Azure Pipelines: CI/CD

Shailendra Chauhan

Microsoft MVP, Technical Consultant and Corporate Trainer

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Azure Pipeline

- A cloud service, used to automatically build and test your project code and making it available to users.
- Works with any language or project type.
- Combines continuous integration (CI) and continuous delivery (CD) to constantly and consistently test and build your code and ship it to any target.

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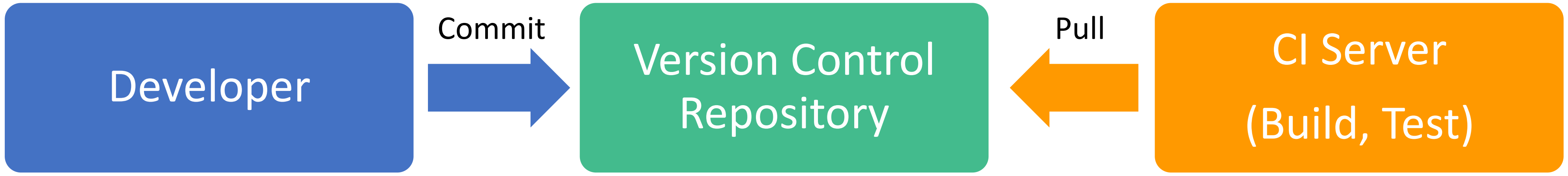
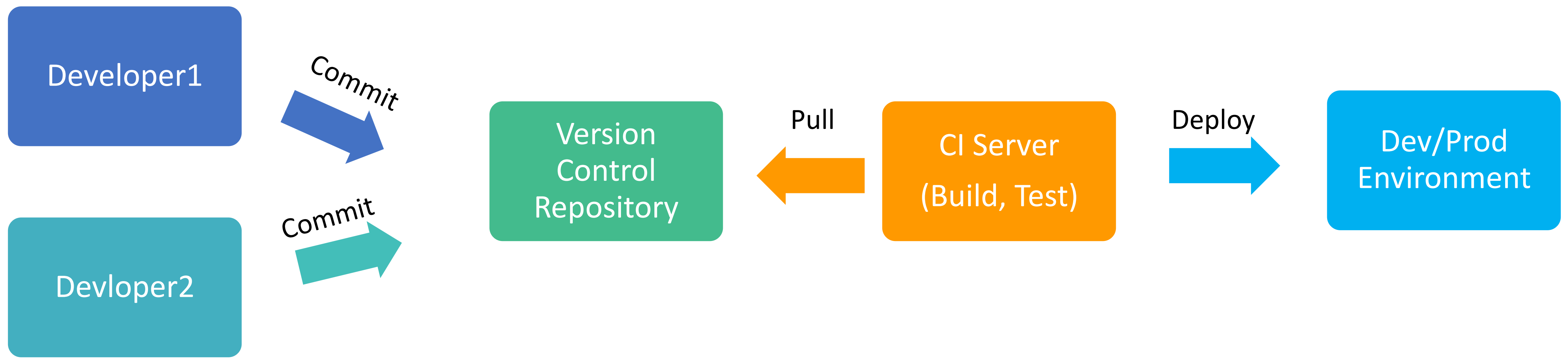
Continuous Integration



Continuous Delivery (CD)



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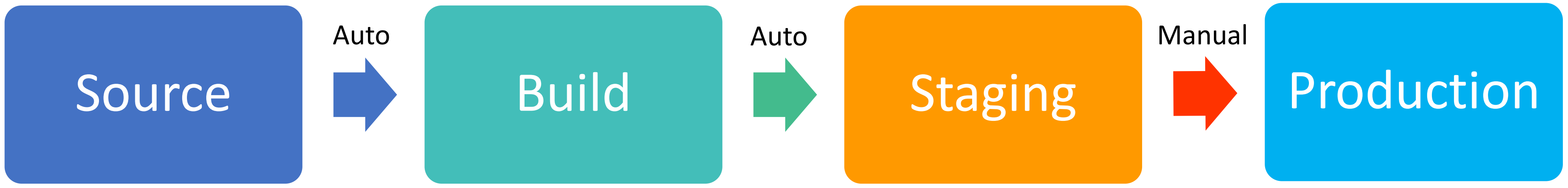
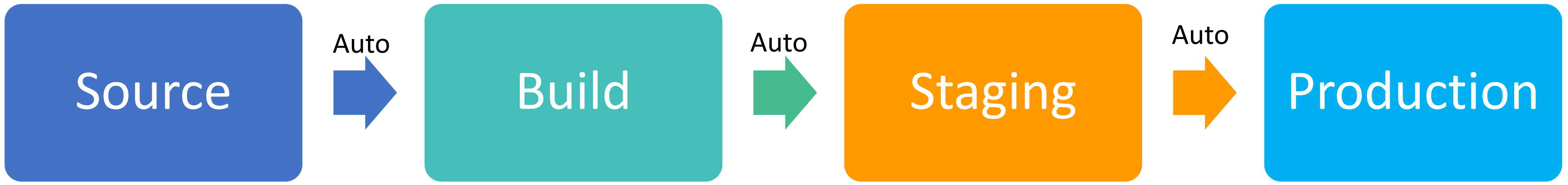
Continuous Delivery & Continuous Deployment



Continuous Delivery



Continuous Deployment

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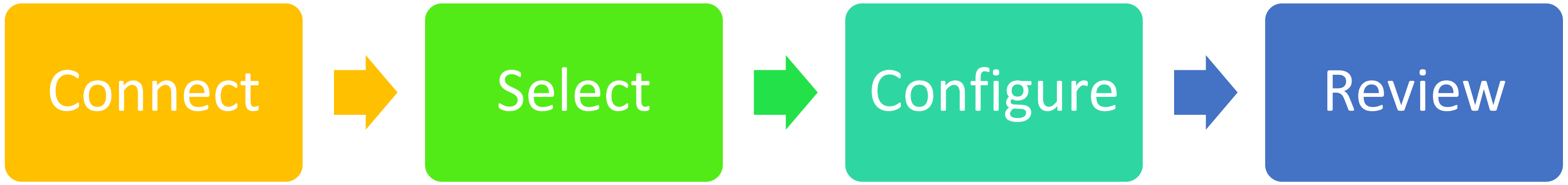
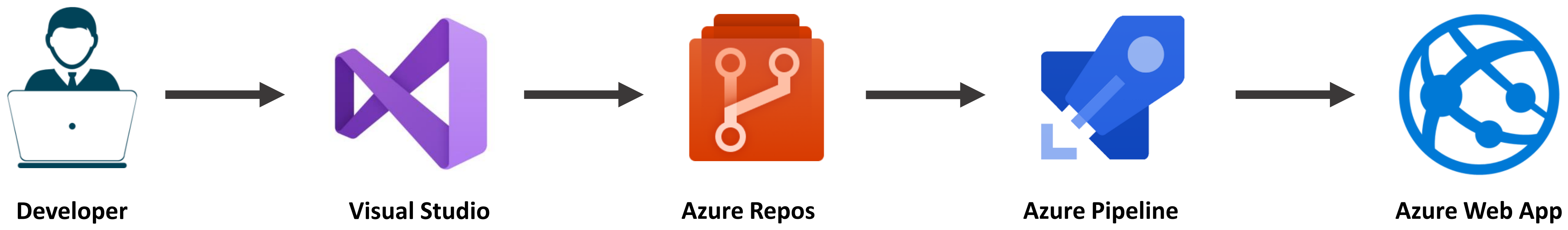
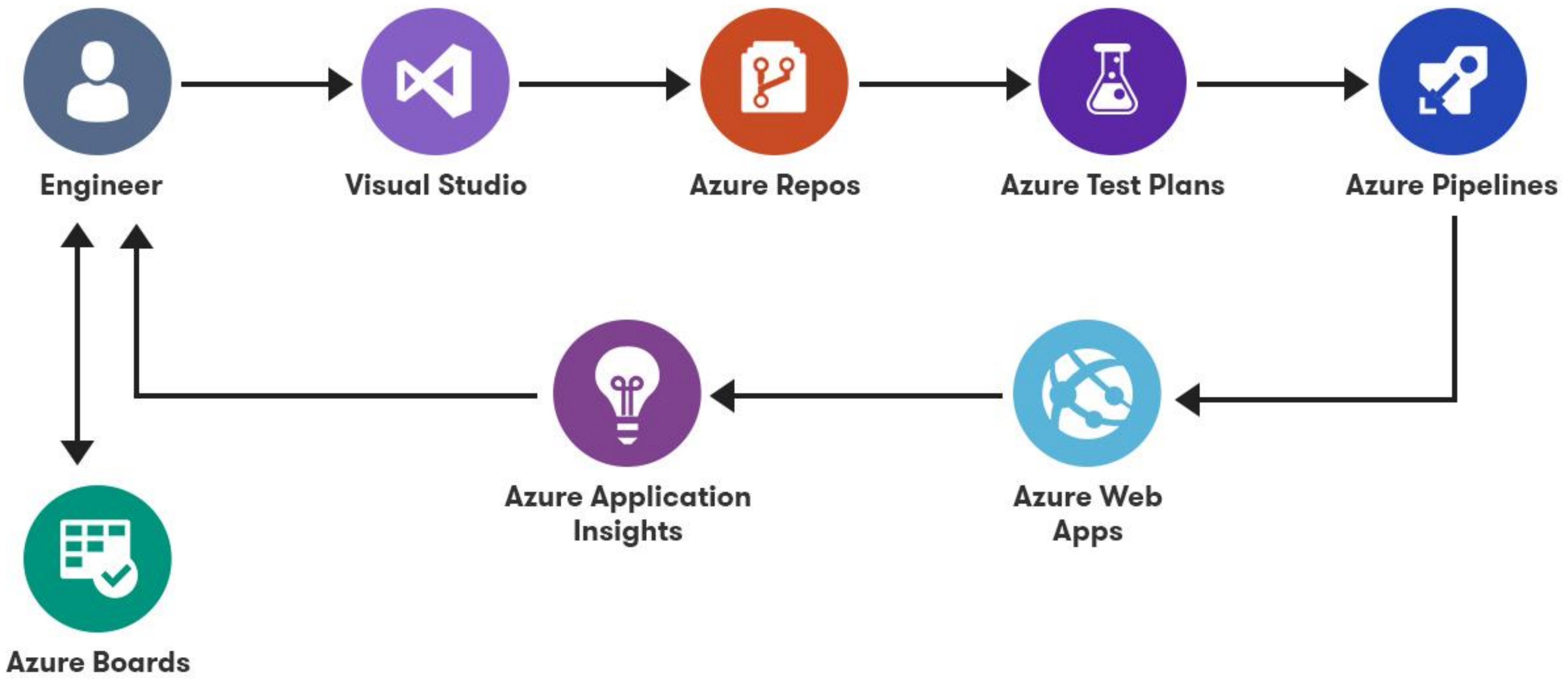
Steps to Configure a Azure Pipeline



Azure Pipeline with Azure Web Apps



Azure Pipeline with Azure Web Apps



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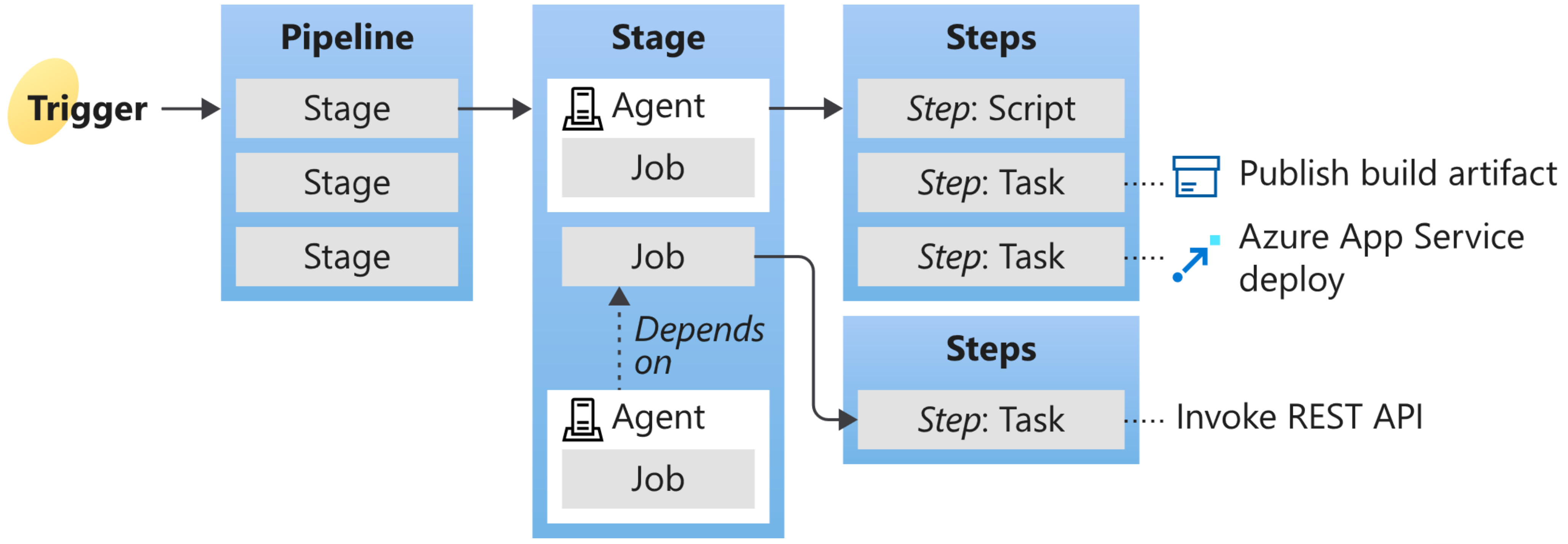
Azure Pipelines Platform Support

.NET Core	Android	Docker	Go
Java	Kubernetes	Linux VM	Node.js
npm	NuGet	PHP	Python
Ruby	UWP	Xamarin	Xcode

Azure Pipeline Structure

- A pipeline has one or more stages to describe a CI/CD process.
- Stages are the major divisions in a pipeline.



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Azure Pipeline YAML Example

```yaml
name: my-pipeline-v1
variables:
 project: xyz
 build_no: 1.0.1

stages:
- stage: Build
  jobs:
  - job: BuildJob
    steps:
    - script: 'echo Building $(project)!'
- stage: Deploy
  jobs:
  - job: Deploy
    steps:
    - script: 'echo Deploying $(build_no)!'
```

Azure Pipeline: Stage

- A stage is a collection of related jobs.
- By default, stages run sequentially. Each stage starts only after the preceding stage is complete.
- Use approval checks to manually control when a stage should run.

```yaml
stages:
- stage: string  # name of the stage (A-Z, a-z, 0-9, and underscore)
  displayName: string  # friendly name to display in the UI
  dependsOn: string | [ string ]
  condition: string
  variables:
  jobs: []
```

Azure Pipeline: Job

- A job is a collection of steps run by an agent or on a server.
- A Job can run conditionally and depend on earlier job.

```yaml
jobs:
- job: string  # name of the job
  displayName: string  # name to display in the UI
  dependsOn: string | [ string ]
  condition: string
  strategy:
    parallel: # parallel strategy
  continueOnError: boolean  # defaults to 'false'
  pool: pool
  workspace:
    clean: outputs | resources | all # clean up before the job runs
  variables: # define variable
  steps: [] # define variable
```

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Azure Pipeline: Steps

- A step is a linear sequence of operations to make a job.
- Each step runs in its own process on an agent and has access to the pipeline workspace.
- Environment variables aren't preserved between steps but file system changes preserved.

```
steps: [ script | bash | pwsh | powershell | checkout | task | templateReference ]
```

Agents

- An agent is a software that runs one job at a time.
- To build your code or deploy your code using Azure Pipelines, you need at least one agent.
- Jobs can be run directly on the host machine of the agent or in a container.
- Two Types of agents : Microsoft-hosted agents, Self-hosted agents

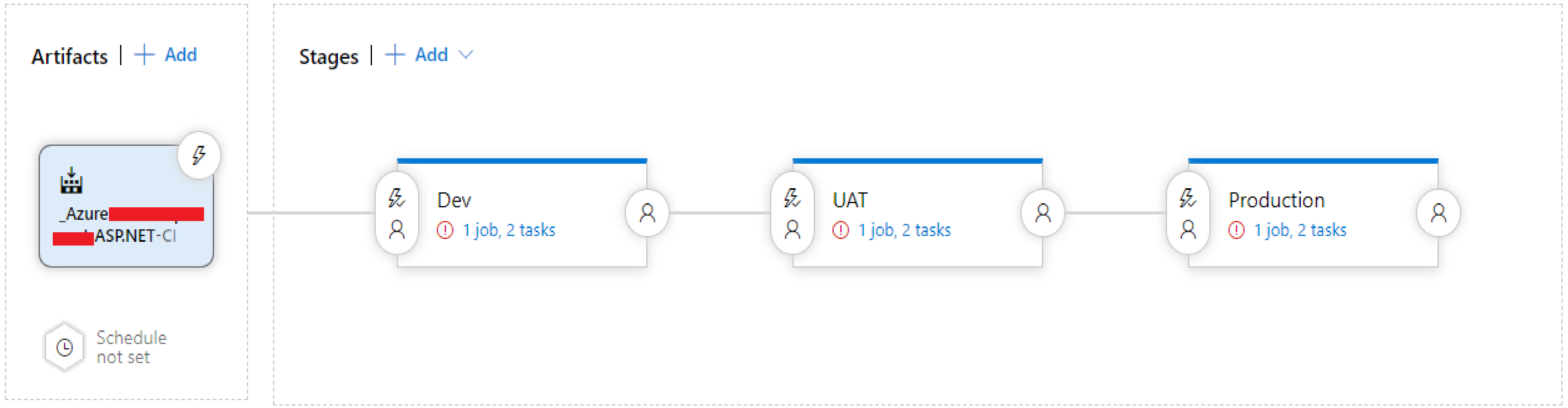
Microsoft-hosted agents

- With Microsoft-hosted agents, maintenance and upgrades are taken care by Microsoft.
- Each time you run a pipeline, you get a fresh virtual machine.
- The virtual machine is discarded after one use.
- Microsoft-hosted agents can run jobs directly on the VM or in a container.

Self-hosted agents

- An agent that you set up and manage to run jobs.
- Self-hosted agents give you more control to install dependent software needed for your builds and deployments.
- A Self-hosted can be installed on Linux, macOS, Windows machines or Docker container.

Release pipelines



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YAML

- YAML is a human friendly data serialization standard for all programming languages.
- Used for defining configuration or in an application where data is being stored or transmitted.
- YAML is introduced in 2001.
- Extension are .yml or .yaml
- YAML is case sensitive.
- YAML supports spaces instead of tabs.

XML vs. JSON vs. YAML

```xml
<Servers>
    <Server>
        <name>server1</name>
        <location>india</location>
        <status>active</status>
    </Server>
</Servers>
```

```json
{
    "Servers": [
        "Server": {
            "name": "server1",
            "location": "india",
            "status": "active"
        }
    ]
}
```

```yaml
Servers:
  - name: server1
    location: india
    status: active
```

YAML in Action

```yaml
integer: 25
string1: name
string2: "name"
string3: 'name'
float: 25.0
boolean: true
```

Basic: Datatype

```yaml
name: server1
location: india
status: active
```

Key/Value

```yaml
Servers:
  - server1
  - server2
  - server3
```

Array/List: Ordered

```yaml
Servers:
    name: server1
    status: active
    location: india
```

Dictionary/Map: Unordered

```yaml
Servers:
  - server1:
      location: india
      status: active
  - server2:
      location: usa
      status: active
```

Array/Dictionary/Key-value

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```yaml
# ASP.NET Core Azure Build Pipeline YAML

trigger:
- master

pool:
  vmImage: 'ubuntu-latest'
  #vmImage: 'windows-latest'
variables:
  buildConfiguration: 'Release'

steps:
- script: dotnet build --configuration $(buildConfiguration)
  displayName: 'dotnet build $(buildConfiguration)'

- task: DotNetCoreCLI@2
  inputs:
    command: 'publish'
    publishWebProjects: true
    arguments: '--configuration $(buildConfiguration) --output  "$(Build.ArtifactStagingDirectory)"'

- task: PublishBuildArtifacts@1
  inputs:
    PathtoPublish: '$(Build.ArtifactStagingDirectory)'
    ArtifactName: 'drop'
    publishLocation: 'Container'
```

```
# ASP.NET Core Stages
trigger:
- main
pool:
  #vmImage: 'windows-latest'
  vmImage: 'ubuntu-latest'

variables:
  buildConfiguration: 'Release'

stages:
- stage: Dev
  jobs:
    - job:
      steps:
      - script: dotnet build --configuration $(buildConfiguration)
        displayName: 'dotnet build $(buildConfiguration)'
      - task: DotNetCoreCLI@2
        inputs:
          command: 'publish'
          publishWebProjects: true
          arguments: '--configuration $(BuildConfiguration) --output "$(build.artifactstagingdirectory)"'
      - task: PublishBuildArtifacts@1
        inputs:
          PathtoPublish: '$(Build.ArtifactStagingDirectory)'
```

```yaml
# Node.js with Angular Build Pipeline YAML

trigger:
- master

pool:
  vmImage: 'ubuntu-latest'

steps:
- task: NodeTool@0
  inputs:
    versionSpec: '10.x'
  displayName: 'Install Node.js'

- script: |
    npm install -g @angular/cli
    npm install
    ng build --prod
  displayName: 'npm install and build'

- task: PublishBuildArtifacts@1
  inputs:
    PathtoPublish: 'dist/myapp'
    ArtifactName: 'drop'
    publishLocation: 'Container'
```

Azure Pipeline Built-In Variables

- Agent variables - Agent.BuildDirectory, Agent.JobStatus, Agent.Name etc.
- Build variables - Build.ArtifactStagingDirectory, Build.BuildNumber etc.
- Pipeline variables - Pipeline.Workspace
- Deployment job variables - Environment.Name, Environment.Id etc.
- System variables - System.JobName, System.StageName etc.

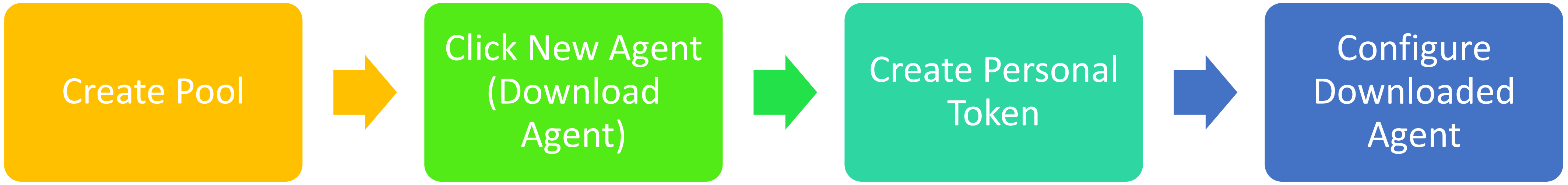
Reference: https://docs.microsoft.com/en-us/azure/devops/pipelines/build/variables

Variable Scopes

- At the root level, to make it available to all jobs in the pipeline.
- At the stage level, to make it available only to a specific stage.
- At the job level, to make it available only to a specific job.

```yaml
variables:
# a regular variable
- name: myvariable
  value: myvalue
# a variable group
- group: myvariablegroup
# a reference to a variable template
- template: myvariabletemplate.yml
```

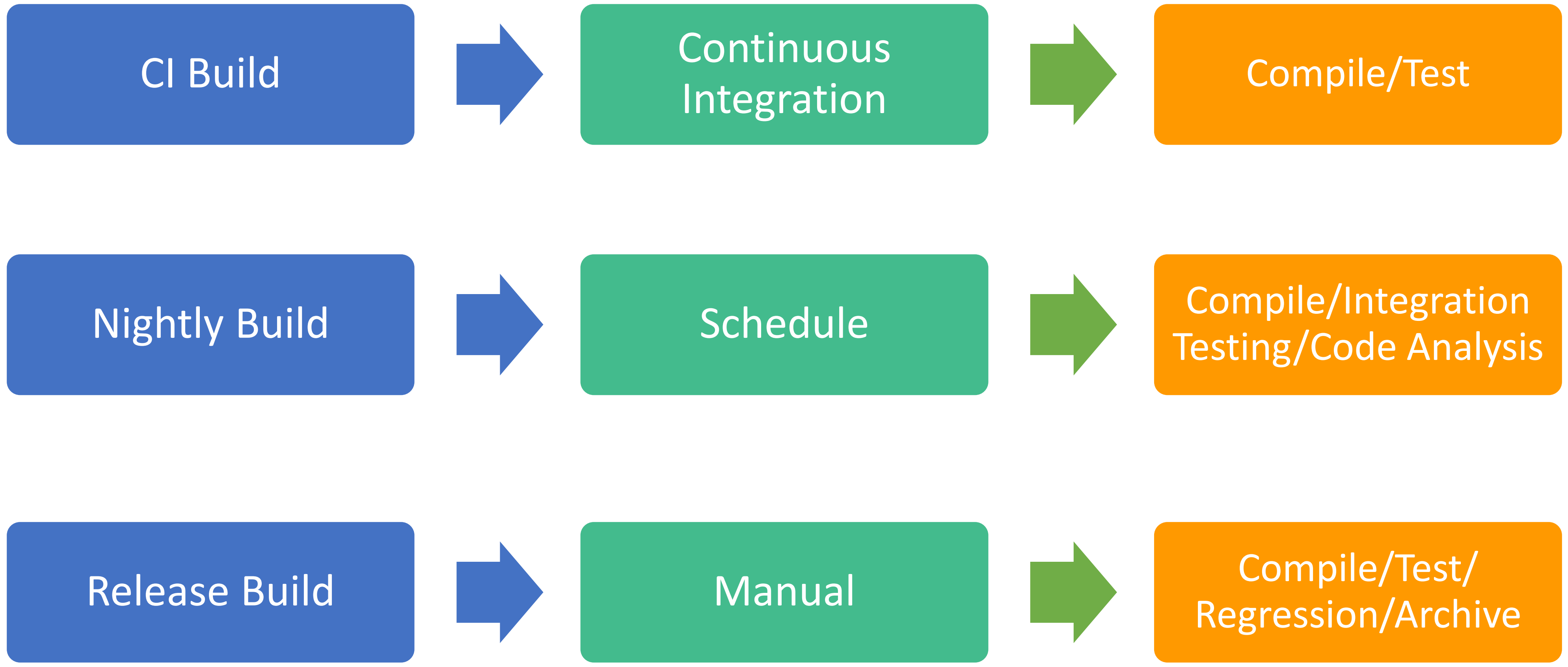
Steps to Configure a Custom Agent



```
> C:\CustomAgent\build>config
> Enter server Url > https://dev.azure.com/dnttestorg
> Enter personal access token > vcrqdthhpmskije7rygnai2grrzet4ock7e4cmztrpll4crqbtxq
> Enter agent pool > Demo Pool
> Enter agent name > MyDemoVm
> Enter work folder > C:\CustomAgent\workdir

-- If it's offline
> C:/CustomAgent> run
```

Different Types of Builds



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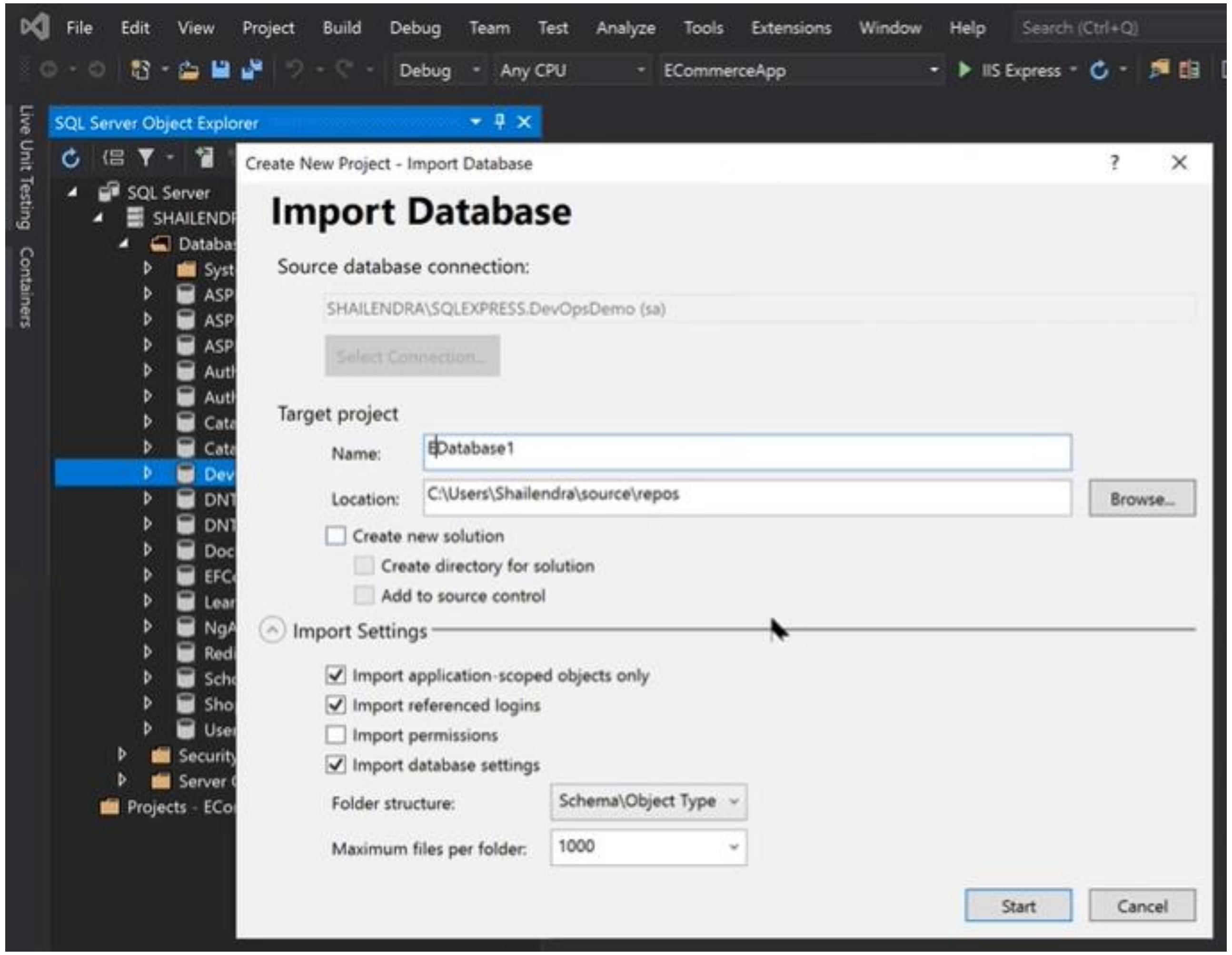
Database Pipeline: Creating Project



Create New Project - Import Database

Import Database

Source database connection:

SHAILENDRA\SQLEXPRESS.DevOpsDemo (sa)

Target project

Name: EDatabase1

Location: C:\Users\Shailendra\source\repos

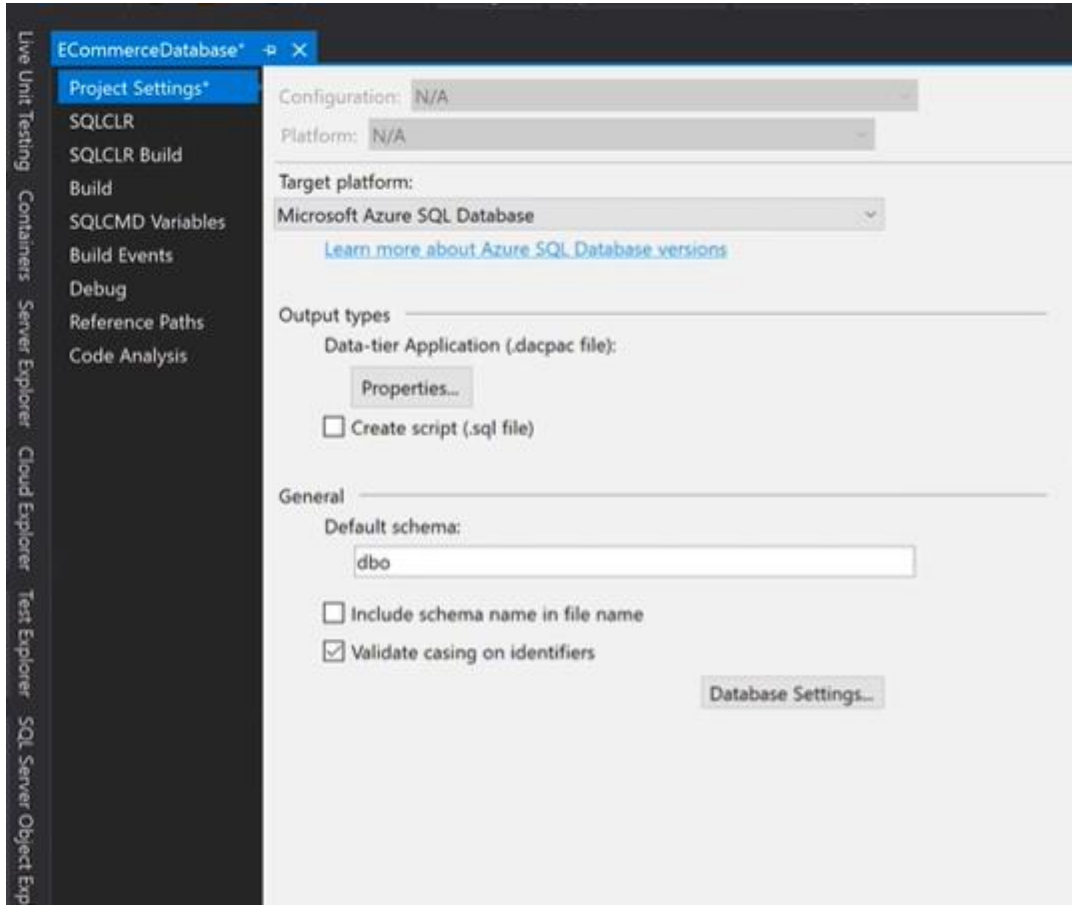
- [ ] Create new solution
- [ ] Create directory for solution
- [ ] Add to source control

Import Settings

- [x] Import application-scoped objects only
- [x] Import referenced logins
- [ ] Import permissions
- [x] Import database settings

Folder structure: Schema\Object Type

Maximum files per folder: 1000



Configuration: N/A

Platform: N/A

Target platform:

Microsoft Azure SQL Database

Output types

Data-tier Application (.dacpac file):

- [ ] Create script (.sql file)

General

Default schema:

dbo

- [ ] Include schema name in file name
- [x] Validate casing on identifiers

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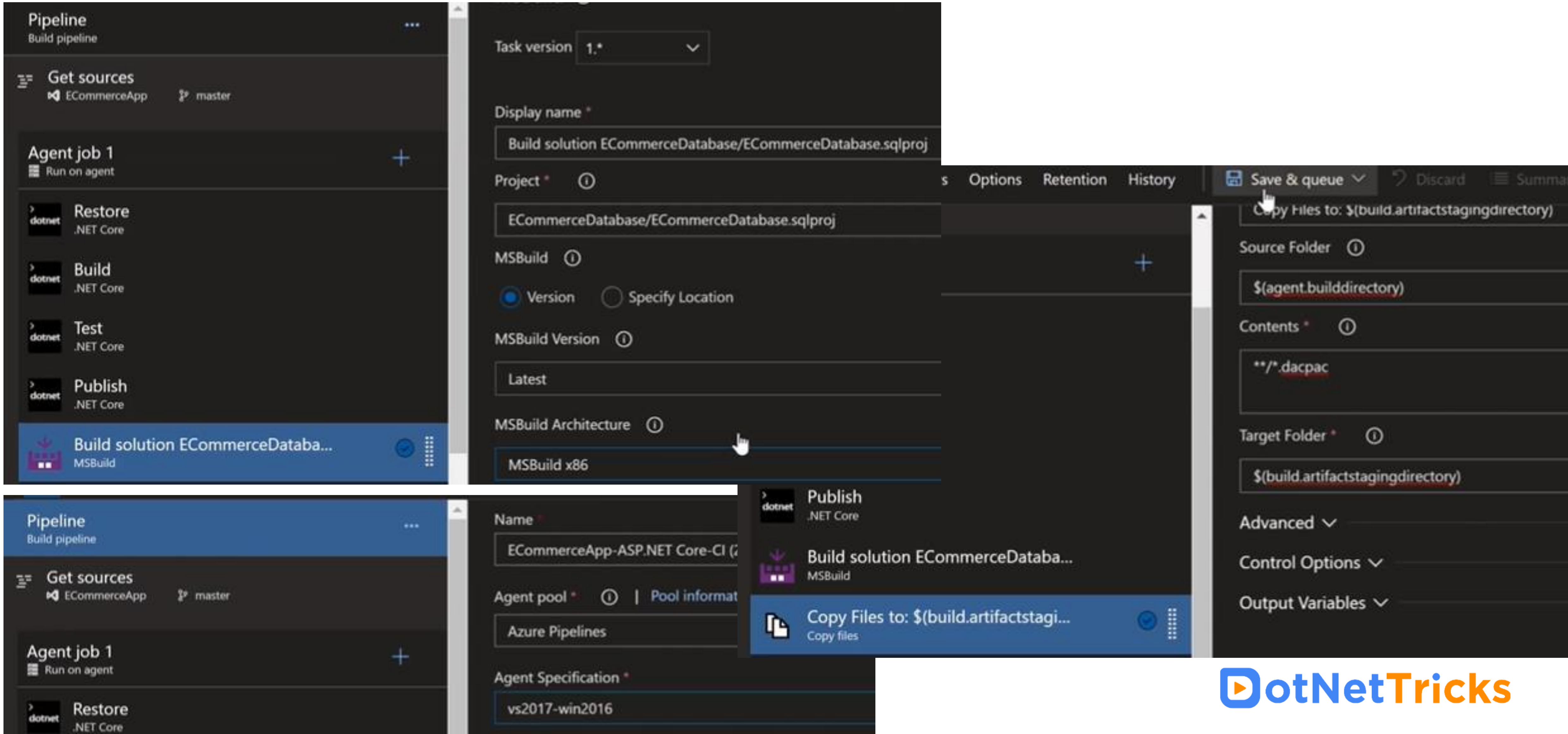
Database Pipeline: Creating Build Pipeline



Pipeline
Build pipeline

Get sources
ECommerceApp master

Agent job 1
Run on agent

Restore
.NET Core

Build
.NET Core

Test
.NET Core

Publish
.NET Core

Build solution ECommerceDataba...
MSBuild

Task version: 1.*

Display name *: Build solution ECommerceDatabase/ECommerceDatabase.sqlproj

Project *: ECommerceDatabase/ECommerceDatabase.sqlproj

MSBuild: [✓ Version] Specify Location

MSBuild Version: Latest

MSBuild Architecture: MSBuild x86

Pipeline
Build pipeline

Get sources
ECommerceApp master

Agent job 1
Run on agent

Restore
.NET Core

Name *: ECommerceApp-ASP.NET Core-CI (2

Agent pool * | Pool informat

Azure Pipelines

Agent Specification *: vs2017-win2016

Publish
.NET Core

Build solution ECommerceDataba...
MSBuild

Copy Files to: $(build.artifactstagi...
Copy files

Copy Files to: $(build.artifactstagingdirectory)

Source Folder: $(agent.builddirectory)

Contents *: **/*.dacpac

Target Folder *: $(build.artifactstagingdirectory)

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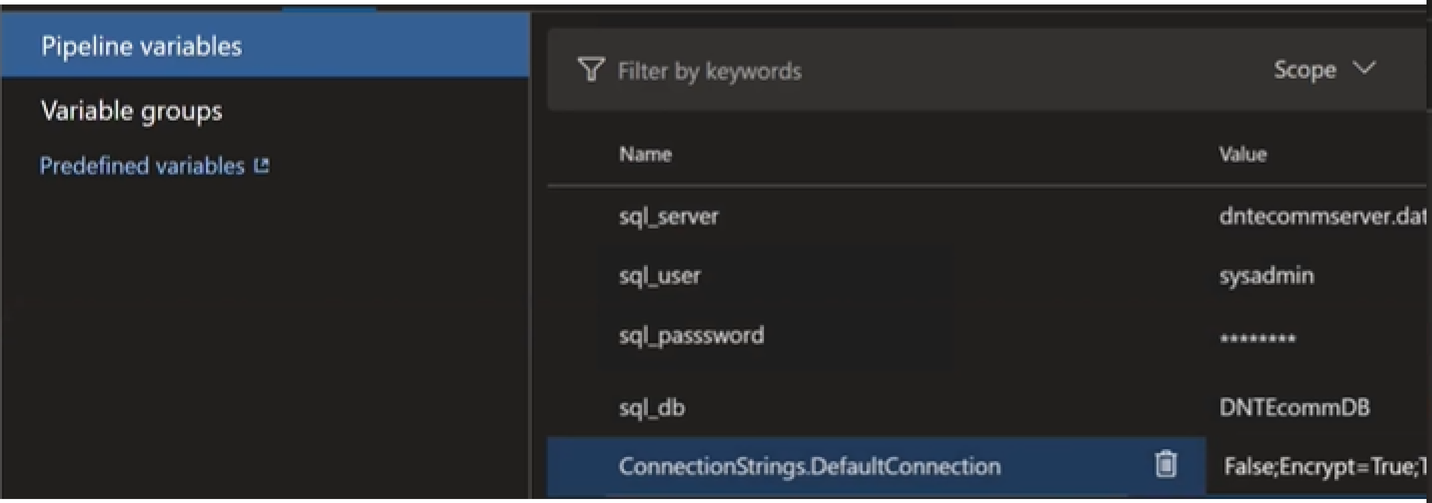
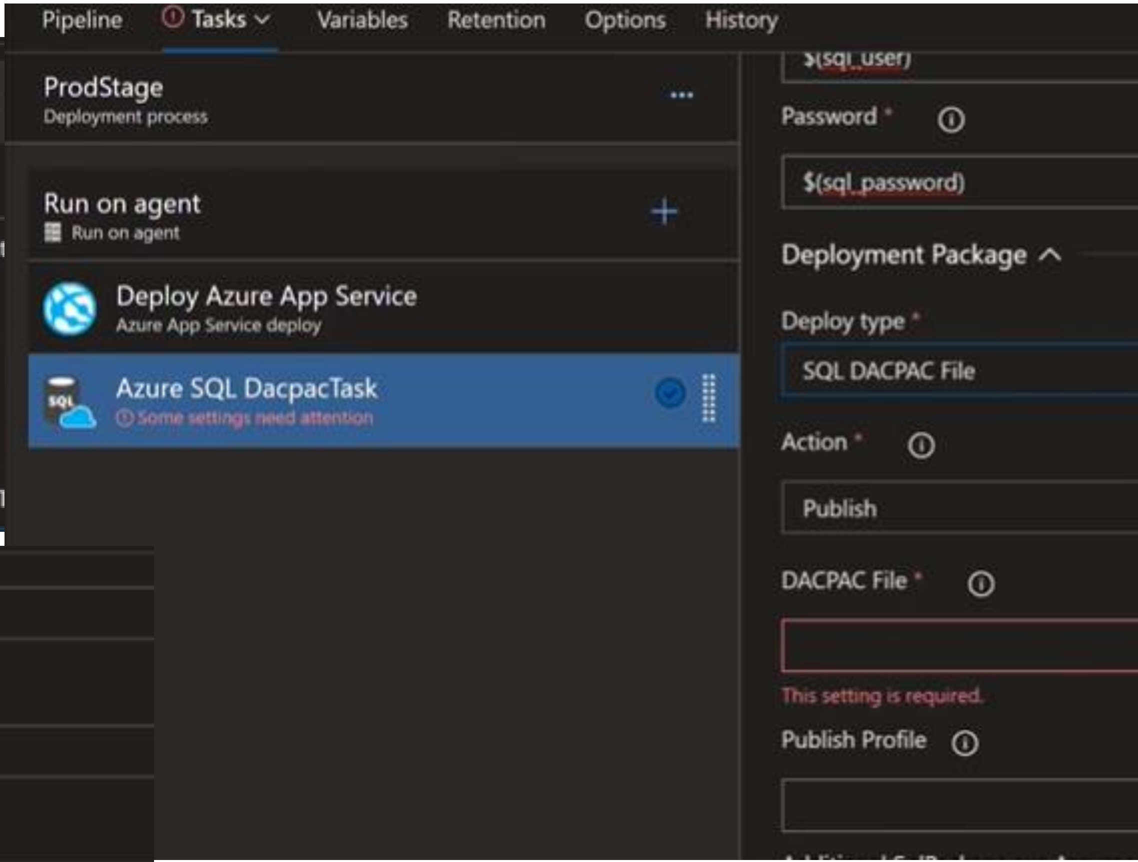
Database Pipeline: Creating Release Pipeline



Name	Value
sql_server	dntecommserver.dat
sql_user	sysadmin
sql_passsword	********
sql_db	DNTEcommDB
ConnectionStrings.DefaultConnection	False;Encrypt=True;1



$(sql_user)

Password: $(sql_password)

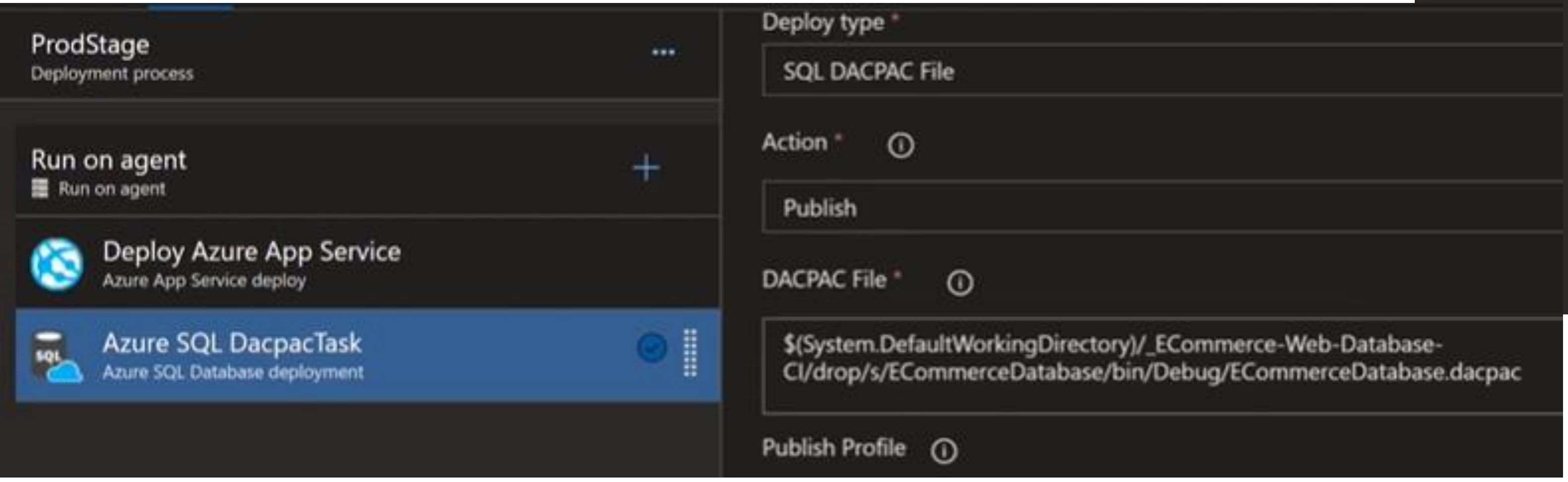
Deploy type: SQL DACPAC File

Action: Publish

DACPAC File:

This setting is required.

Publish Profile:



Deploy type: SQL DACPAC File

Action: Publish

DACPAC File: $(System.DefaultWorkingDirectory)/_ECommerce-Web-Database-CI/drop/s/ECommerceDatabase/bin/Debug/ECommerceDatabase.dacpac

Publish Profile

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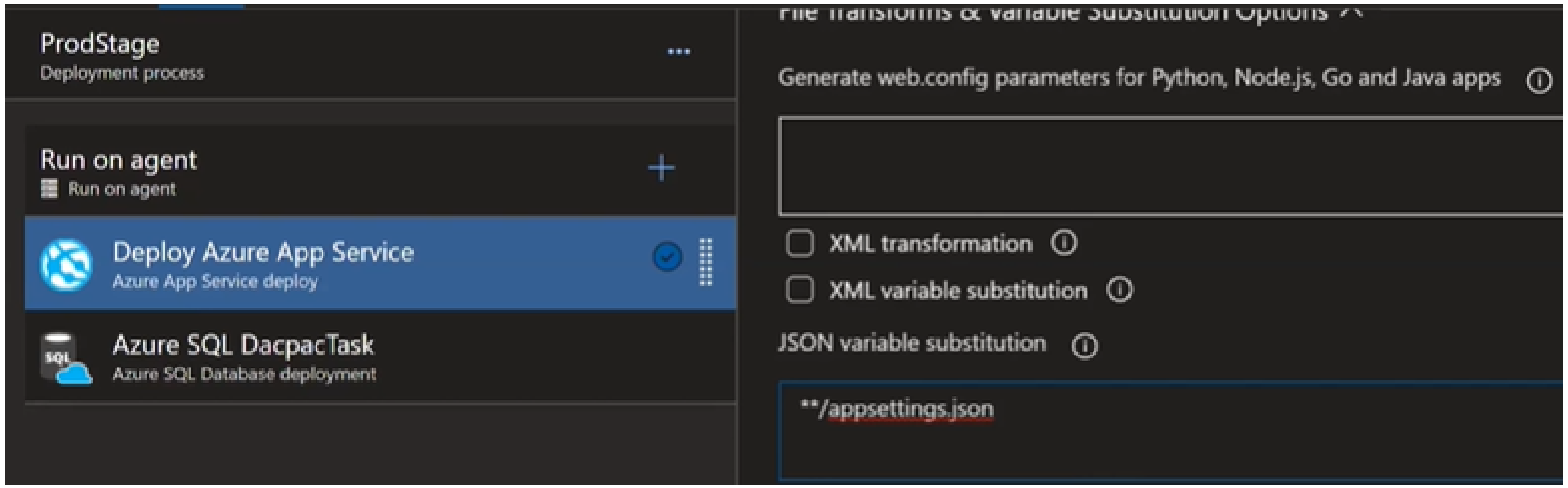
Database Pipeline: Replacing DB Connection



ProdStage
Deployment process

Run on agent
Run on agent

Deploy Azure App Service
Azure App Service deploy

Azure SQL DacpacTask
Azure SQL Database deployment

File Transforms & Variable Substitution Options

Generate web.config parameters for Python, Node.js, Go and Java apps

XML transformation

XML variable substitution

JSON variable substitution

**/appsettings.json