



# Lab 2: VM using CLI, ARM templates, N-Tier architecture.

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IT457 Cloud Computing

1/30/24



## 1. Create a VM using CLI: -

```
akshar [ ~ ]$ # create Bash shell variables
resourceGroup=VMTutorialResources
location=eastus

az group create --name $resourceGroup --location $location
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/VMTutorialResources",
  "location": "eastus",
  "managedBy": null,
  "name": "VMTutorialResources",
  "properties": {
    "provisioningState": "Succeeded"
  },
  "tags": null,
  "type": "Microsoft.Resources/resourceGroups"
}
```

```
akshar [ ~ ]$ # create Bash shell variables
vnetName=TutorialVNet1
subnetName=TutorialSubnet1
vnetAddressPrefix=10.0.0.0/16
subnetAddressPrefix=10.0.0.0/24

# Use the existing resource group
resourceGroup=VMTutorialResources
akshar [ ~ ]$ az network vnet create \
> --name $vnetName \
> --resource-group $resourceGroup \
> --address-prefixes $vnetAddressPrefix \
> --subnet-name $subnetName \
> --subnet-prefixes $subnetAddressPrefix
{
  "newVNet": {
    "addressSpace": {
      "addressPrefixes": [
        "10.0.0.0/16"
      ]
    },
    "enableDdosProtection": false,
    "etag": "W/\"ab372b26-5ac0-4b5d-aba6-0ca4a93c74ba\"",
    "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/",
    "location": "eastus",
    "name": "TutorialVNet1",
    "provisioningState": "Succeeded",
    "resourceGroup": "VMTutorialResources",
    "resourceGuid": "104d2dde-6c37-49f5-8d5d-c98286db6c80",
    "subnets": [
```



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```
"subnets": [
  {
    "addressPrefix": "10.0.0.0/24",
    "delegations": [],
    "etag": "W/\"ab372b26-5ac0-4b5d-aba6-0ca4a93c74ba\"",
    "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/VMTutorialResources/providers/Microsoft.Network/subnets/TutorialSubnet1",
    "name": "TutorialSubnet1",
    "privateEndpointNetworkPolicies": "Disabled",
    "privateLinkServiceNetworkPolicies": "Enabled",
    "provisioningState": "Succeeded",
    "resourceGroup": "VMTutorialResources",
    "type": "Microsoft.Network/virtualNetworks/subnets"
  }
],
"type": "Microsoft.Network/virtualNetworks",
"virtualNetworkPeerings": []
}
```

```
akshar [ ~ ]$ # create Bash shell variable
vmName=TutorialVM1
akshar [ ~ ]$ az vm create \
> --resource-group $resourceGroup \
> --name $vmName \
> --image Ubuntu2204 \
> --vnet-name $vnetName \
> --subnet $subnetName \
> --generate-ssh-keys \
> --output json \
> --verbose
```

```
{
  "fqdns": "",
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/VMTutorialResources/providers/Microsoft.Compute/virtualMachines/TutorialVM1",
  "location": "eastus",
  "macAddress": "68-45-8D-DA-2B-70",
  "powerState": "VM running",
  "privateIpAddress": "10.0.0.4",
  "publicIpAddress": "172.173.198.63",
  "resourceGroup": "VMTutorialResources",
  "zones": ""
}
Command ran in 87.771 seconds (init: 0.192, invoke: 87.578)
```

## Result:

VMTutorialResources Resource group

Search

Overview

- Activity log
- Access control (IAM)
- Tags
- Resource visualizer
- Events
- Settings
  - Deployments
  - Security
  - Deployment stacks
  - Policies

resources recommendations

Filter for any field... Type equals all Location equals all Add filter

Showing 1 to 6 of 6 records. Show hidden types No grouping

Name ↑↓	Type ↑↓
TutorialVM1	Virtual machine
TutorialVM1_disk1_f6ed23d4c244860863399440102b986	Disk
TutorialVM1NSG	Network security group
TutorialVM1PublicIP	Public IP address
TutorialVM1VMNic	Network interface
TutorialVNet1	Virtual network

## 2. Introduction to ARM templates: -

### a. Creating first template

## JSON:

```
azuredploy.json X
azuredploy.json
Select or create a parameter file...
1 {
2   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3   "contentVersion": "1.0.0.0",
4   "resources": []
5 }
```

## Deployment:

```
PS E:\Sem 6\IT457 Cloud Computing\Labs\Lab2\code> az deployment group create --name blanktemplate --resource-group myResourceGroup --template-file azuredploy.json
{
  "id": "/subscriptions/97e43b98-2dab-44c3-a9ba-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/blanktemplate",
  "location": null,
  "name": "blanktemplate",
  "properties": {
    "correlationId": "bfd5ce77-11d2-48ff-84b4-3df60d5d5f53",
    "debugSetting": null,
    "dependencies": [],
    "duration": "PT2.50445275",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [],
    "outputs": null,
    "parameters": null,
    "parametersLink": null,
    "providers": [],
    "provisioningState": "Succeeded",
    "templateHash": "11481920352792298114",
    "templateLink": null,
    "timestamp": "2024-01-25T17:01:13.703952+00:00",
    "validatedResources": null
  },
  "resourceGroup": "myResourceGroup",
  "tags": null,
  "type": "Microsoft.Resources/deployments"
}
```

## Result:

Home > myResourceGroup

**myResourceGroup | Deployments** ☆ ...

Resource group

Search

Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status
blanktemplate	Succeeded

## b. Adding resource

## JSON:

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```

1 {
2   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3   "contentVersion": "1.0.0.0",
4   "resources": [
5     {
6       "type": "Microsoft.Storage/storageAccounts",
7       "apiVersion": "2021-09-01",
8       "name": "store1abhinav250124",
9       "location": "eastus",
10      "sku": {
11        "name": "Standard_LRS"
12      },
13      "kind": "StorageV2",
14      "properties": {
15        "supportsHttpsTrafficOnly": true
16      }
17    }
18  ]
19 }

```

## Deployment:

```

{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/addstorage",
  "location": null,
  "name": "addstorage",
  "properties": {
    "correlationId": "b7fea8ea-7789-4be7-9195-221b18853e34",
    "debugSetting": null,
    "dependencies": [],
    "duration": "PT34.3164261S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/store1abhinav250124",
        "resourceGroup": "myResourceGroup"
      }
    ]
  },
  "outputs": null,
  "parameters": null,
}

```

## Result:

myResourceGroup | Deployments ☆ ...

Resource group

Search

Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status
addstorage	✓ Succeeded
blanktemplate	✓ Succeeded

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Settings

## c. Adding parameters

## JSON:

## Lab- Cloud Computing

```

1 {
2   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3   "contentVersion": "1.0.0.0",
4   "parameters": {
5     "storageName": {
6       "type": "string",
7       "minLength": 3,
8       "maxLength": 24
9     }
10  },
11  "resources": [
12    {
13      "type": "Microsoft.Storage/storageAccounts",
14      "apiVersion": "2021-09-01",
15      "name": "[parameters('storageName')]",
16      "location": "eastus",
17      "sku": {
18        "name": "Standard_LRS"
19      },
20      "kind": "StorageV2",
21      "properties": {
22        "supportsHttpsTrafficOnly": true
23      }
24    }
25  ]
26 }

```

## Deployment:

```

{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/addnameparameter",
  "location": null,
  "name": "addnameparameter",
  "properties": {
    "correlationId": "1ccd6152-9537-4f94-8fcb-225d6b194ce9",
    "debugSetting": null,
    "dependencies": [],
    "duration": "PT34.2821174S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/addstorage",
        "resourceGroup": "myResourceGroup"
      }
    ],
    "outputs": null,
    "parameters": {

```

## Result:

myResourceGroup | Deployments ☆ ...

Resource group

Search << Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status
addnameparameter	✓ Succeeded
addstorage	✓ Succeeded
blanktemplate	✓ Succeeded

Overview Activity log Access control (IAM) Tags Resource visualizer Events Settings

Redeploying with SKU parameters: -

JSON:

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```

1  azuredploy.json
2  {
3    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
4    "contentVersion": "1.0.0.0",
5    "parameters": {
6      "storageName": {
7        "type": "string",
8        "minLength": 3,
9        "maxLength": 24
10     },
11     "storageSKU": {
12       "type": "string",
13       "defaultValue": "Standard_LRS",
14       "allowedValues": [
15         "Standard_LRS",
16         "Standard_GRS",
17         "Standard_RAGRS",
18         "Standard_ZRS",
19         "Premium_LRS",
20         "Premium_ZRS",
21         "Standard_GZRS",
22         "Standard_RAGZRS"
23       ]
24     },
25     "resources": [
26       {
27         "type": "Microsoft.Storage/storageAccounts",
28         "apiVersion": "2021-09-01",
29         "name": "[parameters('storageName')]",
30         "location": "eastus",
31         "sku": {
32           "name": "[parameters('storageSKU')]"
33         },
34         "kind": "StorageV2",
35         "properties": {
36           "supportsHttpsTrafficOnly": true
37         }
38       }
39     ]
40   }

```

### Deployment:

```

{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/usenondefaultsku",
  "location": null,
  "name": "usenondefaultsku",
  "properties": {
    "correlationId": "0c8d4266-b572-4191-a371-078878bb4bfc",
    "debugSetting": null,
    "dependencies": [],
    "duration": "PT9.6112141S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/[storageName]",
        "resourceGroup": "myResourceGroup"
      }
    ]
  },
  "outputs": null,
  "parameters": {

```

### Result:

Home > myResourceGroup

**myResourceGroup | Deployments** ☆ ...

Resource group

Search << Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status	Last modified	Duration
<a href="#">usenondefaultsku</a>	✓ Succeeded	1/25/2024, 11:28:15 PM	9 seconds, 611 milliseconds
<a href="#">addnameparameter</a>	✓ Succeeded	1/25/2024, 11:18:20 PM	34 seconds, 282 milliseconds
<a href="#">addstorage</a>	✓ Succeeded	1/25/2024, 10:52:03 PM	34 seconds, 316 milliseconds
<a href="#">blanktemplate</a>	✓ Succeeded	1/25/2024, 10:31:13 PM	2 seconds, 504 milliseconds

## d. Adding template functions

### Deployment:



## Lab- Cloud Computing

```
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/addlocationparameter",
  "location": null,
  "name": "addlocationparameter",
  "properties": {
    "correlationId": "d634200e-b53b-4fbf-ad6e-65e271ac06df",
    "debugSetting": null,
    "dependencies": [],
    "duration": "PT32.444221S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/storedvgdc4efzyzji",
        "resourceGroup": "myResourceGroup"
      }
    ]
  },
  "outputs": null,
  "parameters": {
    "location": {
      "type": "String",
      "value": "centralus"
    }
  }
}
```

## Result:

myResourceGroup | Deployments

Deployment name	Status	Last modified	Duration
addlocationparameter	Succeeded	1/26/2024, 10:53:34 AM	32 seconds, 444 milliseconds
usenondefaultsku	Succeeded	1/26/2024, 10:36:56 AM	11 seconds, 955 milliseconds
addnameparameter	Succeeded	1/26/2024, 10:34:59 AM	8 seconds, 609 milliseconds
addstorage	Succeeded	1/26/2024, 10:30:28 AM	37 seconds, 133 milliseconds
blanktemplate	Succeeded	1/26/2024, 10:27:10 AM	3 seconds, 203 milliseconds

Resource group and storage account location is in Central US.

## e. Adding variables

### Deployment:

```
PS E:\Sem 6\IT457 Cloud Computing\Labs\Lab2\Code> az deployment group create --name addnamevariable --resource-group myResourceGroup --template-file azuredeploy.json --parameters storagePrefix=store storageSKU=Standard_LRS
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/addnamevariable",
  "location": null,
  "name": "addnamevariable",
  "properties": {
    "correlationId": "054baf65-517f-4e34-b22f-e66cf362be33",
    "debugSetting": null,
    "dependencies": [],
    "duration": "PT34.874578S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/storedvgdc4efzyzji",
        "resourceGroup": "myResourceGroup"
      }
    ]
  },
  "outputs": null,
  "parameters": {
    "location": {
      "type": "String",
      "value": "centralus"
    },
    "storagePrefix": {
      "type": "String",
      "value": "store"
    }
  }
}
```

## Result:





## Lab- Cloud Computing

Home > myResourceGroup

### myResourceGroup | Deployments

Resource group

Search Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status	Last modified	Duration
addnamevariable	Succeeded	1/26/2024, 11:22:37 AM	34 seconds, 874 milliseconds
addlocationparameter	Succeeded	1/26/2024, 10:53:34 AM	32 seconds, 444 milliseconds
usenondefaultsku	Succeeded	1/26/2024, 10:36:56 AM	11 seconds, 955 milliseconds
addnameparameter	Succeeded	1/26/2024, 10:34:59 AM	8 seconds, 609 milliseconds
addstorage	Succeeded	1/26/2024, 10:30:28 AM	37 seconds, 133 milliseconds
blanktemplate	Succeeded	1/26/2024, 10:27:10 AM	3 seconds, 203 milliseconds

Overview  
Activity log  
Access control (IAM)  
Tags  
Resource visualizer  
Events  
Settings  
Deployments  
Security  
Deployment stacks

## f. Adding outputs

### Deployment:

```
PS E:\Sem 6\IT457 Cloud Computing\Labs\Lab2\Code> az deployment group create --name addoutputs --resource-group myResourceGroup
--parameters storagePrefix=store storageSKU=Standard_LRS
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/addoutputs",
  "location": null,
  "name": "addoutputs",
  "properties": {
    "correlationId": "a522b2ce-8837-4a33-a923-301274f89288",
    "debugSetting": null,
    "dependencies": [],
    "duration": "PT11.7015061S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/store",
        "resourceGroup": "myResourceGroup"
      }
    ],
    "outputs": {
      "storageEndpoint": {
        "type": "Object",
        "value": {
          "blob": "https://storedvgdc4efzyzji.blob.core.windows.net/",
          "dfs": "https://storedvgdc4efzyzji.dfs.core.windows.net/",
          "file": "https://storedvgdc4efzyzji.file.core.windows.net/",
          "queue": "https://storedvgdc4efzyzji.queue.core.windows.net/",
          "table": "https://storedvgdc4efzyzji.table.core.windows.net/",
          "web": "https://storedvgdc4efzyzji.z19.web.core.windows.net/"
        }
      }
    }
  }
}
```

### Result:



## Lab- Cloud Computing

myResourceGroup | Deployments ☆ ...

Resource group

Search

Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status	Last modified	Duration
addoutputs	Succeeded	1/26/2024, 11:53:56 AM	11 seconds, 701 milliseconds
addnamevariable	Succeeded	1/26/2024, 11:22:37 AM	34 seconds, 874 milliseconds
addlocationparameter	Succeeded	1/26/2024, 10:53:34 AM	32 seconds, 444 milliseconds
usenondefaultsku	Succeeded	1/26/2024, 10:36:56 AM	11 seconds, 955 milliseconds
addnameparameter	Succeeded	1/26/2024, 10:34:59 AM	8 seconds, 609 milliseconds
addstorage	Succeeded	1/26/2024, 10:30:28 AM	37 seconds, 133 milliseconds
blanktemplate	Succeeded	1/26/2024, 10:27:10 AM	3 seconds, 203 milliseconds

addoutputs | Outputs ...

Deployment

Search

Overview Inputs Outputs Template

storageEndpoint

```
[{"dfs":"https://storedvgdc4efzyzji.dfs.core.windows.net/","web":"https://storedvgdc4efzyzji.z19.web.core.windows.net/","blob":"https://storedvgdc4efzyzji.blob.core.windows.net/","..."}]
```

## g. Using exported template

### Exporting template:

myAppServicePlan | Export template ☆ ...

Linux plan

Download Add to library Deploy Visualize template

To export all resources in this resource group, navigate to the "Export template" experience under "Automation" on the left menu of the resource group.

Include parameters

Template Parameters Scripts

```
1 {
2   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3   "contentVersion": "1.0.0.0",
4   "parameters": {
5     "serverfarms_myAppServicePlan_name": {
6       "defaultValue": "myAppServicePlan",
7       "type": "String"
8     }
9   },
10  "variables": {},
11  "resources": [
12    {
13      "type": "Microsoft.Web/serverfarms",
14      "apiVersion": "2023-01-01",
15      "name": "[parameters('serverfarms_myAppServicePlan_name')]",
16      "location": "Central US",
17      "sku": {
18        "name": "B1",
19        "tier": "Basic",
20        "size": "B1",
21        "family": "B"
```

### Deployment of revised exported template:



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```
PS E:\Sem 6\IT457 Cloud Computing\Labs\Lab2\Code> az deployment group create --name addappserviceplan --resource-group myResourceGroup --template-file .\json --parameters storagePrefix=store storageSKU=Standard_LRS
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/addappserviceplan",
  "location": null,
  "name": "addappserviceplan",
  "properties": {
    "correlationId": "de7e6efc-786b-4950-9b1b-328b5be33871",
    "debugSetting": null,
    "dependencies": [],
    "duration": "PT13.5275613S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/storedvgdc4efzyzji",
        "resourceGroup": "myResourceGroup"
      },
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Web/serverFarms/exampleplan",
        "resourceGroup": "myResourceGroup"
      }
    ],
    "outputs": {
      "storageEndpoint": {
        "type": "Object",
        "value": {
          "blob": "https://storedvgdc4efzyzji.blob.core.windows.net/",
          "dfs": "https://storedvgdc4efzyzji.dfs.core.windows.net/",
          "file": "https://storedvgdc4efzyzji.file.core.windows.net/",
          "queue": "https://storedvgdc4efzyzji.queue.core.windows.net/",
          "table": "https://storedvgdc4efzyzji.table.core.windows.net/",
          "web": "https://storedvgdc4efzyzji.z19.web.core.windows.net/"
        }
      }
    }
  }
}
```

## Result:

myResourceGroup | Deployments ☆ ...

Resource group

Search

Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status	Last modified	Duration
addappserviceplan	Succeeded	1/26/2024, 3:05:34 PM	13 seconds, 527 milliseconds
addoutputs	Succeeded	1/26/2024, 11:53:56 AM	11 seconds, 701 milliseconds
addnamevariable	Succeeded	1/26/2024, 11:22:37 AM	34 seconds, 874 milliseconds
addlocationparameter	Succeeded	1/26/2024, 10:53:34 AM	32 seconds, 444 milliseconds
usenondefaultsku	Succeeded	1/26/2024, 10:36:56 AM	11 seconds, 955 milliseconds
addnameparameter	Succeeded	1/26/2024, 10:34:59 AM	8 seconds, 609 milliseconds
addstorage	Succeeded	1/26/2024, 10:30:28 AM	37 seconds, 133 milliseconds
blanktemplate	Succeeded	1/26/2024, 10:27:10 AM	3 seconds, 203 milliseconds

Showing 1 to 4 of 4 records. ☐ Show hidden types

No grouping List view

Name exampleplan Type App Service plan Location Central US

## h. Using QuickStart template

QuickStart template:



## Lab- Cloud Computing

```
    "reserved": true
  },
  {
    "type": "Microsoft.Web/sites",
    "apiVersion": "2022-03-01",
    "name": "[variables('webAppPortalName')]",
    "location": "[parameters('location')]",
    "kind": "app",
    "properties": {
      "serverFarmId": "[resourceId('Microsoft.Web/serverfarms', variables('appServicePlanName'))]",
      "siteConfig": {
        "linuxFxVersion": "[parameters('linuxFxVersion')]",
        "ftpsState": "FtpsOnly"
      },
      "httpsOnly": true
    },
    "identity": {
      "type": "SystemAssigned"
    },
    "dependsOn": [
      "[resourceId('Microsoft.Web/serverfarms', variables('appServicePlanName'))]"
    ]
  }
]
```

## Deployment:

```
PS E:\Sem 6\IT457 Cloud Computing\Labs\Lab2\Code> az deployment group create --name addwebapp --resource-group myResourceGroup --template-file azuredeploy.json
parameters storagePrefix=store storageSKU=Standard_LRS webAppName=demoapp
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/addwebapp",
  "location": null,
  "name": "addwebapp",
  "properties": {
    "correlationId": "77fa3a3f-eea2-4bb8-a52a-d4695a3c4c4c",
    "debugSetting": null,
    "dependencies": [
      {
        "dependsOn": [
          {
            "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Web/serverfarms/exampleplan",
            "resourceGroup": "myResourceGroup",
            "resourceName": "exampleplan",
            "resourceType": "Microsoft.Web/serverfarms"
          }
        ],
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Web/sites/demoappdvdc4efzyzji",
        "resourceGroup": "myResourceGroup",
        "resourceName": "demoappdvdc4efzyzji",
        "resourceType": "Microsoft.Web/sites"
      }
    ],
    "duration": "PT28.894988S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/storedvdc4efzyzji",
        "resourceGroup": "myResourceGroup"
      }
    ]
  }
}
```

## Result:



## Lab- Cloud Computing

myResourceGroup | Deployments ☆ ...

Resource group

Search

Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status	Last modified	Duration
addwebapp	Succeeded	1/26/2024, 3:21:41 PM	28 seconds, 894 milliseconds
addappserviceplan	Succeeded	1/26/2024, 3:05:34 PM	13 seconds, 527 milliseconds
addoutputs	Succeeded	1/26/2024, 11:53:56 AM	11 seconds, 701 milliseconds
addnamevariable	Succeeded	1/26/2024, 11:22:37 AM	34 seconds, 874 milliseconds
addlocationparameter	Succeeded	1/26/2024, 10:53:34 AM	32 seconds, 444 milliseconds
usenondefaultsku	Succeeded	1/26/2024, 10:36:56 AM	11 seconds, 955 milliseconds
addnameparameter	Succeeded	1/26/2024, 10:34:59 AM	8 seconds, 609 milliseconds
addstorage	Succeeded	1/26/2024, 10:30:28 AM	37 seconds, 133 milliseconds
blanktemplate	Succeeded	1/26/2024, 10:27:10 AM	3 seconds, 203 milliseconds

Showing 1 to 5 of 5 records. Show hidden types

No grouping List view

Name	Type	Location
demoappdvdc4efzyji	App Service	Central US
exampleplan	App Service plan	Central US

## i. Adding Tags

### Deployment:

```
PS E:\Sem 6\IT457 Cloud Computing\Labs\Lab2\Code> az deployment group create --name addtags --resource-group myResourceGroup --template-file
parameters storagePrefix=store storageSKU=Standard_LRS webAppName=demoapp
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Resources/deployments/addtags",
  "location": null,
  "name": "addtags",
  "properties": {
    "correlationId": "fb9514b6-7540-4a4a-a8e2-0afce32e2f32",
    "debugSetting": null,
    "dependencies": [
      {
        "dependsOn": [
          {
            "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Web/serverfarms/exampleplan",
            "resourceGroup": "myResourceGroup",
            "resourceName": "exampleplan",
            "resourceType": "Microsoft.Web/serverfarms"
          }
        ],
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Web/sites/demoappdvdc4efzyji",
        "resourceGroup": "myResourceGroup",
        "resourceName": "demoappdvdc4efzyji",
        "resourceType": "Microsoft.Web/sites"
      }
    ],
    "duration": "PT23.5855718S",
    "error": null,
    "mode": "Incremental",
    "onErrorDeployment": null,
    "outputResources": [
      {
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroup/providers/Microsoft.Storage/storageAccounts/examplestorage",
        "resourceGroup": "myResourceGroup"
      }
    ]
  }
}
```

### Result:



## Lab- Cloud Computing

Home > Resource groups > myResourceGroup

myResourceGroup | Deployments

Search

Refresh Cancel Redeploy Delete View template

Filter by deployment name or resources in the deployment...

Deployment name	Status	Last modified	Duration
addtags	Succeeded	1/26/2024, 3:26:43 PM	23 seconds, 585 milliseconds
addwebapp	Succeeded	1/26/2024, 3:21:41 PM	28 seconds, 894 milliseconds
addappserviceplan	Succeeded	1/26/2024, 3:05:34 PM	13 seconds, 527 milliseconds
addoutputs	Succeeded	1/26/2024, 11:53:56 AM	11 seconds, 701 milliseconds
addnamevariable	Succeeded	1/26/2024, 11:22:37 AM	34 seconds, 874 milliseconds
addlocationparameter	Succeeded	1/26/2024, 10:53:34 AM	32 seconds, 444 milliseconds
usenondefaultsku	Succeeded	1/26/2024, 10:36:56 AM	11 seconds, 955 milliseconds
addnameparameter	Succeeded	1/26/2024, 10:34:59 AM	8 seconds, 609 milliseconds
addstorage	Succeeded	1/26/2024, 10:30:28 AM	37 seconds, 133 milliseconds
blanktemplate	Succeeded	1/26/2024, 10:27:10 AM	3 seconds, 203 milliseconds

### j. Using parameter files

Parameter files:

```
{} azuredeploy.parameters.dev.json X
{} azuredeploy.parameters.dev.json > ...
1
2 {"$schema": "https://schema.management.azure.com/schemas/2015-01-01/deploymentParameters.json#",
3   "contentVersion": "1.0.0.0",
4   "parameters": {
5     "storagePrefix": {
6       "value": "devstore"
7     },
8     "storageSKU": {
9       "value": "Standard_LRS"
10    },
11    "appServicePlanName": {
12      "value": "devplan"
13    },
14    "webAppName": {
15      "value": "devapp"
16    },
17    "resourceTags": {
18      "value": {
19        "Environment": "Dev",
20        "Project": "Tutorial"
21      }
22    }
23  }
24 }
```



## Lab- Cloud Computing

```
{ } azuredeploy.parameters.prod.json > ...
1 {
2   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
3   "contentVersion": "1.0.0.0",
4   "parameters": {
5     "storagePrefix": {
6       "value": "contosodata"
7     },
8     "storageSKU": {
9       "value": "Standard_GRS"
10    },
11    "appServicePlanName": {
12      "value": "contosoplan"
13    },
14    "webAppName": {
15      "value": "contosowebapp"
16    },
17    "resourceTags": {
18      "value": {
19        "Environment": "Production",
20        "Project": "Tutorial"
21      }
22    }
23  }
24 }
```

## Deployment:

```
PS E:\Sem 6\IT457 Cloud Computing\Labs\Lab2\Code> az deployment group create --name devenvironment --resource-group myResourceGroupDev --template-file azuredeploy
.json --parameters azuredeploy.parameters.dev.json
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroupDev/providers/Microsoft.Resources/deployments/devenvironment",
  "location": null,
  "name": "devenvironment",
  "properties": {
    "correlationId": "a362d4bf-1b54-4589-8d0f-6bc8683250f9",
    "debugSetting": null,
    "dependencies": [
      {
        "dependsOn": [
          {
            "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroupDev/providers/Microsoft.Web/serverfarms/devplan",
            "resourceGroup": "myResourceGroupDev",
            "resourceName": "devplan",
            "resourceType": "Microsoft.Web/serverfarms"
          }
        ],
        "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroupDev/providers/Microsoft.Web/sites/devappkjqf7trzohmaa",
        "resourceGroup": "myResourceGroupDev",
        "resourceName": "devappkjqf7trzohmaa",
        "resourceType": "Microsoft.Web/sites"
      }
    ]
  }
}
```

```
PS E:\Sem 6\IT457 Cloud Computing\Labs\Lab2\Code> az group create --name myResourceGroupProd --location "West US"
{
  "id": "/subscriptions/97e43b90-2dab-44c3-a90a-fa73529dceac/resourceGroups/myResourceGroupProd",
  "location": "westus",
  "managedBy": null,
  "name": "myResourceGroupProd",
  "properties": {
    "provisioningState": "Succeeded"
  },
  "tags": null,
  "type": "Microsoft.Resources/resourceGroups"
}
```

## Result:

<input type="checkbox"/> Name ↑↓	Subscription ↑↓	Location ↑↓
<input type="checkbox"/> cloud-shell-storage-centralindia	Azure for Students	Central India
<input type="checkbox"/> myResourceGroup	Azure for Students	Central US
<input type="checkbox"/> myResourceGroupDev	Azure for Students	East US
<input type="checkbox"/> myResourceGroupProd	Azure for Students	West US



## Lab- Cloud Computing

myResourceGroupDev

Resource group

Search

Create

Manage view

Delete resource group

Refresh

Export to CSV

Open query

Assign tags

Move

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Settings

Deployments

Security

Deployment stacks

Essentials

Resources

Recommendations

Filter for any field...

Type equals all

Location equals all

Add filter

Showing 1 to 3 of 3 records.

Show hidden types

No grouping

Name	Type	Location
devapkjgf7trzhmaa	App Service	East US
devplan	App Service plan	East US
devstorekjgf7trzhmaa	Storage account	East US

myResourceGroupProd

Resource group

Search

Create

Manage view

Delete resource group

Refresh

Export to CSV

Open query

Assign tags

Move

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Settings

Deployments

Security

Deployment stacks

Policies

Diagnose

Essentials

Resources

Recommendations

Filter for any field...

Type equals all

Location equals all

Add filter

Showing 1 to 3 of 3 records.

Show hidden types

No grouping

Name	Type	Location
contosodatartwmc7d4jl4cu	Storage account	West US
contosoplan	App Service plan	West US
contosowebapprtvmc7d4jl4cu	App Service	West US

### 3. N-tier architecture: -

Deployment:



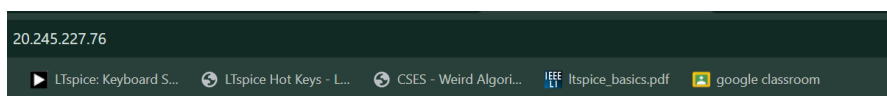


## Lab- Cloud Computing

```
akshar [ ~ ]$ az deployment group create \  
> --resource-group learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2 \  
> --template-uri https://raw.githubusercontent.com/MicrosoftDocs/mslearn-n-tier-architecture/master/Deployment/azuredeploy.json \  
> --parameters password="$(head /dev/urandom | tr -dc A-Za-z0-9 | head -c 32)" \  
{  
  "id": "/subscriptions/16982123-2d3c-44ce-ab2d-0c419f4ce699/resourceGroups/learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2/providers/Microsoft.Resources/deployments/azuredeploy",  
  "location": null,  
  "name": "azuredeploy",  
  "properties": {  
    "correlationId": "6c65591e-7efe-42d8-b7e6-5c2462246e4d",  
    "debugSetting": null,  
    "dependencies": [  
      {  
        "dependsOn": [  
          {  
            "id": "/subscriptions/16982123-2d3c-44ce-ab2d-0c419f4ce699/resourceGroups/learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2/providers/Microsoft.Sql/servers/demo-dbserver-dztydvutelhdu",  
            "resourceGroup": "learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2",  
            "resourceName": "demo-dbserver-dztydvutelhdu",  
            "resourceType": "Microsoft.Sql/servers"  
          }  
        ]  
      }  
    ],  
  }  
}
```

```
akshar [ ~ ]$ az deployment group show \  
> --output table \  
> --resource-group learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2 \  
> --name azuredeploy \  
> --query properties.outputs.webSiteUrl  
Value  
-----  
http://20.245.227.76
```

Result:



What's For Lunch?

Click to vote

pizza	7 Votes	<input type="button" value="✕ Remove"/>
burgers	2 Votes	<input type="button" value="✕ Remove"/>
sandwiches	1 Votes	<input type="button" value="✕ Remove"/>

a. Presentation Tier



```
akshar [ ~ ]$ az resource list --tag tier=presentation --output table
```

Name	ResourceGroup	Status	Location
demo-web-vm-disk	LEARN-47E6CFE4-9B6E-4CAF-A924-99340FC106B2		westus
e/disks			
demo-web-vm	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
e/virtualMachines			
demo-web-vm-nic	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
k/networkInterfaces			
demo-web-nsg	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
k/networkSecurityGroups			
demo-web-vm-nic-pip	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
k/publicIPAddresses			

### b. Application Tier

```
akshar [ ~ ]$ az resource list --tag tier=application --output table
```

Name	ResourceGroup	Status	Location
demo-biz-vm-disk	LEARN-47E6CFE4-9B6E-4CAF-A924-99340FC106B2		westus
isks			
demo-biz-vm	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
irtualMachines			
demo-biz-vm-nic	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
etworkInterfaces			
demo-biz-nsg	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
etworkSecurityGroups			

### c. Data Tier

```
akshar [ ~ ]$ az resource list --tag tier=data --output table
```

Name	ResourceGroup	Status	Location
demo-dbserver-dztydvutelhdu	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
Microsoft.Sql/servers			
demo-dbserver-dztydvutelhdu/demo-sqldb	learn-47e6cfe4-9b6e-4caf-a924-99340fc106b2		westus
Microsoft.Sql/servers/databases			

## 4. Application Gateway Tutorial: -

Resources created:



## Lab- Cloud Computing

myResourceGroupAG

Resource group

Search

+ Create Manage view Delete resource group Refresh Export to CSV Open query Assign tags Move Delete Export template Open in mobile

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Settings

Deployments

Security

Deployment stacks

Policies

Properties

Locks

Cost Management

Cost analysis

Cost alerts (preview)

Budgets

Advisor recommendations

Monitoring

Insights (preview)

Alerts

Metrics

Essentials

Subscription (group) : [Azure for Students](#)

Subscription ID : 97a2b90-26a9-44c3-a92a-fa73529beac

Tags (add) : [Add tags](#)

Deployments : [1 Successful](#)

Location : East US

Resources Recommendations

Filter for any field... Type equals all Location equals all Add filter

Showing 1 to 13 of 13 records. Show hidden types

Name	Type
contosoVM	Virtual machine
contosoVMIp	Public IP address
contosoVMSeg	Network security group
contosoVMnic1	Network interface
contosoVMDisk1_876c3809e75a5d44c0a0716ee0987	Disk
fabrikamVM	Virtual machine
fabrikamVMIp	Public IP address
fabrikamVMSeg	Network security group
fabrikamVMnic1	Network interface
fabrikamVMDisk1_1665c2ee7a44d0e087d2bcafc0db4	Disk
myAGPublicIPaddress	Public IP address
myAppGateway	Application gateway
myVNet	Virtual network

## IIS installation:

```
VERBOSE: Authenticating to Azure ...
VERBOSE: Building your Azure drive ...
PS /home/akshar > Set-AzVMExtension `
>> -ResourceGroupName myResourceGroupAG `
>> -ExtensionName IIS `
>> -VMName contosoVM `
>> -Publisher Microsoft.Compute `
>> -ExtensionType CustomScriptExtension `
>> -TypeHandlerVersion 1.4 `
>> -SettingString '{"commandToExecute":"powershell Add-WindowsFeature Web-Server;
>> -Location eastus

RequestId IsSuccessStatusCode StatusCode ReasonPhrase
-----
True OK
```

```
PS /home/akshar > Set-AzVMExtension `
>> -ResourceGroupName myResourceGroupAG `
>> -ExtensionName IIS `
>> -VMName fabrikamVM `
>> -Publisher Microsoft.Compute `
>> -ExtensionType CustomScriptExtension `
>> -TypeHandlerVersion 1.4 `
>> -SettingString '{"commandToExecute":"powershell Add-WindowsFeature Web-Server;
>> -Location eastus

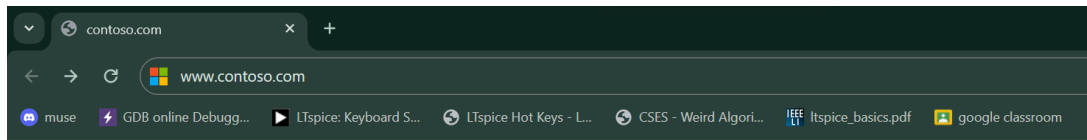
RequestId IsSuccessStatusCode StatusCode ReasonPhrase
-----
True OK
```

IP Address: 20.127.93.242

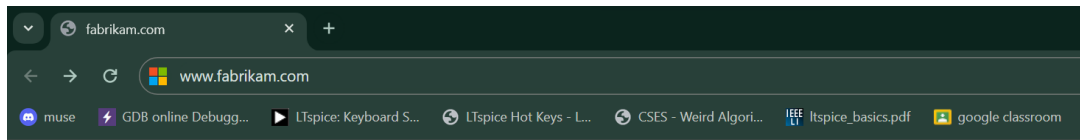
Result:



## Lab- Cloud Computing



contosoVM



fabrikamVM