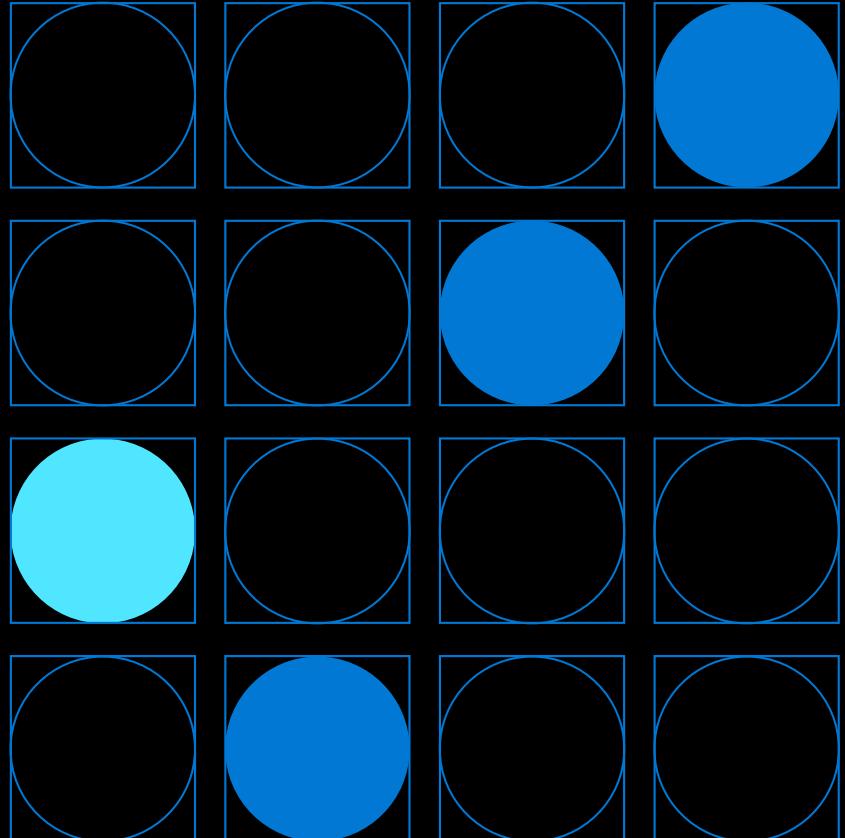


Microsoft Azure Training

Day:

Migrating Applications to the Cloud



Consolidating infrastructure with Azure Kubernetes Service

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Goals for this session.

- Discover Azure's options for containers
- Learn how to deploy a Kubernetes cluster with AKS
- Learn to deploy your services to Kubernetes
- Learn options for high-availability and redundancy.

Mission control

Your mission, should you choose to accept it...

THE DAILY NEWS

theuselessweb.com

THE WORLD'S MOST MEH NEWSPAPER

- Since 5 seconds ago

Tailwind Traders Acquires Northwind



REDMOND, WA - Tailwind Traders, Inc announced that it has agreed to acquire Northwind **Traders**, the venerable "old guard" international foods company, in an effort to bolster its virtual hardware offerings with some international culinary flare. Tailwind agreed to acquire Northwind for an undisclosed sum and **is** assuming control of all of Northwind's virtual assets, **not** excluding the company's flagship product: Aniseed Syrup/ "This is a profoundly wonderful development for

for all involved, and will help to bring our food products to a whole new sector of the market" stated Nancy Daviolo, Executive Vice President of Operations. "We **really** couldn't be happier with the arrangement". The recently-promoted Daviolo will join the Tailwind executive team along with two of her close associates, Margaret Peacock and Michael Suyama. Daviolo took over Northwind's **company** sales operations in 2012 after Andrew Fuller was

Containers

A refresher

What Containers Are

- Fully packaged applications
- Resource isolation without overhead
- Ready to deploy with a standard API call
- Better resource utilization
- Standard *image format*

What Containers Aren't

- Virtual Machines
- No hardware virtualization
- No hard security boundary

Moving from VMs to Containers

- Now is the best time to move
- More cost effective, efficient and reliable
- Dramatic deployment and resilience benefits

Cost Savings

- Far more granular compute units
 - Use only what you need
- Dramatic utilization improvement
- Azure has per-second billing

Reliability

- Standard, robust monitoring APIs
- Battle tested monitoring and orchestration tools
- Incredible launch / restart / stop times

Security Wins

- Fine-grained "sandbox" per-process
 - Principle of least privilege for processes
- Quickly react to vulnerabilities, etc...
 - Easily build a new image with patch
- Open technologies get constant audits

Azure Container Products:

Which option is right for me?

Azure Container Instances

- Containers on demand
- Per-second billing (!)
- Integrations with other Azure services
- No need to provision VM's or clusters
- Hypervisor level isolation
- Public IP
- Persistent Storage
- Supports both Linux and Windows containers



Azure Container Instances

```
$ az container create  
  --resource-group myrg \  
  --name aci-helloworld \  
  --image microsoft/aci-helloworld \  
  --dns-name-label aci-demo \  
  --ports 80
```

Azure App Services for Linux

- Fully managed PaaS for containers
- Support for many workflows
- Advanced features for webapps



Azure App Services for Linux

```
$ az webapp create \
  -g myrg \
  -n nginx \
  --plan my-appservice-plan \
  --deployment-container-image-name 'nginx'
```

Azure Kubernetes Service

Azure's managed Kubernetes Product



What is Kubernetes?

What is Kubernetes?

- Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications.
- Container Orchestrator
- Modular and pluggable
- Self-healing
- Designed by Google based on the system they use to run billions of containers per week.
- Over 2,300 contributors
 - Including contributions from companies like Google, Microsoft, Red Hat, Intel, Huawei, CoreOS, IBM, Mesosphere, and many more)

What is Container Orchestration?

Decouple SRE teams from what's inside the box

What is container orchestration?

- Scheduling
- Affinity / Anti-Affinity
- Health Monitoring
- Failover
- Scaling
- Networking
- Service Discovery

How does Kubernetes work?

Kubernetes Objects

- ReplicaSet
- StatefulSet
- DaemonSet
- Job
- Deployment
- Node
- Pod
- Service
- Ingress
- Namespace
- ConfigMap
- Secret
- Volume
- PersistentVolume
- PersistentVolumeClaim

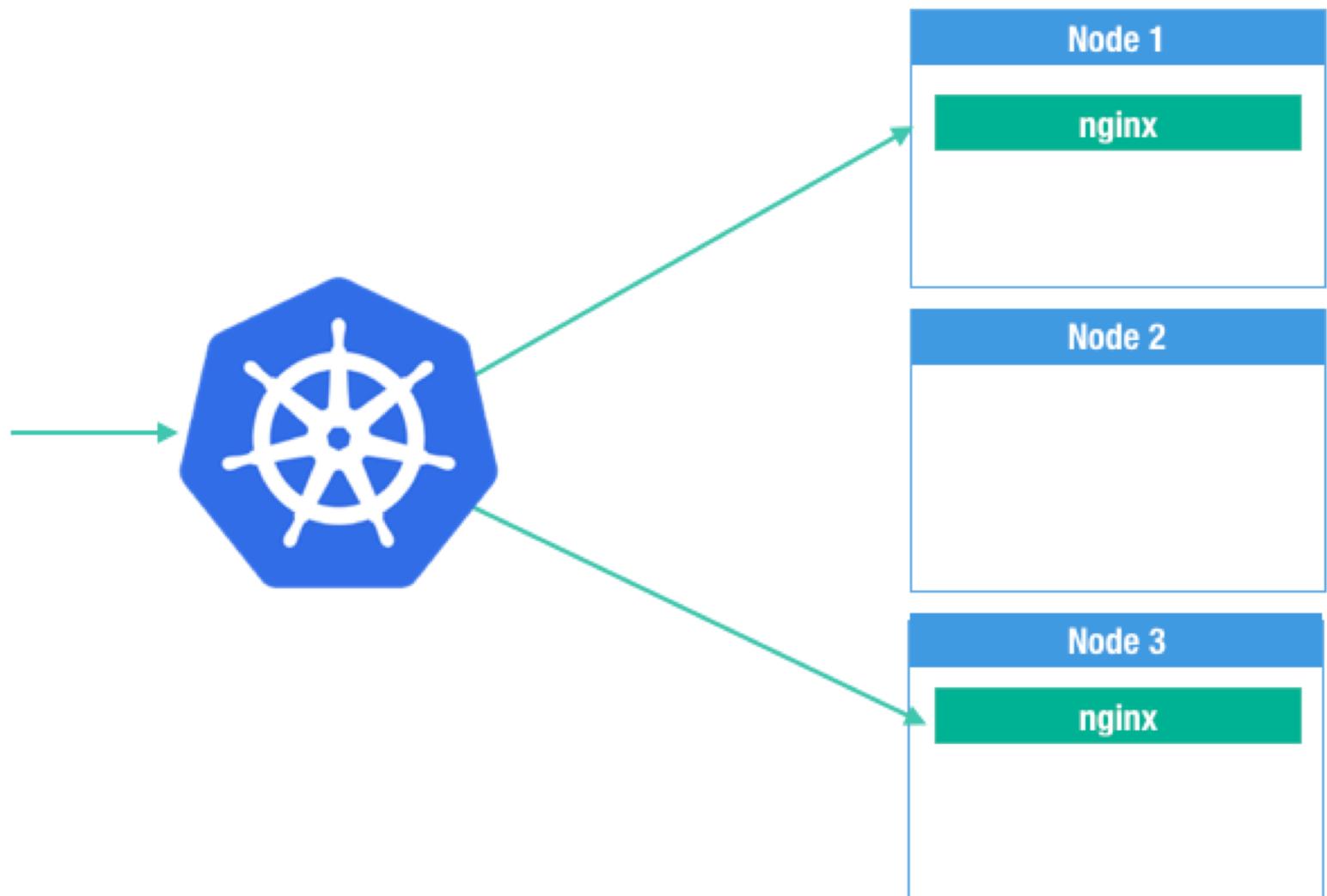
Reconciliation

Desired State

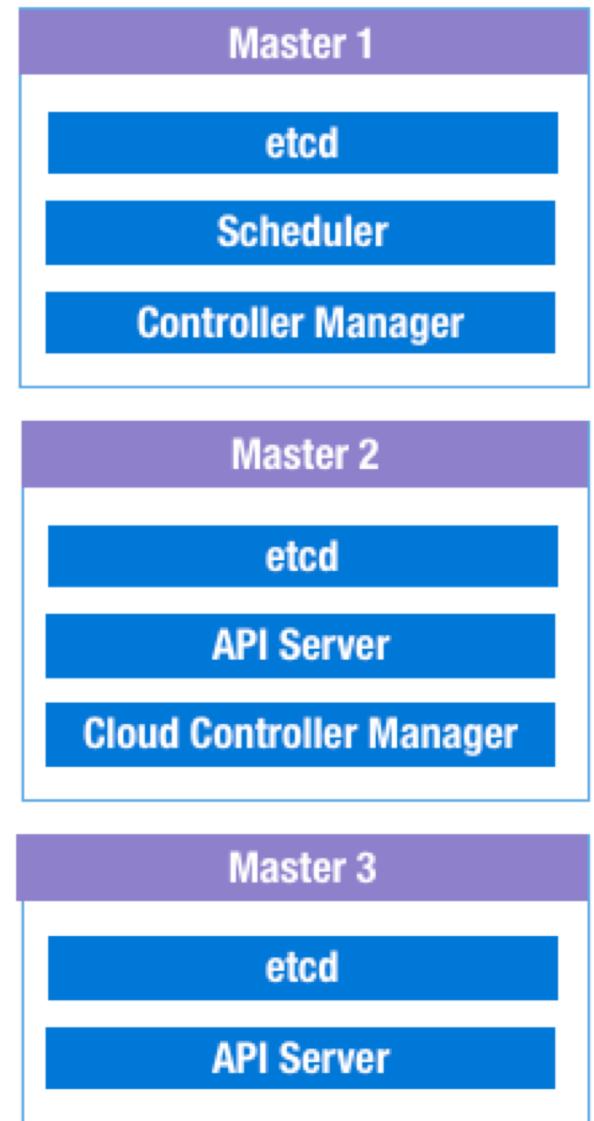
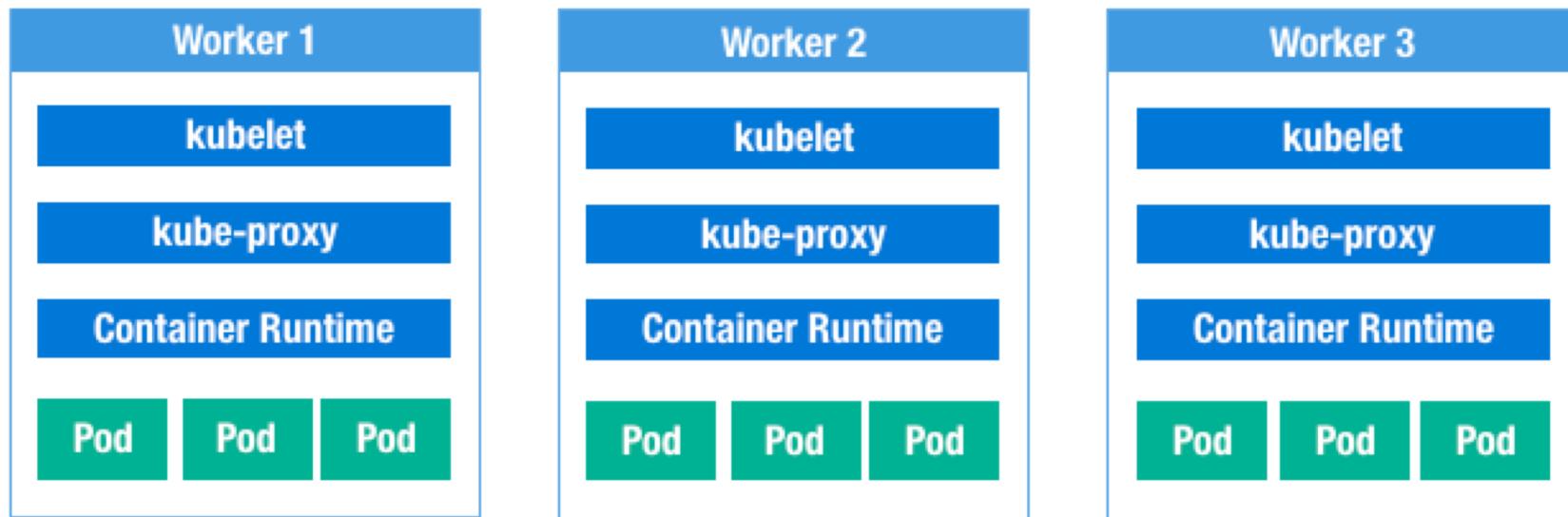


Actual State

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 2
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: nginx
          image: nginx:1.7.9
```



Control Plane



AKS

Azure Kubernetes Service

Azure Kubernetes Service

- Kubernetes architecture is complex
- Azure manages all of it for you
- Full upstream Kubernetes code
- Control plane (Kube API) is free, you pay for the workers VMs
 - And you have full access & ownership over the VMs you use
- Cross-region *and* cross-cloud support

Kubernetes Setup

```
az aks create \
--resource-group myResourceGroup \
--name myAKSCluster \
--node-count 5 \
--enable-addons monitoring,http_application_routing \
--generate-ssh-keys
```

Kubernetes Setup

- `az aks install-cli`
 - Install kubectl tool to manage the cluster
- `az aks get-credentials`
 - Configure kubectl to securely connect

Kubernetes Upgrade

```
az aks get-upgrades \
--name myAKSCluster \
--resource-group myResourceGroup \
--output table
```

Name	ResourceGroup	MasterVersion	NodePoolVersion	Upgrades
default	myResourceGroup	1.8.10	1.8.10	1.9.1, 1.9.2, 1.9.6

Kubernetes Upgrade

```
az aks upgrade \
--name myAKScluster \
--resource-group myResourceGroup \
--kubernetes-version 1.9.6
```

Kubernetes Scaling

```
az aks scale \
--name myAKSCluster\
--resource-group myResourceGroup \
--node-count 10
```

*Completely automate with Cluster Autoscaler

Helm

The Kubernetes Package Manager

Helm

- Another cloud native tool
- “The Kubernetes Package Manager”
- Simplifies deployment of applications
- <https://helm.sh>

Helm Charts

- Recipes for application deployment
- You provide a few configuration values
- Helm installs complex applications, all as one unit

Helm Chart Structure

- `Chart.yaml` - metadata
- `values.yaml` - variables
- `templates/` - Kubernetes deployment templates
 - `service.yaml`
 - `deployment.yaml`
 - `ingress.yaml`

Helm Setup

- Create cluster admin account for helm
- `helm init --service-account tiller`
- Installs “tiller” - the in-cluster component

Demo

Helm Deployment

Front Door

Geographical Load Balancing

Front Door

- Fully managed Layer 7 (HTTP) global load balancer
- Battle tested by Microsoft's own apps
- Modern features and standards built in

DDoS protection, edge SSL termination, intelligent caching, robust monitoring, ...

Front Door

We'll show:

- Creating a Front Door frontend
- Finding / creating a backend pool
- Creating powerful routing rules
- Instant SSL certificate provisioning

Demo

Azure Front Door Basics

Multi Region

High availability during catastrophic failure.

Front Door with AKS

- AKS *ingress* creates a public IP, routes inside the cluster
- No SSL, caching, etc... out of the box
- Layer Front Door on top

Multi-Region Redundancy

An entire region is offline, what do you do?

Multi-Region Redundancy

- Identical AKS clusters in different regions
- Deploy to each with a strategy
- One Front Door for everything

What About the Data?

- Multi-region compute needs data replication
- Cosmos DB is already global
- SQL databases have replication

Front Door & Data Replication with AKS

We'll show:

- A second AKS cluster, a second LB
- Seamless failover to the second LB to Front Door

Demo

Failover via Front Door for AKS

Putting it All Together

- Benefits of containers on Azure
 - And all the options you have
- Deploying to AKS with a click
- How Azure Front Door fits in
- Front Door & multiple AKS clusters with data replication