Azure Administration: Compute Management

Aligned with Microsoft Certification Exam AZ-104

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Course Topics

Virtual Machine Management
Azure App Service Management
Container Management

AZ-104 Objective Domains

- Manage Azure Identities and Governance (15-20%)
- Implement and Manage Storage (10-15%)
- **Deploy and Manage Azure Compute Resources (25-30%)**
- Configure and Manage Virtual Networking (30-35%)
- Monitor and back up Azure resources (10-15%)

Exam AZ-104: Microsoft Certified Azure Administrator Associate

- Configure VMs for high availability and scalability
  - configure high availability
  - deploy and configure scale sets
- Automate deployment and configuration of VMs
  - modify Azure Resource Manager (ARM) template
  - configure VHD template
  - deploy from template
  - save a deployment as an ARM template
  - automate configuration management by using custom script extensions
- Create and configure VMs
  - configure Azure Disk Encryption
  - move VMs from one resource group to another
  - manage VM sizes
  - add data discs
  - configure networking
  - redeploy VMs
- Create and configure containers
  - create and configure Azure Kubernetes Service (AKS)
  - create and configure Azure Container Instances (ACI)
- Create and configure Web Apps
  - create and configure App Service
  - create and configure App Service Plans

Pre-requisites

- **Azure Fundamentals**

Virtual Machine Fundamentals

Virtual Machine Fundamentals

- Virtual Machine Architecture
- Virtual Machine Elements
- Virtual Machine Sizing

Virtual Machine Architecture

Virtual Machine Elements

- Image
- OS disk
- Data disk(s)
- OS profile (server name, admin, etc.)
- NIC(s)
- Availability set/availability zone
- Extensions
- Diagnostics

Virtual Machine Sizing

- Size defines
  - processor type and number of vCores
  - disk type and number
  - memory
  - NIC capacity
  - temp disk size
- Categories
  - general purpose
  - compute optimizes
  - memory optimized
  - storage optimized
  - GPU
  - high performance compute

Deploy Virtual Machines

Deploy Virtual Machines

- Provisioning Virtual Machines
- Updating Virtual Machines
- Demo: Deploy Virtual Machines

Provisioning Virtual Machines

- Platforms
  - Portal
  - PowerShell
  - CLI
  - API
- Resource dependencies
  - virtual network
  - subnet
  - NIC
  - OS disk
- Additional resources
  - public IP address(es)
  - data disk(s)
  - extensions

Updating Virtual Machines

- Online updates
  - Disk
    - add a disk
    - change disk cache setting
  - NIC
    - change public or private IP settings*
- Offline updates
  - Resize a VM
  - Disk
    - resize disk
    - remove disk
  - NIC
    - add or remove a NIC*

*sometimes

Demo: Deploy Virtual Machines

Advanced Virtual Machine Deployment

Advanced Virtual Machine Deployment

- Deploy Multiple NICs
- Deploy Multiple Disks
- Demo: Deploy Virtual Machines

Advanced Virtual Machine Deployment

- Deploy Multiple NICs
- Deploy Multiple Disks

```
$vm0Config = New-AzVMConfig -VMName $vm0Name `
    -VMSize Standard_D2_V3 | `
  Set-AzVMOperatingSystem -Windows -ComputerName
$vm0Name `
    -Credential $cred | `
  Set-AzVMSourceImage -PublisherName `
    MicrosoftWindowsServer -Offer WindowsServer `
    -Skus 2016-Datacenter -Version latest | `
  Add-AzVMNetworkInterface -Id $nic0.Id -Primary |
`
  Add-AzVMNetworkInterface -Id $nic1.Id | `
  Add-AzVMDataDisk -Name "vm0-datadisk0" -
DiskSizeInGB 10 `
    -Caching None -Lun 0 -CreateOption Empty  | `
  Add-AzVMDataDisk -Name "vm0-datadisk1" -
DiskSizeInGB 10 `
    -Caching None -Lun 1 -CreateOption Empty
```

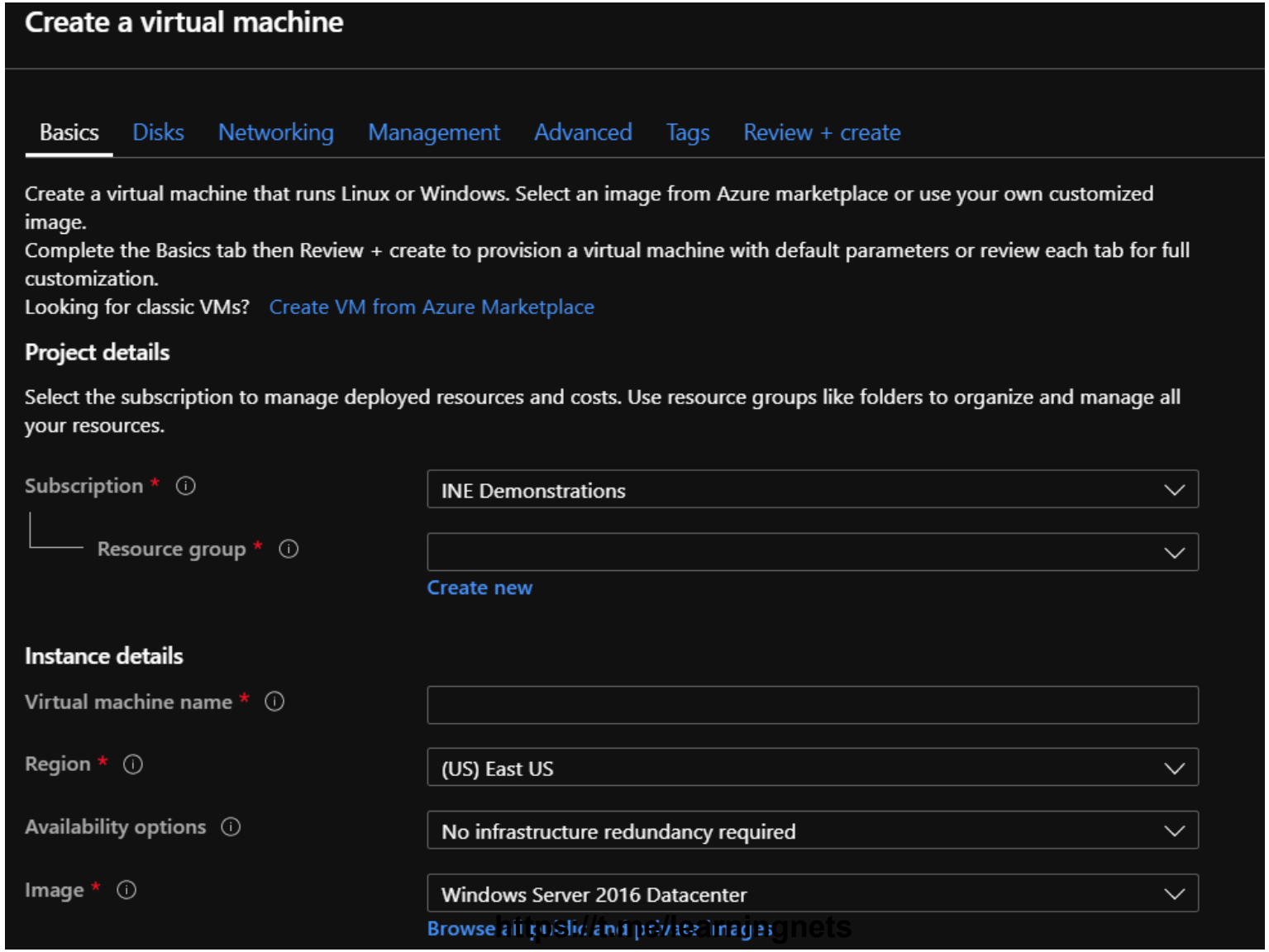
Demo: Deploy Virtual Machines

ARM Template Deployment

ARM Template Deployment

- Repeatable Deployments with ARM Templates
- ARM Template Elements
- ARM Template for Virtual Machines
- Generate an ARM Template from the Azure Portal
- Demo: ARM Template Deployment

Repeatable Deployments with ARM Templates



Repeatable Deployments with ARM Templates

```powershell
# Variables for common values
$rg = "VOD-AZ300-VM"
$location = "EastUS"
$vmName = "ps-long-vm"


# Create user object
$cred = Get-Credential -Message "Enter a username and password for the virtual machine."

# Create a resource group

# Create a subnet configuration
$subnetConfig = New-AzVirtualNetworkSubnetConfig -Name default -AddressPrefix 10.0.0.0/24

# Create a virtual network
$vnet = New-AzVirtualNetwork -ResourceGroupName $rg -Location $location `
  -Name az-300-dmo-vm-vnet -AddressPrefix 10.0.0.0/16 -Subnet $subnetConfig

# Create a public IP address and specify a DNS name
$pip = New-AzPublicIpAddress -ResourceGroupName $rg -Location $location `
  -Name $vmName  -AllocationMethod Static -IdleTimeoutInMinutes 4

# Create an inbound network security group rule for port 3389
$nsgRuleRDP = New-AzNetworkSecurityRuleConfig -Name myNetworkSecurityGroupRuleRDP  -Protocol Tcp `
  -Direction Inbound -Priority 1000 -SourceAddressPrefix * -SourcePortRange * -DestinationAddressPrefix * `
  -DestinationPortRange 3389 -Access Allow

# Create a network security group
$nsg = New-AzNetworkSecurityGroup -ResourceGroupName $rg -Location $location `
  -Name myNetworkSecurityGroup -SecurityRules $nsgRuleRDP

# Create a virtual network card and associate with public IP address and NSG
```

https://t.me/learningnets

Repeatable Deployments with ARM Templates

```
New-AzResourceGroupDeployment -Name vm -ResourceGroupName 02tasks `
        -TemplateFile .\AZ104.3-ARM-Template.json -Verbose
```

ARM Template Elements

```
{
  "$schema": "",
  "contentVersion": "",
"parameters": {  },
  "variables": {  },
"resources": [  ],
  "outputs": {  },
 "functions": [  ],
  "apiProfile": ""
}
```

ARM Template for Virtual Machines

```
{
        "type": "Microsoft.Compute/virtualMachines",
        "apiVersion": "2018-10-01",
        "name": "",
        "location": "",
        "dependsOn": [],
        "properties": {
                "hardwareProfile": {"vmSize": ""},
                "osProfile": {"computerName":"",…},
                "storageProfile": {"imageReference":{},"osDisk": {},"dataDisks": []},
                "networkProfile": {"networkInterfaces": []},
                "diagnosticsProfile": {"bootDiagnostics": {}
        }
}
```

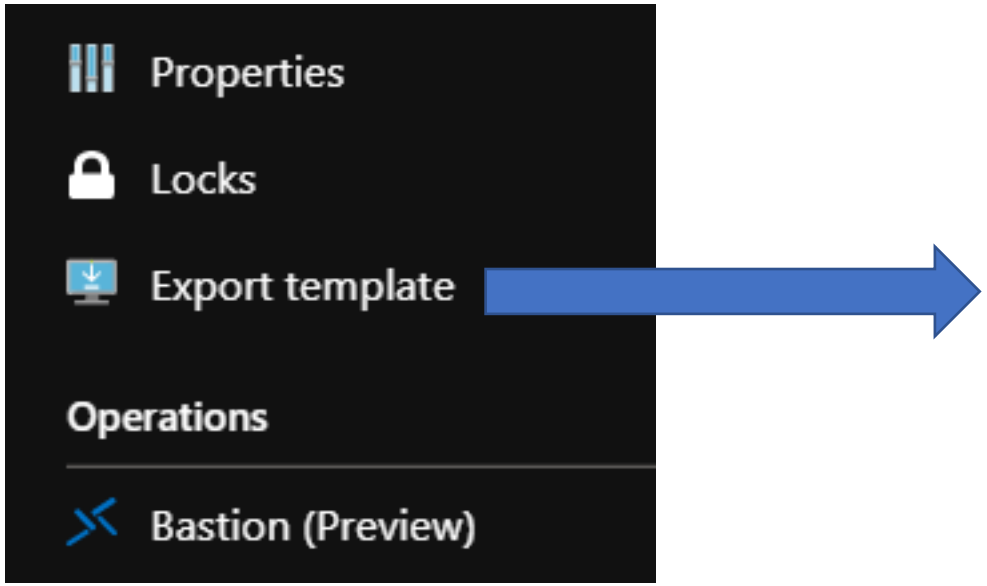
VHD Template Elements

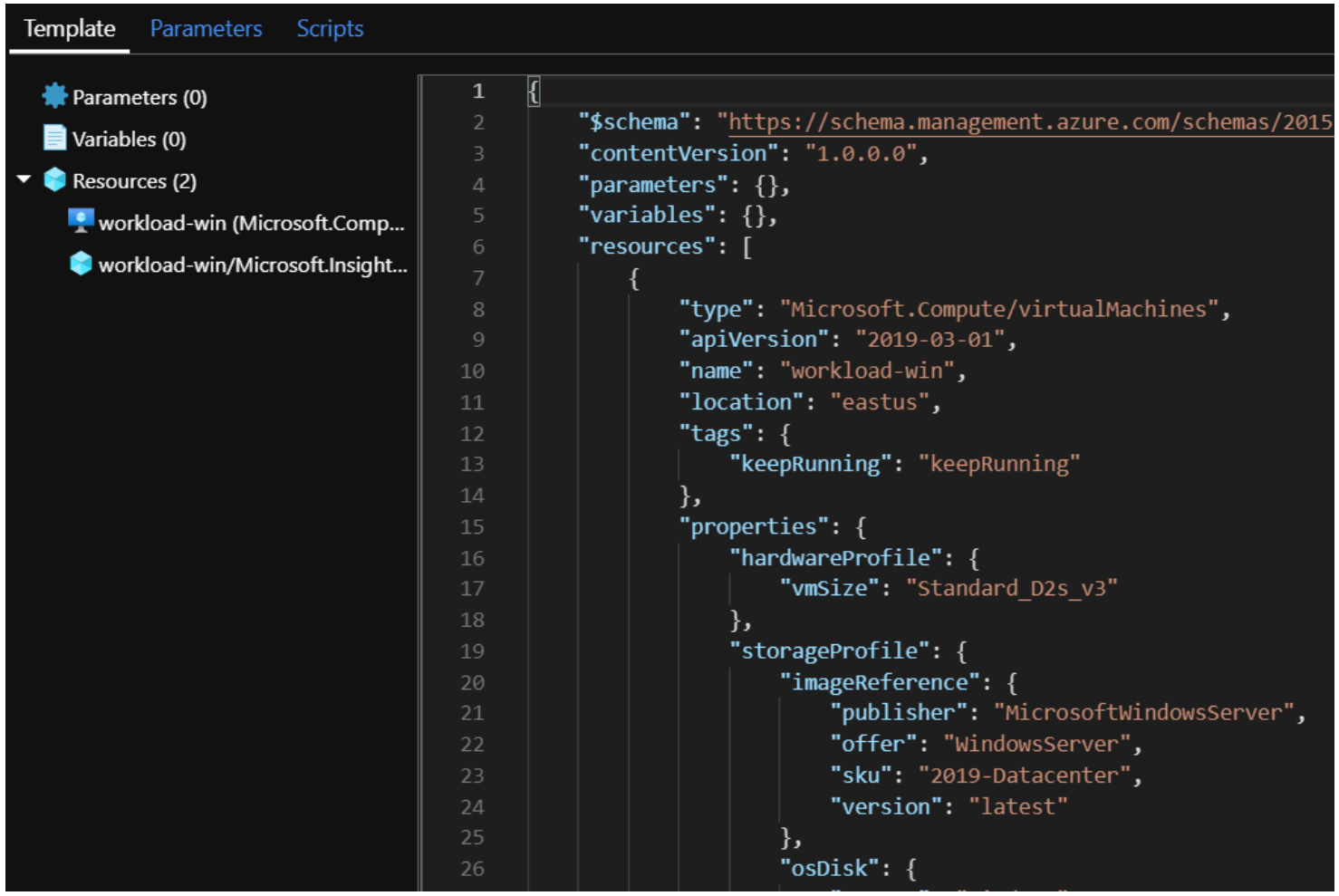
```
"osDisk": {
      "osType": "string",
      "encryptionSettings": {"diskEncryptionKey": {}, "keyEncryptionKey": {},"enabled": ""},
      "name": "",
      "vhd": {"uri": ""},
      "image": {"uri": ""},
      "caching": "string",
      "writeAcceleratorEnabled": "boolean",
      "diffDiskSettings": {},
      "createOption": "string",
      "diskSizeGB": "integer",
      "managedDisk": {"id": "", "storageAccountType": "","diskEncryptionSet": {}}
    }
```

VHD Template Elements

```
"dataDisks": [
      {
        "lun": "",
        "name": "",
        "vhd": {"uri": ""},
        "image": {"uri": ""},
        "caching": "",
        "writeAcceleratorEnabled": "",
        "createOption": "",
        "diskSizeGB": "",
        "managedDisk": {},
        "toBeDetached": ""
      }
    ]
```

Generate an ARM Template from the Azure Portal





Demo: ARM Template Deployment

Advanced ARM Template Deployment

Advanced ARM Template Deployment

- Deploy NICs and Disks
- Template Functions
- Multiple Instances
- Update Via Template
- Demo: Complex Deployments

Deploy NICs and Disks

- NICs
- Data Disks

```
"networkProfile": {
  "networkInterfaces":
    [ "id":
    ]
}
"dataDisks": [
  {
    "lun": "0",
    "name": "datadisk0",
    "caching": "None",
    "writeAcceleratorEnabled": "false",
    "createOption": "Empty",
    "diskSizeGB":"10"
  },
    "properties":{
      "primary":"true"
    }
  {
    "lun": "1",
    "name": "datadisk1",
    "caching": "None",
    "writeAcceleratorEnabled": "false",
    "createOption": "Empty",
    "diskSizeGB": "10",
    "managedDisk": {
  ]
"storageAccountType": "Premium_LRS"
    }
  }
]
```

Template Functions

- Add dynamic and responsive capabilities
- Format: "property":"[function(parameters)]"
- Examples:
  - "location":"[resourceGroup().location]"
  - "name":"[concat(variables('basename'),'-vm')]"
  - "id":"[resourceId('Microsoft.Compute/VirtualMachines','thisvm')]"
- Common Categories
  - deployment
  - resource
  - array and object
  - string
  - numeric
  - comparison
  - logical

Multiple Instances

- Copy elements

```
"copy": {
    "name": "vmCopy",
    "count": 3
}
```

- Arrays

```
"baseNames": ["onprem", "hub", "spoke"]
```

- Functions

```
"name": "[concat(variables('baseNames')[copyindex()],'-VM')]"
```

Update Via Template

- Template deployment "mode" option
  - complete
  - incremental
- New resources
  - build a template incrementally
- Modify existing resources
  - many "properties" are objects which can be deployed via template
  - app service settings
  - VM extensions
  - network peering

Demo: Complex Deployments

Virtual Machine Extensions

Virtual Machine Extensions

- Virtual Machine Extensions
- Desired State Configuration
- Custom Script
- Demo: DSC Extension

Virtual Machine Extensions

Desired State Configuration

```
Configuration Main
{
Param ( [string] $nodeName )

Import-DscResource -ModuleName PSDesiredStateConfiguration

Node $nodeName
  {
    WindowsFeature WebServerRole
    {
      Name = "Web-Server"
      Ensure = "Present"
    }
    WindowsFeature WebManagementConsole
    {
      Name = "Web-Mgmt-Console"
      Ensure = "Present"
    }
    WindowsFeature WebManagementService
    {
      Name = "Web-Mgmt-Service"
      Ensure = "Present"
    }
  }
```

```
        "name": "Microsoft.Powershell.DSC",
        "type": "extensions",
        "location": "[resourceGroup().location]",
        "apiVersion": "2016-03-30",
        "dependsOn": [
          "[resourceId('Microsoft.Compute/virtualMachines', parameters('winvmName'))]"
        ],
        "properties": {
          "publisher": "Microsoft.Powershell",
          "type": "DSC",
          "typeHandlerVersion": "2.9",
          "autoUpgradeMinorVersion": true,
          "settings": {
            "configuration": {
              "url": "",
              "script": "dsc.ps1",
              "function": "Main"
            },
            "configurationArguments": {
              "nodeName": "[parameters('winvmName')]"
            },
            "protectedSettings": {
              "configurationUrlSasToken": "[parameters('_artifactsLocationSasToken')]"
            }
          }
        }
```

Custom Script

```
mkdir /webserver
cd /webserver
wget https://inedemoassets.blob.core.windows.net/taskfiles/azure/webserver.py
chmod +x ./webserver.py
./webserver.py &
```

```
{
  "name": myvm/customScript1')]",
  "type": "Microsoft.Compute/virtualMachines/extensions",
  "apiVersion": "2018-06-01"
  "location": [resourceGroup().location]",
  "dependsOn": "[resourceId('Microsoft.Compute/VirtualMachines','myvm')]"],
  "properties": {
    "publisher": "Microsoft.OSTCExtensions",
    "type": "CustomScriptForLinux",
    "typeHandlerVersion": "1.4",
    "autoUpgradeMinorVersion": true,
    "settings": {
      "fileUris": [

"https://inedemoassets.blob.core.windows.net/taskfiles/azure/webserverinstall.sh"
      ],
      "commandToExecute": "sh webserverinstall.sh"
    }
  }
}
```

Demo: DSC Extension

Virtual Machine Scale Set

Virtual Machine Scale Set

- Virtual Machine Scale Set Concepts
- Azure Autoscale
- Load Balancing Virtual Machine Scale Sets
- Demo: VMSS

Virtual Machine Scale Set Concepts

Azure Autoscale

- Applies to
  - virtual machine scale set
  - app service
  - cloud service (classic)
- Microsoft.Insights

Load Balancing Virtual Machine Scale Sets

- Integrate with load balancer
- Automatically accounts for scale operations
- Set NAT rules for direct instance access
- Always deploy via template

Demo: VMSS

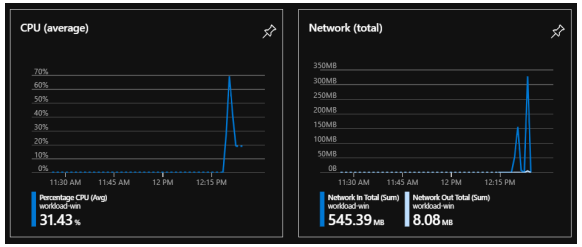
Manage Virtual Machines

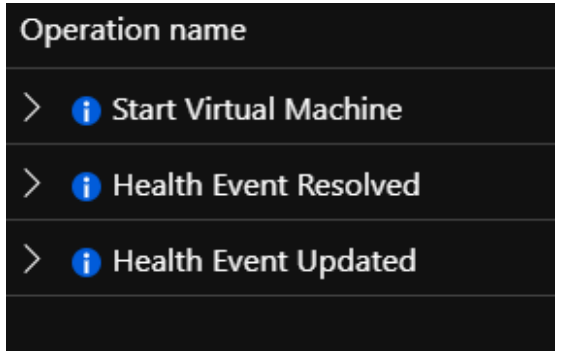
Manage Virtual Machines

- Monitor Virtual Machines
- Move Virtual Machines
- Images and Snapshots
- Demo: Monitor Virtual Machines
- Demo: Create a VM from a Snapshot

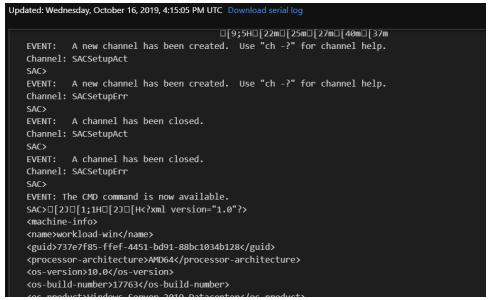
Monitor Virtual Machines

Basic

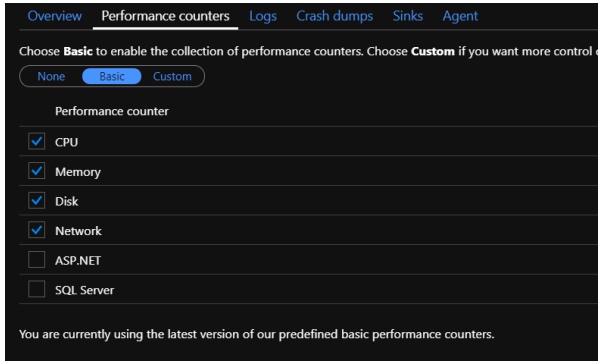




Boot Diagnostics



Diagnostics Extension



Log Analytics Extensior

Move Virtual Machines

- Online operations
  - move between resource groups
  - move between subscriptions (must move all dependent resources)
  - source and destination resource groups are locked
- Offline operations
  - move between regions (de-provision and re-provision)

Snapshots and Images

Demo: Monitor Virtual Machines

Demo: Create a VM from a Snapshot

Virtual Machine Availability

Virtual Machine Availability

- Azure Virtual Machine SLAs
- Availability Sets
- Availability Zones
- Demo: Virtual Machine Availability

Virtual Machine Availability

- Azure VM SLAs
- Availability Sets
- Availability Zones

99.9% - Single VM with premium storage
99.95% - Multiple VMs in an availability set
99.99% - Multiple VMs in different availability zones

Demo: Virtual Machine Availability

Azure Disk Encryption

Azure Disk Encryption

- Disk encryption overview
- Demonstration: Encrypt a VHD

Azure Disk Encryption Scenarios

- Encrypt new or existing Azure VMs
- Create new VMs based on pre-encrypted VHDs and encryption keys
- Encrypt Windows virtual machine scale sets.
- Encrypt Linux virtual machine scale set data drives.
- Disable encryption on Windows VMs.
- Disable encryption on data drives for Linux VMs.
- Disable encryption on Windows virtual machine scale sets.
- Disable encryption on data drives for Linux virtual machine scale sets.
- Update encryption settings of an existing encrypted VMs.
- Back up and restore encrypted VMs.

Azure Disk Encryption

- Pre-requisites:
  - Supported OS
  - Networking – connect to Azure AD, connect to key vault, extension storage access
  - Windows requirements – Bitlocker policy (GPO)
  - Linux requirements – 7GB RAM, vfat, /etc/fstab
- Key vault:
  - Same region as VM
  - Advanced access policy
  - Add a key encryption key (KEK) – optional
- Encrypt – PowerShell, CLI, template

Azure Disk Encryption Take-aways

- Disk encryption options:
  - Storage – managed vs unmanaged
  - OS disk – BitLocker, DM-Crypt
- Managed disk encryption:
  - Pre-requisites
  - Process

Create an Azure App Service Web App

Create an Azure App Service Web App

- Web App Concepts
- Demonstration: Create an Azure Web App
- Demonstration: Deploy an Azure Web App

Manage a Web App

Manage a Web App

- Web App Configuration
- Platform Configuration
- Web App Networking
- Web App Development Support
- Demo: Manage a Web App

Web App Configuration

- Host dependent – Windows or Linux
- Application settings
- General settings
  - Stack (.NET Core, Python, Node.JS, etc.)
  - FTP state
  - HTTP version
  - Web sockets
  - Always on
  - ARR affinity
  - Client Certificate

Platform Configuration

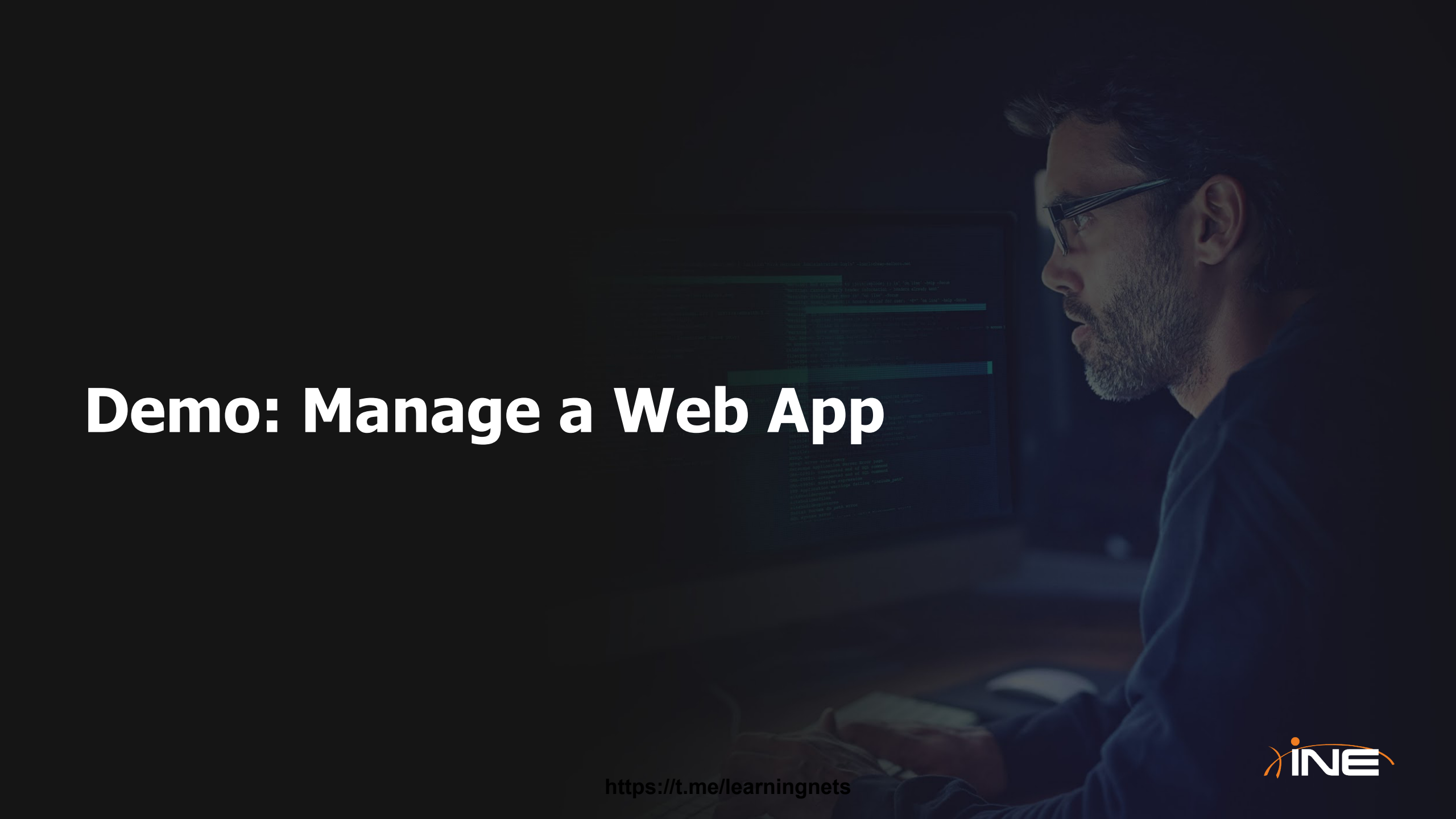
- Authentication
- Identity
- Domains
- TLS/SSL
- Scale

Web App Networking

Web App Development Support

- Deployment Slots
- DevOps
  - Azure DevOps integration
  - GitHub, Bitbucket, Local Git
  - Jenkins
  - Containers
- Canary release support

Demo: Manage a Web App



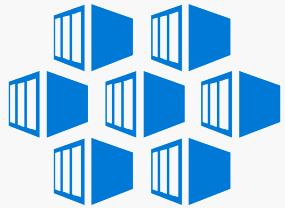
Azure Container Instance

Azure Container Instance

- Azure Container Instance Concepts
- Demonstration: Provision an Azure Container Instance

Azure Container Instance Concepts

- Simple container hosting solution
  - Port mapping
  - File share mounting
  - Charged by the second
- Use cases
  - Single container solutions
  - Simple services
  - Automation
  - Processes with a short lifetime



Kubernetes Crash Course

Kubernetes Crash Course

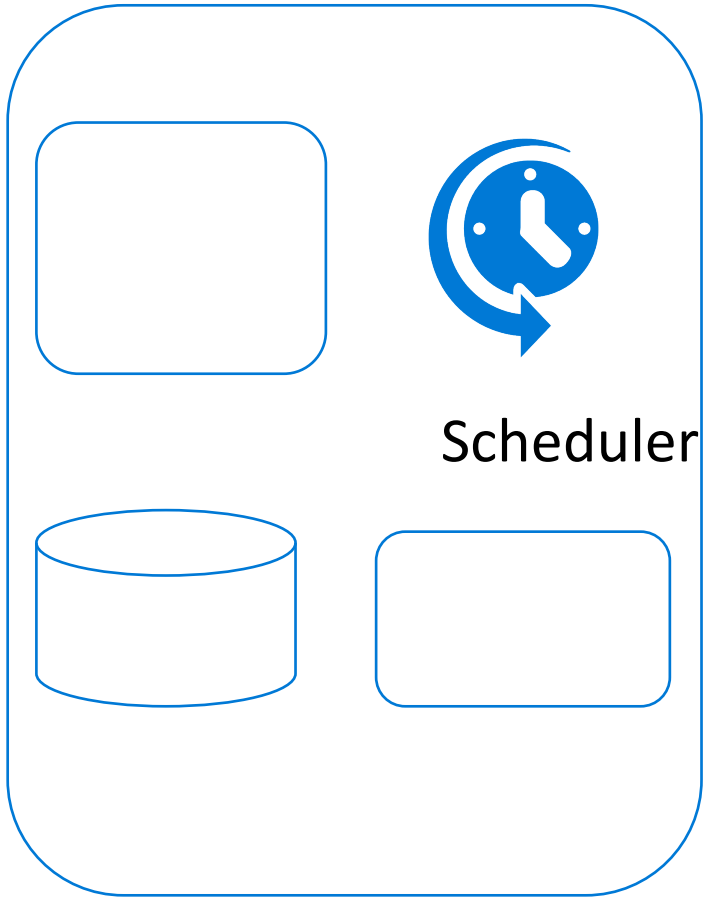
- What is Kubernetes?
- Azure Kubernetes Service
- Azure Kubernetes Components

Azure Kubernetes Service

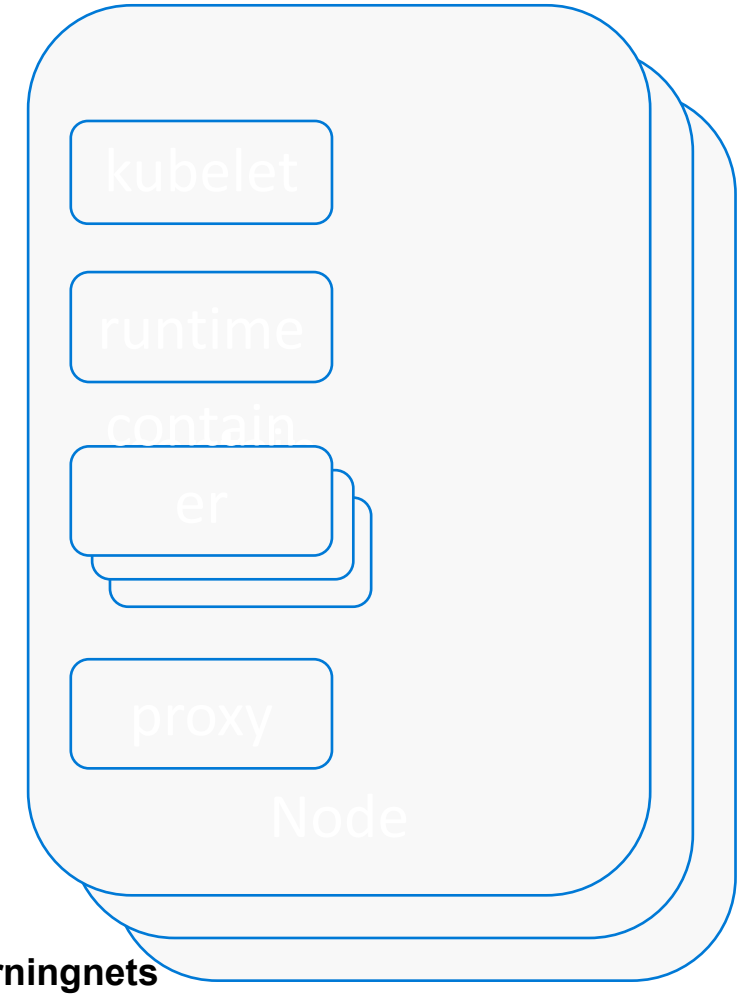
- Managed Kubernetes cluster
- Master managed by Azure
- Infrastructure provisioned and managed by Azure
- Pay for and manage agent nodes
- Auto-scale at node and pod level*
- RBAC security (integrate with Azure AD)
- Integrated logging
- Ingress options

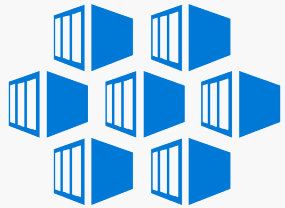
Azure Kubernetes Components

Managed by Azure



Managed by you

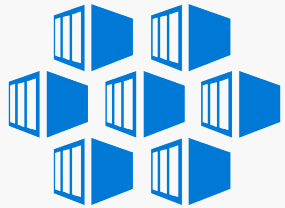




Create an Azure Kubernetes Service

Create an Azure Kubernetes Service

- Demonstration: Create an Azure Kubernetes Service



Deploy a Web Site to an Azure Kubernetes Service

Deploy a Web Site to an Azure Kubernetes Service

- Demonstration: Deploy a Web Site to an Azure Kubernetes Service