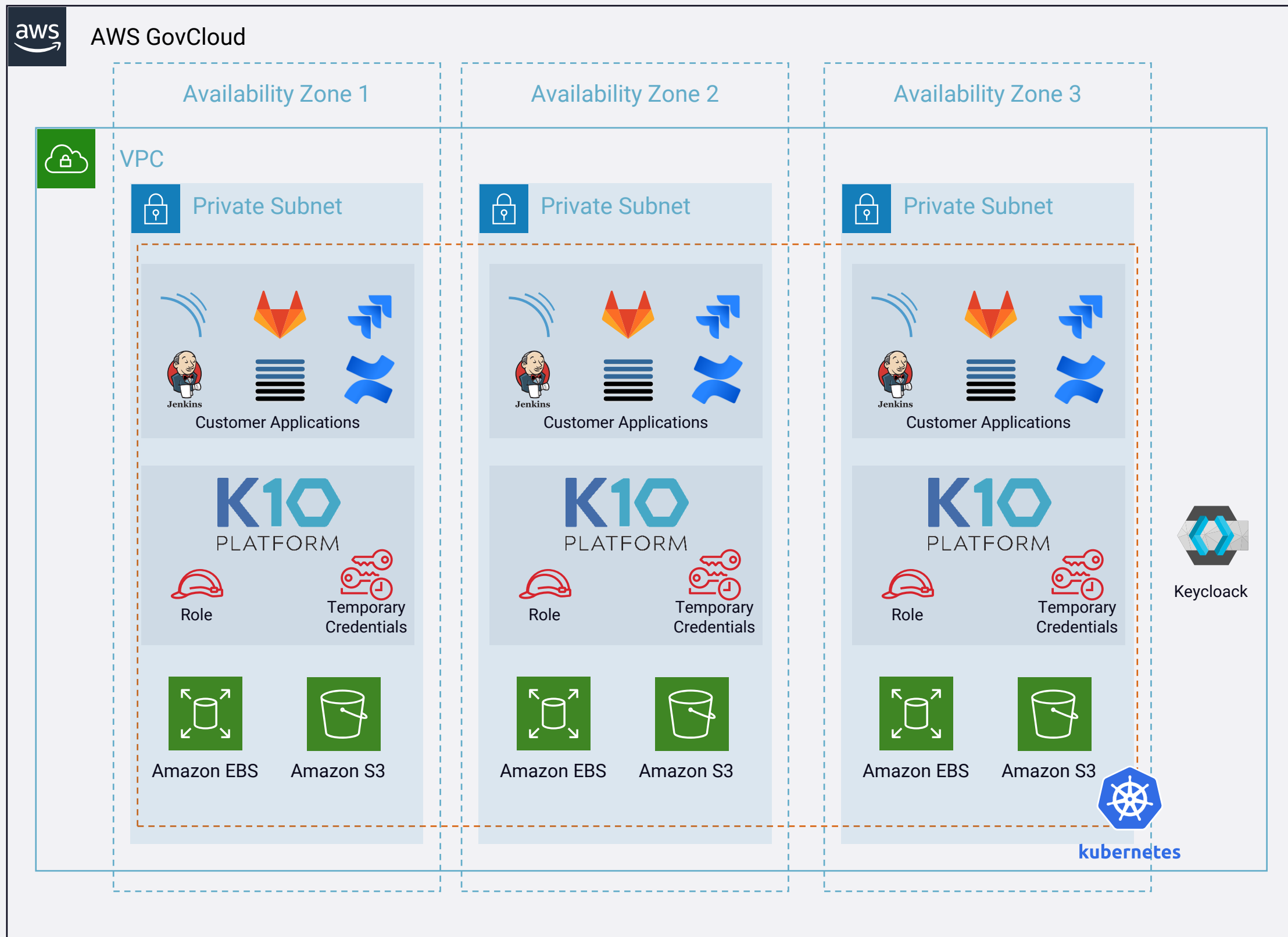


### DevOps and “Shift Left”

- Focus on Applications, Not Infrastructure
- Backup needs to be on Day1 in dev and not just in prod
- Self-Service and Dynamic Provisioning via Infrastructure as Code (IaC)
- Greater Accidental Risk w/ self-service

# devsecops: shift left for data protection

## backup/recovery baked into “golden” stack



### BUILT FOR KUBERNETES

1500+ devs, 100+ projects,  
multi-tenant accounts, small  
ops teams



### BACKUP/DR REQUIREMENTS

Easy to deploy via CI/CD  
100% automation (backup, DR)  
Extensible for custom needs



### END-TO-END SECURITY

Encryption, IAM, RBAC, Auth  
Compliance: 30+ to 3-5 days  
Future-proof multi-app policies

# what's different?

## kubernetes operator challenges



### Operator Challenges

- Skills gap and talent shortage is critical
- Ops has to be application vs. infra-centric
- Must enable self-service for team scaling
- Multi-cluster, GitOps, CI/CD calls for 100% automation
- Must deal with rapidly evolving Kubernetes releases

# kubernetes moves quickly upgrade frequently or be left behind

## Releases

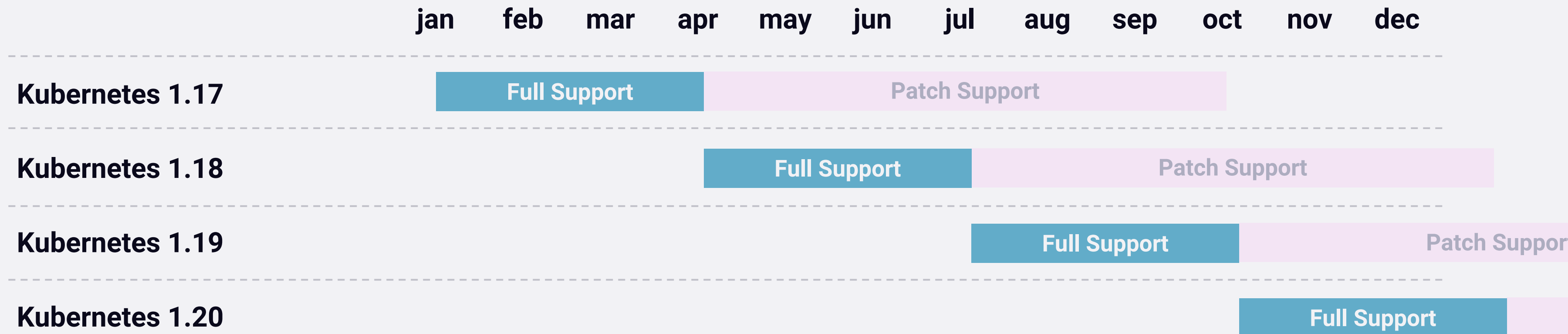
Kubernetes releases minor (x.Y.z) releases every 3 months.  
No official roadmap.

## EOL in 9 Months

Only 3 versions supported at a given time. Fixes can only show up in most recent patch releases

## Restore Xforms

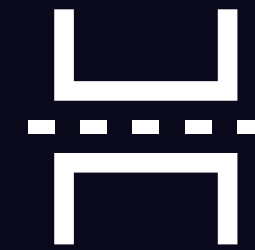
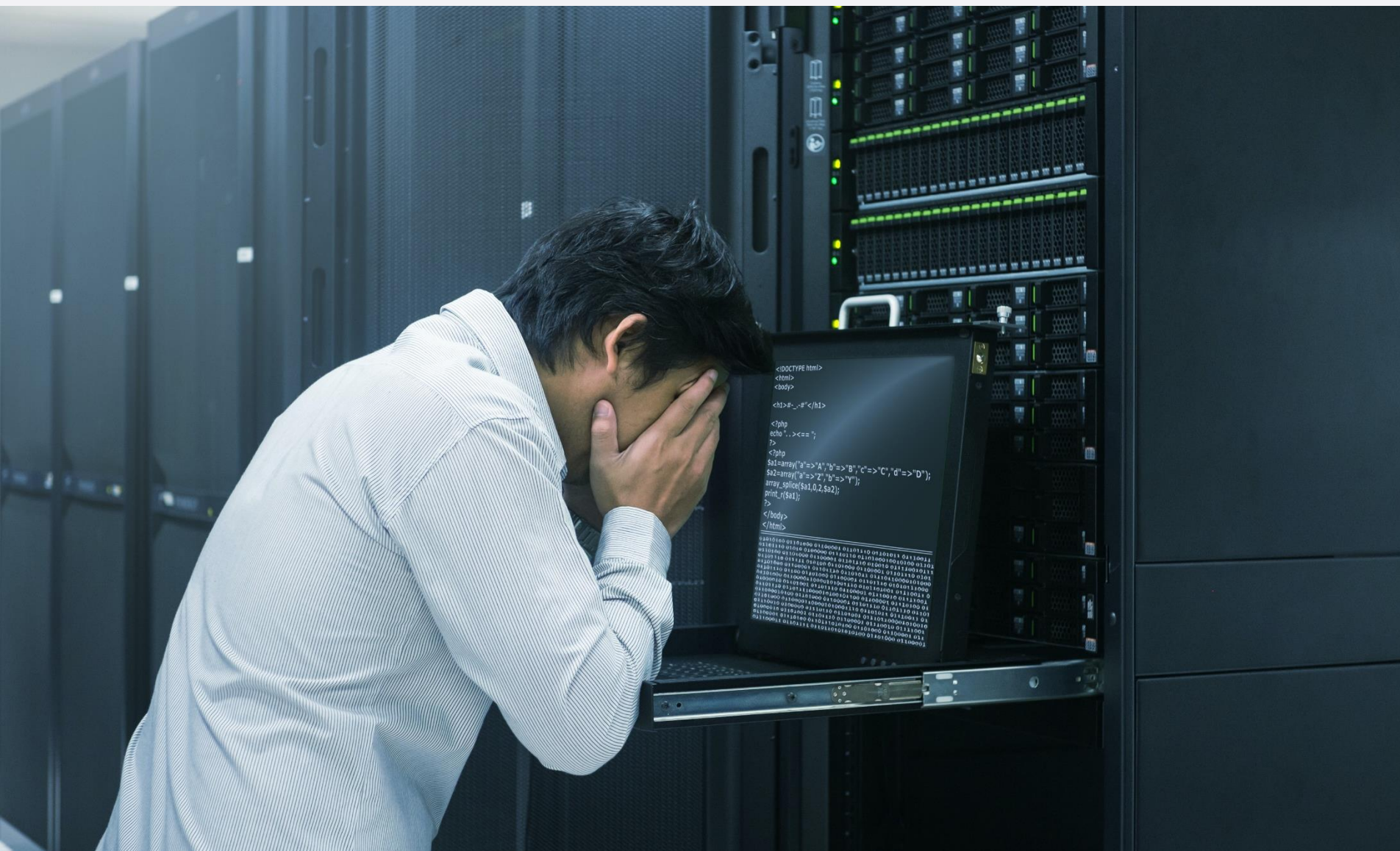
Restores must deal with deprecated API transforms, object refreshes (e.g., secrets), etc.



# **Other Data Management Concerns To Watch Out For**



# data management cloud-native protection gaps



## Infra. & Software Protection Gaps

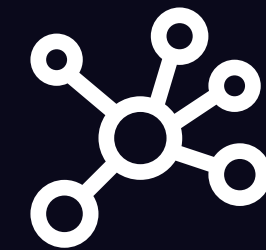
- Backup vs. replication fault-tolerance differences
- Public cloud annual failure rates (AFR) > 0
- File system freeze typically unavailable or insecure
- Need to understand entire stack: OS, Kubernetes, application, database, networking, security



## Security and Protection Gaps

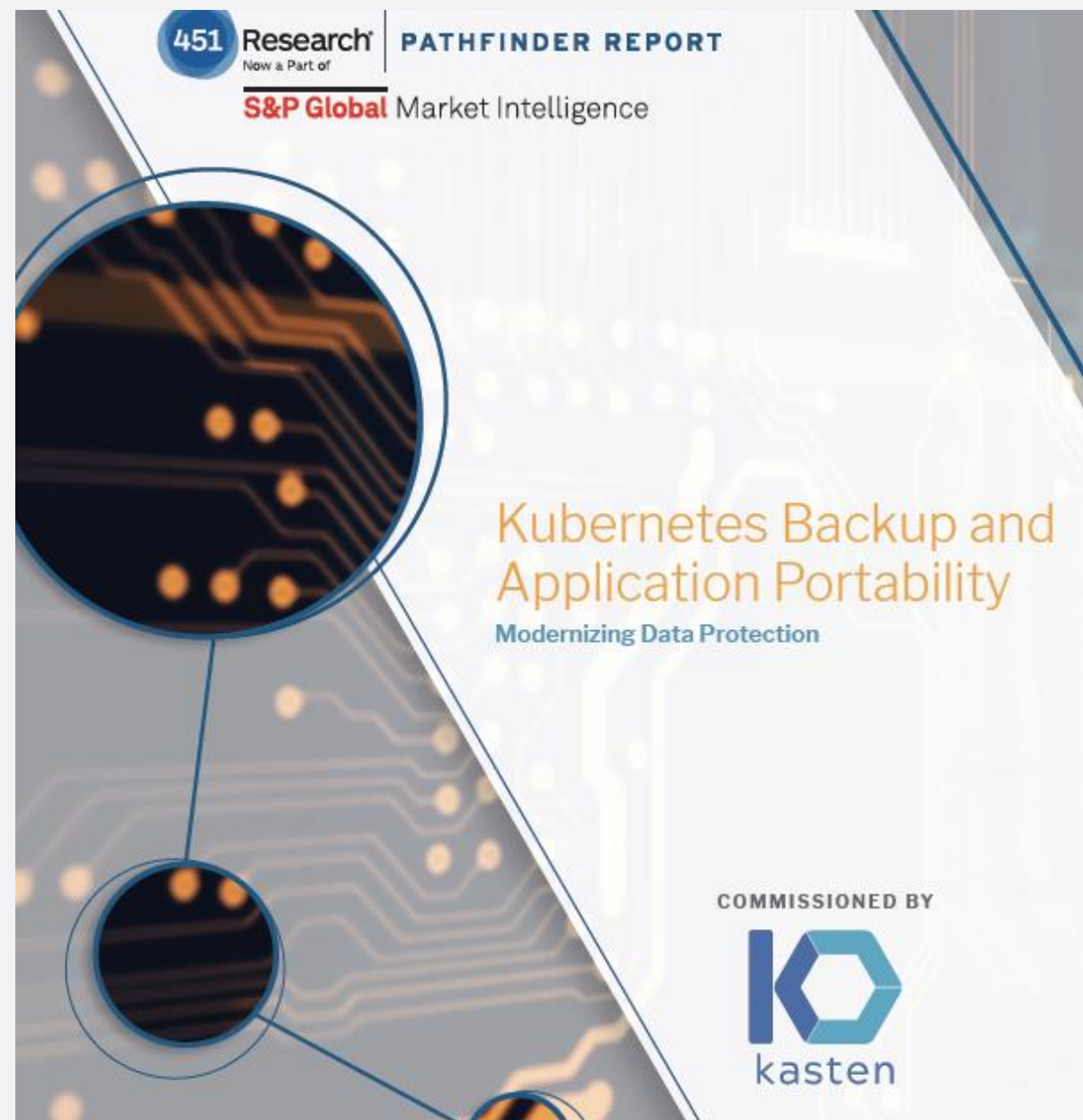
- Support for Network Policies
- Authentication (OIDC, Token, etc.) w/ Self-Service
- End-to-End Encryption w/ Customer Managed Keys
- Quick Recovery from Ransomware Attacks

# data management ecosystem integration



## Ecosystem Integration

- Database and NoSQL System Hooks
- Cloud-Native Monitoring and Alerting
- Kubernetes-Native CRD-Based APIs
- Mobility and Freedom of Choice



**Want to learn more?  
Download ebooks today!**

**<https://kasten.io/resources/>**





**Want to learn more?**  
**Download “Phippy In Space” today!**

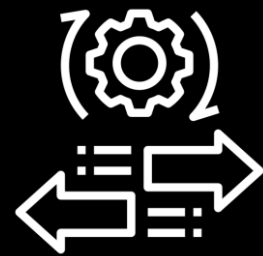
<https://kasten.io/resources/>



# Summing Up: Things to Look for



Backup &  
Recovery



Application  
Mobility



Disaster  
Recovery



Multi & Hybrid  
Cloud



Polyglot  
Persistence



Multi-Tenancy  
RBAC



## Built for Kubernetes

Purpose-built for Kubernetes using cloud-native architectural principles.



## Ease of Use

State-of-the-art management interface; cloud-native API, easy install, extensible.



## End-to-End Security

Support for RBAC, OIDC, Token Auth, IAM, and industry-standard encryption



## Rich Ecosystem

Extensive support across the entire application stack. Select the best tools or infrastructure.

# kasten k10

## kubernetes backup and mobility made easy

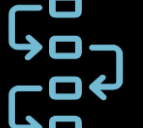
# K10 PLATFORM

Use Our Forever-Free Starter Edition!

<https://kasten.io/product>

[info@kasten.io](mailto:info@kasten.io)

 Application  
Discovery

 Policy-driven  
Automation

 Ease of Use,  
Simple UX

 End-to-End  
Security

