Azure Compute

Lesson Objectives

At the end of this module you will be able to:

- ✓ Understand the Azure computing options IaaS, PaaS and LaaS
- ✓ Create Azure Virtual Machines
- ✓ Deploy Container Images
- ✓ Create and deploy Web and Mobile Apps
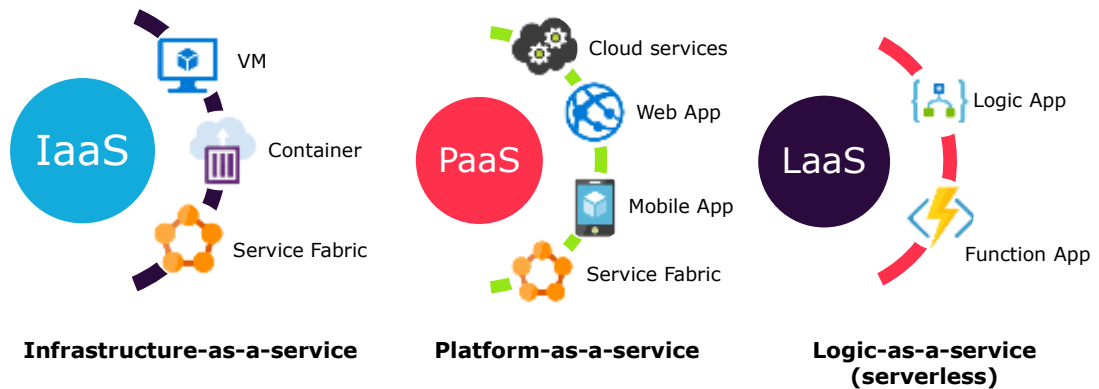- ✓ Create Function and Logic App

2

Azure Computing Introduction

- Computing resources like CPU, Memory, Disk space etc. are needed to run or deploy the application / logic
- Microsoft Azure lays the foundation for lot of such resources and services.
- Azure provides computing resources through IaaS, PaaS & LaaS as options for running our applications

Application

Microsoft Azure Cloud

Azure Computing options

IaaS — Infrastructure-as-a-service (VM, Container, Service Fabric)

PaaS — Platform-as-a-service (Cloud services, Web App, Mobile App, Service Fabric)

LaaS — Logic-as-a-service (serverless) (Logic App, Function App)

IaaS
Full Control for us but we need to own complete responsibility
Vendor agnostic(No ties to specific vendor)

PaaS
Azure Manages the app
We need to manage the scaling and configuration

LaaS
Azure Manages the app including scaling
We need to manage just the configuration

Azure Resource Manager

- Azure Resource Manager (ARM) is the service used to provision resources in your Azure subscription
- It helps to deploy, manage, and monitor resources and 3rd party services as a group in Azure
  - **Resource**: A manageable item that is available through Azure. Some common resources are a virtual machine, storage account, web app, database, and virtual network
  - **Resource group**: A container that holds related resources for an Azure solution

5

Resource Manager provides several benefits:

- You can deploy, manage, and monitor all the resources for your solution as a group, rather than handling these resources individually.

- You can repeatedly deploy your solution throughout the development lifecycle and be confident that your resources are deployed in a consistent state.

- You can manage your infrastructure through declarative templates rather than scripts.

- You can define the dependencies between resources so they are deployed in the correct order.

- You can apply access control to all services in your resource group because Role-Based Access Control (RBAC) is natively integrated into the management platform.

- You can apply tags to resources to logically organize all the resources in your subscription.

- You can clarify your organization's billing by viewing costs for a group of resources sharing the same tag.

Azure Virtual Machine

- This is a managed virtual machine service in the cloud where we can run our applications in to it
- It starts and stops in minutes
- Azure Marketplace has many images, Windows, Linux etc. and also we can create a VM with our own image
- We have many options to choose the size of our VM in terms of CPU memory and disk type which fits best with our workload
- VM's can be managed easily with configuration options like auto shutdown, adding disks and to virtual networks

© 2018 Capgemini. All rights reserved.

6

Virtual Machine is a fully functioning virtual computer which imitates dedicated hardware

Azure Virtual Machines gives you the flexibility of virtualization for a wide range of computing solutions with support for Linux, Windows Server, SQL Server, Oracle, IBM, SAP and more.

Azure virtual machines can be used in various ways. Some examples are:

Development and test
Azure VMs offer a quick and easy way to create a computer with specific configurations required to code and test an application.

Applications in the cloud
Because demand for your application can fluctuate, it might make economic sense to run it on a VM in Azure. You pay for extra VMs when you need them and shut them down when you don't.

Extended datacenter
Virtual machines in an Azure virtual network can easily be connected to your

organization's network.

VM Sizes

Type	Common sizes	Description
General purpose	Dsv3, Dv3, DSv2, Dv2, DS, D, Av2, A0-7	Balanced CPU-to-memory. Ideal for dev / test and small to medium applications and data solutions.
Compute optimized	Fs, F	High CPU-to-memory. Good for medium traffic applications, network appliances, and batch processes.
Memory optimized	Esv3, Ev3, M, GS, G, DSv2, DS, Dv2, D	High memory-to-core. Great for relational databases, medium to large caches, and in-memory analytics.
Storage optimized	Ls	High disk throughput and IO. Ideal for Big Data, SQL, and NoSQL databases.
GPU	NV, NC	Specialized VMs targeted for heavy graphic rendering and video editing
High performance	H, A8-11	Our most powerful CPU VMs with optional high-throughput network interfaces (RDMA).

A virtual machine size determines the amount of compute resources such as CPU, GPU, and memory that are made available to the virtual machine. Virtual machines need to be created with a size appropriate for the expect workload. If workload increases, an existing virtual machine can be resized.

You can capture and upload your own custom VM images as well

VM Power States

Power State	Description
Starting	Indicates the virtual machine is being started.
Running	Indicates that the virtual machine is running.
Stopping	Indicates that the virtual machine is being stopped.
Stopped	Indicates that the virtual machine is stopped. Virtual machines in the stopped state still incur compute charges.
Deallocating	Indicates that the virtual machine is being deallocated.
Deallocated	Indicates that the virtual machine is completely removed from the hypervisor but still available in the control plane. Virtual machines in the Deallocated state do not incur compute charges.
-	Indicates that the power state of the virtual machine is unknown.

8

An Azure VM can have one of many power states. This state represents the current state of the VM from the standpoint of the hypervisor.

Connecting Virtual Machines
Windows VMs can be connected using Remote Desktop Protocol or RDP most of the time. By default this service listens TCP 3389, but for security reasons it can be changed within the virtual machine, and also need to updated in Network Security Group

PowerShell remoting depends on HTTP at port 5985 or HTTPS at 5986

Linux VMs can be connected using Secure Shell(SSH), Authentication using password or keys and via RDP

Key Points regarding Azure VMs
- Unless the VM is deallocated, it still incurs charge
- Related assets are charged separately
- You can't connect to VMs in other virtual networks
- Deleting the VM doesn't delete the VHD
- You can't connect without an NSG rule

- DNS names require creativity and should be standardized
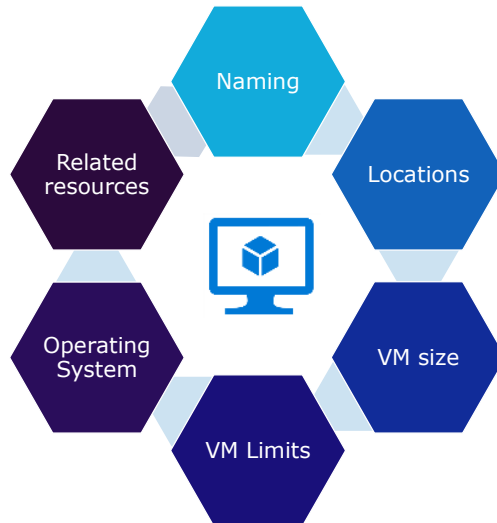
Naming
The name of a VM can be up to 15 characters.

Locations
Usually, the region is called location when you create a VM. For a VM, the location specifies where the virtual hard disks are stored.

VM size
The size of the VM that you use is determined by the workload that you want to run. The size that you choose then determines factors such as processing power, memory, and storage capacity.

VM Limits
Your subscription has default quota limits in place that could impact the deployment of many VMs for your project. The current limit on a per subscription basis is 20 VMs per region

Operating system
Azure provides many marketplace images to use with various versions and types of operating system. Only 64-bit operating systems are supported.

Related resources
Resource Group, Storage Account, Virtual Network, Public Ip Address, Network Interface and Data disks are the related resources used by the VM and need to exist or be created when the VM is created.

VM Extensions

- Azure virtual machine (VM) extensions are small applications that provide post-deployment configuration and automation tasks on Azure VMs
- Can be added, updated, disabled or removed any time
- Managed via portal, Powershell and Management APIs

For example, If a virtual machine requires software installation, anti-virus protection, or to run a script inside of it, a VM extension can be used.

Azure Container Instance

- Azure Container Instances Service is meant for running single containers at a time, which also start and stop in seconds.
- There is no need to have a container orchestrator to run containers in Azure Container Instances
- Both Linux and Windows-based containers can be run in Azure Container Instances
- Images from Docker Hub or the Azure Container Registry can be used.

11

Azure Container Service

This is another service in azure which is used to run and orchestrate multiple containers that makes up the application. This is similar to hosting applications in a virtual machine. But the main difference between containers and VMs is that containers start and stop in seconds where VMs start and stop in minutes.

Containers are much more lightweight than virtual machines as your container service comes with a container orchestrator it is required when we have multiple containers. Container orchestrator takes care of provisioning and deprovisioning containers scaling them up and down and monitoring them.

Azure Service Fabric

- Azure Service Fabric is another way to run the applications.
- Service Fabric is an orchestrator that replicates your applications over multiple notes to keep it available and performant and to upgrade them seamlessly
- Any type of application can be run in Azure Service Fabric.
- Service fabric can be run in Azure, on-premises, on local machine or in another cloud.

12

Azure Service Fabric is the technology that Microsoft uses itself to run many of their own Azure services like Azure SQL Databases.

Any type of application in Azure Service Fabric.
- Can run any stand-alone executable.
- Can run reliable services which is a concept within service fabric that allows you to have services that can be stateful.
- Can run actor-based applications that can share state
- Can even run application in containers within Azure Service Fabric

To make sure that services are reliable and available, we need to run service fabric on a minimum of five VMs in a production scenario.

Azure Cloud Services

- Cloud services run the applications in VMs and manages that in the form of web or worker roles
- It abstracts the VM, so that we don't have to deal with it
  - It also provides the ability to scale the amount of roles and sizes of underlying VMs.
- Application can be deployed by packaging it, which can be done using Visual Studio template
- We can remote desktop into the VM and even we can create tasks to install things on the VMs even though cloud services takes care of the VM and operating system.

Cloud service was one of the first platform as a services offerings from Azure and takes care of the management of the VMs on behalf of us. You don't have to worry about the operating system or the network, cloud services does that for you. It also provides the ability to scale the amount of roles and sizes of underlying VMs.

You can deploy web applications or APIs to it to run in web roles that are HTTP-based or you can run background jobs in worker roles or both.

Azure Web App

- The web app is a web server as a service which means that runs the app in an abstraction of a web server like IIS or Tomcat.
- All sorts of applications in the web app like .NET, Java, PHP, Node.js, Python can be run.
- The app services platform is special because it provides lots of capabilities like Continuous Deployment, Custom Domains, Deployment Slots, Scaling, Authentication / Authorization, Web Jobs and Hybrid Connection to on-premises resources.

14

The app services platform is special because it provides lots of capabilities out of the box like
- Ability to easily continuously deploy from source code.
- Use custom domains and deployment slots that let you test your new app before you deploy it into production and lets you deploy to production with almost no downtime.
- Automatic and manual scaling and easy authentication and authorization

WebJobs and hybrid connections that let you connect to resources on-premises like a database in your own data center.

WebJobs are a feature of Azure Apps Services Web Apps, mobile apps and function apps. They allow you to run background tasks. They run as part of your app service, so they take up some of the resources like CPU and memory. Because they are a part of the app service they are dependent on them. If you use a WebJob as a part of a web app, the WebJob will be stopped when the Web app is stopped. WebJobs can run continuously or on a timer like every 10 minutes, or it can be triggered by outside events like when a new message is put on a queue. The WebJobs SDK enables these triggers and makes it easy to consume data from triggers like queues without you needing to write the plumbing to connect to the queue

App services web apps are available for 99.95% of the time by default even if you run just one instance of them..

Azure Mobile App

- Azure Mobile App are meant for running a backend for mobile applications
- We can create backend for Azure Mobile Apps in .NET or Node.js.
- Mobile applications can easily connect to backends using the Azure App Services Mobile App SDK which is available for almost every mobile platform
- Mobile apps offer some unique features like offline sync and push notifications that web apps don't have.

15

Offline sync enables the application to lose connection to the backend and continue working and sync its data back whenever it reconnects

Push notifications enables to send notifications to mobile devices

Since mobile apps is part of Azure App Services it also has all of the other features of Azure App Services like deployment slots, scaling, and so on.

Azure Function App

- Azure Function App executes small pieces of code in a faster manner
- Azure Function App runs one or more Azure Functions continuously or on a scheduled interval, or can be triggered by outside resources like new messages on a queue.
- Function apps binding makes it easy to get input for the function and outputs it to resource like azure block storage without writing any code.

Function Apps are use these to run small pieces of code that execute something small and fast like resizing an image and putting it somewhere every time an image is uploaded to storage.

As function apps are part of Azure Apps Services they also share the app services features like deployment slots, continuous deployment, and so on.

Function apps can run like web apps where you run them continuously and pay for them the whole month, or you can run them in a consumption mode which is sometimes called serverless. In this mode you only pay for when the function is invoked and functions scale automatically. This works well for functions that run a short time as in consumption mode. They are cut off after five minutes.

Azure Logic App

- Azure Logic apps are used to design and execute a pipeline of tasks in a process
- It replaces Azure BizTalk Services
- A logic app can be triggered on a schedule or by outside resources just like function apps and WebJobs.
- Logic app can be started by calling its endpoint when it is exposed as a WebHook or trigger it by a new message on a queue, or with many other trigger possibilities.
    - After being triggered, the logic app goes on to execute a process by calling connectors, which basically are APIs
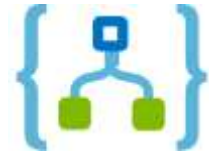
17

Logic Apps are used to create business process and workflows visually.

It automates EAI, B2B/EDI and business process

Connectors ➡ Triggers ➡ Conditions / Actions

There are many connectors available out of the box like connectors to Office 365, Twitter, SendGrid, and many more. You can also expose your own APIs or Azure Functions as connectors for the logic app.

Just like Azure Function Apps, logic apps can run in consumption mode. Actually, it can only run in consumption mode so you don't have to worry about scaling. Logic apps does that for you.

Summary

- Azure compute enable us to access computing resources on Azure cloud and scale on demand by paying only for the resources we use.
- Virtual Machines provides windows and Linux machines in seconds
- Using Container instances we can run containers with a single command
- Using App Services we can quickly create powerful cloud apps for web and mobile

18

18

Summary

- Service Fabric help us to develop microservices and orchestrate containers on windows or linux
- Function app helps us to process events with serverless code
- Logic Apps automate the access and use of data across clouds without writing code

Summary

About Capgemini

With more than 190,000 people, Capgemini is present in over 40 countries and celebrates its 50th Anniversary year in 2017. A global leader in consulting, technology and outsourcing services, the Group reported 2016 global revenues of EUR 12.5 billion. Together with its clients, Capgemini creates and delivers business, technology and digital solutions that fit their needs, enabling them to achieve innovation and competitiveness. A deeply multicultural organization, Capgemini has developed its own way of working, the Collaborative Business Experience™, and draws on Rightshore®, its worldwide delivery model.

Learn more about us at

www.capgemini.com

People matter, results count.