ANYX TECHNOLOGIES

CLOUD COMPUTING

- Why Cloud Computing?
- What is Cloud Computing?
- Cloud Providers
- Cloud Essential Characteristics
- Cloud Service Models
- Cloud Deployment Models

Cloud??

THINKNYX TECHNOLOGIES

Cloud..


External HDD
1TB
Memory Card
64GB
SDCard
16GB


iCloud
Dropbox
OneDrive
Google Drive

On-premise vs Cloud

On-Premise- A company hosts everything in-house

Cloud- A third-party provider hosts all that for you

On-premise vs Cloud

Dave

Peter

Scalability

Data Center

Data Security

Data Loss

Maintenance

What is Cloud Computing?

Cloud computing is the use of computing resources (hardware & software) that are delivered as a service over a network (typically the internet).

In simple words, Cloud computing is using the internet to access someone else's software running on someone else's hardware in someone else's data center.

Delivery as a Service

" Cloud computing is the delivery of computing as a service rather than a Product."

Cloud Providers

aws

Azure

IBM Cloud

Google Cloud

ORACLE

The NIST Definition Cloud Computing

This cloud model is composed of:

- Five essential characteristics
- Three service models, and
- Four deployment models

Characteristics of Cloud Computing

On-demand self-service

Rapid Elasticity

Broad network access

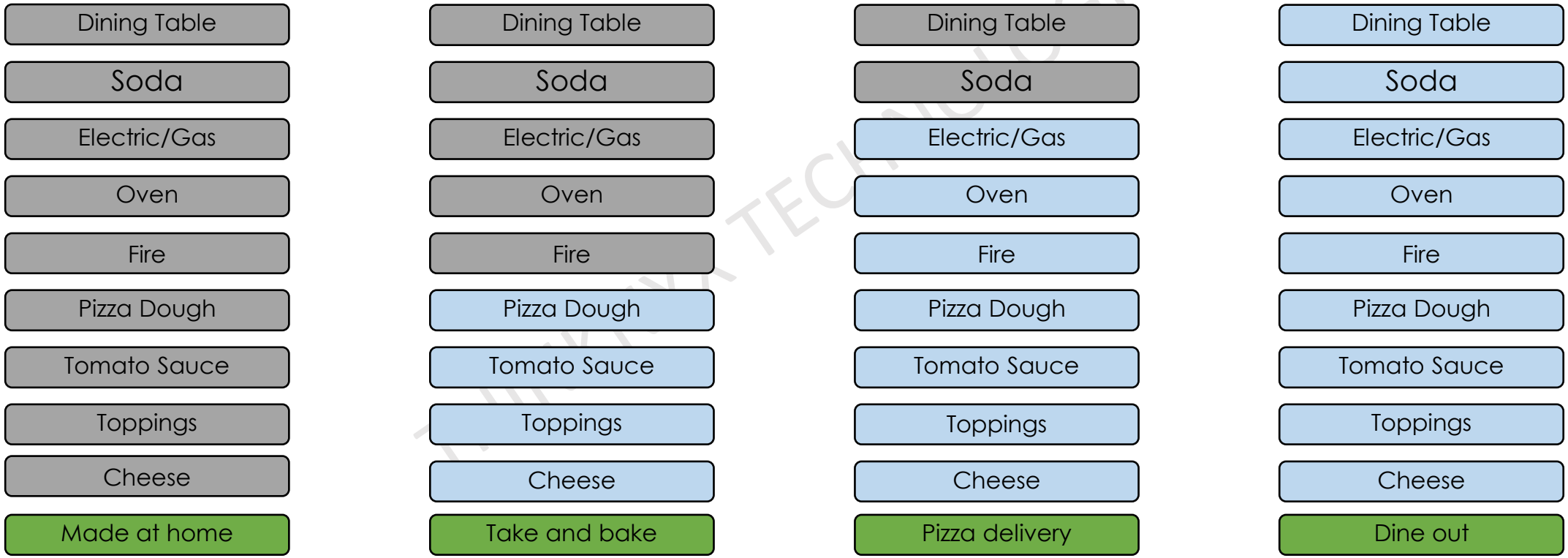
Measured Services

Resource Pooling

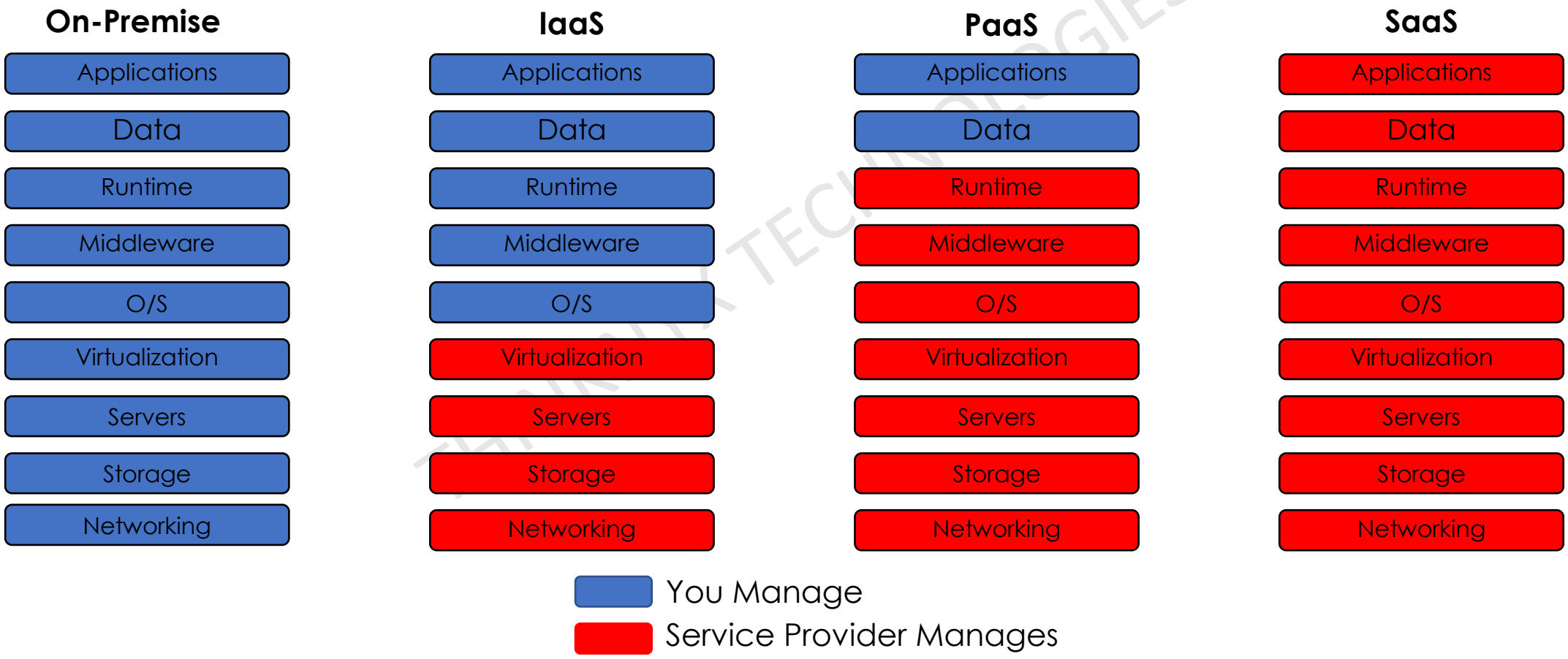
Service Models

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

Service Models



Service Models



Deployment Models

- Public
- Private
- Community
- Hybrid

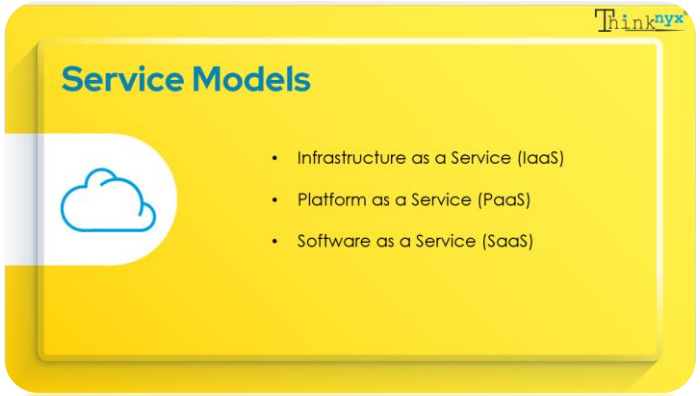
Virtualization

- Virtualization uses software to create an abstraction layer over the physical hardware. In doing so, it creates a virtual compute system, known as virtual machines (VMs).

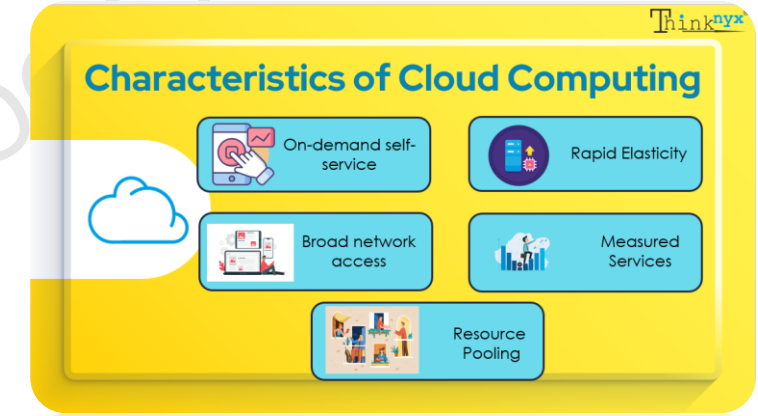
- This allows organizations to run multiple virtual computers, operating systems, and applications on a single physical server — essentially partitioning it into multiple virtual servers.

- Simply put, one of the main advantages of virtualization is that it's a more efficient use of the physical computer hardware; this, in turn, provides a greater return on a company's investment.

Summary


Service Models
Infrastructure as a Service (IaaS)
Platform as a Service (PaaS)
Software as a Service (SaaS)


Cloud computing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Rapid Elasticity
Broad network access
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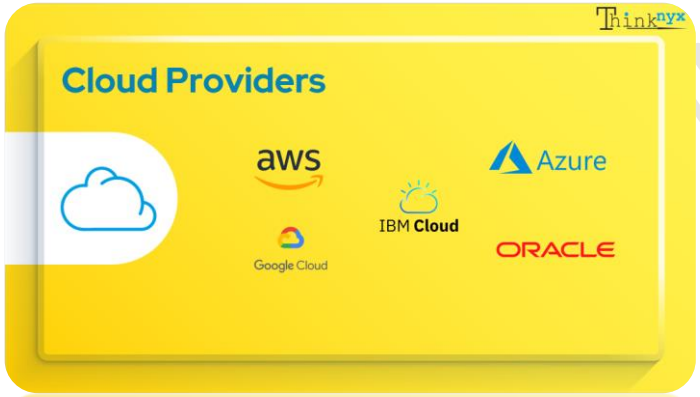
Resource Pooling


Cloud Providers
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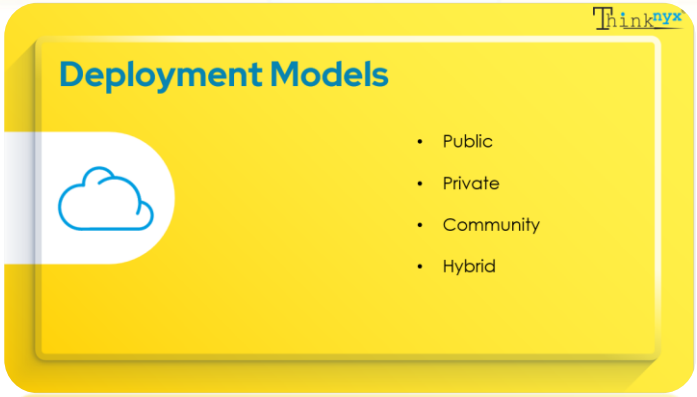
ORACLE


Deployment Models
Public
Private
Community
Hybrid

Azure - Microsoft Cloud

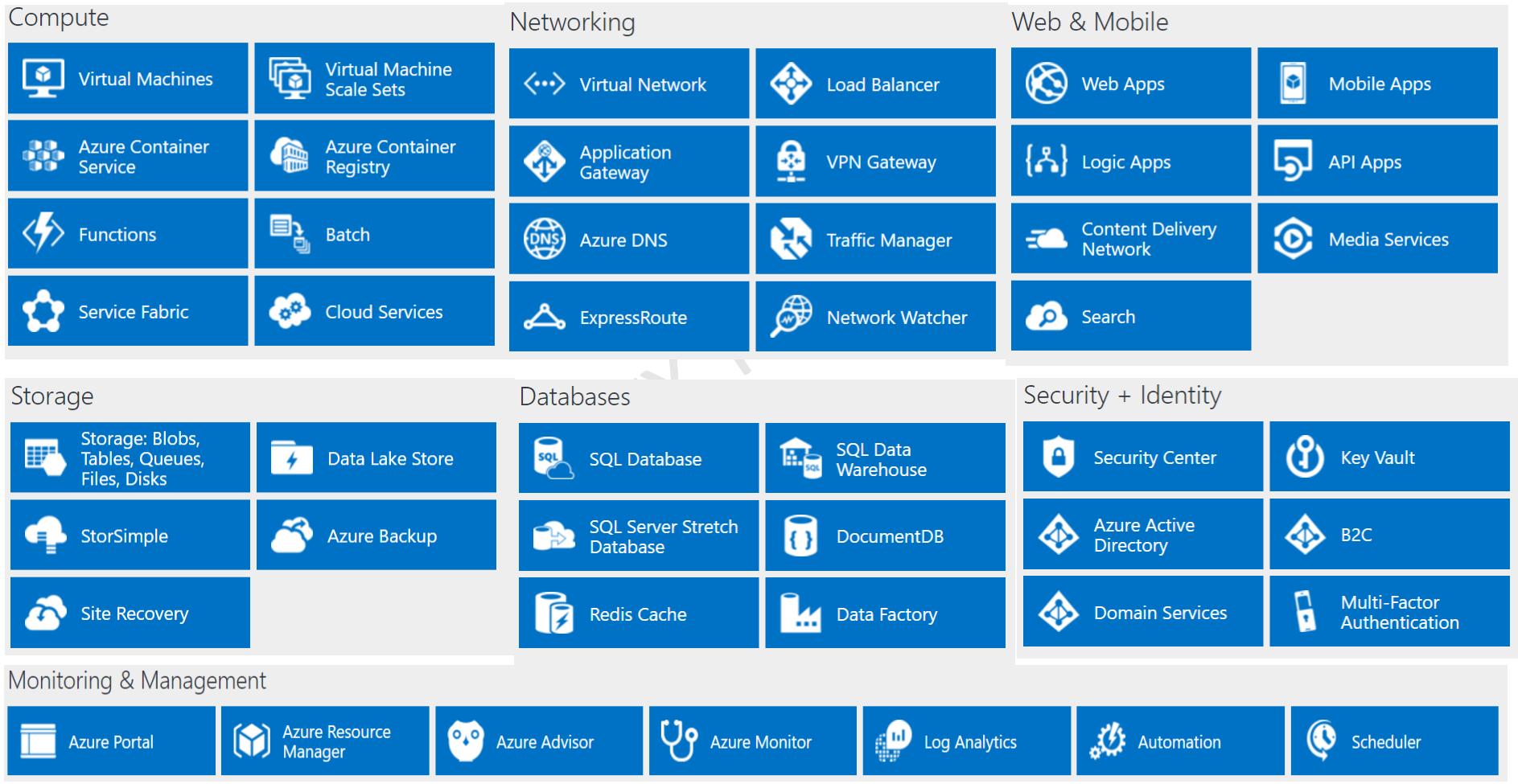
Microsoft Azure

Azure is a cloud offering from Microsoft that individual and organizations can use to create, deploy and operate Cloud based apps and Infrastructure services.

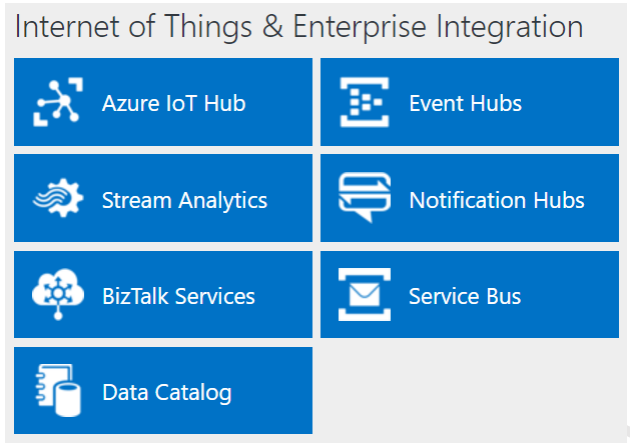
- Best in class support services offered by Microsoft since its release in 2010.
- Available for purchase in 139 countries around the world and support billing in 24 currencies
- Major Focus on PaaS and SaaS.
- 40+ Azure regions – more than any cloud provider (Q2-2017)
- 60+ Compliance offerings – again more than any cloud provider as of now (Q2-2017)

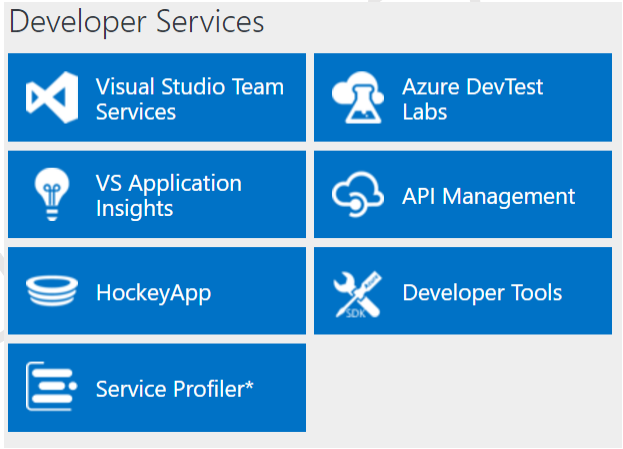
Azure Regions

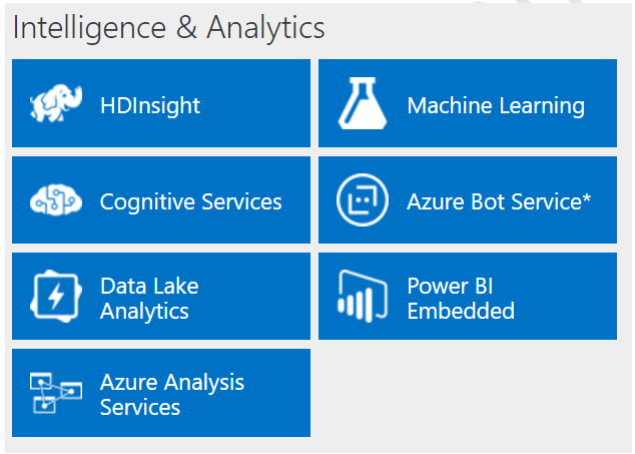
Basic Services



Advanced Services







Ongoing….

Refer portal for latest supported services.
http://azureplatform.azurewebsites.net/en-us/

Azure Resource Manager (ARM)

Azure Resource Manager is the deployment and management service for Azure. It provides a management layer that enables you to create, update, and delete resources in your Azure account.

To meet these challenges, you can automate deployments and use the practice of infrastructure as code, we use **ARM templates**.

ARM template

Language-JSON

```
az deployment sub create \
  --name demoSubDeployment \
  --location centralus \
  --template-uri "https://raw.githubusercontent.com/Azure/azure-docs-json-samples/master/azure-resource-manager/emptyrg.json" \
  --parameters rgName=demoResourceGroup rgLocation=centralus
```

Azure hierarchy

Azure follows a hierarchy and create things accordingly.

1. Management Groups :
    - The organization or company.
    - If we assign any policy on management group level, all the subscriptions will inherit the policy.

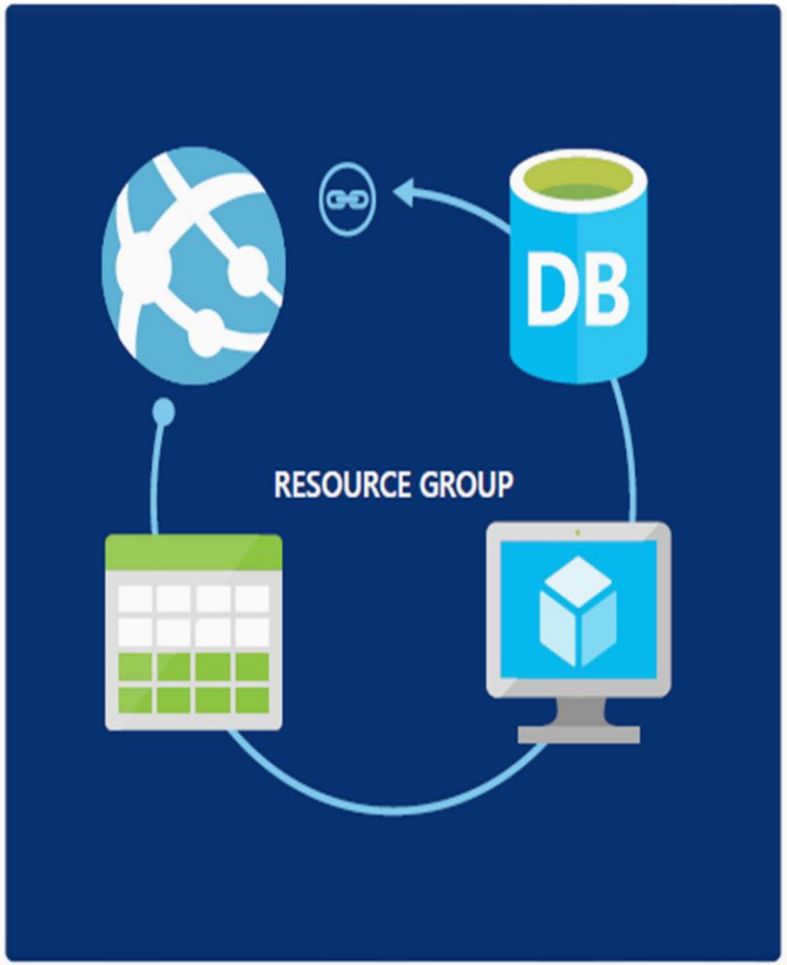
2. Subscriptions :
    - Subscriptions are further division of organization and we can use different subscriptions for different clients or different projects.
    - Logical Groups of the resources that are created for a particular account.
    - It will track the resource quota and the cost.

3. Resource Groups :
    - Logical containers where we can deploy our resources and manage them.
    - In Azure, we can't create any resource without a resource group.

4. Resources :
    - Virtual machines, databases, storage, networks, etc.

Resource Group

A resource group is a container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group.



- Tightly coupled containers of multiple resources of similar or different types
- Resource groups can span regions
- Every resource *must* exist in one and only one resource group

Azure Services

- **Compute services** This includes the Azure Virtual Machines—both Linux and Windows, Cloud Services, App Services (Web Apps, Mobile Apps, Logic Apps, API Apps, and Function Apps), Batch (for large-scale parallel and batch compute jobs), RemoteApp, Service Fabric, and the Azure Container Service.

- **Data services** This includes Microsoft Azure Storage (comprised of the Blob, Queue, Table, and Azure Files services), Azure SQL Database, DocumentDB, StorSimple, and the Redis Cache.

- **Application services** This includes services that you can use to help build and operate your applications, such as Azure Active Directory (Azure AD), Service Bus for connecting distributed systems, HDInsight for processing big data, Azure Scheduler, and Azure Media Services.

- **Network services** This includes Azure features such as Virtual Networks, ExpressRoute, Azure DNS, Azure Traffic Manager, and the Azure Content Delivery Network.

Azure Virtual Machines

Azure Virtual Machines

Azure Virtual Machines supports the deployment of Windows or Linux virtual machines (VMs) in a Microsoft Azure datacenter.

You have total control over the configuration of the VM.

You are responsible for all server software installation, configuration, and maintenance and for operating system patches.

IaaS

VM Billing

Azure Virtual Machines is priced on a per-hour basis, but it is billed on a per-minute basis. For example, you are only changed for 23 minutes of usage if the VM is deployed for 23 minutes.
The cost for a VM includes the charge for the Windows operating system. Linux-based instances are slightly cheaper because there is no operating system license charge.
The cost, and the appropriate licensing, for any additional software you install is your responsibility.
Some VM images, such as Microsoft SQL Server, you acquire from the Azure Marketplace may include an additional license cost (on top of the base cost of the VM).

Relationship between the VM's status and billing:

- VM is up and running (billable).
- VM is stopped but still deployed to a physical host (billable)
- Stopped (Deallocated) the VM is not deployed to a physical host (not billable).

Virtual machine components

1) Virtual machine - A virtual machine can be defined as having a status, a specific configuration (operating system, CPU cores, memory, disks, IP address, and so on), and state.

2) Disks -Azure VMs use attached VHDs to provide durable storage.

Image: Template for the creation of a new Azure VM.
Disk: OS disk, Ephemeral Disk and a data disk.
Caching Disk- Swap disks

3) Credentials: Either Provide Password or Public Key , along with username.

Virtual machine components

4) Virtual Network -Components that all allow you to operate your virtual machines in a scalable and secure manner. These components could include equipment such as separate network spaces for Internet-facing and backend servers, load balancers, firewalls, and more.

- Subnet
- IP address (Private & Public)
- Load balancer (Internal & External)
- Network security group
- Network interface card (NIC)

Available sizes and options for the Azure virtual machines

Type	Sizes	Description
General purpose	Dsv3, Dv3, DSv2, Dv2, DS, D, Av2, A0-7,	Balanced CPU-to-memory ratio. Ideal for testing and development, small to medium databases, and low to medium traffic web servers.
Compute optimized	Fs, F	High CPU-to-memory ratio. Good for medium traffic web servers, network appliances, bath processes, and application servers.
Memory optimized	Esv3, Ev3, M, GS, G, DSv2, DS, Dv2, D	High memory-to-CPU ratio. Great for relational database servers, 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 virtual machines targeted for heavy graphic rendering and video editing. Available with single or multiple GPUs.
High performance compute	H, A8-11	Our fastest and most powerful CPU virtual machines with optional high-throughput network interfaces (RDMA).

Network Security Groups

Security Group protection for your VMs and resources

Can be applied to single VM or to complete subnet

By default all incoming traffic is blocked, all internal traffic between VMs of same security group is allowed

By default all outgoing traffic is allowed.

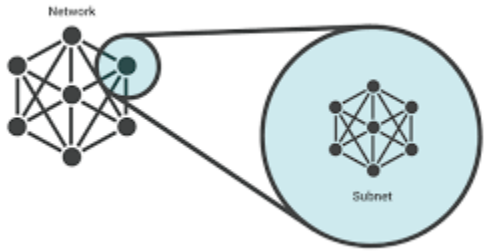
For Unix VMs, port 22 is default allowed in new NGSs and RDP-3389 is allowed for Windows.

Subnet

Subnets break large networks into smaller, more manageable network that can run efficiently.

Each subnet is a logical subdivision of a larger network.

Connected devices within a subnet share a common IP address identifier.



Routers manage communication between the subnets.

Subnet

Advantages:

Security

Organization

Performance

LAB 1-VM

Create a Linux virtual machine through Portal

Accessing a Virtual Machine

Stop, Start, Restart etc. to be performed

Azure Bastion

- Azure Bastion :
- Bastion will allow us to connect to VMs through browser.
- It is fully managed PaaS service.
- Provides platform to access our VMs.
- It provides both RDP[Windows] and SSH[Linux] connections.

Azure Storage

Understanding VM Disks

OS Disk vs Data Disk

OS Disk

Every virtual machine has one attached operating system disk. That OS disk has a pre-installed OS, which was selected when the VM was created.

Data Disk

A data disk is a managed disk that's attached to a virtual machine to store application data, or other data you need to keep.

LAB 2- Disks

- Create a data disk and attach same to VM.
- Mount the disk
- Add some files to it

Snapshots

A snapshot is a full, read-only copy of a virtual hard disk (VHD). You can use a snapshot as a point-in-time backup, or to help troubleshoot virtual machine (VM) issues. You can take a snapshot of both operating system (OS) or data disk VHDs.

LAB 3- Snapshots

- Create a snapshot of the data disk
- Make sure to choose the AZ same as VM
- Create a disk out of the VM
- Attach as an existing disk
- Check if the old files are still visible

Types of Storage Accounts

- **Based on the performance, we have 2 types:**
- **Standard-** Magnetic drives to store the data and a offered at low cost. These are useful for bulk and infrequent access storage.
- **Premium-** Solid State Drives[SSD] and offer consistency and low latency performance. These are used for Azure virtual machines and high I/O databases.

Storage Accounts

- Storage account is a container for most of the Azure services.
- An Azure storage account contains all of your Azure Storage data objects, including blobs, file shares, queues, tables, and disks.
- The storage account provides a unique namespace for your Azure Storage data that's accessible from anywhere in the world over HTTP or HTTPS.
- Data in your storage account is durable and highly available, secure, and massively scalable.
- An Azure subscription can host up to 100 storage accounts, each of which can hold 500 TB.

Azure Storage Account Services

Blobs

Block: Text or binary data (.log, .exe, .jpg, etc.).

Up to 200GB.

Page: Optimized for disks (.vhd). Supports random read-write. Up to 1TB.

Append Blob: Writes to end of the blob (4MB max) up to 50k times (~195GB)

File Shares

Supports SMB 3.0 protocol.

Can be accessed like a traditional file share.

Share files between multiple Virtual Machines.

A single file share can be up to 5TB.

Tables

NoSQL storage of structured data (entities).

Key/value storage.

A single entity can have up to 255 properties and be up to 1MB.

Queues

Durable messaging.

Provides asynchronous communication between application tiers and components.

A single message can be up to 64KB.

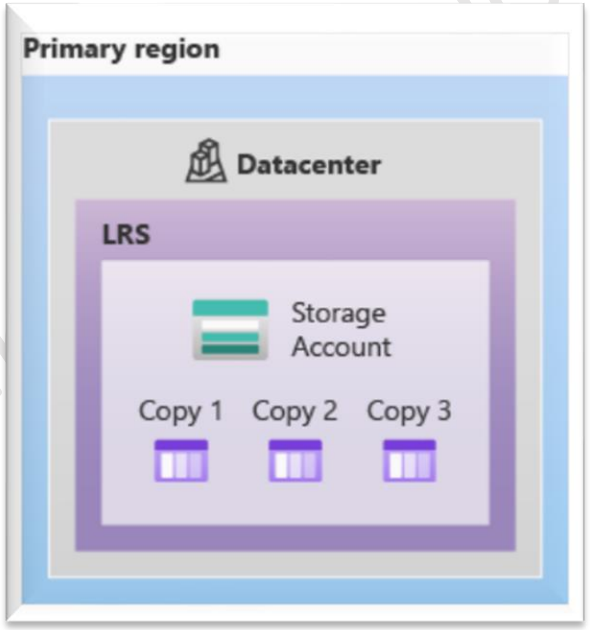
Microsoft

Blob (Binary large object) Storage

Store and access them from anywhere in the world by using URLs, the REST interface, or one of the Azure SDK storage client libraries

Storage Redundancy

Locally redundant storage (LRS) copies your data synchronously three times within a single physical location in the primary region. LRS is the least expensive replication option, but isn't recommended for applications requiring high availability or durability.

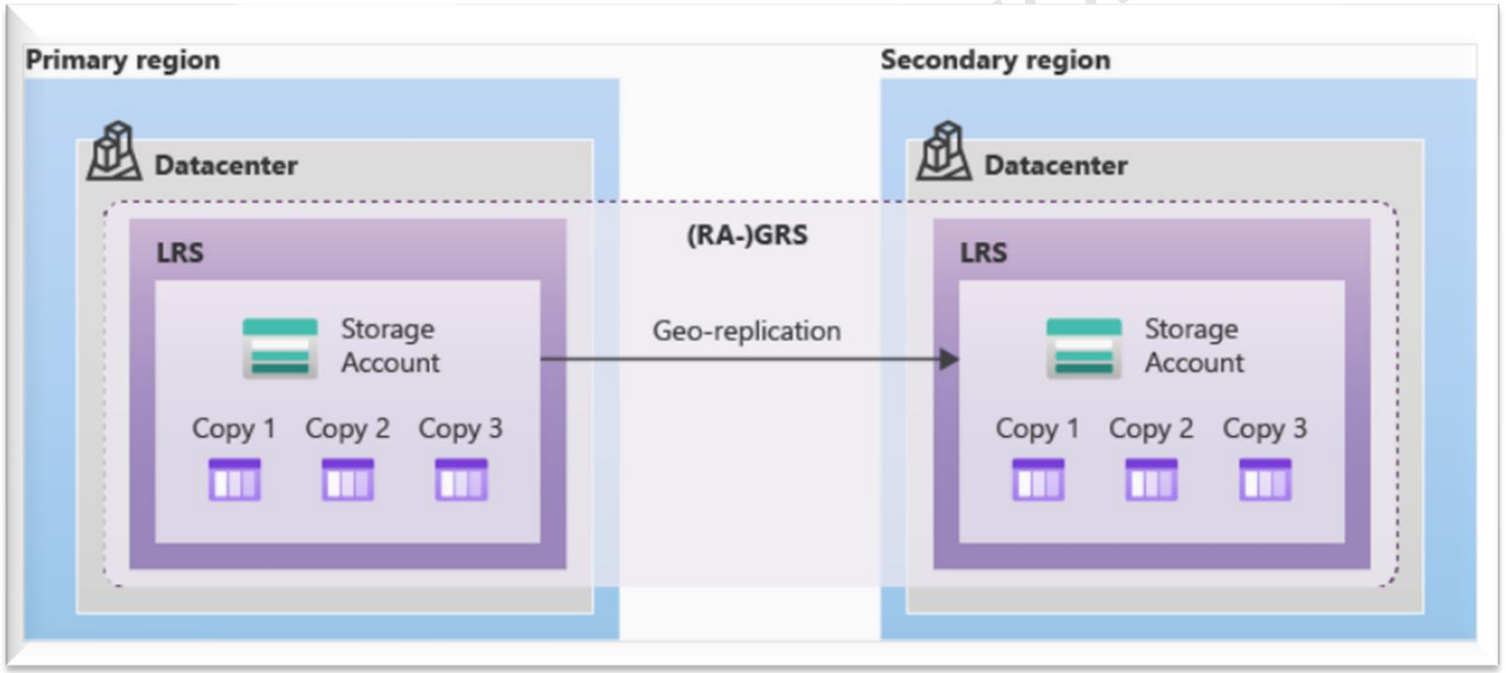


Storage Redundancy

Zone-redundant storage (ZRS) copies your data synchronously across three Azure availability zones in the primary region. For applications requiring high availability, Microsoft recommends using ZRS in the primary region, and also replicating to a secondary region.

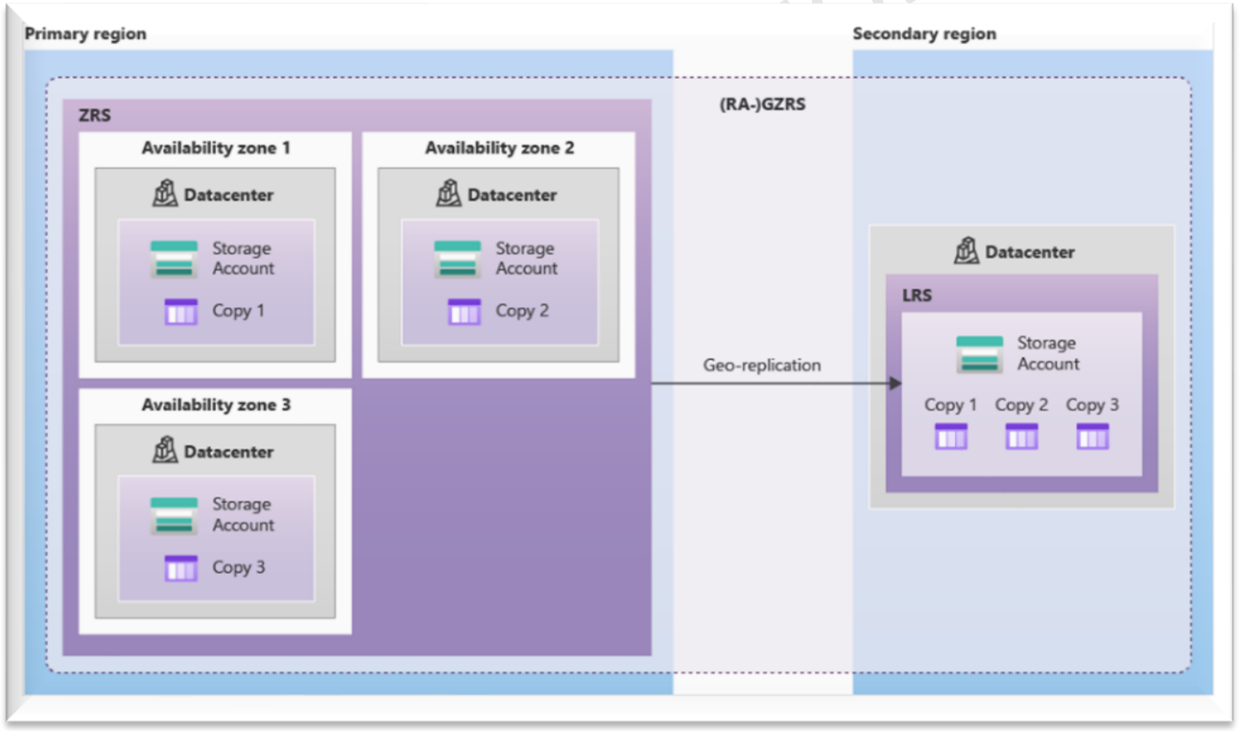
Storage Redundancy

Geo-redundant storage (GRS) copies your data synchronously three times within a single physical location in the primary region using LRS. It then copies your data asynchronously to a single physical location in the secondary region. Within the secondary region, your data is copied synchronously three times using LRS.



Storage Redundancy

Geo-zone-redundant storage (GZRS) copies your data synchronously across three Azure availability zones in the primary region using ZRS. It then copies your data asynchronously to a single physical location in the secondary region. Within the secondary region, your data is copied synchronously three times using LRS.



LAB 4- Storage Account

- Create a storage account using the Azure portal.
- Create a blob container and upload blobs.
- Access it through browser.

Securing the data

- NSG
- Disable SSH/RDP port and use bastion
- Separate subscription for Production
- Firewall
- Key Vault

Implementing Azure Backup

Recovery Services vaults

- A Recovery Services vault is a storage entity in Azure that houses data.
- The data is typically copies of data, or configuration information for virtual machines (VMs), workloads, servers, or workstations.
- You can use Recovery Services vaults to hold backup data for various Azure services such as IaaS VMs (Linux or Windows) and SQL Server in Azure VMs.

Azure Databases

Azure SQL

Types:

- **Azure SQL Database** - Support modern cloud applications on an intelligent, managed database service, that includes serverless compute.(PaaS)
- **Azure SQL Managed Instance-** Best for most migrations to the cloud. Database migration from on-premises with minimal to no database change. (PaaS)
- **SQL Server on Azure VMs-** full control over the SQL Server engine. Supports all on-premises capabilities.(IaaS)

PostgresSQL

Advantages:

- Highly available, flexible managed database with 99.99 percent uptime.
- Migrate to an open-source PostgreSQL database
- Optimize value with a lower total cost of ownership
- Simplify the developer experience

LAB 5-PostgresSQL

- Go to "Azure Database for PostgreSQL servers"
  - Create single server
  - Region :
  - Version : 11
  - Add PostgreSQL rule in the VM like we added HTTP rule
  - Go to Connection security in our azure database and change Allow access to Azure services to "Yes"
  - Do this in VM "apt-get install postgresql-client"
  - To connect with the PostgreSQL server through our VM,

    psql -h [DB-URL] -U [user]@[DB-name]-d postgres

Azure Monitoring

Azure Monitoring

- Service to monitor our resources
- Azure monitor can monitor Applications, VMs, Containers, Network.
- Collects, analyzes and provides solutions if there are any problems.
- When we will enable the monitoring for our resources, Azure monitor will create Log Analytics Workspace.
- To monitor any resource, the Azure monitor agent gets installed in our VMs.
- Agent will gather the data inside the VM and send it back to the Workspace
- Agents : Azure Monitor Agent : install in our VMs as well as on-premise resources
- Log Analytics Agent

LAB 6- Monitoring

- Enable insights under Monitoring for VM.

- Go to performance tab inside insights to view the details.

Azure Networking Services

Virtual Network

Azure Virtual Network (VNet) is the fundamental building block for your private network in Azure. VNet enables many types of Azure resources, such as Azure Virtual Machines (VM), to securely communicate with each other, the internet, and on-premises networks. VNet is similar to a traditional network that you'd operate in your own data center, but brings with it additional benefits of Azure's infrastructure such as scale, availability, and isolation.

Why use an Azure Virtual network?

- ✓ Communicate with the internet
- ✓ Communicate between Azure resources
- ✓ Communicate with on-premises resources
- ✓ Filter network traffic
- ✓ Route network traffic

LAB 8-Vnet

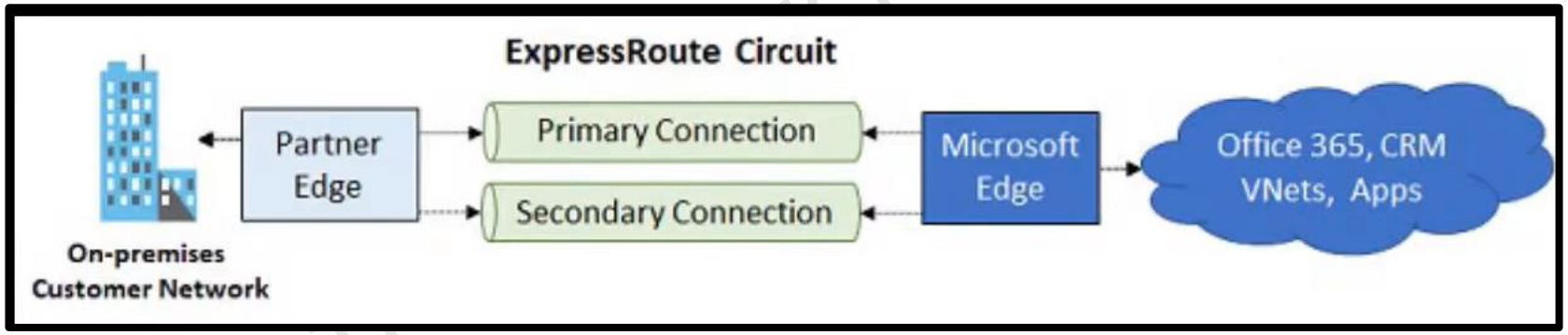
- Create a virtual network.

- Understand sections IP Address and Security

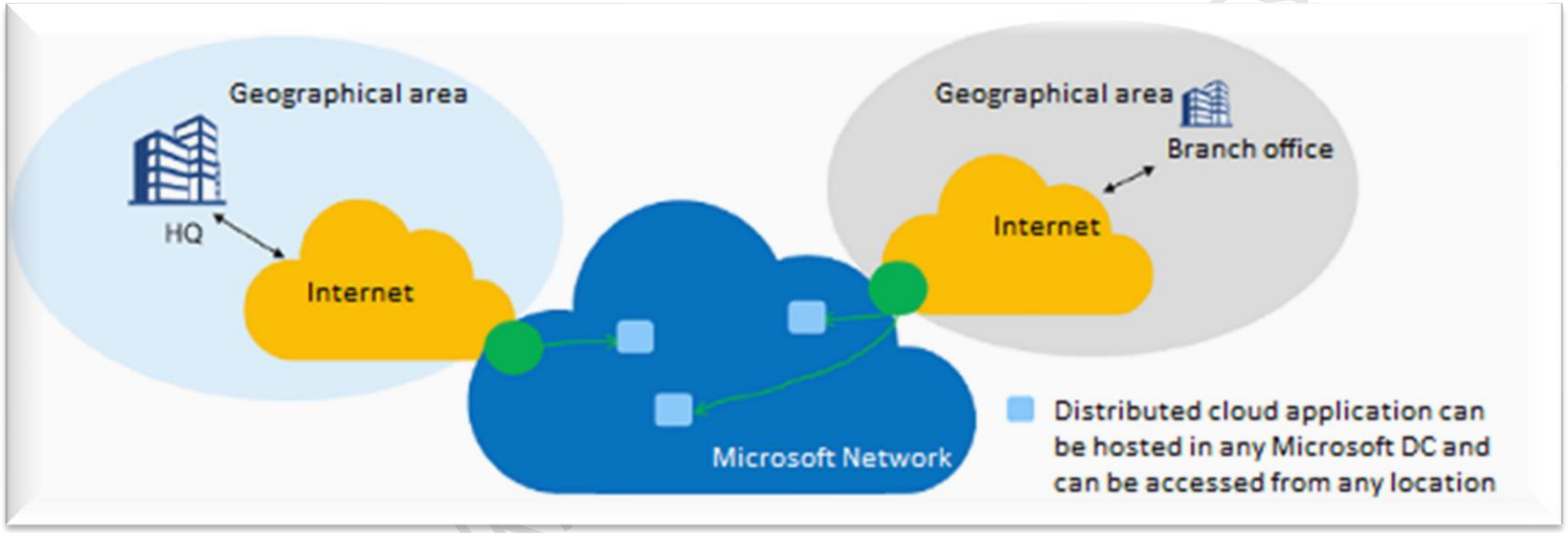
ExpressRoute

ExpressRoute lets you extend your on-premises networks into the Microsoft cloud over a private connection with the help of a connectivity provider. With ExpressRoute, you can establish connections to Microsoft cloud services, such as Microsoft Azure and Microsoft 365.

Secure, reliable, low latency, high speed connections.



Azure Peering Service



With Peering Service, customers can select a well-connected partner service provider in a given region. Public connectivity is optimized for high reliability and minimal latency from cloud services to the end-user location.

LAB 8-Peering

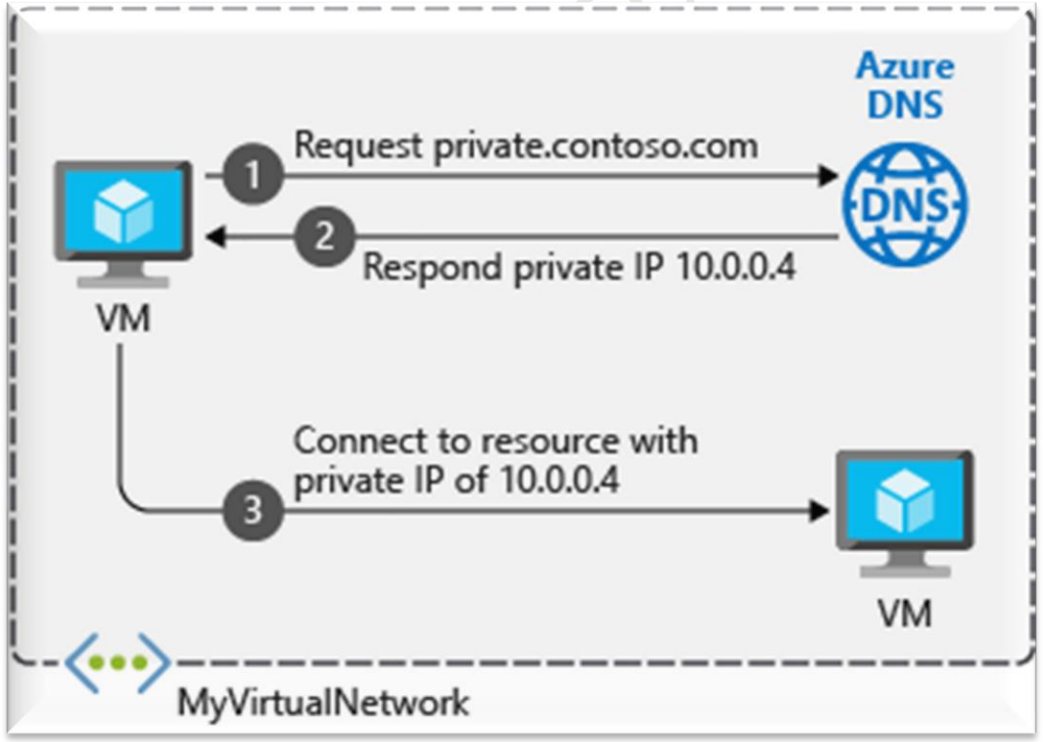
- Create two virtual networks. Make sure the subnets are different.
- Create two VM's using the virtual networks. You may not assign public IP to one of the VM.
- Ping the second VM from the first using private address. You should not be able to connect.
- Go to peering in one of the virtual network and click on add and select the second virtual network.
- Ping the second VM from the first using private address. This time, you should be able to connect.

Azure DNS

DNS service to provide name resolution

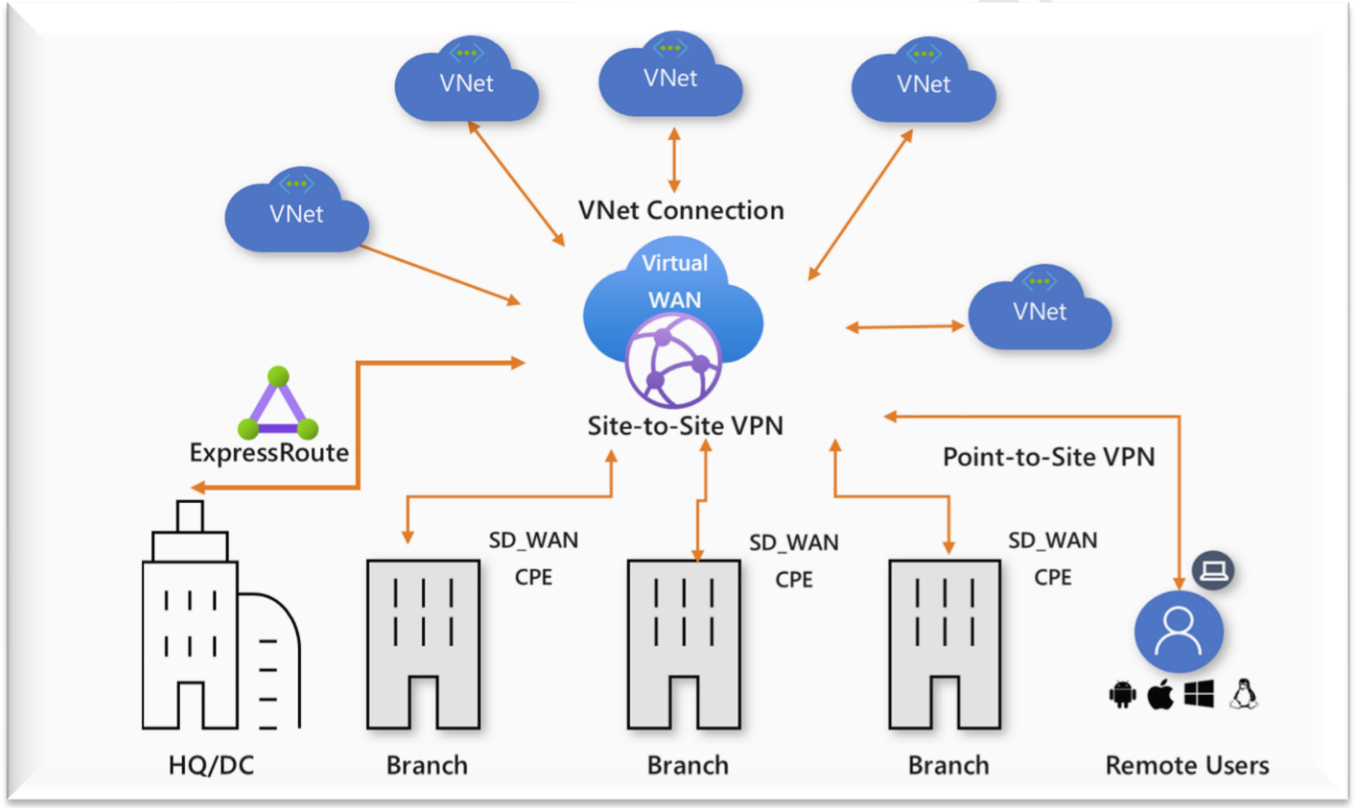
DNS server information is injected into the settings at startup

You can use the Azure-provided name resolution or
you can specify your own DNS server



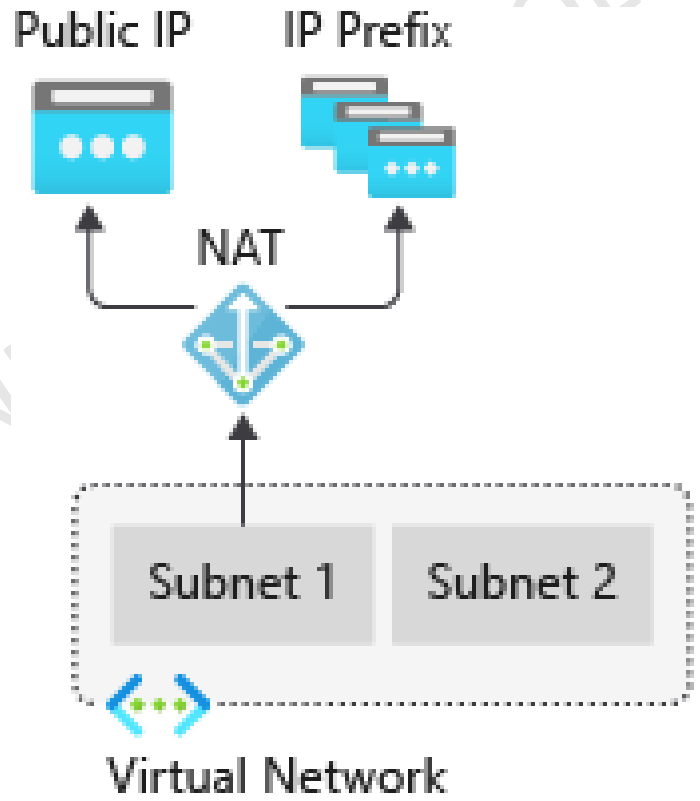
Virtual WAN

Azure Virtual WAN is a networking service that brings many networking, security, and routing functionalities together to provide a single operational interface.



NAT Gateway

Virtual Network NAT is a fully managed and highly resilient Network Address Translation (NAT) service. Virtual Network NAT simplifies outbound Internet connectivity for virtual networks. When configured on a subnet, all outbound connectivity uses the Virtual Network NAT's static public IP addresses.



Different Ways To Connect To Azure resources

- Azure Portal.
- Azure Power Shell.
- Azure CLI.
- Azure SDKs.

Windows PowerShell

A great tool for IT professional, who are not comfortable with Visual studio and more familiar with PowerShell.

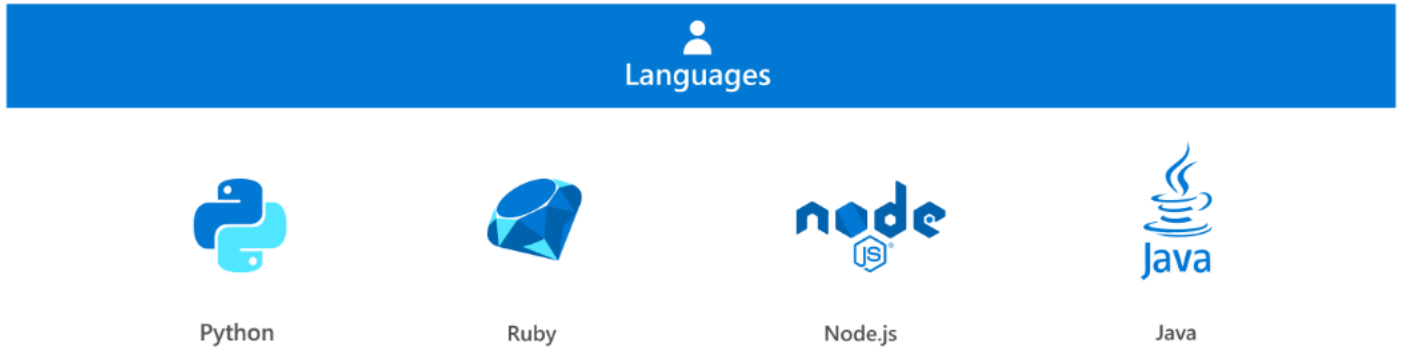
Automating provisioning and deployment of Azure resources through scripts. Accessing advanced or new Azure features not included in the Azure tools for Visual Studio or the Azure portal.

- Set-ExecutionPolicy -ExecutionPolicy RemoteSigned -Scope CurrentUser
- Install-Module -Name Az -Scope CurrentUser -Repository PSGallery -Force
- Import-Module AZ
- Connect-AzAccount
- Get-AzContext
- Select-AzSubscription -Subscription “Pay-As-You-Go “ [/ “Free Trial”]
- Get-AzResourceGroup
- New-AzResourceGroup -Name amdemo -Location 'North Europe’

- New-AzVM -ResourceGroupName amdemo -Location 'North Europe' -Name vmdemo

Azure for developers

Azure supports the most popular programming languages in use today, including Python, JavaScript, Java, .NET, C#, PHP and Go.



thank you!