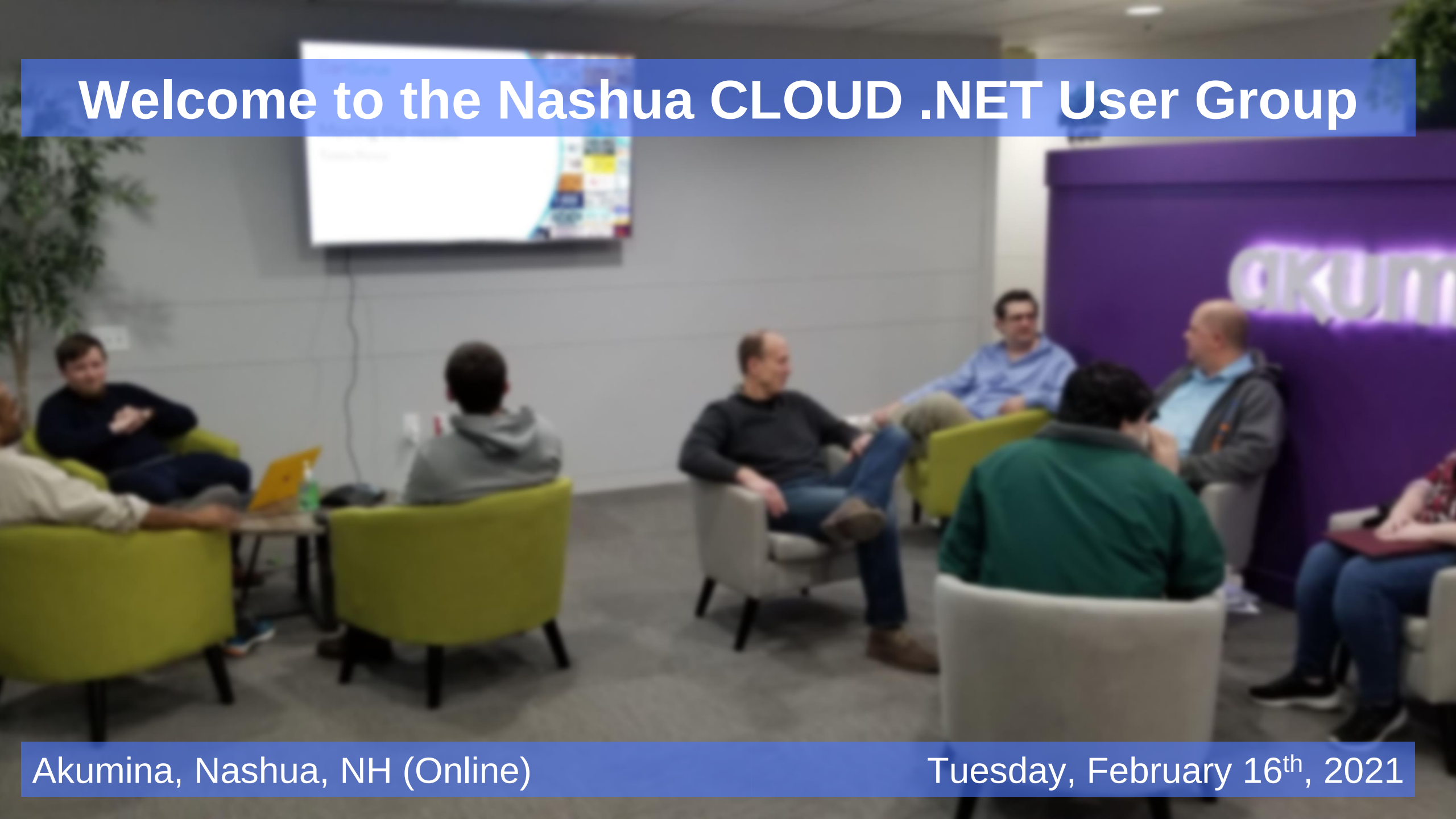
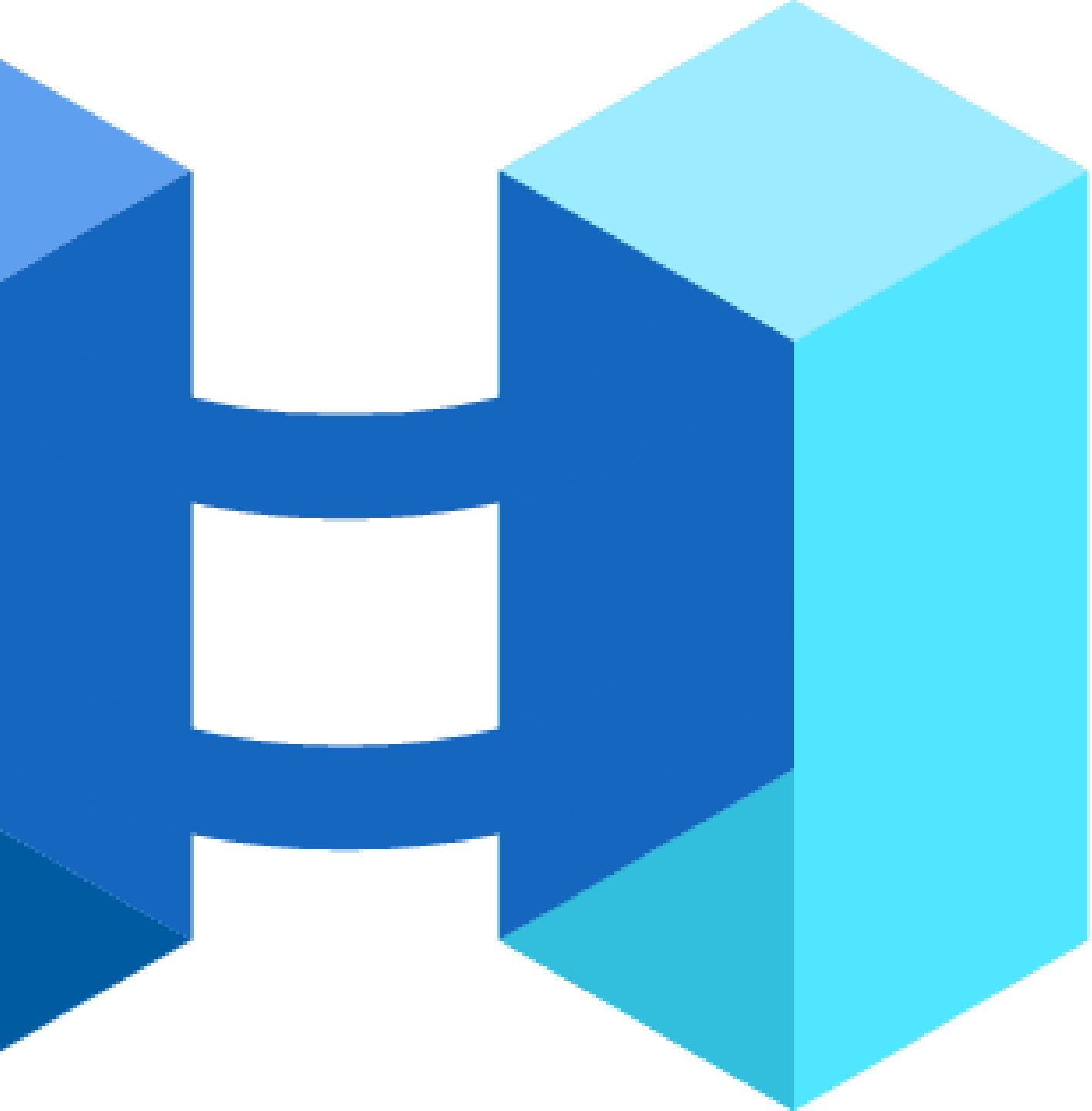
Welcome to the Nashua CLOUD .NET User Group



Akumina, Nashua, NH (Online)

Tuesday, February 16th, 2021



Enabling Management of Hybrid, and Multi-Cloud k8s Solutions w/ Azure Arc

About me!

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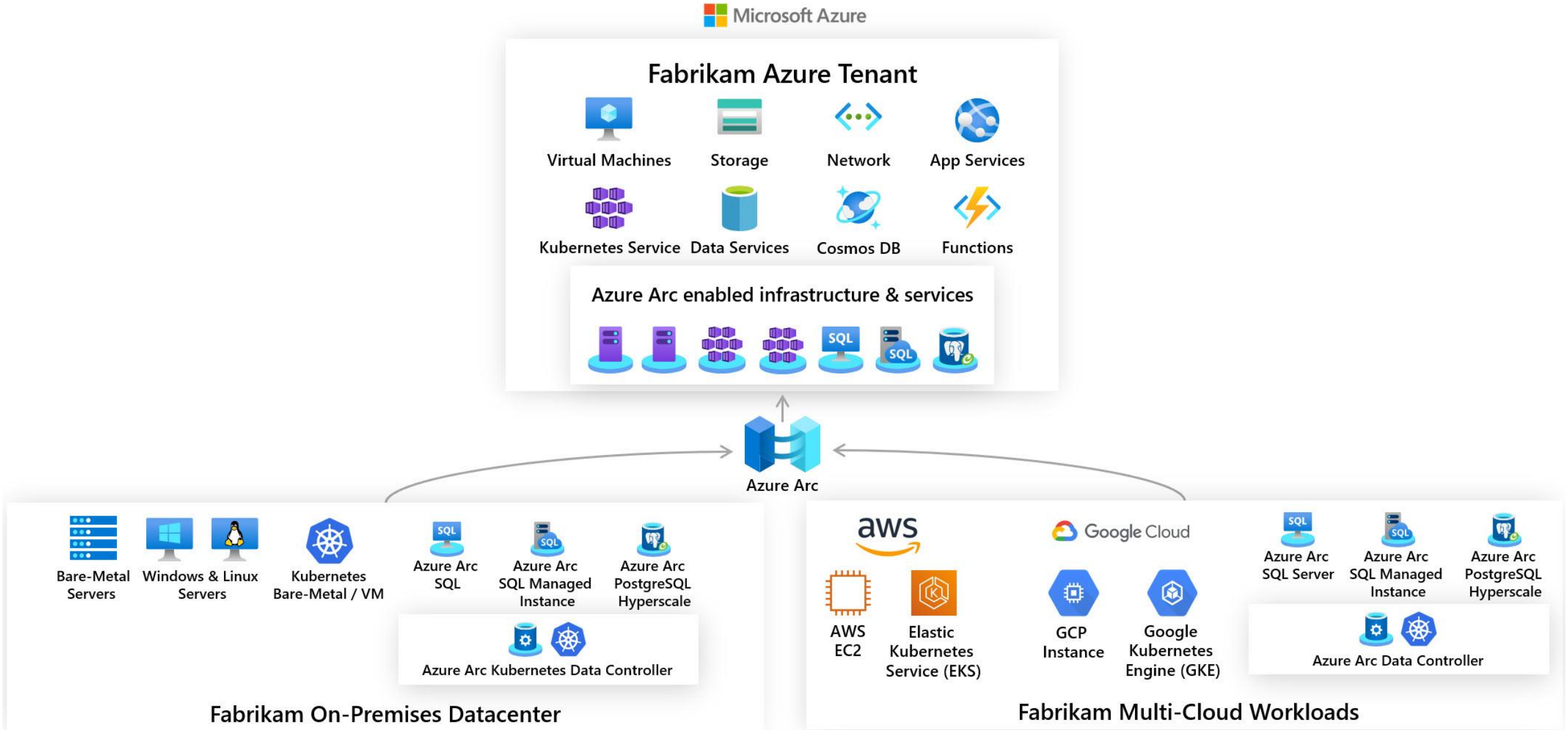
Agenda

- Azure Arc
- Getting Started
- GitOps
- Policies
- Other Azure Enterprise Resources to Consider

Azure Arc

- Enables management and governance of resources that can live virtually anywhere such as multi-cloud, on-prem or edge environments
  - Servers
  - Kubernetes
  - Data Services



Taken from https://azurearcjumpstart.io/overview/

Use Cases

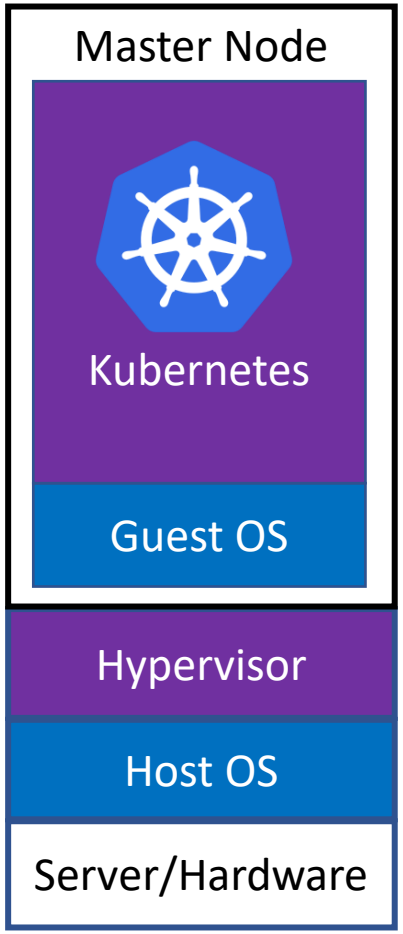
- Management of existing multi-cloud or on-prem environments
- Leverage compliance and security capabilities of Azure Security Center for all cloud resources. Patching, policies, tags and more can be automatically rolled out to all your VMs.
- Help prevent vendor lock-out or vendor lock-in
  - AWS and Parler

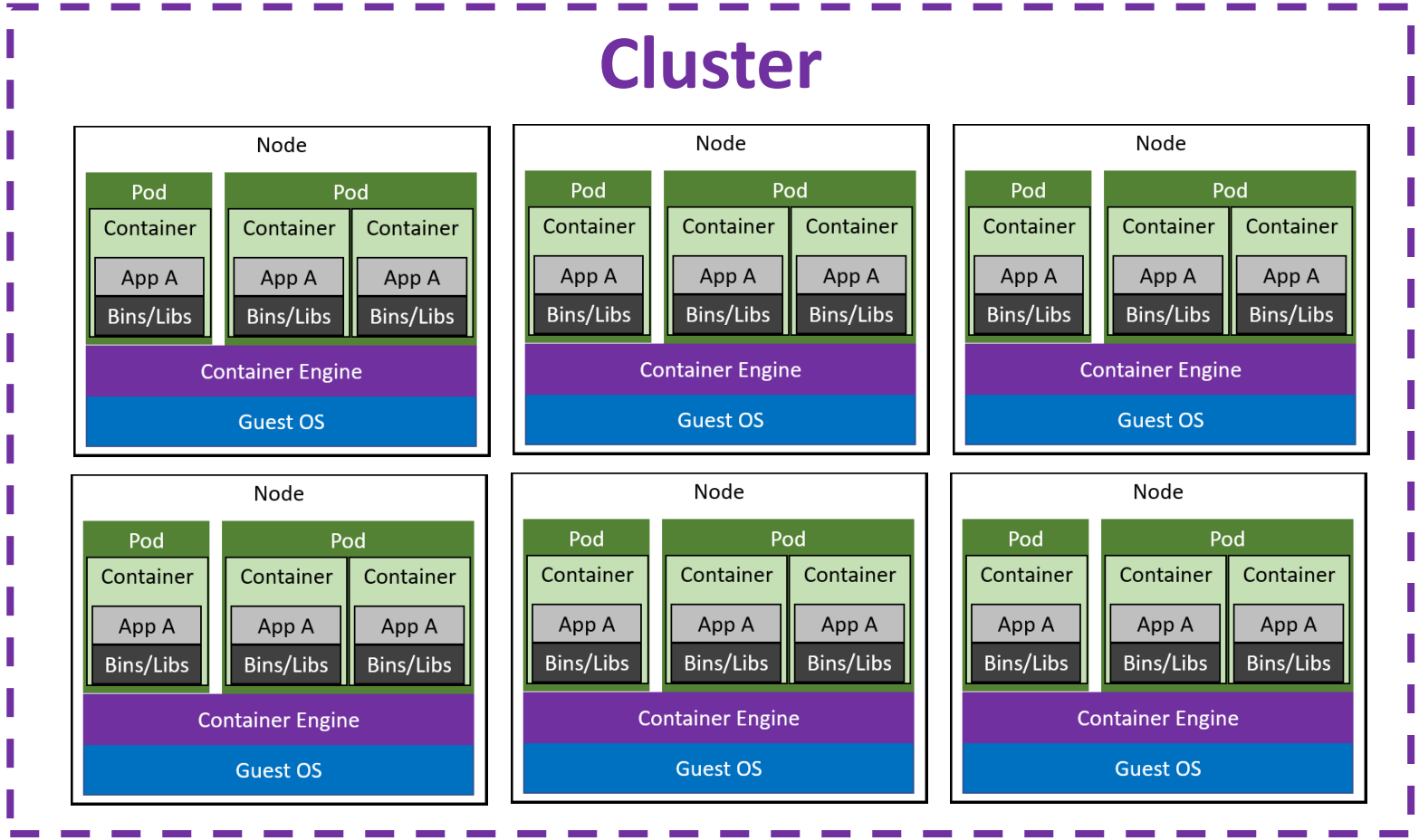
Kubernetes (K8S)

Container Based Application Management

- Containerized infrastructure
- Auto-scalable infrastructure
- Loosely coupled infrastructure
- Higher density of resource utilization
- Declarative configuration

Kubernetes


Master Node
Kubernetes
Guest OS
Hypervisor
Host OS
Server/Hardware


Cluster
Node
Pod
Container
App A
Bins/Libs
Container Engine
Guest OS

Azure Kubernetes Demo

Azure Arc enabled Kubernetes

- **Prerequisites**
  - Azure CLI v2.15.0 or higher
  - Note: Just run this in the Cloud Shell and you will have the latest version

- **Register the following providers**
  - az provider register --namespace Microsoft.Kubernetes
  - az provider register --namespace Microsoft.KubernetesConfiguration

- **Ensure you can access the cluster via kubectl**
  - **AKS** - az aks get-credentials –name NAME –resource-group RESOURCEGROUP
  - **AWS** – aws eks –region update-kubeconfig –name NAME
  - **GCP –** gcloud container clusters get-credentials NAME [--region=REGION]
  - kubectl get nodes

- **Connect k8s to Azure Arc**

  az connectedk8s connect –name NAME –resource-group RESOURCEGROUP

az connectedk8s --help

```
Group
    az connectedk8s : Commands to manage connected kubernetes clusters.
        This command group is in preview and under development. Reference and support
        levels:   https://aka.ms/CLI_refstatus
Commands:
    connect : Onboard a connected kubernetes cluster to azure.
    delete  : Delete a connected kubernetes cluster along with connected cluster agents.
    list    : List connected kubernetes clusters.
    show    : Show details of a connected kubernetes cluster.
    update  : Update properties of the onboarded agents.
```

Managing multiple k8s with kubectl

Azure	az aks get-credentials –name NAME –resource-group RESOURCEGROUP
AWS	aws eks –region update-kubeconfig –name NAME
GCP	gcloud container clusters get-credentials NAME [--region=REGION]

kubectl config current-contect

kubectl config get-contexts

kubectl config use-context context_name

config file location: $Home/.kube/config

Enabling k8s on Azure Arc Demo

GitOps

- Framework for automating continuous deployment and declarative infrastructure using Git as the single source of truth
- Commonly used to simplify Kubernetes pipelines for centralized and dev-centric approach to deploying your apps, configuration management, and infrastructure as code

GitOps Principles

- Git is the single source of truth for entire system
- Desired system state is versioned in Git
- System state described declaratively

GitOps Practices

- Pull over Push
- At least 2 Repos per App. One for App Source Code & second for Config (manifests)
- Ensure you Test
- Have a plan for Secrets management

GitOps Tooling

- Kubernetes - Defacto for cloud native apps. Handles 3 major infra pillars computer, network, & storage
- Docker - Runtime for containers. More & more cloud native apps containerized
- Container/Helm Registry - Used to host & manage container images/Helm Charts
- Git - Version control, ie. Bit Bucket, Azure DevOps, GitHub, GitLab – GitOps source of truth
- Helm – Package manager for Kubernetes used for creating, installing, & managing packages
- Flagger – Delivery operator that automates the promotion of canary deployments with GitOps
- Prometheus – Monitoring & alerting system – the heart of GitOps alerting
- Terraform – Provision any infrastructure. Often used to deploy Kubernetes clusters in GitOps
- Flux – GitOps operator for Kubernetes
- Argo CD – GitOps operator for Kubernetes with a visual approach
- Jenkins X – CI/CD platform for Kubernetes used to manage GitOps pipelines
- Git-Secret – Encrypts secrets & stores them in Git. Automatically encrypts decrypts in GitOps workflow
- Git-backup/Kube Backup – Kubernetes & Git repos are critical, back them up. Automate backup of git repos & cluster config

Helm

- Package manager for Kubernetes
- K8s equivalent of yum or apt
- Collection of all versioned, pre-configured application resources to be deployed as a unit

- Improves productivity
- Reduces complexity of deployment
- Enables adaptation of cloud native applications

- simplest of deployments, you would need at least 3 YAML manifests with duplicated and hardcoded values

Flux

- Flux is a tool for keeping Kubernetes clusters in sync with sources of configuration (like Git repositories), and automating updates to configuration when there is new code to deploy.

GitOps on Azure Arc Demo

Additional Notes on GitOps with Azure Arc

- sourceControlConfiguration resource will be deleted immediately. Deletion of associated objects should happen within 10 minutes
- When sourceControlConfiguration with namespace scope gets deleted, namespace are left intact in order to avoid breaking other workloads. If needed, you can delete namespace with kubectl.
- Changes to cluster that were the result of deployments from the tracked Git repo are not deleted when the sourceControlConfiguration is deleted.

Summary

- Azure Arc extends multi-cloud and on-prem
  - Management
  - Governance
  - Azure Security

- Azure Arc can manage the following resources
  - Kubernetes
  - Servers
  - Data Services

Other Azure Enterprise Resources to Consider

- Azure Sentinel

Resources

- Azure Arc Documentation
  https://docs.microsoft.com/en-us/azure/azure-arc/

- Azure Arc Jumpstart
  https://azurearcjumpstart.io/overview/

- Guide To GitOps
  https://www.weave.works/technologies/gitops/