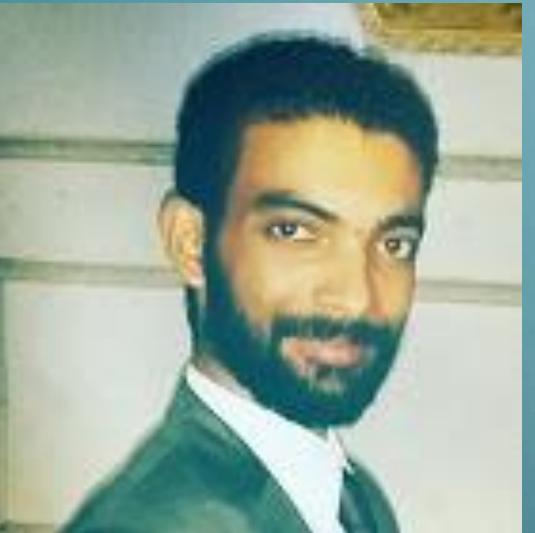
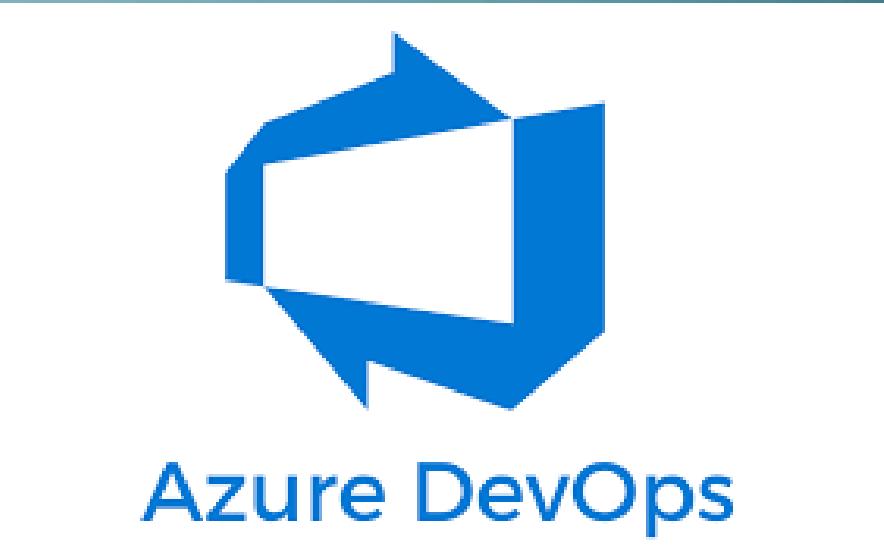


AZ-400 AZURE DEVOPS



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saleh.elnaggar@gmail.com

AZ-400 AZURE DEVOPS

- COURSE STRUCTURED
- WHAT IS DEVOPS?
- SOURCE CONTROL AND VERSION CONTROL
- CONTINUOUS INTEGRATION
- CONTINUOUS DELIVERY
- IMPLEMENTING INFRASTRUCTURE

About the certificate

Certification details

Complete one prerequisite



PREREQUISITE OPTION 1

Microsoft Certified: Azure
Administrator Associate

OR



PREREQUISITE OPTION 2

Microsoft Certified: Azure
Developer Associate

Take one exam



CERTIFICATION EXAM

Designing and Implementing
Microsoft DevOps Solutions

Earn the certification



EXPERT CERTIFICATION

Microsoft Certified: DevOps
Engineer Expert

Pre-requisite “requirement”

Familiar with Azure common services “Azure vm, vmss, azure web apps”

Simple knowledge on any development framework

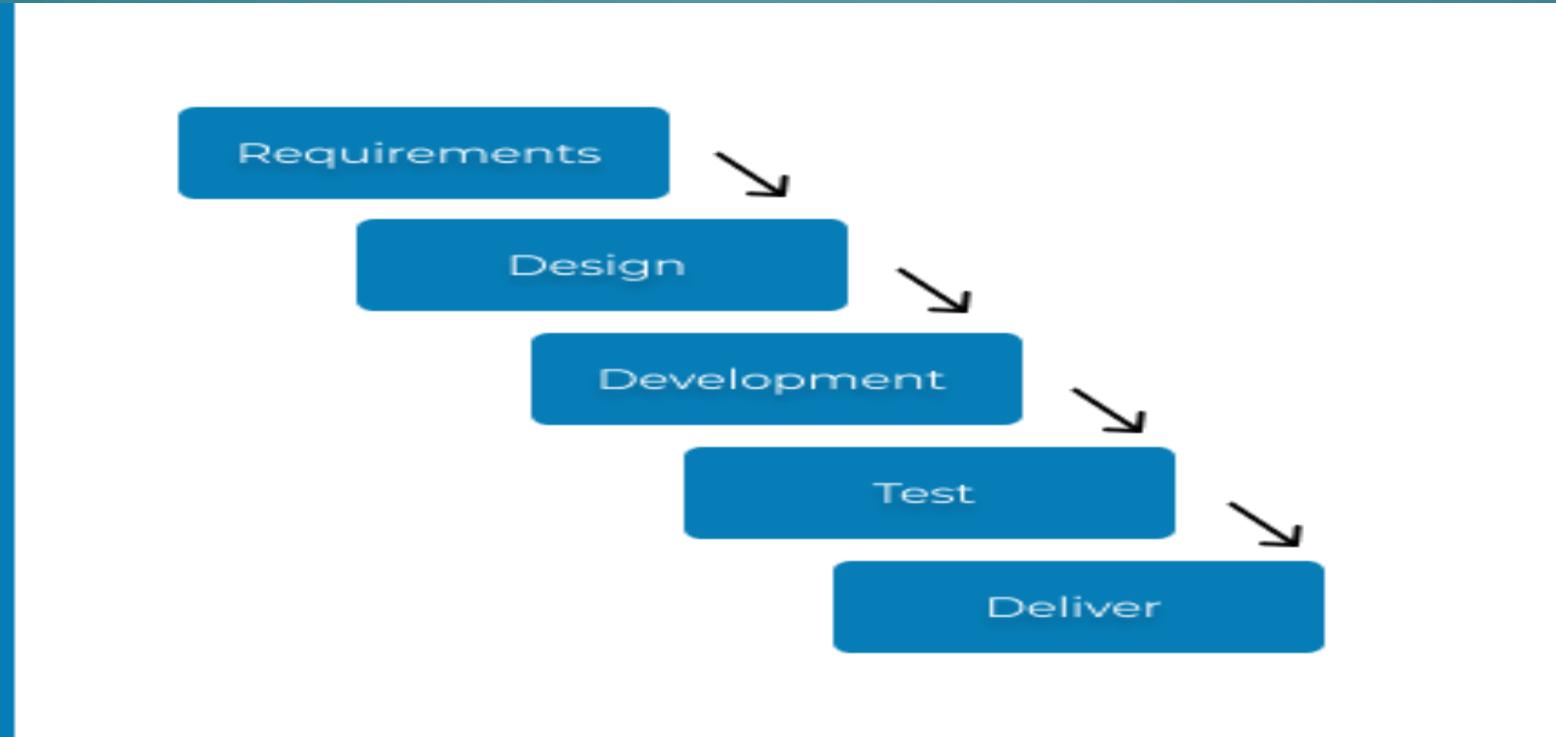
Knowledge on how applications are deployed

What do you need?

- An Azure account with Azure subscription
- An Azure DevOps account – easy to create

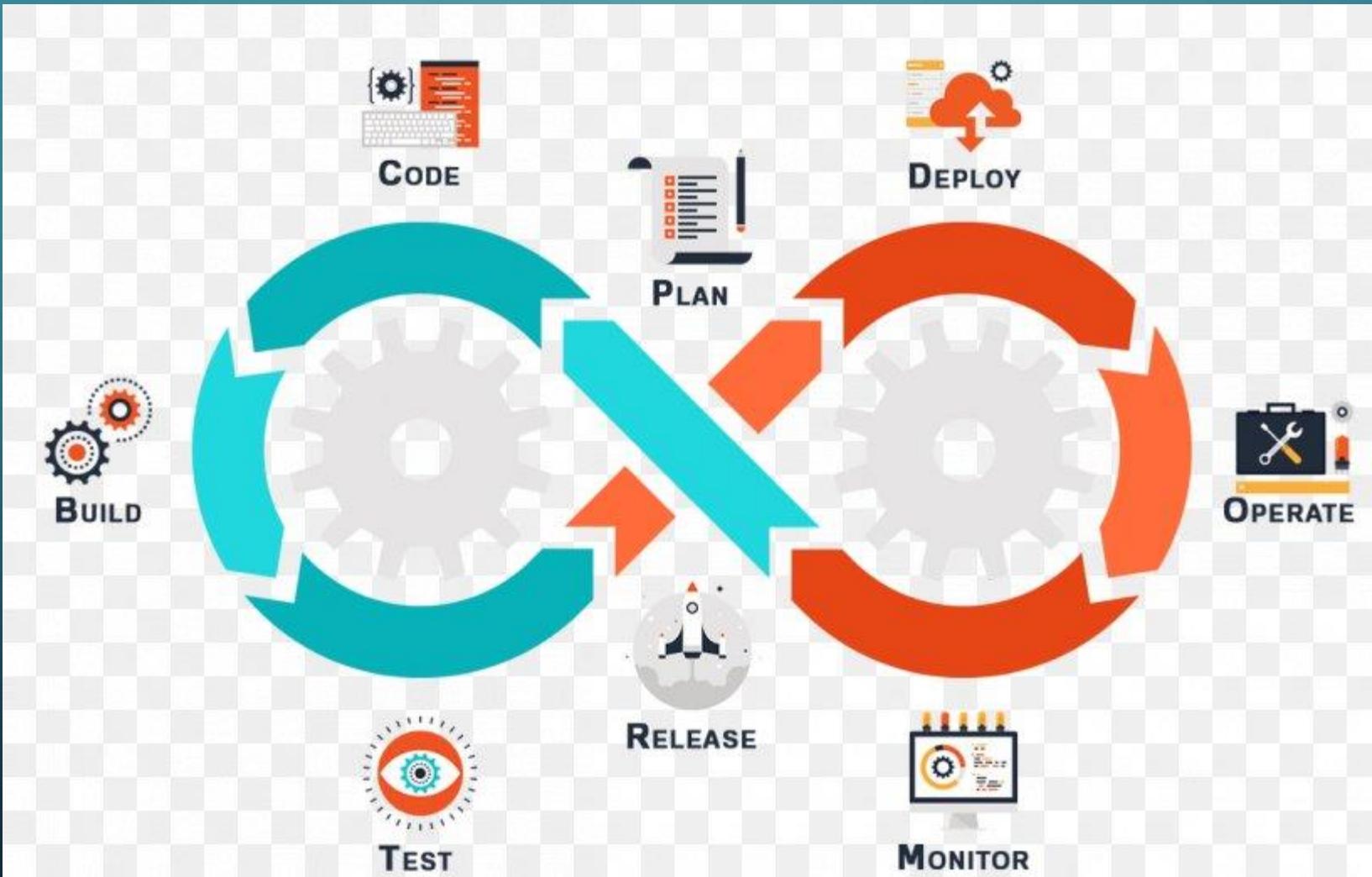
Before DevOps concept

- Traditional Project lifecycle



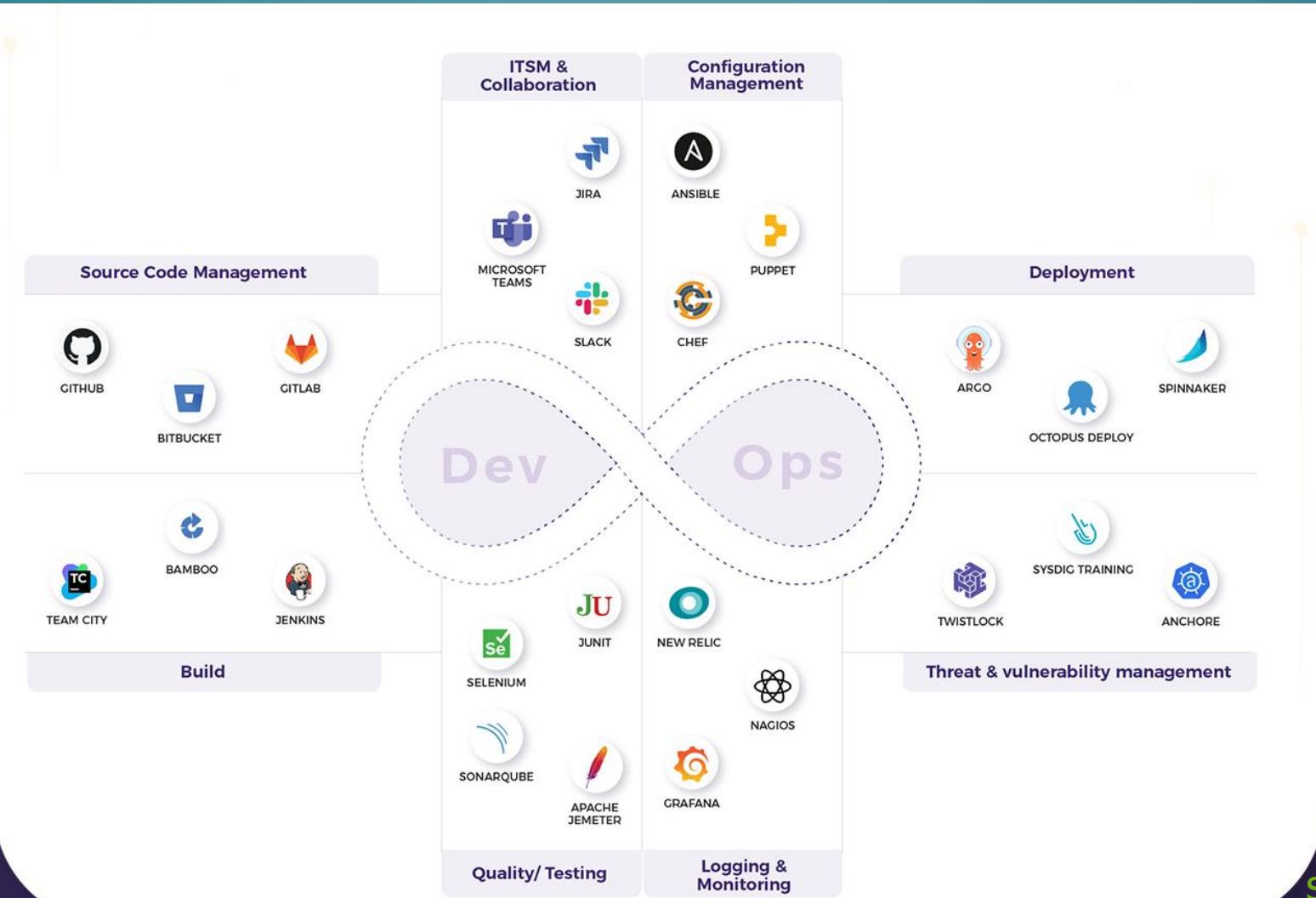
Why DevOps?

- Agile Project lifecycle



Why DevOps?

- DevOps tools



Azure DevOps tools



Azure Boards

Plan, track, and discuss work across teams, deliver value to your users faster.



Azure Repos

Unlimited cloud-hosted private Git repos. Collaborative pull requests, advanced file management, and more.



Azure Pipelines

CI/CD that works with any language, platform, and cloud. Connect to GitHub or any Git provider and deploy continuously to any cloud.



Azure Test Plans

The test management and exploratory testing toolkit that lets you ship with confidence.



Azure Artifacts

Create, host, and share packages. Easily add artifacts to CI/CD pipelines.

Azure DevOps services pricing

Basic Plan



First 5 users free,
then \$6 per user per month

[Start free](#)

- **Azure Pipelines:** Includes the free offer from INDIVIDUAL SERVICES
- **Azure Boards:** Work item tracking and Kanban boards
- **Azure Repos:** Unlimited private Git repos
- **Azure Artifacts:** 2 GiB free per organization

First 5 users free

[more details](#)

Basic + Test Plans



\$52 per user
per month

[30 day free trial](#)

- Includes all Basic plan features
- Test planning, tracking & execution
- Browser-based tests with annotation
- Rich-client test execution
- User acceptance testing
- Centralized reporting

salehelnaggar.live

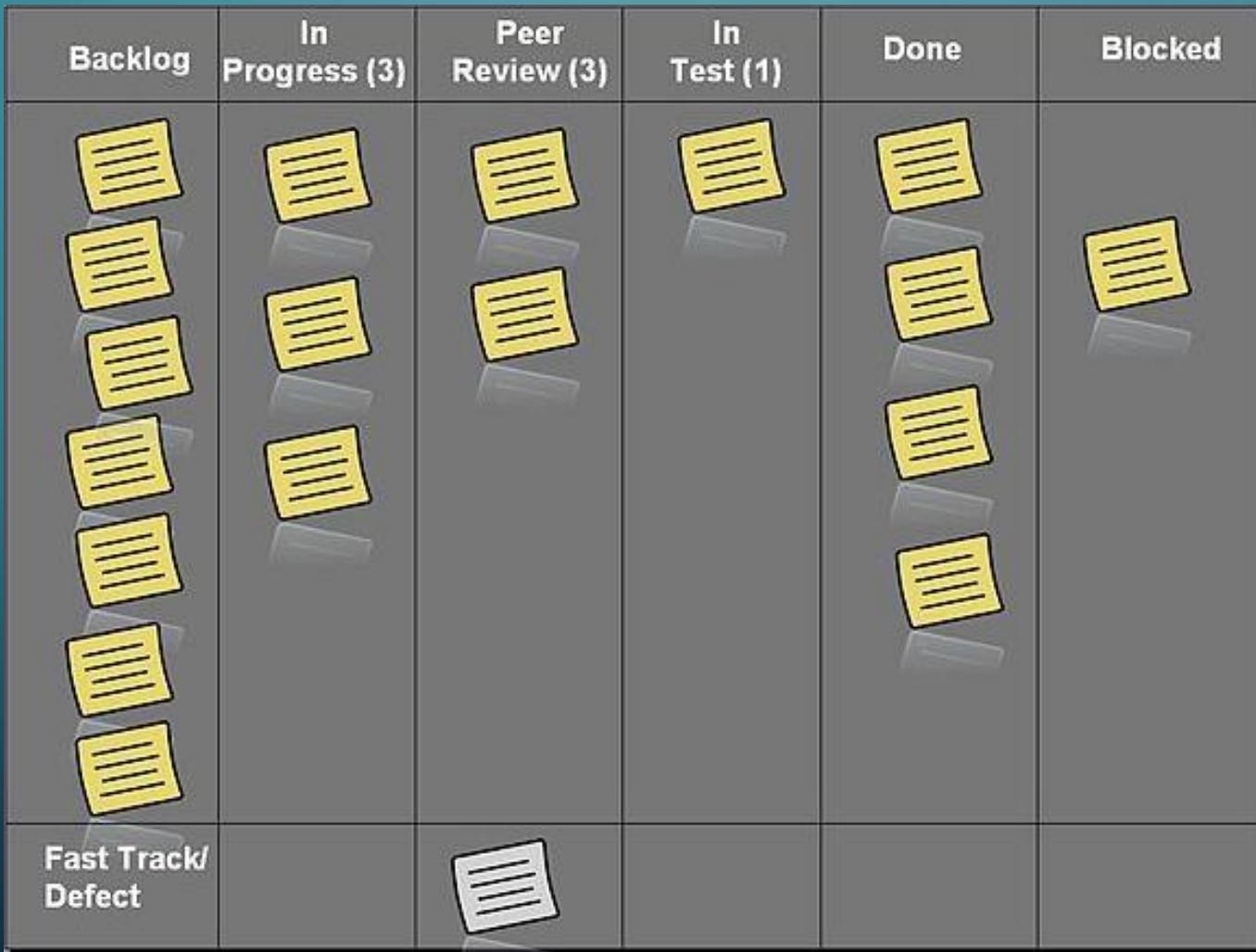
Azure Boards

PRODUCT BACKLOG



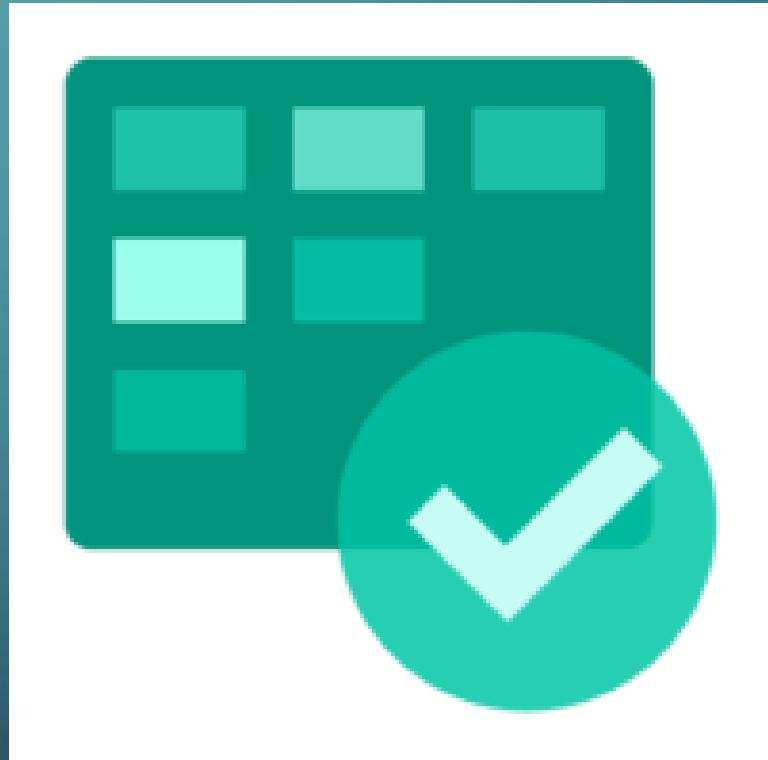
Azure Boards

- Sprint



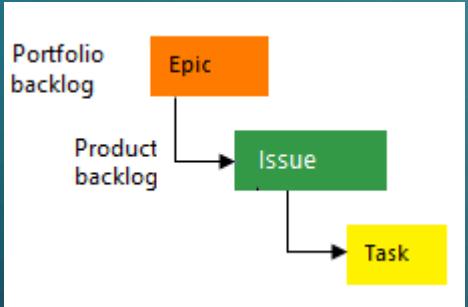
Azure Boards

Demo lab

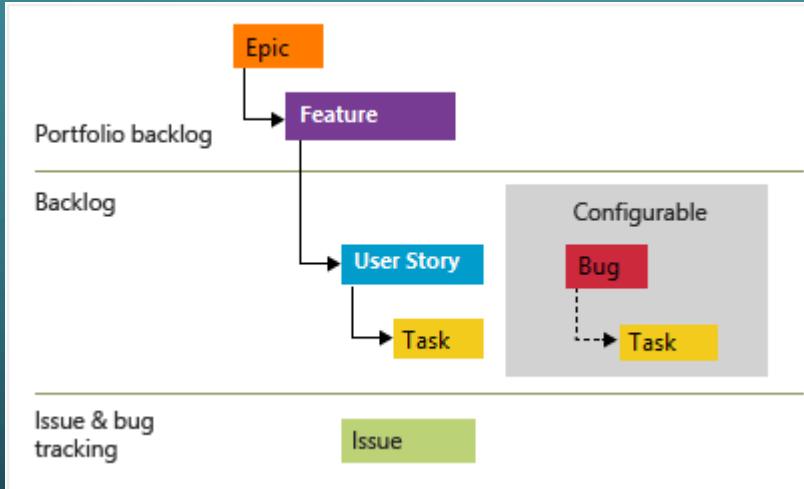


Azure Boards – Project types

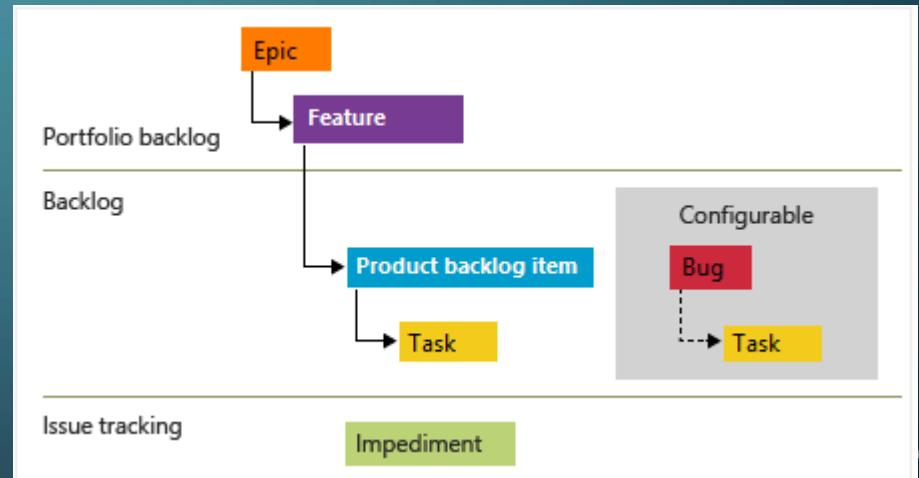
Basic



Agile



Scrum



[more details](#)

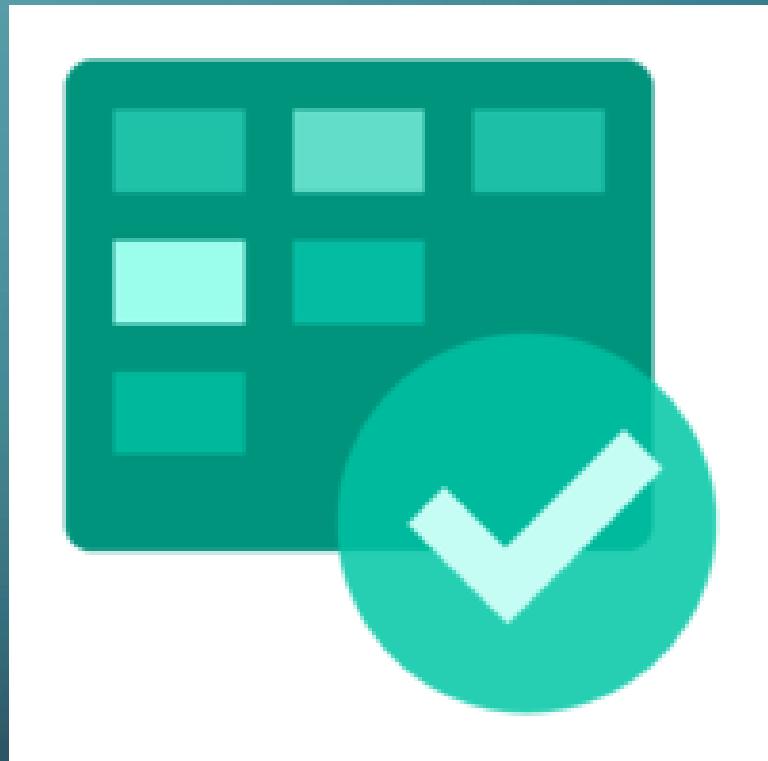
Azure Boards – use sprint

Demo lab



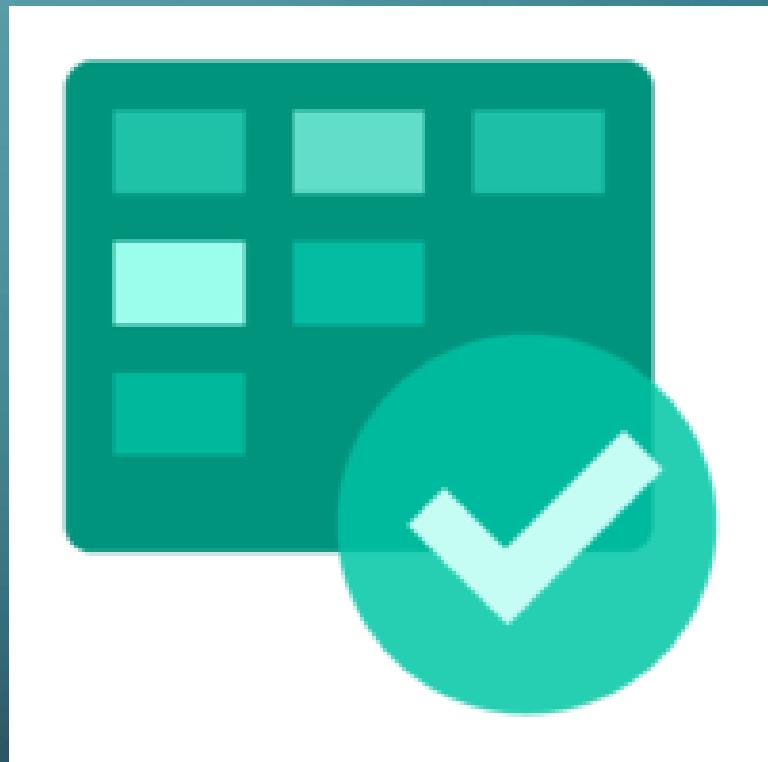
Azure Boards – integration with slack

Demo lab



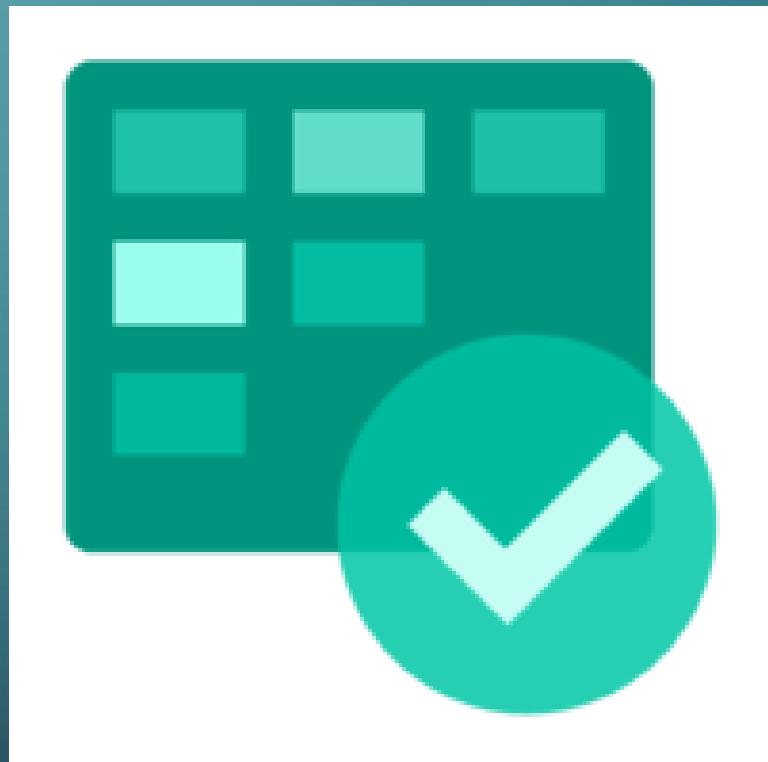
Azure Boards – Azure AD integration

Demo lab

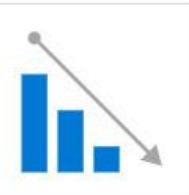


Azure Boards – add users to project

Demo lab



Azure Boards – different charts



Burndown

Displays burndown across multiple teams and multiple sprints. Create a release burndown or bug burndown.

Focus on the remaining work within the specified period of time



Burnup

Displays burnup across multiple teams and multiple sprints. Create a release burnup or bug burnup.

Focuses on the completed work



Chart for Work Items

Visualize work items like bugs, user stories, and features using shared work item queries.

Are we on track to complete the set of work by the end date

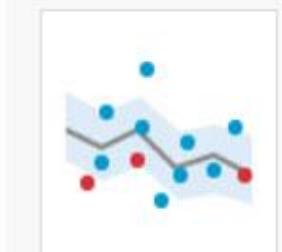


Cumulative Flow Diagram (CFD)

Visualize the flow of work and identify bottlenecks in the software development process.

This helps to see the items as they move through the different states

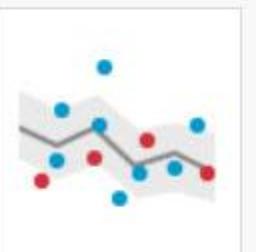
Azure Boards – different charts



Cycle Time

Visualize and analyze your team's cycle time using a control chart.

Measures the time taken for the team to complete work items once they have begun actively working on them



Lead Time

Visualize and analyze your team's lead time using a control chart.

Measures the total time elapsed from the creation of work items to their completion

Source code tool – version control

- What is Git?
- Azure repos



Source code tool – version control

- Version control categories:
 - Centralized system
 - Subversion control
 - Team foundation
 - Decentralized system
 - git

Source code tool – version control

- Version control categories:

- Centralized system
 - Subversion control
 - Team foundation



Source code tool – version control

- Decentralized system
 - git

	Git Version 1	Git Version 2
FileA	Version 1	Version 1
FileB	Version 1	Version 2
FileC	Version 1	Version 2

Git

Demo lab

1. Install git.
2. Initialize an empty repository.
3. Playing with git locally.



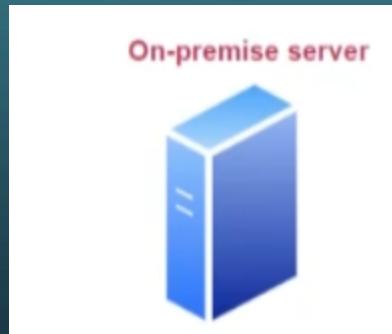
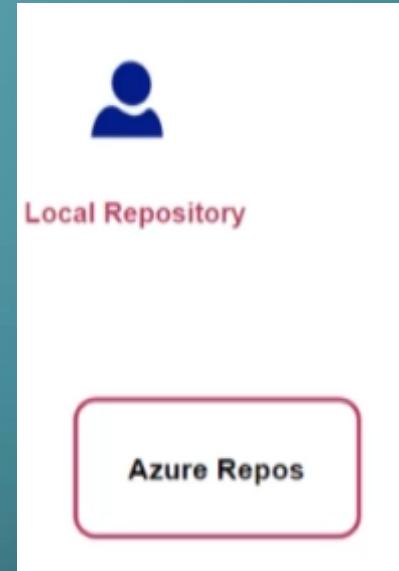
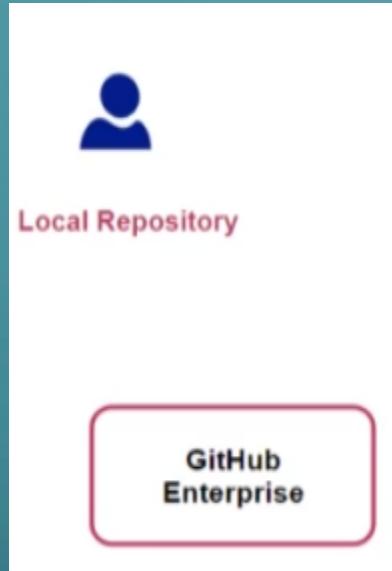
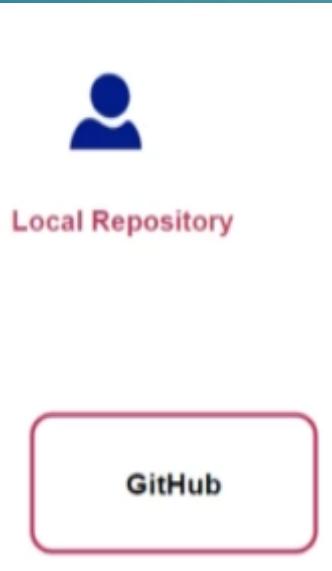
Git

Demo lab

1. Making changes to your files
2. Go back to previous commit.



Central git repository



Using GitHub

Demo lab

1. Create new repo
2. Add remote repo to local repo.



Using GitHub

Demo lab

1. Make changes on repo locally
2. See the different pointers.
3. Check it in the remote repo.



Azure Repos

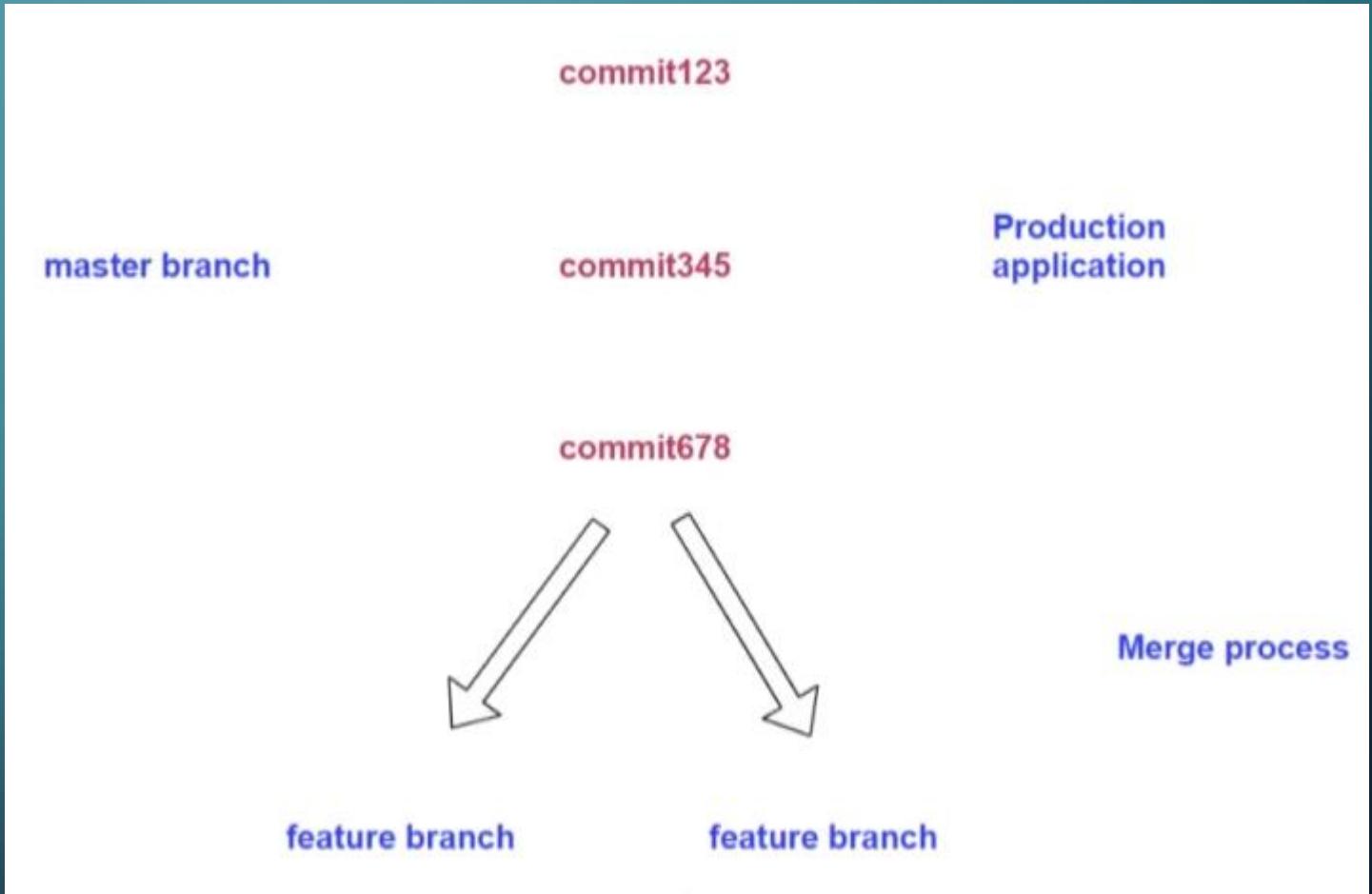
Demo lab

1. Check the default repo.
2. Create new repo.
3. Add Azure repo to local repo.
4. Make changes locally and push it.



Understanding branches

- Good practices:
 - Create many short feature branches
 - Delete once they are not required.



Branches

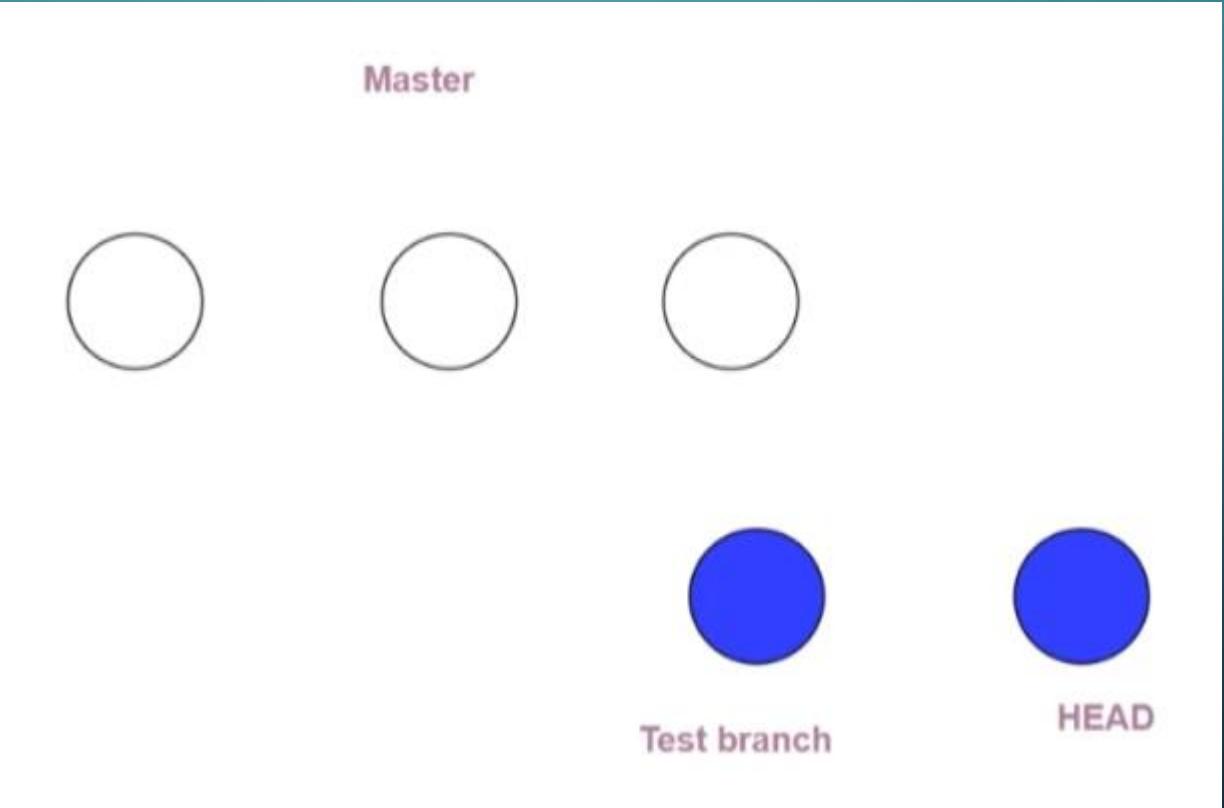
Demo lab

1. Show all branches.
2. Create new branch.
3. Work with the new branch.



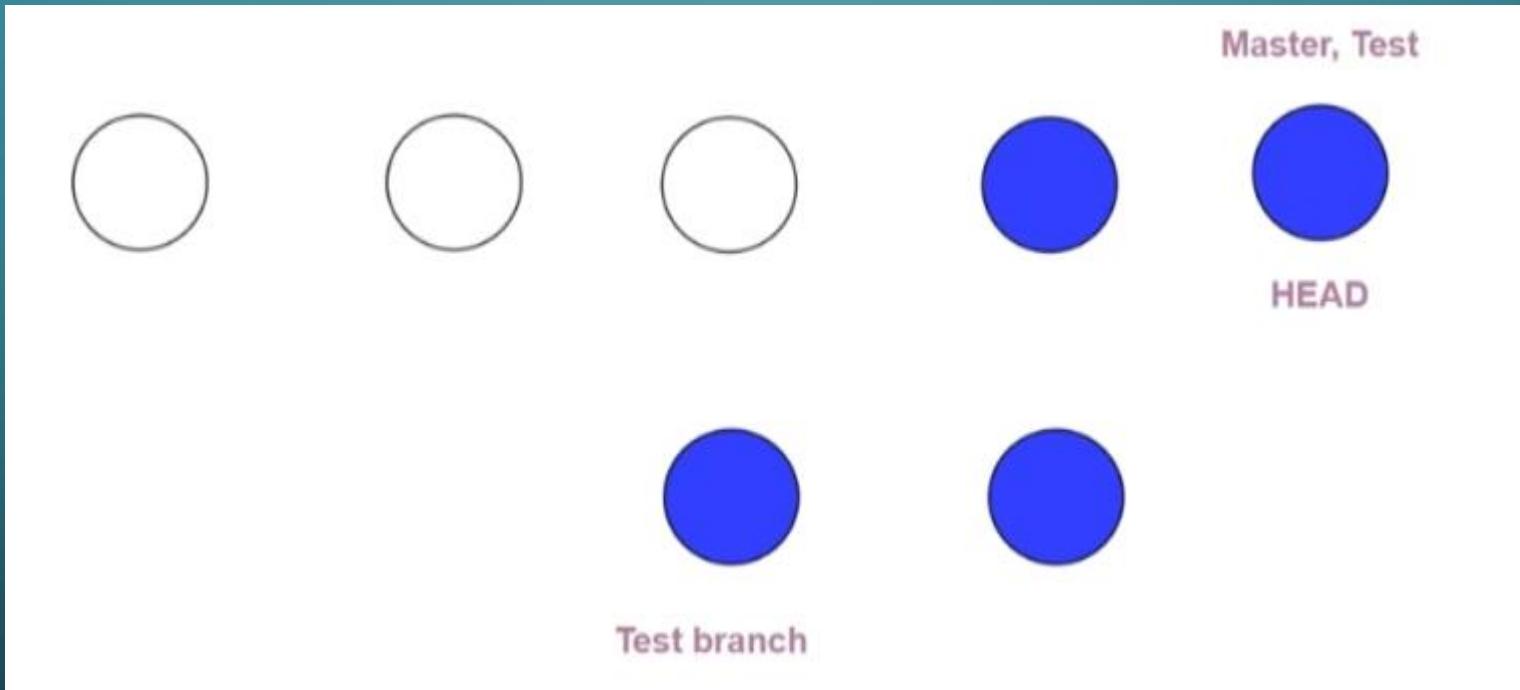
Merges in git

Implicit Merge “Fast forward merge”



Merges in git

Implicit Merge “Fast forward merge”



Fast forward merge

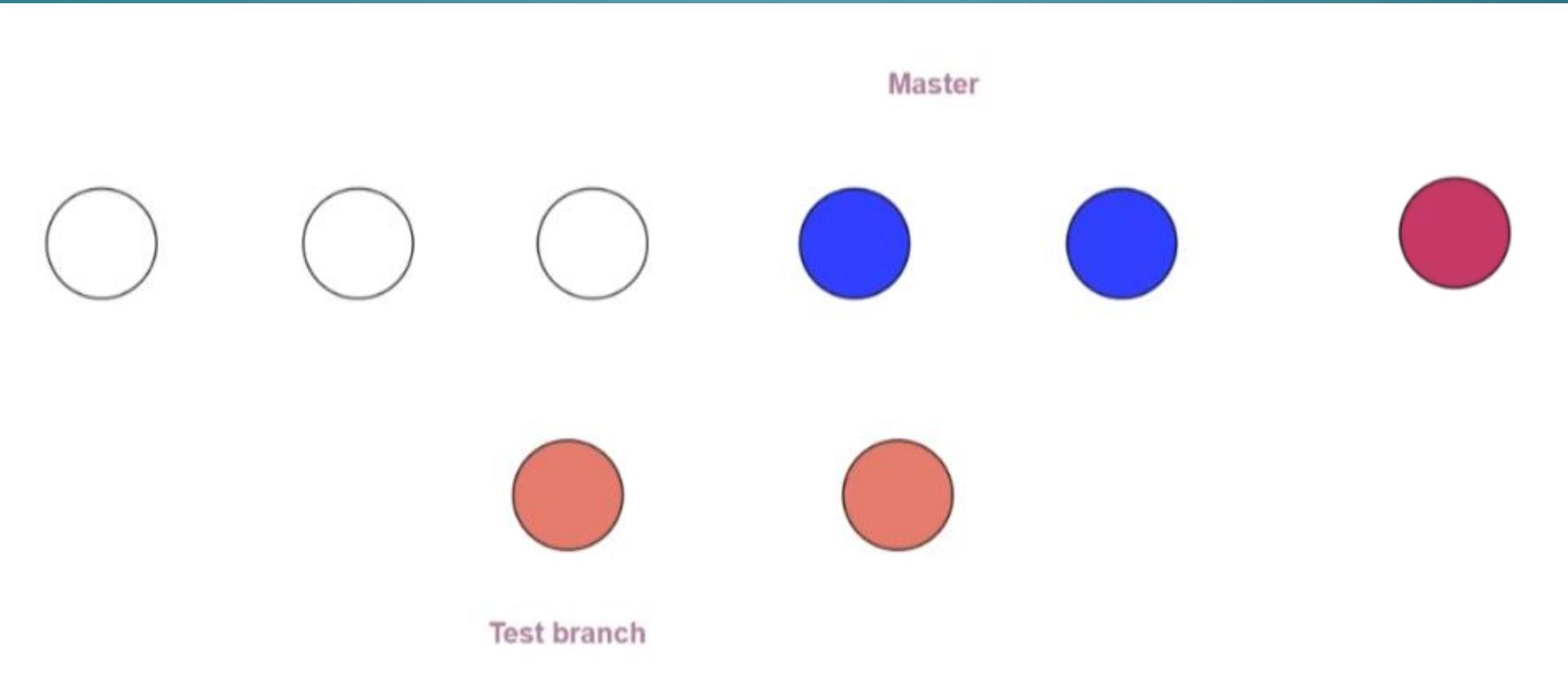
Demo lab

1. Do fast forward merge
2. Check the pointer



Merges in git

Recursive merge “3-way merge”



Recursive merge

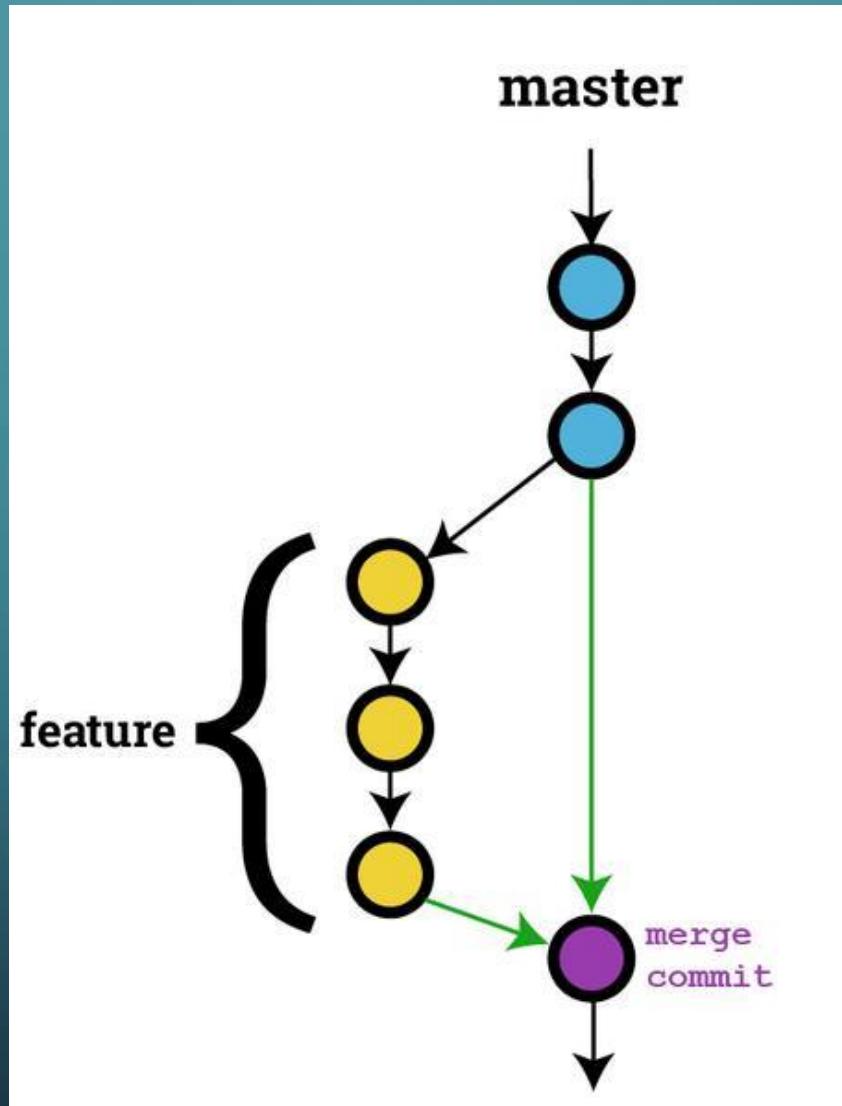
Demo lab

1. Make changes in the main.
2. Add new file to feature branches.
3. Try to do merge “recursive merge”.



Merges in git

Squash merge



Squash merge

Demo lab

1. Make more than two commit in the feature.
2. Try to do merge “squash merge”.



Conflict in the merge

Demo lab

1. Make changes in the main.
2. Make changes in the feature.
3. Try to make merge.
4. Solve the conflict.
5. How to avoid that in the real live?



Pushing branches

Demo lab

1. Check the repo branches
2. Use the git push command “push the main”
3. Check again your branches.
4. Push the new branch also.
 1. `git push --all origin`
 2. `git push --u origin feature`



Pull requests



Pull request

Demo lab

1. Enable any of branch policies
2. Make changes in the new branch
3. Merge to main locally
4. Try to push to main branch
5. Go to pull requests
 1. Create new pull request
 2. Approve and complete reviewing the changes



Pulling changes from the repo

Demo lab

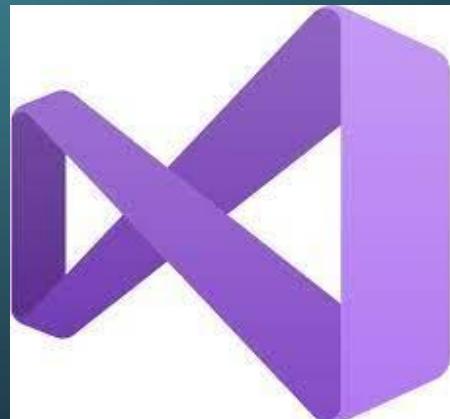
1. Make change in the remote repo.
2. If the developer in the local git try to push after some modification in the same file!
3. His push will rejected.
4. Need to make pull first from the remote repo.



GitHub with Visual Studio

Demo lab

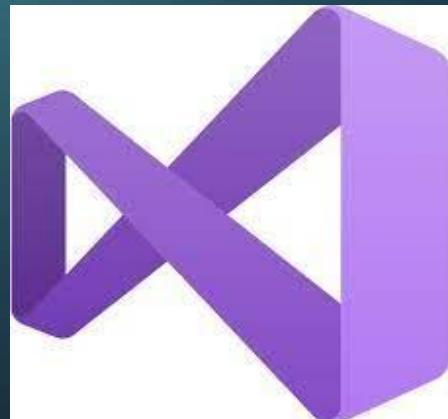
1. Create new .NET core project.
2. Make sure that the source control in your VS is git.
3. Create new GitHub repo.
4. Make changes on the code and commit and push it.
5. Check the changes on GitHub.



Azure repos with Visual Studio

Demo lab

1. Create new .NET core project.
2. Make sure that the source control in your VS is git
3. Add Azure repo to your project.
4. Push the code to Azure repo.
5. Make changes and check it remotely.



Git – .gitignore file

Demo lab

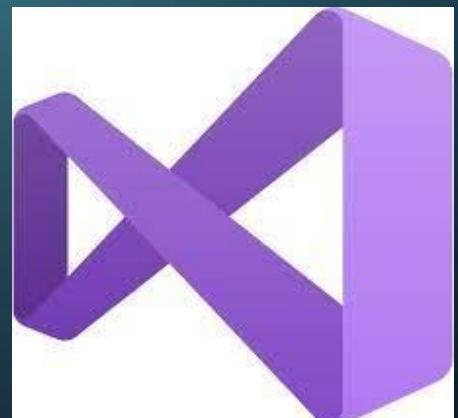
1. Make a new folder to try gitignore.
2. Create more than 3 files
3. Add which files you need to .gitignore
 1. Manually
 2. echo command “echo yourFile >> .gitignore”



Team foundation version control with Visual Studio

Demo lab

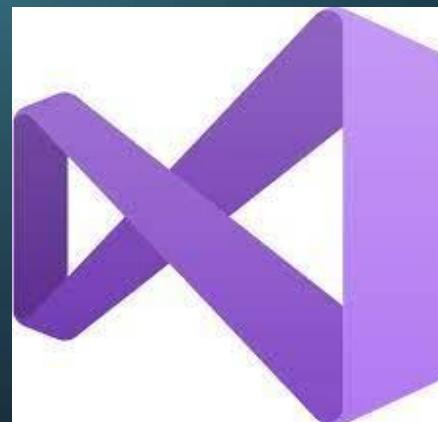
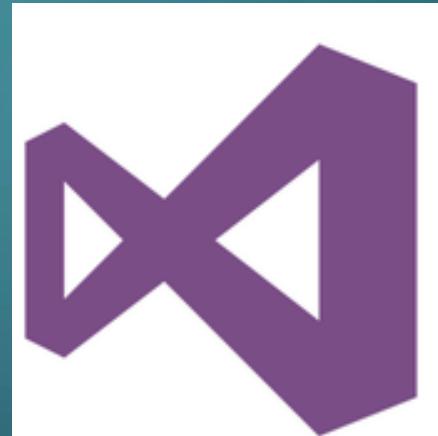
1. Create new repo with TFVC
2. Manage connection to browse your repos
3. Choose your TFVC repo and map & Get
4. Add your project to source control.
5. Check in your project to the TFVC repo.
6. Check out for edit and check in again.



Team foundation version control with Visual Studio

Demo lab

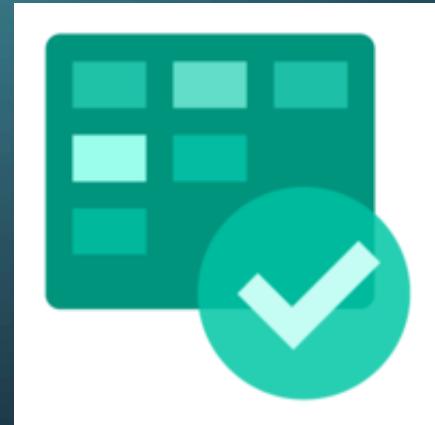
1. Create new repo with TFVC
2. Manage connection to browse your repos
3. Choose your TFVC repo and map & Get
4. Add your project to source control.
5. Check in your project to the TFVC repo.
6. Check out for edit and check in again.



Integration GitHub with Azure Boards

Demo lab

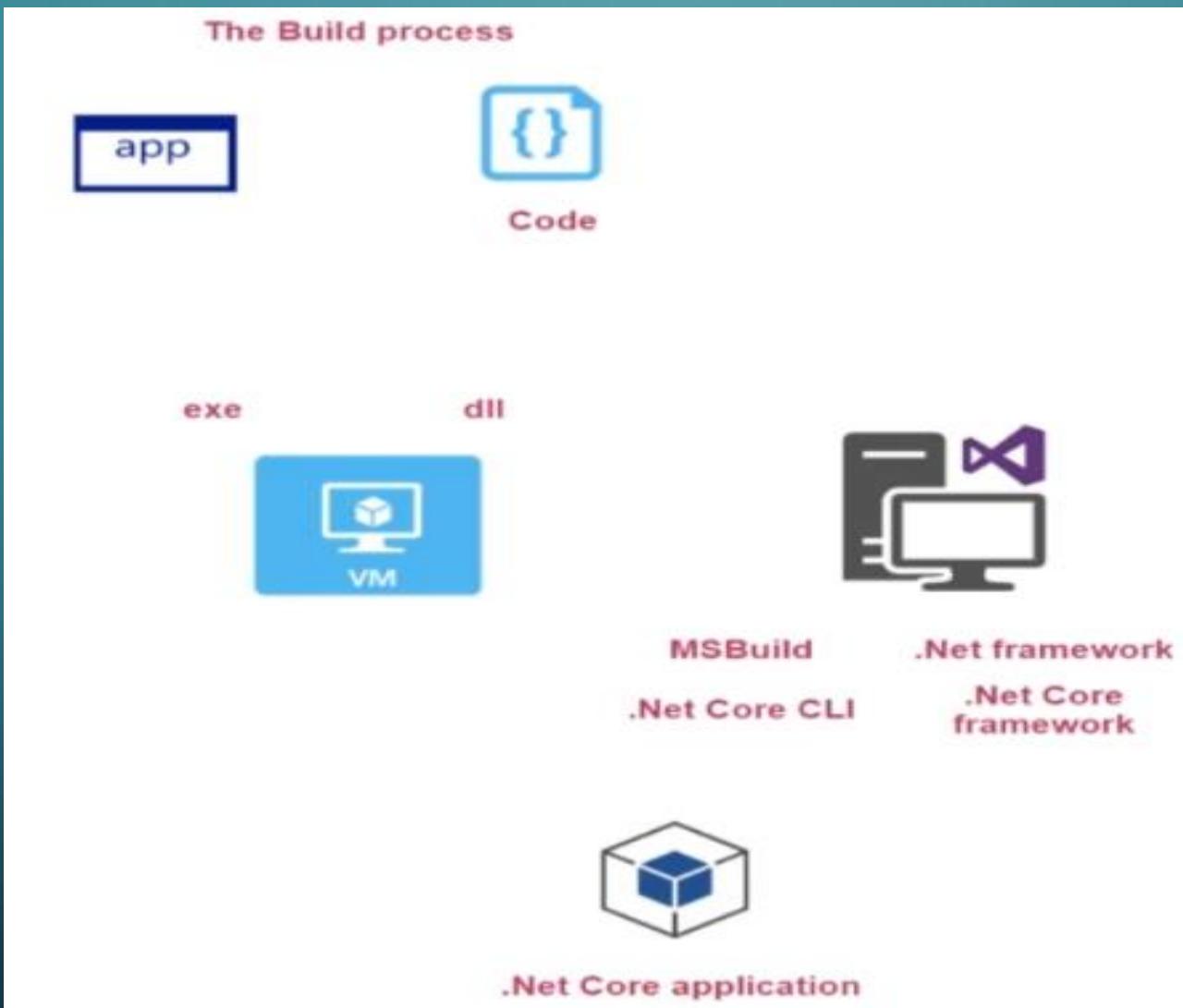
1. Make GitHub connection
2. Using the specific keyword which integrate with Azure Boards “Fixed AB#taskNumber”



Continuous integration



Build



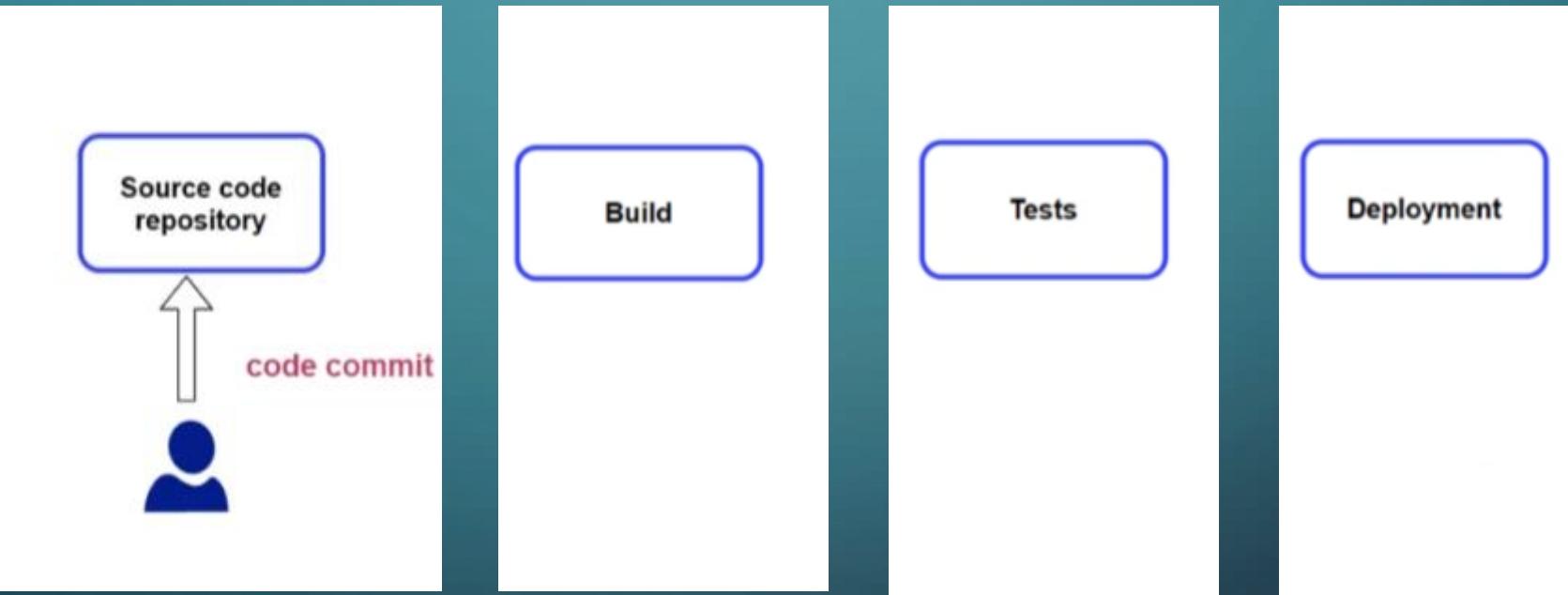
Build

Demo lab

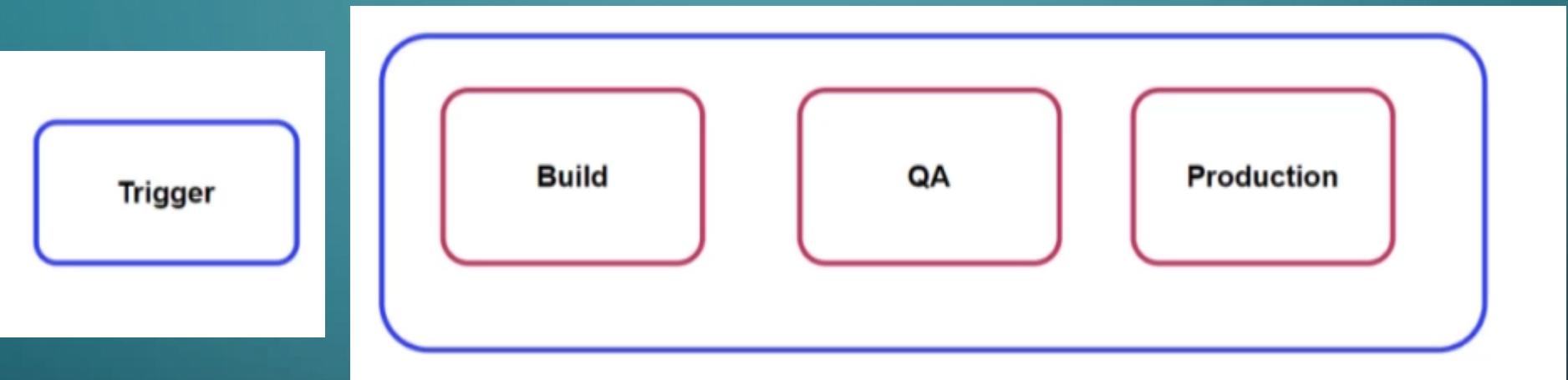
1. Check build files
2. Use Visual Studio for build
3. Run the app
4. Check again the build directory



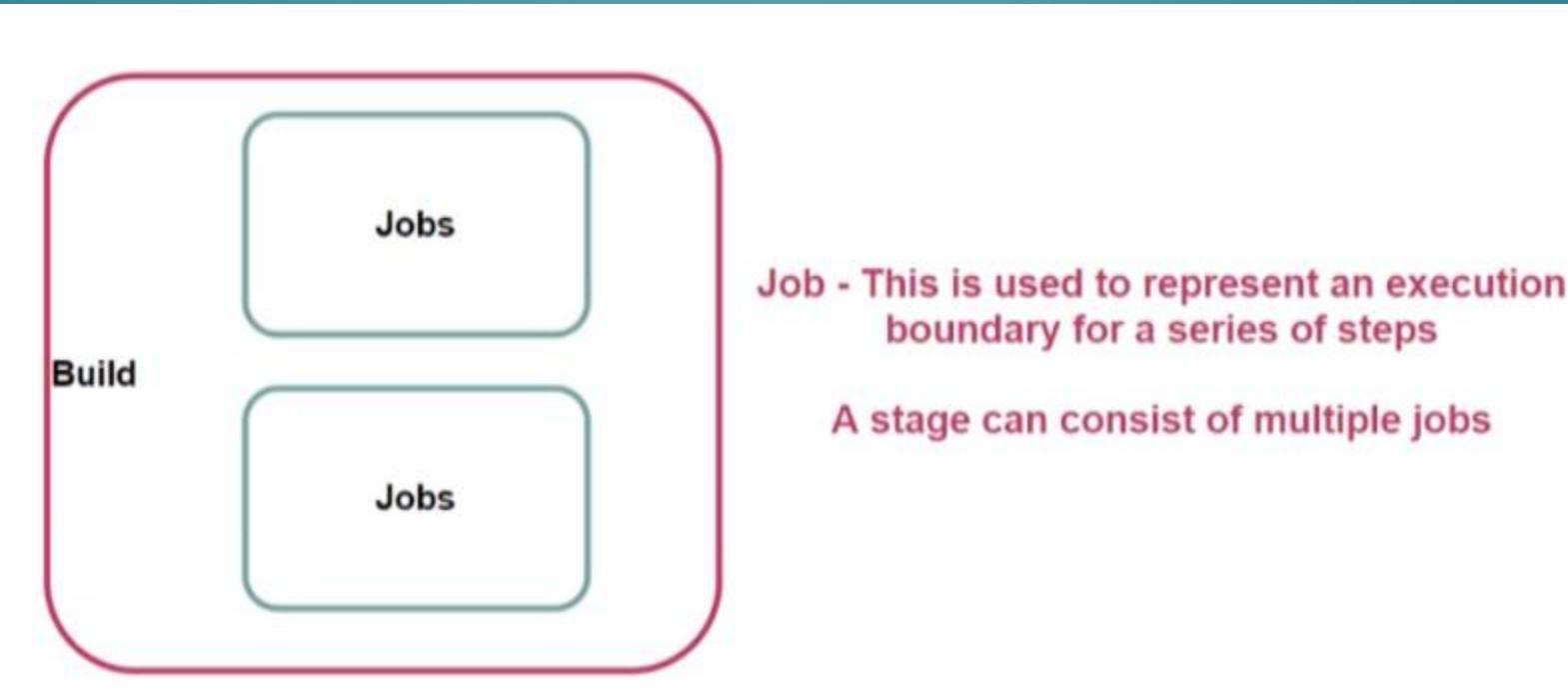
Continuous Integration/Continuous Delivery CI/CD



Azure Pipelines



Azure Pipelines - stage



Azure Pipelines - Build



agent is part of
the agent pool

There are
different types of
agent

Jobs

images

Steps

1. vs2017-
win2016

Script/Task

2. macOS-10.14
3. ubuntu-16.04

Azure Pipelines

Demo lab

1. Create simple pipeline
2. Check the trigger
3. Edit the pipeline and use multiple jobs



Azure Pipelines – build .NET Core application

Demo lab

1. Create new repo for app code
2. Push my code to the repo
3. Create new Azure pipeline
4. Check the trigger



[More details](#)

Azure Pipelines – GitHub

Demo lab

1. Create new repo for app code
2. Push my code to the repo
3. Create new Azure pipeline and choose to pick your code from GitHub



Microsoft hosted agent

Demo lab

1. [Microsoft hosted agent details](#)
 1. Managed service by Azure pipelines
 2. Check various images and it's labels

Self hosted agent

Demo lab

1. Create Azure VM
2. Install git, NuGet, Visual Studio and .NET Core for the build
3. Azure pipelines agent – download agent and run it
4. Use the self agent to build the .NET Core app



Quick note

- After creating your first pipeline, you have the yaml file located in your repo, and this yaml file didn't exist in your local repo, so if you made any changes on your local machine and try to push it in the repo, you will have an issue because you didn't have the latest version from your remote repo.

Jenkins another Continues Integration tools

Demo lab

1. Create Azure VM
2. Install Java development kit
3. Install Jenkins
4. Log on as a service



Jenkins

Build .NET Core app

Demo lab

1. Install build tools “git, NuGet, visual studio, .NET Core SKD 3.1”
2. Install MSBuild in the Jenkins server
3. Set global tool configuration
 1. Git location
 2. MSBuild
4. Copy the home directory path from configure system

Jenkins

Build .NET Core app

Demo lab

1. Add new item to build the app
2. Choose git as a source control
3. Add build step “windows batch command”
4. Add build a visual studio project

Jenkins Build .NET Core app

Demo lab

1. Deploy the same build but using Azure repos

Jenkins CI

Demo lab

1. Make continuous Integration with Jenkins
 1. Add security group rule to open port 8080
 2. Open port 8080 in windows firewall
 3. Create a Jenkins token (people/configure)
 4. Add Jenkins token to the project service hooks
 5. Make a simple change to the code to check

Security in the CI/CD pipeline

Integrated Development Environment / Pull request

Static Code Analysis
Code Review
Link to work items

Continuous Integration

Static Code Analysis
Vulnerability scans
Unit Tests
Code Metrics

Development

Penetration Testing
Infrastructure Scanning

Load and Performance testing
Automated Regression Testing

Testing

Infrastructure Scanning

Security in the CI/CD pipeline

Integrated Development Environment / Pull request

Static Code Analysis
Code Review
Link to work items

Continuous Integration

Static Code Analysis
Vulnerability scans
Unit Tests
Code Metrics

Development

Penetration Testing
Infrastructure Scanning

Load and Performance testing
Automated Regression Testing

Testing

Infrastructure Scanning

Static Code Analysis

Demo lab

1. Analysis code by your VS
2. Add packages for analysis
 1. <https://api.nuget.org/v3/index.json>
3. Try to make a build by the pipeline

Using WhiteSource Bolt

Demo lab

1. Add whiteSource in the organization extensions
2. Check your pipeline section you will have WhiteSource in place
3. Open any previous pipeline which have .NET Core code
4. Add whiteSource task to your pipeline



Unit testing

Demo lab

1. Run the Unit test on VS.
2. Make a new repo and push your code.
3. Create new pipeline and add test unit task.

Code Coverage

Demo lab

1. We'll use the same last code in unit test.
2. In the unit test project add NuGet package
“coverage.msbuild”
3. Create new repo and push your code
4. Create new build pipeline

sonarQube

Demo lab

1. You can use this tool by download it in vm and implement sonarQube or You can use it in the cloud "[sonarCloud](#)"
2. Login with your Azure devops account
3. Create new organization and project
4. Create new .NET Core project and new repo
5. Add sonarQube to organization extensions
6. Add new project service connection to connect with this instance
7. Build your pipeline
 1. Before the build task you can add Prepare analysis configuration task
 2. After the build you can add Run code Analysis and publish the result tasks



Technical debt

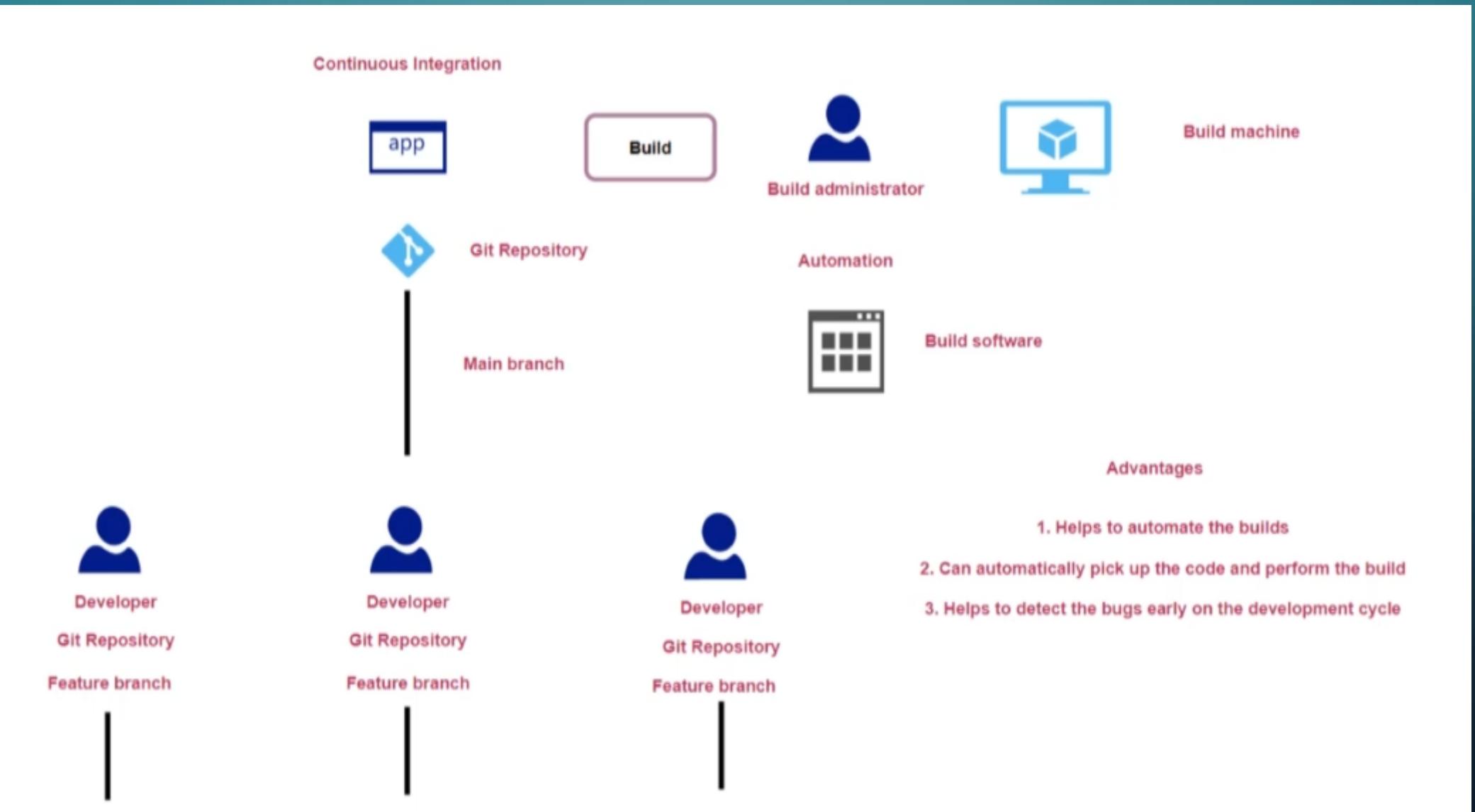
1. Cost of rework caused by choosing easy solution instead of using better approach that would take longer
2. This could be anything that could slow or hinder the entire development process
3. As the technical debt increases, it can become more difficult to make changes to code
4. sonarCloud can calculate technical debt

Classic editor

Demo lab

1. Create new pipeline but choose classic editor to create your pipeline
2. Build our .NET Core by the classic editor

Benefits of CI

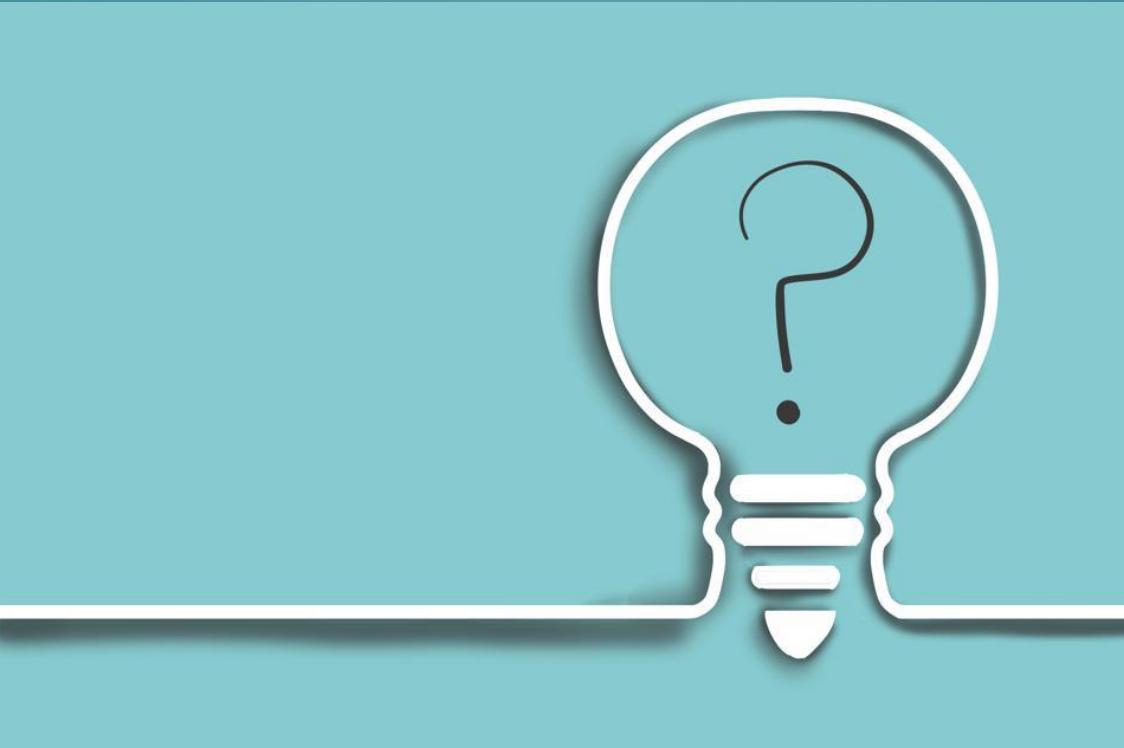


Parallel jobs

Demo lab

1. Check parallel jobs option in organization settings
2. If you need to purchase parallel job you should add your Azure subscription to do that.

Questions



Infrastructure – Azure Web App

Demo lab

- Create Azure Web App
- Publish a web app from visual studio

Infrastructure – Azure VM

Demo lab

- Create Azure VM
- Add IIS role and ensure that the management service installed also If you need to publish directly from VS
- Open the IIS manager to enable management service remote connection
- Install packages and framework for your app
 - [.NET Core 3.1](#)
 - [Web deploy 3.6](#)
- Configure DNS for the VM
- Publish a web app from visual studio

Infrastructure – Custom script extensions

Demo lab

- Create Azure VM
- Add rule to NSG, open port 80
- Create storage account in the same location of the vm
- Upload your custom script to the storage account container
- Add your custom script to extensions section in your vm

Infrastructure – PS Desired State Configuration

Demo lab

- Create Azure VM
- Add rule to NSG, open port 80
- Create storage account in the same location of the vm
- Upload your configuration file “zip files” & Data configuration file “.psd1” to your storage account container
- Add your DSC files to extensions section in your vm

Infrastructure – PS Desired State Configuration - Maintain

Demo lab

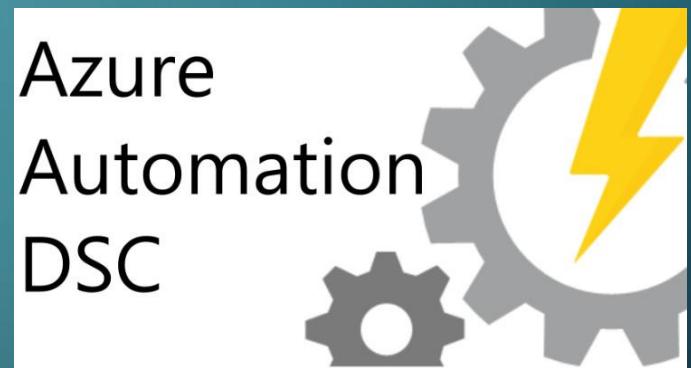
- Create Azure Automation Account
- Go to state configuration (DSC)
- Configurations/Add → Upload your .ps1 from local machine
- Open your uploaded file and Compile it
- Nodes/Add → Choose the machine, choose node configuration, modify Configuration mode
- Check and remove IIS role



Infrastructure – Automation Account on other machines

Demo lab

- Create new vm
- Go to state configuration (DSC)
- Configurations/Add → Upload your .ps1 from local machine
- Open your uploaded file and Compile it
- Edit config file (RegistrationUrl , Registrationkey, configFileName, ComputerName)
- Run the config file to create DSCMetaConfigs
- Set-DscLocalConfigurationManager -Path ./DscMetaConfigs



Infrastructure – Review topics

- Azure Resource Manager template

Template format

In its simplest structure, a template has the following elements:

JSON

Copy

```
{  
    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploy  
    "contentVersion": "",  
    "apiProfile": "",  
    "parameters": { },  
    "variables": { },  
    "functions": [ ],  
    "resources": [ ],  
    "outputs": { }  
}
```

Version of the template language being used

Version of the template

Collection of API version for resource types

Values that can be provided during deployment

Values that can be reused in the template

Resource that need to be deployed

Values that can be retrieved after resource deployment

Infrastructure – Review topics

ARM template – Storage account

Demo lab

Infrastructure – Review topics

ARM template – VM

Demo lab

Infrastructure – Review topics

ARM template – VM with custom script

Demo lab

Infrastructure – IAC

- These are a few popular choices:
 - Chef
 - Puppet
 - Red Hat Ansible Automation Platform
 - Saltstack
 - Terraform
 - AWS CloudFormation
 - Azure ARM

Infrastructure – IAC

Terraform



Terraform – storage account

Demo lab

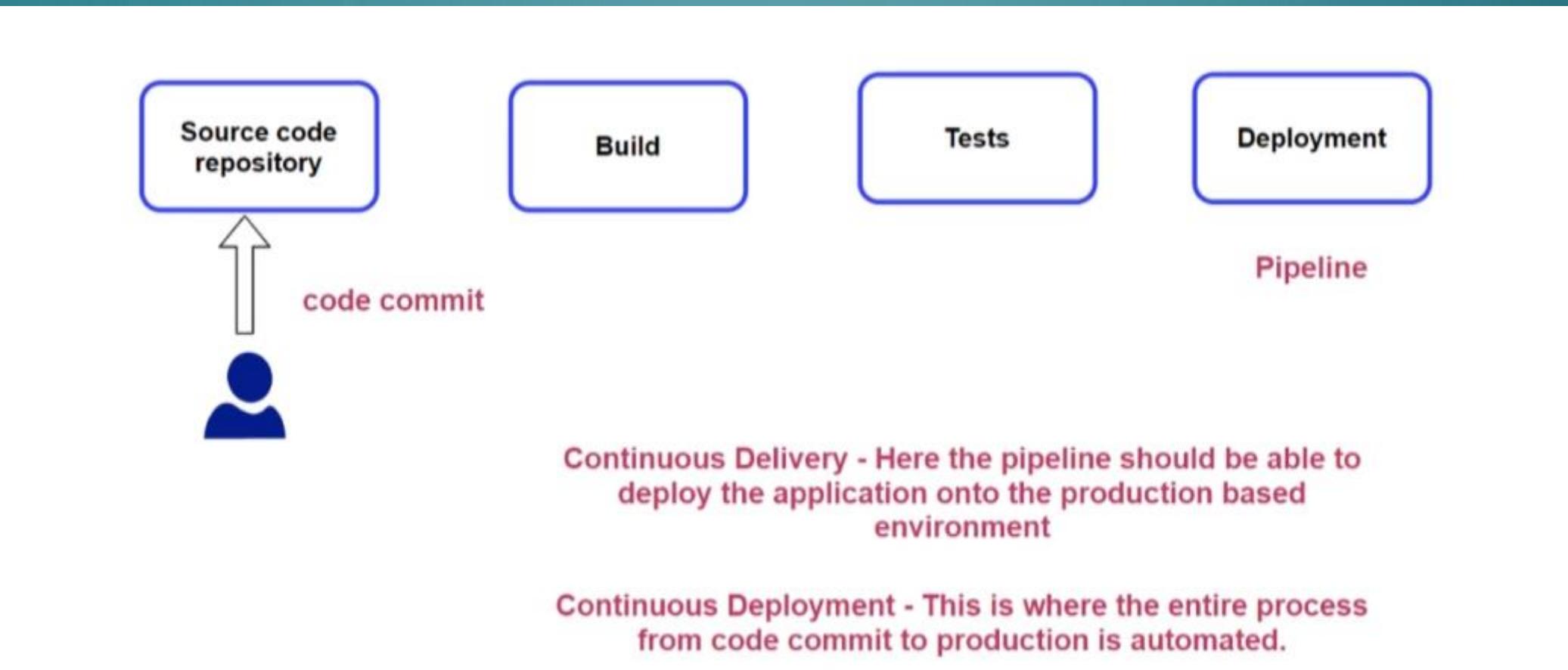


Terraform – VM

Demo lab



Continuous Delivery



Azure Release Pipeline

The screenshot shows the Azure Release Pipeline interface. On the left, under 'Artifacts', there is a card for '_demoapp' with a build icon and a 'Schedule not set' button. In the center, under 'Stages', there is a 'Staging' stage card with a 'Pre-deployment approval' section containing the text: 'Here you can define an approval before a release is done to a stage'. A blue circular icon with a globe and a gear is positioned to the right of the stage. At the bottom, the navigation bar shows 'All pipelines > demo-release' and includes 'Save' and 'Run' buttons.

Trigger

Artifacts | + Add

_demoapp

Schedule not set

Stages | + Add ▾

Staging
1 job, 1 task

Pre-deployment approval -
Here you can define an
approval before a release is
done to a stage

All pipelines > demo-release

Save Run

Azure Release Pipeline

All pipelines > demo-release

 Save  Create release

Pipeline Tasks  Variables Retention Options History

x Staging

Deployment process

...

Agent job

 Run on agent



 Azure App Service Deploy: demoapp10001

Azure App Service deploy

The agent is the software which is used to run the tasks that are part of the deployment

The agent can download the artifacts from Azure Pipelines

Agent job 

Display name *

Agent job

Agent selection ^

Agent pool  | Pool information

Azure Pipelines

Agent Specification *

vs2017-win2016

Release Pipeline – Az webApp

Demo lab

- Create new azure web app
- Create new Build pipeline based on Azure repos
- Publish build artifact
- Create Azure pipeline release

Release Pipeline – Continuous trigger

Demo lab

- Enable trigger
- Make a change in our code

Release Pipeline – Multi stages

Demo lab

- Edit the last release and add new stage
- Parallel and sequential
- Create new web app
- Create new release with both stages

Release Pipeline – Approvals and Gates

- More control over the deployment pipeline.
- Scenarios:
 - Users need to validate a change request before the deployment – Pre-deployment approval.
 - What you need to do after the current stage – Post deployment gates

Release Pipeline – Approvals

Demo lab

- Edit the stages release pipeline
- Try pre-deployment conditions – pre-deployment approvals
- Change the timeout
- Change in you code again

Release Pipeline – Gates

Demo lab

- Edit the stages release pipeline
- Disable the pre-deployment approvals
- Enable Gates – connect with Query work items
- Make a new query “if bug not equal to closed” – open Query security – projectName build service “permission”
- Run the release and after some time close the bugs

Release Pipeline – Gates – azure policies

Demo lab

- Add definition in Azure policy – tag required for resources
- Enable Gates – Check azure policy
- Run the release and after some time add tag to the resource

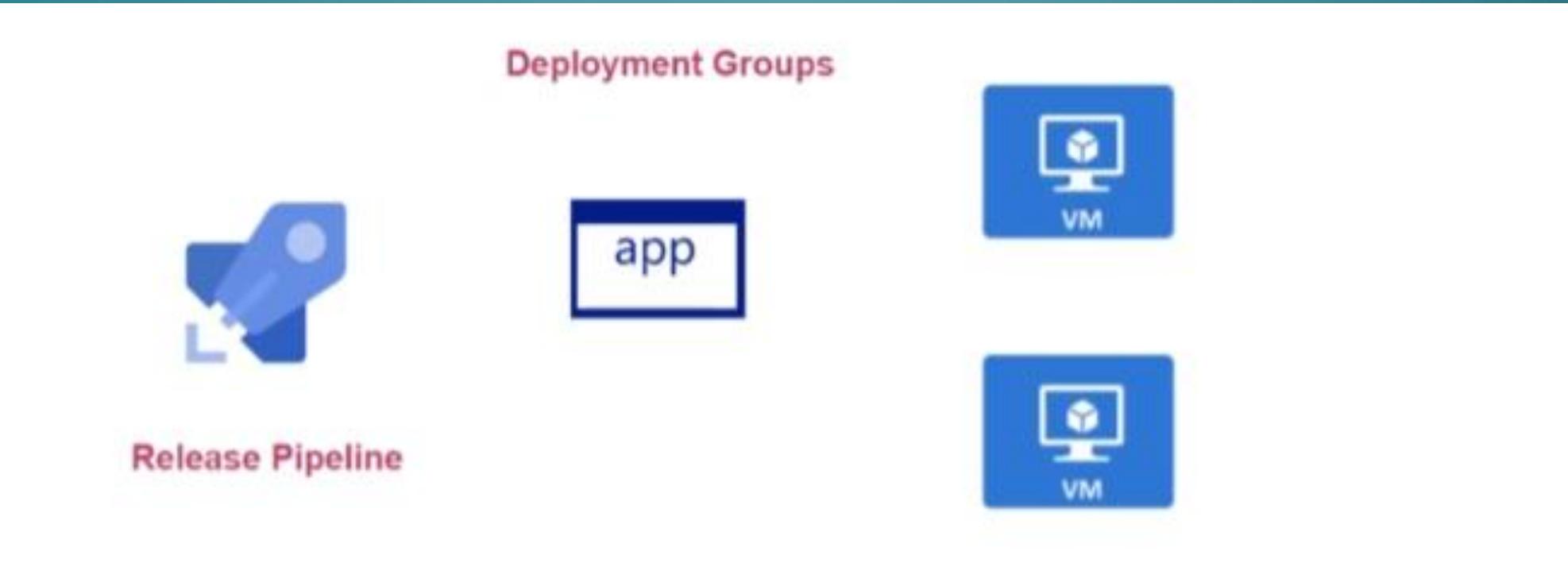


Your PC ran into a problem that it couldn't
handle, and now it needs to restart.

You can search for the error online: SOMETHING VERY SERIOUS

It'll restart in: ∞ seconds

Release Pipeline – deployment group



Release Pipeline – deployment group

Demo lab

- Create a virtual machine and install IIS and .NET Core Hosting bundle
- Add deployment group and run the script to add the agent
- Use PAT for authentication
- Replace the agent by Deployment group job
- Add task: “IIS web app manage”
- Add task: “IIS web app deploy”

Docker - revision

Demo lab

- Create Linux vm
- Install docker on it
- Pull Nginx service
- Run Nginx service on port 80

Revision- Dockerize .NET Core app

Demo lab

- Create new project based on .NET Core
- Publish the project: dotnet publish
- Copy the publish folder to our Linux machine
- Make the Dockerfile
- Build your image
- Run your image as a container

Revision–Azure Container Registry “ACR”

Demo lab

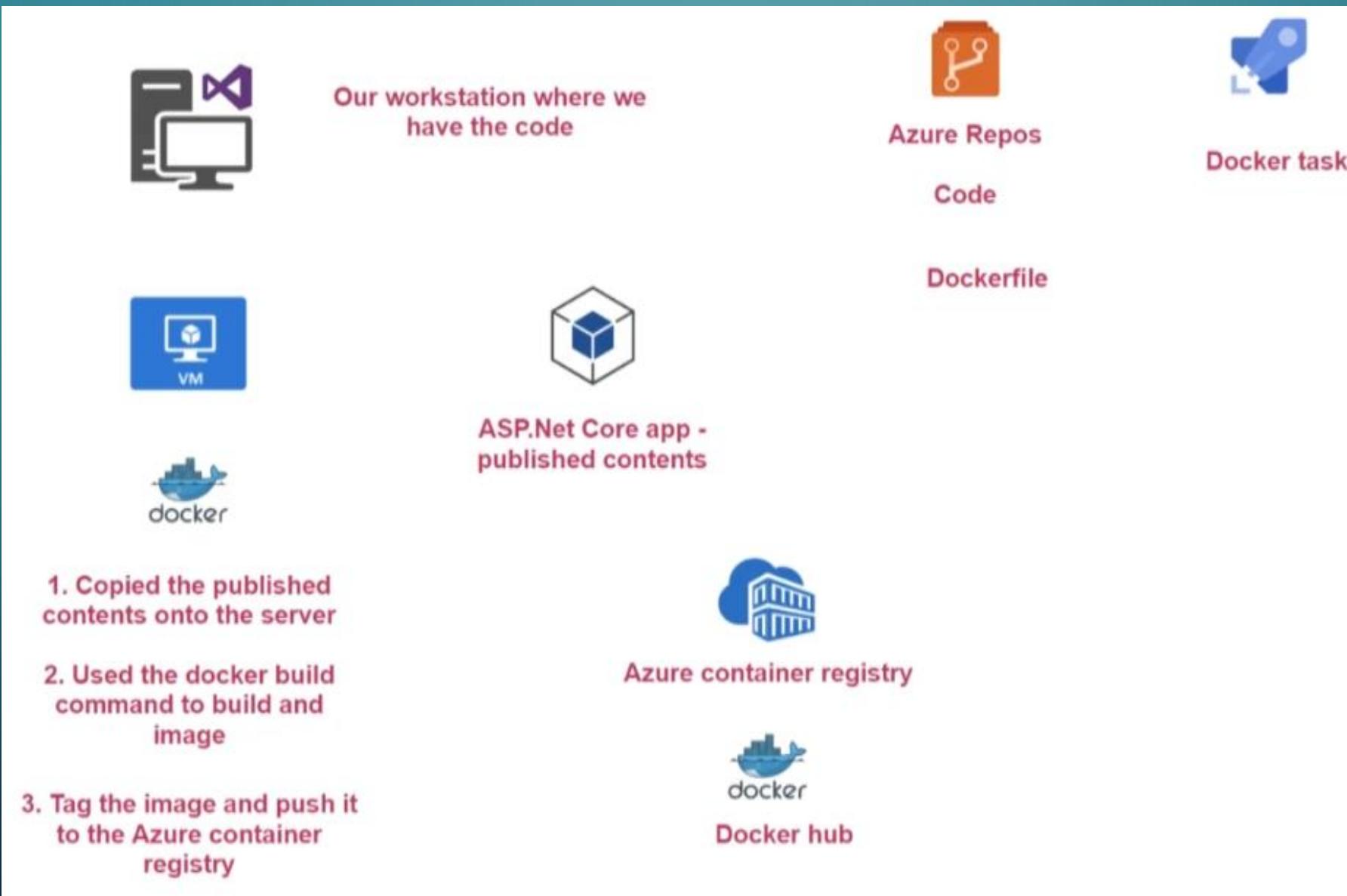
- Create Azure Container Registry
- Install azure-cli to the Linux machine
- Login to Azure subscription and ACR
- Tag our image by the acr name and url
- Push the image to the acr
- Enable admin user option if you will use ACI – from Access keys

Revision–Deploy to Kubernetes

Demo lab

- Create Azure k8s service
- Install Kubernetes-cli on your local machine by choco
- Apply the manifest files “deployment&service”
- You can also deploy these file from the portal

Publish to Azure Container Instance ACI



Publish to Azure Container Instance ACI

Demo lab

- Stop the last ACI we use
- Push your code to the repo and make your Dockerfile
- Build your Azure pipeline
- Choose to build and push to ACR
 - IT will create new service connection with our ACR
- Start the ACI and check the new release

Azure Pipeline - AKS

Demo lab

- Remove your latest deployment and service from AKS
- Upload your manifest to the azure repo
- Create service connection for AKS
- Build your Azure pipeline
 - Add task: copy the manifest files
 - Add task: Kubernetes manifest
 - Run the pipeline