Implement and Manage Azure Pipelines Infrastructure

UNDERSTANDING AZURE PIPELINES AGENTS

Overview

Understanding Azure Pipelines Agents

Microsoft Hosted vs Self-Hosted Agents

Implementing Self-Hosted Agents

Leveraging Docker in Azure Pipelines

Overview

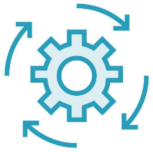
Understanding Pipeline Jobs

Running Pipeline Jobs

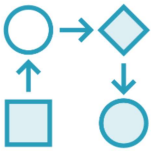
Developing Azure Pipeline Jobs Exploring Azure Pipeline Jobs Integrating Third-Party Platforms

Understanding Pipeline Jobs

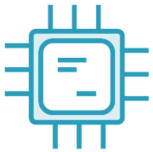
What are Pipeline Jobs?



The smallest unit of organisation in a pipeline



Consists of a series of steps & can be combined in to stages



Can be run across a range of different compute platforms

https://docs.microsoft.com/en-us/azure/devops/pipelines/process/phases

Sample Job

```
job: Sample_Job
timeoutInMinutes: 10
pool:
  vmImage: 'ubuntu-16.04'
steps:
- bash: echo "Hello world"
```

- Use ‘job:’ when you want to provide additional properties like ‘timeoutInMinutes:’
- ‘pool’ and ‘vmImage’ are needed when you want to run the job against a Hosted Agent
- ‘steps:’ consist of multiple discrete actions, like processing a Bash script on the agent which is running the job

Running Pipeline Jobs

Agent Pool Jobs

Run on a dedicated or assigned system contained within a pool

The capabilities of the system determine the jobs which can be run

Jobs can only be run if the pool has an agent available

https://docs.microsoft.com/en-us/azure/devops/pipelines/process/phases#agent-pool-jobs

Server Jobs

Jobs are executed directly on the Azure DevOps (or TFS) server

Jobs are executed without an agent, so range of jobs are limited

Use ‘pool: server’ or ‘server: true’ to use server jobs

https://docs.microsoft.com/en-us/azure/devops/pipelines/process/phases#server-jobs

Using Agent Demands

Specifies what capabilities the agent must have

Linked to operating system, applications and versions

Multiple demands can be specified for each job

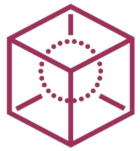
Demands can be asserted manually or automatically

https://docs.microsoft.com/en-us/azure/devops/pipelines/process/demands

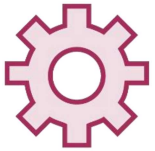
```
pool:
  name: privatePool
  demands:
  -agent.os -equals Linux
 -python3 -equals
 /usr/bin/python3  steps:
 -  task: PythonScript@0
    inputs:
      scriptSource: inline
      script: print("Hello, World!")
```

- Specify the name of the private pool
- Specify multiple demands (if the task does not automatically assert demands)
- Create a job which utilizes the asserted demands

Container Jobs



Jobs can run inside a Docker container on Windows and Linux agents



Provides more control over the job execution environment

Images can be retrieved from Docker Hub or private registries

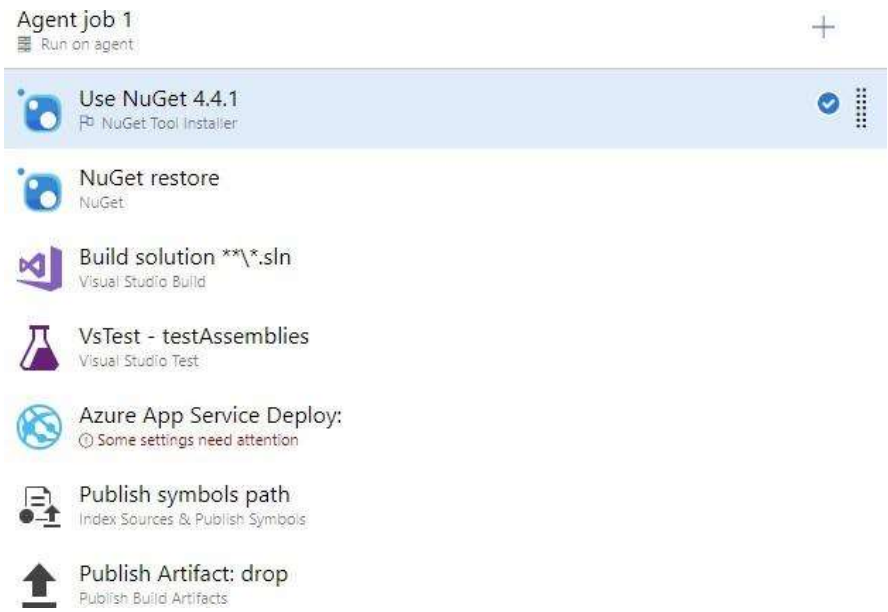
https://docs.microsoft.com/en-us/azure/devops/pipelines/process/container-phases

Developing Azure Pipeline Jobs

Using the Classic UI

Build/Release Pipelines

Manual job addition Useful for learning Underlying YAML exposed



Using YAML Pipelines

Unified CI/CD Pipelines

Targeted at more modern platforms

UI offers drag-and-drop plus IntelliSense

master jamesbannan/pipelines-dotnet-core / azure-pipelines.yml *

```yaml
# ASP.NET Core
# Build and test ASP.NET Core projects targeting .NET Core.
# Add steps that run tests, create a NuGet package, deploy, and more:
# https://docs.microsoft.com/azure/devops/pipelines/languages/dotnet-core

trigger:
- master

pool:
  vmImage: 'ubuntu-16.04'

variables:
  buildConfiguration: 'Release'

steps:
- task: DotNetCoreInstaller@0
  inputs:
    version: '2.1.300'

- task: DotNetCoreCLI@2
  inputs:
    command: restore
    projects: '**/*.csproj'
    feedsToUse: config
    nugetConfigPath: NuGet.config    # Relative to root of the repository
    externalFeedCredentials: <Name of the NuGet service connection>

- task: DotNetCoreCLI@2
  displayName: Build
  inputs:
    command: build
    projects: '**/*.csproj'
    arguments: '--configuration Release'

```

Classic UI vs YAML Pipelines

Classic UI

Build and Release Pipelines are separate

Release pipelines require build artifacts Suitable for more mature platforms Cannot be managed via source control Does not support container jobs

Will slowly be phased out

YAML Pipelines

Multi-stage Pipelines enable unified CI/CD Build artifacts are not necessary

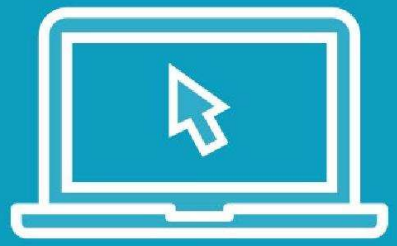
Suitable for more modern platforms

Managed via source control

Only way to run container jobs

Will slowly become the only approach

Demo

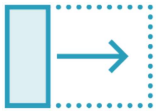


Explore pipelines using the Classic UI

Explore pipelines using the YAML editor

Integrating Third-party Platforms

Extending Azure Pipelines Functionality



Azure DevOps is extensible via the Visual Studio Marketplace

Allows for integration with external and pre-existing platforms

Enables Azure DevOps to be part of an integrated CI/CD framework

https://marketplace.visualstudio.com/azuredevops

```
# Deploy to Chef environments by
editing environment attributes

- task: Chef@1

  inputs:

    connectedServiceName: ''

    environment: 'dev'

    attributes: 'something'

    chefWaitTime: '30'
```

- Uses the standard task syntax
- Name of the connected service endpoint
- Task inputs which are only meaningful to the remote service

Summary

Understanding Pipeline Jobs

Running Pipeline Jobs

Developing Azure Pipeline Jobs

Exploring Azure Pipeline Jobs

Integrating Third-party Platforms

Coming next:
Microsoft Hosted vs. Self-hosted Agents

Continuous Delivery and DevOps with Azure DevOps: Pipelines

Outline

Release management in the context of continuous delivery

Steps of a release

Release management concepts

Release management infrastructure

Deploying to on-premise or cloud

Release Management in the Context of Continuous Delivery

In continuous delivery we strive to separate a deployment from a release

This provides better stability to the deployment, better validation of the deployment and makes releasing a feature a functional operation, preferably done by the “business” at the moment they prefer

Separating Deployment from Release

Deploy your product

See if it operates in a stable fashion

Enable your feature for

- Segment of users
- Random selected percentage
- All in one

Watch how the system behaves

This is a safe and stable way of deploying. It separates deployments from revealing a feature; you can now deploy any time a day!

Steps of a Release

Steps of a Release

First you build the software
- And validate product quality

Then you deploy the software
- And validate runtime stability

Then you release the feature
- And validate feature usage

Clean separation in the different stages of delivery

Azure DevOps Release Pipelines

Distinction between build and release

Build produces artifacts

- Mix and match with other build software

A release pipeline picks these up and deploys them in an environment

End-to-end traceable process

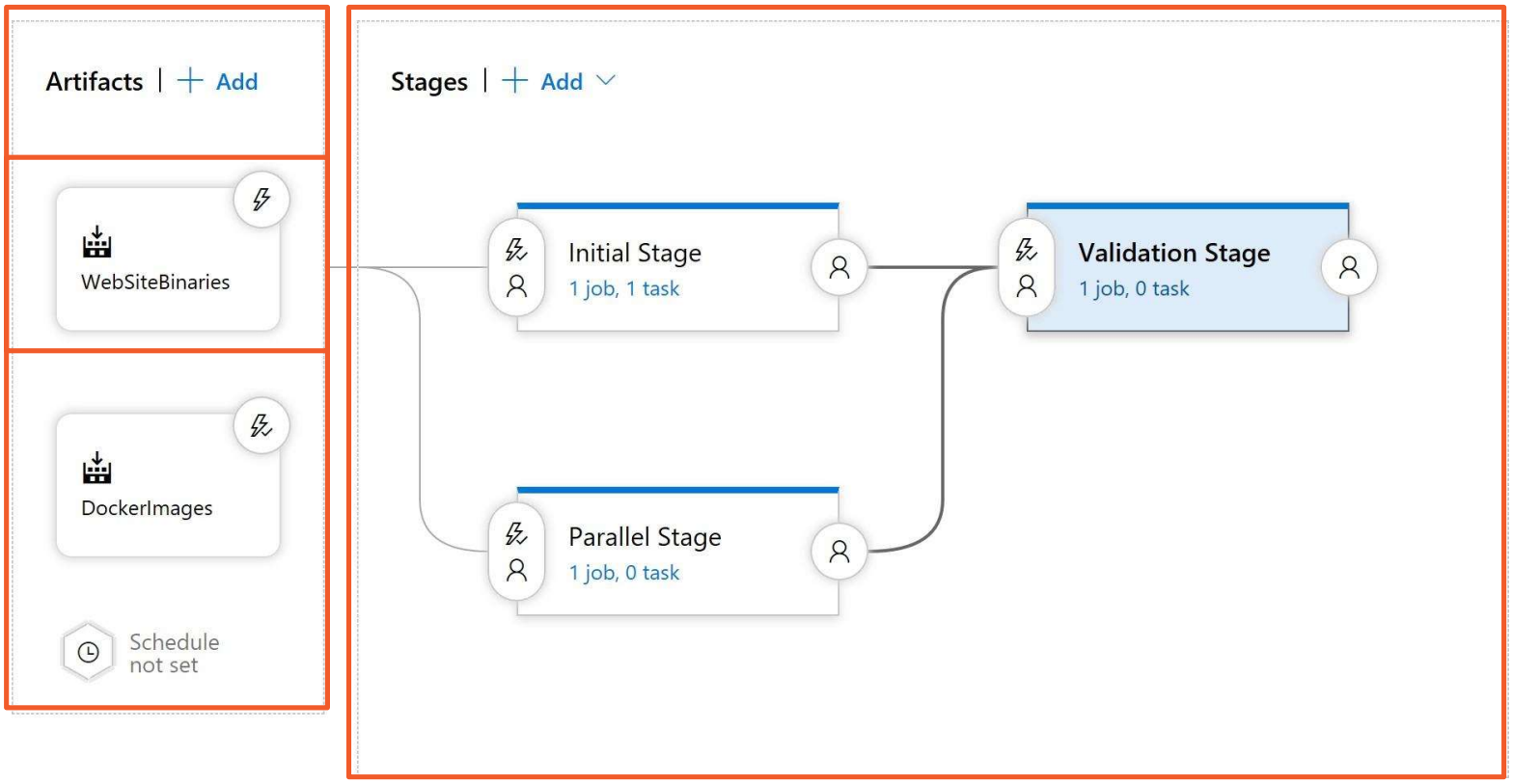
Release Management Concepts

How a Release Is Set Up

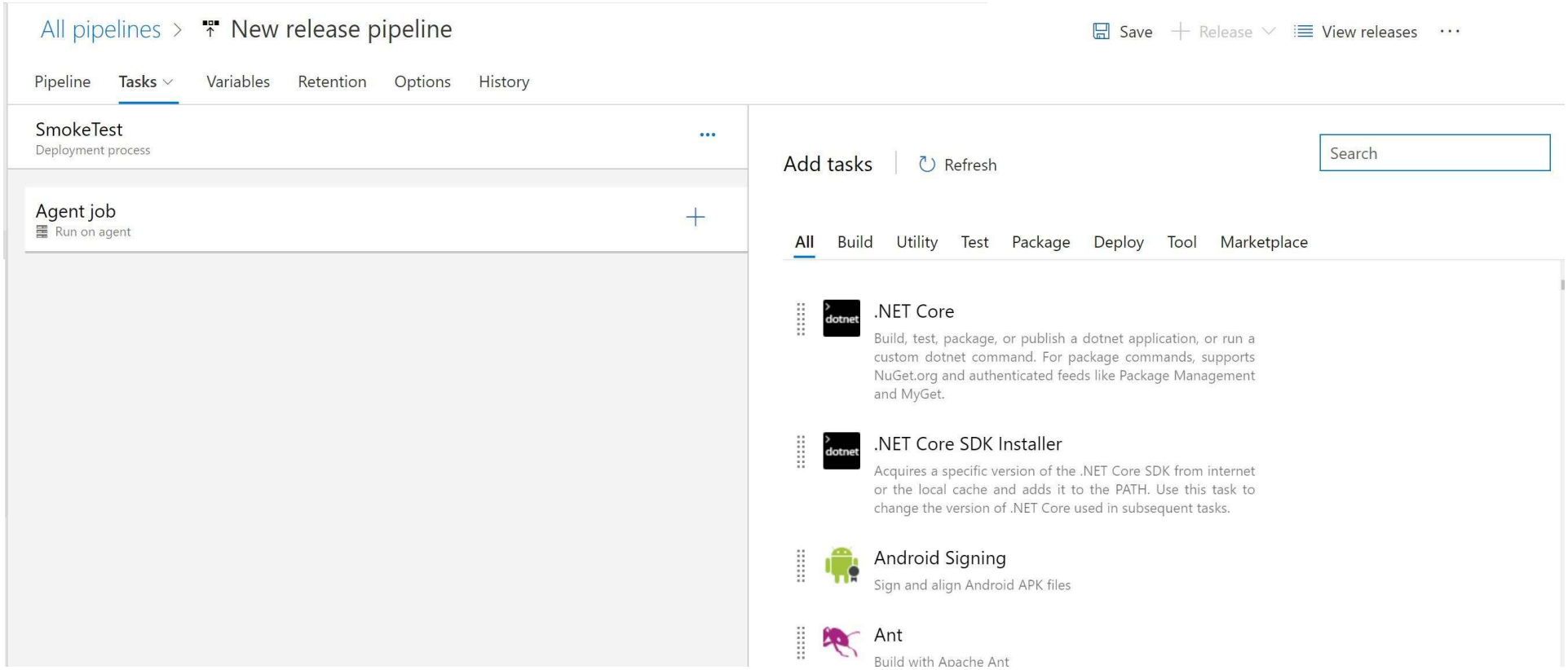
Release Pipeline Definition

Release Agent

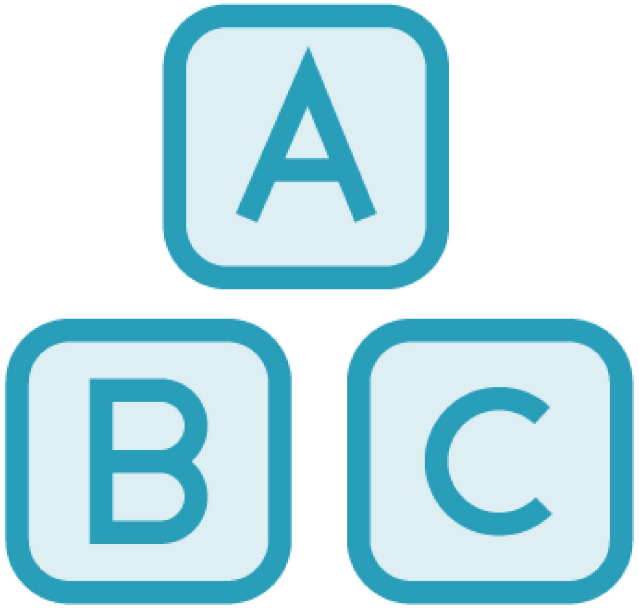
Artifacts, Stages, and Gates



Jobs and Tasks



Release Variables



Custom Variables

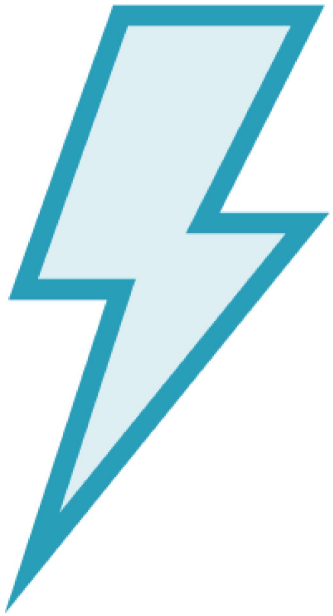
$(variablename)

Build In Variables

Secrets

Environment Variable

Continuous Deployment Trigger



Build, (Azure DevOps) Git,
Team Foundation Version Control

GitHub

Jenkins

Azure DevOps Artifact Management

Container Registry

Docker Hub

Release Management Infrastructure

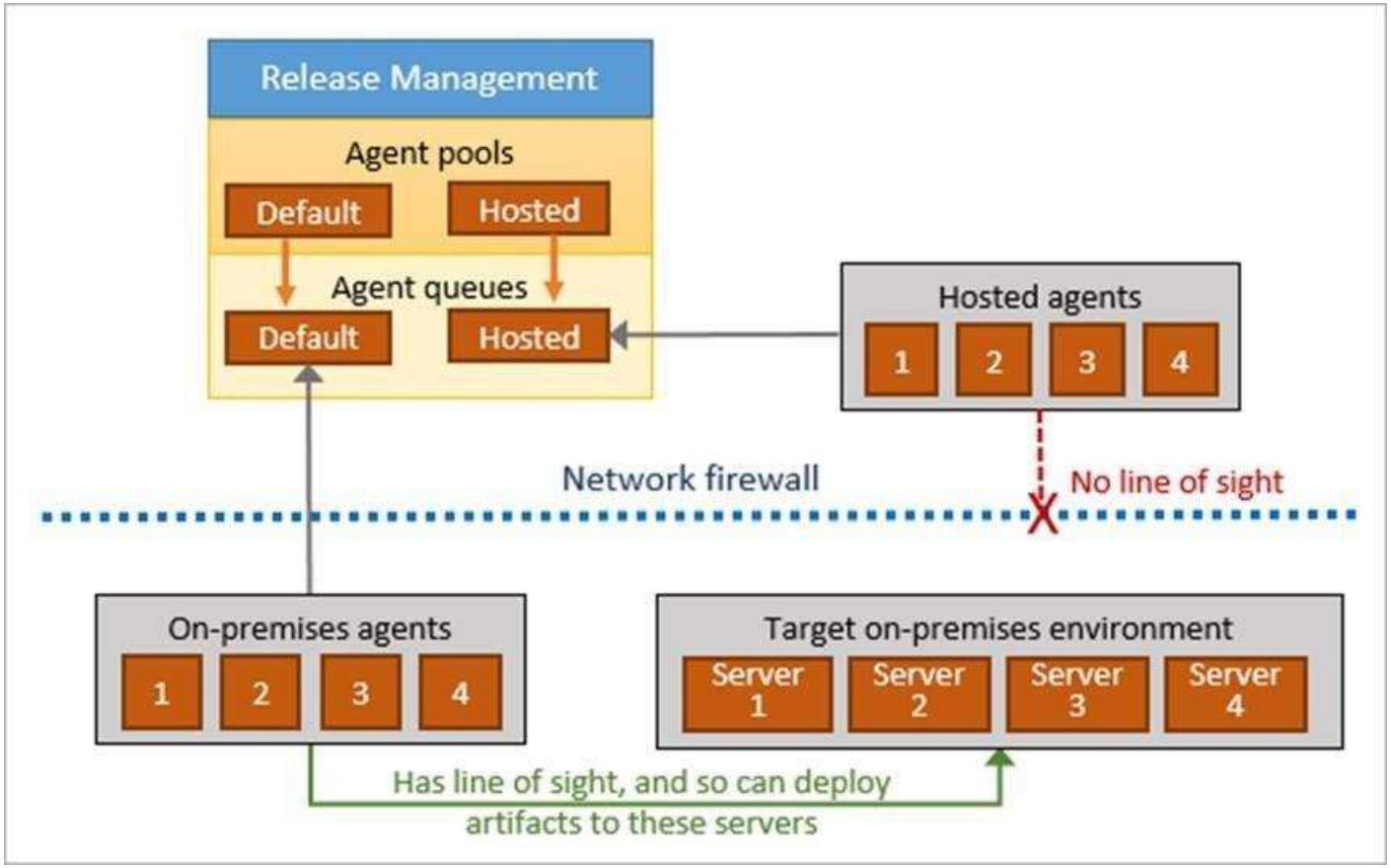
Agents and Pipelines

Hosted Agent

Pipelines

Custom Agent

Hybrid Release Management



Deploying to On-premise or Cloud

Deployment Groups

Provisioned per project or for multiple teams

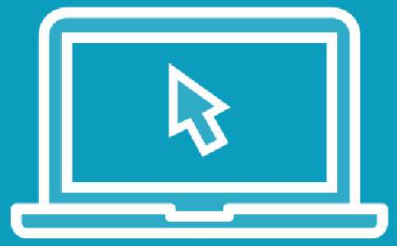
- Deployment Pool
- Deployment Group

Requires Agent install per machine that is part of the pool/group

Agent runs as system service

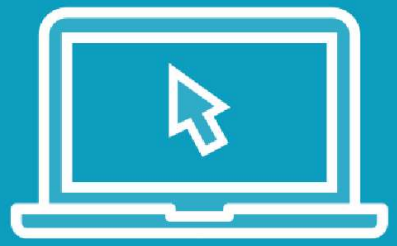
Primarily used for on-premises hosting

Demo



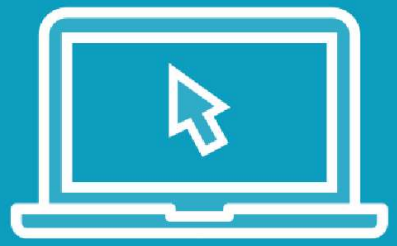
Create a release for an ASP.NET web application

Demo



Deploy to a deployment group

Demo



Set up a custom agent

Summary

- Release management in the context of continuous delivery
- Steps of a release
- Release management concepts
- Release management infrastructure
- Deploying to on-premise or cloud

Infrastructure as Code

Outline

Infrastructure as code

Provisioning on demand

Using Containers

Yaml based pipelines

Infrastructure as Code

Infrastructure as Code

infrastructure defined in text files checked in your version control system

Provision on demand

From environments to quality gates

Improves traceability of changes

Improves repeatability

Improves cost efficiency

Configuration and Secrets

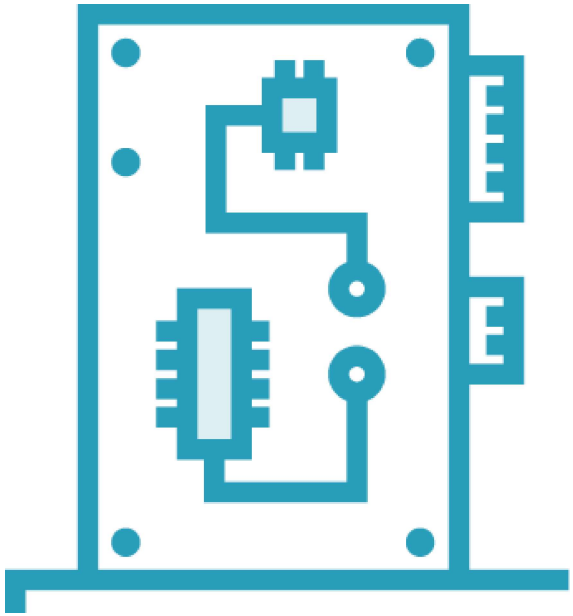
Have admin define secrets in variables

Use the release to replace secrets

Use transform tasks

Provisioning on Demand

Provisioning



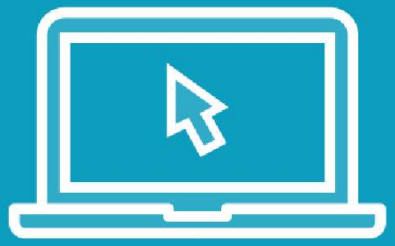
Prepare the environment on which we can deploy our new version of the software

Azure ARM

Template

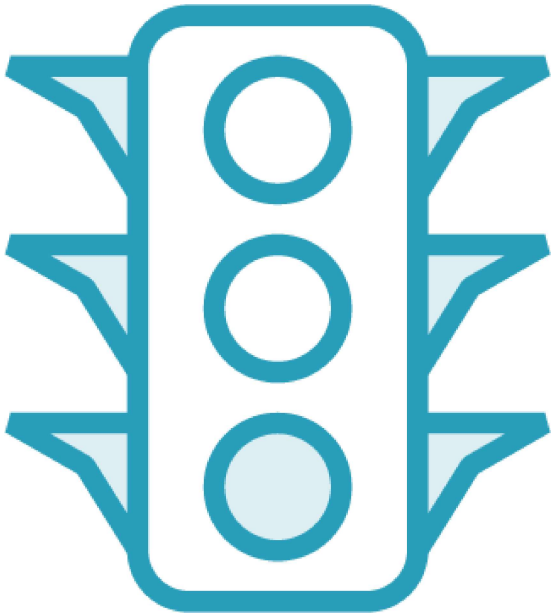
Parameters

Demo



Create new appservice as part of the release

Test, Validation, and Approval



We deploy to the new provisioned resource

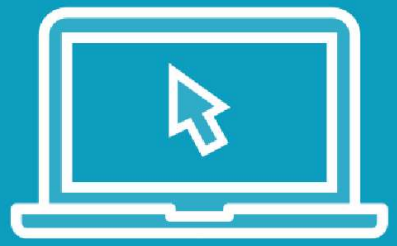
We run various tests

We report the results

We de-provision resources

We wait on approval

Demo



Deploy to the provisioned appservice and test the product using UI tests

Using Containers

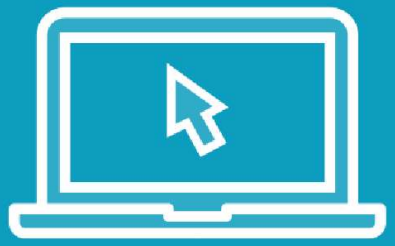
Container Workflow

Build “bakes” the container(s)

Deployment involves only command to target machine

Target machine takes care of the work Often a cluster, e.g. Kubernetes

Demo

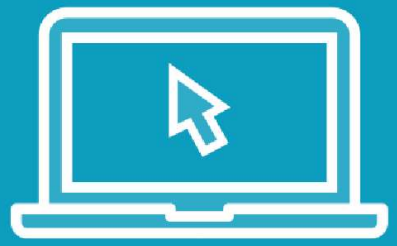


Deploy our website to a kubernetes cluster

Yaml Based Pipelines

- Build pipeline
- Release pipeline
- Combined pipeline experience
- Improved traceability
- Environments

Demo



Integrated Yaml pipelines and environments

Summary

Infrastructure as code

Provisioning on demand

Using Containers

Yaml based pipelines

Security, Approval, and Audit Trails

Outline

Release pipeline security

Audit trails and logs

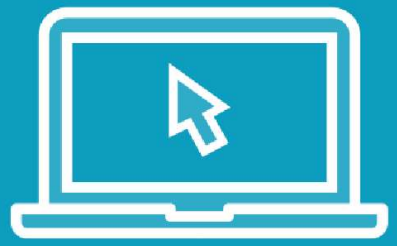
Four eyes principle

Release Pipeline Security

Securable Parts of a Release

- Release Definition
- Release Stages
- Agents & Queues
- Logs & Audit Trails

Demo



Set up release security

Audit Trails and Logs

What Information Gets Logged?

Release runs

Every step in a release is logged

Every approval is logged

Changes to release definition

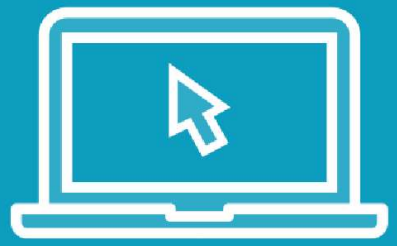
Access to the Azure DevOps services

Four Eyes Principle

The four eyes principle **is a requirement that two individuals approve some action before it can be taken**

http://whatis.techtarget.com/definition/four-eyes-principle

Demo



Implement 4 eyes principle

Leveraging Docker in Azure Pipelines

Overview

Understanding Docker with Azure Pipelines

How to use Docker within Azure Pipelines

Implement Self-hosted Docker agent

Deploy a container-based solution

Understanding Docker with Azure Pipelines

Why Use Docker?

- Provides more control over where and how jobs are run
- Enables a strategy of testing builds across different OS versions
- Decouples application dependencies from supporting host system

Ways of Using Docker

Docker tasks

Agent executes docker binary to run Pipeline jobs

Container jobs

Job is executed within nominated container image

Docker agent

Agent runs in a container on an agentless system

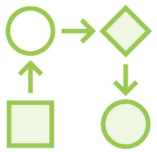
Understanding Docker Tasks

- Agent acts as the Docker host (Hosted Linux and VS2017)
- Functionality exposed by native tasks or docker binary (script)
- Cached containers are not persisted on Microsoft-hosted agents

https://docs.microsoft.com/en-us/azure/devops/pipelines/languages/docker

Understanding Container Jobs

Agent acts as the Docker host (Hosted Linux and VS2017)



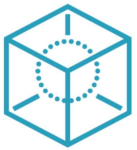
Functionality exposed by native tasks or docker binary (script)

Cached containers are not persisted on Microsoft-hosted agents

https://docs.microsoft.com/en-us/azure/devops/pipelines/process/container-phases

Understanding the Docker Agent

Agent runs within the container, Docker host is agentless



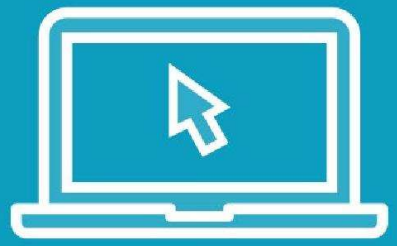
Agent runs on Windows Server Core or Ubuntu container images

Containers run on self-hosted system or Azure Container Instances (ACI)

https://docs.microsoft.com/en-us/azure/devops/pipelines/agents/docker

Use Docker with Azure Pipelines

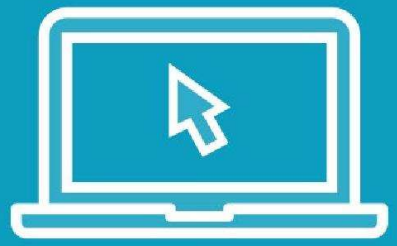
Demo



Implement a Self-hosted Docker agent

Verify agent functionality

Demo



Create a container-based solution

Deploy and verify solution

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Implementing Self-hosted Agents Leveraging Docker in Azure Pipelines