Microsoft

Building Resilient Stateful Applications in Azure Kubernetes Service with Kasten

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Managed Kubernetes Offerings in Azure

Development Tools

- IDEs
- Docker
- Build Tools
- GitHub
- Azure Container Registry

Container PaaS

- Azure Kubernetes Service
- Azure Red Hat OpenShift
- Azure Container Apps

Platform

- Active Directory
- Azure Policy
- Security Center
- Key Vault
- Azure Monitor
- Managed DBs
- Service Bus
- Azure Advisor

Azure Arc
Management across environments

What is a stateful application?

Stateful applications

Applications that save data from the activities of one session so it can be used in the next session

Examples

MySQL, MariaDB, Postgres, SQL Server, Percona, MongoDB

Cassandra, Kafka, Elastic Search + Kibana, Spark, Solr, Kubeflow

Wordpress, Redis, Jenkins

When do customers build their own stateful data services?

- There is no managed/PaaS service offered
- Lift and shift of existing workload running on-premises or in other clouds, or hybrid deployments
- They require more control on their service or performance characteristics which the PaaS service doesn’t offer
- More control always comes with an operational cost, always weigh the cost vs benefits

Azure Storage options for stateful container workloads

	 Azure Disk Storage	 Azure File Storage	 Azure Blob and Data Lake Storage	 Azure NetApp Files via Trident
Workloads	Databases, bigdata, cache, CI/CD	Shared/user workspace, CMS, databases, AI/ML	Analytics on data lake, HPC	Analytics, HPC, Custom apps currently using NetApp
Access protocol	SCSI	SMB, NFS v4.1	Blobfuse, NFS v3.0	NFS (v3.0,v4.1), SMB (v2.1, v3.1)
Workloads	Databases, bigdata, cache, CI/CD	Shared/user workspace, CMS, databases, AI/ML	Analytics on data lake, long term retention, HPC	Analytics, HPC, Custom apps currently using NetApp
SKUs	Standard HDD, Standard SSD, Premium SSD, Premium SSDv2, Ultra	Standard HDD, Premium SSD	Standard HDD, Premium SSD	Standard, Premium, Ultra
Access modes	RWO, RWX (v1.21 in ZRS only)	RWO, RWX	RWO, RWX	RWO, RWX
Container type	Linux, Windows	Linux, Windows, ACI	Linux	Linux
Availability	LRS, ZRS	LRS, ZRS, GRS, RAGRS	LRS, ZRS, GRS, RAGRS	Single-zone

Resiliency Concepts

Robustness

- Build mechanisms into our software and process to accommodate expected problems

Rebound

- The ability to recover after a traumatic event
- How well we recover/rebound from disruption?

Graceful extensibility [People Focused]

- How well we deal with a situation that is unexpected

Sustained adaptability [People Focused]

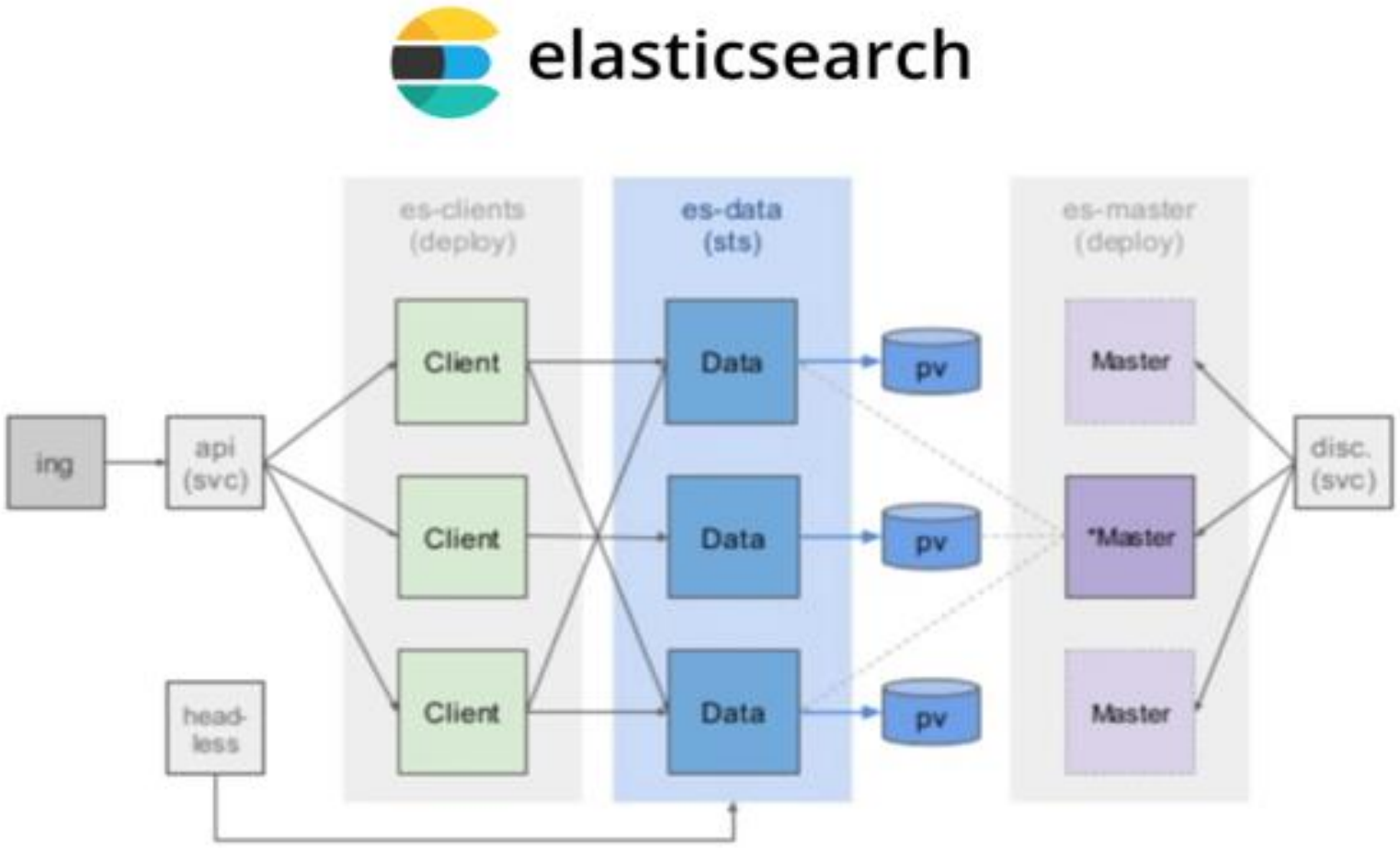
- The ability to continually adapt to changing environment, stakeholders, and demands

As defined by David Woods in " Four Concepts for Resilience and the Implications for the Future of Resilience Engineering,"

Inspired by "Building Microservices" by "Sam Newman"

Resiliency Ladder

Our Application - ElasticSearch

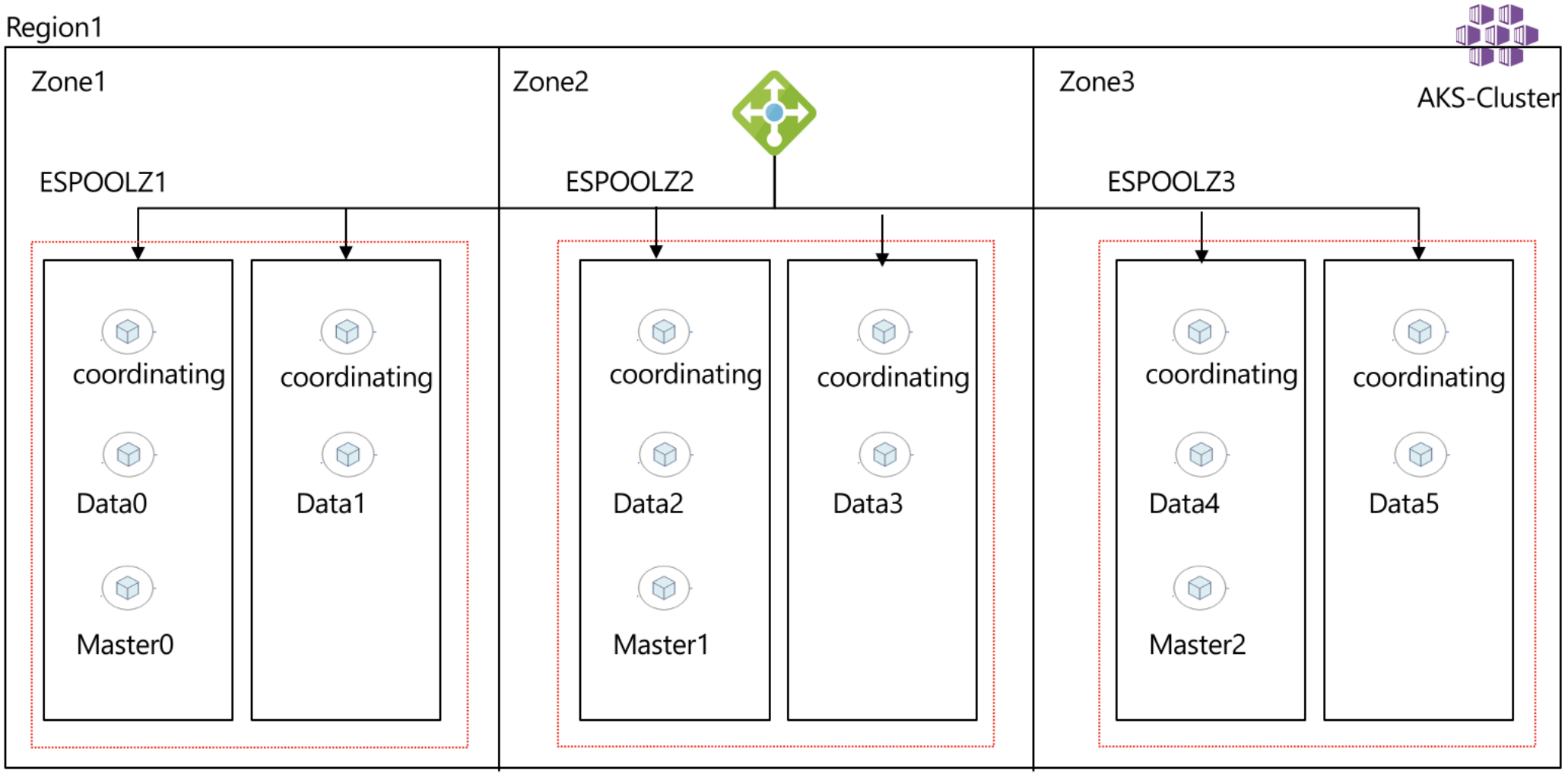


Robustness

Robust Elastic Search on AKS

- 3 dedicated user node pools spread across 3 different availability zones
- Each shard will be 3 way replicated
- Dedicated storage class for the elastic search pods
- Elastic search nodes are tainted, and only elastic search pods are allowed to run there
- Autoscaling is enabled

Our Elastic Search Cluster



Rebound

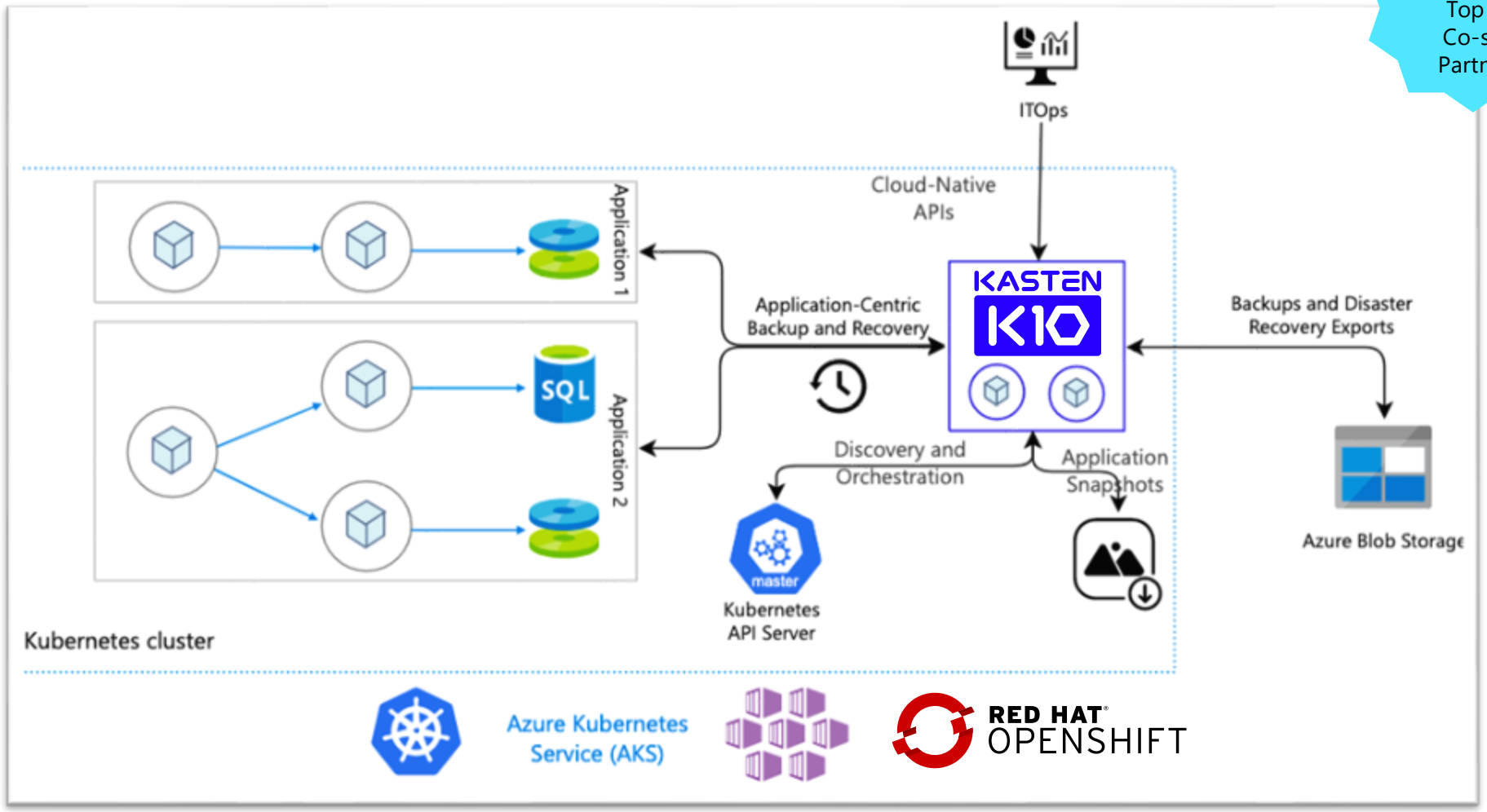
Rebound – How to Recover From Failures

- Cluster is down
  - Human error
  - Underlying issues
  - Data corruption
  - Regional failures
- Maintenance
  - Cluster or node pool upgrades
  - Test or migrate to a new clusters During upgrades
- Need data to be available across regions

Kasten K10 on Azure

Seamless Backup and DR

Veeam is Microsoft's Top 3 Co-sell Partner



- **Application Discovery**
- **Policy-driven Automation**
- **End-to-End Security**
- **Ease of Use, Simple UX**

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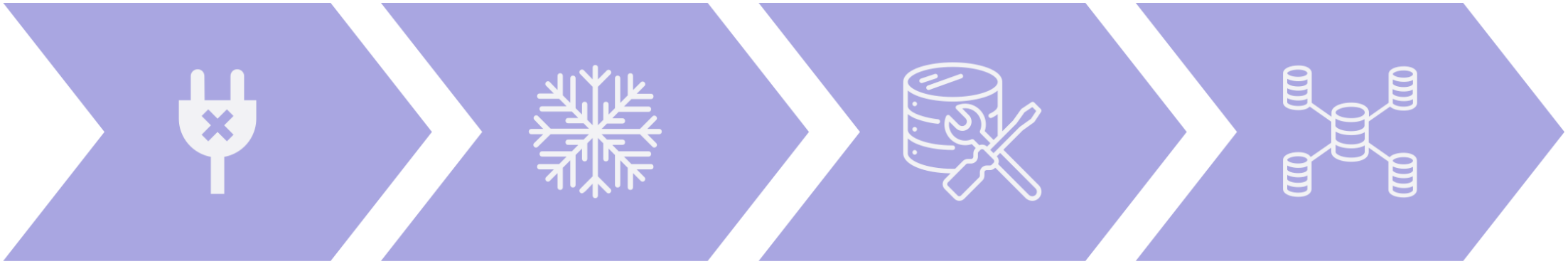
Kasten K10 Consistency Spectrum

for Data Services – including Microsoft SQL Server



Crash Consistent

- Storage snapshots

"app" Consistent

- Freeze data service
- Storage snapshot
- Unfreeze data service

db Consistent

- Logical dumps via data service-specific tool (e.g., pg_dump)

System Consistent

- Full app capture
- Combination of tools across data and storage layers

PostgreSQL MySQL mongoDB elastic cassandra FoundationDB redis Couchbase

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Learn More

- Demo @ aks-best-practices/kce23-aks-kasten at master · mohmdnofal/aks-best-practices (github.com)
- AKS Docs https://docs.microsoft.com/en-us/azure/aks
- ARO Docs https://docs.microsoft.com/en-gb/azure/openshift
- Kasten Docs https://docs.kasten.io

Microsoft

Thank You!