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Alternative Multi-Cloud Native Deployment Tool

Pillar #1

PI-21

March - June 2023

Workstream

Build a PoC for a new modern multi-cloud cost effective and easy to use Mojaloop deployment tool that deploys an "enterprise ready" configuration of Mojaloop to the Managed Kubernetes Service of a small number of prominent cloud providers.
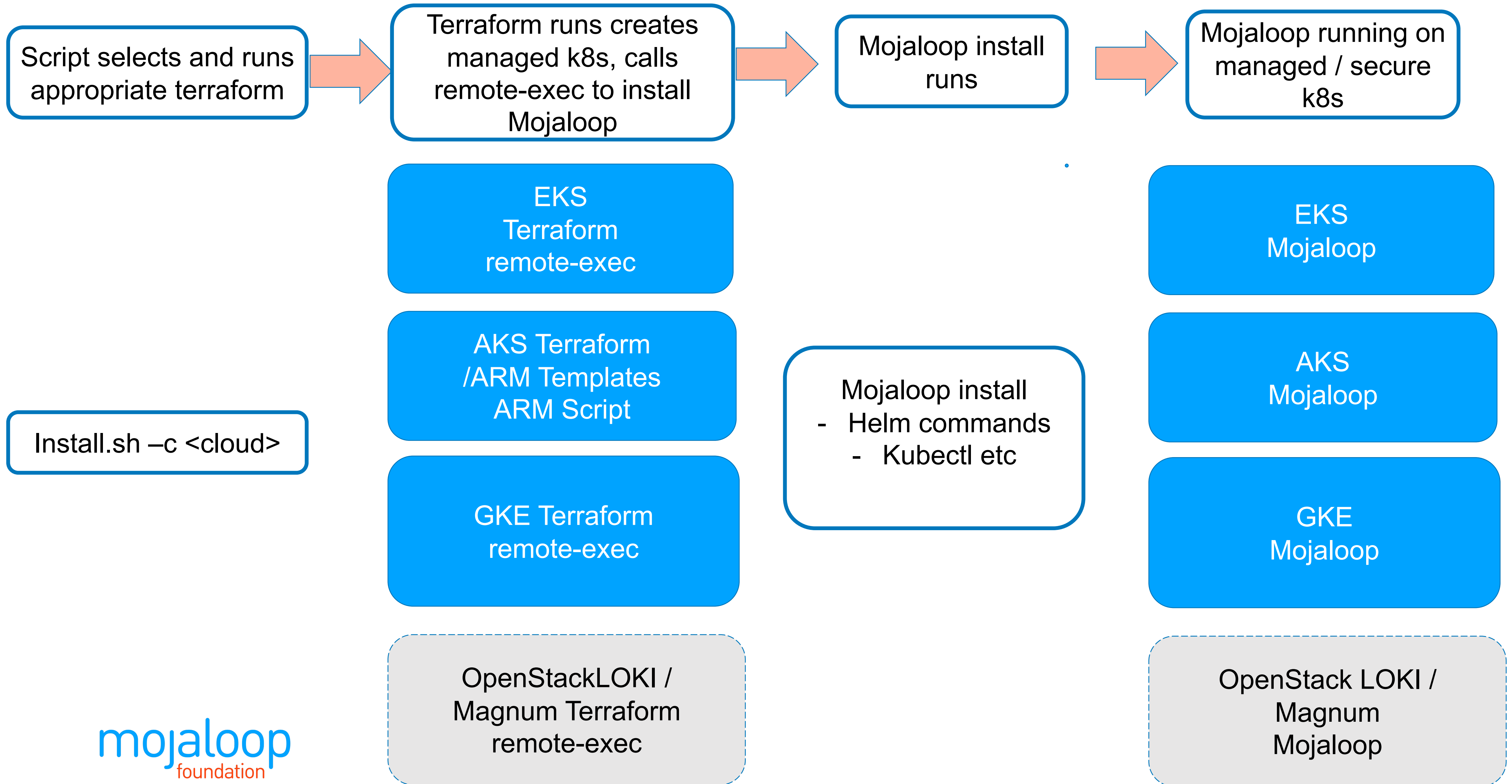
Start with EKS and report on TCO

AWS Elastic Kubernetes Service = EKS

Azure Kubernetes Service = AKS

Google Kubernetes Engine = GKE

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The "broad" idea in pictures => pluggable terraform (or ARM) providers

Script selects and runs appropriate terraform

→

Terraform runs creates managed k8s, calls remote-exec to install Mojaloop

→

Mojaloop install runs

→

Mojaloop running on managed / secure k8s

Install.sh –c <cloud>

EKS Terraform remote-exec

AKS Terraform /ARM Templates ARM Script

GKE Terraform remote-exec

OpenStackLOKI / Magnum Terraform remote-exec

Mojaloop install
- Helm commands
- Kubectl etc

EKS Mojaloop

AKS Mojaloop

GKE Mojaloop

OpenStack LOKI / Magnum Mojaloop

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Current Mojaloop deploy options
Each option has purpose/strength/weakness

Manual using docs

- gain a good understanding of the infrastructure

- Instructions for Linux,Mac and Windows

- Manual process (not easily repeatable)

- Slow

- No good for ci/cd etc

mini-loop

- For demo/test/dev ci/cd POCs , training

- Highly automated and simple to use

- Cheap (laptops, small VMs etc) !

- Quick

- Tested on Ubuntu 20, 22

- Not for production

- Not secure

IaC

- Comprehensive and mature (!) Mojaloop deployment aimed at giving users a starting point for production.

- Highly automated (terraform, ansible)

- Potentially on-prem ← potential major advantage !

- Currently still requires significant expertise to use

- Cloud (VM) costs need to be managed

Mojaloop on Azure Marketplace
(Azure AKS native)

- Sophisticated Mojaloop deployment aimed at giving users a starting point for production.

- Highly automated ARM template

- Extremely simple deployment

- Deploys to managed Kubernetes => easier management

- Currently deploys Mojaloop 13.1
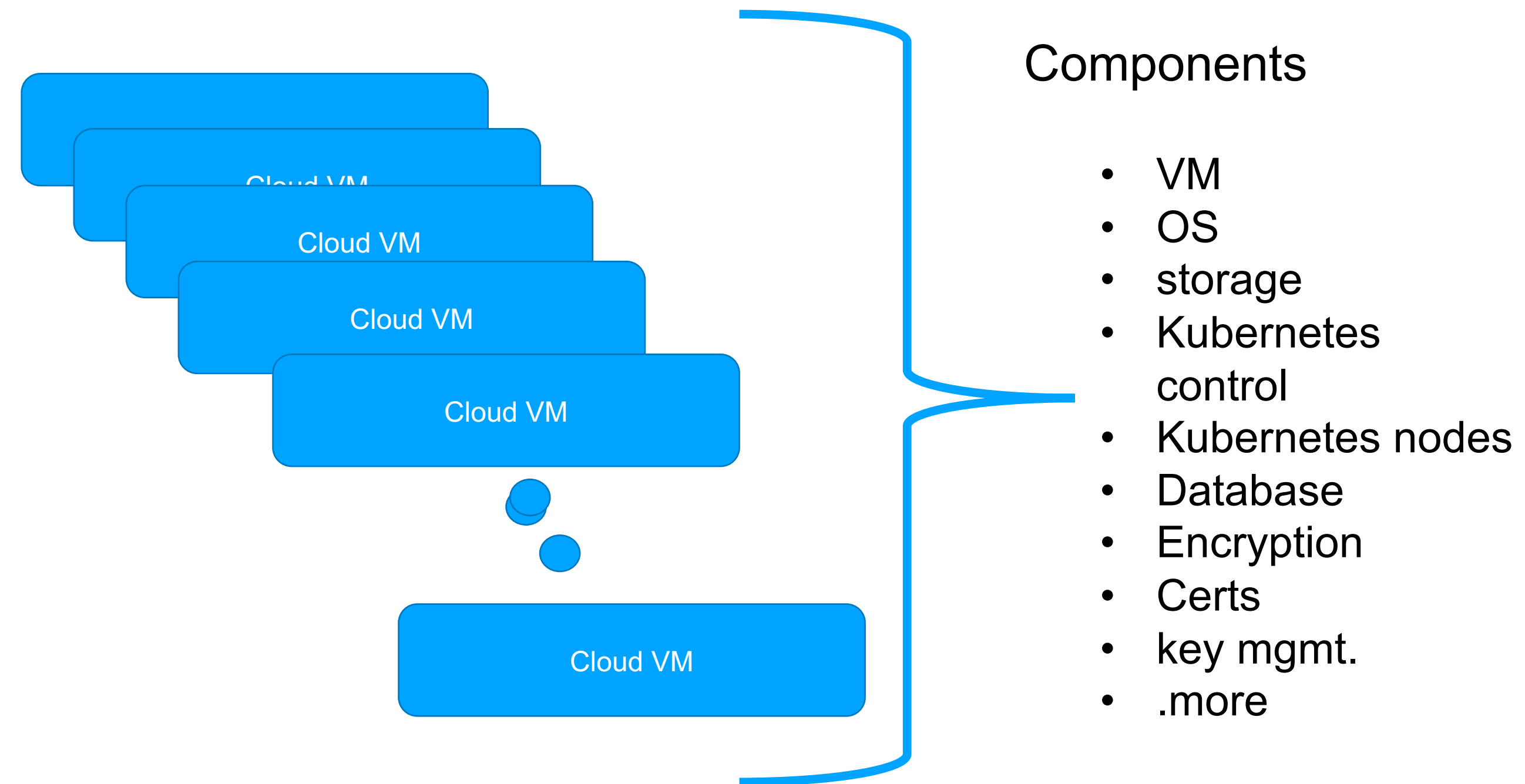
- Cloud SLA costs need to be managed

Azure Stack Hub

- Similar end-state to Azure (native) but on Stack HUB (data residence)

- Deploys to managed Kubernetes => easier management

- Currently deploys Mojaloop 13.1

- Cloud SLA costs need to be managed

- Significantly less automated than Azure Native deployed from Marketplace

Mojaloop in (multiple) Cloud **VMs**

Today
○ Manual
○ Mini-loop
○ IaC

Cloud VM
Cloud VM
Cloud VM
Cloud VM

Cloud VM

Components

- VM
- OS
- storage
- Kubernetes control
- Kubernetes nodes
- Database
- Encryption
- Certs
- key mgmt.
- .more

Cost Challenges

Largely static
⇒ over configure VMs
⇒ No easy spin up / down
⇒ hard to scale rapidly in response to load

Little sharing of resources
=>Duplication of resources low %util

Management Challenges

maintain each VM and its contents
⇒How to upgrade ?
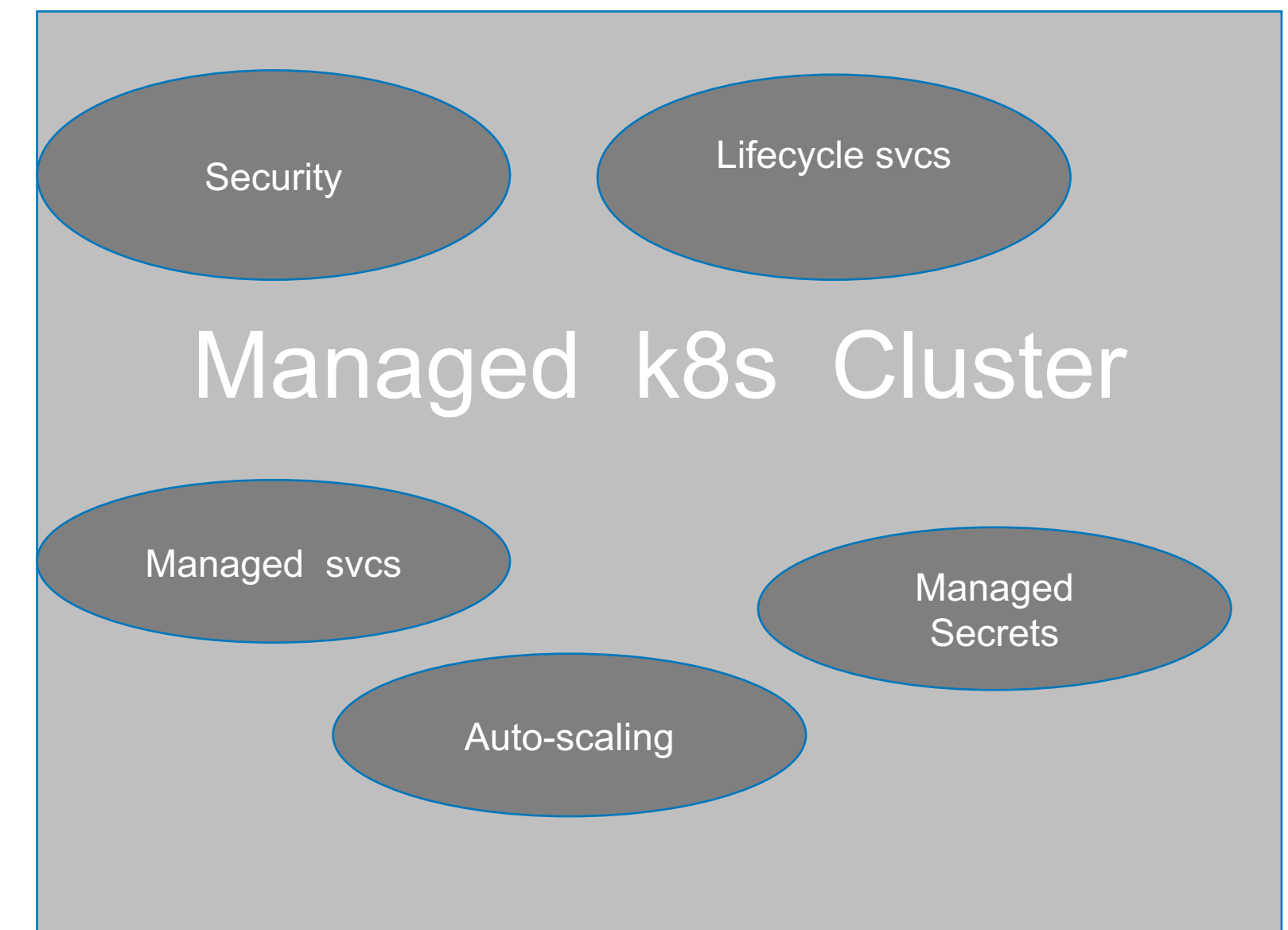⇒Complexity due to number of moving parts
⇒Costs in managing many VMs and infrastructure components
=> Costs in managing security
=> Confidence in achieving/proving security

Managed Kubernetes

- Deploy the cluster as a whole e.g. AKS or EKS , GKE etc
- Deploy node-pools as a whole
- Cloud vendor provides tools for managing cluster
- Cluster is familiar to Kubernetes developers and admins kubectl,helm etc
- Cloud vendor provides scalable secure Kubernetes node-pools including auto-scale

Managed k8s Cluster

Security

Lifecycle svcs

Managed svcs

Managed Secrets

Auto-scaling

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Managed K8s advantages (AKS/EKS)

Summary	Description	
Simplified Deployment:	AKS/EKS simplifies the deployment of Kubernetes clusters by automating many of the complex tasks such as setting up and configuring the Kubernetes control plane, as well as scaling and managing worker nodes.	
Integrated	AKS/EKS are deeply integrated with Azure/AWS services, making it easy to use services such as Container Registry, Monitor, Active Directory,/IAM and more.	
High Availability and Scalability	AKS/EKS are designed to provide high availability and scalability for your Kubernetes workloads. AKS/EKS provide highly available control plane that is replicated across multiple availability zones, and can automatically scale the worker nodes up/down in response to demand.	
Security and Compliance	AKS/EKS provide strong security features. The Kubernetes control plane is secured behind Azure/AWS network with no direct user control. Support for AWS Identity and Access Management (IAM) and Amazon Virtual Private Cloud (VPC) networking. Similarly AKS integration with AD and network security policies	
Monitoring and Logging	AKS/EKS provide built-in monitoring and logging capabilities, => insights into your Kubernetes workloads. Easily monitor the health and performance of your Kubernetes cluster, and get real-time insights into application metrics, log data, and events.	

Mojaloop in **Managed Kubernetes**

TCO Advantages

- Easily accessible i.e. can be easily deployed by anyone e.g. Mojaloop on Azure Marketplace (try for free!)
- Simplified maintenance
- Rapid deployment => spin up / spin down of cluster
- Managed node-pools: scale up/down in response to demand => Little or no over-provisioning of resources
- Increased resource sharing / better %util
- Significantly easier upgrade => lower maintenance/operational costs
- More secure => less money needed on ensuring security
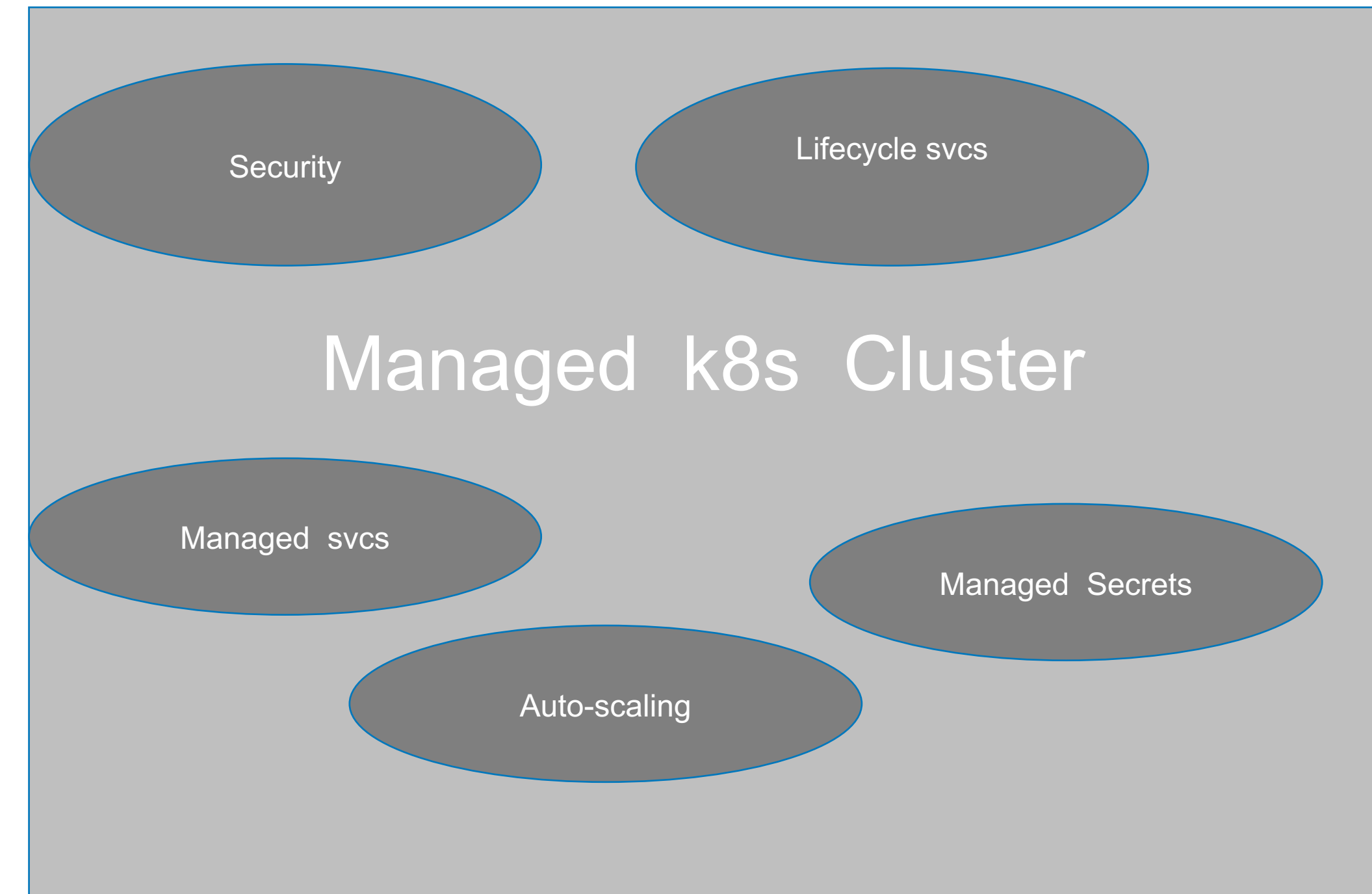
Goals

- Significantly reduce cloud costs for more "enterprise ready" Mojaloop deployments (i.e. not like mini-loop)
  - Easy/fast deploy/un-deploy
  - Auto scale up / down

- Lower barrier to entry to more robust Mojaloop cloud deployment
  - Azure Marketplace simplicity is a good example

- Optimise Mojaloop deployment and operations "on-cloud"
  - Using VMs versus managed k8s services is inflexible and costly
  - Opens opportunities for adopting "new" cloud vendor features example serverless Kubernetes service (think AWS lambda for k8s nodes)

- Include current and future Mojaloop releases

- Expand deployment options and increase community participation in deployment tools

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Detail / Discussion

Complements existing deployment options

- mini-loop : single node, no HA no mTLS , no upgrade just re-install
- IaC : very mature, cloud-agnostic VM deploy focus , could potentially be targeted to on-prem
- Azure Marketplace

This proposal:

- Would draw experience from IaC and Azure Marketplace
  => ensure IaC features available in "managed Kubernetes"

- Cloud only (though going to investigate OpenStack for on-prem)

- Dove-tails with upgrade/lifecycle workstream

- Improve sharing e.g. dev and test in single cluster using k8s namespaces and RBAC

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Scope / Timing / Obstacles

Scope

- AWS – Elastic Kubernetes Service initially
- As close to production ready as possible (managed security etc)

Timing

- POC for AWS / EKS for PI-21

- Others to follow