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# CLOUD CONCEPTS

# RESOURCE GROUP

* Resource Group can be considered as a logical container/separation of resources. For example – For an organization resource group can be separated based resources a department of an organization is using.

# REGION AND ZONES

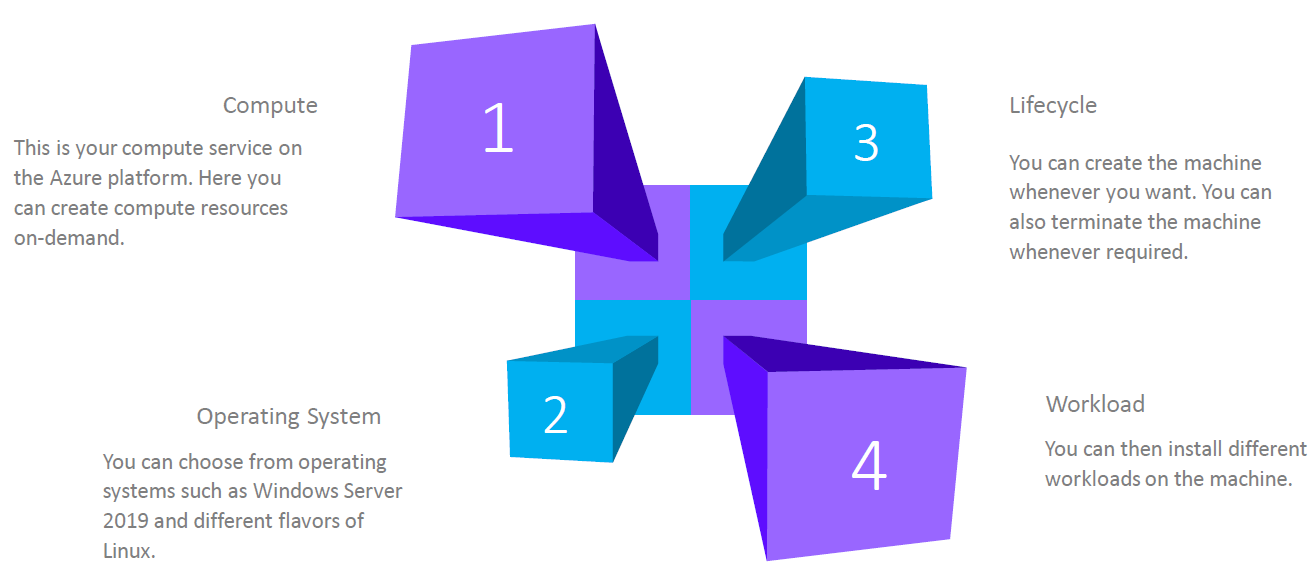
|  |  |
| --- | --- |
|  | CASE 1: SINGLE DATA CENTER IN A REGION  Imagine that your application is deployed in a data center in London  WHAT WOULD BE THE CHALLENGES?   * Challenge 1: Slow access for users from other parts of the world (high latency) * Challenge 2: What if the data center crashes?   *Your application goes down (low availability)* |
|  | CASE 2: MULTIPLE DATA CENTER IN A REGION  Let's add in one more data center in London  WHAT WOULD BE THE CHALLENGES?   * Challenge 1: Slow access for users from other parts of the world * Challenge 2 (SOLVED) : What if one data center crashes?   *Your application is still available from the other data center*   * Challenge 3: What if entire region of London is unavailable?   *Your application goes down*  16 |
| CASE 3: MULTIPLE REGION – MULTIPLE DATA CENTER    Let's add a new region: Mumbai  WHAT WOULD BE THE CHALLENGES?   * Challenge 1 (PARTLY SOLVED): Slow access for users from other parts of the world   *You can solve this by adding deployments for your applications in other regions*   * Challenge 2 (SOLVED) : What if one data center crashes?   *Your application is still live from the other data centers*   * Challenge 3 (SOLVED) : What if entire region of London is unavailable?   *Your application is served from Mumbai*  ADVANTAGES:   * *High Availability* * *Low Latency* * *Global Footprint* * *Adhere to government regulations* | |

# VIRTUAL MACHINE

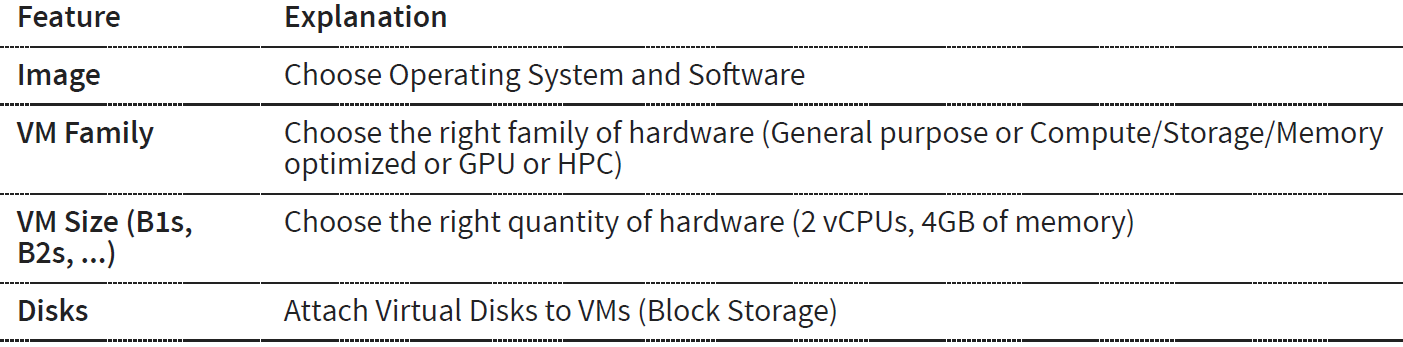
* It is a computer file typically called as an image which behaves like an actual computer.
* It runs in windows, Linux etc. This gives you a flexibility that can run multiple machines in a physical computer.
* Each system can have a different operating system.
* Each of these virtual machines provides its own virtual hardware which includes CPUs, memory, hard drives, network interfaces and other such devices.

## AZURE’S VIRTUAL MACHINE SERVICE

* In corporate data centers, applications are deployed to physical servers, but we deploy applications in the cloud by renting(provisioning) virtual servers (Virtual Machine)

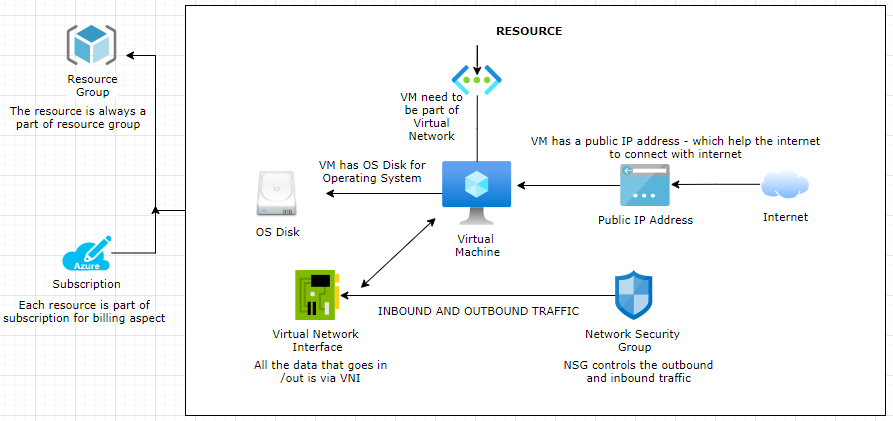


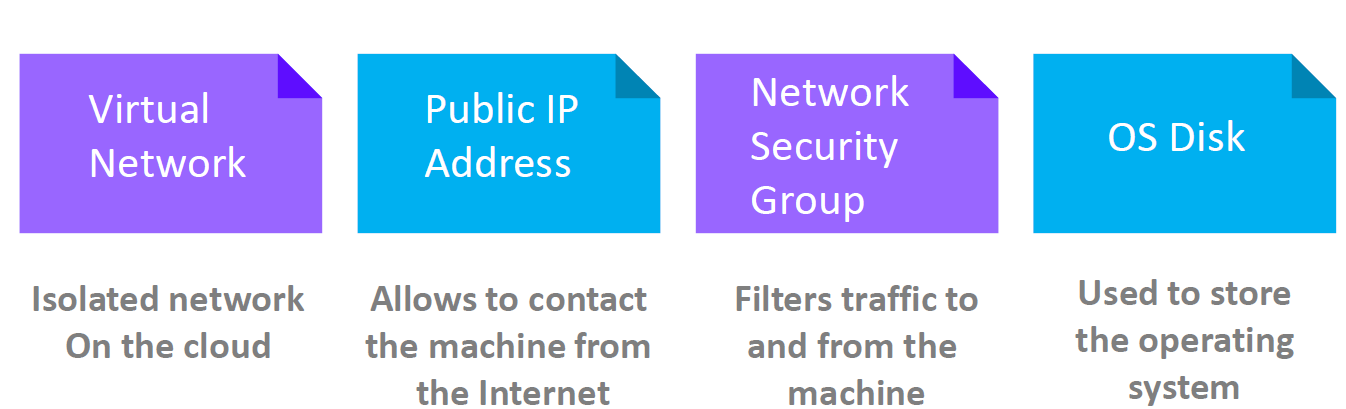
### AZURE VIRTUAL MACHINE – KEY CONCEPTS



## DEPLOYING A VIRTUAL MACHINE

* When we deploy a virtual machine – there are other aspects also get deployed with it.
* VM is a compute resource in Azure Platform. It is an Infrastructure as a service in azure platform





#### OS DISK

* The virtual machine has OS Disk where operating system can be installed
* Addition disk can be added too

#### VIRTUAL NETWORK INTERFACE

* Virtual Network Interface is like network interface card
* All the data that goes in or out go via Virtual Network Interface

#### NETWORK SECURITY GROUP

* It controls all the inbound and outbound traffic

#### VIRTUAL NETWORK

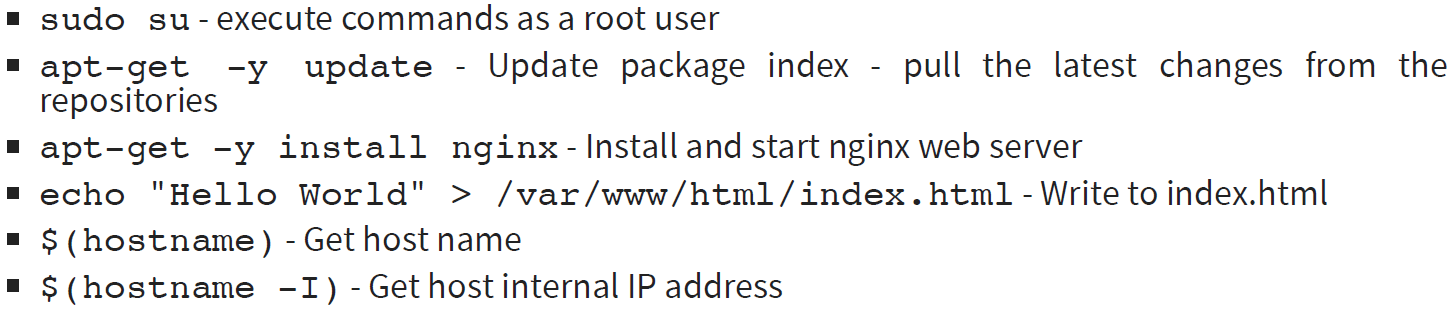
* Every VM is part of a Virtual Network.

#### PUBLIC IP ADDRESS

* The VM are always associated to a public ip address –through which the internet can connect with the VM.

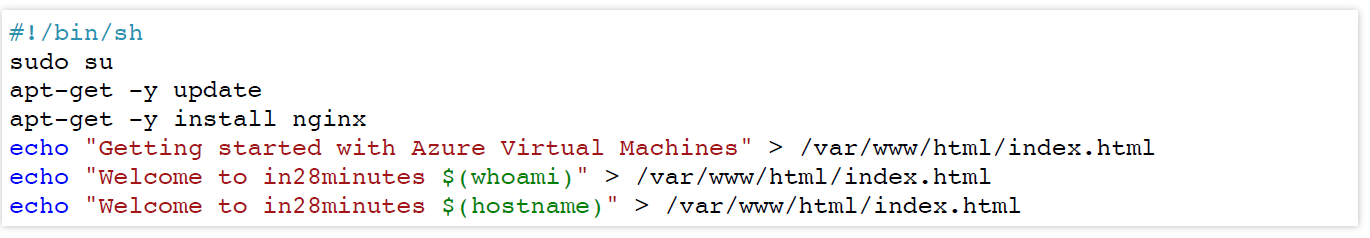
### INSTALLING SOFTWARES IN VM

#### INSTALLING NGINX (HTTP SERVER)

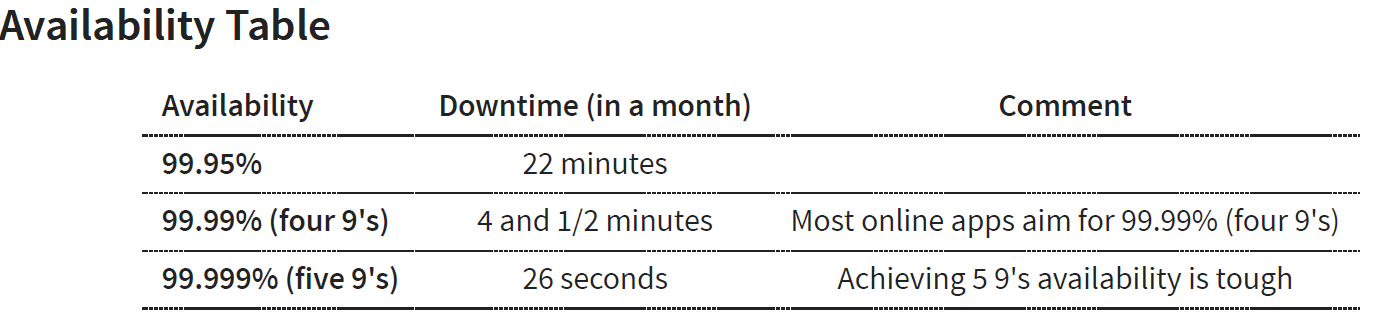


#### USING CLOUD INIT

* In the above steps – We first created the VM and the installed the nginx server. We did all by doing the “***ssh***” and running command from cloud shell.
* Just In case if we want to run a specific set of command after the VM start up – we can write the series of command in “Advanced Tab” 🡪 Cloud init as a bash script . As show below.



## AVAILABILITY



### INCREASING THE AVAILABILITY

* **SINGLE INSTANCE VM:** I few are using single instanc VM we can use a specific disk type . Below is the availbility – when we select a spefic disk type(from Disk Tab)

|  |  |
| --- | --- |
| **DISK TYPE** | **AVAILABILITY** |
| Premium SSD or Ultra Disk | 99.9% |
| Standard SSD Managed Disks | 99.5% |
| Standard HDD Managed Disks | *95%* |

Two or more instances in same Availability Set: 99.95%

* Availability set is a logical grouping of VMs
  + **FAULT DOMAINS**: Group of VMs sharing a common power source and network switch. We can create upto 3 fault domains
  + **UPDATE DOMAINS**: Group of VMs that are rebooted (updated) at the same time.We can create up to 20 update domains
* Two or more instances in two or more Availability Zones in the same Azure region: 99.99%
* ***Summary: Create multiple instances in multiple AZs if you want high availability***

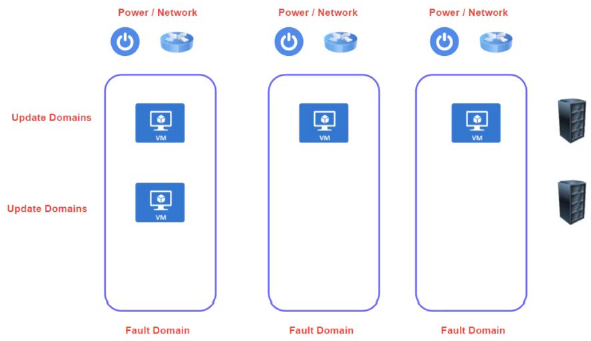
### AVAILABILITY SETS

|  |  |
| --- | --- |
|  | * When we deploy the application is multiple VMs – these VM are actually created in phycial server in Azure Data Center. * The phycial server has its dedicated power source and networking. * When we spin-up a VM – we cannot control in which phycial server the VMs are created. * Just in case the physical server goes down (may be duethe power source) , then both VMs will go down and hence the application. * To solve this option Azure platform has offers “Availability Set” |

* When a VM is created it is configured to be part of Fault Domain and Update Domain.
* This feature helps to protect your machines against infrastructure level failures.
* An unplanned event wherein the underlying infrastructure fails unexpectedly. The failures could be attributed to network failures , local disk failures or even rack failures
* Planned maintenance events , wherein Microsoft needs to make planned updates to the underlying physical environment. In such cases , a reboot might be required on your virtual machine
* You can increase the availability of your application by making use of availability sets. Each virtual machine that is assigned to the availability set is assigned a separate fault and update domain.

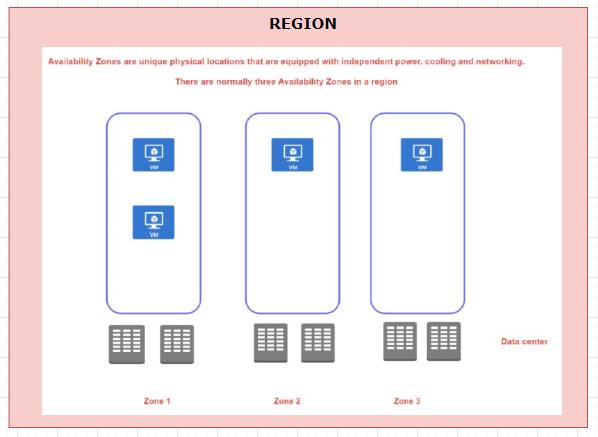
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | **UD1** | **VM1** | **VM3** | | **UD2** | **VM2** | **VM4** | |  | **FD1** | **FD2** | | * In the following matrix diagram – Virtual Machine VM1 & VM2 belong to a Fault Domain (FD1)and VM3 and VM4 belong to fault domain FD2 * VM1 and VM3 belong to update domain UD1 and VM2 an VM4 belong to update domain UD2 |

* As the fault domain shares the common power source and network switch – Just in case some goes wrong with this fault domain – then the application will be still available via VM3 and VM4 and vice versa.
* When the physical server needs an update – It will be updated based on update domain. Hence – if update domain UD1 is getting updated then applicatiomn will be available via VM2 and VM4.



### AVAILABILITY ZONES

* In a specific zone – we have multiple zones and each zone is a collection of data centers.
* Availability zones are unique physical location that are equiped with independent power , colling and networking.
* This features help provides better availability for your application by protecting them from datacenterfailures
* Each Availability zone is a unique physical location in an Azure region
* Each zone comprises of one or more data centersthat has independent power, cooling, and networking
* Using Availability Zones, you can be guaranteed an availability of 99.99% for your virtual machines. You need to ensure that you have 2 or more virtual machines running across multiple availability zones.



* When we create a VM in a availability zone – It is in turn mapped to the data center in that availability zone.
* The advantage we get with availability zone is that – if a data centers in a zone goes down – the application will eb up and running from other zones in a specific region.

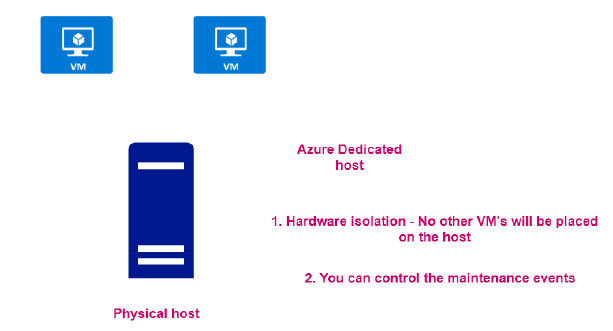
### NOTES ON AVAILABILITY ZONES AND SET

* There is no extra cost involved in creating availability zone or sets. But the is a costing aspect – when it comes to VM communication between the Zones. But this cost is not applicable when it comes to availability set as those VM are part of same physical data center.
* When we create a VM is availability zone or set – it our responsibility to sync the application in all the newly created VMs- To achieve the sync we can make use of extension of custom script called “Cloud Init Script”.

## VIRTUAL MACHINE SCALE SETS

* Virtual machine scale set simplify the creation and management of multiple VMs(group of VMs)
* VM scale set also allow as to add a load balancer
* Supports manual and auto scaling
* Distribute VM instances across multiple Availability Zones
* Supports 1000 VM instances in a single scale set.

## AZURE DEDICATED HOST



* When we create VMs, they are get created in physical server/ host in the azure data center
* In Azure – it come with a capability to assign the entire physical host as a resource. Note this capability are usually leveraged by large scale organization.

#### ADVANTANGE OF DEDICATED HOST

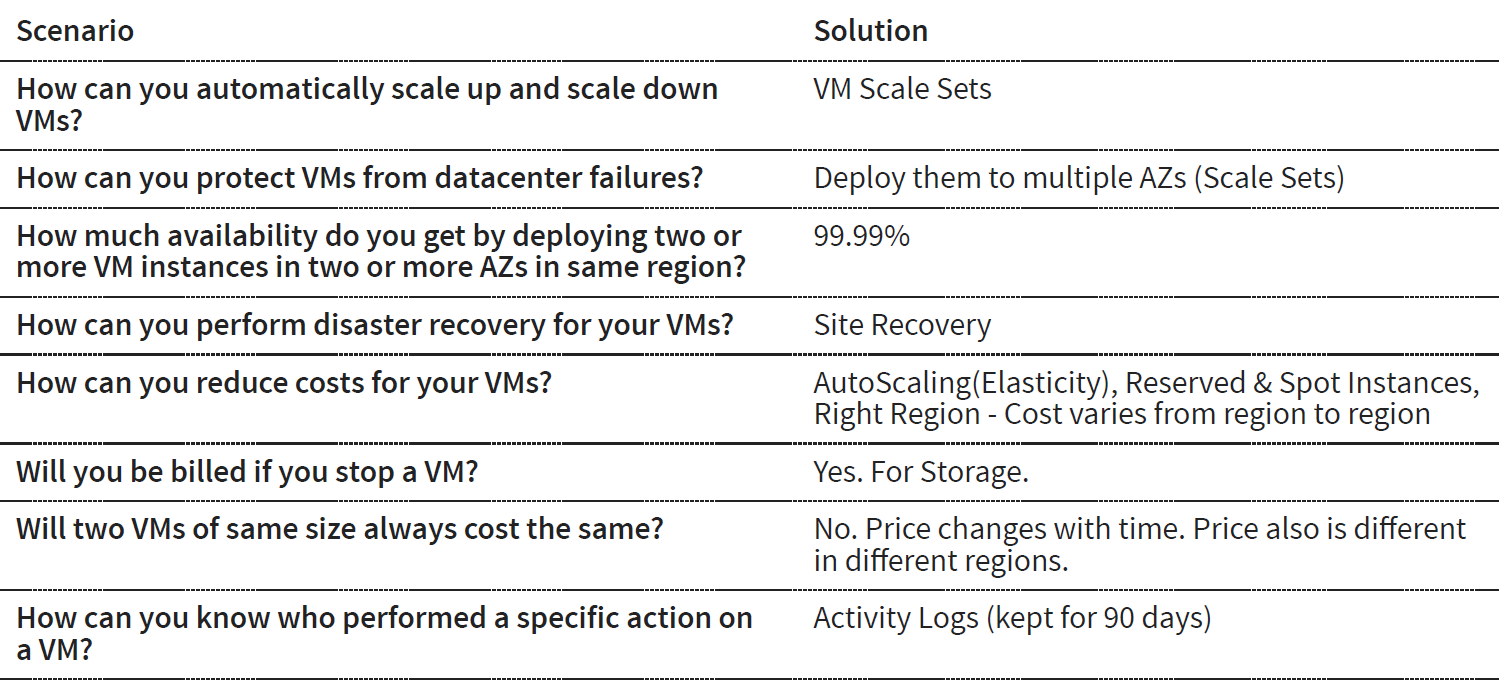
* As it is a dedicated host – no other VM can be placed in the host.
* We can able to control the maintenance events of the VMs

## AZURE SPOT INSTANCES

## WORKLOAD

|  |  |
| --- | --- |
|  | * Workload is unit functionality which can be an application or service. * For example – If we have a web application which we want to host then it can be called as “workload”. Similarly, if we want to host a database server - they it called as a workload |

## IMPORTANT USE CASES AND SOLUTIONS



# AZURE VIRTUAL NETWORK

## NETWORK SECURITY GROUP