Exam AZ-400: Microsoft Azure DevOps Solutions Crash Course

Tim Warner
@TechTrainerTim

Pearson

Tim Warner

- Based in Nashville, TN, US
- MCT, MVP
- Twitter: **@TechTrainerTim**
- Badge: **timw.info/doc**

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Course Materials

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Session 1 of 2 Learning Goals

- Introduction
- Understand DevOps and Azure DevOps
- Source Code Control
- Build infrastructure
- Continuous integration pipelines
- Application configuration and secrets
- Mobile DevOps

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Session 2 of 2 Learning Goals

- Release strategy
- Dependency management
- Infrastructure and configuration management
- System feedback mechanisms
- A-400 exam strategy

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Setting Expectations

- Content is scoped tightly to AZ-400 exam objectives
  - DevOps and Azure DevOps are enormous subjects
- This is a six-hour "crash course"
  - Please plan to review these materials more than once
  - Five-minute break at midpoint
- Please ask/answer questions and provide feedback in the Q/A panel, not the group chat
- I'll post outstanding question answers to my Twitter feed: **@TechTrainerTim**

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2020 Exam Update Information

- Microsoft WorldWide Learning (WWL) revisits the Azure role-based certs yearly
  - Relevant blog post: **timw.info/az2020**
- AZ-400 has reached its 1-year birthday
  - This is a good reason to accelerate your exam prep!

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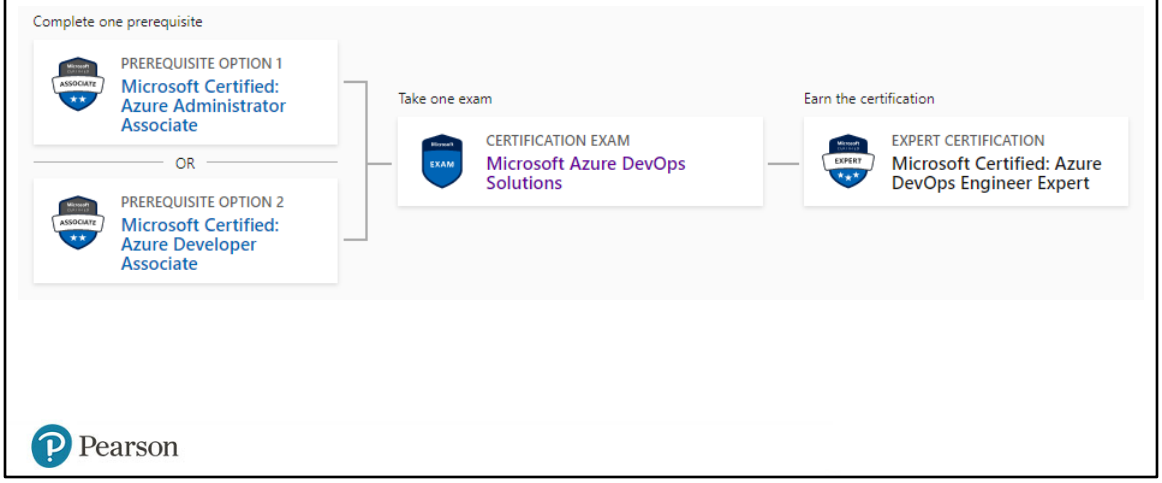
Azure DevOps Engineer Certification



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Exam AZ-400….

IS:

- A product familiarity exam (much like the Microsoft Office MOS exams)
- Skewed more towards the Azure administrator than Azure developer
- Going to require you (sadly) to memorize some non-Microsoft product names

IS NOT:

- A consideration of DevOps, Agile, or Scrum practices
- A coding exam
- Going to cover all Azure DevOps products equally

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DevOps and
Azure DevOps
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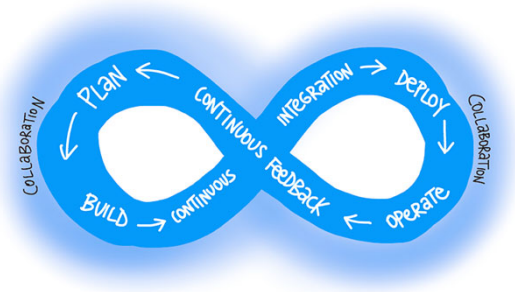
DevOps

"The union of people, process, and products to enable continuous delivery of value to our end users"



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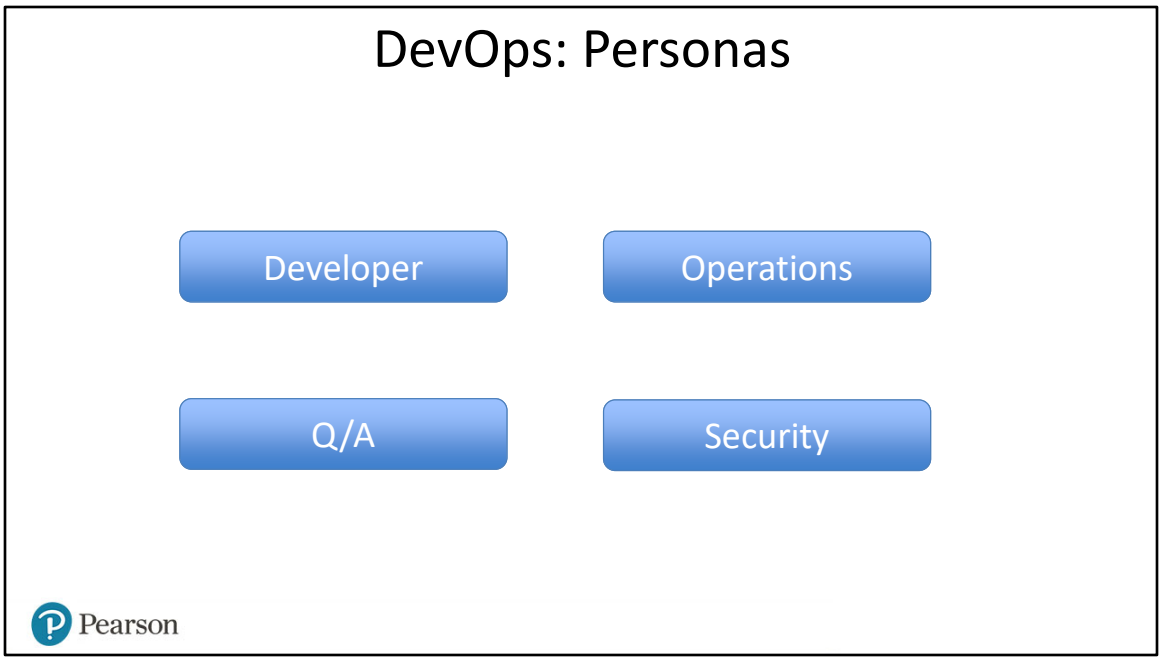
DevOps: Personas



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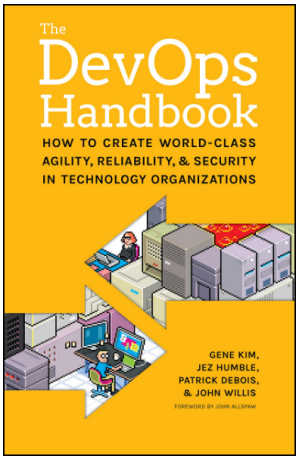
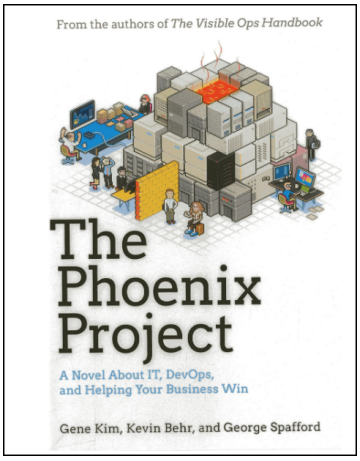
DevOps: Required Reading





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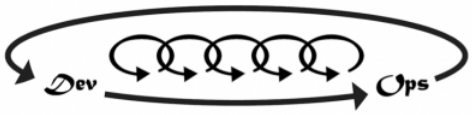
DevOps: The Three Ways

The First Way:
Systems Thinking

The Second Way:
Amplify Feedback Loops

The Third Way:
Culture Of Continual Experimentation And Learning



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DevOps Engineer Role

- DevOps professionals streamline delivery by optimizing practices, improving communications and collaboration, and creating automation. They design and implement strategies for application code and infrastructure that allow for continuous integration, continuous testing, continuous delivery, and continuous monitoring and feedback.

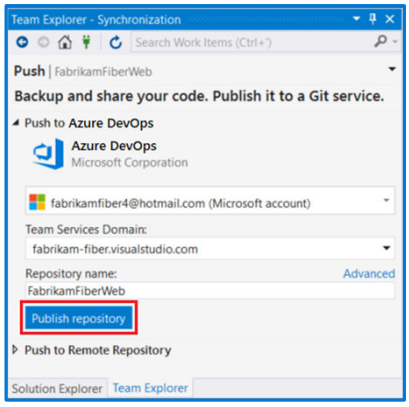
- Azure DevOps professionals must be able to design and implement DevOps practices for version control, compliance, infrastructure as code, configuration management, build, release, and testing by using Azure technologies.

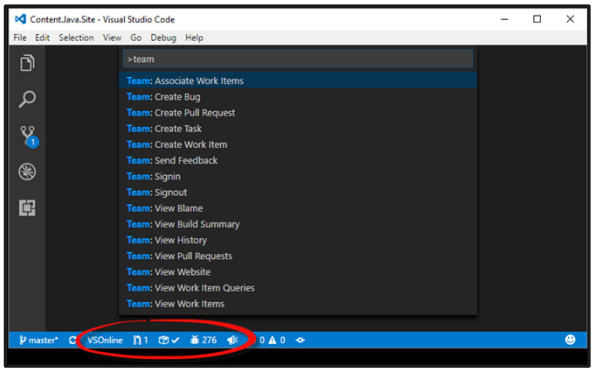
Azure DevOps Products

Visual Studio Team Services > Azure DevOps Services

Team Foundation Server > Azure DevOps Server 2019

Azure DevOps IDE Extensions





Azure DevOps CLI Extension

```
 az extension add --name azure-devops

$az devops login --organization https://dev.azure.com/contoso
Token:

 az devops configure --defaults organization=https://dev.azure.com/contoso
project=ContosoWebApp

az devops -h

az pipelines build show --id 1 --open
```

Accessing the Azure DevOps REST API with PowerShell

```
$AzureDevOpsPAT = "ocd2rrtds7bj6mff6jcxjllmaaXXXXXXXXXXXXXXXXXXXXXXX"
$OrganizationName = "DEMOXXXXXXXXXXXXXX"

$AzureDevOpsAuthenicationHeader = @{Authorization = 'Basic ' +
[Convert]::ToBase64String([Text.Encoding]::ASCII.GetBytes(":$($AzureDevOpsPAT)"
)) }

$UriOrga = "https://dev.azure.com/$($OrganizationName)/"
$uriAccount = $UriOrga + "_apis/projects?api-version=5.1"

Invoke-RestMethod -Uri $uriAccount -Method get -Headers
$AzureDevOpsAuthenicationHeader
```


Source Control in
Azure DevOps
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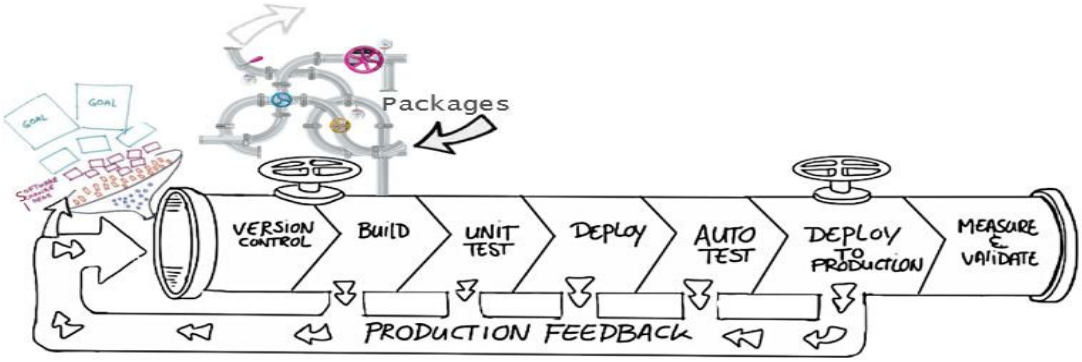
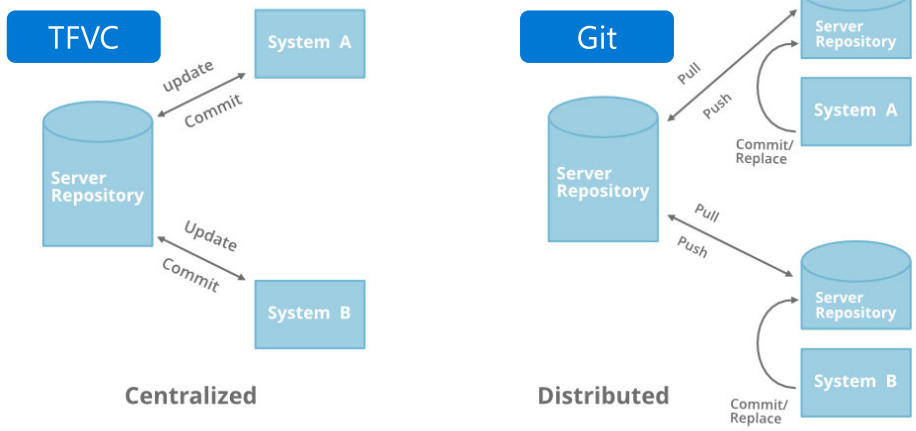
Source Control Benefits



- Collaboration
- Change history
- Task automation

Source Control Types

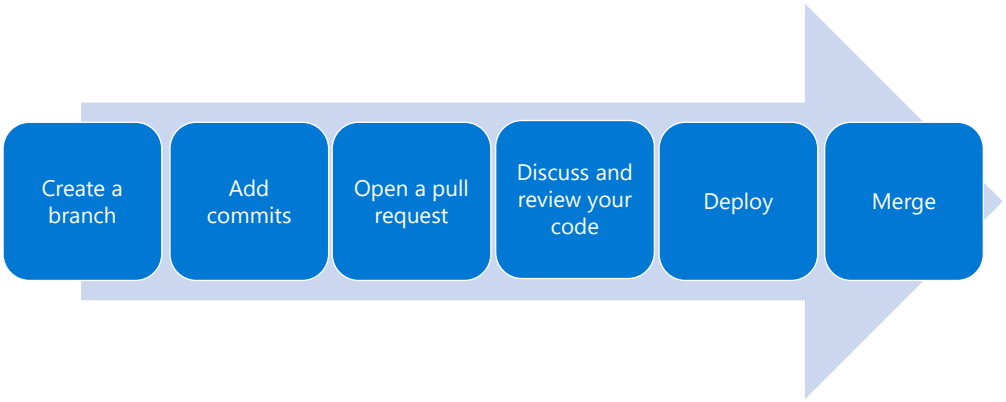


timw.info/g4g

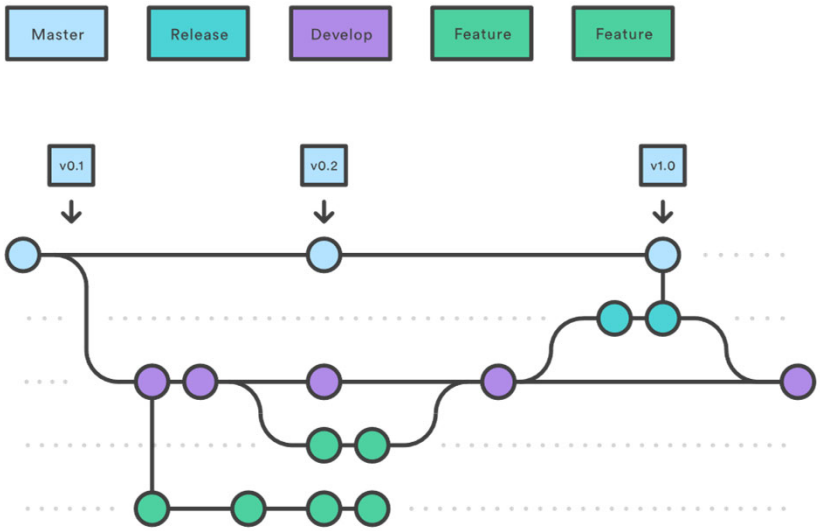
Source Control Proven Practices

- Make small changes
- Don't commit personal files or secrets
- Update often and right before pushing to avoid merge conflicts
- Pay close attention to commit messages as these will tell you why a change was made
- Link code changes to work items
- No matter your background or preferences, be a team player and follow agreed conventions and workflows

Git: Feature Branch Workflow



GitFlow Branch Workflow



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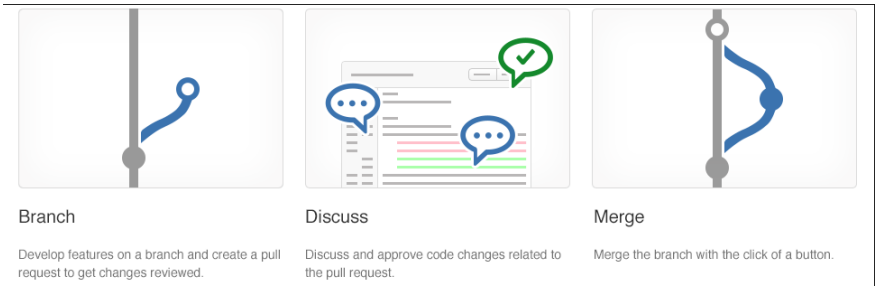
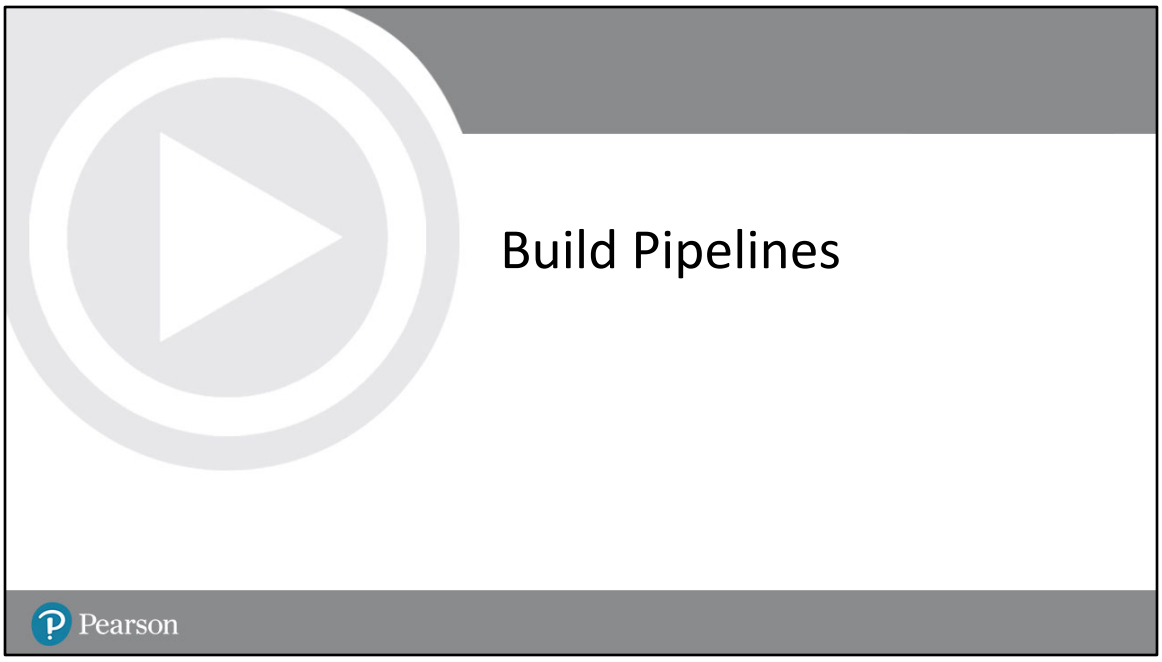
Collaborating with Pull Requests



- Pull requests let you tell others about changes
- Collaboration using the Shared Repository Model
- Review and merge your code in a single collaborative process
- Be sure to provide good feedback and protect branches with policies

- Start an organization
- Open sample project
- Create/import repos
- Clone/commit/push workflow
- Pull request workflow


Build Pipelines
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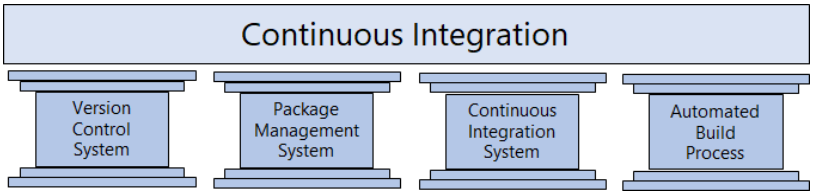
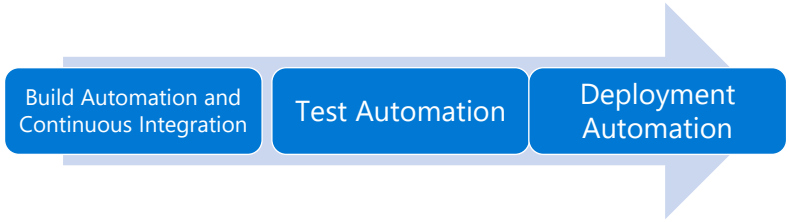
The Four Pillars of Continuous Integration



- A **Version Control System** manages changes to your source code over time.
- A **Package Management System** is used to install, uninstall and manage software packages.
- A **Continuous Integration System** merges all developer working copies to a shared mainline several times a day.
- An **Automated Build Process** creates a software build including compiling, packaging, and running automated tests.

Cover the software examples shown in the student materials.

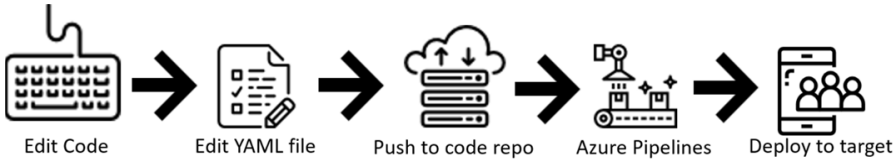
The Concept of Pipelines in DevOps



- Constant, automated change flow into production
- Repeatable, reliable and incrementally improving process
- Requires infrastructure, this agent hardware has a direct impact on the pipeline's efficiency

Azure Pipelines and YAML

- Configure your pipelines in a YAML file that exists alongside your code



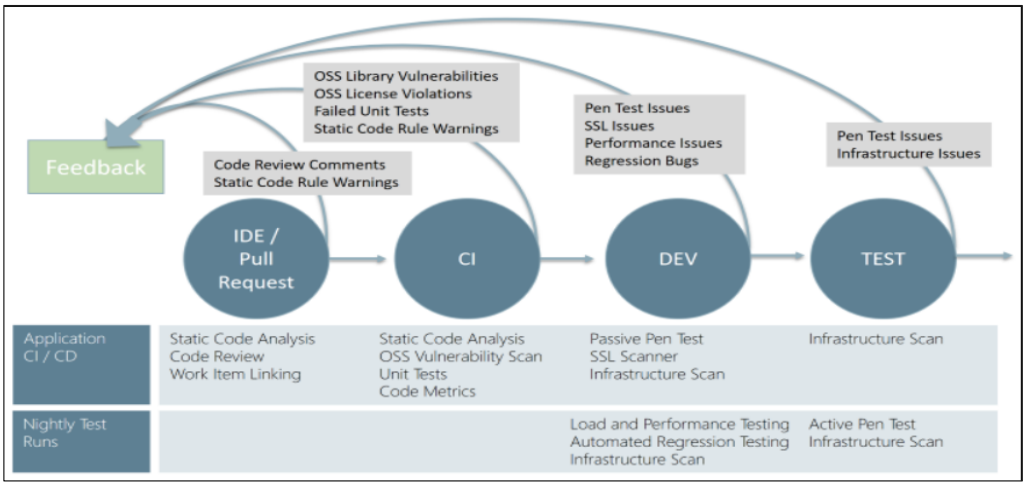
- Configure Azure Pipelines to use your Git repo
- Edit your azure-pipelines.yml file to define your build
- Push your code to your version control repository
- Your code is now updated, built, tested, and packaged

Hosted vs Private Agents

- You need at least one agent to build or deploy your project
- An agent is installable software that runs one build or deployment job at a time
- Two types of agents:
  - **Microsoft-hosted agents -** Automatically take care of maintenance and upgrades. Each time you run a pipeline, you get a fresh virtual machine. The virtual machine is discarded after one use.
  - **Self-hosted agents** – You take care of maintenance and upgrades. Give you more control to install dependent software needed. You can install the agent on Linux, macOS, Windows machines, or even in a Linux Docker container.

Application Settings and Secrets

Key Security Validation Points



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Integrating Azure Key Vault with Azure Pipeline

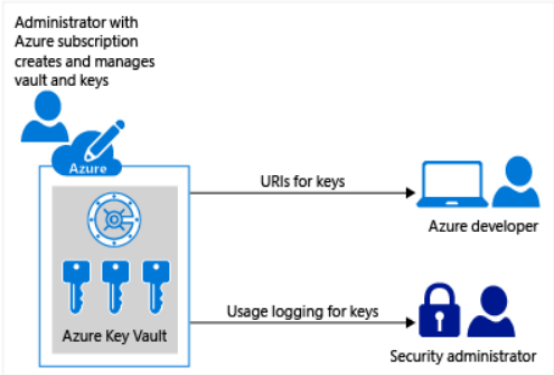
Complete the Integrating Azure KeyVault with Azure DevOps. You will learn how to:

- Create a key vault, from the Azure portal, to store a MySQL server password
- Configure permissions to let a service principal to read the value
- Retrieve the password in an Azure pipeline and passed on to subsequent tasks

Integrating Azure KeyVault with Azure DevOps - https://www.azuredevopslabs.com/labs/vstsextend/azurekeyvault/

Manage Secrets, Tokens & Certificates

- Centralize application secrets
- Securely store secrets and keys
- Monitor access and use
- Simplified administration of application secret
- Integrate with other Azure services



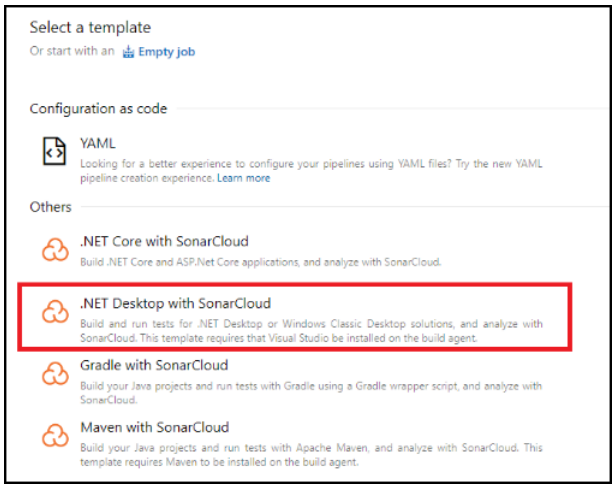
Code Quality and Security

SonarCloud

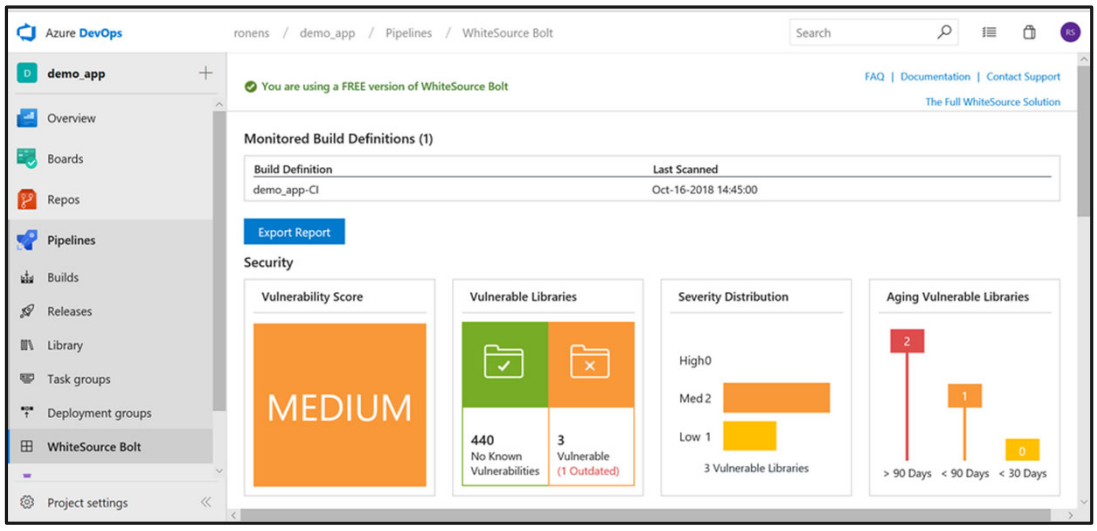
Technical debt – measure between the codebase's current state and an optimal state

SonarCloud performs
- Static code analysis
- Bug detection
- Security vuln ID
- Code smells

SonarQube is the on-premises product
- Azure DevOps Server 2019



WhiteSource Bolt



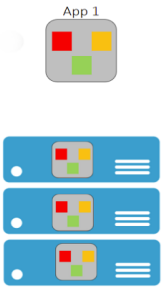
Managing Open-source security and license with WhiteSource - https://www.azuredevopslabs.com/labs/vstsextend/WhiteSource/

✔ Note that you must have already completed the prerequisite labs in the Welcome section.

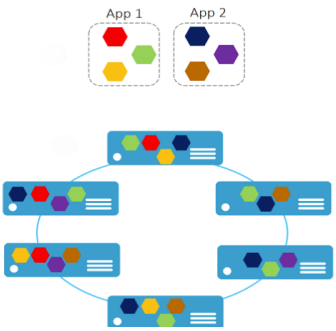
Container Build Strategy

Microservices and Containers

Monolithic application approach



Microservices application approach



- ✔ With Microservices every part of the application is deployed as a fully self-contained component

Dockerfile Core Concepts

```
FROM ubuntu
LABEL maintainer="greglow@contoso.com"
ADD appsetup /
RUN /bin/bash -c 'source $HOME/.bashrc; \
echo $HOME'
CMD ["echo", "Hello World from within the container"]
```

- ✔ Dockerfiles are text files that contain the commands needed by **docker build** to assemble an image

For more information, you can see:
Dockerfile reference - https://docs.docker.com/engine/reference/builder/

Optimizing Docker Container Builds

- Keep the image size as small as possible
- Layers are additional instructions added to the Dockerfile

- Each FROM instruction starts a new stage
- The stages are numbered in order, starting with stage 0
- Stages are named using an AS clause
- Naming stages lets you build them separately

The Demonstration: Adding Docker Support to an Existing App explains the code sample in the student guide.


Mobile DevOps
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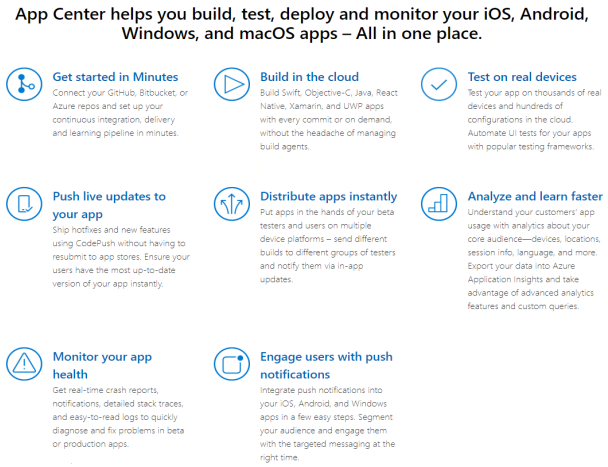
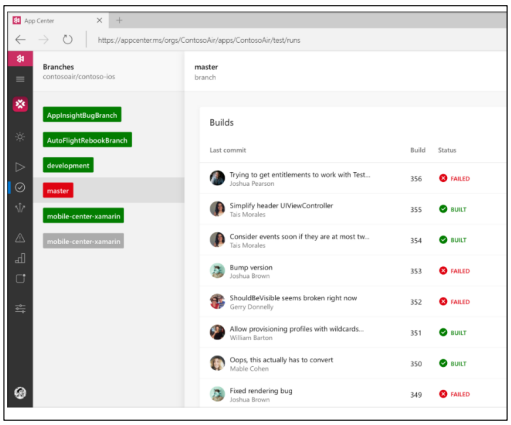
Visual Studio App Center

- App Center brings together multiple services into an integrated cloud solution
- Developers use App Center to Build, Test, and Distribute applications
- Once the app's deployed, developers can monitor the status and usage of the app



Continuous Integration in Minutes

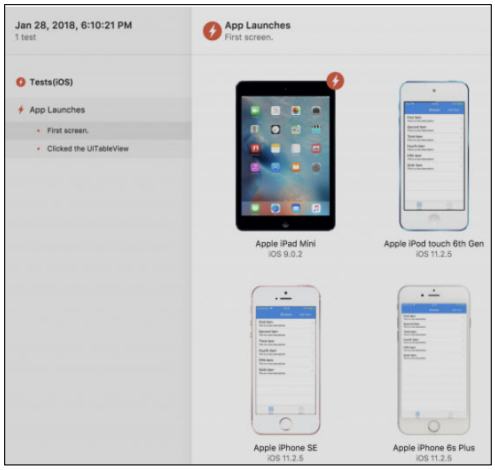
- Build apps more frequently and faster- iOS, Android, Windows, and macOS
- Connect to your GitHub, Bitbucket or Azure repos and build your apps
- Create an installable app package - GitHub, or Git repos on Bitbucket and Azure DevOps



Run UI Tests

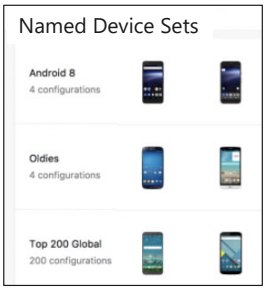
- Upload your test suite after completing a build
- Generate a test upload shell command, add it to your app's repo
- When your test code finishes executing, a detailed report will appear in the App Center Test
- App Center provides device logs, test framework logs, and the line in which the failure occurred

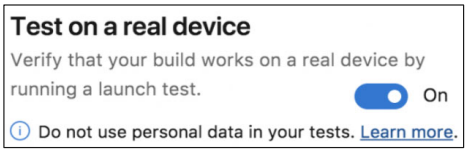
Vs Appium / Selenium

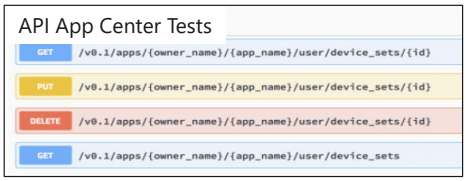


App Center Distribution

- Developer tool to release application binaries to their end user devices
- Distribute packages for iOS, Android, UWP, and macOS








Release Infrastructure and Continuous Delivery
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The Eight Principles of Continuous Delivery

The process for releasing/deploying software MUST be repeatable and reliable.

Automate everything!

If somethings difficult or painful, do it more often.

Keep everything in source control.

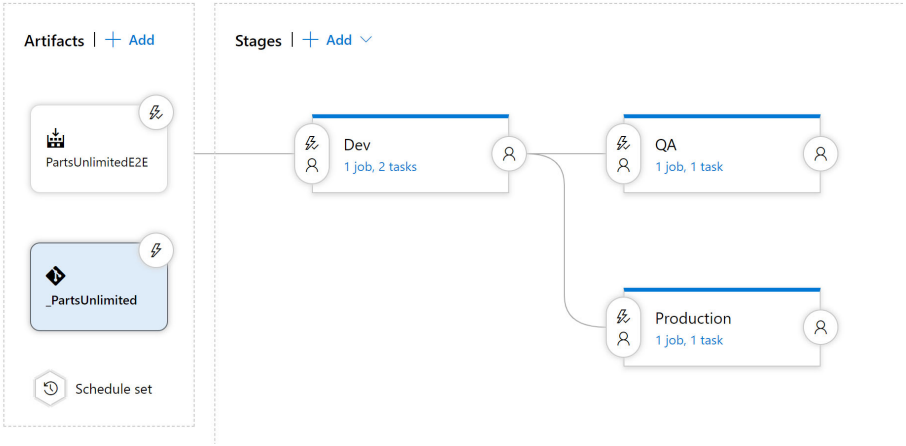
Done means "released".

Build quality in!

Everybody has responsibility for the release process.

Improve continuously.

Components in a release pipeline



Delivery cadence - three types of triggers

CONTINUOUS DEPLOYMENT TRIGGER

SCHEDULED TRIGGER

MANUAL TRIGGER

Release Approvals

Release approvals are not to control *how*, but control *if* you want to deliver multiple times a day.

Manual Approvals help in building trust about the automated release process

Release Gate Examples

INCIDENT AND ISSUES MANAGEMENT

NOTIFICATION OF USERS BY INTEGRATION WITH COLLABORATIO N SYSTEMS

QUALITY VALIDATION

SECURITY SCAN ON ARTIFACTS

USER EXPERIENCE RELATIVE TO BASELINE

CHANGE MANAGEMENT

INFRASTRUCTUR E HEALTH

Release Management Tools

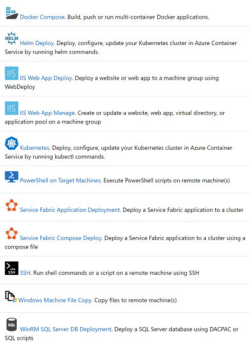
Jenkins
Circle CI
Azure DevOps Pipelines
GitLab Pipelines
Atlassian Bamboo
XL Deploy/XL Release

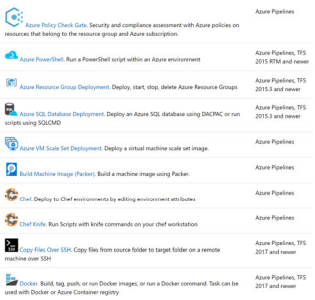
Create a Release Pipeline

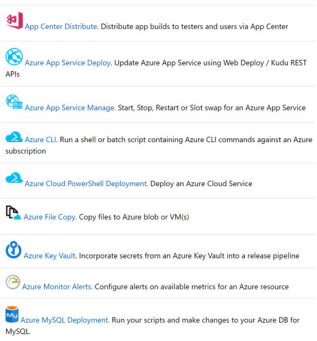
Definitions and Glossary

Term	Description	Synonym
Stage	an isolated and independent target for deployment	Environment
Job	A phase in the release pipeline that can run simultaneously with other phases on different Operating Systems	Phases
Agent	The program that runs the build or release	
Build & Release Task	Tasks are units of executable code used to perform designated actions in a specified order.	Action, Plugin, App
Release pipeline	The process that runs when deploying an artifact. Including triggers, approvals and gates	release process, pipeline, release definition
CI/CD	Continuous Integration / Continuous Deployment	
Release Gate	An automated check that approves the continuation	Quality Gate, Automatic Approval
Service Connection	A secure connection to an environment or service	Service Endpoint

Important Deployment Tasks







Secrets in your release pipeline

- Service Connections
- **Using secret variables**
- **Storing secrets in a key vault**
  - **Retrieve with a variable group**
  - **Accessing Keyvault from within the pipeline**

Release Gates

As a quality gate or as an automatic approval
Can be configured pre- and post stage
Keeps evaluating for success for a timeframe
Ships out of the box in Azure DevOps
Different types of Release Gate
- Call an Azure Function
- Call a REST API
- Azure Monitor
- Query Work Items
- Publish to Azure Service Bus

Service Hooks

Service hooks enable you to perform tasks on other services when events happen

Out of the Box integrations

Build and release	Collaborate	Customer support	Plan and track	Integrate
AppVeyor	Campfire	UserVoice	Trello	Azure Service Bus
Bamboo	Flowdock	Zendesk		Azure Storage
Jenkins	HipChat			Web Hooks
MyGet	Hubot			Zapier
Slack				

Introduction into Deployment Patterns

Definitions of microservices

Small and focused on doing one thing well

Autonomous

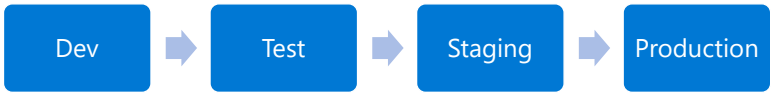
"*Loosely coupled service oriented architecture with bounded contexts*"
Adrian Cockcroft (Netflix)

"*SOA done right*"
Anonymous

"… services are independently deployable and scalable, each service also provides a firm module boundary, even allowing for different services to be written in different programming languages."
Martin Fowler (Thoughtworks)

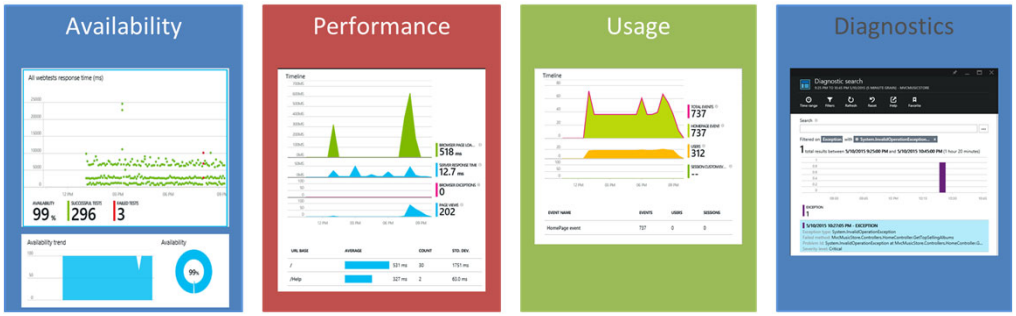
Deployment Patterns

"Classical" Deployment Patterns

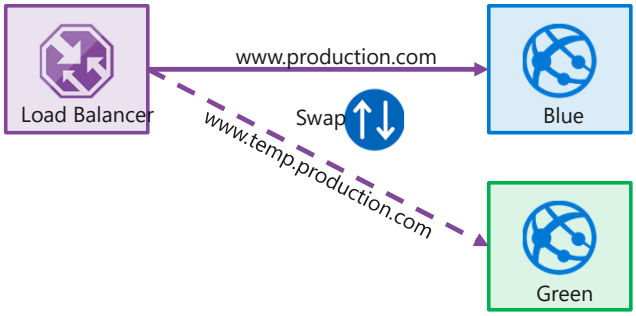


Feedback loops

Application Insights > Application Map



Blue Green deployment



Feature toggles

What is it?

- Mechanism to separate feature deployment from feature exposure
- A.k.a. feature flippers, feature flags, feature switch, conditional feature, etc.

Why do you need it?

- It enables you to give control back to the business on when to release the feature
- Enables A/B testing, canary releases and dark launching
- It provides an alternative to keeping multiple branches in version control
- Enables change without redeployment

Canary release

What is it?

- Releasing a feature to a limited subset of end users

Why do you need it?

- Validates there is no break
- When you want to gradually roll out a feature to ensure enough capacity

Canary release

How do you do it?

- Use a combination of feature toggles, traffic routing and deployment slots
- Random selection of users:
  - Setup deployment slots with feature enable
  - Route %traffic to the instance with the new feature enabled
  - Target specific user segment
- Use feature toggle to enable feature for specific user segment

Traffic Manager

What is it?

- Traffic manager provides the ability to route traffic between Azure app services
- Within an app service, routes traffic between deployment slots

Why do you need it?

- It enables failover and load distribution capabilities
- It enables you to deploy to a slot and then slowly move traffic over to the other slot

Dark Launching

Dark Launching is in many ways similar to Canary Testing. However, the difference here is that you are looking to assess the response of users to new features in your frontend, rather than testing the performance of the backend. The idea is that rather than launch a new feature for all users, you instead release it to a small set of users. Usually, these users aren't aware they are being used as guinea pigs for the new feature and often you don't even highlight the new feature to them, hence the term **"Dark"** launching.

Microsoft

AZ-400.4
Module 1: Designing a Dependency Management Strategy

Dependencies in software

- Modern software is complex
- Component based development is common
- Not all software is written by a single team
- Dependencies on components created by other teams or persons

What is a package?

- Mechanism to create, share and consume code and components
- Contains (compiled) code with metadata content for consuming packages

Types of packages

Microsoft platform and .NET artifacts

Node.js modules

Python scripts

Universal packages

Java packages

Docker images

Package feeds

- Centralized storage of package artifacts
  - Public or privately available
  - Offer secure access for private feeds
  - Versioned storage of packages
  - Managed by tooling
- Also known as
  - Package repositories
  - Package registry

Private and public feeds

- Public
  - NuGet.org
  - Npmjs.org
  - PyPi.org
  - Docker Hub
- Private feeds
  - MyGet
  - Azure Container Registry
  - Azure Artifacts
  - Self-hosted solution

Public sources

NuGet Gallery	https://nuget.org
NPMjs	https://npmjs.org
Maven	https://search.maven.org
Docker Hub	https://hub.docker.com
Python Package Index	https://pypi.org

Azure Artifacts

Part of Azure DevOps

- Create private and public package feeds

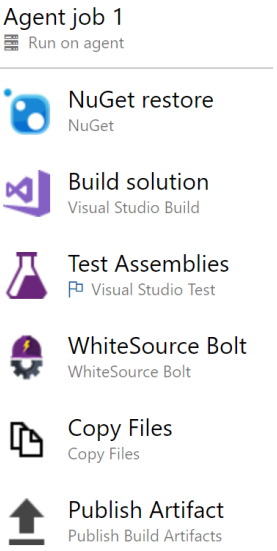
Types of packages supported

1. NuGet
2. NPM
3. Maven
4. Universal
5. Python

Integrating in build pipelines

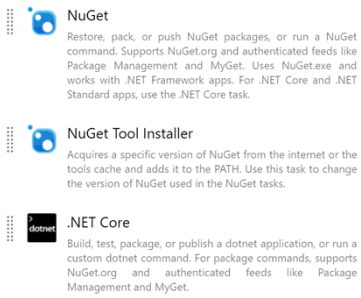
Why integrate in build pipeline?

- Automate to avoid errors
- Quality checks
- Implement a versioning strategy



Azure Pipelines tasks

- Different tasks for each of the package types
- Native integration with Azure Artifacts feeds
- Connecting with remote packages sources possible
- Requires authentication



Semantic versioning

Express nature and risk of change

See also: https://semver.org

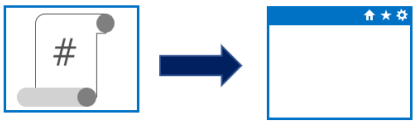
Infrastructure as Code and Configuration Management

Imperative vs. Declarative

Approaches to implementing infrastructure and configuration as code

Declarative

- Functional
- Defines what the final state should be



Imperative

- Procedural
- Defines the "how" for what the final state should be

Could mention that Imperative can also be known or called as procedural. And Declarative can sometimes be referred to as functional.

Declarative abstracts away the methodology of how a state is achieved.

A *declarative* approach would generally be the preferred option where ease of use is the main goal. Azure Resource Manager template files are an example of a declarative automation approach.

An *imperative* approach may have some advantages where there are complex scenarios where changes in the environment take place relatively frequently, which need to be accounted for in your code.

There is no absolute on which is the best approach to take, and individual tools may be able to be used in either *declarative* or *imperative* forms. The best approach for you to take will depend on your particular needs

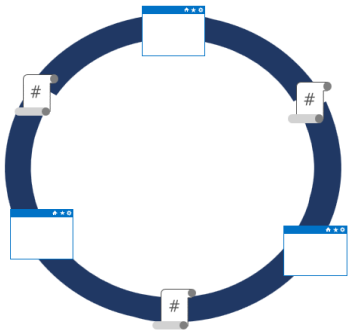
Idempotence

Idempotence – definition

- Mathematical term used in the context of infrastructure and configuration as code
- Ability to apply one or more operations against a resource, resulting in the same outcome

To attain idempotence

- Automatically configure and reconfigure an existing set of resources, or
- Discard existing resources and spin up a fresh environment



Idempotence – mathematical term used in the context of infrastructure and configuration as code, referring to the ability to apply one or more operations against a resource, resulting in the same outcome.

For more information about *idempotence* in general and in the context of Azure, see - https://www.wintellect.com/idempotency-for-windows-azure-message-queues/

Configuration Drift

Configuration drift

- Process whereby a set of resources change their state over time
- Can occur from changes made by people, processes, or programs

Potential security risks introduced by configuration drift

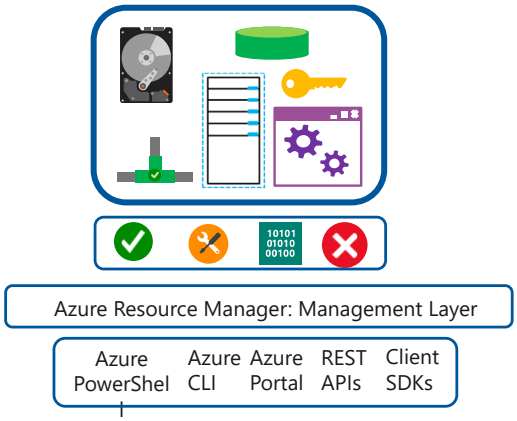
- Open ports that should have been closed
- Inconsistent patching across environments
- Software that doesn't meet compliance requirements

Solutions that can help

- Windows PowerShell Desired State Configuration
- Azure Policy
- Many non-Microsoft solutions integrated with Azure

What is Azure Resource Manager?

- *Azure Resource Manager* is a management layer in which a resource group and all the resources within it are created, configured, managed, and deleted



Azure Resource Manager provides a consistent management layer that allows you automate deployment and configuration of resources, using different automation and scripting tools such as Microsoft Azure PowerShell, Azure Command-Line Interface (Azure CLI), Microsoft Azure portal, REST API, and client SDKs.

Why Use ARM templates?

- Make deployments faster and more repeatable
- Improve consistency by providing a common language
- Enable you to deploy multiple resources in the correct order by mapping out resource dependencies
- Reduce manual, error-prone tasks
- Templates can be linked together to provide a modular solution

Can discuss some of the benefits of using ARM templates when deploying and configuring resources in Azure.

What is Azure CLI?

- Command-line program to connect to Azure
- Execute administrative commands on Azure resources through a terminal, command-line prompt, or script, instead of a web browser
  - For example, to restart a VM use the command:

    ```
    az vm restart -g MyResourceGroup -n MyVm
    ```

  - Can be installed on Linux, Mac, or Windows computers
- Can be use interactively or scripted
  - *Interactive*: Issue commands directly at the shell prompt
  - ***Scripted:*** *A*ssemble the CLI commands into a shell script and then execute the script

The Azure CLI is a command-line program to connect to Azure and execute administrative commands on Azure resources. It runs on Linux, macOS, and Windows and allows administrators and developers to execute their commands through a terminal or command-line prompt (or script!) instead of a web browser.

Mention the **cross-platform command-line tools support for managing Azure resources, as well as the ability to access the CLI from the Cloud Shell.**

What is Azure PowerShell?

- Module added to Windows PowerShell or PowerShell Core
  - Connect to your Azure subscription and manage resources
  - Adds the Azure-specific commands
- Example: the NewAzVm command
  -
```
New-AzVm `
    -ResourceGroupName "CrmTesting ResourceGroup" `
    -Name "CRMUnitTests" `
    -Image "UbuntuLTS"
```
- Azure PowerShell available either locally or via the Cloud Shell
- Can be use in interactive or scripting mode

VM Extensions with PowerShell

- Include Azure VM extensions with ARM templates for making configuration changes on already deployed VMs
- To see a list of individual extensions:

```
Get-Command Set-*Extension* -Module Az.Compute
```

- Example of a Custom Script Extension

```
Set-AzureRmVMCustomScriptExtension `
-ResourceGroupName "ResourceGroup11" `
-Location "Central US" -VMName "VirtualMachine07"`
-Name "ContosoTest" -TypeHandlerVersion "1.1" `
-StorageAccountName "Contoso"    `
-StorageAccountKey <StorageKey> `
-FileName "ContosoScript.exe"
-ContainerName "Scripts"
```

Point out that the wild characters in the command are intentional and its use will return all cmdlets that contain the word “extension”, so they can all be viewed.

Also, point students to the Azure documentation from where the sample Custom Script Extension is taken.

Set-AzureRmVMCustomScriptExtension
https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/set-azurermvmcustomscriptextension?view=azurermps-6.13.0#examples

Azure Cloud Shell

- Cloud Shell hosted in the cloud and accessible via web browser and multiple access points including:
  - https://shell.azure.com
  - Directly via the Azure Portal,
  - Azure mobile app,
  - Visual Studio Code - Azure Account extension,
- Authenticates automatically and securely with Azure
- Can choose between **Bash** or **PowerShell** shell
- Contains integrated script editor
- Requires the creation of a storage account

✔ You might recommend the following video to students for viewing after class. It provides more details about Azure Cloud Shell. See Azure Friday – PowerShell in Azure Cloud Shell GA (https://azure.microsoft.com/en-us/resources/videos/azure-friday-powershell-in-azure-cloud-shell-ga/).

Azure Automation

What is Azure Automation?

- An Automation service integrated with Microsoft Azure for automating the creation, deployment, monitoring and maintenance of Azure resources and resources external to Azure
- Integration with Microsoft Azure remove some complexity of automating in Azure

Azure Automation Capabilities include:

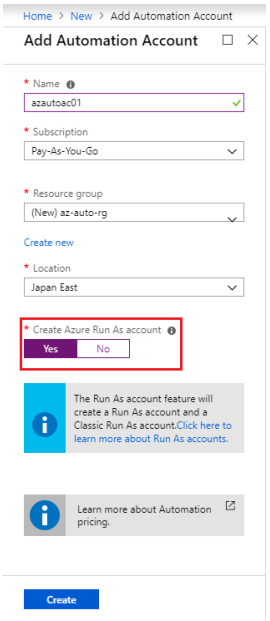
- Manage Shared resources
- State configuration
- Integration with GitHub, Azure DevOps Git/TFVC
- Update management
- Can automate Windows or Linux environments
- Can apply to any system that exposes an API over internet protocols

Automation accounts

- To use Azure Automation you must create an Azure Automation account
- Automation account acts as a container in which you store, manage and use automation artifacts
- Provides a way to separate your environments or further organize your Automation workflows and resources.
- Requires subscription-owner level access as provides access to all Azure resources via an API
- Need at least 1 but should have multiple for access control

Run As account

- Can create when creating Azure Automation account
- Creates a service principal user in Azure AD which allows access to Azure resources when running automation



Could create Azure Automation accounts for dev, test, production, security, or other elements in your pipeline for more granular auditing, cost analysis and general management, as well as increased security.

When you create a Run As account, it creates a new service principal user in Azure Active Directory and assigns the Contributor role to this user at the subscription level

Infrastructure as a Service

Azure Virtual Machines

Azure VMs provide the benefits of virtualization, but must still be deployed, configured, and maintained

Operating system support for Windows and Linux OS deployments

Windows

- Windows Server and Windows client images available in Azure Marketplace for development test and production
- Images identified by publisher, offer, SKU, and version
- Only 64-bit operating systems supported

Linux

- Endorsed distributions available in Azure Marketplace
- Additional Linux partner-products, such as Docker, Jenkins

Mention how to find what Windows Server SKUs are available in different locations, using the Azure CLI example in the content, in this case West Europe. A similar query is shown for Linus RedHat SKUs in the West US region.

Call out the list of Linux endorsed distribution, and though not an extensive list you can point them to https://docs.microsoft.com/en-us/azure/virtual-machines/linux/endorsed-distros for a complete list of endorsed distributions with links to specific products.

Scaling Azure VMs

Use virtual machine scale sets (vmss) for managing a group of identical, load balanced VMs

Benefits of scale sets

- Create and manage multiple VMs at large scale
- Provide high availability and application resiliency
- Automatically scale as resource demand fluctuates

Options to configure VMs deployed in a scale set

- Use extensions to configure a VM post deployment
- Deploy a managed disk with a custom disk image

Differences between VMs and scale sets

- Scale sets provide automated versus manual creation, configuration, and integration for different scenarios

Discuss some of the benefits of virtual machine scale sets for each of the scenarios in the table. When you have multiple VMs that must be deployed across Availability Zones or Availability Sets, or you need to control traffic where load balancer and gateway configuration is required, creating scale sets will be a significant benefit. In these scenarios, would you rather manually create and manage individual VMs, or automatically do this from a central configuration? Especially when you need to add more instances and ensure high availability.

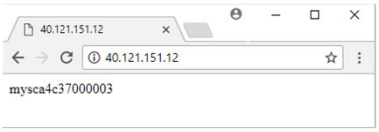
Also, with scale sets, you can automatically scale out based on host metrics or things like Application Insights.

As with all quoted numbers related to service limits, quotas, and constraints, these can change over time.

Walkthrough-Create Virtual Machine Scale Set

1. Create a resource group and a virtual machine scale set.
2. Deploy a sample web application using a Custom Script Extension.
3. Create a load balancer rule to allow traffic to reach the sample application.
4. Access the sample web application and obtain the load balancer's IP address:

   Load balancer distributes traffic to one of your VM instances



✔ You could have students do this walkthrough, but it may be easier to just demonstrate the procedure. That way if some students don't already have a subscription, you avoid the issues associated with ensuring all students can meet the prerequisites to do the task.

The slide lists the individual steps only for the walkthrough, so you will need to cover the sample script in the content.

Mention the "good hygiene" of removing resources when no longer needed, using **az group delete**.

Windows Server and Hyper-V containers

Windows Server containers

- Additional services in the OS for managing containers – the Docker engine and compute services
- Each container uses same set of system processes, with a set of application process to distinguish each container

Hyper-V containers

- Specifically optimized to run containers
- More secure alternative to Windows Server containers in the event of a vulnerability in the OS from sharing kernel and memory

Nano Server

- Headless deployment option for running cloud applications
- Runs as a container in a container host such as Server Core

Use the diagrams to highlight the differences in architecture between Windows Server and Hyper-V containers. While there are similarities, focus on Hyper-V's containers' more optimized, virtualized environment that allows a more secure container implementation.

Note that Hyper-V containers are supported now on both Windows Server 2016 and newer versions, and on the Windows 10 Anniversary edition.

Note the different scenario examples listed for Nano Server.

Azure DevTest Labs

- Creates environments consisting of pre-configured bases or Azure Resource Manager templates
- Enables developers on teams to efficiently self-manage virtual machines (VMs) and PaaS resources without waiting for approvals.
- Quickly provision Windows and Linux environments by using reusable templates and artifacts

Usage Scenarios:

- Dev or Test environments
- Integrate with CI/CD pipeline for automated tests and deleting images afterwards
- Scale up your load testing by provisioning multiple test agents and create pre-provisioned environments for training and demos

Azure App Service

Fully managed environment enabling high productivity development

- Platform-as-a-service (PaaS) offering for building and deploying highly available and scalable cloud apps for web and mobile
- Developer productivity using .NET, .NET Core, Java, Python and a host of others
- Pay only for the compute resources used
- Azure platform handles infrastructure so that developers focus on core web apps and services
- Azure provides enterprise-grade security and compliance. Azure Active Directory

✔ With App Service, you pay for the Azure compute resources you use. The compute resources you use is determined by the App Service plan that you run your Web Apps on.

For more information, you can see:

App Service - https://azure.microsoft.com/en-us/services/app-service/

While the slide provides a high-level look at App Service, focus on some of the DevOps capabilities, such as continuous deployment from Azure DevOps, GitHub, Docker Hub, and other sources.

Additionally, security and compliance is built-in with App Service being ISO, SOC, and PCI compliant. Authentication occurs through Azure AD, or through the appropriate API for the various social media services.

App Service Plans

- Define a set of compute resources for a web app to run
- One or more apps can be configured to run in the same App Service plan
- App Service plans define:
  - Region where compute resources will be created (West US, East US, etc.)
  - Number of virtual machine instances (scale count.)
  - Instance size (Small, Medium, Large)
  - Pricing tier (next slide)

Don’t spend too much time on this and the next slide (which goes into a little more detail on the different pricing tiers). Just introduce the concepts of an app service plan.

For more information, you can see:

Azure App Service plan overview - https://docs.microsoft.com/en-us/azure/app-service/azure-web-sites-web-hosting-plans-in-depth-overview

Azure Functions

Key features of Azure Functions

- Choice of language
- Pay-per-use pricing model
- Support for NuGet and Node Package Manager
- Integrated security with OAuth providers, such as Azure AD, Facebook, Microsoft Account, and others
- Simplified integration with other Azure services and SaaS offerings
- Options for code development and deployment (portal, continuous integration, GitHub, Azure DevOps Services, and more)
- Functions runtime is open-source and available on GitHub

Briefly cover the key Azure Function features as you've already covered the key attributes when discussing serverless computing… things like focus on code only and not underlying infrastructure, event driven, automatic scaling, charges billed only as used, and statelessness. Mention that Azure Functions are ideal when messages are being received for example, from an IoT solution, and can rapidly respond to the message/trigger.

The list of key features is not exhaustive, and you can see more information at https://docs.microsoft.com/en-us/azure/azure-functions/.

Mention that language support is dependent on the different versions of Azure Functions runtime, so be sure to check the documentation for the latest information – https://docs.microsoft.com/en-us/azure/azure-functions/supported-languages#languages-in-runtime-1x-and-2x

You can also point students to the Azure Serverless Computing Cookbook at https://azure.microsoft.com/en-us/resources/azure-serverless-computing-cookbook/, which is a downloadable guide to building serverless apps that is provided by Microsoft.

Batch services

Azure Batch – fully managed cloud service for job scheduling and compute resource management

- Creates, manages, and scales a pool of compute nodes (VMs) to run largest, resource-intensive workloads.
- Provides a job scheduler to submit jobs into the VM pool (or set of VM pools)

Requirements to run applications

- Application (doesn't need to be cloud aware)
- Pool of VMs (Batch service creates, manages, and monitors the pool)
- Job scheduler to define the tasks that make up the job
- Location to store output, typically Blob storage

Azure Batch is ideal for running batch processing automated tasks that are composed of large-scale jobs. This can be done on demand so is an excellent option when you need to run large scale batch processing in the cloud, without having to worry about predefining a schedule.

Essentially, it enables the breaking down of computationally intensive workloads into individual tasks and you get the benefits of efficiently running those tasks in parallel at scale.

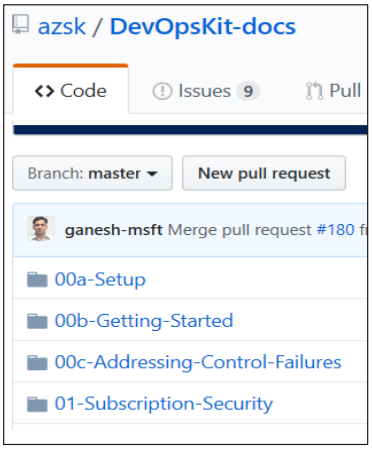
Security and Compliance in the Pipeline

Secure DevOps Kit for Azure (AzSK)

AzSK is a collection of scripts, tools, extensions, automations

- Helps secure the subscription
- Enables secure development
- Integrates security into CI/CD
- Provides continuous assurance
- Assists with alerts & monitoring
- Governing cloud risks

Available at:
https://github.com/azsk/DevOpsKit-docs



Consider going to the github site, https://github.com/azsk/DevOpsKit-docs, and showing the readme to call out some elements of the AzSK

Azure Security Center

- Provide security recommendations
- Monitor security settings
- Monitor all your services
- Use Azure Machine Learning
- Analyze and identify potential attacks
- Provide just-in-time (JIT) access control
- Supports Windows and Linux operating systems
- Available in two pricing tiers

Azure Policy

- Is a service in Azure that you use to create, assign, and, manage policies
- Provides enforcement by using policies and initiatives
- Runs evaluations on your resources and scans for those not compliant
- Comes with several built-in policy and initiative definitions
- Integrates with Azure DevOps by applying any continuous integration (CI) and continuous deployment (CD) pipeline policies

✔ An example of an Azure policy that you can integrate with your DevOps pipeline is the Check Gate task

Azure Policy Check Gate - https://docs.microsoft.com/en-us/azure/devops/pipelines/tasks/deploy/azure-policy-check-gate?view=vsts

Azure Key Vault

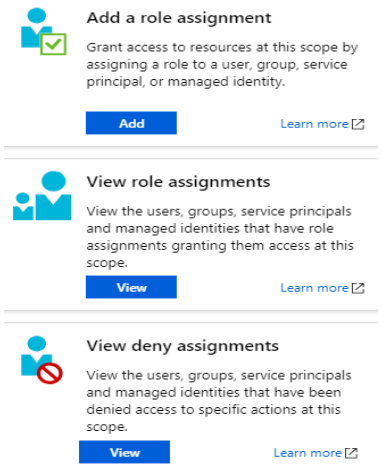
- Usage scenarios
  - Secrets management
  - Key management
  - Certificate management
  - Hardware security modules
- Benefits
  - Centralized application secrets
  - Securely stored secrets and keys
  - Monitor access and use
  - Simplified administration of application secrets
  - Integrate with other Azure services

Centralized cloud service for storing your applications' secrets

Role-Based Access Control (RBAC)

Segregate duties within your team and grant only the amount of access to users that they need to perform their jobs

- Fine-grained access management for Azure resources
- Grant users the lowest privilege level that they need to do their work
- No additional cost to all Azure subscribers
- Built-in roles for an *allow model*



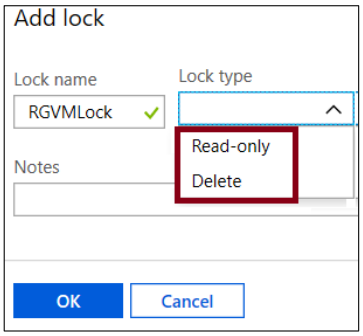
Examples of when you might use RBAC include when you want to:

- Allow one user to manage VMs in a subscription, and another user to manage virtual networks.
- Allow a database administrator (DBA) group to manage SQL Server databases in a subscription.
- Allow a user to manage all resources in a resource group, such as VMs, websites, and subnets.
- Allow an application to access all resources in a resource group.

Locks

Prevent accidental deletion or modification of your Azure resources

- CanNotDelete - means authorized users can still read and modify a resource, but they can't *delete* the resource
- ReadOnly - means authorized users can read a resource, but they can't delete or update it. Applying this lock is like restricting all authorized users to the permissions granted by the Reader role

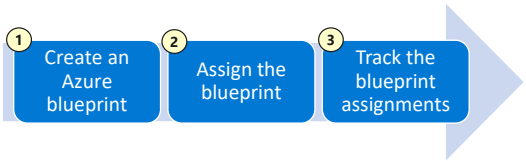


In the Azure portal, the locks are called ***Delete*** and **Read-only** respectively

Azure Blueprints

Allows for the definition of a repeatable set of Azure resources that implement and adhere to an organization's standards, patterns, and requirements

- Can ensure a deployment meets an organization's standards, patterns, and requirements.
- Is a declarative way to orchestrate deployment for various resource templates and other artifacts
- Provides for traceability and auditing as well as adherence



The blueprint definition (what should be deployed) and the blueprint assignment (what is deployed) supports improved deployment tracking and auditing

Discussion: How to Azure Blueprint policies differ from templates?

Azure Blueprints is also useful in Azure DevOps scenarios where blueprints are associated with specific build artifacts and release pipelines, and can be tracked more rigorously.

Note: At the time of writing, Azure Blueprints is in **preview** and has not yet been released publicly.

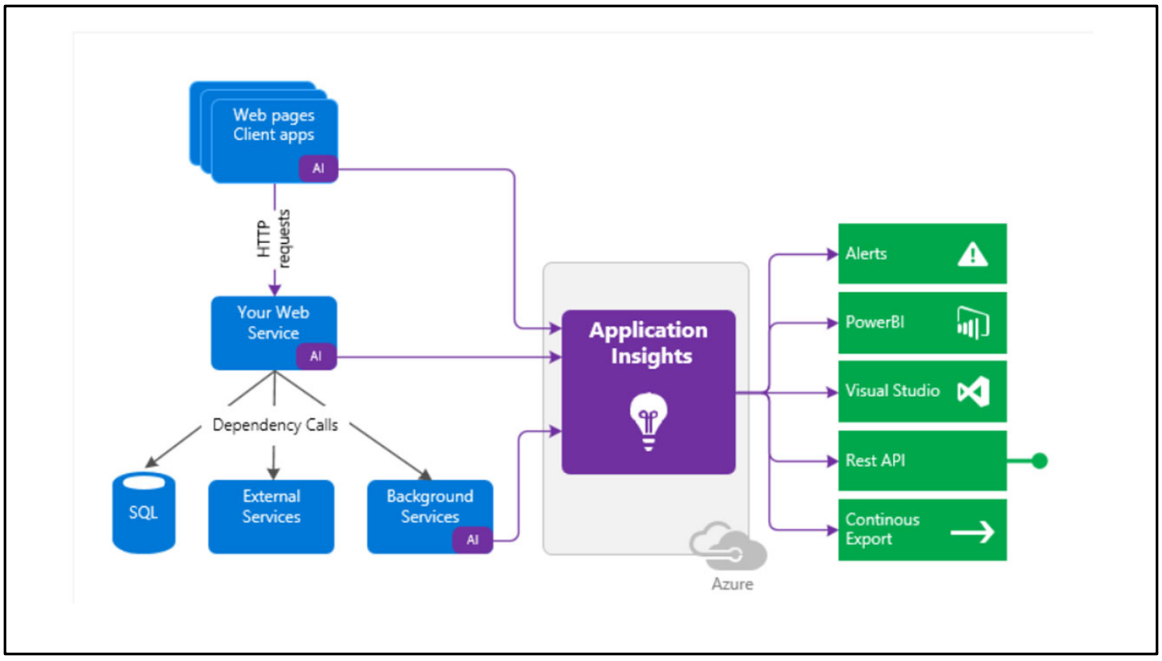
Discussion: How to Azure Blueprint policies differ from templates?
Answer:
The blueprints in Azure Blueprints are different from Azure Resource Manager templates. When Azure Resource Manager templates deploy resources, they have no active relationship with the deployed resources (they exist in a local environment or in source control). By contrast, with Azure Blueprints, each deployment is tied to an Azure Blueprints package. This means that the relationship with resources will be maintained, even after deployment. In this way, maintaining relationships improves auditing and tracking capabilities.

Practices to Measure End-User Satisfaction

Design Practices to Measure End-User Satisfaction

1. Outline your goals and plan.
2. Create a customer satisfaction survey.
3. Choose your survey's trigger and timing.
4. Analyze the survey data.
5. Make adjustments and repeat.

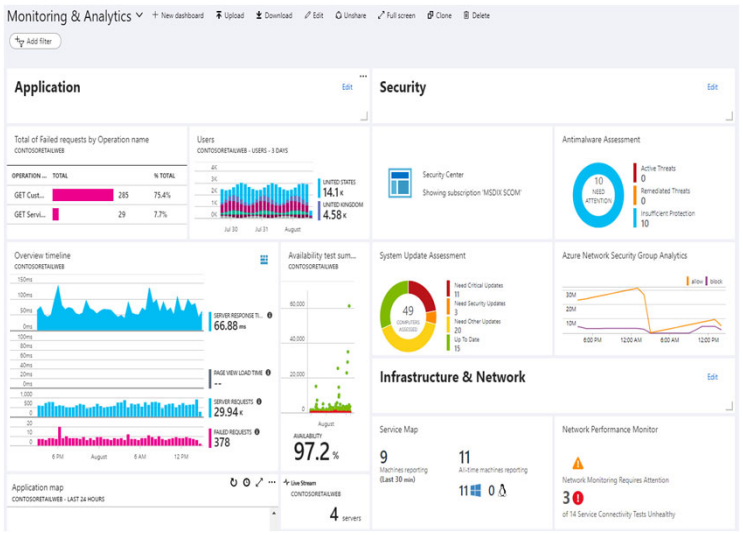
Tools to Track System Usage, Feature Usage, and Flow

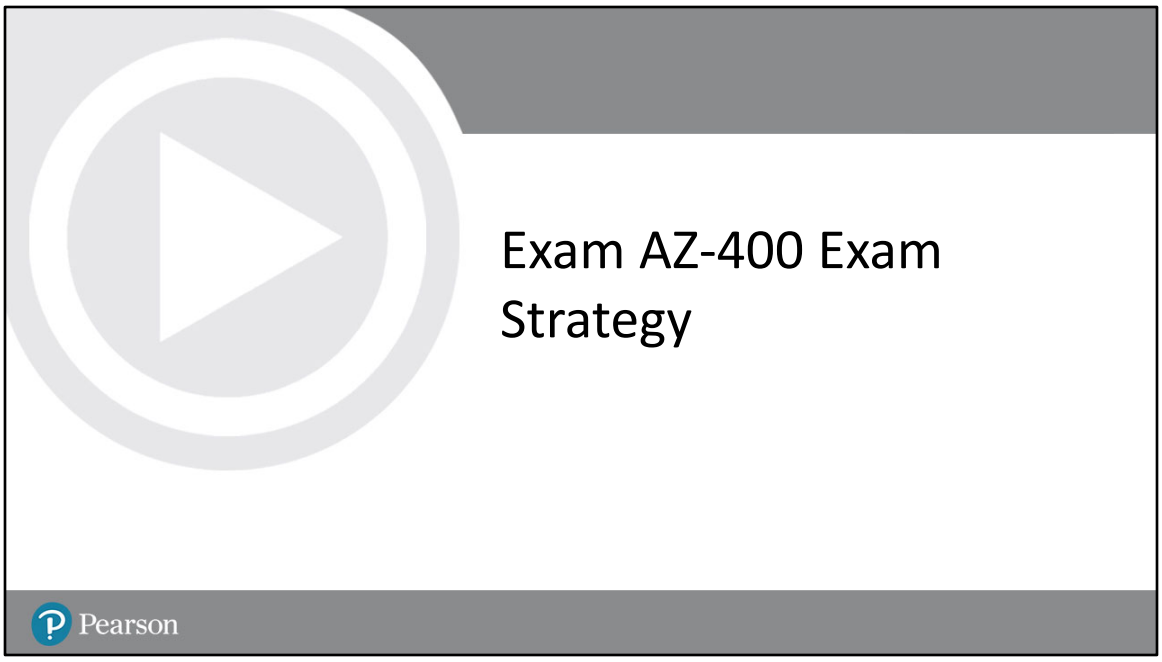

Web pages
Client apps
AI
HTTP requests
Your Web Service
AI
Dependency Calls
SQL
External Services
Background Services
AI
Application Insights
Azure
Alerts
PowerBI
Visual Studio
Rest API
Continous Export

App Center Diagnostics

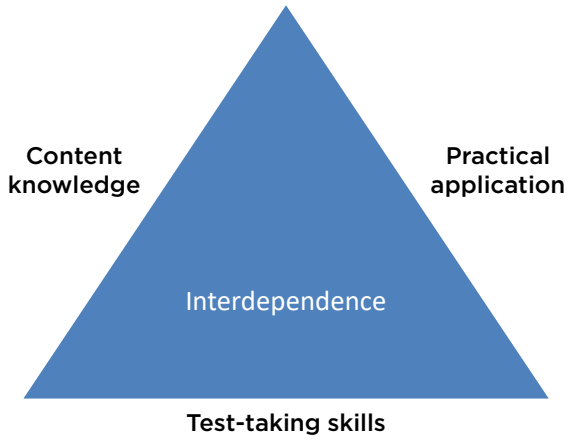
- App Center Diagnostics is a cloud service that helps developers monitor the health of an application, delivering the data needed to understand what happens when an app fails during testing or in the wild.
- In the App Center Diagnostics UI, you can attach, view and download one binary and one test attachment to your crash reports.
- Track events leading up to a crash to capture useful information about the state of your app.

Azure Dashboards

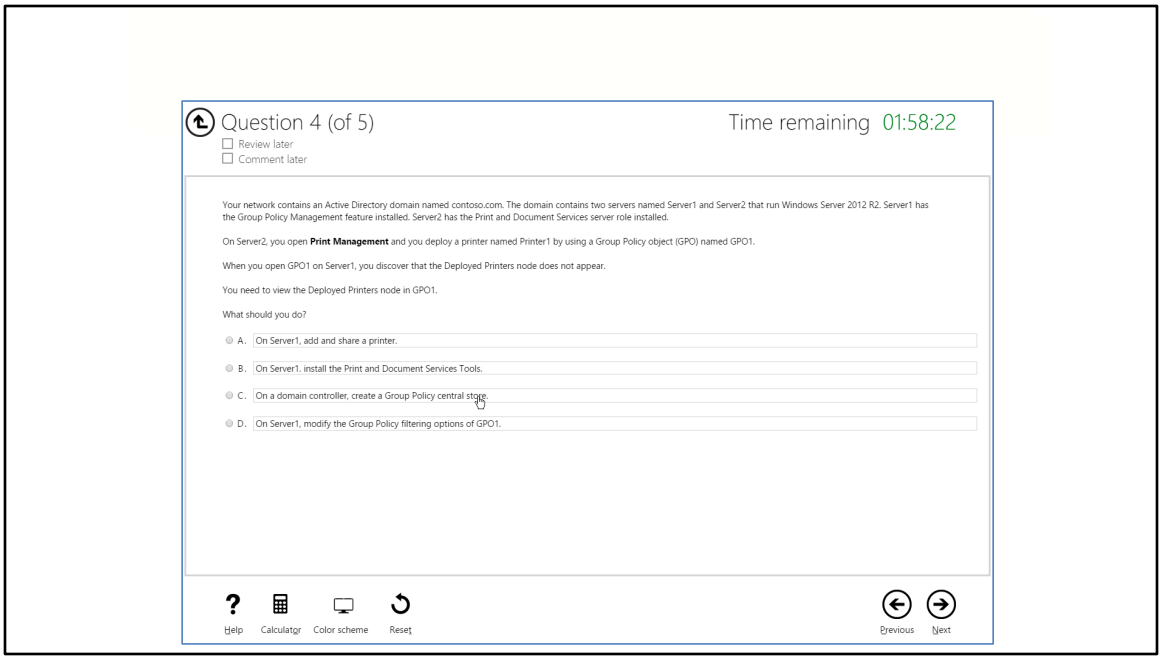



Exam AZ-400 Exam Strategy
Pearson

Tim's Certification Study Pyramid



AZ-400 Item Types


Question 4 (of 5)
Time remaining 01:58:22
Review later
Comment later
Your network contains an Active Directory domain named contoso.com. The domain contains two servers named Server1 and Server2 that run Windows Server 2012 R2. Server1 has the Group Policy Management feature installed. Server2 has the Print and Document Services server role installed.
On Server2, you open Print Management and you deploy a printer named Printer1 by using a Group Policy object (GPO) named GPO1.
When you open GPO1 on Server1, you discover that the Deployed Printers node does not appear.
You need to view the Deployed Printers node in GPO1.
What should you do?
A. On Server1, add and share a printer.
B. On Server1. install the Print and Document Services Tools.
C. On a domain controller, create a Group Policy central store.
D. On Server1, modify the Group Policy filtering options of GPO1.
Help
Calculator
Color scheme
Reset
Previous
Next

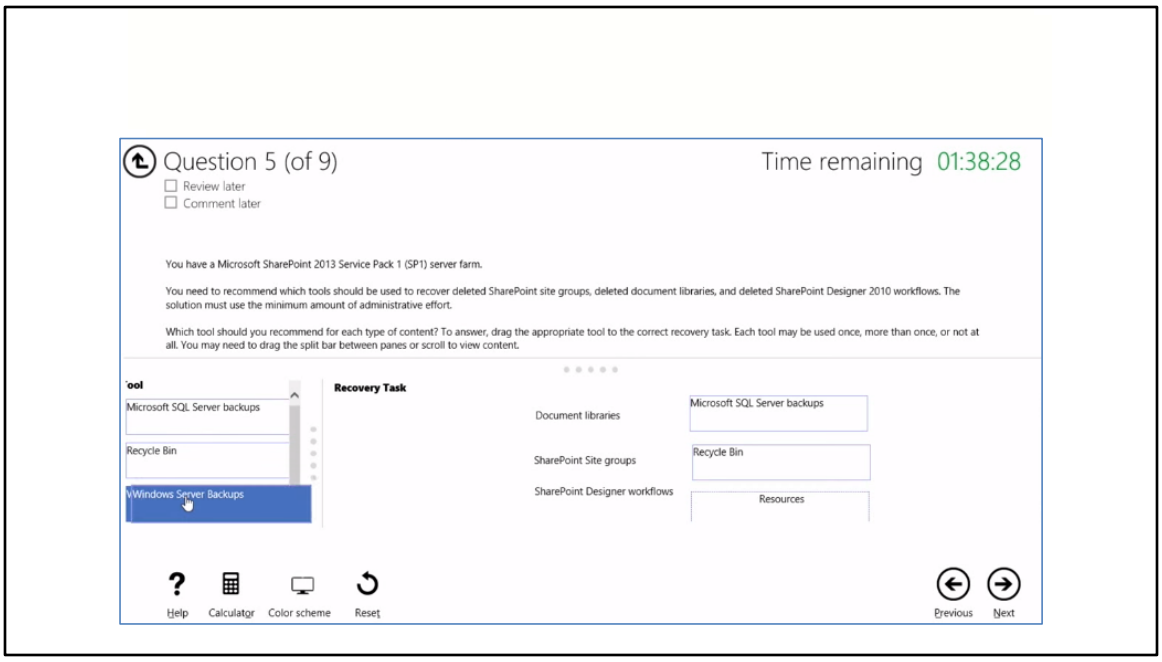

Acclaim
This badge was issued to TIMOTHY WARNER on 4 December 2018.
Expires on 30 October 2020
Share
Microsoft CERTIFIED
AZURE ADMINISTRATOR
ASSOCIATE
Additional Details
Microsoft Certified: Azure Administrator Associate
Issued By Microsoft
Earning Azure Administrator Associate certification demonstrates understanding of services across the IT lifecycle, and ability to take requests for infrastructure services, applications, and environments. Candidates for this certification are typically Azure Administrators who manage cloud services spanning storage, security, networking, and compute cloud capabilities. They recommend services to use for optimal performance and scale, as well as provision, size, monitor, and adjust resources.
Demonstrated Skills
Azure
Cloud Architecture
Cloud Computing
Cloud Data
Cloud Developer
Cloud Infrastructure
Cloud Networking
Cloud Platform
Cloud Security
Cloud Services
Cloud Storage
Cloud Technologies
Powershell
Virtualization
Earning Criteria
PASS AZ-100 AND AZ-101:
- AZ-100 Microsoft Azure Infrastructure and Deployment
- AZ-101 Microsoft Azure Integration and Security

You need to move an Azure VM to another hardware host.

Solution: You redeploy the VM.

Does this solution meet the goal?

a. Yes
b. No


Question 5 (of 9)
Time remaining 01:38:28
Review later
Comment later
You have a Microsoft SharePoint 2013 Service Pack 1 (SP1) server farm.
You need to recommend which tools should be used to recover deleted SharePoint site groups, deleted document libraries, and deleted SharePoint Designer 2010 workflows. The solution must use the minimum amount of administrative effort.
Which tool should you recommend for each type of content? To answer, drag the appropriate tool to the correct recovery task. Each tool may be used once, more than once, or not at all. You may need to drag the split bar between panes or scroll to view content.
ool
Microsoft SQL Server backups
Recycle Bin
Windows Server Backups
Recovery Task
Document libraries
SharePoint Site groups
SharePoint Designer workflows
Microsoft SQL Server backups
Recycle Bin
Resources
Help
Calculator
Color scheme
Reset
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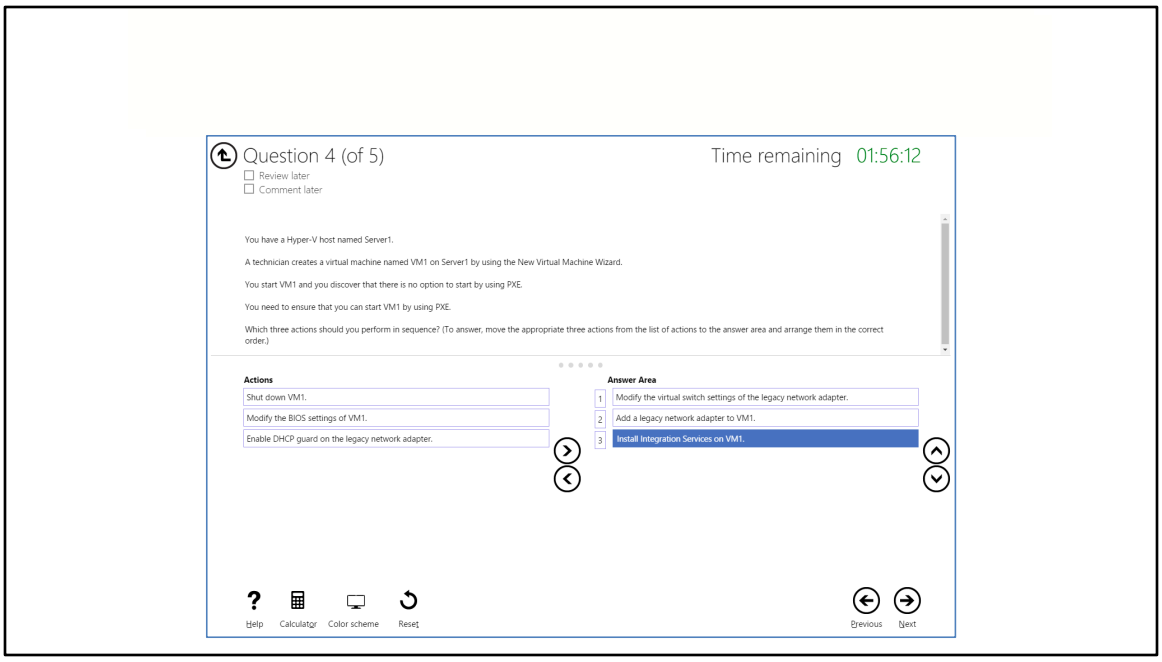
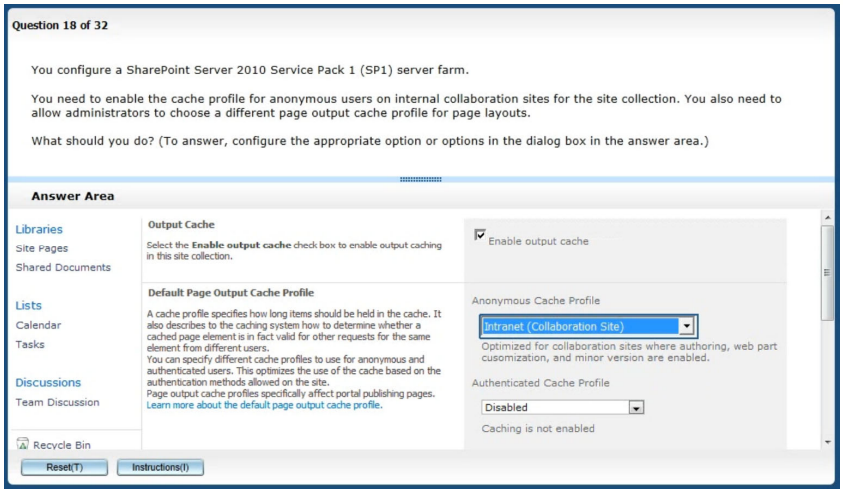
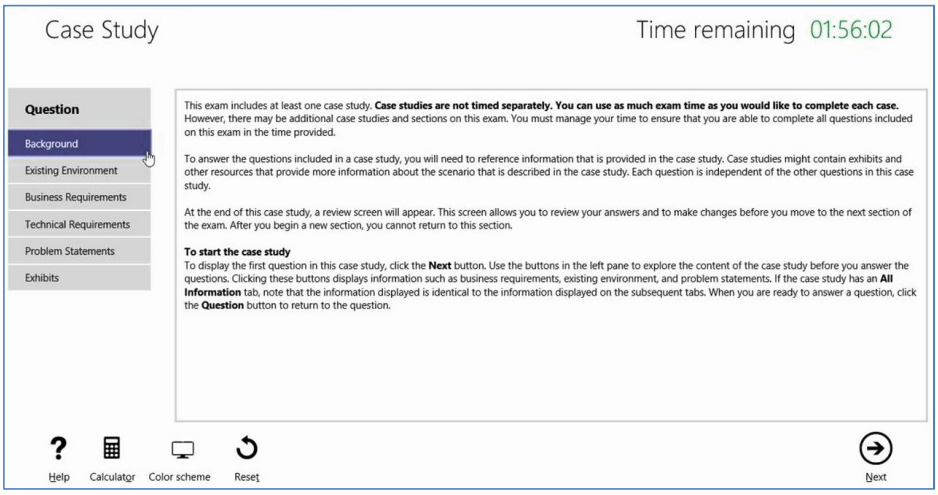
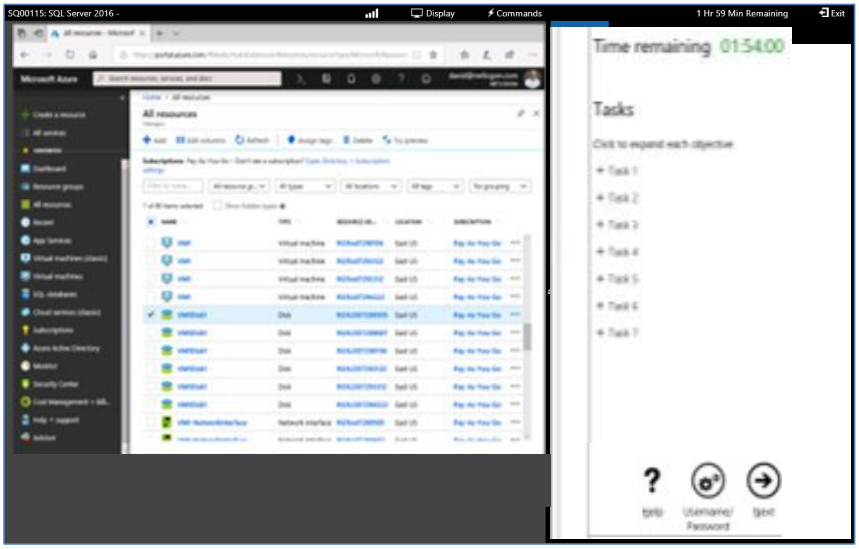
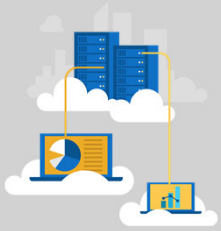

Question 4 (of 5)
Time remaining 01:56:12
Review later
Comment later
You have a Hyper-V host named Server1.
A technician creates a virtual machine named VM1 on Server1 by using the New Virtual Machine Wizard.
You start VM1 and you discover that there is no option to start by using PXE.
You need to ensure that you can start VM1 by using PXE.
Which three actions should you perform in sequence? (To answer, move the appropriate three actions from the list of actions to the answer area and arrange them in the correct order.)
Actions
Shut down VM1.
Modify the BIOS settings of VM1.
Enable DHCP guard on the legacy network adapter.
Answer Area
1 Modify the virtual switch settings of the legacy network adapter.
2 Add a legacy network adapter to VM1.
3 Install Integration Services on VM1.
Help
Calculator
Color scheme
Reset
Previous
Next


Question 18 of 32
You configure a SharePoint Server 2010 Service Pack 1 (SP1) server farm.
You need to enable the cache profile for anonymous users on internal collaboration sites for the site collection. You also need to allow administrators to choose a different page output cache profile for page layouts.
What should you do? (To answer, configure the appropriate option or options in the dialog box in the answer area.)
Answer Area
Libraries
Site Pages
Shared Documents
Lists
Calendar
Tasks
Discussions
Team Discussion
Recycle Bin
Output Cache
Select the Enable output cache check box to enable output caching in this site collection.
Enable output cache
Default Page Output Cache Profile
A cache profile specifies how long items should be held in the cache. It also describes to the caching system how to determine whether a cached page element is in fact valid for other requests for the same element from different users.
You can specify different cache profiles to use for anonymous and authenticated users. This optimizes the use of the cache based on the authentication methods allowed on the site.
Page output cache profiles specifically affect portal publishing pages.
Learn more about the default page output cache profile.
Anonymous Cache Profile
Intranet (Collaboration Site)
Optimized for collaboration sites where authoring, web part cusomization, and minor version are enabled.
Authenticated Cache Profile
Disabled
Caching is not enabled
Reset(T)
Instructions(I)


Case Study
Time remaining 01:56:02
Question
Background
Existing Environment
Business Requirements
Technical Requirements
Problem Statements
Exhibits
This exam includes at least one case study. Case studies are not timed separately. You can use as much exam time as you would like to complete each case. However, there may be additional case studies and sections on this exam. You must manage your time to ensure that you are able to complete all questions included on this exam in the time provided.
To answer the questions included in a case study, you will need to reference information that is provided in the case study. Case studies might contain exhibits and other resources that provide more information about the scenario that is described in the case study. Each question is independent of the other questions in this case study.
At the end of this case study, a review screen will appear. This screen allows you to review your answers and to make changes before you move to the next section of the exam. After you begin a new section, you cannot return to this section.
To start the case study
To display the first question in this case study, click the Next button. Use the buttons in the left pane to explore the content of the case study before you answer the questions. Clicking these buttons displays information such as business requirements, existing environment, and problem statements. If the case study has an All Information tab, note that the information displayed is identical to the information displayed on the subsequent tabs. When you are ready to answer a question, click the Question button to return to the question.
Help
Calculator
Color scheme
Reset
Next


SQ00115: SQL Server 2016 -
Display
Commands
1 Hr 59 Min Remaining
Exit
Time remaining 01:54:00
Tasks
Click to expand each objective
Task 1
Task 2
Task 3
Task 4
Task 5
Task 6
Task 7
Help
Username/ Password
Next

Preparing for Online Testing



The High-Level Process

- Process is same both for pre-check and pre-exam
- Download the OnVUE client (~100 MB)
- System test: webcam, microphone, Internet speed
- SMS to your cell phone to continue validation
- Selfie
- Front and back pics of your photo ID
- 4 pics of your exam room

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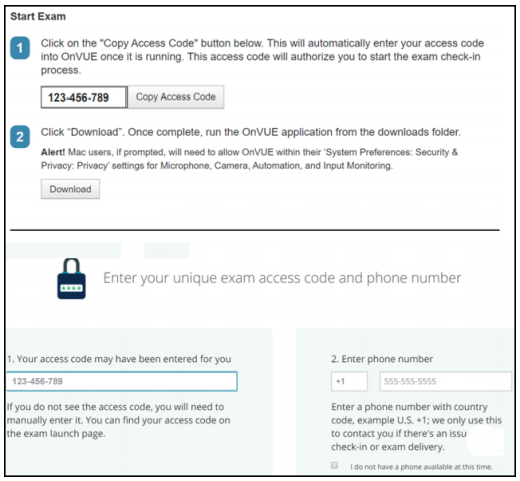
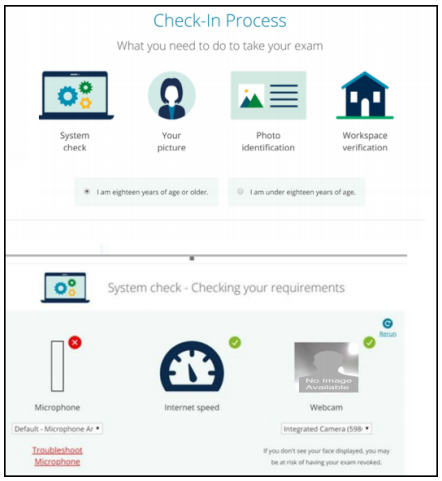
Pearson OnVUE





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Online Testing Environment Tips

- Charge your cell phone
- Have your photo ID ready
- Clear your desk (1 monitor) and your room as much as possible
- Dump every process except your web browser (especially background processes)
- Communicate with your housemates (no interruptions)
- Take care of your bio break beforehand
- Be mindful to keep your eyes forward and avoid fidgeting

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AZ-400 Exam Tips

- Expect to see a lot of JSON, PowerShell, and CLI
- Expect not to see C# or JavaScript
- It doesn't matter which exam order you use:
  - AZ-203
  - AZ-103/AZ-104
  - AZ-400
- Perform due diligence in validating your environment for Microsoft online testing

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Thank you!

- Course materials: **timw.info/az400**
- Twitter: **@TechTrainerTim**
- Work: **timw.info/ps**
- Web: **TechTrainerTim.com**

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