



Exam AZ-400: Microsoft DevOps Solutions Crash Course



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- Senior Content Developer, Microsoft
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- Badge: TechTrainerTim.com



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Session 1 of 2 Learning Goals

- Azure DevOps intro
- Git source control
- CI/CD (start)



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Session 2 of 2 Learning Goals

- CI/CD (finish)
- IaC
- Artifacts
- Monitoring



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Course Materials

timw.info/az400



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Setting Expectations

- This is a six-hour "crash course"
 - Please plan to review these materials more than once
 - 10-minute break at midpoint
- Please ask/answer questions and provide feedback in the Q/A panel, not the group chat
- I'll post outstanding questions/answers to my Twitter feed: [@TechTrainerTim](#)



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A Surgical Approach

- We cut closely to the exam objectives and precisely what information you need to know to clear the AZ-400 exam (respecting NDA, of course)
- The AZ-400 exam is a mile wide and a foot deep



Session Recordings

The screenshot shows the O'Reilly website's "Live Events" section. The left sidebar has a dark theme with white text and includes links for Home, Answers, Explore, Live Events (which is selected and highlighted in blue), All Events, Architectural Katas, AI & ML, Data Sci & Eng, Programming, Infra & Ops, Software Arch, Interactive, Certifications, Settings, Support, Newsletters, and Sign Out. The main content area has a light background and features a search bar at the top right. Below the search bar, there's a "Live Events" heading with a subtext: "Advance your career by attending live events that give you direct access to our industry experts, from online courses and Q&A sessions to Superstream conferences." A navigation bar below this includes "All Events", "Your Events" (which is highlighted with a yellow box), and "Your Recordings" (also highlighted with a yellow box). A note states: "Event recordings will be available approximately 24 hours after an event has ended." Below this, a video thumbnail shows a man speaking, with the text "MICROSOFT AZURE" and "FEB. 11, 2020". The title of the recording is "Azure Certified DevOps Engineer Crash Course" and it "With Mike Pfeiffer". At the bottom of the listing, it says "1 RECORDING AVAILABLE".



Session Recordings

O'REILLY®

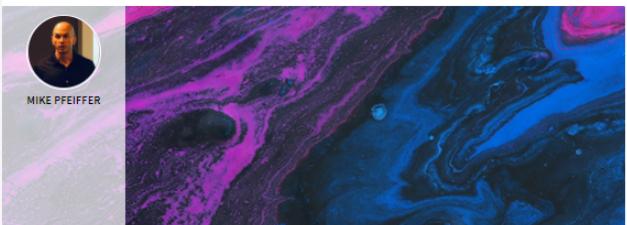
LIVE ONLINE TRAINING

Azure Certified DevOps Engineer Crash Course

Prepare for Microsoft Certification Exam AZ-400

Topic: System Administration

MIKE PFEIFFER



February 11, 2020
11:00am – 3:00pm CDT

This course has ended.

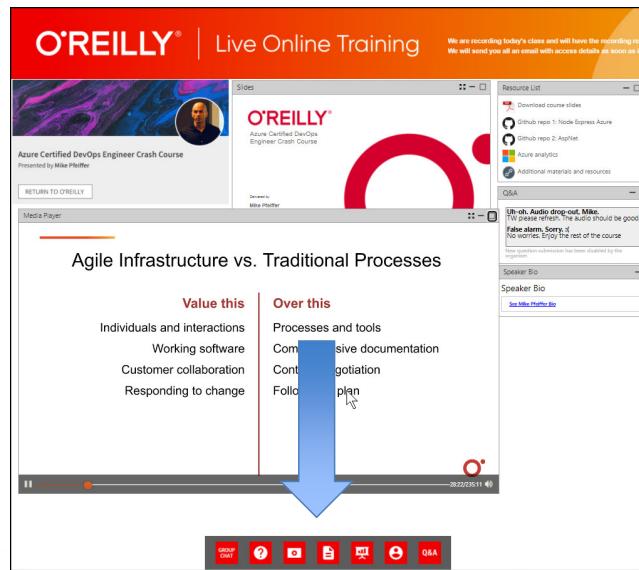
Watch the recording.

SESSION 1 VIDEO

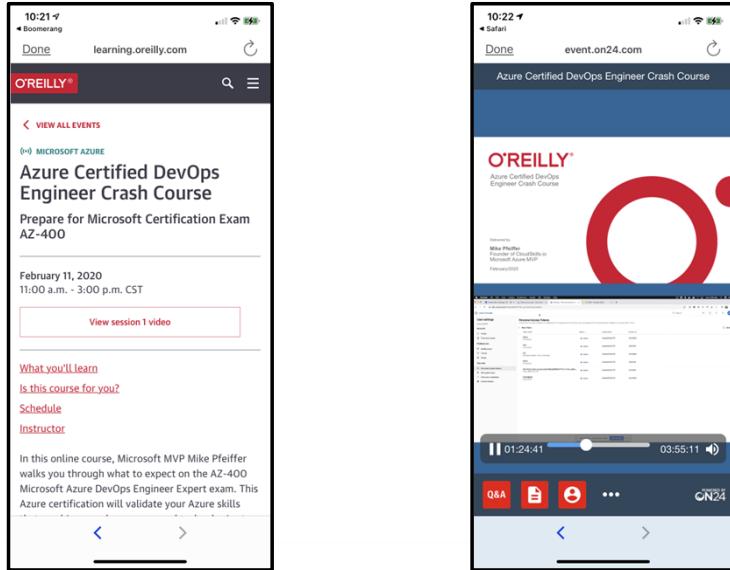
What you'll learn Instructor Schedule

P Pearson

Session Recordings



Mobile Browser: learning.oreilly.com



P Pearson

O'Reilly Mobile App

The image displays three screenshots of the O'Reilly mobile application interface, showcasing its features for learning and attending events.

- Main Dashboard:** Shows the "Your O'Reilly" section with "Playlists" and "Downloads". Below this is the "Your History" section, which lists completed courses such as "Microsoft Azure Security Technologies" (52%), "BGP in the Data Center" (6%), and "Exam Ref AZ-500" (9%). The "Your Live Events" section indicates no upcoming events and provides a link to "View past events".
- Live Event View:** Shows a live event titled "Azure Certified DevOps Engineer Crash Course with Mike Heffler" scheduled for FEBRUARY 11, 2020. It includes a thumbnail of the instructor and a "View Recording" button.
- Video Player View:** Displays a video player for the "Azure Certified DevOps Engineer Crash Course". The video controls show a play button, a progress bar at 00:00, and a volume icon.

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Exam AZ-400 Updates

Objective domain: skills the exam measures

The English language version of this exam was updated on **November 1, 2022**.

Some exams are localized into other languages, and those are updated approximately eight weeks after the English version is updated. Other available languages are listed in the **Schedule Exam** section of the **Exam Details** webpage. If the exam isn't available in your preferred language, you can request an additional 30 minutes to complete the exam.

Note

The bullets that follow each of the skills measured are intended to illustrate how we are assessing that skill. **Related topics** may be covered in the exam.

Note

Most questions cover features that are **general availability (GA)**. The exam may contain questions on Preview features if those features are commonly used.

Skills measured

- Configure processes and communications (10–15%)
- Design and implement source control (15–20%)
- Design and implement build and release pipelines (40–45%)
- Develop a security and compliance plan (10–15%)
- Implement an instrumentation strategy (10–15%)



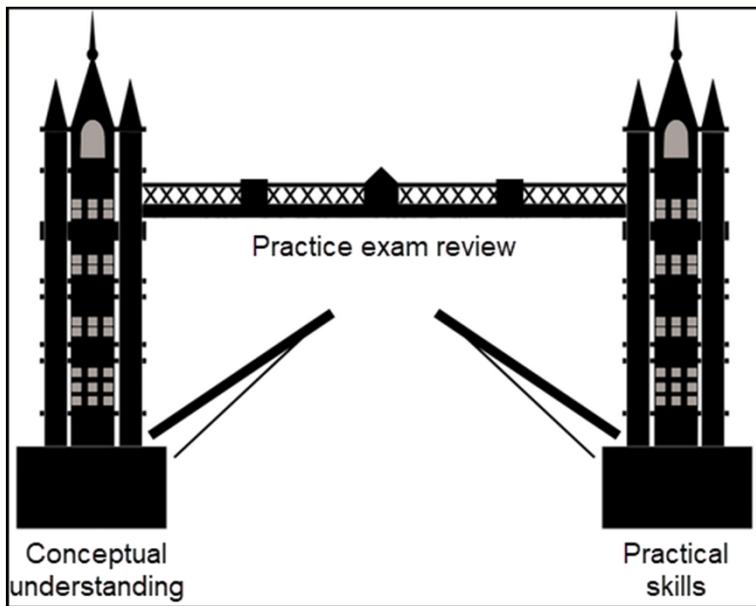
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DevOps Engineer Expert Certification



Tim's Certification Study Model



Thank you!

- Course materials: timw.info/az400
- Twitter: [@TechTrainerTim](https://twitter.com/TechTrainerTim)
- Work: timw.info/ps
- Web: TechTrainerTim.com

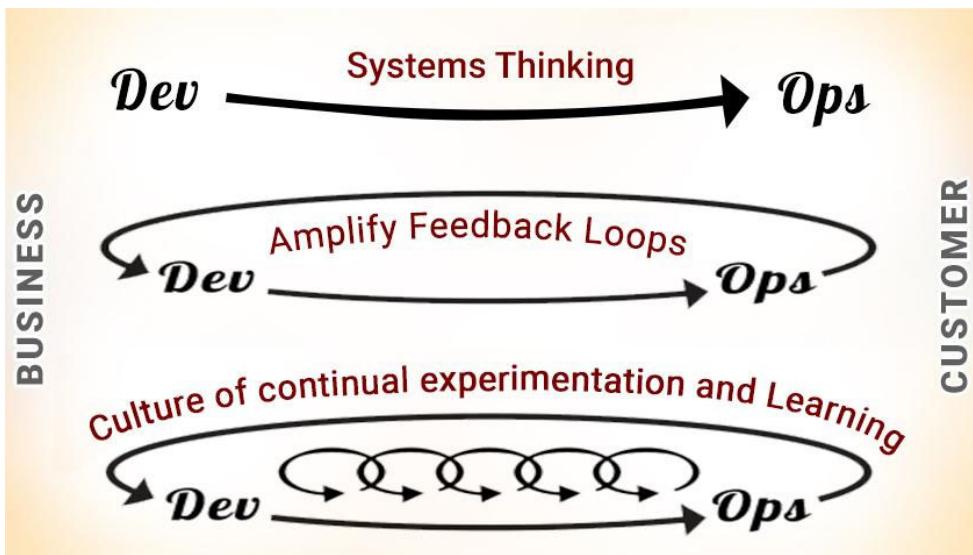




Source Control and SRE Strategy

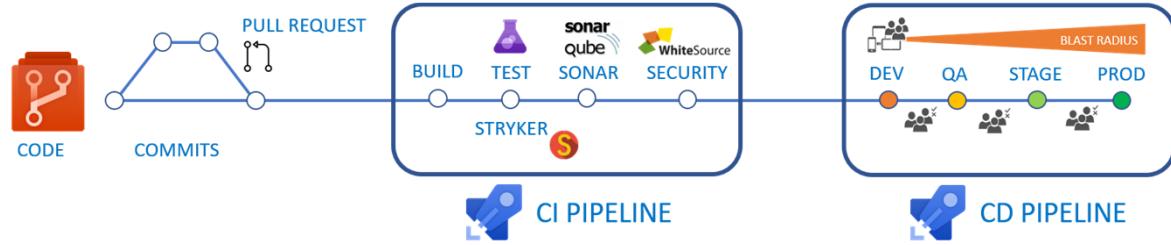
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DevOps - The Three Ways



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CI/CD Pipelines



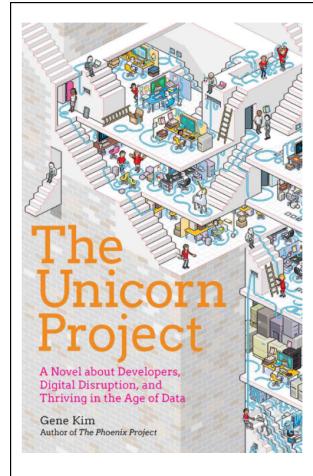
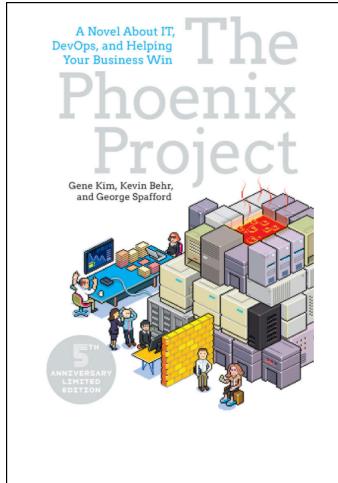
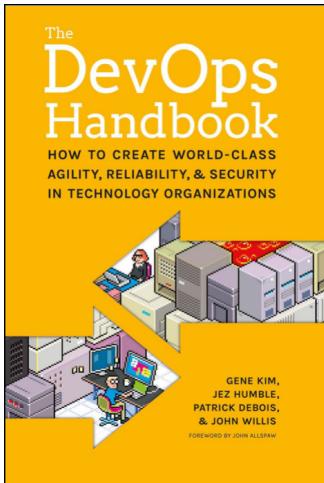
Formats 'n' Languages

- Data formats
 - JSON
 - YAML
- Languages
 - Azure PowerShell
 - Azure CLI
 - Dockerfile
 - KQL

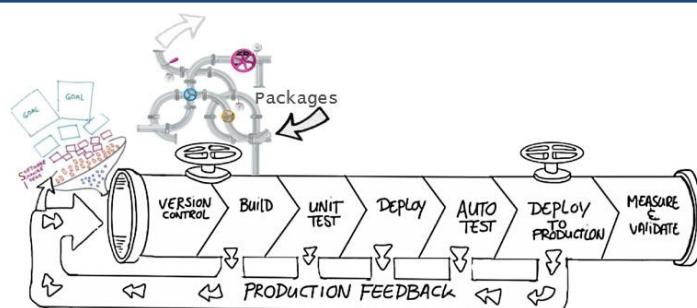


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DevOps Reading List



Benefits of source control



Create workflows

Work with versions

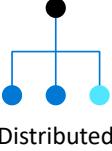
Collaboration

Maintains history of changes

Automate tasks

Benefits include: Reusability, traceability, manageability, efficiency, collaboration, and learning

Distributed source control

	Strengths	Best Used for
 <p>Distributed</p>	<ul style="list-style-type: none"> • Cross platform support • An open-source friendly code review model via pull requests • Complete offline support • Portable history • An enthusiastic growing user based 	<ul style="list-style-type: none"> • Smaller size (in bytes) and modular codebases • Evolving through open-source • Highly distributed teams • Teams working across platforms • Greenfield codebases

Every developer clones a copy of a repository and has the full history of the project.

Common distributed source control systems are Mercurial, Git, and Bazaar.

A **greenfield project** is one that lacks constraints imposed by prior work.

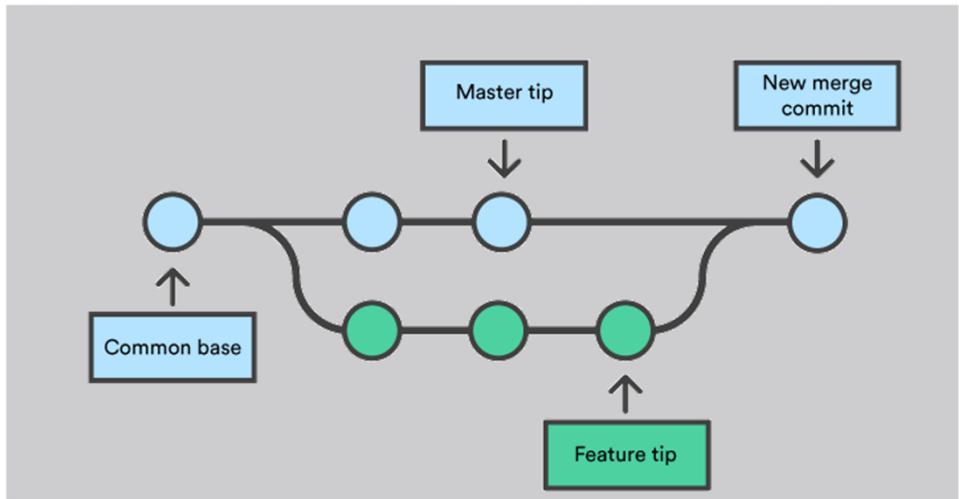
Centralized source control

Strengths	Best Used for
 Centralized <ul style="list-style-type: none">• Easily scales for very large codebases• Granular permission control• Permits monitoring of usage• Allows exclusive file locking	<ul style="list-style-type: none">• Large integrated codebases• Audit and access control down to the file level• Hard to merge file types

There is a single central copy of your project, and programmers commit their changes to this central copy.

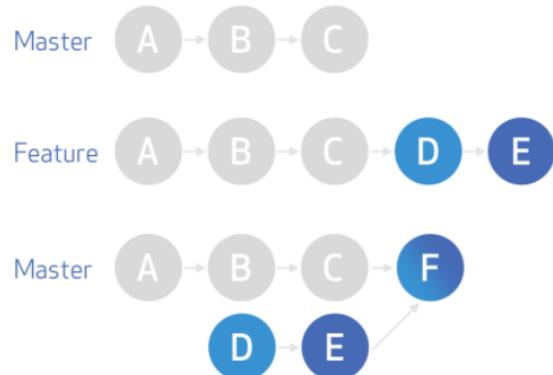
Common centralized source control systems are TFVC, CVS, Subversion (or SVN), and Perforce.

Feature Branching and Merging



Merge commits

Merge commits: retains all of the commits in your branch and interleaves them with commits on the base branch



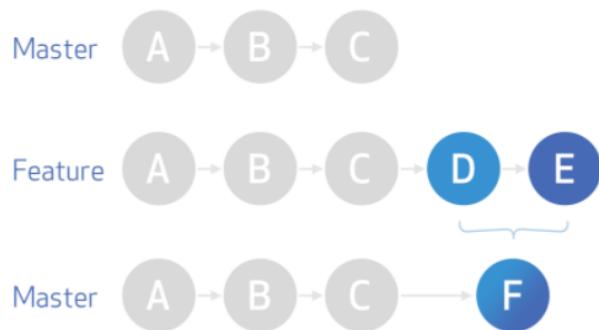
Merge commit: D + E added to Master via F



Pearson <https://timw.info/k0n>

Merge squash

Merge Squash: retains the changes but omits the individual commits from history



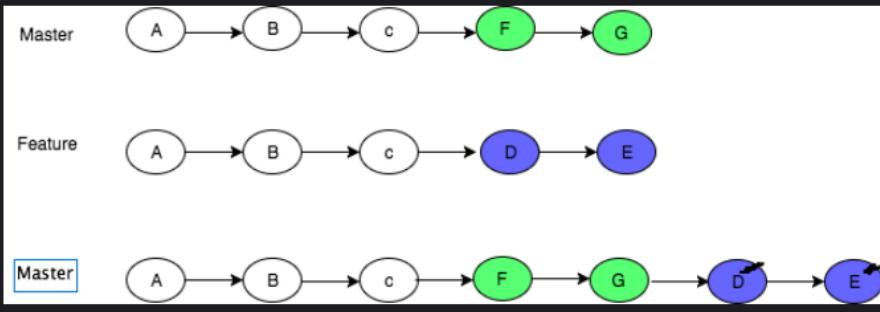
Squash and merge: D + E combined into F



Pearson <https://timw.info/k0n>

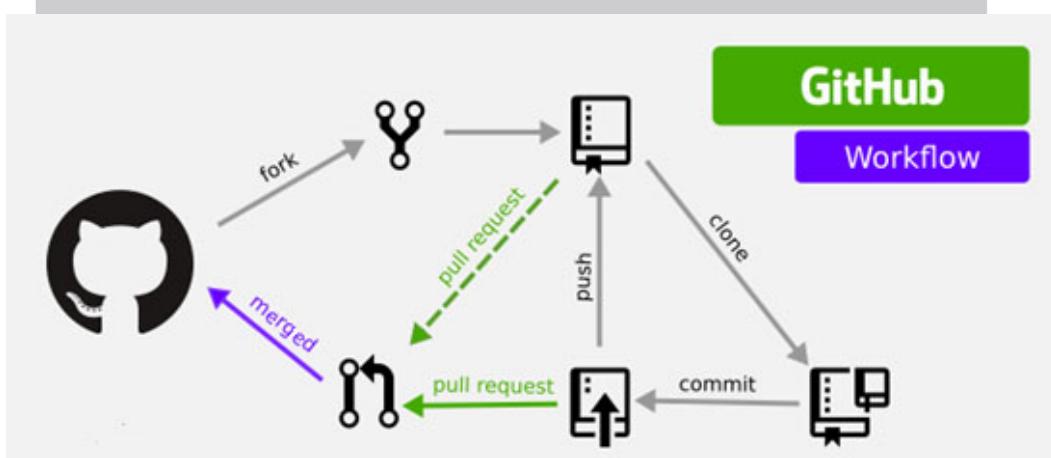
Rebase

Rebase: This moves the entire feature branch to begin on the tip of the master branch, effectively incorporating all of the new commits in master



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GitHub Workflow



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Single-Stage Dockerfile

```
FROM node:10

# set the work directory
WORKDIR /usr/src/app

# copy package.json
COPY package*.json .

# copy webapp folder
COPY WebApp/package*.json ./WebApp/

# RUN npm install for node js dependencies
RUN npm install \
    && cd WebApp \
    && npm install @angular/cli \
    && npm install

# Bundle app source
COPY . .

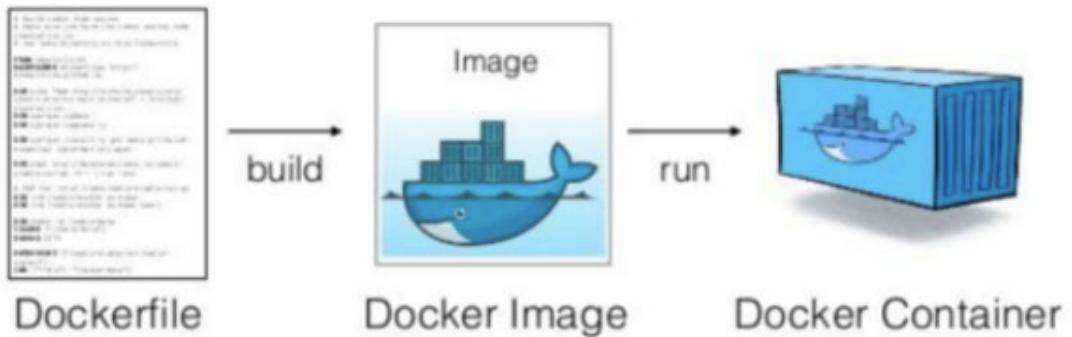
# building Angular UI
RUN cd WebApp && npm run build

EXPOSE 3070

ENTRYPOINT ["node"]
CMD ["index.js"]
```



Docker Container Development Process



Multi-Stage Dockerfile

```
FROM node:10 AS ui-build
WORKDIR /usr/src/app
COPY WebApp/ ./WebApp/
RUN cd WebApp && npm install @angular/cli && npm install && npm run build

FROM node:10 AS server-build
WORKDIR /root/
COPY --from=ui-build /usr/src/app/WebApp/dist ./WebApp/dist
COPY package*.json ./
RUN npm install
COPY index.js .

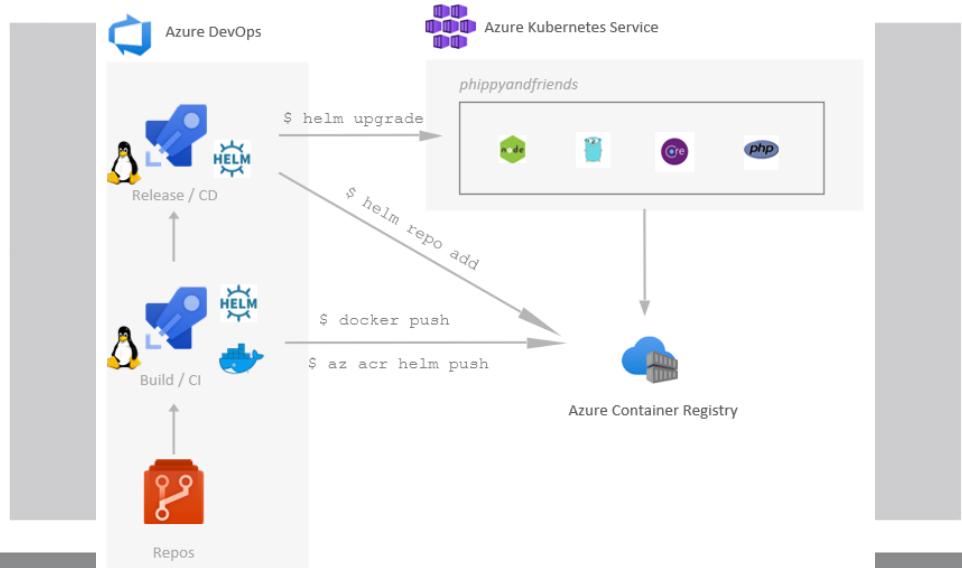
EXPOSE 3070

ENTRYPOINT ["node"]
CMD ["index.js"]
```



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Helm, ACR, and AKS



Build Engines



Jenkins
Software

Jenkins is a free and open source automation server that automates the parts of software development related to testing, building, and deployment, facilitating continuous integration and continuous delivery. It is a server-based system that runs on containers such as Apache Tomcat. [Wikipedia](#)



Maven™
Apache Maven
Software

Maven is a build automation tool used primarily for Java projects. Maven can also be used to build and manage projects written in C#, Ruby, Scala, and other languages. The Maven project is hosted by the Apache Software Foundation, where it was formerly part of the Jakarta Project. [Wikipedia](#)

Initial release: 13 July 2004; 16 years ago
Stable release: 3.6.3 / 25 November 2019; 14 months ago
License: Apache License 2.0
Developer: Apache Software Foundation
Programming languages: Java, C#



GraalVM
Software

GraalVM is a platform for multi-language software development process in the tasks of building, deployment, and publishing. It supports Java, C/C++, JavaScript. [Wikipedia](#)

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Code Testing Extensions



WhiteSource Bolt

WhiteSource | 951 installs | ★★★★★ (6) | Free

Get real-time security alerts and compliance issues on your open source dependencies within your Azure DevOps Services environment.



SonarQube

SonarSource | Top Publisher | 58,865 installs | ★★★★★ (58) | Free

Detect bugs, vulnerabilities and code smells across project branches and pull requests.



Cobertura Transform

Swellaby | 37 installs | ★★★★★ (0) | Free

Pipeline tasks to transform Cobertura 3 format to Cobertura 4

[Get it free](#)

code coverage



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Sources and impacts of technical debt

Common sources of technical debt are:

Lack of coding style and standards	Over-engineering code
Lack of or poor design of unit test cases	Insufficient comments and documentation
Ignoring or not understanding object orient design principles	Not writing self-documenting code
Monolithic classes and code libraries	Taking shortcuts to meet deadlines
Poorly envisioned use of technology, architecture and approach	Leaving dead code in place

Code Testing Extensions, Continued

Black Duck Software Composition Analysis

Secure and manage open source risks in applications and containers

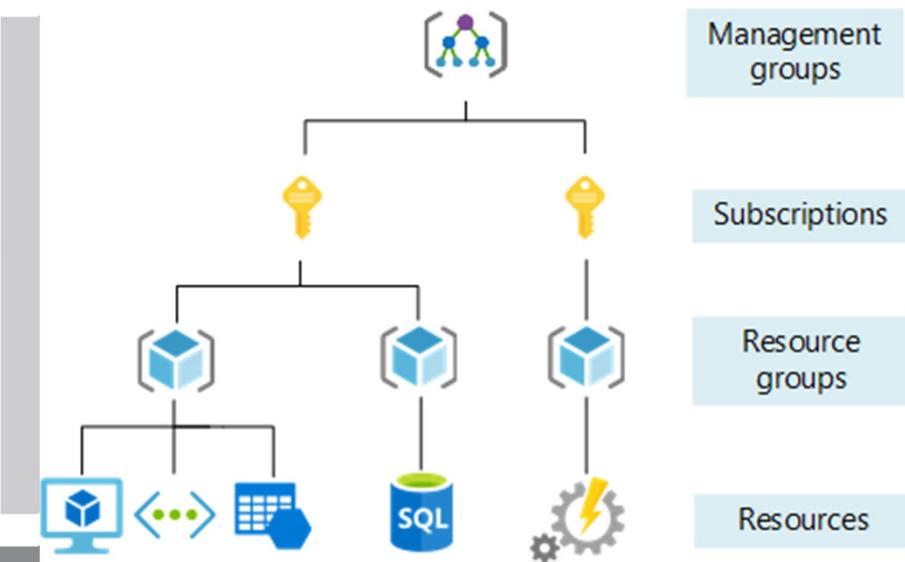
The **PMD** Plugin allows you to automatically run the **PMD** code analysis tool on your project's source code and generate a site report with its results. It also supports the separate Copy/Paste Detector tool (or CPD) distributed with **PMD**. Oct 24, 2020

Programming languages used: Java (programming language)



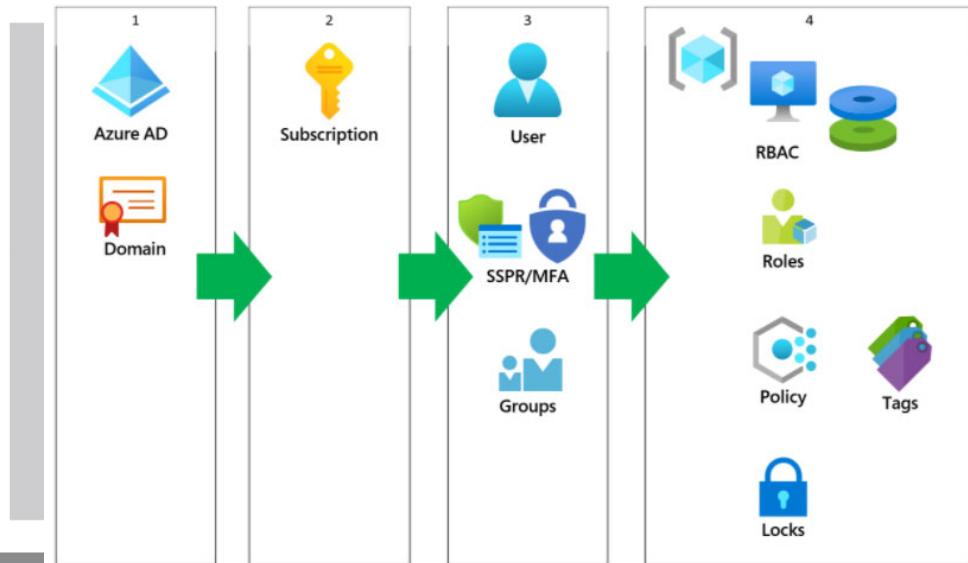
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Azure Management Scopes

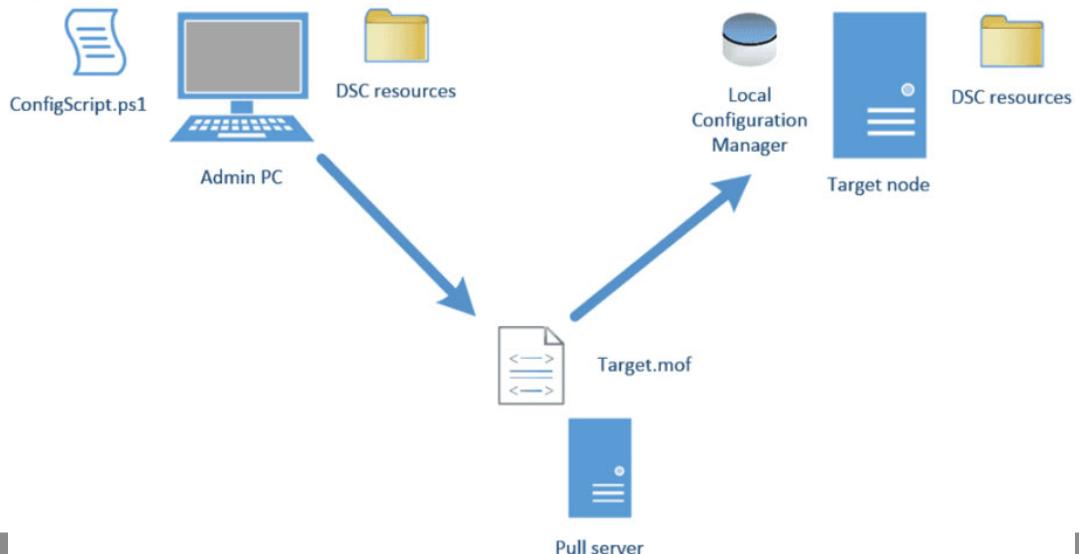


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Azure AD Identity

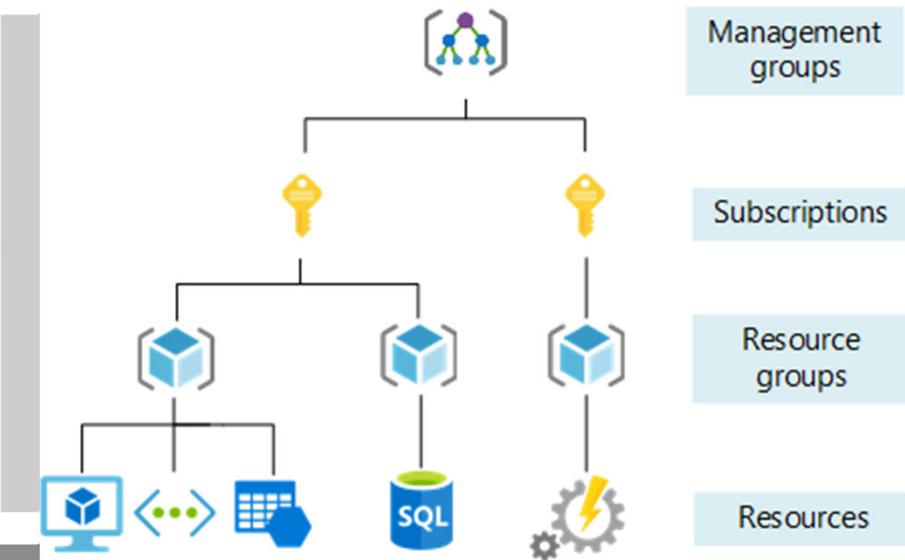


Azure Automation DSC



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Azure Management Scopes



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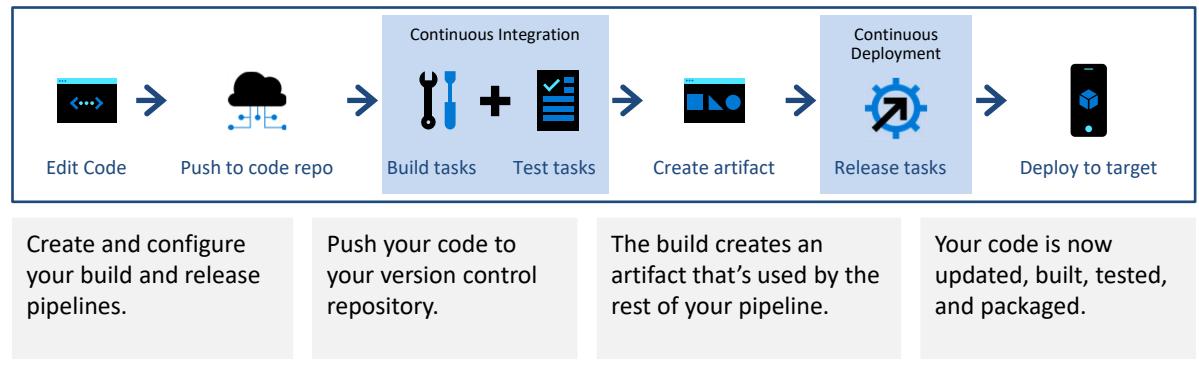
Build Automation with Azure Pipelines



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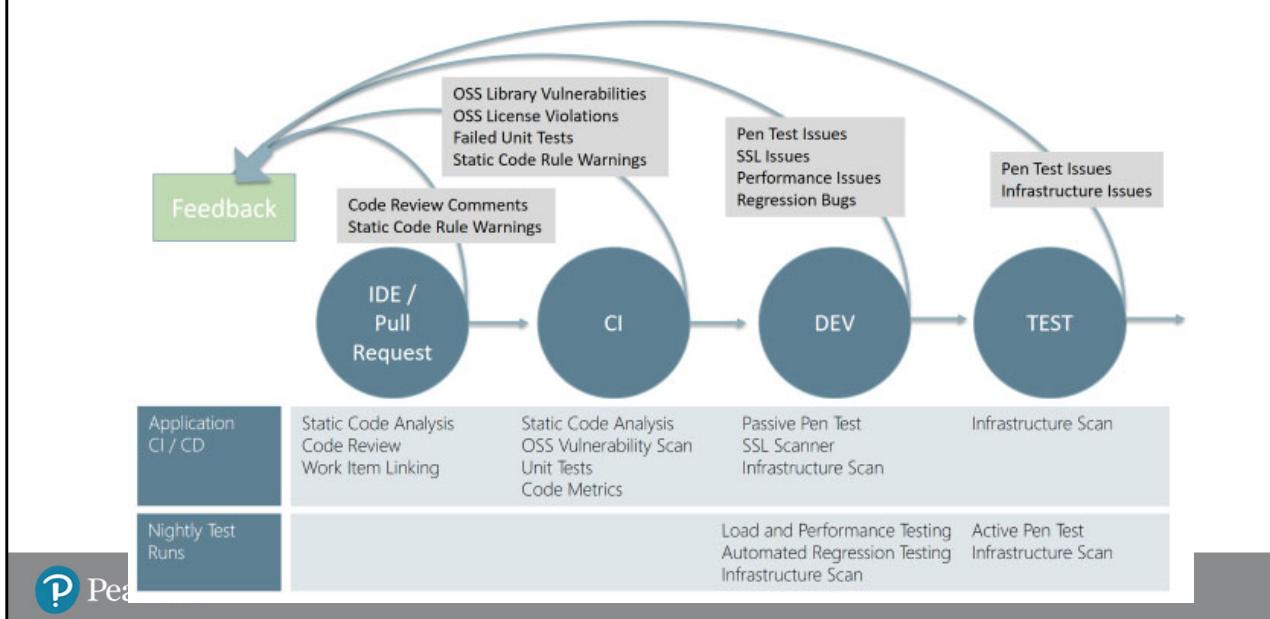
Azure pipelines and visual designer

Configure your pipelines with the Visual Designer



Often referred to as "Classic Pipelines"

Continuous Security Validation



Peacock

Microsoft vs self-hosted agents

You generally 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:



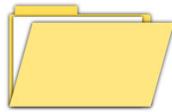
Microsoft-hosted agents – Automatically take care of maintenance and upgrades. Each time you run a pipeline, you get a fresh virtual machine. The virtual machine is discarded after one use. There are time limits on jobs run on these agents.



Self-hosted agents – You take care of maintenance and upgrades that 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. There are no time limits on these jobs.

Hosted Agent Folders and Predefined Variables

C:\agent_work\1\s



\$(Build.SourcesDirectory)

C:\agent_work\1\b



\$(Build.stagingDirectory)

C:\agent_work\1\a



\$(Build.ArtifactStagingDirectory)

Predefined agent pool – Azure pipelines

Hosted VS2019

Hosted VS2017

Hosted Ubuntu 20.04

Hosted Ubuntu 18.04

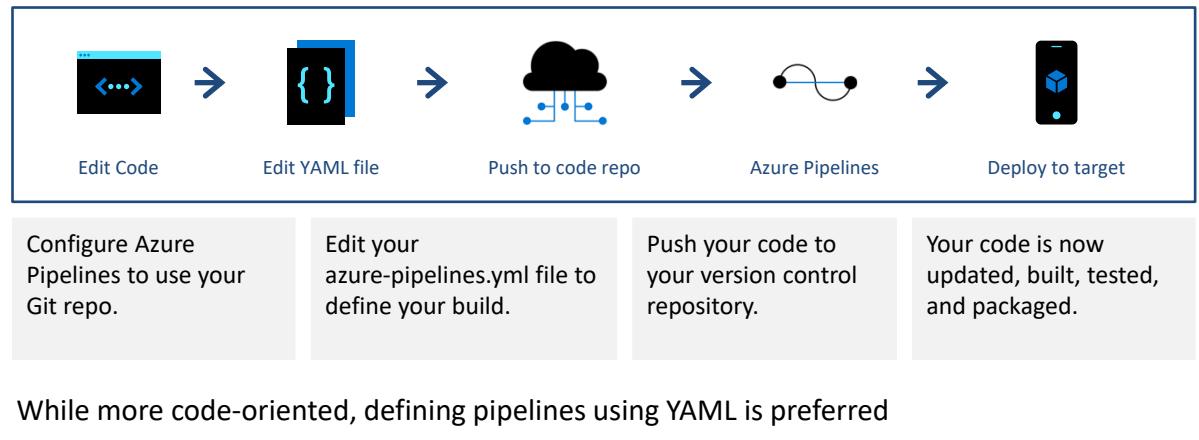
Hosted Ubuntu 16.04

Hosted macOS X Mojave 10.14

Hosted macOS X Catalina 10.15

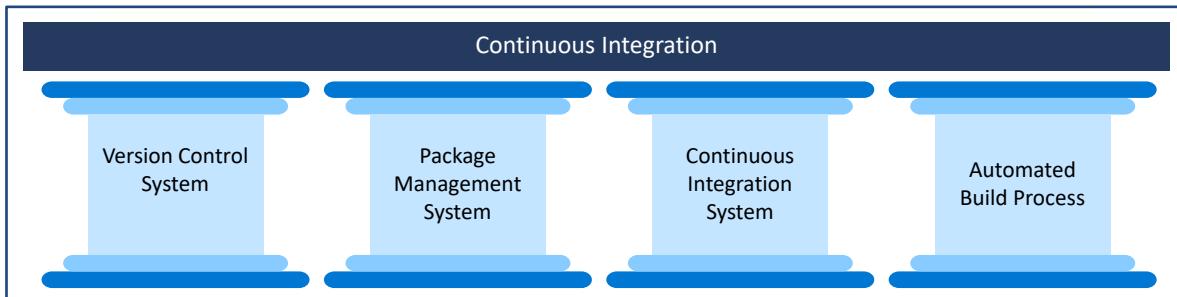
Azure pipelines and YAML

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



While more code-oriented, defining pipelines using YAML is preferred

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.

Anatomy of a pipeline



Name – Though often this is skipped (if it is skipped, a date-based name is generated automatically)



Trigger – More on triggers later, but without an explicitly trigger, there's an implicit "trigger on every commit to any path from any branch in this repo"



Variables – These are "inline" variables (more on other types of variables later)



Job – Every pipeline must have at least one job



Pool – You configure which pool (queue) the job must run on



Checkout – The "checkout: self" tells the job which repository (or repositories if there are multiple checkouts) to checkout for this job



Steps – The actual tasks that need to be executed: in this case a "script" task (script is an alias) that can run inline scripts

YAML resources

Pipelines

Containers

Repositories

Types

```
resources:  
  pipelines: [ pipeline ]  
  repositories: [ repository ]  
  containers: [ container ]
```

```
resources:  
  pipelines:  
    - pipeline: MyAppA  
      source: MyCIPipelineA  
    - pipeline: MyAppB  
      source: MyCIPipelineB  
      trigger: true  
    - pipeline: MyAppC  
      project: DevOpsProject  
      source: MyCIPipelineC  
      branch: releases/M159  
      version: 20190718.2  
      trigger:  
        branches:  
          include:  
            - master  
            - releases/*  
          exclude:  
            - users/*
```

What are actions ?



Automations within the GitHub environment



Often used to build CI/CD implementations



Based on YAML files living within GitHub repositories



Executed on GitHub or self-hosted runners



Large number of existing actions in the GitHub Marketplace

Actions flow

Events trigger workflows:

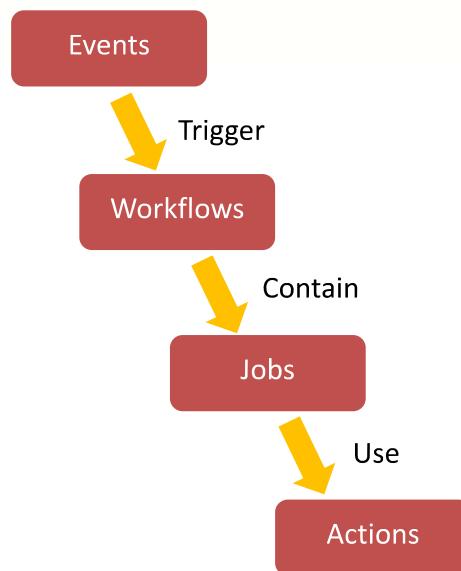
- Schedule, code, etc.

Workflows contain jobs:

- May contain multiples

Jobs use actions:

- Configured within steps



Workflows

Define the required automation:

Events, Jobs

Written in YAML

Stored in **.github/workflows**

Starter workflows available

```
# .github/workflows/build.yml
name: Node Build

on: [push]

jobs:
  mainbuild:

    runs-on: ${{ matrix.os }}

    strategy:
      matrix:
        node-version: [12.x]
        os: [windows-latest]

    steps:
      - uses: actions/checkout@v1
      - name: Run node.js on latest Windows
        uses: actions/setup-node@v1
        with:
          node-version: ${{ matrix.node-version }}
      - name: Install NPM and build
        run: |
          npm ci
          npm run build
```

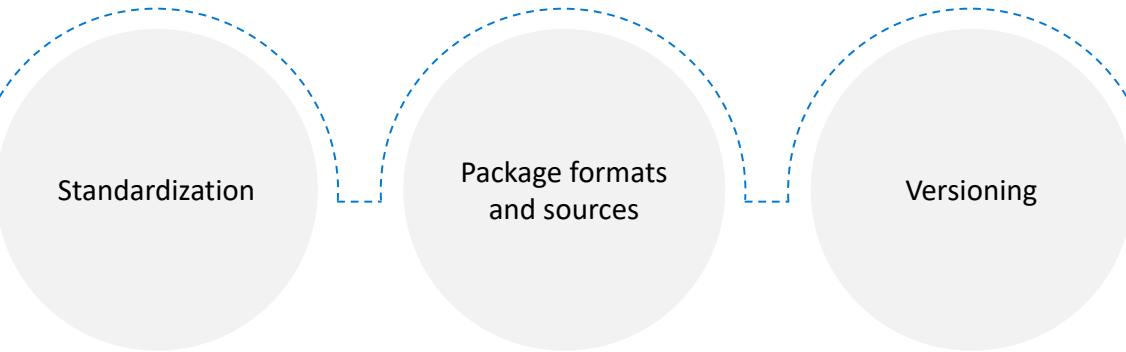


Dependency Management with Azure Artifacts



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Elements of a Dependency Management Strategy



Identifying Dependencies

Find components and source code that can have independent:

- Deployment
- Release
- Versioning

Things to consider:

- Change frequency
- Changes should be unrelated to other parts of system
- Can package exist by itself
- Package should add value for others

Packages

A package is a formalized way of creating a distributable unit of software artifacts that can be consumed from another software solution.



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

Package Types:

Public: NuGet.org, Npmjs.org, PyPi.org, Docker Hub

Private: MyGet, Azure Container Registry, Azure Artifacts, Self-hosted solutions

Securing access to package feeds



Feeds have to be secured:

Private feeds

Not allow access by unauthorized users for publishing

Restricted access for consumption:

Whenever a package feed and its packages should only be consumed by a certain audience, it is required to restrict access to it. Only those allowed access will be able to consume the packages from the feed.

Restricted access for publishing:

Secure access is required to restrict who can publish, so feeds and their packages cannot be modified by unauthorized or untrusted persons and accounts.



Exam AZ-400 Exam Strategy

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Preparing for Online Testing

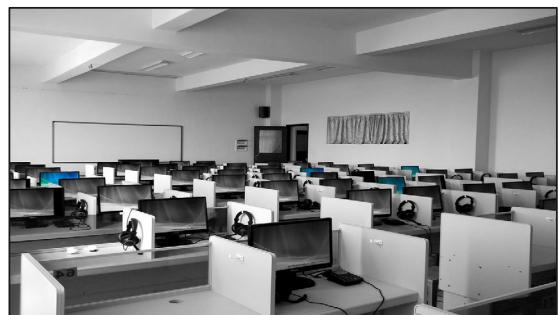


Tim's Online Testing Video

timw.info/online

Why Microsoft Online Testing?

- COVID means Pearson VUE physical testing centers are unavailable
- The Pearson OnVUE client has come a LONG way
- I'll use online testing exclusively from now on



Pearson OnVUE System Requirements

- Windows 10 / Windows 8.1
- macOS High Sierra (10.13)
- 4 GB RAM
- 1024x768/16 resolution
 - 1920x1080/32 recommended
 - Touchscreens are prohibited



Pearson OnVUE System Requirements

- 3 Mbps down/up network bandwidth
- Mobile hotspot tethering is prohibited
- Browsers:
 - IE 11, Edge, Chrome, Firefox, or Safari (latest versions)



Pearson OnVUE System Requirements

- Webcam: 640x480/10 fps
- Microphone: integrated
 - Headsets not allowed
- Corporate VPNs, firewalls, and proxies will likely disrupt the delivery
 - Check with networking team first



Your Pre-Exam Checklist

- Computer set up
 - Kill all tasks except for your browser
 - May need to use Task Manager or Activity Monitor
- Additional monitors turned off
- Mobile phone
- ID

During the Exam

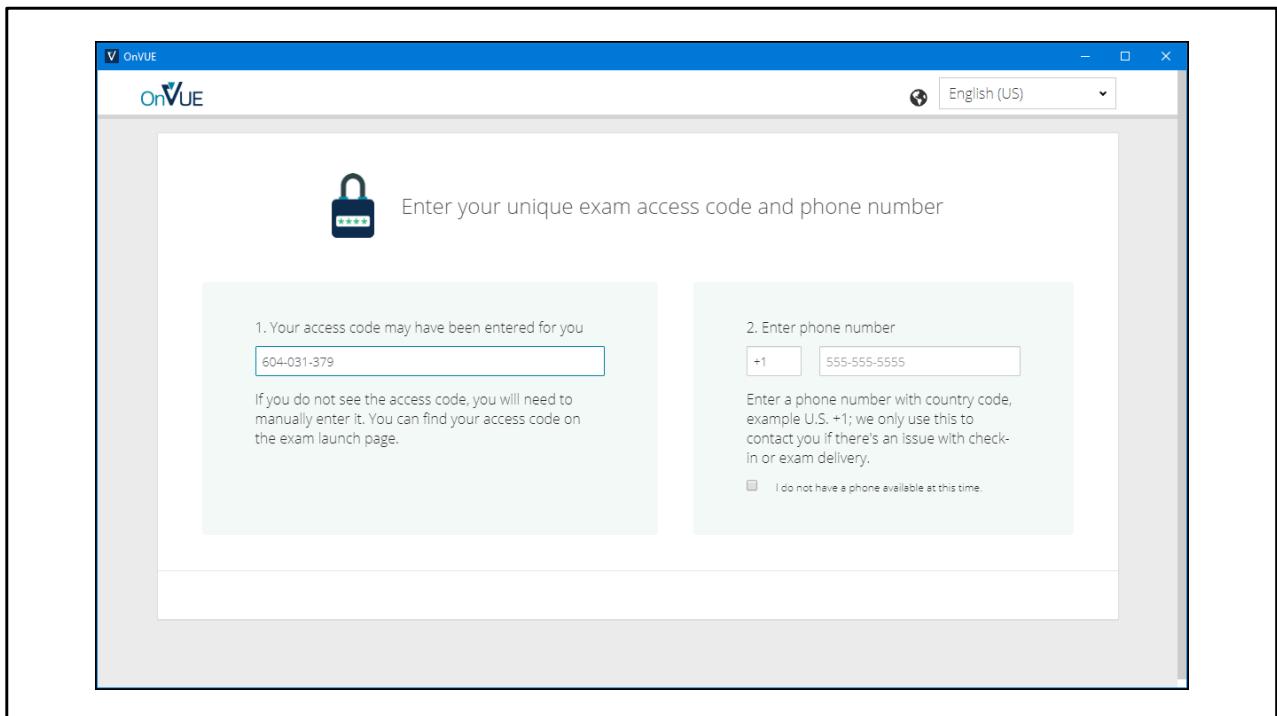
- Keep your face in the webcam frame
- Keep your hands away from your mouth
- Ensure you aren't interrupted
 - Walled room
 - Door closed
- No bio breaks are allowed

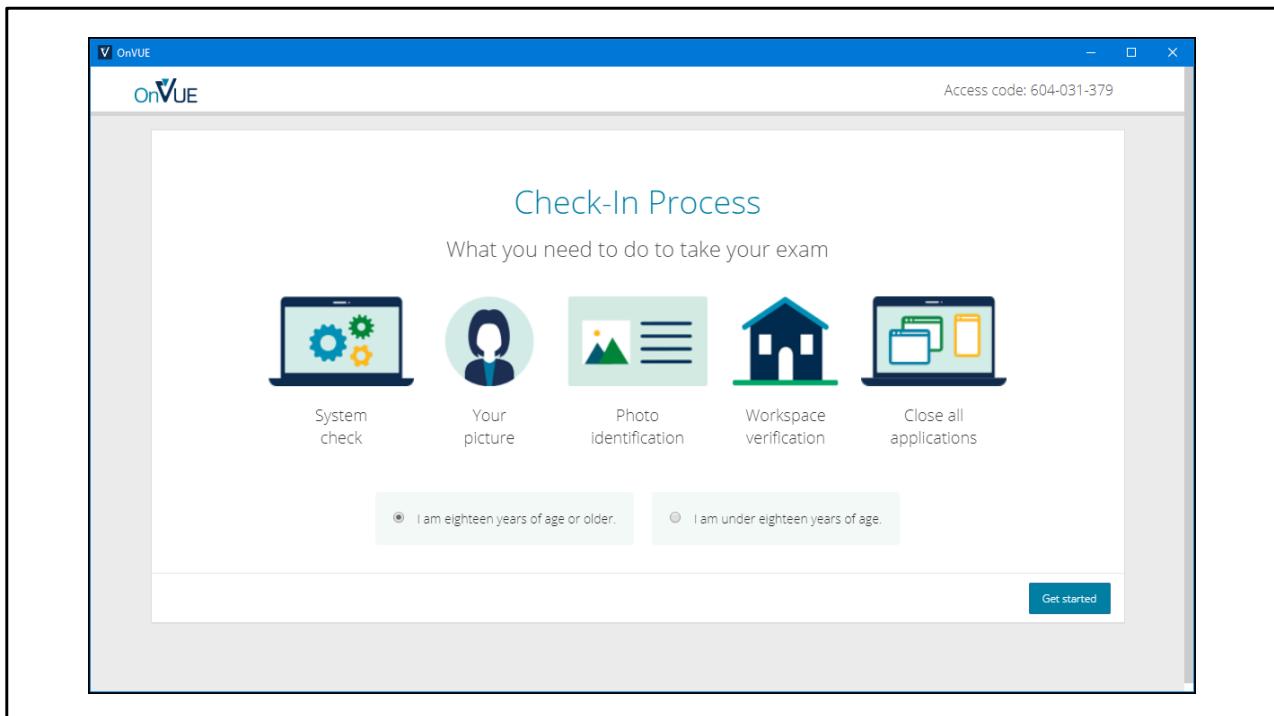
The screenshot shows the OnVUE System Test page. At the top left is the OnVUE logo. Below it, the title "System Test" is displayed. Three numbered steps are listed:

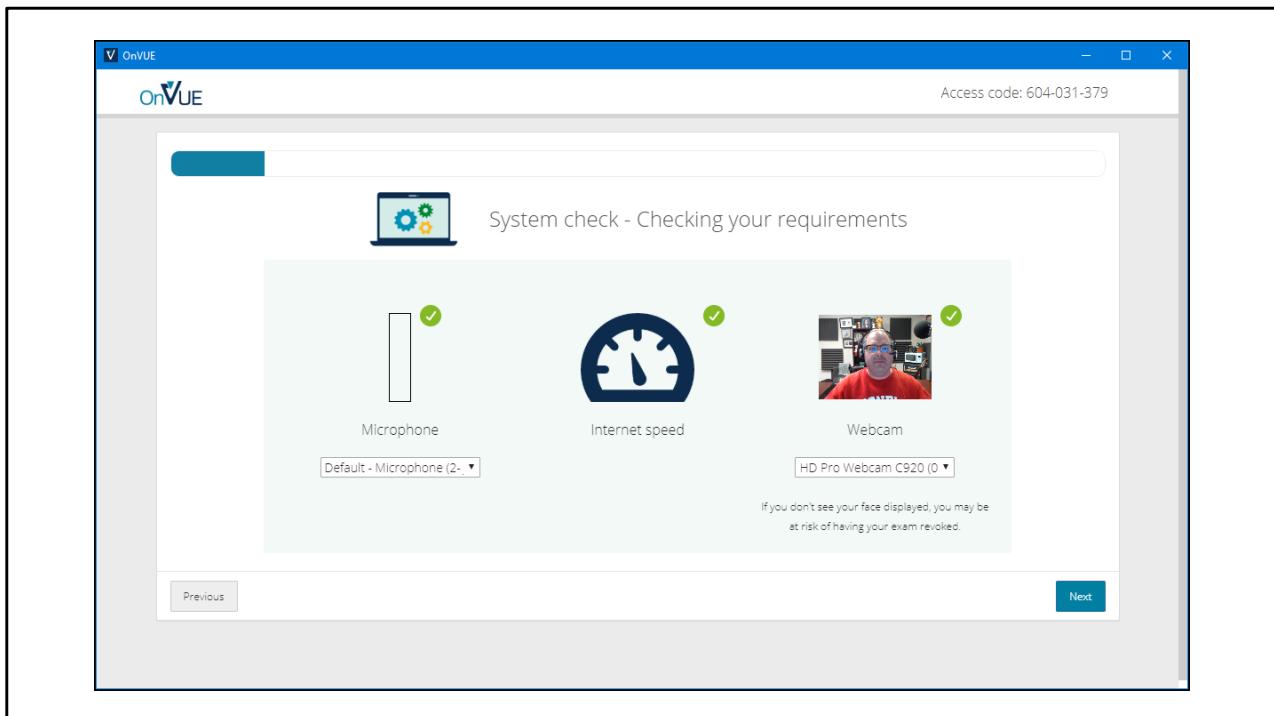
- 1** Check this box to confirm you are using the computer and location that you will be testing from on exam day.
- 2** Click on the "Copy Access Code" button below. This will automatically enter your access code into OnVUE once it is running. This access code will authorize you to start the exam check-in process.
604-031-379 Copy Access Code
- 3** Click "Download" and then run the application. This will ensure you are running the most up to date version of OnVUE.
Alert! Mac users, if prompted, will need to allow OnVUE within their 'System Preferences: Security & Privacy: Privacy' settings for Microphone, Camera, Automation, and Input Monitoring.
Download

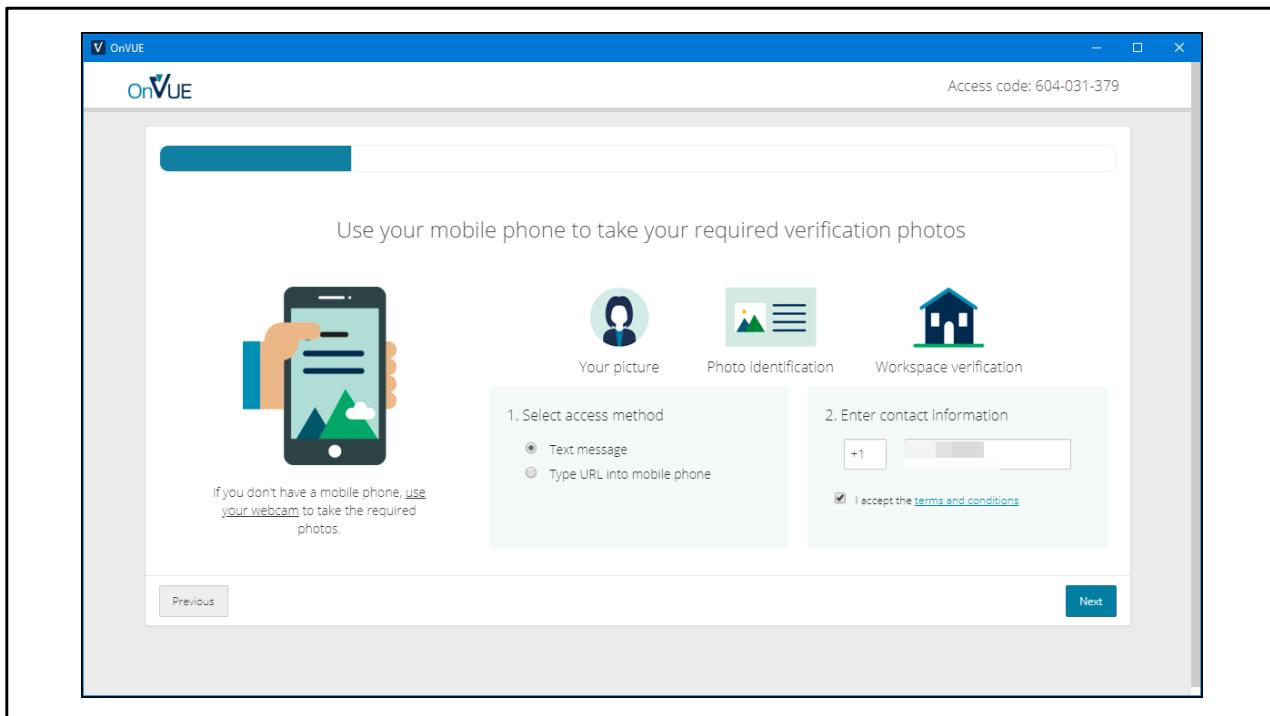
A horizontal line with the Japanese text "以下の日本語の説明は、ここをクリックするか、下にスクロールしてください" (Click here to read the Japanese instructions or scroll down) follows.

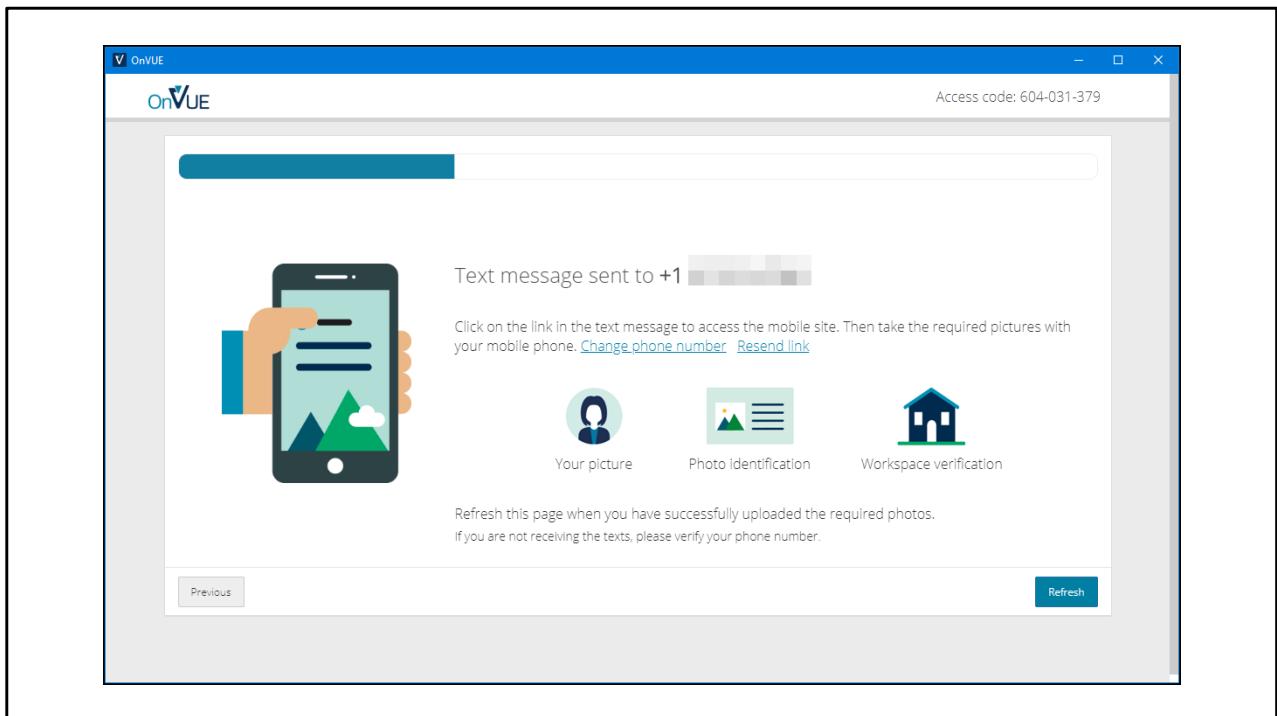
At the bottom right of the main content area, the text "© Pearson PLC 2020" is visible.

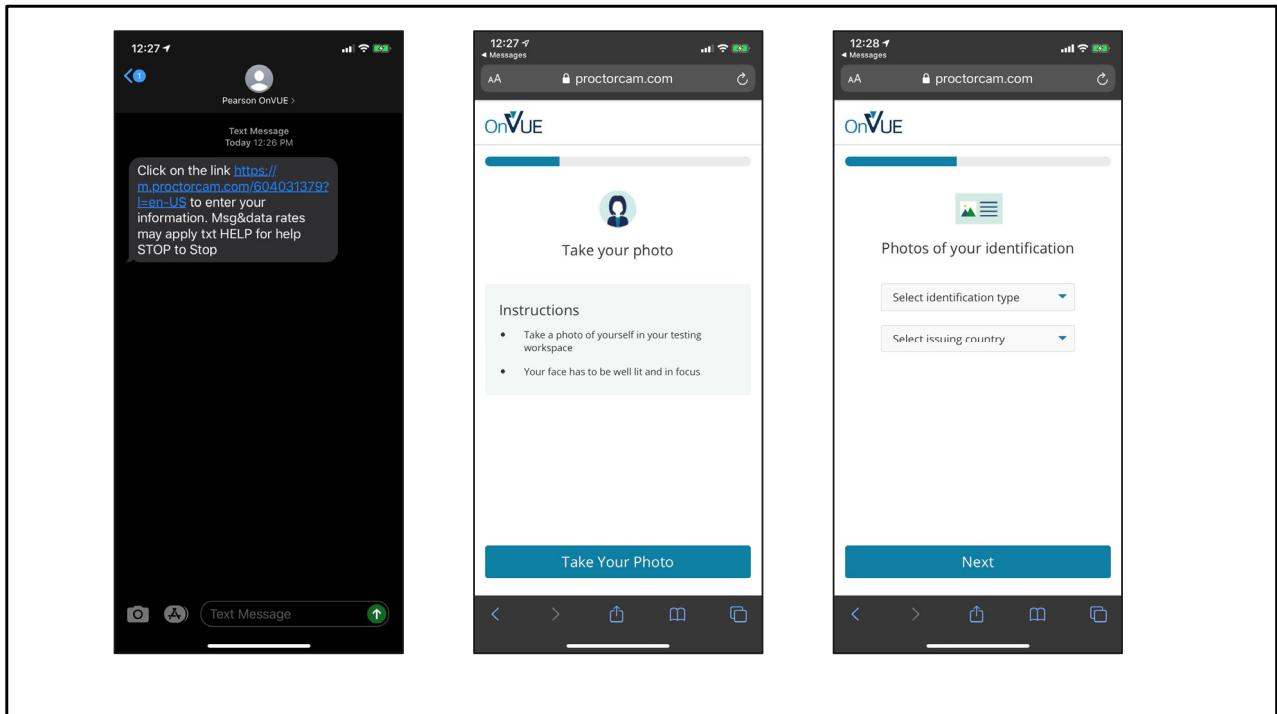


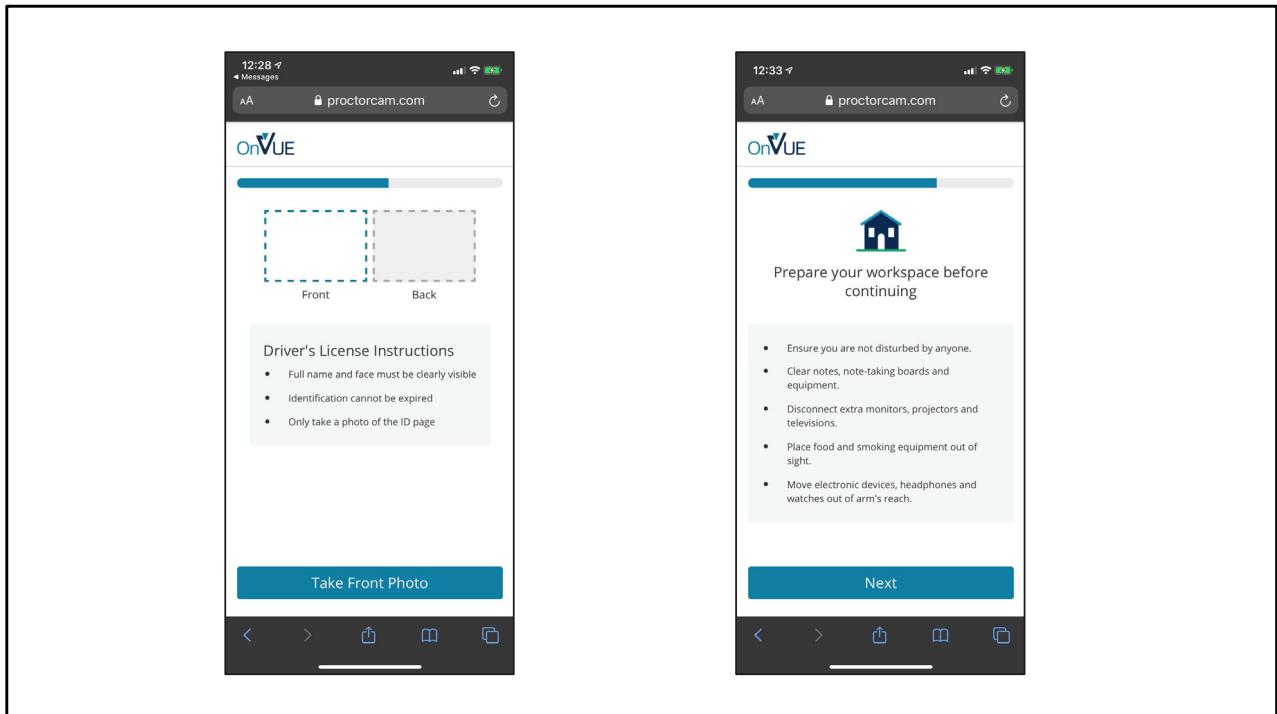


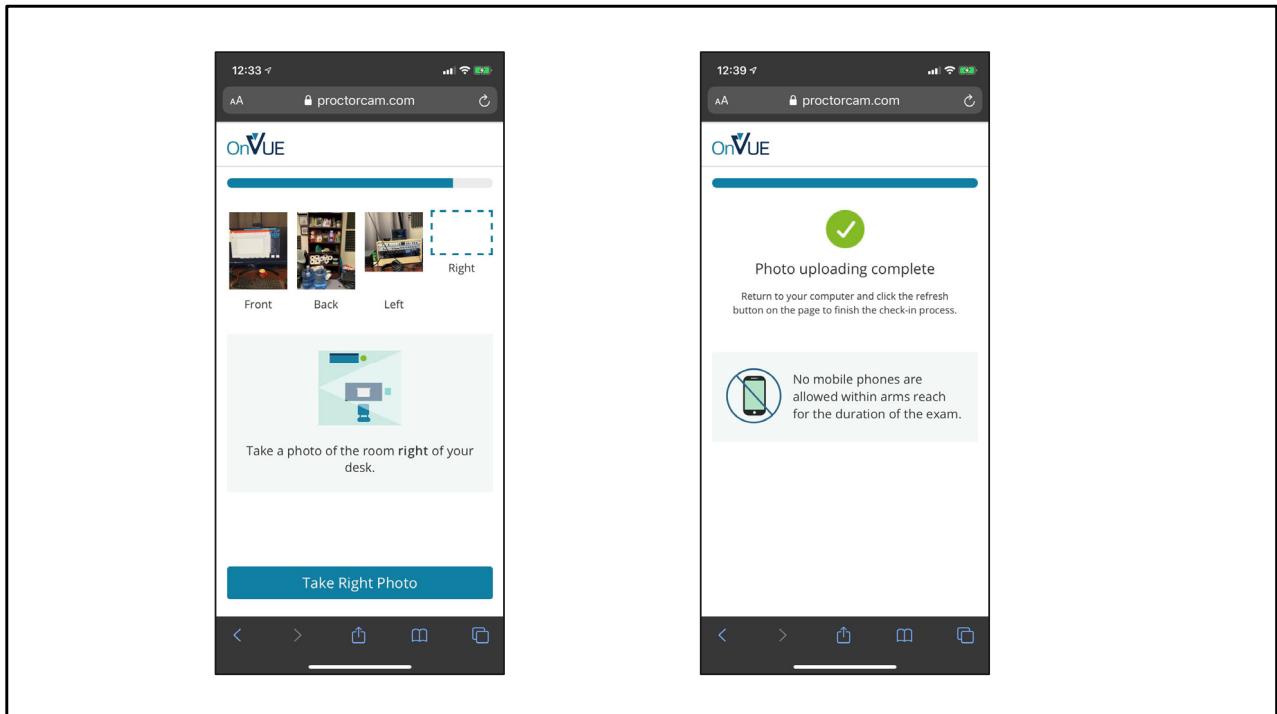


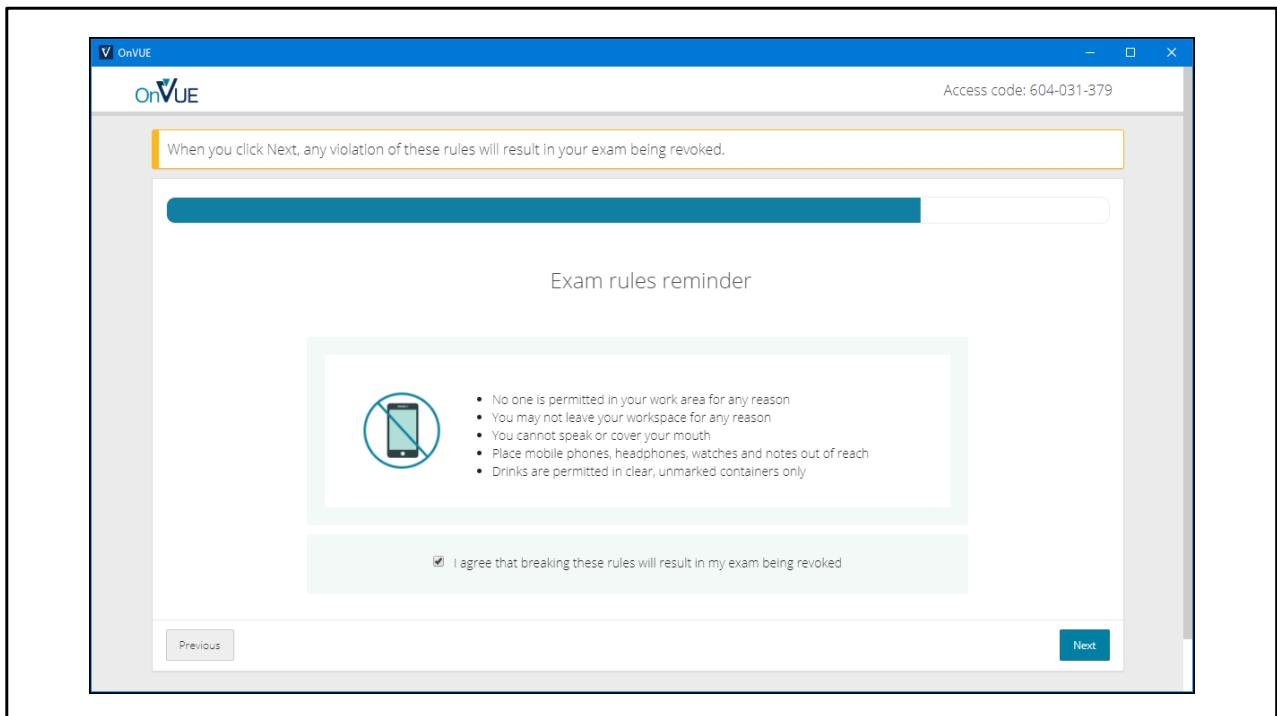


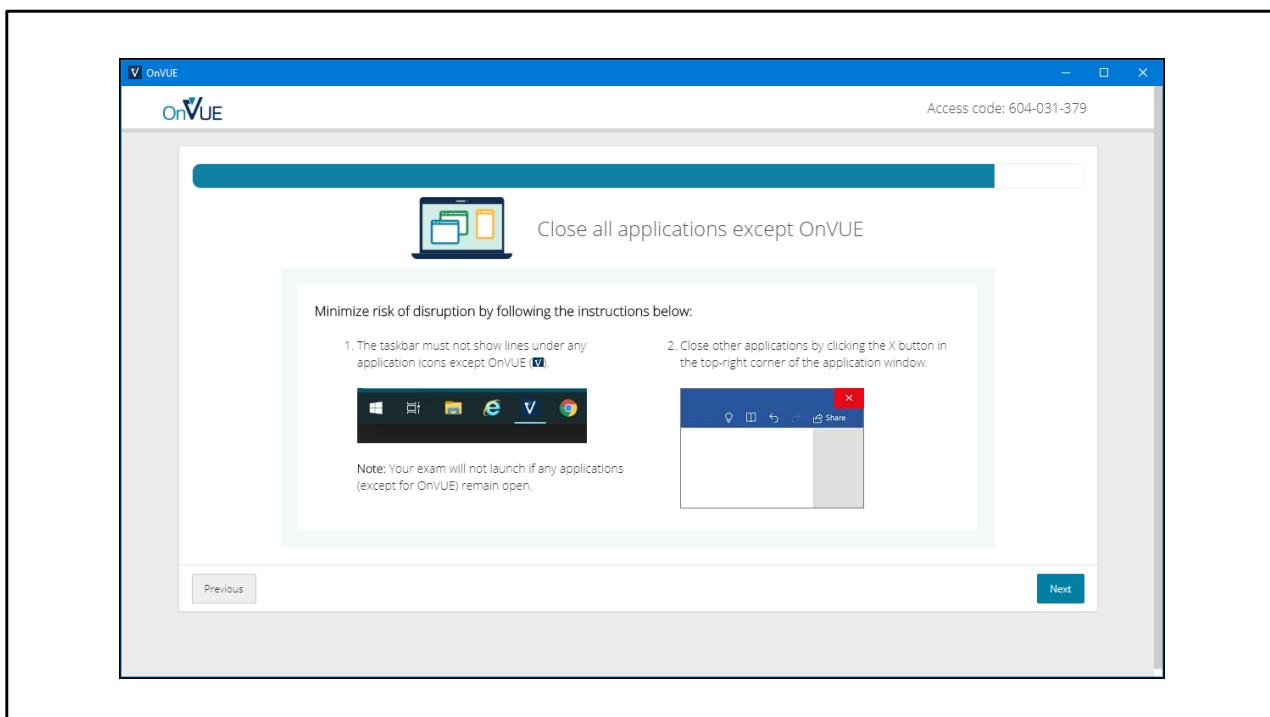


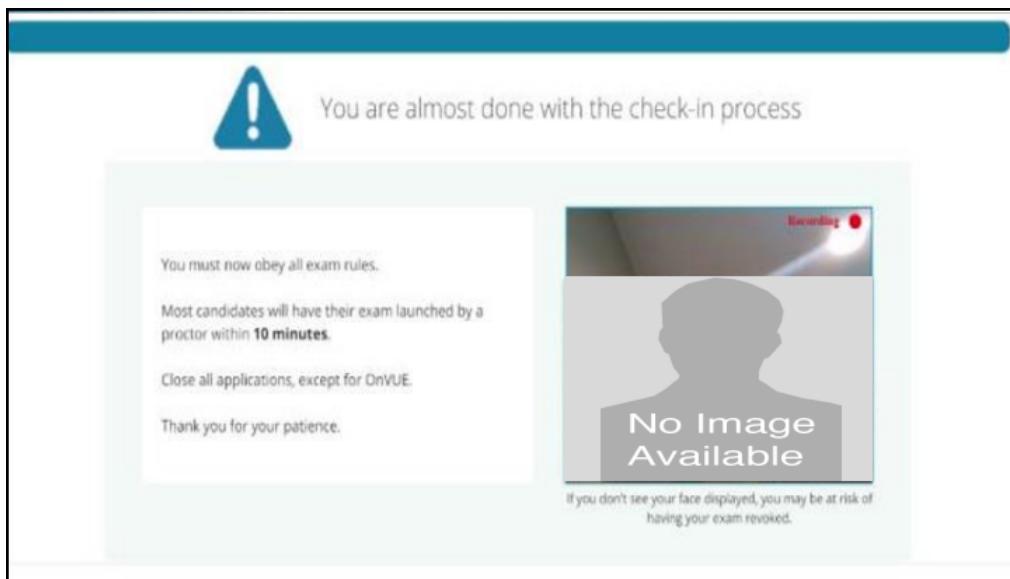












AZ-400 Exam Tips

- Expect to see a lot of JSON, PowerShell, and Azure 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

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.

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Question 3 of 7

You have a computer that runs Windows 7.

You start the computer and receive the following error message:

BOOTMGR is missing
Press Ctrl+Alt+Del to restart

You then start the computer from the Windows 7 installation media.

You need to ensure that the computer successfully starts Windows 7.

What are two possible ways to achieve this goal? (Each correct answer presents a complete solution. Choose two.)

- A. Run Startup Repair.
- B. Run System Restore.
- C. Run **Bootrec /RebuildBcd**.
- D. Run **Bcdedit /createstore**.

Reset(T)

Instructions(I)

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

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

Solution: You restart 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.

The screenshot shows a user interface for recovering deleted SharePoint content. On the left, a vertical list of tools includes "Microsoft SQL Server backups", "Recycle Bin", and "Windows Server Backups". The "Windows Server Backups" item is highlighted with a blue selection bar. On the right, a grid of recovery tasks is shown:

Recovery Task	Tool
Document libraries	Microsoft SQL Server backups
SharePoint Site groups	Recycle Bin
SharePoint Designer workflows	Resources

At the bottom of the interface, there are navigation buttons: Help, Calculator, Color scheme, Reset, Previous, and Next.

 Question 4 (of 5)

Time remaining 01:56:12

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.

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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.](#)

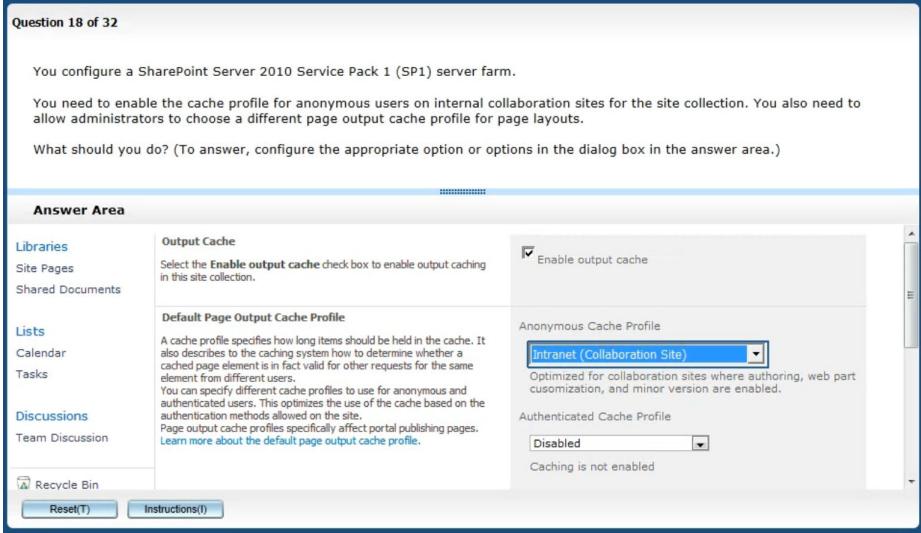
Anonymous Cache Profile
Intranet (Collaboration Site)

Optimized for collaboration sites where authoring, web part customization, 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

