Practical Container Scenarios in Azure

Anthony E. Nocentino
Enterprise Architect
Centino Systems

Level: Intermediate

Anthony E. Nocentino

- **Consultant and Trainer**
- **Founder and President of Centino Systems**
  - Specialize in system architecture and performance
  - Masters Computer Science
  - Microsoft MVP - Data Platform - 2017 - 2020
  - Linux Foundation Certified Engineer
  - Friend of Redgate - 2015-2019
- **email**: aen@centinosystems.com
- **Twitter**: @nocentino
- **Blog**: www.centinosystems.com/blog
- **Pluralsight Author**: www.pluralsight.com

Agenda

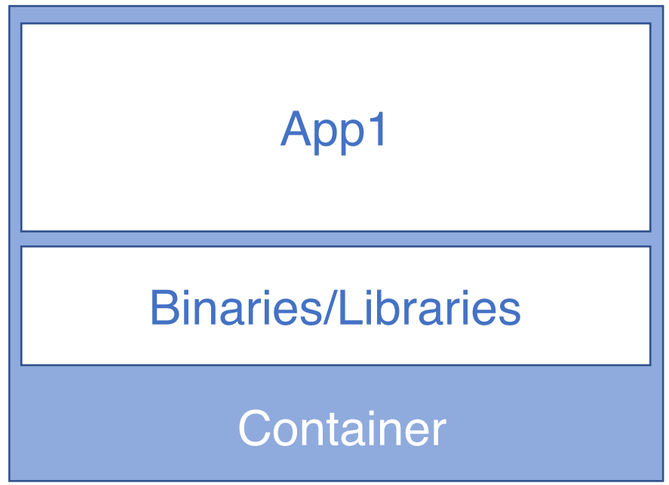
- **Container Fundamentals**
- **Creating a Container Image**
- **Working with Azure Container Registry**
- **Deploying our Application in Azure Kubernetes Service**

Containerizing Apps and Data Centers

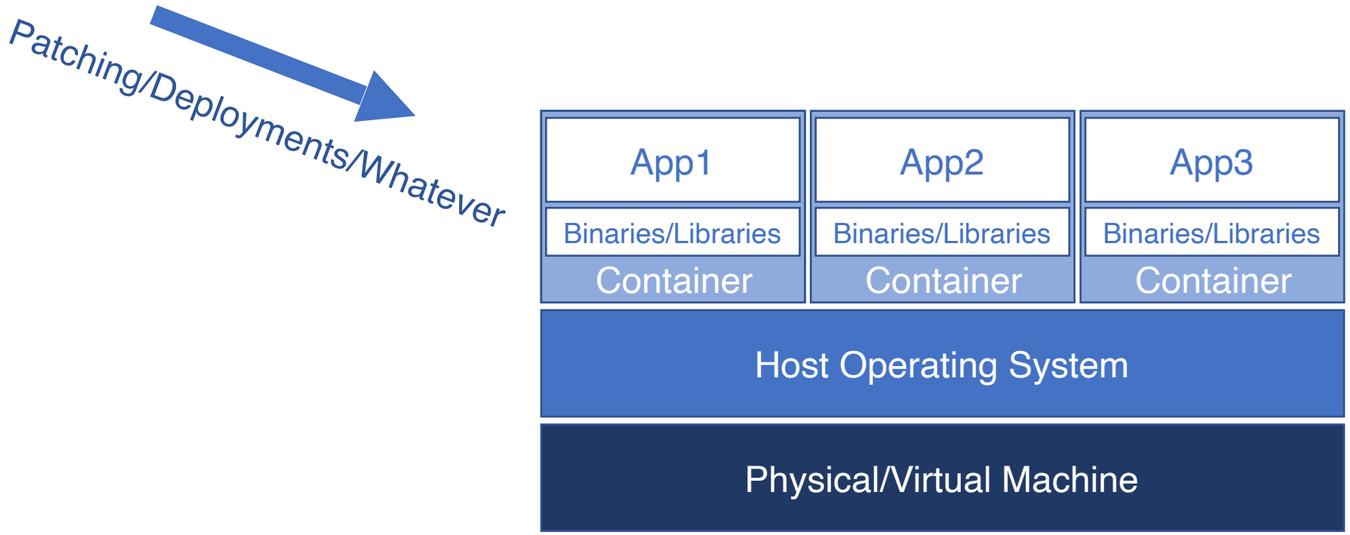
- **Reducing development time**
- **Deployment automation – speed and consistency**
- **Enables DevOps and CI/CD scenarios**
- **Rethink how you deploy - it’s the application service, not the server**

Container Fundamentals

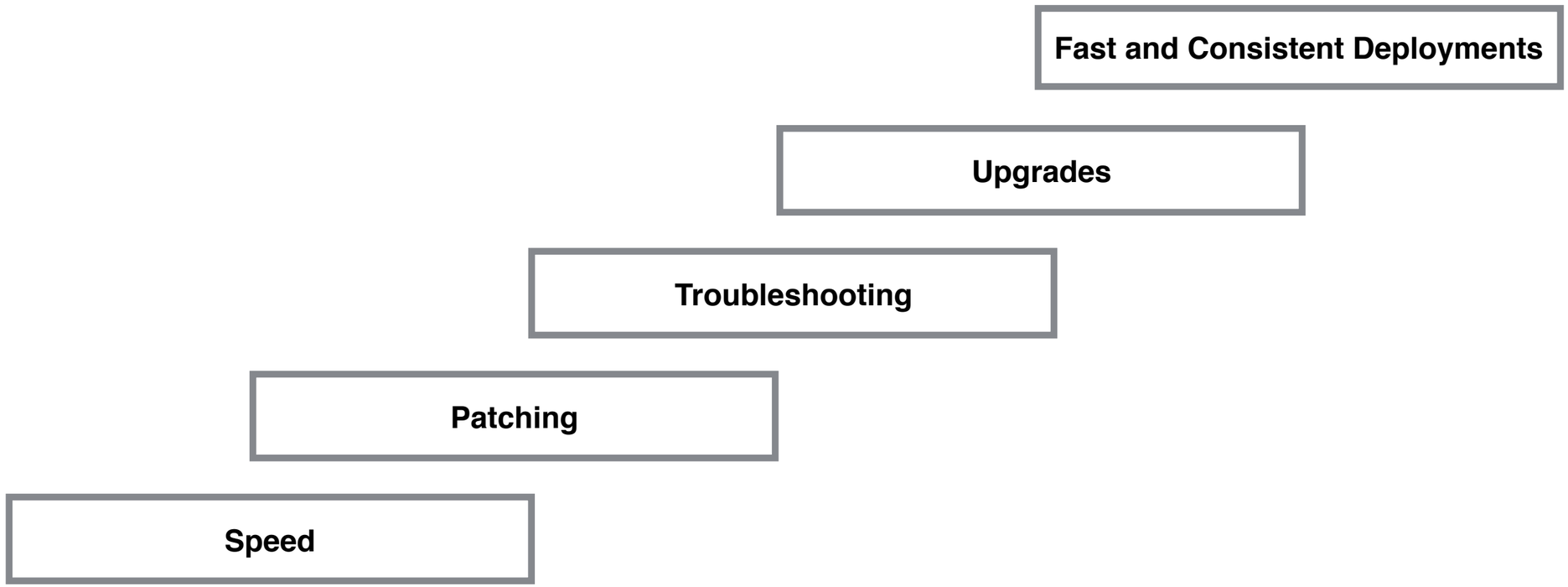
- **Operating system virtualization**
  - **Shared kernel and system resources**
- **Container…contain…**
  - **Binaries, libraries and file system**
- **One app inside the container**
  - **This is the unit of work**
- **Containers are ephemeral**
  - **Let's start off with a comparison…**



Containers



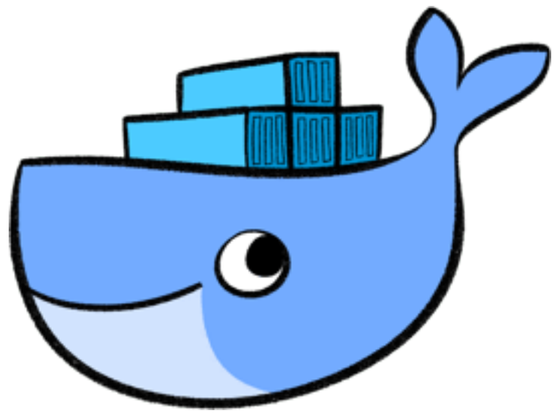
What do Containers Bring to the Table?



Services, we care about getting work done!

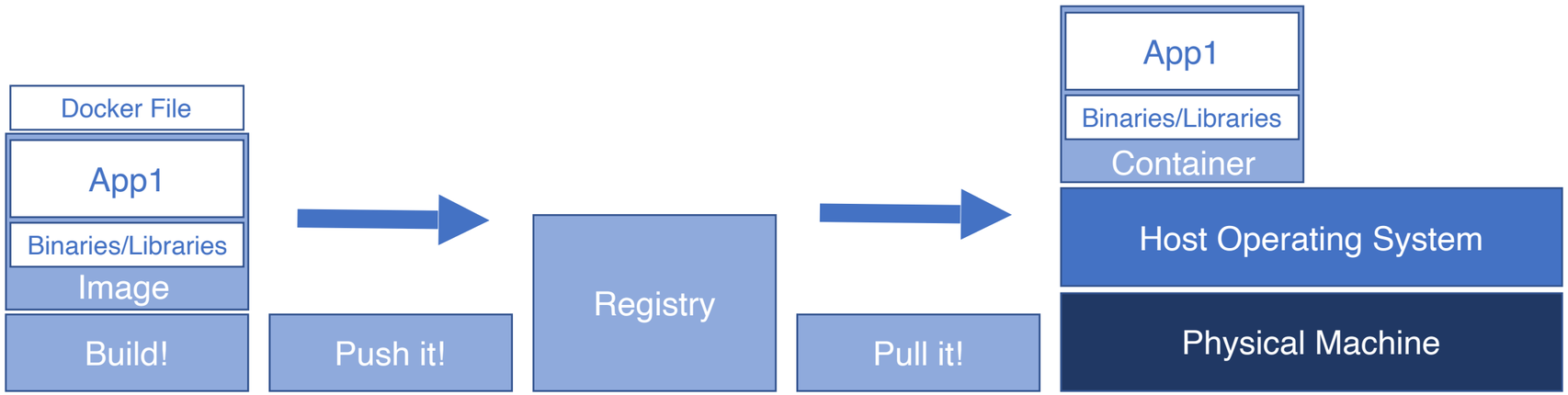
The Container Universe

- **Docker**
  - **Linux**
  - **Windows**
  - **Mac**
- **Docker Inc.**
- **Other Container Engines**
  - **rkt**
  - **CoreOS**
  - **Windows**
  - **chroot…chwhat?**

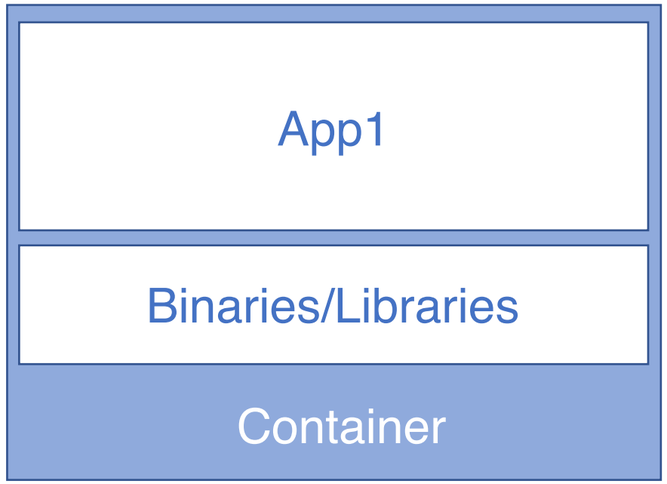


Getting/Creating Containers

- **Images** – code, runtimes, libraries, environment variables
- **Registries** – where images live. Docker Hub, Azure Container Registry, internal
- **Docker Files** – defines the container image



Docker Files



- Describes the commands to build an **image**

```
FROM mcr.microsoft.com/dotnet/core/aspnet:2.2
COPY ./myWebApp/bin/Release/netcoreapp2.2/publish app/
ENTRYPOINT ["dotnet", "app/myWebApp.dll"]
EXPOSE 80
```

```
docker build -t mywebappimage .
```

https://docs.docker.com/engine/reference/builder/

Container Registries

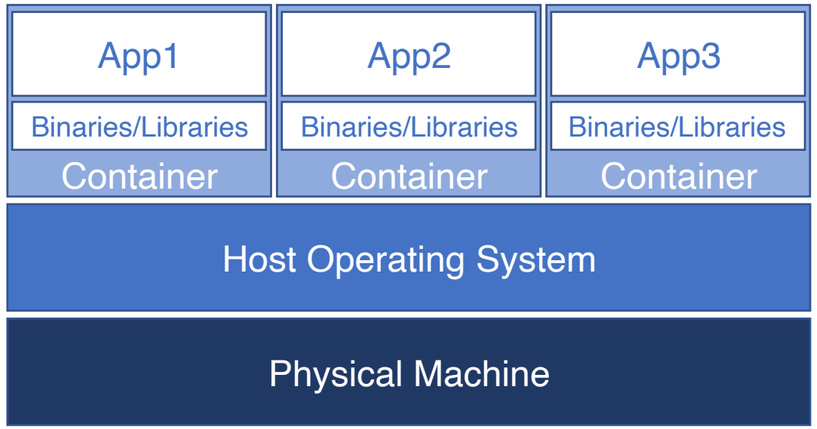
- **Store container images**
- **Public or private**
- **Secured**
  - **Transport - HTTPS**
  - **Image digests - hash of image**
- **Key component of building a CI/CD pipeline**
- **Images are organized by tags**
- **Docker Hub**
- **Azure Container Registry**
  - **mcr.microsoft.com**

Demo!

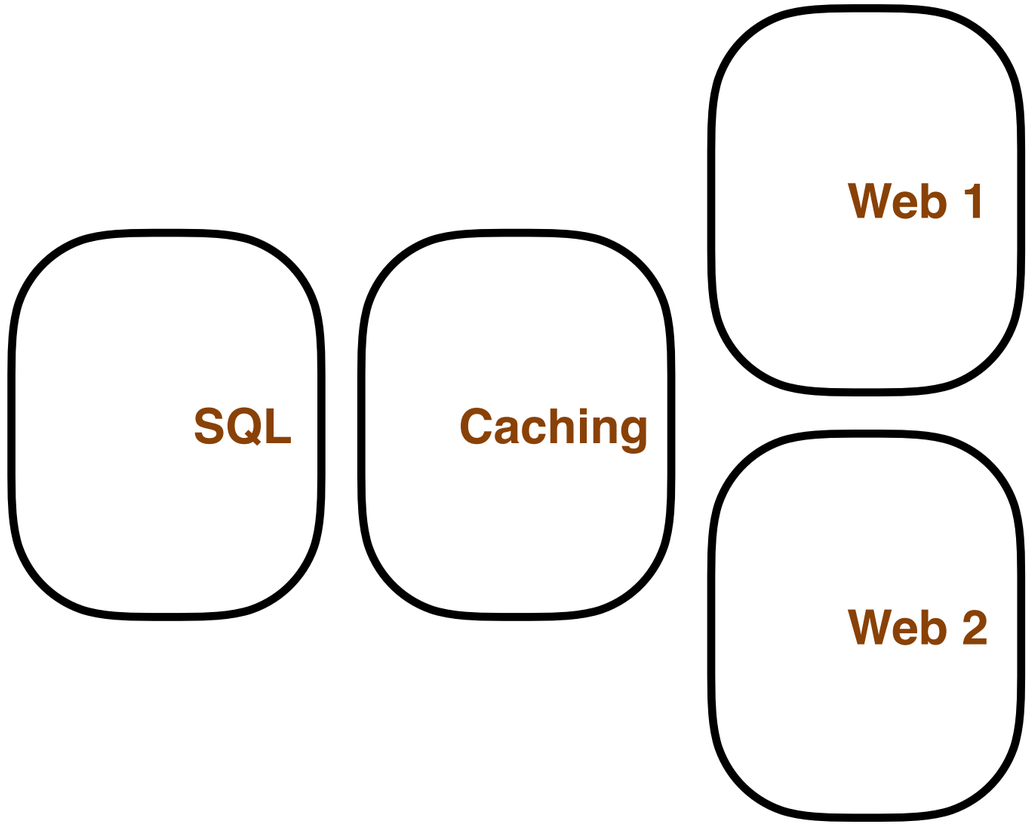
- **Creating a container based application**
- **Building it in Azure Container Registry**

Container Based Application Deployment

- **Single-tier applications** - anything written by IBM
- **Multi-tier applications** - Service oriented, Client/Server…
- **Micro-services** - smaller, more easily changed units



Modern Application Deployment



- **Where do I run the application?**
- **How do I scale the application?**
- **How do I consistently deploy?**
- **How do I access the application?**

Container Orchestration

- **Workload placement**
- **Managing state, starting things up and keeping things up**
- **Networking and Services**
- **Load balancing services**
- **Persistent storage**
- **Declarative model**

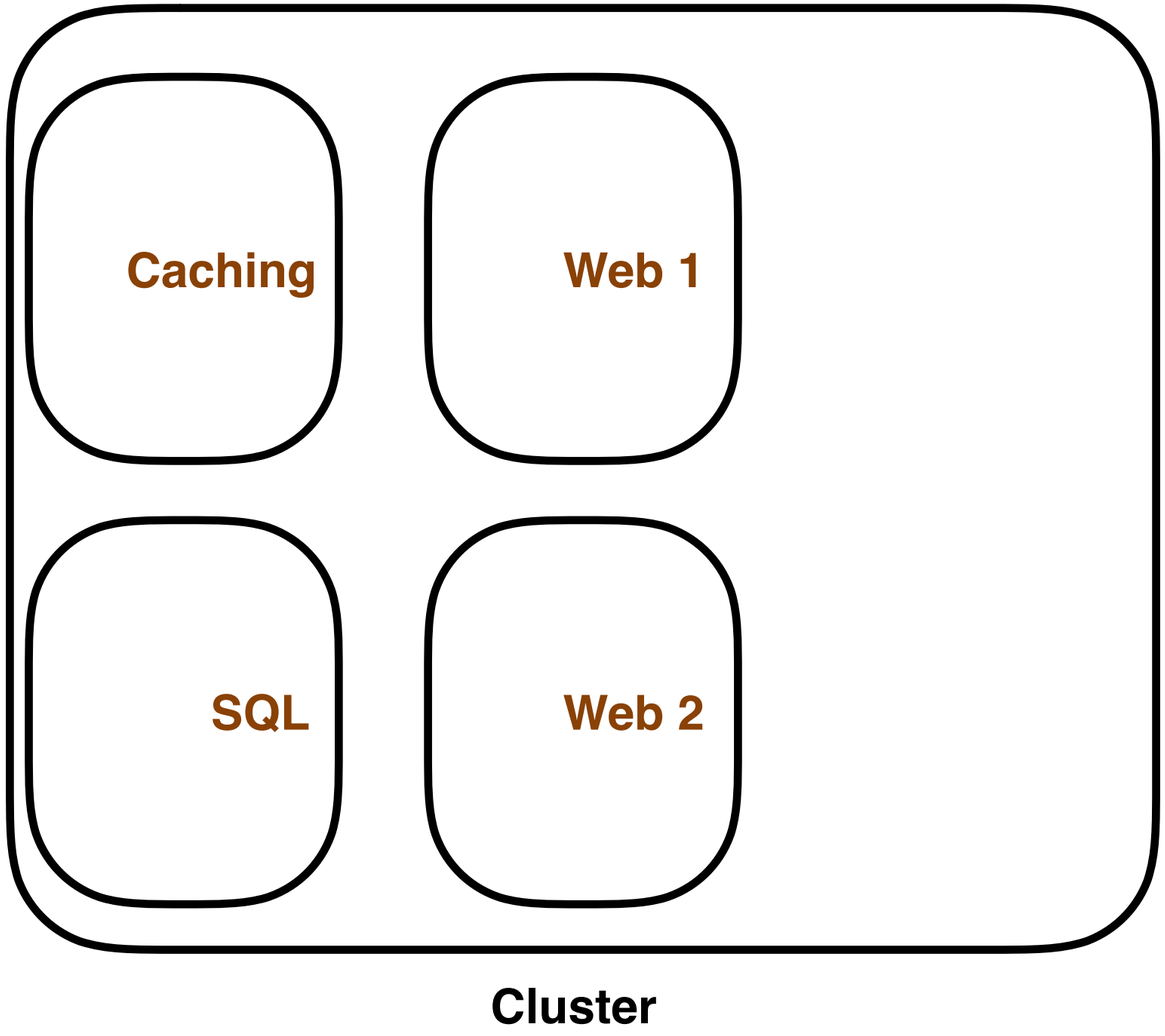
Container Orchestrators

- **Docker Swarm/Docker Enterprise**
- **Kubernetes**
- **Red Hat OpenShift**
- **Managed Services**
  - **Azure Kubernetes Services (AKS)**
  - **Google Kubernetes Engine (GKE)**
  - **Amazon Elastic Container Service for Kubernetes (EKS)**

What is Kubernetes?

- **Container Orchestrator**
- **Infrastructure Abstraction**
- **Desired State**

Kubernetes Cluster



Getting Kubernetes

- **Where to install?**
  - **Cloud**
    - **IaaS - Virtual Machines**
    - **PaaS - Managed Service**
  - **On-Prem**
    - **Bare Metal**
    - **Virtual Machines**
  - **Which one should you choose?**

https://kubernetes.io/docs/setup/pick-right-solution/

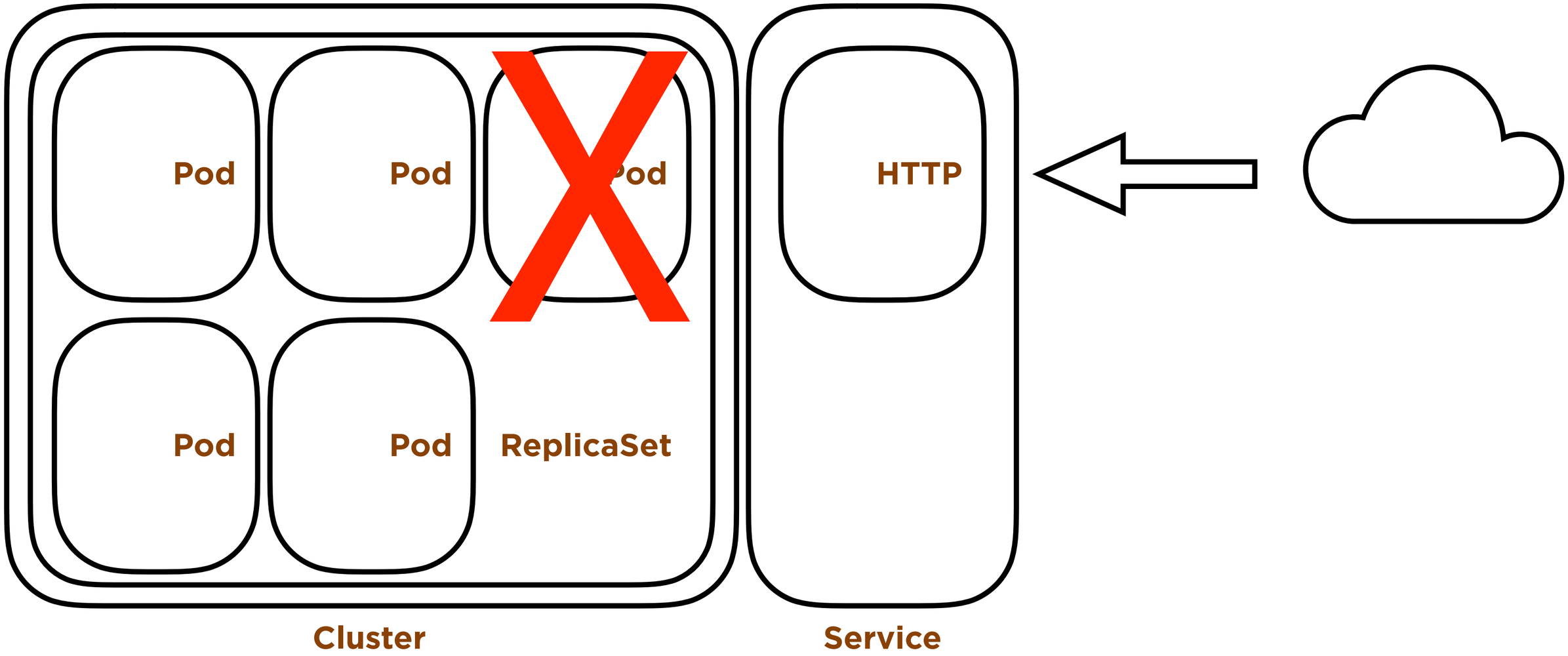
Azure Kubernetes Service

- **Managed Cluster**
- **Upgrades handled in Azure (CLI/Portal)**
- **Define a number of Nodes (Agents)**
- **Nodes are Virtual Machines**
- **Nodes are in Availability Sets**
- **Node auto-scaling**
- **Pod auto-scaling**

Kubernetes API

- **API Objects** - Represent resources in your system
  - Really an API to the resources in your cluster…
  - **Pods** - your container based applications
  - **Controllers** - maintain desired state
  - **Services** - persistent access to your apps
  - **Storage** - persistent storage for your data
  - …and more

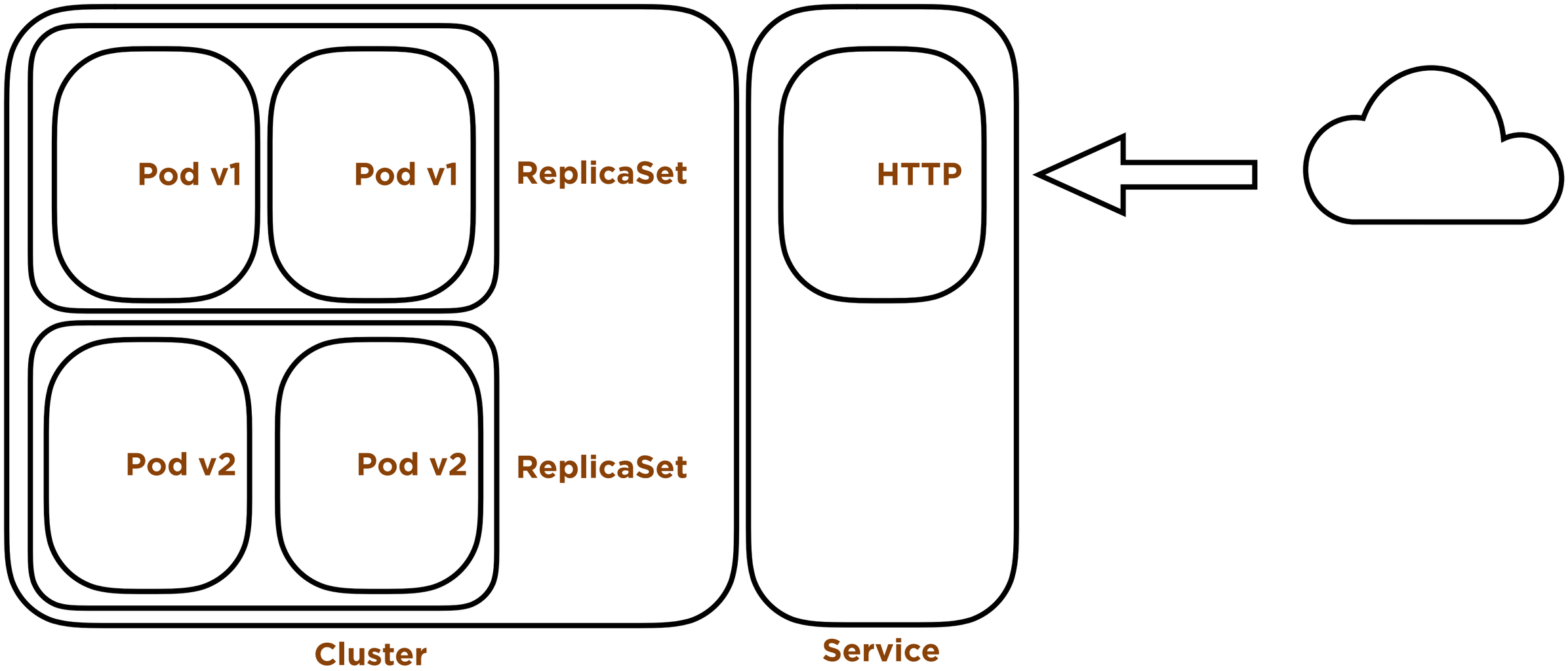
Services and ReplicaSets



Using Deployments

- **`Deployments`** are used to provide declarative updates to Pods and **`ReplicaSets`**
- We define the state and use the Deployment Controller to move towards that state
- **`Deployments`** are made of **`ReplicaSets`** and manage the transition between the **`ReplicaSets`**
- Scaling
  - Manually
  - Automatically based on resource consumption

Controller Operations - `Deployment`



Application Deployment in Kubernetes

- Imperative
  - **`kubectl run mywebapp --image=centinosystems.azurecr.io/mywebappimage`**
- Declarative
  - Define our desired state in code
  - Manifest
  - YAML or JSON
  - **`kubectl apply -f deployment.yaml`**

Basic Manifest - Deployment

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: webapp-deployment
  labels:
    app: webapp
spec:
  replicas: 1
  selector:
    matchLabels:
      app: webapp
  template:
     metadata:
       labels:
         app: webapp
     spec:
       containers:
       - name: webapp
         image: centinosystems.azurecr.io/mywebappimage:v1
         ports:
         - containerPort: 80
```

```
kubectl apply -f deployment.yaml
```

Demos!

Declaratively Deploying Applications in AKS

- **`Deployments`**
- **`Services`**

Scaling our application from 1 to 50 Replicas

What's Next?

- **Building a Data Tier**
  - **Database Service**
  - **Database Connections**
- **Production Ready App Tier**
  - **Connection Strings in Azure Key Vault**
  - **SSL Termination (AppGW, Ingress…etc)**
- **DevOps**
  - **Automatically build container image**
  - **Automatically deploy to Kubernetes using a `Deployment`**
  - **Azure DevOps**

More Resources

- **Docker for Windows/Mac**
- **Managed Service Providers**
  - Azure Kubernetes Service **(AKS)**
    - https://docs.microsoft.com/en-us/azure/aks/kubernetes-walkthrough
- **Pluralsight!**
  - https://app.pluralsight.com/profile/author/anthony-nocentino
  - **Kubernetes Installation and Configuration Fundamentals**
  - **Managing the Kubernetes API Server and Pods**
  - **Managing Kubernetes Controllers and Deployments**

Review

- **Container Fundamentals**
- **Creating a Container Image**
- **Working with Azure Container Registry**
- **Deploying our Application in Azure Kubernetes Service**

Need more data or help?

http://www.centinosystems.com/blog/talks/

Links to resources
Demos
Presentation
Pluralsight

aen@centinosystems.com
@nocentino
www.centinosystems.com

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Thank You!