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Microsoft Azure DevOps Solutions Certification (AZ-400)

COURSE OUTLINE

Azure AZ-400

MODULE 1: Introduction to Azure DevOps

MODULE 2: Implementing Continuous Integration

MODULE 3: Build Containers with Azure DevOps

MODULE 4: Designing a Dependency Management Strategy and Managing Artifact Versioning

MODULE 5: Setting up Release Management Workflow

MODULE 6: Implementing Deployment Models and Services

MODULE 7: Implement and Optimize Continuous Feedback Mechanism

MODULE 8: Azure Tools: Infrastructure and Configuration, and Third-Party Tools

MODULE 9: Implementing Compliance and Security

MODULE 10: Azure Case Studies

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Azure Tools : Infrastructure and Configuration, and Third-party tools

Topics

Following are the topics covered in this module:

- Infrastructure as Code and Configuration Management
- Azure Resources
- Desired State Configuration (DSC)
- Automation with DevOps
- Chef
- Puppet
- Ansible
- Terraform
- Jenkins

Objectives

After completing this module, you should be able to:

- Create Azure resources using ARM templates, Azure CLI, and Azure PowerShell
- Demonstrate Desired State Configuration (DSC)
- Configure DSC using Configuration Management section
- Implement different automation scripts in Azure DevOps
- Automate Infrastructure Deployment in the cloud with Terraform and Azure Pipelines
- Perform Azure Deployments using Resource Manager Templates

Automating Innovation

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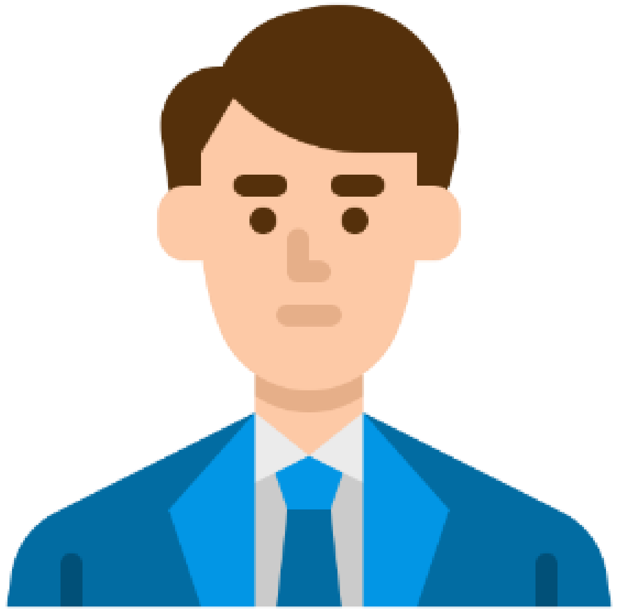
The Innovation Team

Microsoft is an example of a very innovative and creative organization whose mission is to continually develop and advance information technology and make it readily accessible to the common man

The Issue

To bring the innovations in the development of the engineering team, Microsoft has hired Mike, an Innovations Manager

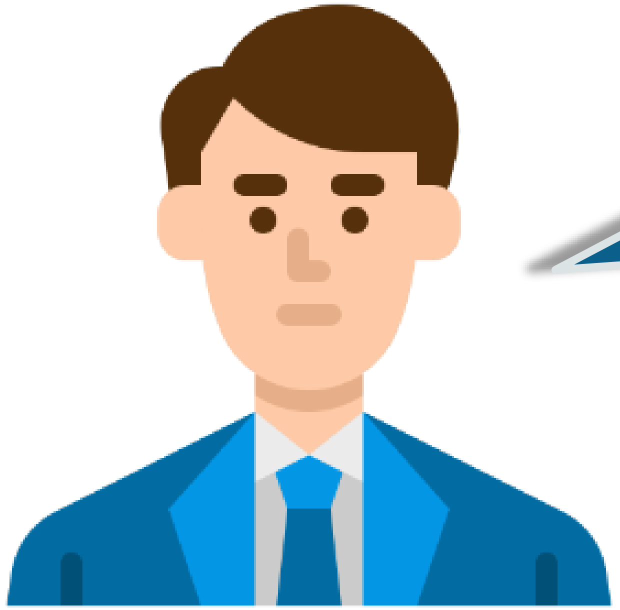


Mike
Innovations Manager

The Issue

Mike has observed that the company has a different configuration for each phase of development

Mike’s Observations



Mike
Innovations Manager

From my research, I have observed that two things need to be fixed:

- There should be a similar environment for development, testing, and production with the same configuration
- And the deployment process needs to be automated to reduce the deployment team's effort

The Solution

For Single Environment:

Use an ARM template

To Automate the Deployment Process

Automate infrastructure deployment and manage Azure deployments using Resource Manager templates

Infrastructure as Code and Configuration Management

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Infrastructure as Code (IaC)

IaC is the management of infrastructure - networks, virtual machines, load balancers, and connection topology

Infrastructure can be created faster and with zero error

Map infrastructure to a set of code

Versioning with Infrastructure as a code can be applied for all the new changes

IaC helps to solve the environment drift problem

Azure Infrastructure

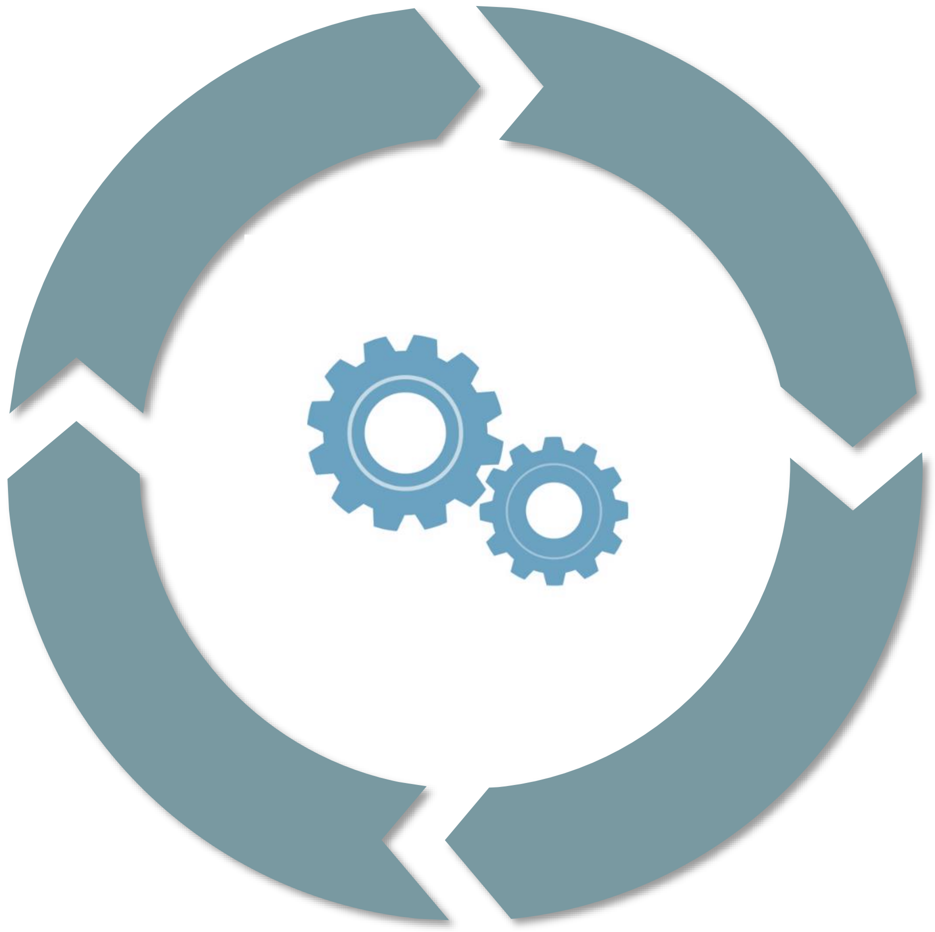
Azure Infrastructure is a collection of Services

— dependent on each other for working

Example: For Azure Virtual machine to work, it depends on many other services like Virtual Network, Network security group, storage etc.

Configuration Management

Configuration management is used where a configuration platform is used to automate, monitor, design, and manage otherwise manual configuration processes. The goal is to replace the manual configuration with an automated one using a configuration management tool



Ensure the desired state, roll out the configuration update, and automate the resolution of unexpected changes or issues

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Configuration Management: Tools

Azure offers support for these tools.

01 Ansible

02 Chef

03 Puppet

04 Azure Automation

These tools can work independently of azure as well

Creating Azure Resources

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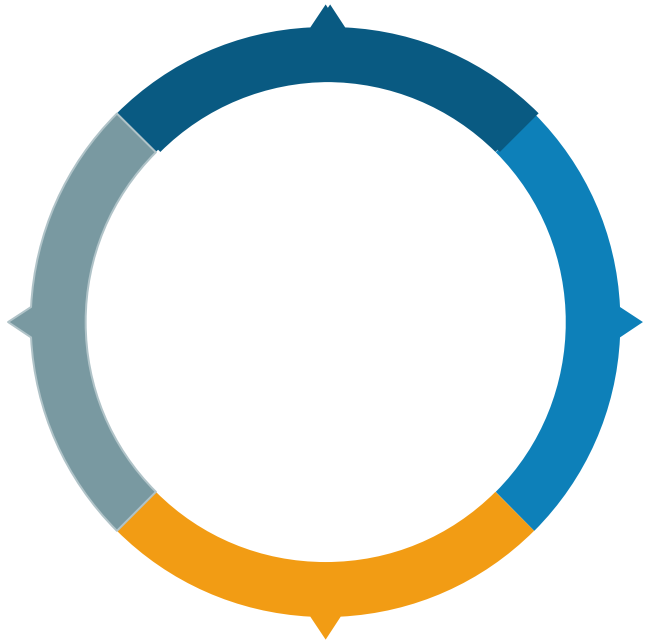
Creating Azure Resources using ARM Templates

ARM Template — Azure Resource Manager Template

ARM is the interface for managing and organizing cloud resources



ARM can be used to deploy, manage, and delete

ARM template is a JSON file

ARM can be taken to deploy cloud resources

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Benefits of ARM Template

Improving consistency

Helps in complex deployment

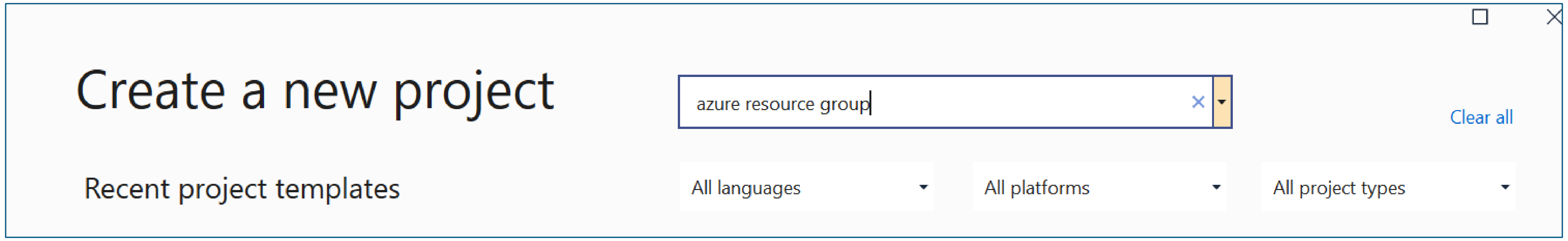
Reduces manual and error-prone tasks

The template can be reused for replicating the environment

Creating a Virtual Machine using Visual Studio

Open Visual Studio 2017 or above

Search for Azure Resource Group as shown here:


Create a new project

azure resource group

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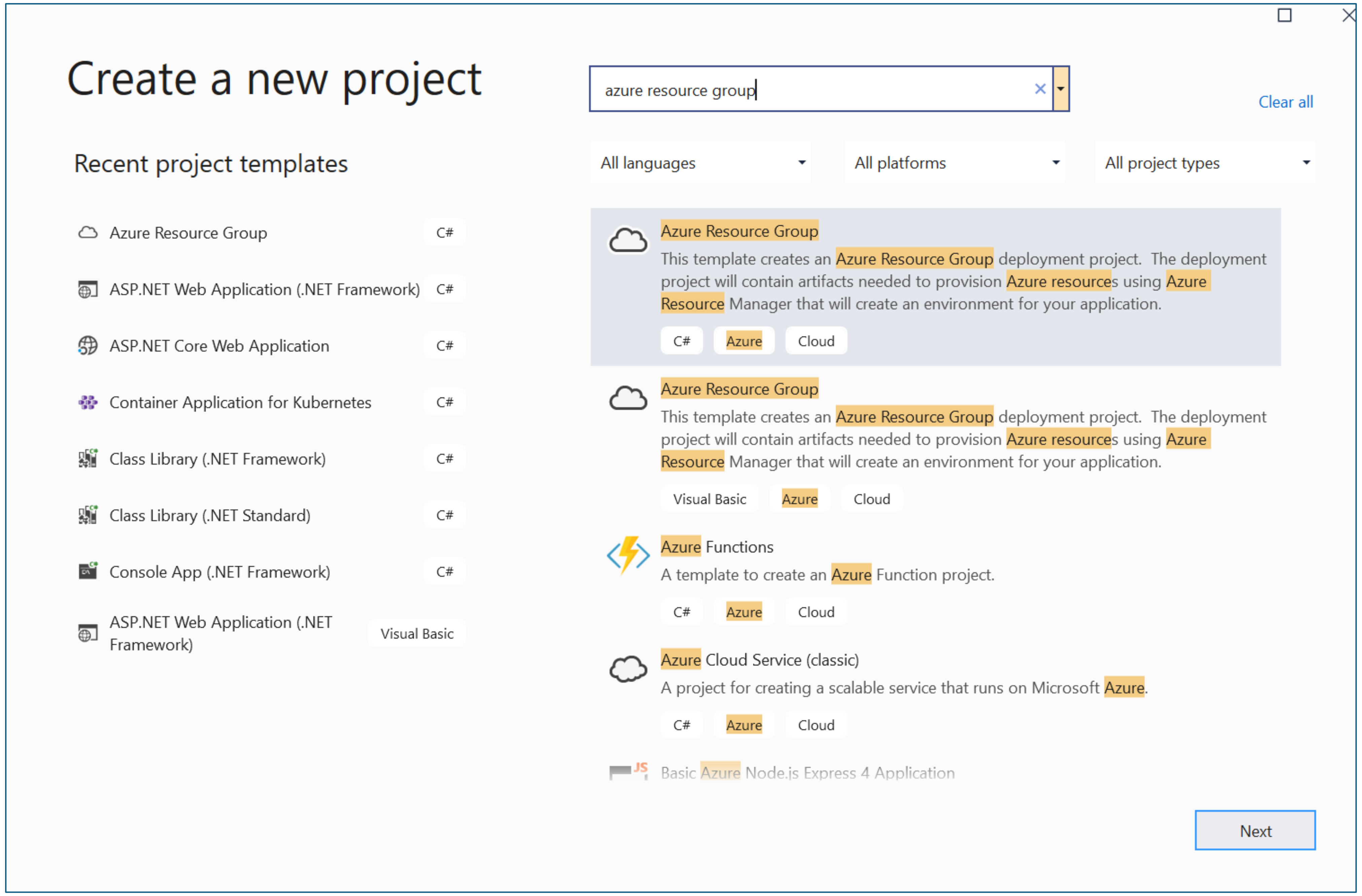
Creating a Virtual Machine using Visual Studio (Contd.)

Using the Azure resource group option as shown here, the ARM Template deployment can be created from Visual Studio.



Create a new project

azure resource group

Clear all

All languages · All platforms · All project types

Recent project templates

Azure Resource Group	C#
ASP.NET Web Application (.NET Framework)	C#
ASP.NET Core Web Application	C#
Container Application for Kubernetes	C#
Class Library (.NET Framework)	C#
Class Library (.NET Standard)	C#
Console App (.NET Framework)	C#
ASP.NET Web Application (.NET Framework)	Visual Basic

Azure Resource Group
This template creates an Azure Resource Group deployment project. The deployment project will contain artifacts needed to provision Azure resources using Azure Resource Manager that will create an environment for your application.
C# · Azure · Cloud

Azure Resource Group
This template creates an Azure Resource Group deployment project. The deployment project will contain artifacts needed to provision Azure resources using Azure Resource Manager that will create an environment for your application.
Visual Basic · Azure · Cloud

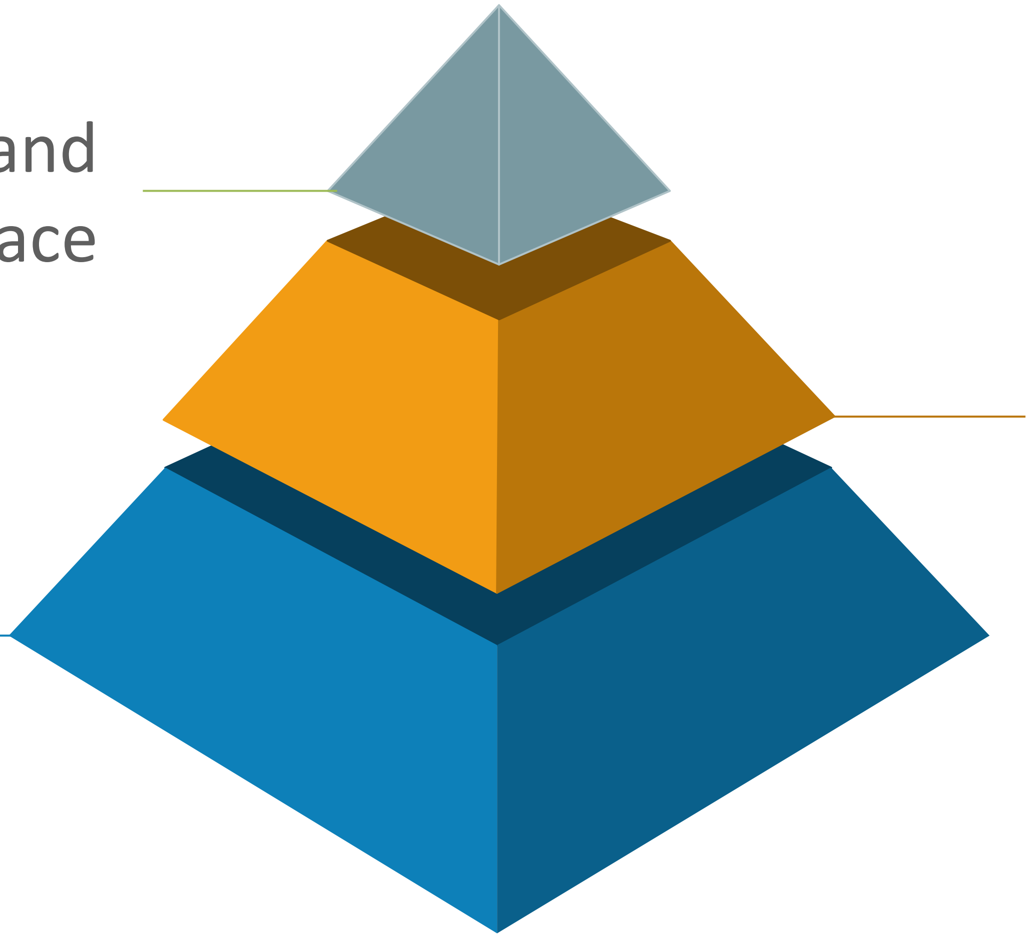
Azure Functions
A template to create an Azure Function project.
C# · Azure · Cloud

Azure Cloud Service (classic)
A project for creating a scalable service that runs on Microsoft Azure.
C# · Azure · Cloud

Basic Azure Node.js Express 4 Application

Next

Creating Azure Resources using Azure CLI



Azure CLI is a command line interface

Using this command line, various azure resources can be created

Azure portal is not required to create resources

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Creating Azure Resources using Azure CLI: Step 1

Azure CLI can be installed in local system and can be used to log into Azure account

Download Azure CLI installer from Microsoft site

The URL can change in future as many updates related to Azure happens frequently

https://docs.microsoft.com/en-us/cli/azure/install-azure-cli-windows?view=azure-cli-latest&tabs=azure-cli

Creating Azure Resources using Azure CLI: Step 2

Type az Login for logging to Azure

Enter the Azure Login credential

```
#  The command for creating resource group

     az group create --name myResourceGroup --location westus

#  This will create resource group having name myResourceGroup
```

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Creating Azure Resources using Azure CLI: Step 3

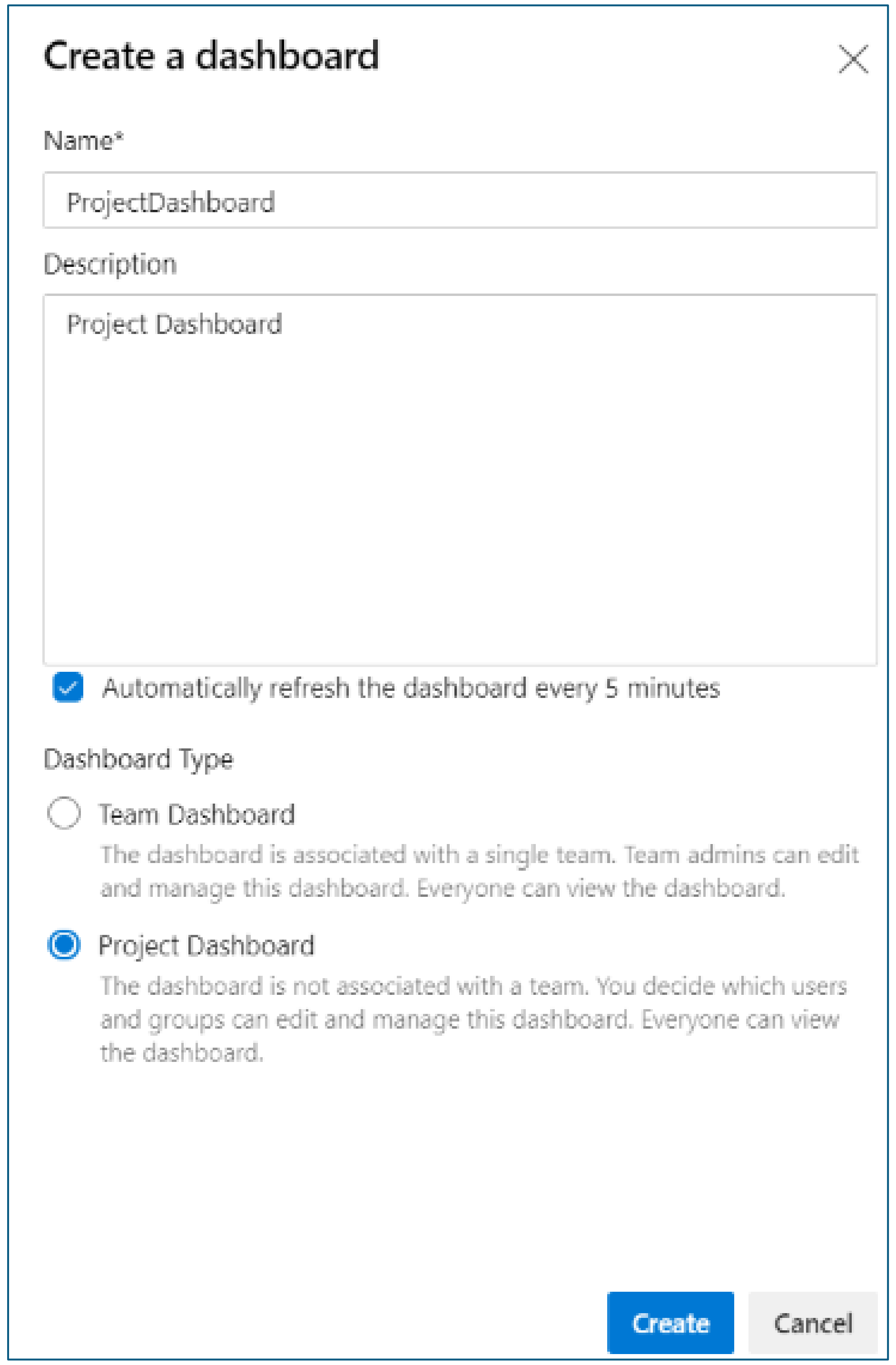
```
#  The command for creating Windows virtual machine

UserPassword=Pass@1234

az vm create \
    --resource-group myResourceGroup \
    --name myVM \
    --image win2016datacenter \
    --admin-username azureuser \
    --admin-password $UserPassword
```

Dashboard Creation

Click on New Dashboard and fill in the information as shown. The dashboard can be created for team or project



Create a dashboard

Name*

ProjectDashboard

Description

Project Dashboard

☑ Automatically refresh the dashboard every 5 minutes

Dashboard Type

○ Team Dashboard
The dashboard is associated with a single team. Team admins can edit and manage this dashboard. Everyone can view the dashboard.

● Project Dashboard
The dashboard is not associated with a team. You decide which users and groups can edit and manage this dashboard. Everyone can view the dashboard.

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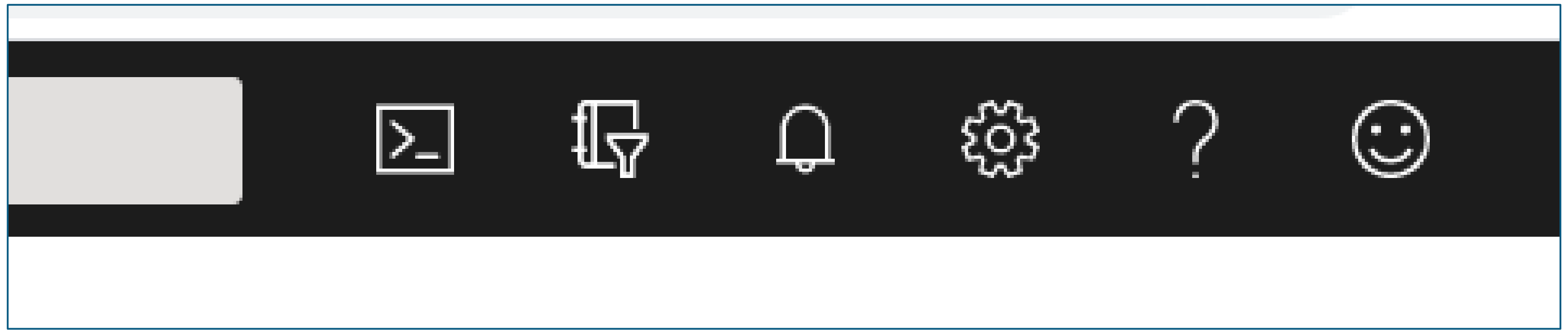
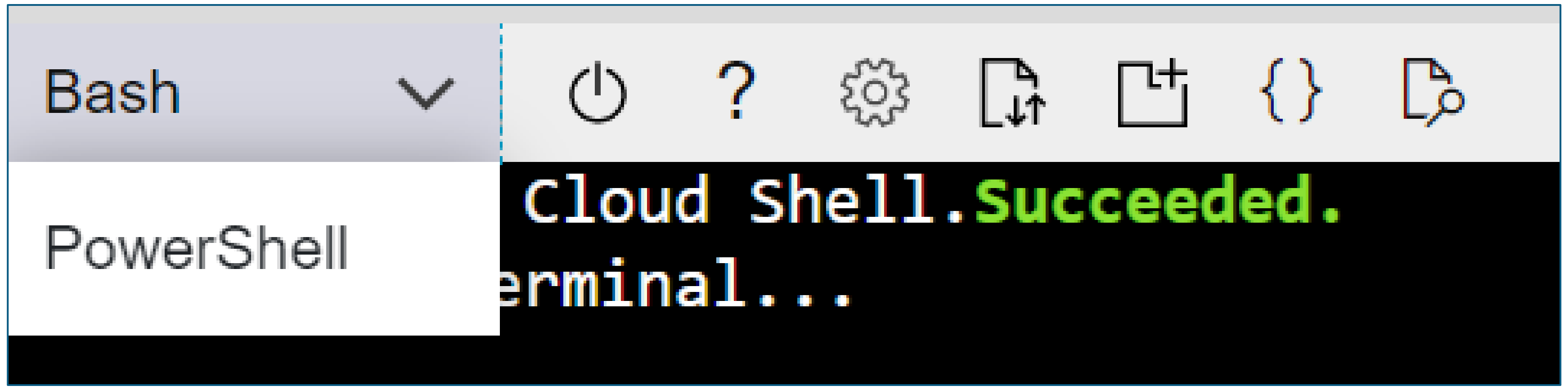
Working Azure CLI in Portal

Click on the Cloud shell on the portal home page.

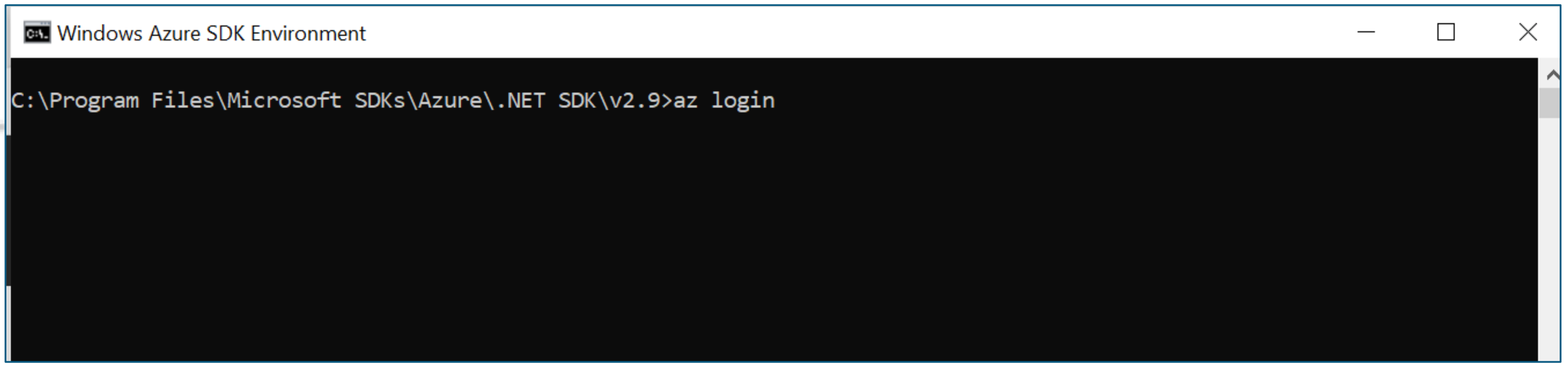


Select Bash for Azure CLI commands.



```
Cloud Shell.Succeeded.
erminal...
```

CLI can be executed from the CLI installed as shown here.



```
C:\Program Files\Microsoft SDKs\Azure\.NET SDK\v2.9>az login
```

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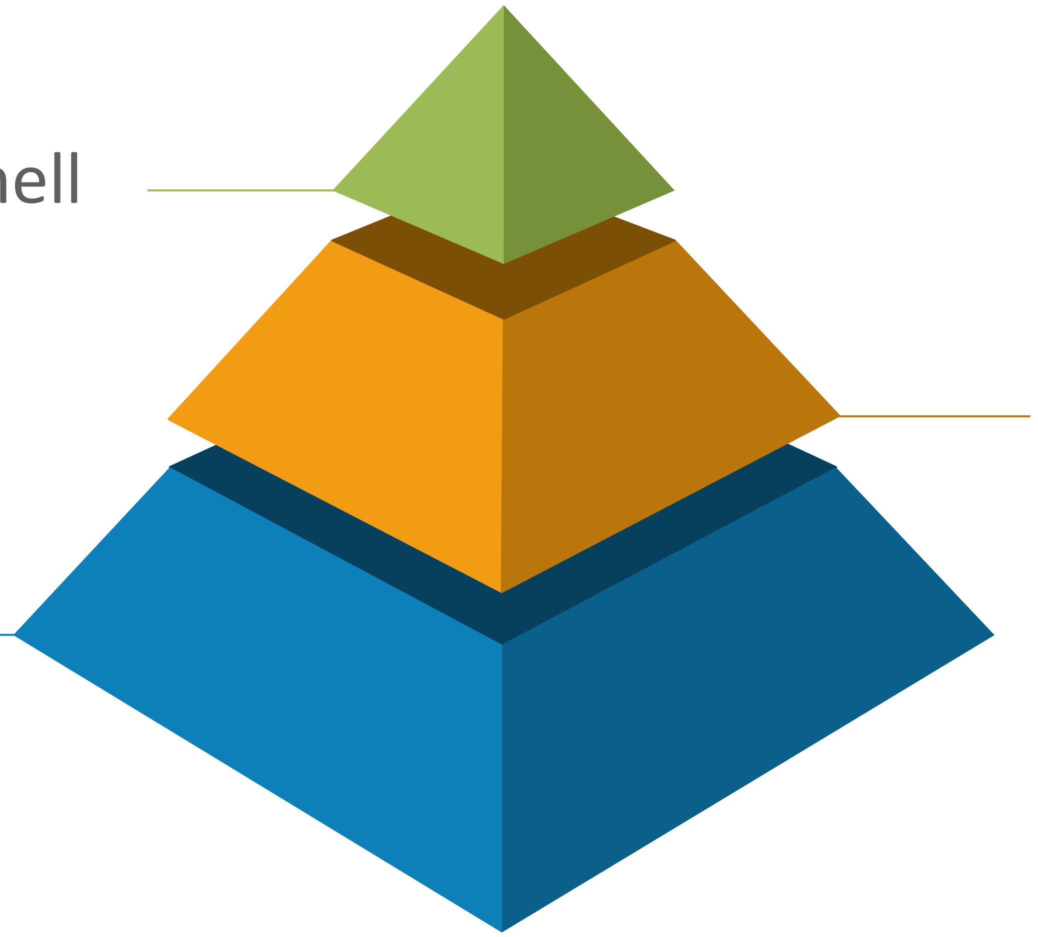
Creating Azure Resources using Azure PowerShell



Open PowerShell

Execute the command `Login-AzureRmAccount`

Enter the credentials

# In case of error, use the below command and enter the credentials

```
Install-Module AzureRM
```

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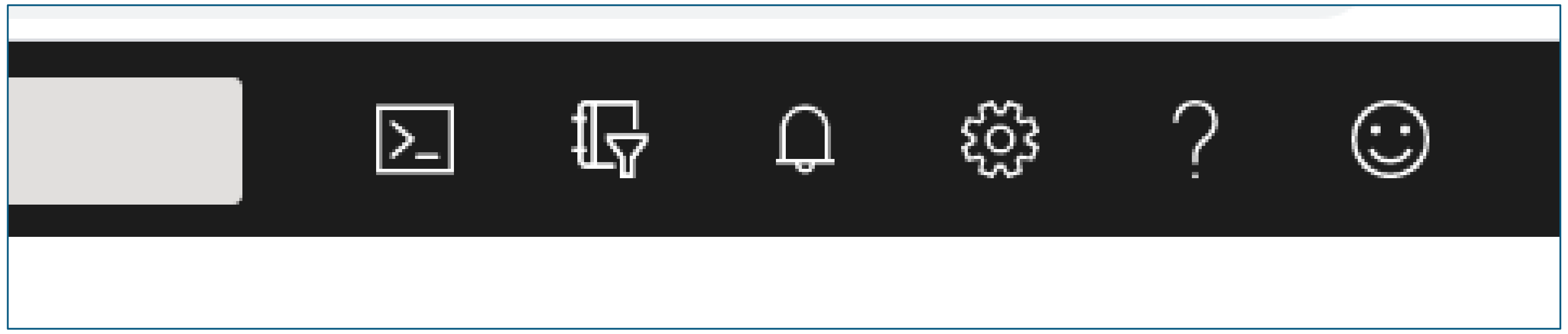
Creating Resource Group and VM using Commands

```
#  The command for creating resource group

New-AzResourceGroup -Name myResourceGroup -Location eastus
```

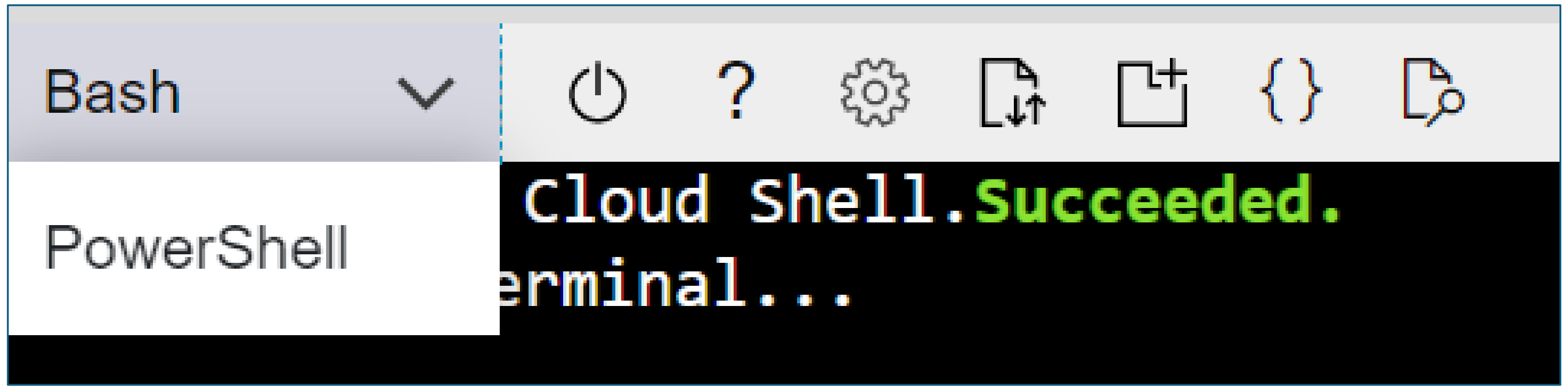
```
#  The command for creating virtual machine

New-AzVm `
    -ResourceGroupName "myResourceGroup" `
    -Name "myVM" `
    -Location "EastUS" `
    -VirtualNetworkName "myVnet" `
    -SubnetName "mySubnet" `
    -SecurityGroupName "myNetworkSecurityGroup" `
    -PublicIpAddressName "myPublicIpAddress"
```

Working Azure CLI in Portal

Click on the Cloud shell on the portal home page

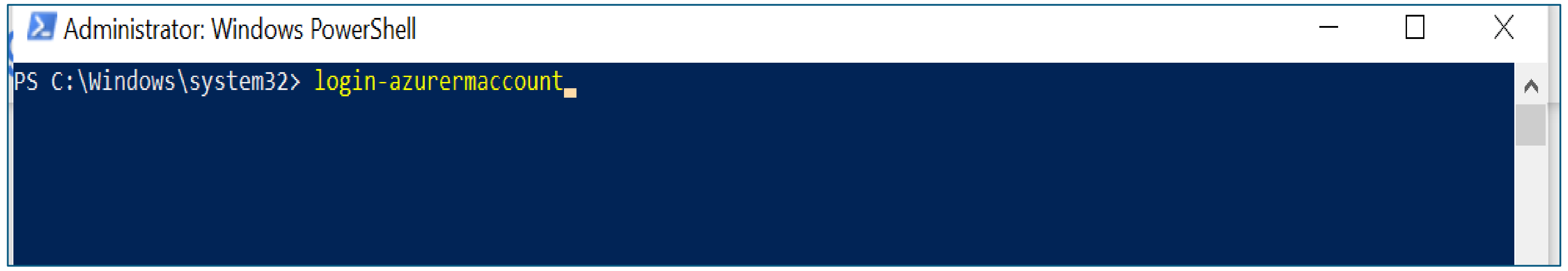


Select PowerShell for Azure PowerShell commands



```
Cloud Shell.Succeeded.
erminal...
```

This command can be used in PowerShell



```
PS C:\Windows\system32> login-azurermaccount_
```

Desired State Configuration (DSC)

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Desired State Configuration (DSC): Overview

Used to keep the VM's in the desired or pre-defined configuration

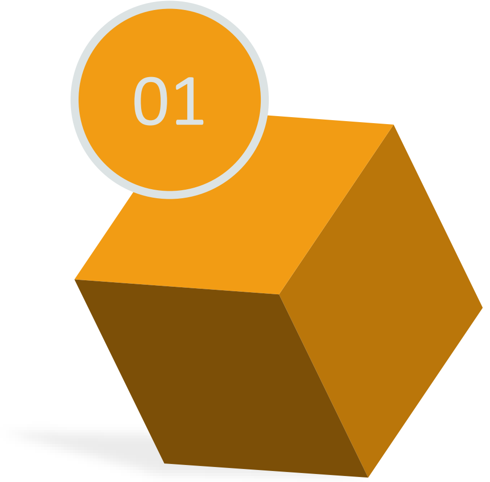
Due to multiple users, settings and configurations can be modified

The VM gets drifted from its initial configuration

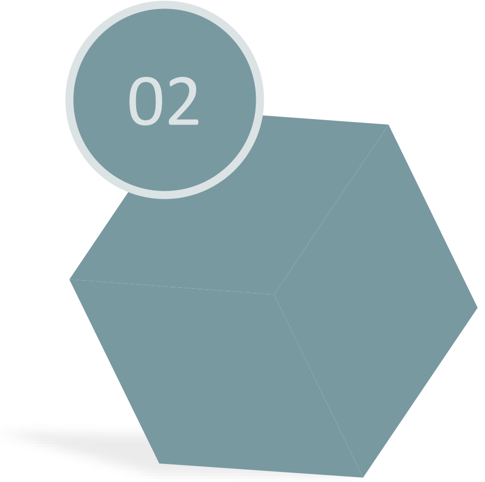
DSC is used to maintain initial configuration

Series of PowerShell commands execute on VM and maintains its state

DSC: Types of Architecture



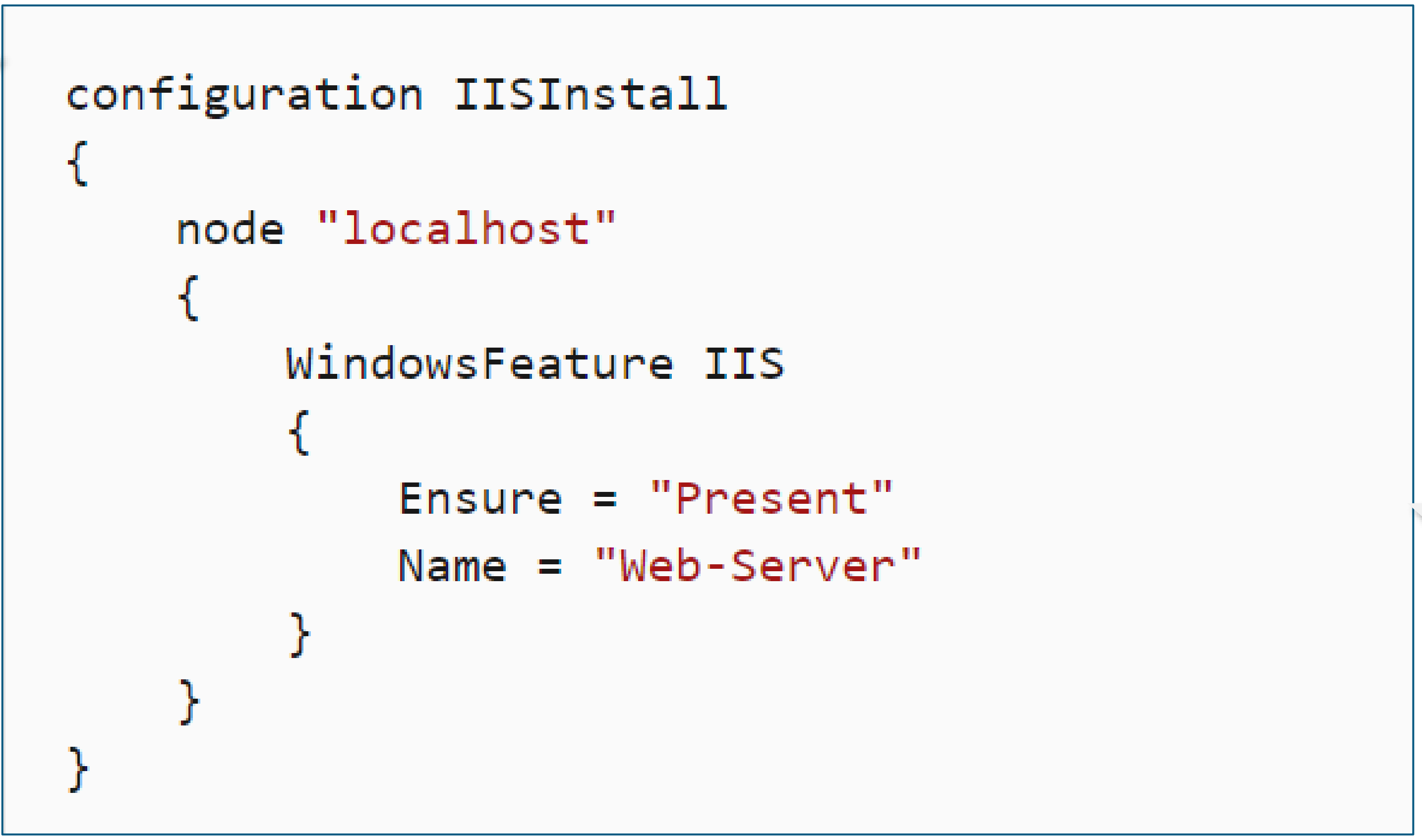
Push Mode
The configuration is sent to the System to maintain its state



Pull Mode
The system pulls the configuration from a server to maintain its state

DSC: Example

PowerShell script — installs/enables IIS server in the VM



```
configuration IISInstall
{
    node "localhost"
    {
        WindowsFeature IIS
        {
            Ensure = "Present"
            Name = "Web-Server"
        }
    }
}
```

PowerShell will enable the Web-server/IIS, if disabled

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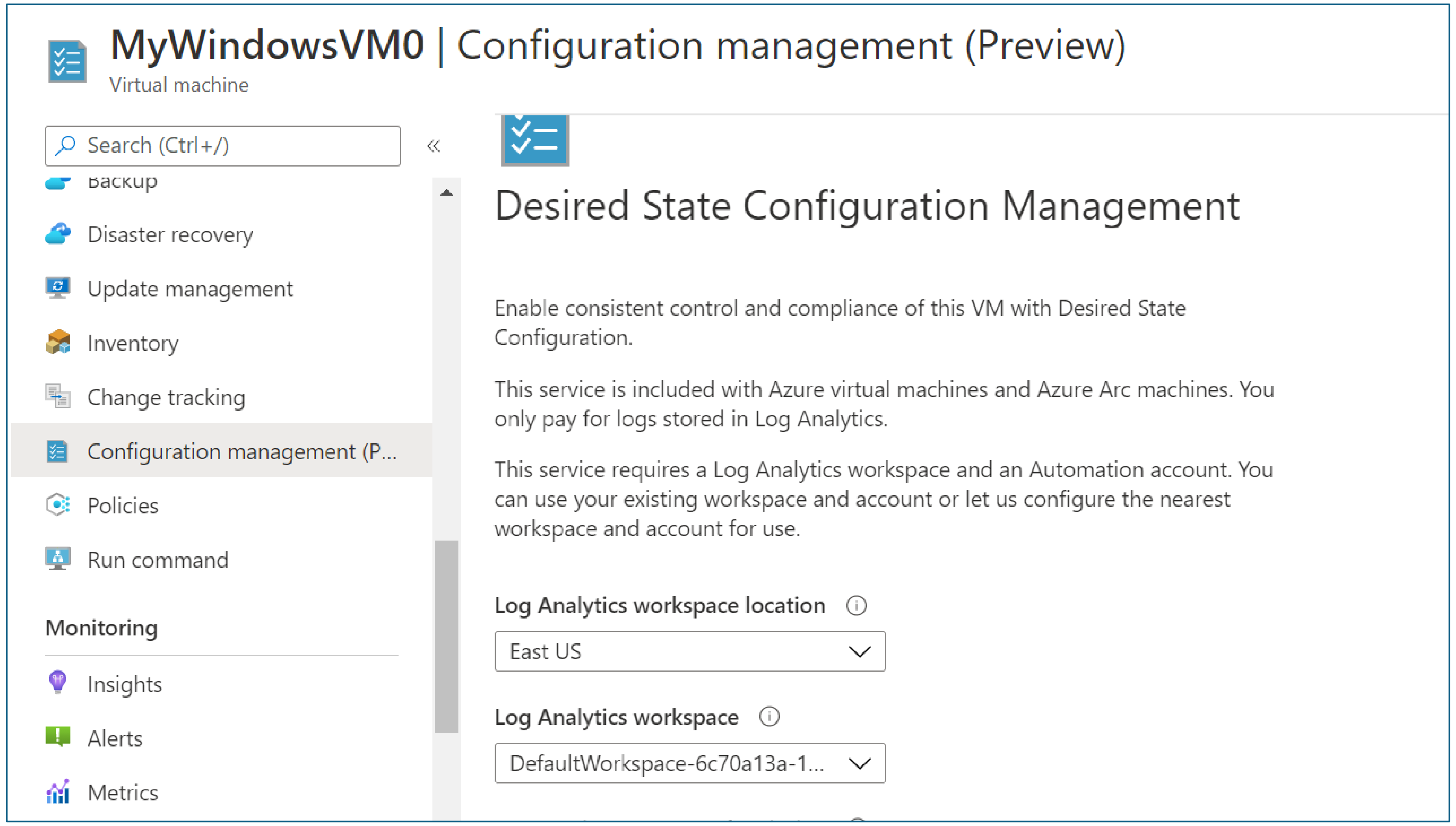
PowerShell DSC

PowerShell DSC is used to implement configuration management

DSC can be configured using Configuration Management section on the left side as shown here:



MyWindowsVM0 | Configuration management (Preview)

Virtual machine

Desired State Configuration Management

Enable consistent control and compliance of this VM with Desired State Configuration.

This service is included with Azure virtual machines and Azure Arc machines. You only pay for logs stored in Log Analytics.

This service requires a Log Analytics workspace and an Automation account. You can use your existing workspace and account or let us configure the nearest workspace and account for use.

Log Analytics workspace location: East US

Log Analytics workspace: DefaultWorkspace-6c70a13a-1...

Azure Portal

Automation with DevOps

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Automation with DevOps

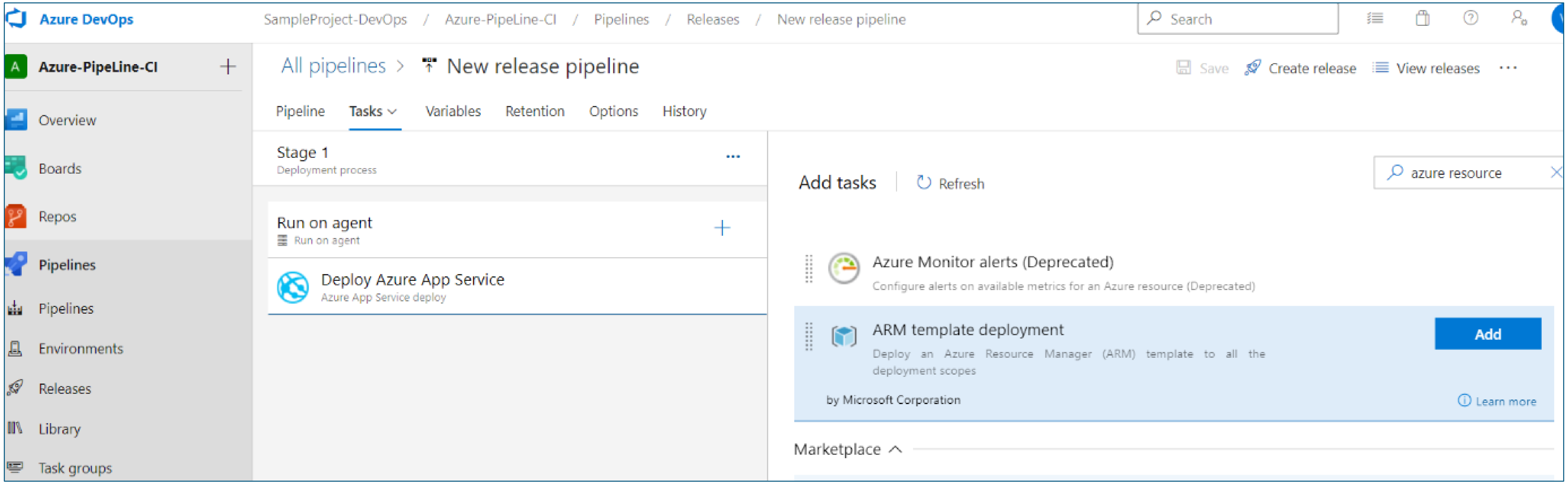
Automation scripts can be implemented in Azure DevOps through the Release pipeline.

During the release pipeline:

- Occasionally, we need to provision environment during the release pipeline
- Different automation options can be used as part of the release pipeline

Automation Options

ARM template, Terraform, ansible can be added as a task in the release pipeline



Azure DevOps   SampleProject-DevOps / Azure-PipeLine-CI / Pipelines / Releases / New release pipeline

Azure-PipeLine-CI

- Overview
- Boards
- Repos
- Pipelines
- Pipelines
- Environments
- Releases
- Library
- Task groups

All pipelines > New release pipeline

Save   Create release   View releases

Pipeline   Tasks   Variables   Retention   Options   History

Stage 1
Deployment process

Run on agent
Run on agent

Deploy Azure App Service
Azure App Service deploy

Add tasks   Refresh   azure resource

Azure Monitor alerts (Deprecated)
Configure alerts on available metrics for an Azure resource (Deprecated)

ARM template deployment
Deploy an Azure Resource Manager (ARM) template to all the deployment scopes
by Microsoft Corporation

Add

Learn more

Marketplace

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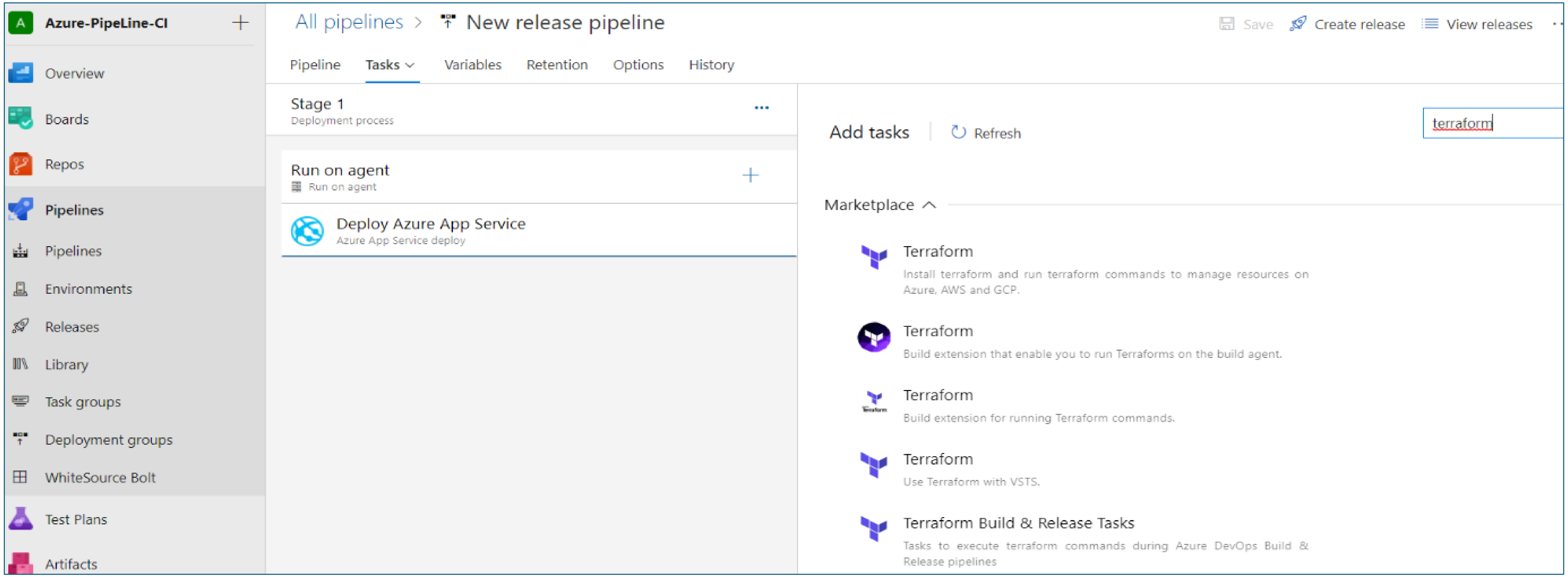
Automation Options (Contd.)

Environment can be provisioned, or configuration can be set



Terraform
Install terraform and run terraform commands to manage resources on Azure, AWS and GCP.

Terraform
Build extension that enable you to run Terraforms on the build agent.

Terraform
Build extension for running Terraform commands.

Terraform
Use Terraform with VSTS.

Terraform Build & Release Tasks
Tasks to execute terraform commands during Azure DevOps Build & Release pipelines

Other Automation Tools

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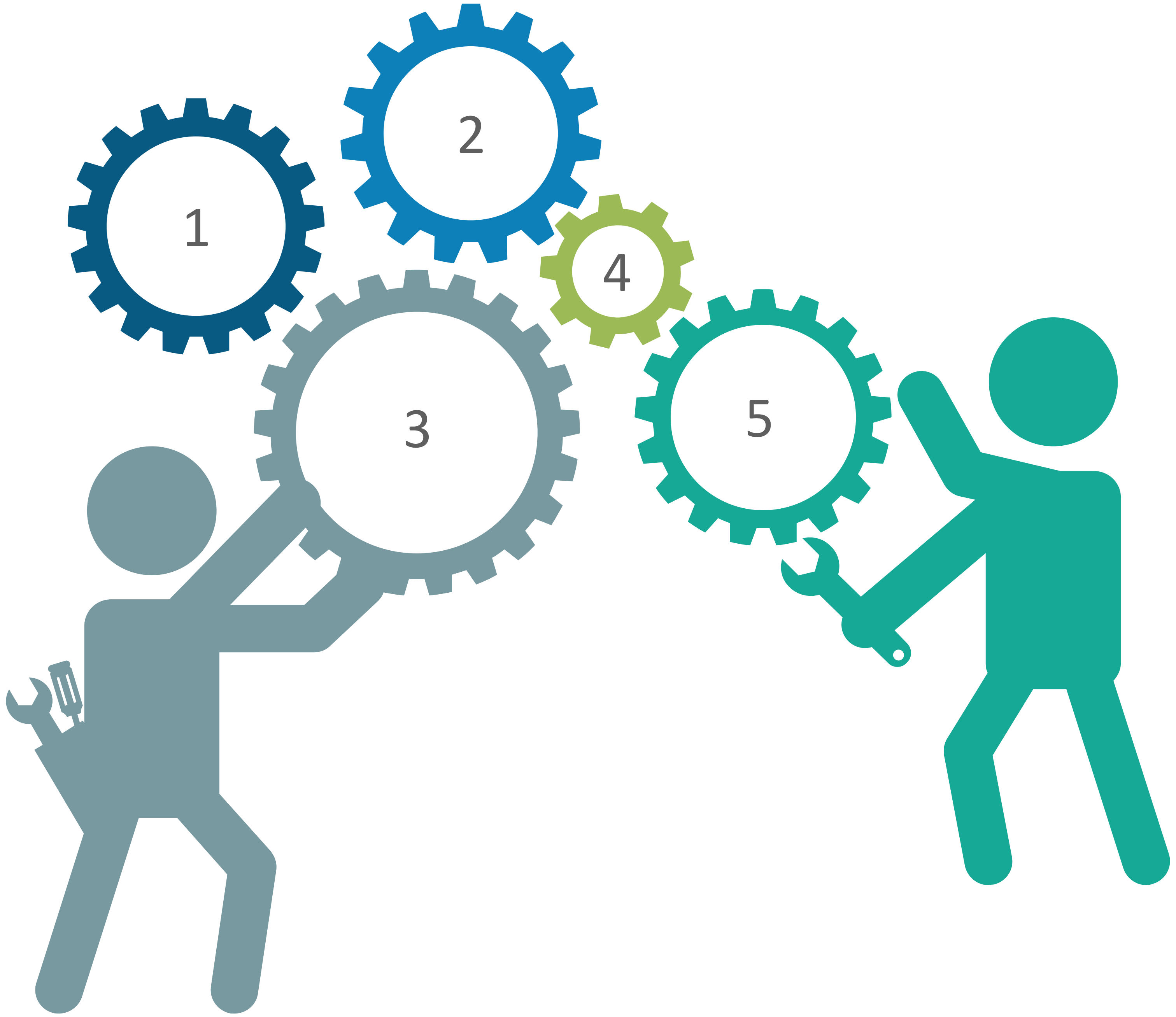
Automation Tools



Apart from azure Automation, Azure provides the integration with many other automation tools

- Chef
- Puppet
- Ansible
- Terraform
- Jenkins

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Chef

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Chef: Overview

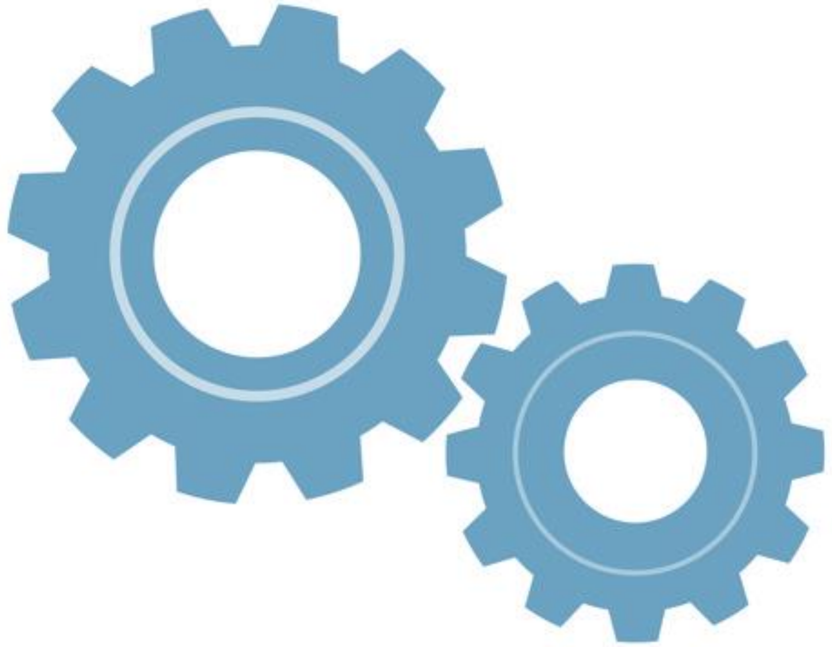
Chef is a configuration management tool - used to set the configuration of VM and make it consistent.

This automated configuration management is required to avoid error and configuration drift from a baseline.

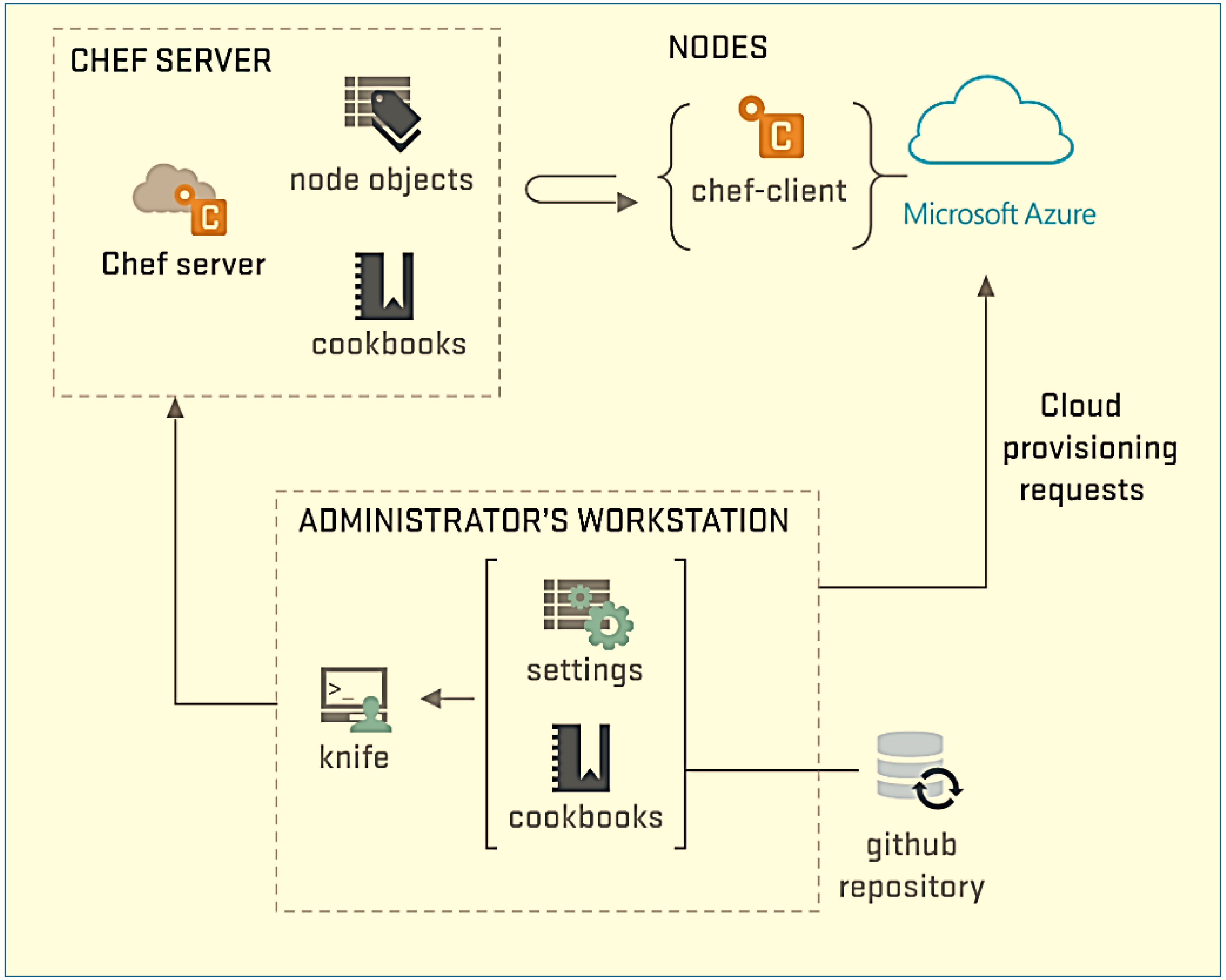
Chef infrastructure configuration becomes flexible and can be changed easily.

The VM managed by Chef is consistently evaluated to check whether there is any configuration drift.

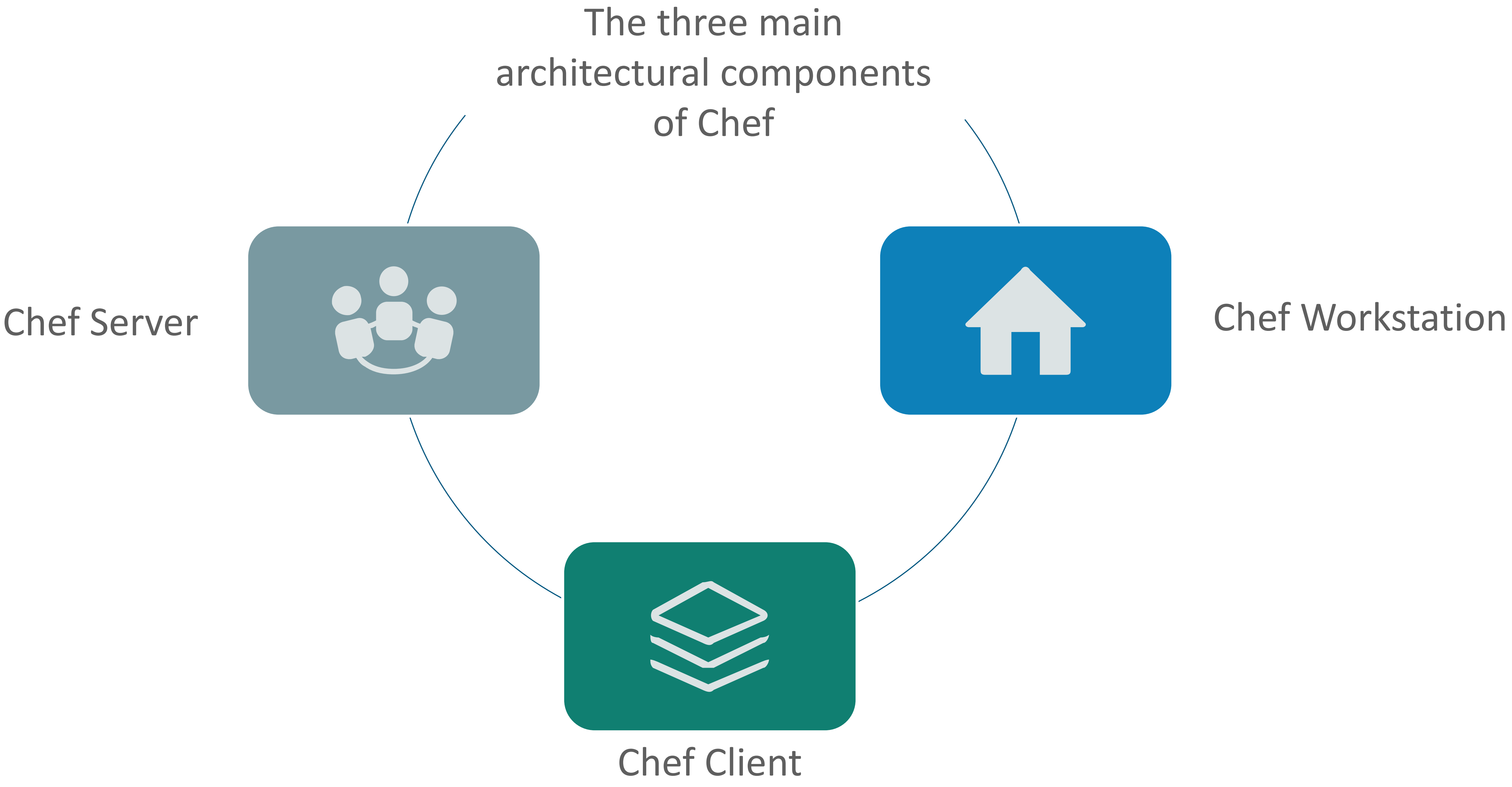
To configure VM with the chef, chef extension should be installed in VM. It can be done from PowerShell commands.



Chef Architectural Components



Main Architectural Components



The three main architectural components of Chef

Chef Server

Chef Workstation

Chef Client

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Puppet

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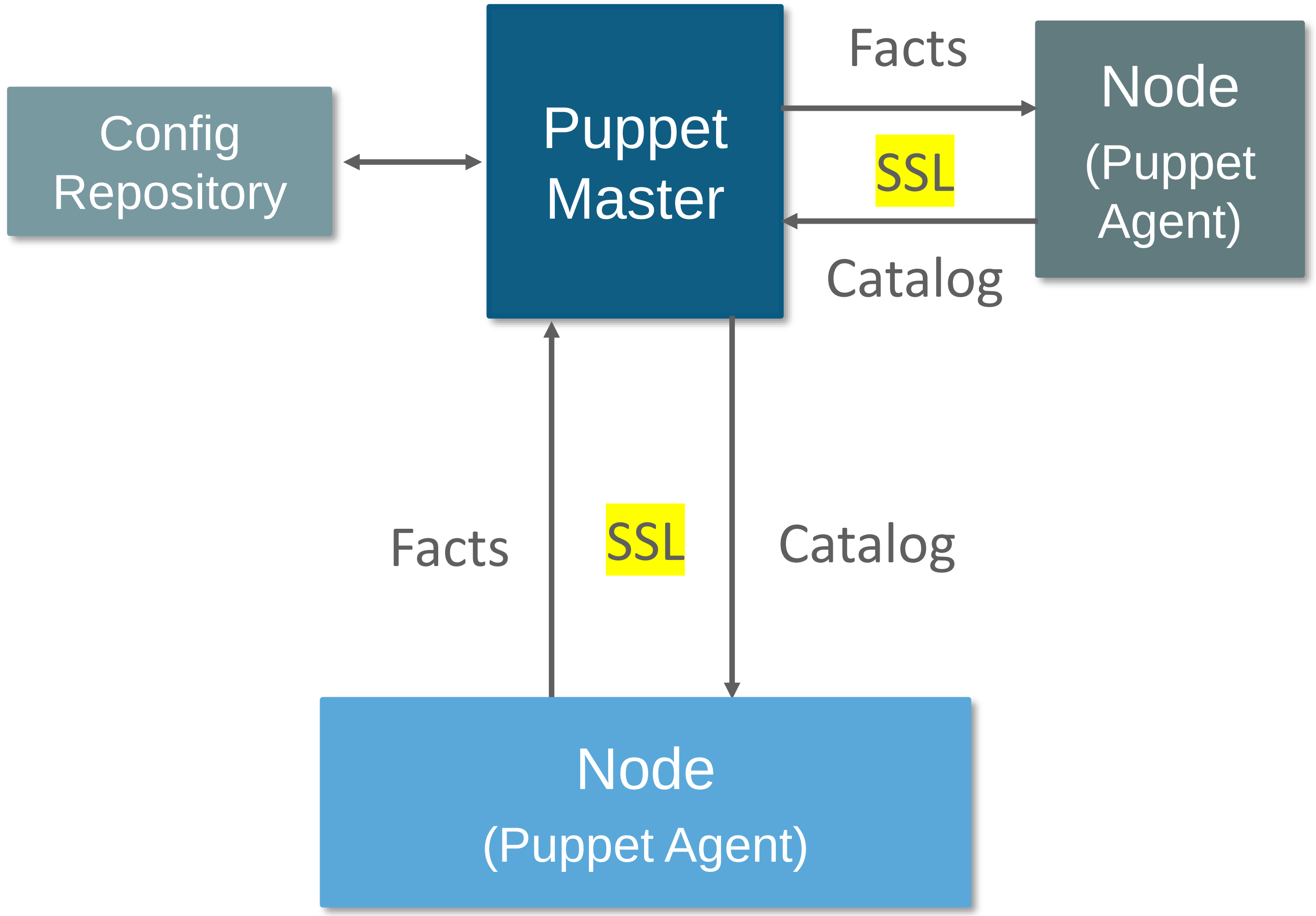
Puppet: Overview

Puppet helps to manage and automate the configuration of servers

Server desired state can be configured and managed by Puppet

Puppet master - stores the code of desired state

Puppet agent - pulls configuration from the puppet master to get to the desired state

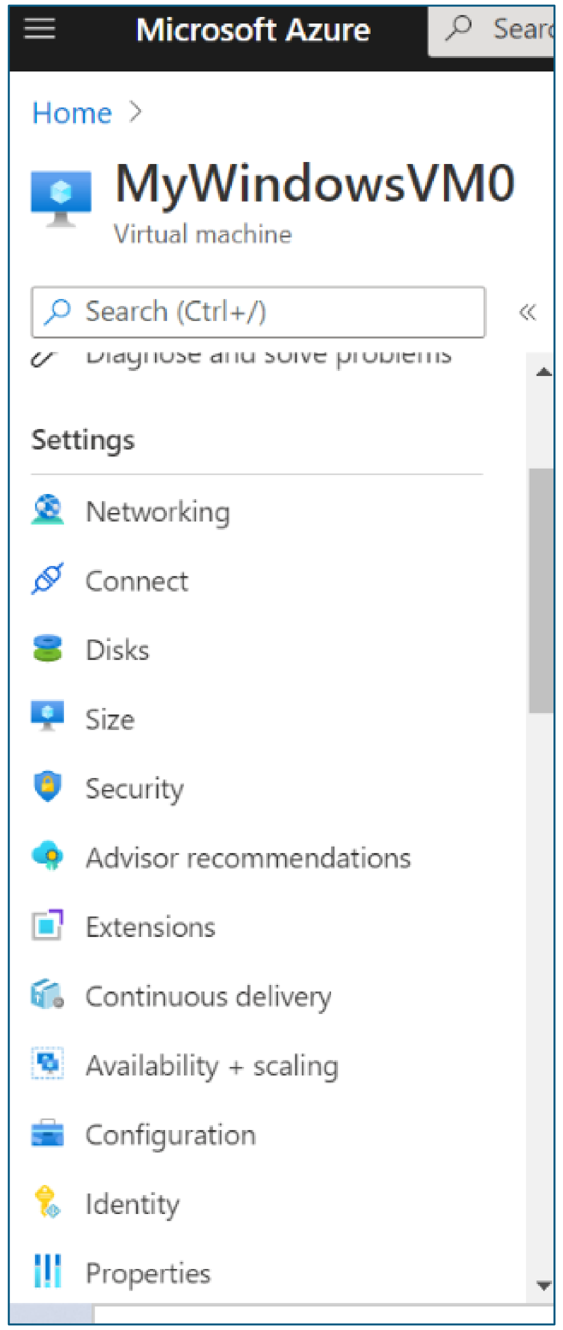


Client-Server Architecture

Installing Puppet Agent

Puppet agent should be installed in the VM, while creating Azure VM.

To install Puppet Agent, go to VM and on the left side, look for Extensions



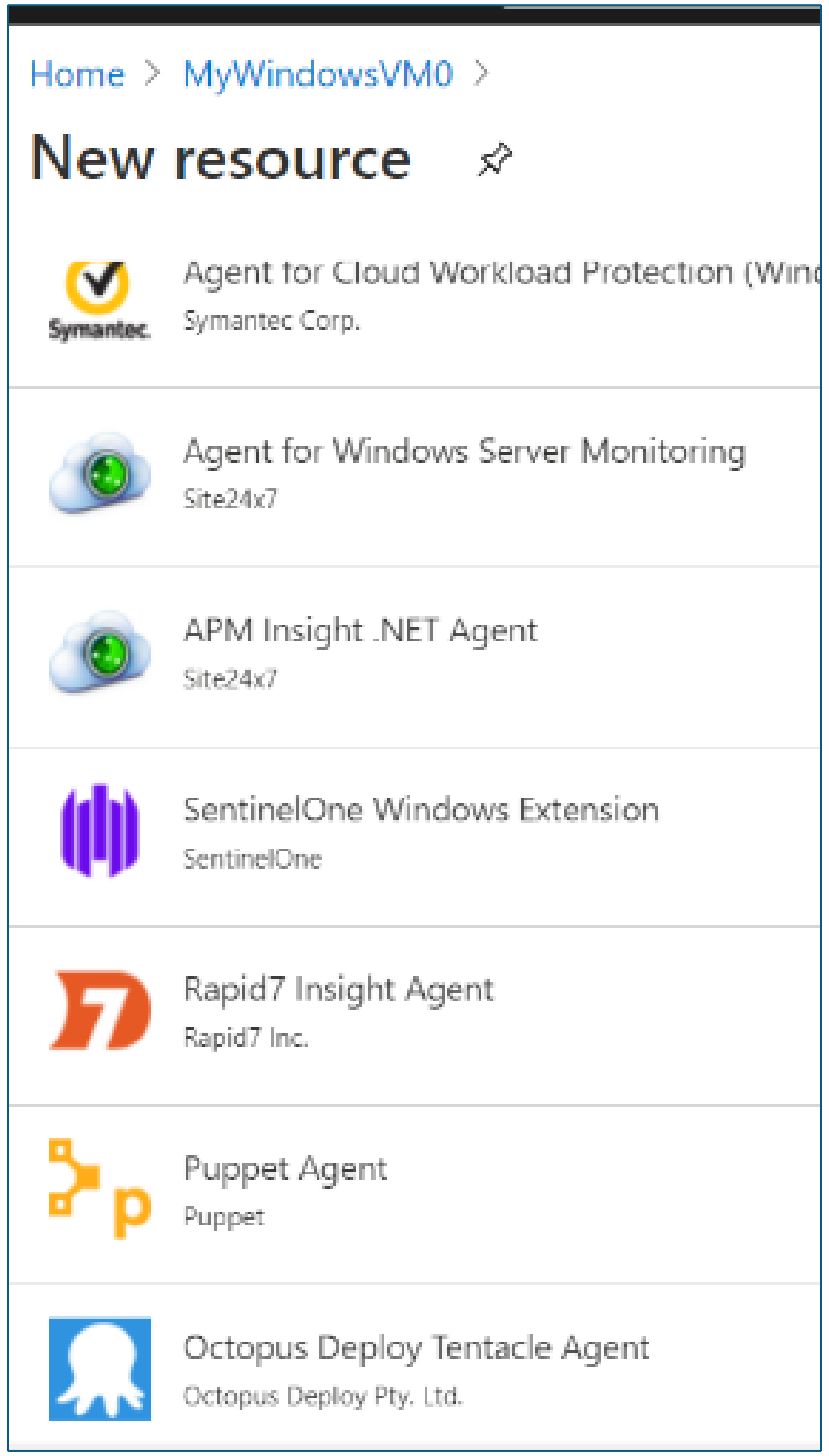
Installing Puppet Agent (Contd.)

Click Extensions, click add and search for Puppet agent

Select it and click on Create

Specify the puppet master server needs

Puppet agent fetches the configuration from the puppet master



Home > MyWindowsVM0 >

New resource

Agent for Cloud Workload Protection (Wind
Symantec Corp.

Agent for Windows Server Monitoring
Site24x7

APM Insight .NET Agent
Site24x7

SentinelOne Windows Extension
SentinelOne

Rapid7 Insight Agent
Rapid7 Inc.

Puppet Agent
Puppet

Octopus Deploy Tentacle Agent
Octopus Deploy Pty. Ltd.

Ansible

Ansible: Overview

It is an open-source tool that automates cloud provisioning, configuration management, and application deployments.

Can be used to provision virtual machines, containers, network, and complete cloud infrastructures.

Ansible uses playbooks to configure the environment. Playbooks are written in YAML language.

Ansible: Overview (Contd.)

The control node and the managed node are the two categories of computers in Ansible.

Managed nodes are the servers which we want to apply the configuration.

Control node sends the programs called ansible modules to the managed nodes.

These programs are sent to servers and executed for configuration management.

Terraform

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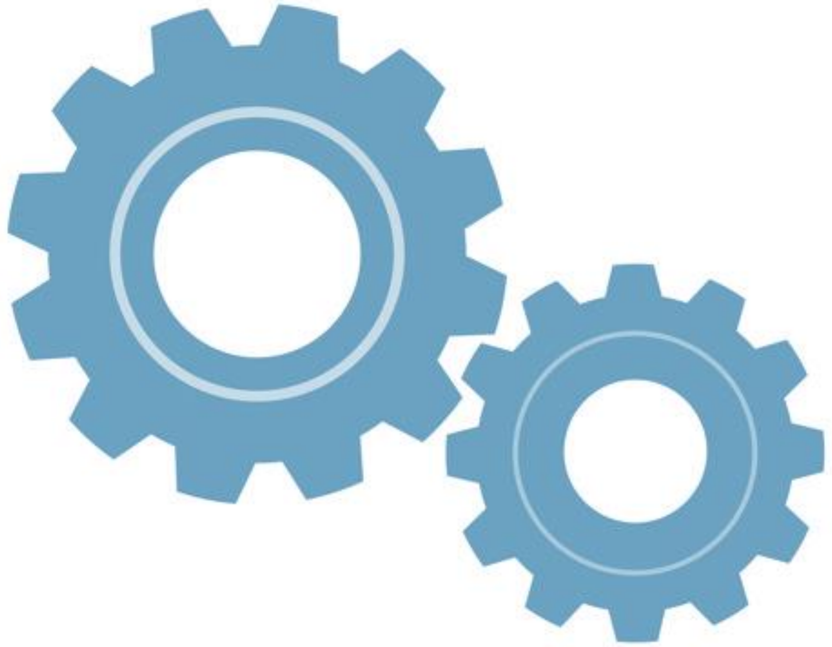
Terraform: Overview

Hashicorp Terraform is an open-source tool for provisioning and managing cloud infrastructure.

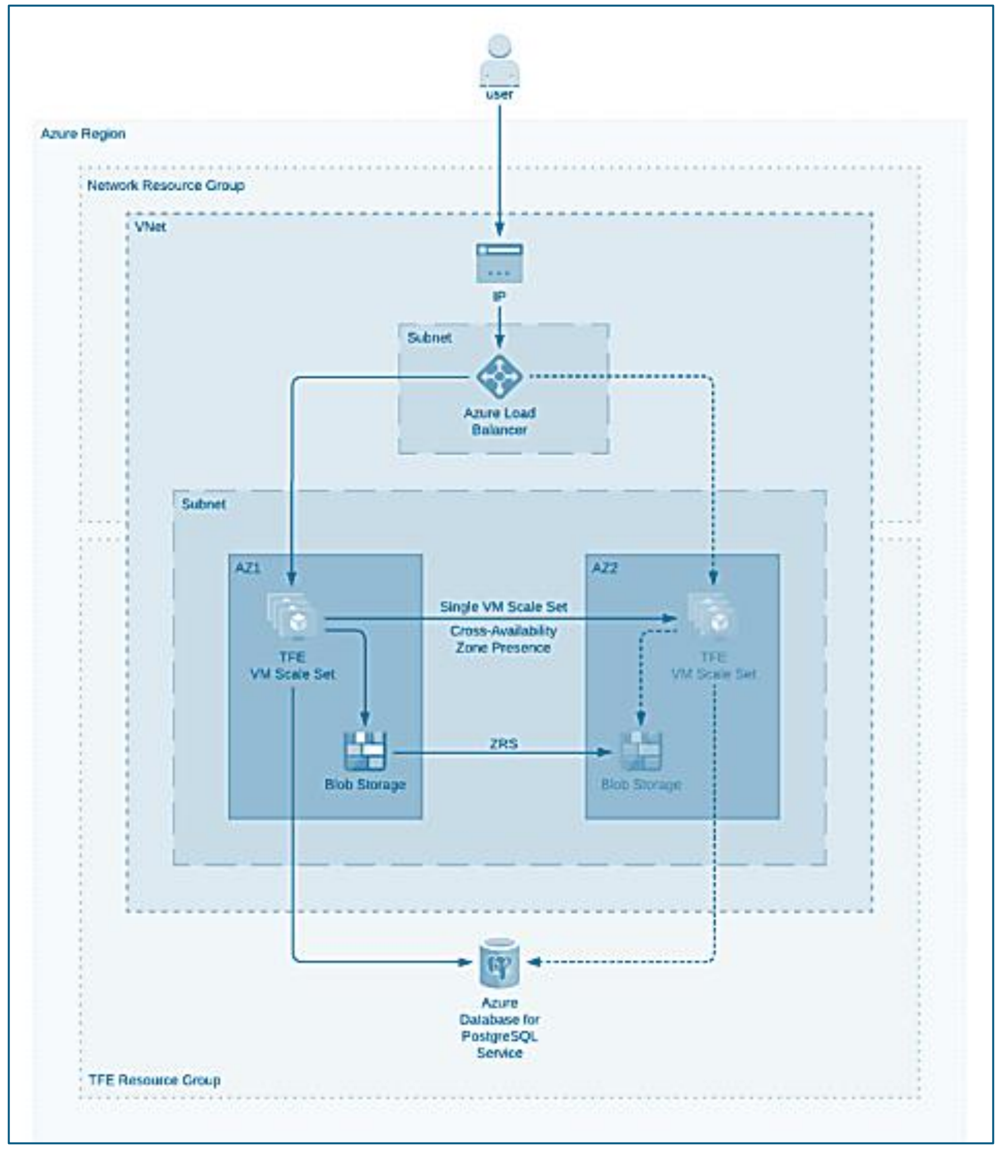
It codifies infrastructure in configuration files that describe the topology of cloud resources.

These resources can be Virtual machine, storage accounts, networking interfaces, Load balancer, etc.



Terraform: Uses

Terraform is an open-source tool for provisioning and managing cloud infrastructure



Jenkins

Azure Pipelines

Azure Pipelines supports integration with Jenkins for Continuous Integration (CI)

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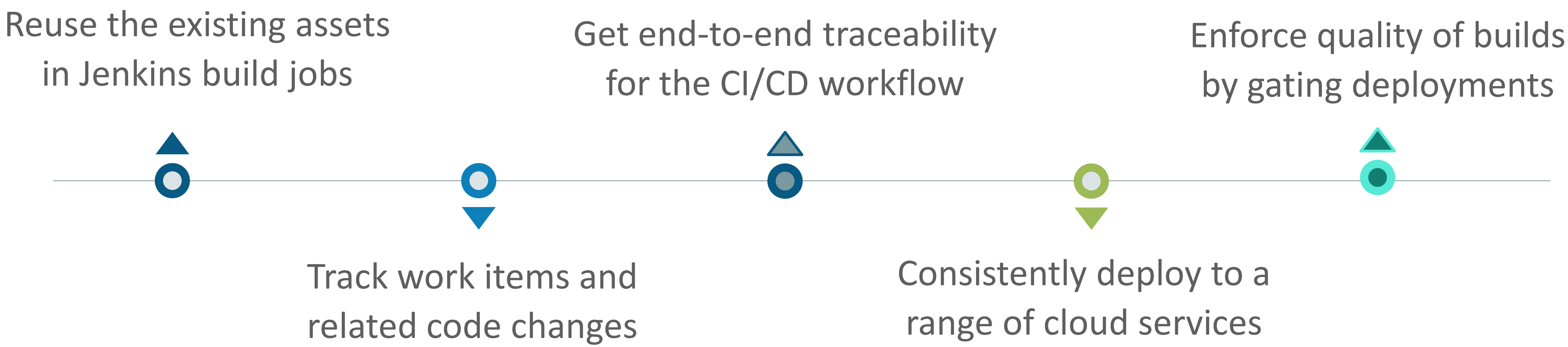
How Azure Pipelines Benefits DevOps?

Azure Pipelines release pipeline that deploys to Azure to:



Reuse the existing assets in Jenkins build jobs

Track work items and related code changes

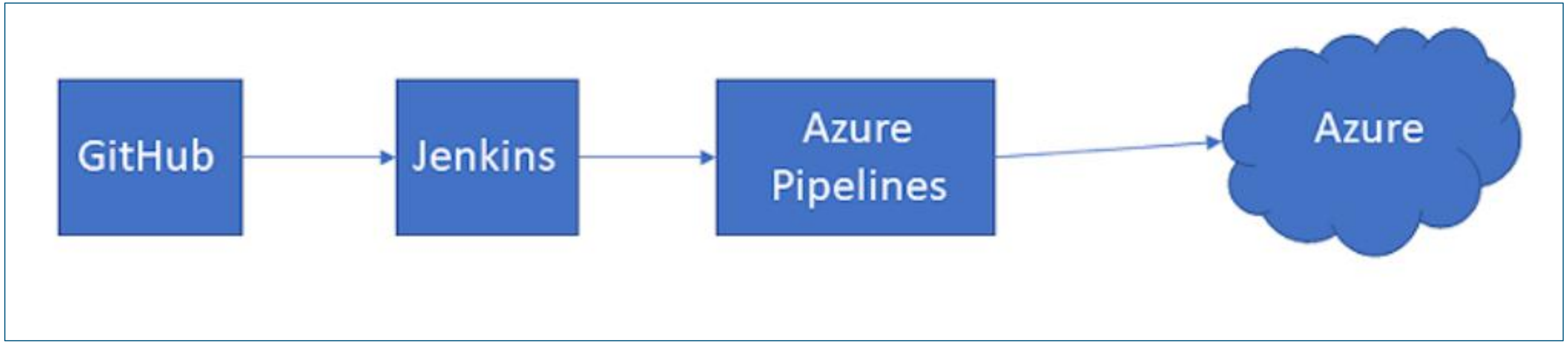
Get end-to-end traceability for the CI/CD workflow

Consistently deploy to a range of cloud services

Enforce quality of builds by gating deployments

Azure Pipelines Integration with Jenkins

- Integrate Jenkins with JIRA and Azure Pipelines
- Define workflows such as manual approval processes and CI triggers
- Integrate with other service management tools such as ServiceNow



Jenkins connects with GitHub to trigger the build process and through Azure pipelines, the build can be deployed to Azure.

Demo: Automate Infrastructure Deployment in the Cloud with Terraform and Azure Pipelines

Demo: Azure Deployments using Resource Manager Templates

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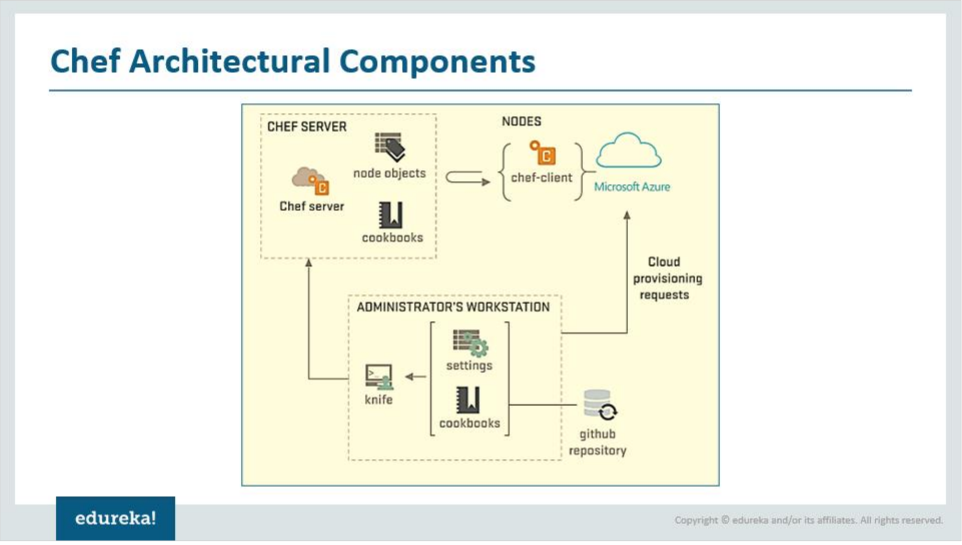
Summary



Chef Architectural Components

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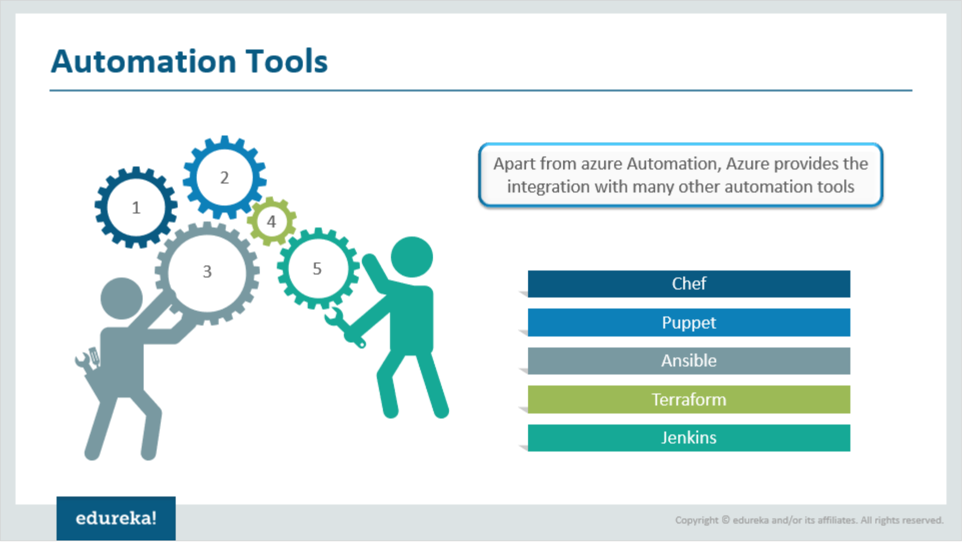

Automation Tools

Apart from azure Automation, Azure provides the integration with many other automation tools

- Chef
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- Jenkins

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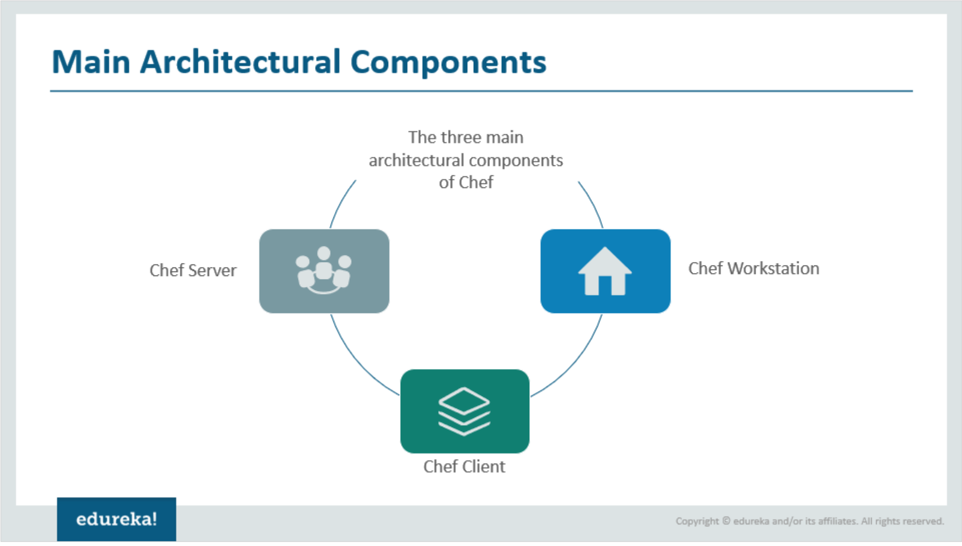

Main Architectural Components

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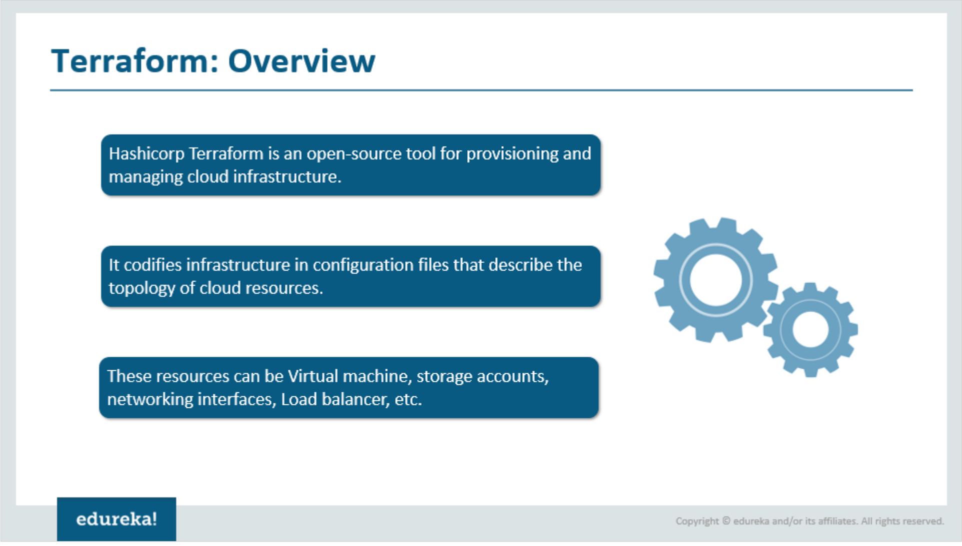

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These resources can be Virtual machine, storage accounts, networking interfaces, Load balancer, etc.

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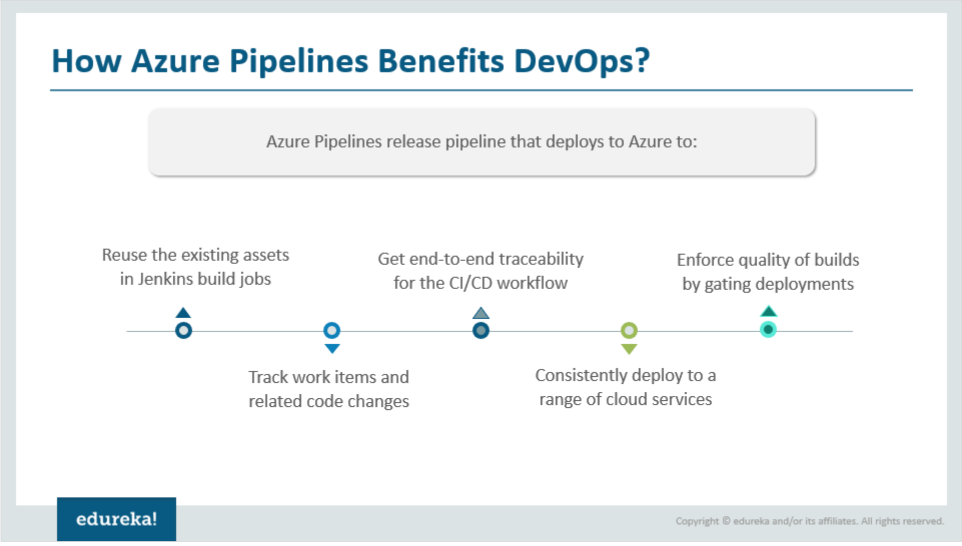

How Azure Pipelines Benefits DevOps?

Azure Pipelines release pipeline that deploys to Azure to:

- Reuse the existing assets in Jenkins build jobs
- Track work items and related code changes
- Get end-to-end traceability for the CI/CD workflow
- Consistently deploy to a range of cloud services
- Enforce quality of builds by gating deployments

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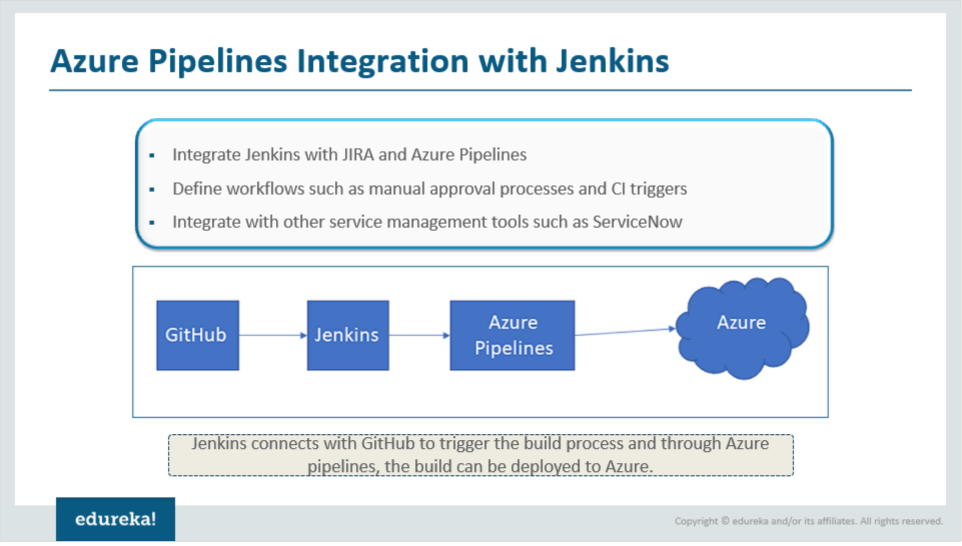

Azure Pipelines Integration with Jenkins

- Integrate Jenkins with JIRA and Azure Pipelines
- Define workflows such as manual approval processes and CI triggers
- Integrate with other service management tools such as ServiceNow

Jenkins connects with GitHub to trigger the build process and through Azure pipelines, the build can be deployed to Azure.

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Questions

FEEDBACK

Comments

Ratings

Suggestions

Survey

Likes

Ideas

Thank You

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