Azure Introduction and Training

Part Two

[Current to Sept 2017]

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What **not** to do in Azure

Sample Azure Environment

Something to work towards

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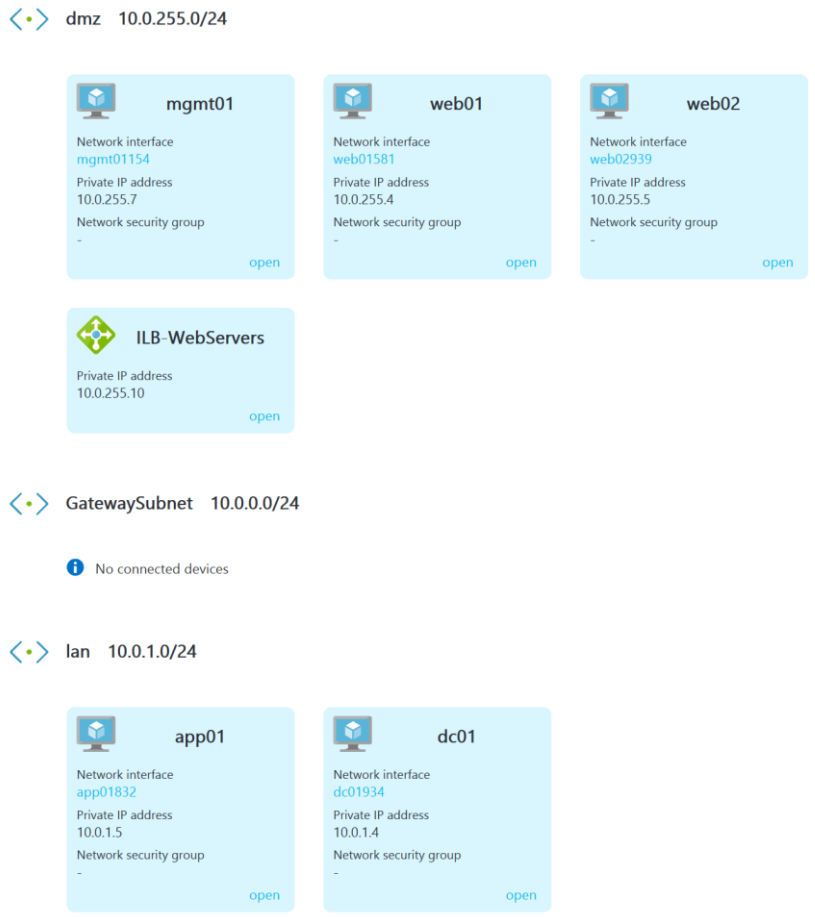
A Sample Environment

Azure Diagram View of the demonstration environment we will use today.



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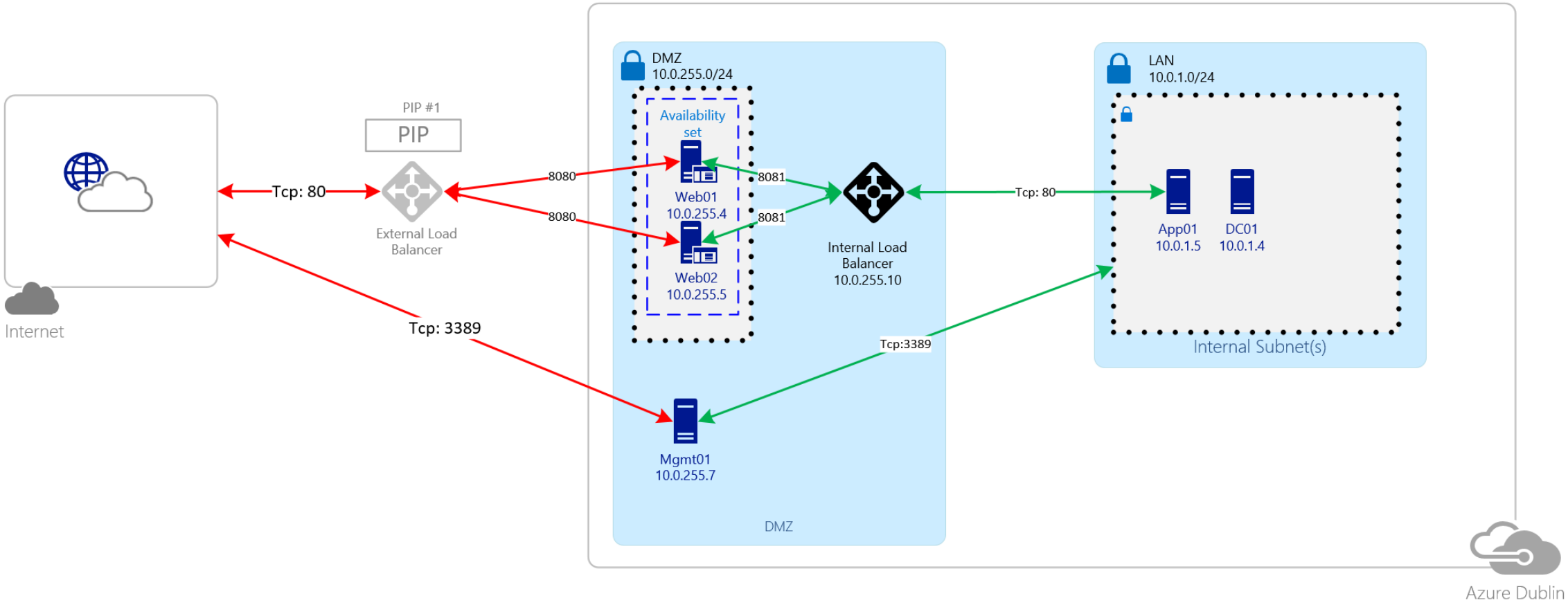
Lets build this



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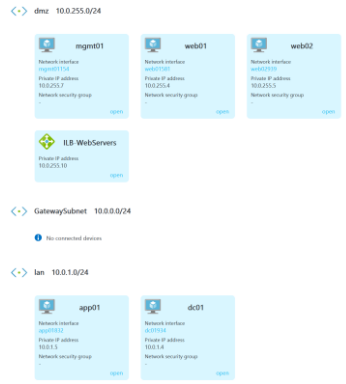
Creating the sample environment

We will build the environment as we progress through the course.

https://portal.azure.com/



Azure Deep Dive

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Tools of the Trade

Tools of the Trade

Working with Azure will always mean tools of the trade are needed. You will never be able to live 100% in the Portal.

1. Configuration and Automation: PowerShell
2. Storage Management: Storage Explorer
3. ARM Template and DevOps: VS Code/Visual Studio – JSON Templates

What are you using to manage Azure environments?

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Tools of the Trade - PowerShell

Critical that you **use PowerShell from the beginning**. There are plenty of sample scripts and other resources to get you started.

PowerShell commands split into three areas:

- Azure Resource Manager
- Azure Service Management
- Azure Storage

Everything you need to get started :

https://docs.microsoft.com/en-us/powershell/azureps-cmdlets-docs/

http://aka.ms/webpi-azps

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Tip:

Don’t do anything in PowerShell unless you are using **PowerShell ISE**

Tip:

Don’t mix up PowerShell commands. Always look for **Rm** in the cmdlet

e.g. Get-Azure**Rm**VM and not Get-AzureVM

Tools of the Trade – Storage Explorer

Fastest way to do anything with Storage in Azure:

Azure Storage Explorer

http://storageexplorer.com/

https://docs.microsoft.com/en-us/azure/vs-azure-tools-storage-explorer-blobs

Tools of the Trade – VS Code

What is **VS Code**?

- More or less a free code editor.
- Does not have the orchestration and automation that Visual Studio has
- It is very useful for **JSON templates** … more on than in the next session.

Everything you need to now about VS Code:

https://docs.microsoft.com/en-us/azure/azure-resource-manager/resource-manager-vs-code

https://code.visualstudio.com/

Tip:

Don’t forget to **add the Azure module** to VS Code for JSON or it will not recognise the format

DEMONSTRATION: TOOLS OF THE TRADE

Virtual Networks and Connectivity

Getting the design right

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Virtual Networks – In This Section

1. Choosing an Address Space
2. Network/Subnet Design
3. DNS
4. Gateway Subnets
5. VPN and ExpressRoute
6. Co-existence
7. VNET Peering
8. Network Security Groups

Choosing an Address Space

- **ALWAYS** make sure the address space is routable to your customers network. Even if they don't ask for hybrid connectivity … don't take the risk.
- **ALWAYS** allocate at least /16 Address Space. You might not use it now but you should future proof
- **NEVER** use public address ranges. Even if you customer is using them on-premise. Remember that Azure VMs will always connect to public IP address for various services e.g. KMS, Load Balancer etc.

There was a time when you could not

change an Azure Virtual Network Address Space!

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Name Resolution for VMs and Role Instances

- Azure provided DNS is enabled by default. Caters for HOSTNAME and FQDN resolution based on VMs and other PaaS service.
- Azure provided DNS is not going to work for Active Directory Domain Joined VMs.
- You Active Directory - Directory Services AND DNS Service on a DC
- DNS server settings can be set by VNET and on the Network Card.

How Address Spaces and Subnets Work

- **SYSTEM ROUTES** are used in a Virtual Network
- Traffic between VMs in the same subnet.
- Between VMs in different subnets in the same virtual network.
- Data flow from VMs to the Internet.
- Allowing virtual machines to communicate with each other via a Vnet-to-Vnet VPN.
- Enabling virtual machines to route to your on-premises network via a gateway (site-to-site VPN or ExpressRoute).

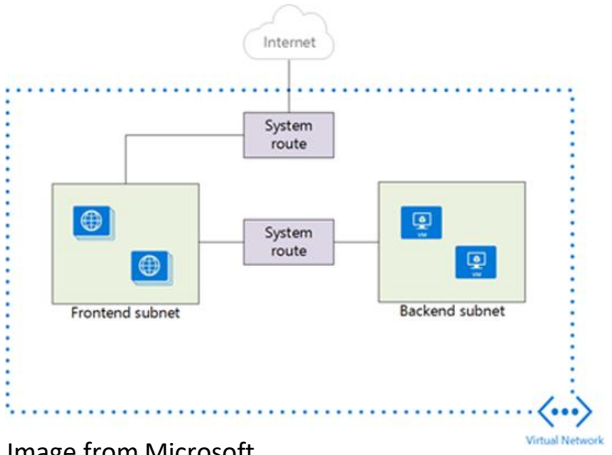

Image from Microsoft

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How Address Spaces and Subnets Work

- **SYSTEM ROUTES** will work between different network ranges in an Azure Virtual Network

  Example:

  VNET01:

  - 10.0.0.0/16 – [10.0.255.0/24, 10.0.0.0/24, 10.0.1.0/24]
  - 192.168.0.0/16 : [192.168.1.0/24]

Importance of Gateway Subnets

- Gateway Subnets are different to other Subnets
- Not designed to put Virtual Machines in them
- Specifically for external network termination e.g. Various VPN connections and ExpressRoute
- Remember that **SYSTEM ROUTES** are in place

The Different Types of External Connection

- **Site-to-Site** – VPN connection over IPsec (IKE v1 and IKE v2). This type of connection requires a VPN device or RRAS.
- **Point-to-Site** – VPN connection over SSTP (Secure Socket Tunneling Protocol). This connection does not require a VPN device.
- **VNet-to-VNet** – This type of connection is the same as a Site-to-Site configuration. VNet to VNet is a VPN connection over IPsec (IKE v1 and IKE v2). It does not require a VPN device.
- **Multi-Site** – This is a variation of a Site-to-Site configuration that allows you to connect multiple on-premises sites to a virtual network.
- **ExpressRoute** – ExpressRoute is a direct connection to Azure from your WAN, not over the public Internet.

VPN Recommendations

- Design with **Multi-Site** in mind
- The **BASIC** VPN is ok for dev/test and small production environments
- The **VPNGW1** type as a minimum for reasonable connectivity options e.g. co-existence, failover, speed etc.

Tip:

You cannot create the **Local Network Gateway** until you have created the **Virtual Network Gateway**

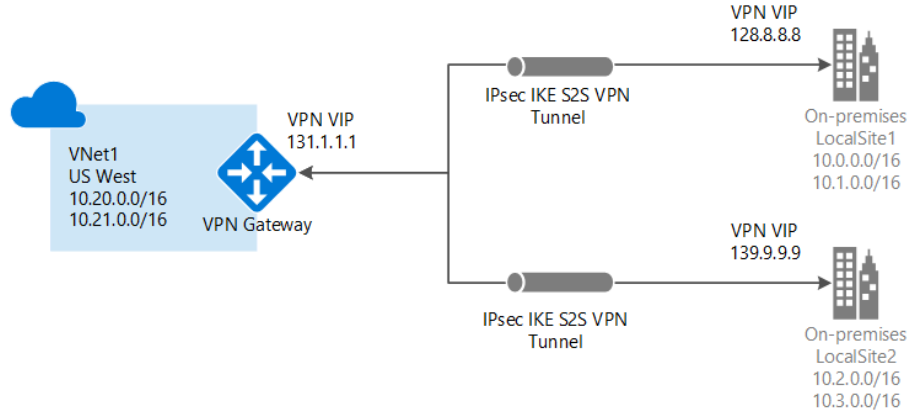
Local Network Gateway specifies the on-premise address space and creates the network routes in Azure

VPN Recommendations

SKU	S2S/VNet-to-VNet Tunnels	P2S Connections	Aggregate Throughput Benchmark
VpnGw1	Max. 30	Max. 128	650 Mbps
VpnGw2	Max. 30	Max. 128	1 Gbps
VpnGw3	Max. 30	Max. 128	1.25 Gbps
Basic	Max. 10	Max. 128	100 Mbps

VPN Recommendations

- Connecting Azure VNETS across regions uses a VPN Gateway (currently). Which meant you needed to use Route based VPN configuration.
- If your on-premise device is policy based the you would not be able to connect Azure VNET to VNET AND on-premise through the same VPN Gateway.
- The new VNET-to-VNET cross region without VPN Gateway will make complex network configuration easier.



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Quick Note on ExpressRoute

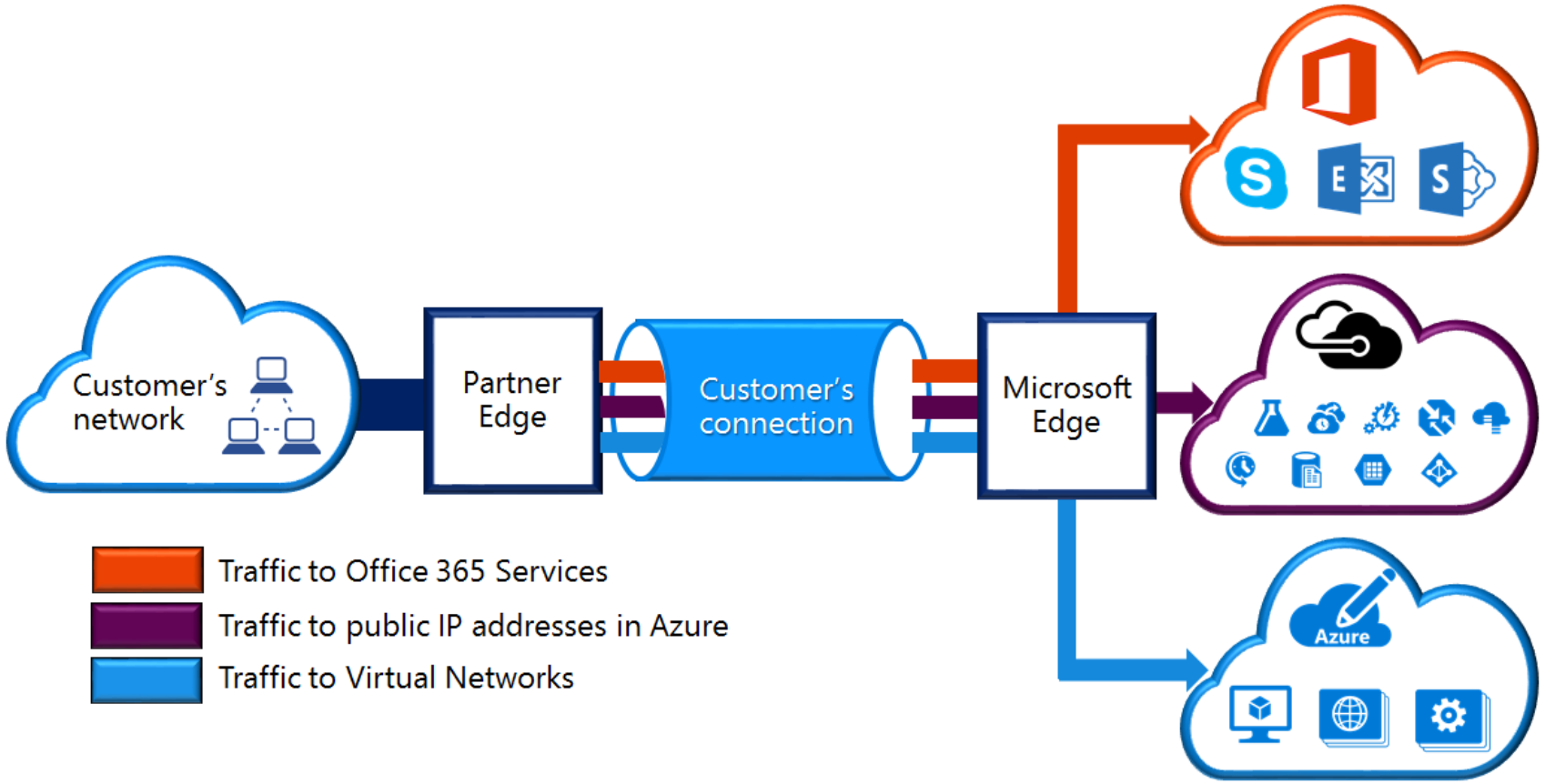

Image from Microsoft

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ExpressRoute

- Three Peering Types:
  - Public: PaaS
  - Private: IaaS
  - Microsoft: SaaS

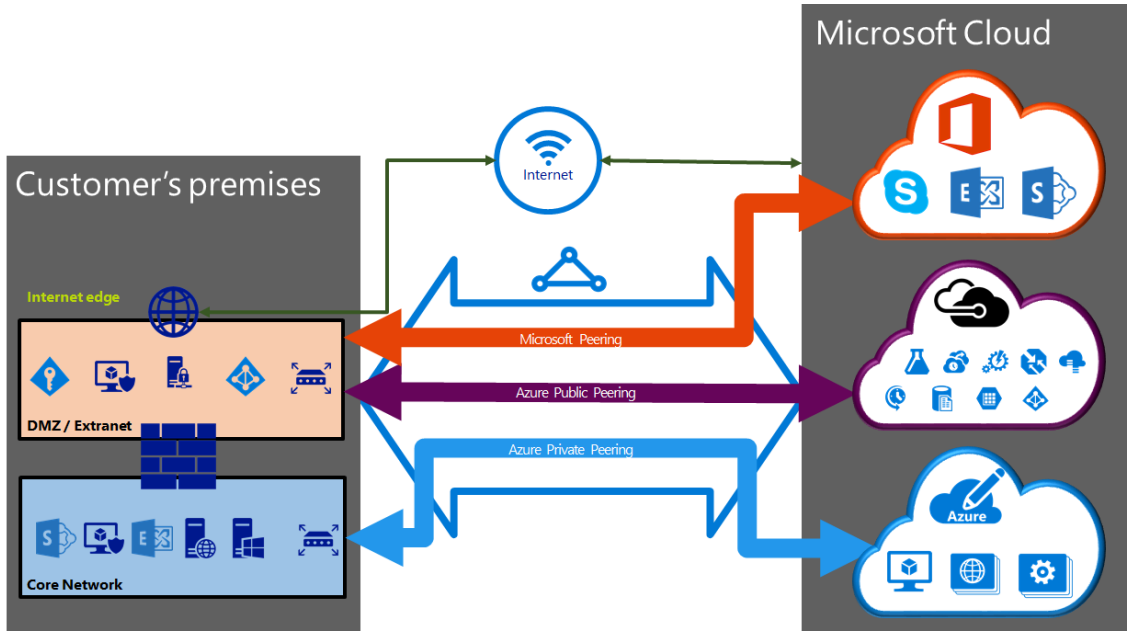

Image from Microsoft

https://docs.microsoft.com/en-us/azure/expressroute/expressroute-circuit-peerings

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Tip:

Don’t under estimate the **lead time** and the **complexity** of setting up ExpressRoute

Tip:

If **Default routes** are advertised over BGP on Private Pairing … they **cannot be overwritten** by User Defined Routes (UDR). This is the equivalent of Forced Tunnelling

Tip:

Multi-Site VPN has **specific hardware requirements**. Always check your customers network devices before starting anything.

https://docs.microsoft.com/en-us/azure/vpn-gateway/vpn-gateway-about-vpn-devices

Short Note on VNET-Peering

- Connect two VNets in the **same region** through the Azure backbone network. **Cross region is now in preview (MS Ignite 2017)**
- The peered VNets must have **non-overlapping IP address spaces**.
- VNet peering is between two VNets, but there is **no derived transitive relationship across peerings**. For example, if VNetA is peered with VNetB, and VNetB is peered with VNetC, VNetA is not peered to VNetC.
- **You can connect Azure Classic VNET with an Azure ARM VNET.**

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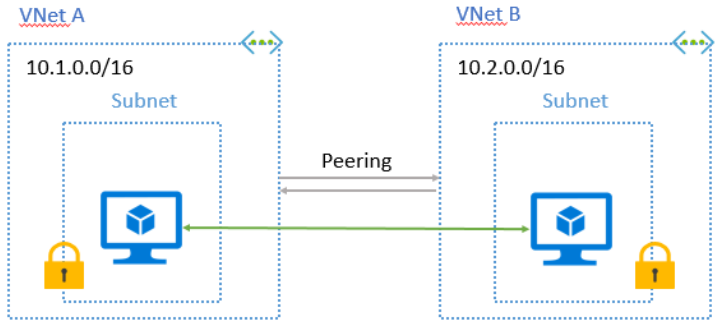
VNET Peering

- When peered, the SYSTEM ROUTES are updated to include both VNETS
- You can configure User Defined Routes (UDR) to point to next hop in another VNET (hub-spoke).
- Internal Load Balancers are accessible in peered VNETS in same Azure region. Not available cross region (during the preview). Expect to be in final VNET peering multi-region.



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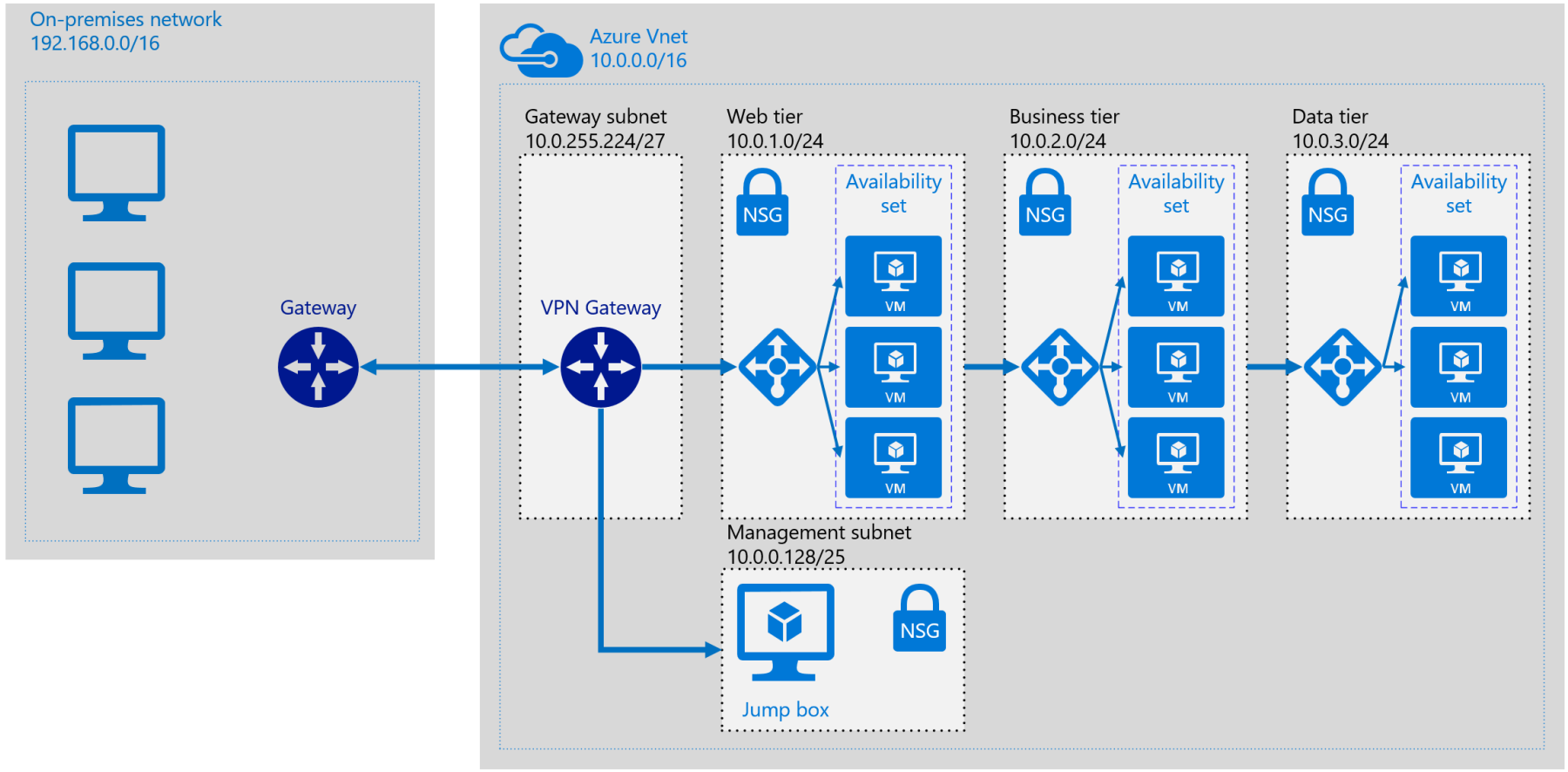
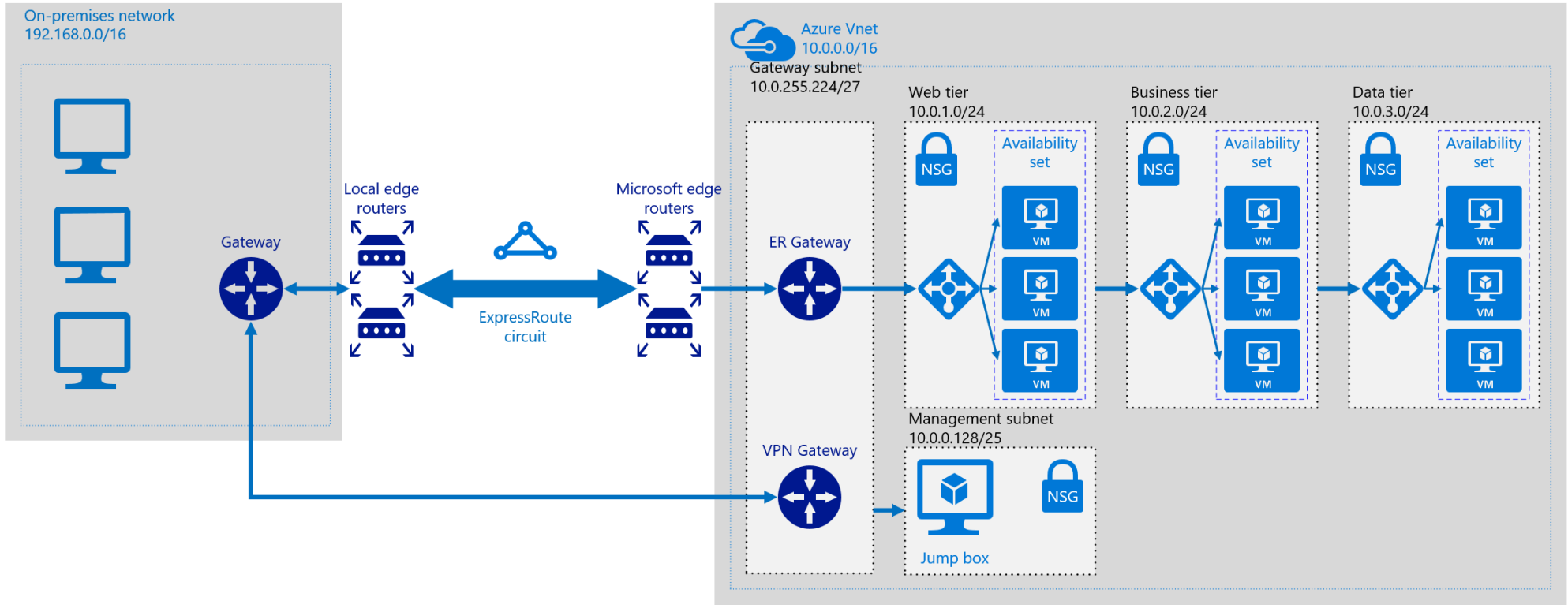
VNET Design Examples

- Standard VPN and Azure Network
- Express Route/VPN and Azure Network
- DMZ between Azure and your own Network
- DMZ between Azure and the internet
- Hub-Spoke Azure network

Standard VPN and Azure Network



Express Route/VPN and Azure Network



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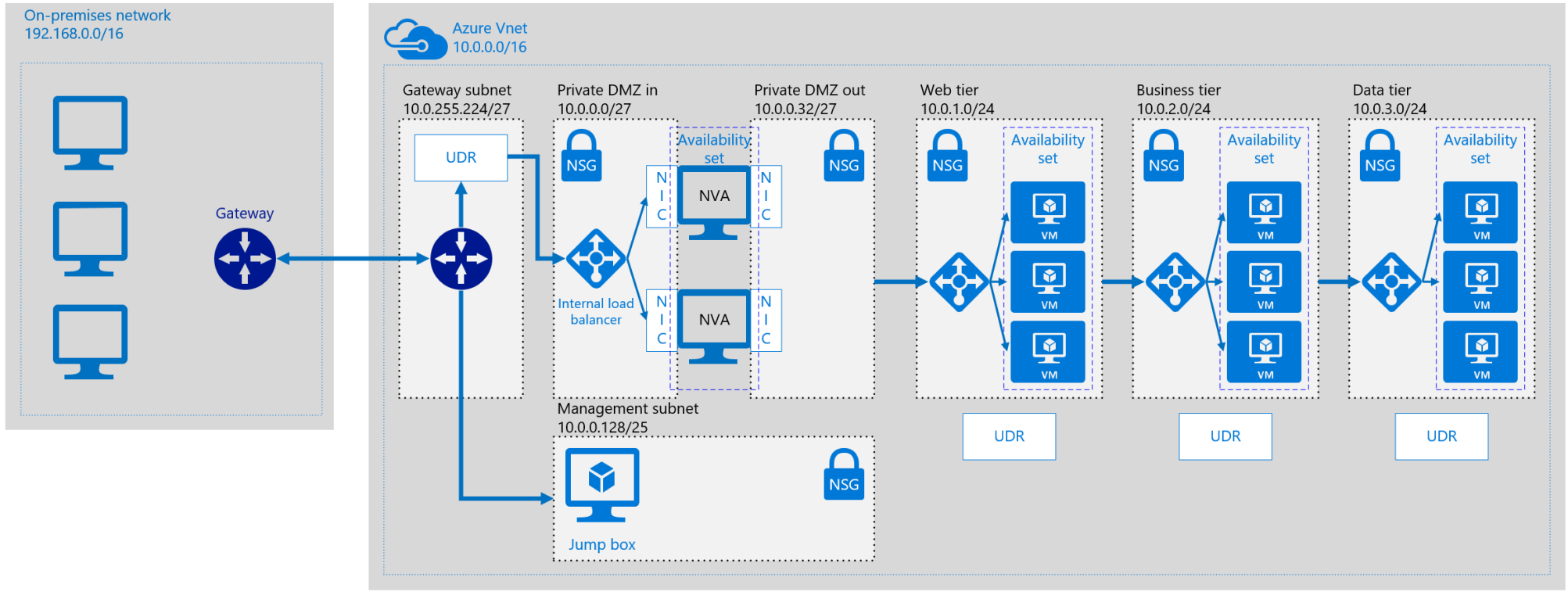
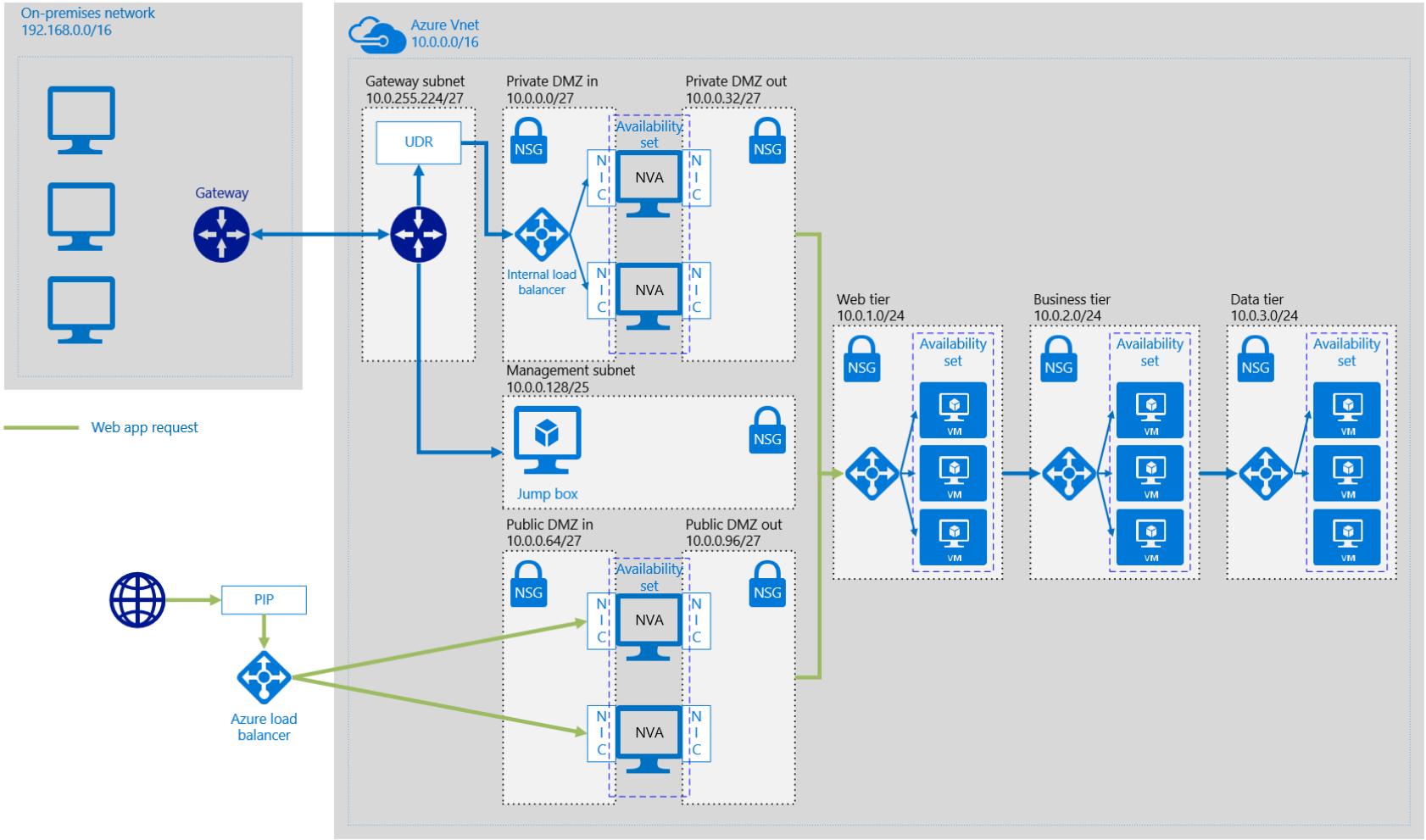
DMZ between Azure and your network



DMZ between Azure and Internet



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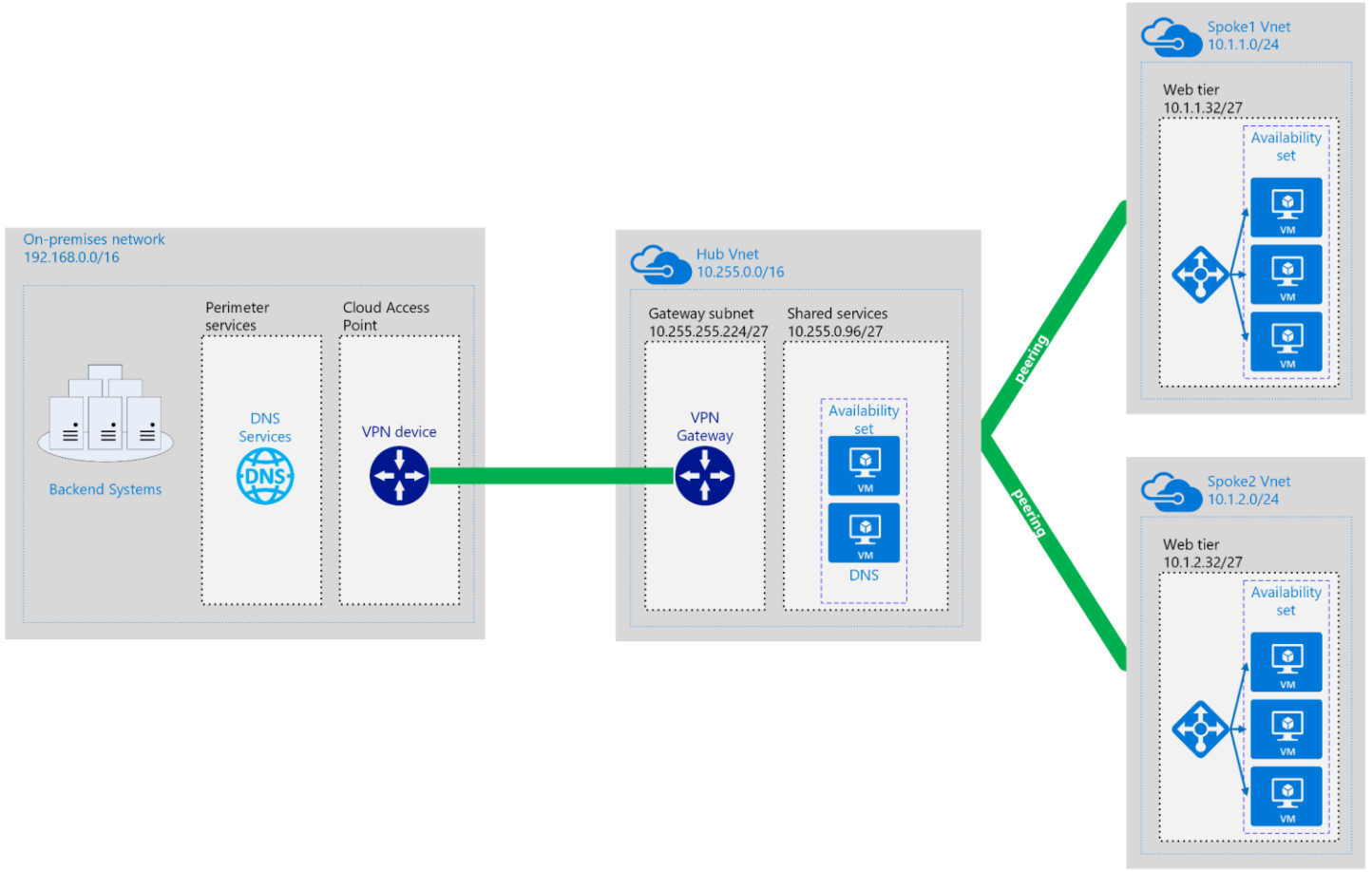
Hub and Spoke Network



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Network Security Groups:

Stateful packet inspection devices that use the **5-tuple** (the source IP, source port, destination IP, destination port, and layer 4 protocol) approach to create allow/deny rules for network traffic

Network Security Groups

- NSG can be applied to **Subnet** AND **Network Interfaces**
- **Common mistake:** Applying same rule to Subnet and Network Interface.
- NSG are network access controls. **Not aware of what program or service initiated the connection.** INBOUND or OUTBOUND … that's it.
- **Rules are not bi-directional**. You have to account for traffic in both directions. Understanding TAGS is very important.

Network Security Groups

- Recommend that you **match the rule priority for both directions**. E.g. If INBOUND Priority rule is 100, then make the OUTBOUND 100.
- The **highest user created priority is 4096 in an NSG**. Recommend you use this for the default DENY to VirtualNetwork

Tip:

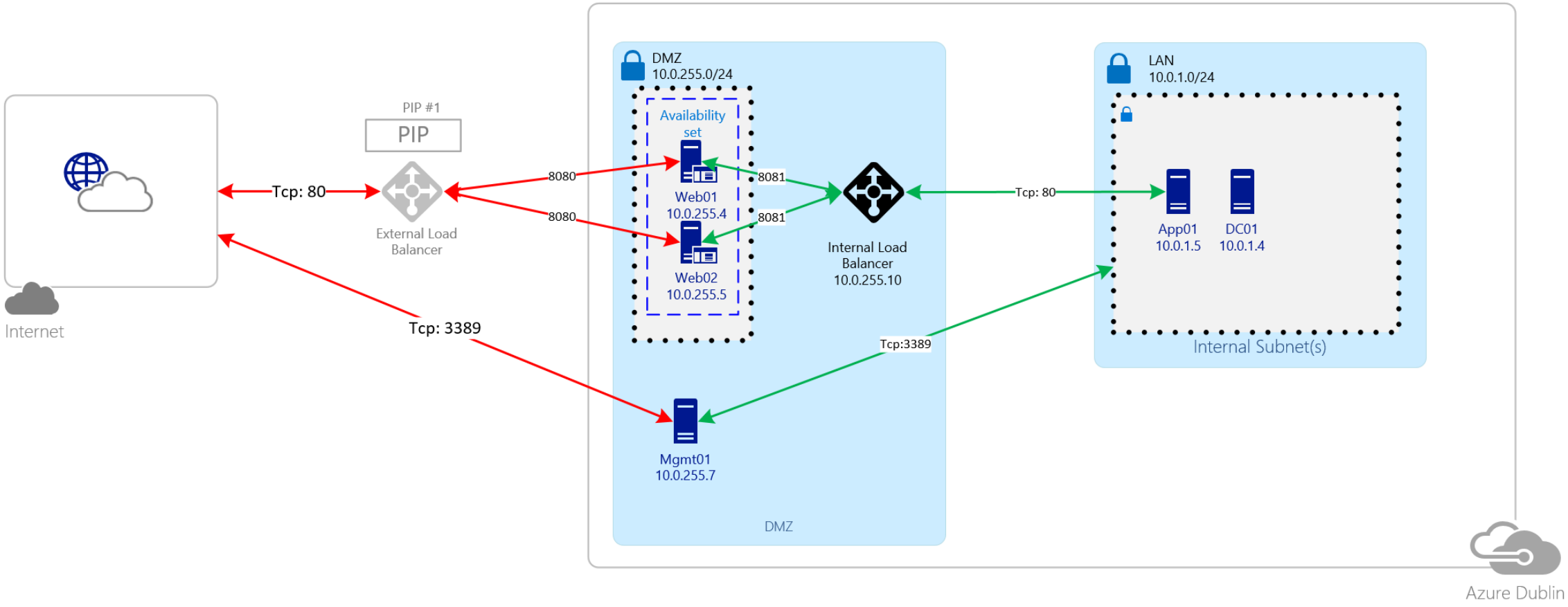
You can **check effective network rights** for a virtual machine using the portal.

DEMONSTRATION:
VIRTUAL NETWORKS and NETWORK SECURITY GROUPS

LAB WORK:

Build your Azure Network

Lets build this



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Storage

Performance, Limits and Best Practice

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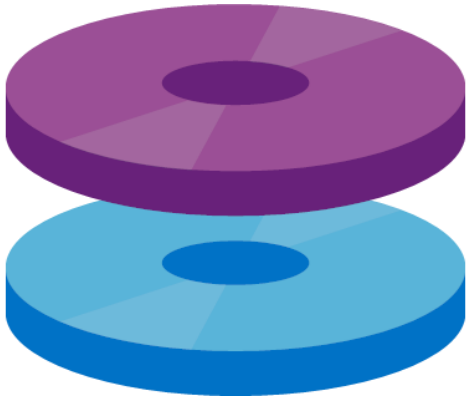
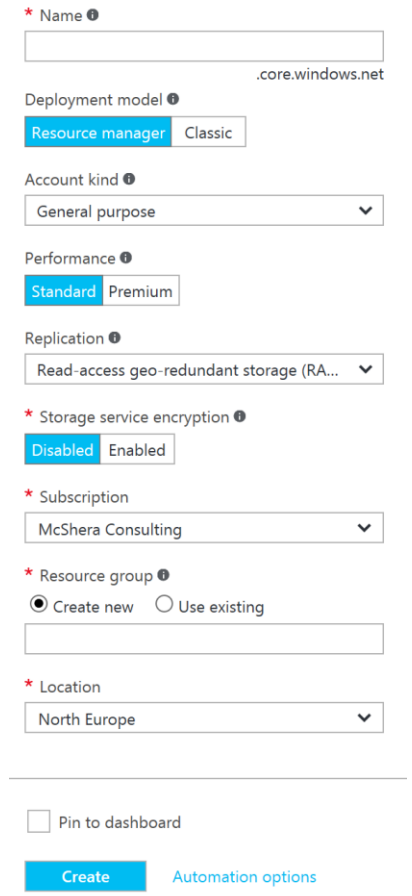
Storage – In This Section

1. Replication Options
2. Performance and Limits
3. Managed Disks
4. Disk Cache Settings
5. Azure Disk Encryption (ADE)



Storage Accounts

- Up until Q2 2017, Storage Accounts were required for VM disks.
- Managed disks have largely replaced Storage Accounts for IaaS VMs.
- Still merit in understanding them as they are still used for many other services.



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Storage and Replication for VMs (Legacy)

- **GRS cannot be accessed unless there is a region outage** i.e. an Azure datacentre going offline and Microsoft decide to fail to another DC
- This means **Virtual machines cannot access replicated storage** … well, that's not entirely true. What about RA-GRS?

Storage and Replication for VMs (Legacy)

- You can access the ReadOnly storage in RA-GRS account without Microsoft help. But its read only.
- You could copy the ReadOnly disk to another account to make it Writeable … but **there is no SLA on the asynchronous replication**. So you cannot tell what condition your disk will be in when replication finishes.
- **GRS replicates each blob separately**. Which means each disk is separately replicated, without any consistency with OS, Applications or Data.
- **You cannot rely on consistent protection using RA-GRS.**

Storage Performance Limits

This was very, very, very relevant … its now just very relevant. Managed Disk has changed everything.

There is a big list of the Azure Storage Scalability and Performance Targets

Scalability targets for blobs, queues, tables, and files

Resource	Default Limit
Number of storage accounts per subscription	200[1]
TB per storage account	500 TB
Max number of blob containers, blobs, file shares, tables, queues, entities, or messages per storage account	Only limit is the 500 TB storage account capacity
Max size of a single blob container, table, or queue	500 TB
Max number of blocks in a block blob or append blob	50,000
Max size of a block in a block blob	100 MB
Max size of a block blob	50,000 X 100 MB (approx. 4.75 TB)
Max size of a block in an append blob	4 MB
Max size of an append blob	50,000 X 4 MB (approx. 195 GB)
Max size of a page blob	1 TB
Max size of a table entity	1 MB
Max number of properties in a table entity	252
Max size of a message in a queue	64 KB
Max size of a file share	5 TB
Max size of a file in a file share	1 TB
Max number of files in a file share	Only limit is the 5 TB total capacity of the file share
Max 8 KB IOPS per share	1000
Max number of files in a file share	Only limit is the 5 TB total capacity of the file share
Max number of blob containers, blobs, file shares, tables, queues, entities, or messages per storage account	Only limit is the 500 TB storage account capacity
Max number of stored access policies per container, file share, table, or queue	5
Maximum Request Rate per storage account	Blobs: 20,000 requests per second for blobs of any valid size (capped only by the account's ingress/egress limits) Files: 1000 IOPS (8 KB in size) per file share Queues: 20,000 messages per second (assuming 1 KB message size) Tables: 20,000 transactions per second (assuming 1 KB entity size)
Target throughput for single blob	Up to 60 MB per second, or up to 500 requests per second
Target throughput for single queue (1 KB messages)	Up to 2000 messages per second
Target throughput for single table partition (1 KB entities)	Up to 2000 entities per second
Target throughput for single file share	Up to 60 MB per second
Max ingress[2] per storage account (US Regions)	10 Gbps if GRS/ZRS[3] enabled, 20 Gbps for LRS
Max egress[2] per storage account (US Regions)	20 Gbps if RA-GRS/GRS/ZRS[3] enabled, 30 Gbps for LRS
Max ingress[2] per storage account (Non-US regions)	5 Gbps if GRS/ZRS[3] enabled, 10 Gbps for LRS
Max egress[2] per storage account (Non-US regions)	10 Gbps if RA-GRS/GRS/ZRS[3] enabled, 15 Gbps for LRS

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Storage Performance Limits

- **20,000 IOPS** per storage account
- For Availability and performance you have to **spread your Virtual Machines across the Storage Accounts.**
- Do not forget that **Backup/Restore impacts performance**
- **Performance** figures are referred to as **“Targets”**

https://docs.microsoft.com/en-us/azure/storage/storage-scalability-targets

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Storage Design and Cost

The common mistakes include:

- Assuming that Compute includes storage costs

INSTANCE	CORES	RAM	DISK SIZES [1]	PRICE
A1 v2	1	2.00 GiB	**10** GB	€0.035/hr
A2 v2	2	4.00 GiB	**20** GB	€0.074/hr
A4 v2	4	8.00 GiB	**40** GB	€0.155/hr
A8 v2	8	16.00 GiB	**80** GB	€0.323/hr
A2m v2	2	16.00 GiB	**20** GB	€0.118/hr
A4m v2	4	32.00 GiB	**40** GB	€0.246/hr
A8m v2	8	64.00 GiB	**80** GB	€0.516/hr

[1] Storage values for disk sizes use a legacy "GB" label. They are actually calculated in gibibytes, and all values should be read as "X GiB"

The "Disk Sizes" refer to the temporary SSD storage. Does NOT include the storage cost for the OS disk

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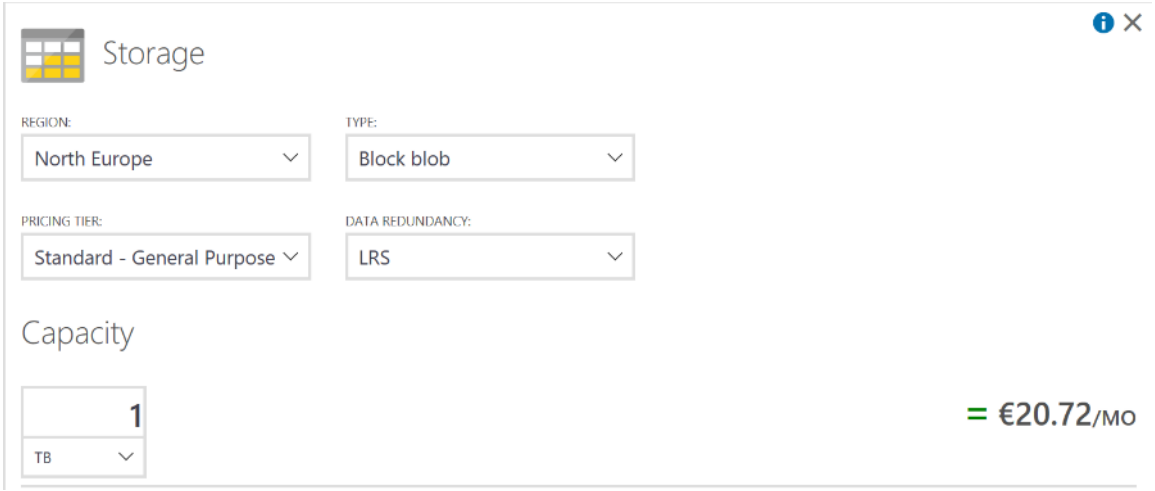
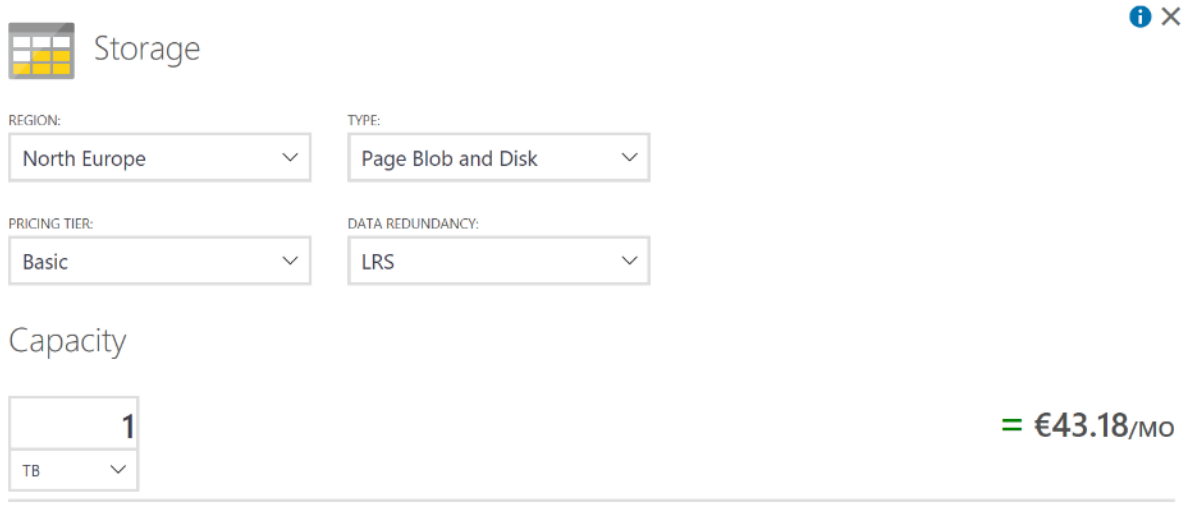
Storage Design and Cost

The common mistakes include:

- Not selecting the right storage type





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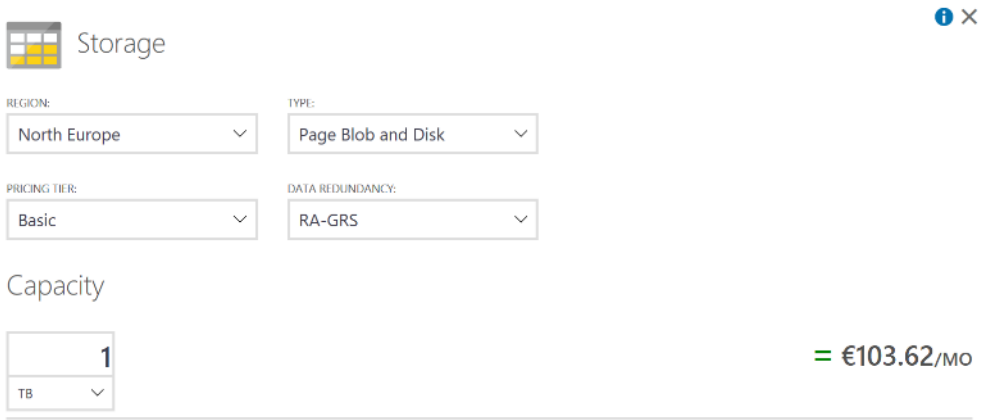
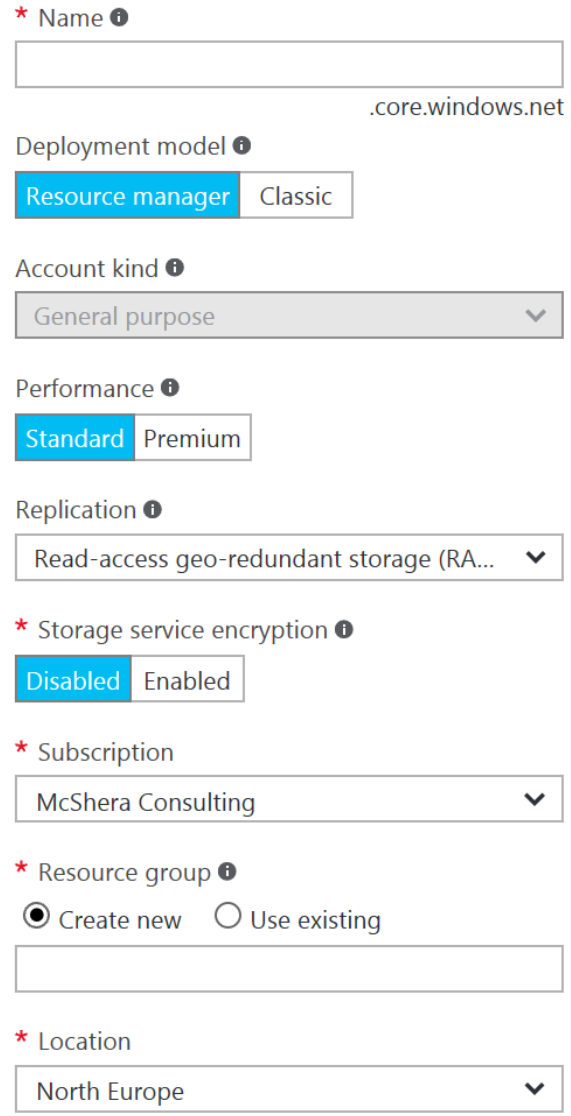
Storage Design and Cost

The common mistakes include:

- This is more of build issue … the default when creating a New Storage Account is RA-GRS. Look what that does to the cost!





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Managed Disks

- The arrival of Managed Storage has changed the approach to Storage completely. This service is still evolving.
- Managed storage performance is the same as Storage Accounts
- Disk sizes are increasing i.e. 1TB was the largest, now 4TB is.
- There are some limitations on disk size and backup/ASR
- Azure Site Recovery Azure to Azure does not support Managed Disks (for now)

Managed Disks

- Managed disks support DISK snapshots. It's a full snap for now.
- The snapshot has a very limited use though. More on this later.
- You can move from Standard Managed to Premium Managed disks
- Managed disks are Locally Redundant only. More on this later.
- Managed Disks are encrypted at rest using Azure Storage Service Encryption (SSE)

Managed Disks

- Managed disks are charged by allocation.
- If you create a 100GB disk I will be charge at S10/P10
- If you create a 132GB disk you will be charge S20/P20

Premium Managed Disk Type	**P4**	**P6**	**P10**	**P20**	**P30**	**P40**	**P50**
Disk Size	32 GB	64 GB	128 GB	512 GB	1024 GB (1 TB)	2048 GB (2 TB)	4095 GB (4 TB)
Standard Managed Disk Type	**S4**	**S6**	**S10**	**S20**	**S30**	**S40**	**S50**
Disk Size	32 GB	64 GB	128 GB	512 GB	1024 GB (1 TB)	2048 GB (2 TB)	4095 GB (4 TB)

Managed Disks – Large Data Disks

- How do you create a data disk that is 8TB in size for a VM?
- Disk Stripping and Storage Space in Azure VMs running Windows:
  - 8 x P30 = 8 x 5000 IOPS = 40,000 IOPS, 200MB per sec, 8192 GB
    - 8k (block size) x 40,000 = 320,000k = ~320MB per sec
  - 4 x P40 = 4 x 7500 IOPS = 30,000 IOPS, 250MB per sec, 8192 GB
    - 8k (block size) x 30,000 = 240,000k = ~240MB per sec

Managed Disks - Performance

Standard managed virtual machine disks

Standard Disk Type	S4	S6	S10	S20	S30	S40	S50
Disk size	32 GB	64 GB	128 GB	512 GB	1024 GB (1 TB)	2048 GB (2TB)	4095 GB (4 TB)
IOPS per disk	500	500	500	500	500	500	500
Throughput per disk	60 MB/sec	60 MB/sec	60 MB/sec	60 MB/sec	60 MB/sec	60 MB/sec	60 MB/sec

Premium managed virtual machine disks: per disk limits

Premium Disks Type	P4	P6	P10	P20	P30	P40	P50
Disk size	32 GB	64 GB	128 GB	512 GB	1024 GB (1 TB)	2048 GB (2 TB)	4095 GB (4 TB)
IOPS per disk	120	240	500	2300	5000	7500	7500
Throughput per disk	25 MB/sec	50 MB/sec	100 MB/sec	150 MB/sec	200 MB/sec	250 MB/sec	250 MB/sec

Managed Disks – Disk Cache

- Three types of CACHE setting:
  - None
  - Read
  - ReadWrite
- You have to think about what is using the disk before setting cachce.
- Think about the application and how it handles/manages cache. Get it wrong and you could loose data.

Azure Disk Encryption (ADE)

- **Different to SSE**. Users **Bitlocker** or **DM-Crypt** … its Volume encryption.
- Works the **Azure Key Vault** AND **Azure Active Directory**.
- Security Centre will report on status of ADE
- It's a little complex but it is **100% encryption at rest**

https://docs.microsoft.com/en-us/azure/security/azure-security-disk-encryption

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Choosing the Right Compute

Compute 101

- Region availability and cost is not universal

https://azure.microsoft.com/en-us/regions/services/

- Region performance at the storage backend is not the same

Max ingress[2] per storage account (US Regions)	10 Gbps if GRS/ZRS[3] enabled, 20 Gbps for LRS
Max egress[2] per storage account (US Regions)	20 Gbps if RA-GRS/GRS/ZRS[3] enabled, 30 Gbps for LRS
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Compute 101

VM Processor types (this is important):

- **D Series:** Have never found the CPU type. Its slower than Dv2 and more expensive.
- **Dv2 Series:** 35% faster than D Series. 2.4Ghz Intel E5-2673v3 (Hasswell) with boost. These are the workhorse VMs. Physical cores.
- **Dv3 and Ev3:** 2.4Ghz Intel E5-2673v4 (Hasswell) with boost. Hyper-threaded.
- **F Series:** Same CPU as Dv2. Positioned as best price-performance.
- **G Series:** Xeon E5 v3 "family". Biggest machine type.

Compute 101. Cont.

VM Processor types (this is important):

- **H Series:** E5-2667 V3 and DDR4 memory with some RDMA/InfiniBand options at the top end of the cost scale.
- **Ls Series:** Same CPU as G Series. Level memory but *apparently* faster local disk (lower latency). Ive not tested.
- **NC and NV Series:** GPU-enabled using NVIDIA cards.
- **B Series:** Burstable VMs are ideal for workloads that do not need the full performance of the CPU continuously

Tip:

You will most likely use Av2, Dv2/v3 and F Series VMs. Start small and work up in sizes. **You will never find an exact match for requirements**. Its about compromise.

Compute and Storage Performance

Maximum uncached throughput will often exceed VM capacity

Example:

- DS2_V2: 6,400/96
- If you attached 2 x P30 (striped) the disks can do 10,000/400

DSv2-series*

Size	CPU cores	Memory: GiB	Local SSD: GiB	Max data disks	Max cached disk throughput: IOPS / MBps (cache size in GiB)	Max uncached disk throughput: IOPS / MBps	Max NICs / Network bandwidth
Standard_DS1_v2	1	3.5	7	2	4,000 / 32 (43)	3,200 / 48	1 moderate
Standard_DS2_v2	2	7	14	4	8,000 / 64 (86)	6,400 / 96	2 high
Standard_DS3_v2	4	14	28	8	16,000 / 128 (172)	12,800 / 192	4 high
Standard_DS4_v2	8	28	56	16	32,000 / 256 (344)	25,600 / 384	8 high
Standard_DS5_v2	16	56	112	32	64,000 / 512 (688)	51,200 / 768	8 extremely high
Standard_DS11_v2	2	14	28	4	8,000 / 64 (72)	6,400 / 96	2 high
Standard_DS12_v2	4	28	56	8	16,000 / 128 (144)	12,800 / 192	4 high
Standard_DS13_v2	8	56	112	16	32,000 / 256 (288)	25,600 / 384	8 high
Standard_DS14_v2	16	112	224	32	64,000 / 512 (576)	51,200 / 768	8 extremely high
Standard_DS15_v2***	20	140	280	40	80,000 / 640 (720)	64,000 / 960	8 extremely high**

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Compute and Storage Performance

It is really important to **understand your application**.

- If you have lots of small I/O sizes then IOPS will be the performance measure (or bottleneck)
- If you have lots of larger I/O sizes (e.g. data warehouse) then Throughput will be the performance measure (or bottleneck). Why is this?

Compute and Storage Performance

- 8 x P30 = 8 x 5000 IOPS = 40,000 IOPS, 200MB per sec, 8192 GB
  - 8k (block size) x 40,000 = 320,000k = ~320MB per sec
- 4 x P40 = 4 x 7500 IOPS = 30,000 IOPS, 250MB per sec, 8192 GB
  - 8k (block size) x 30,000 = 240,000k = ~240MB per sec

Size	vCPU	Memory: GiB	Temp storage (SSD) GiB	Max data disks	Max cached and temp storage throughput: IOPS / MBps (cache size in GiB)	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network performance (Mbps)
Standard_E2s_v3	2	16	32	4	4,000 / 32 (50)	3,200 / 48	2 / moderate
Standard_E4s_v3	4	32	64	8	8,000 / 64 (100)	6,400 / 96	2 / moderate
Standard_E8s_v3	8	64	128	16	16,000 / 128 (200)	12,800 / 192	4 / high
Standard_E16s_v3	16	128	256	32	32,000 / 256 (400)	25,600 / 384	8 / high

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Compute and Storage Price-Performance

Some people are afraid to go with Premium Storage. **Its really important to run the price-performance comparision.**

Example: Application needs 16,000 IOPS

	Standard	Premium
Cost of VM per month	$1,570.58 (Standard_D14)	$1,003.66 (Standard_DS13)
Cost of Disks per month	$1,638.40 (32 x 1 TB disks)	$544.34 (4 x P30 disks)
Overall Cost per month	$3,208.98	$1,544.34

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You are encouraged to **read** the following on **Storage: Design for High Performance**

https://docs.microsoft.com/en-us/azure/storage/storage-premium-storage-performance

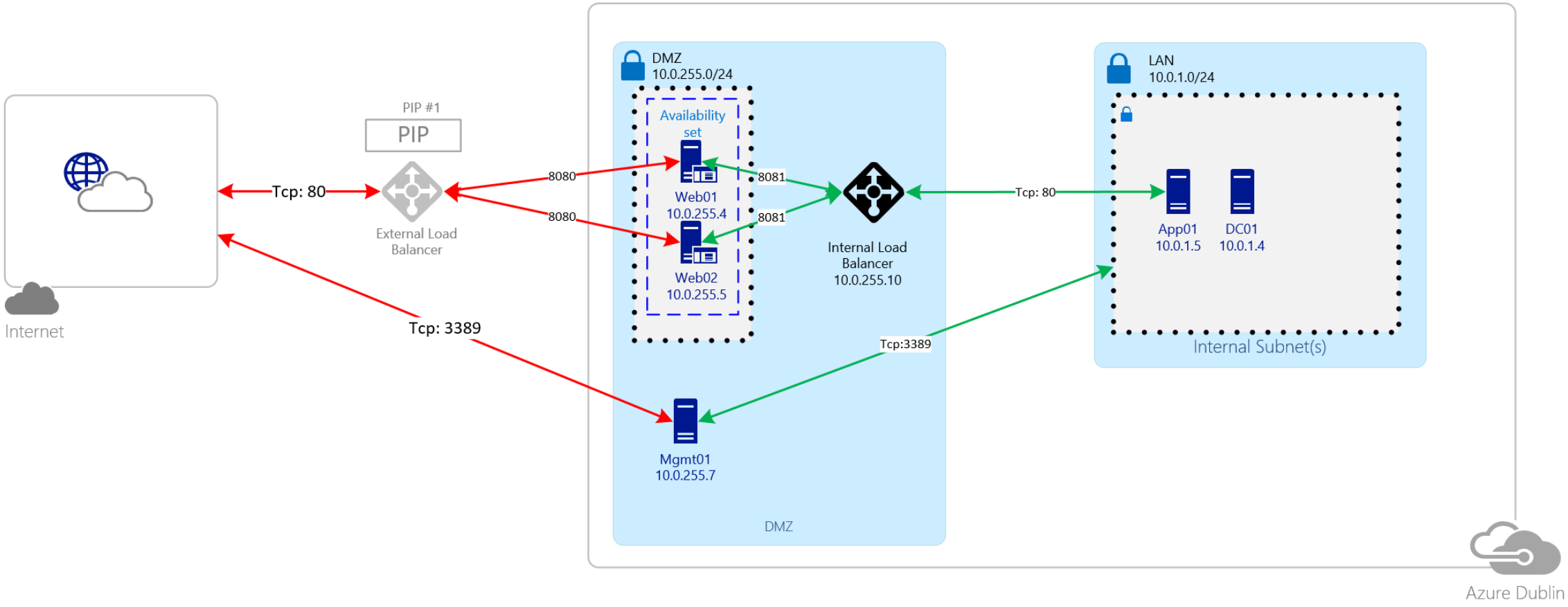
DEMONSTRATION:

Building a Virtual Machine and introduction to Availability Sets

LAB WORK:

Build your virtual machines and the availability sets. Create your Active Directory.

Lets build this



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Availability Sets and Load Balancers

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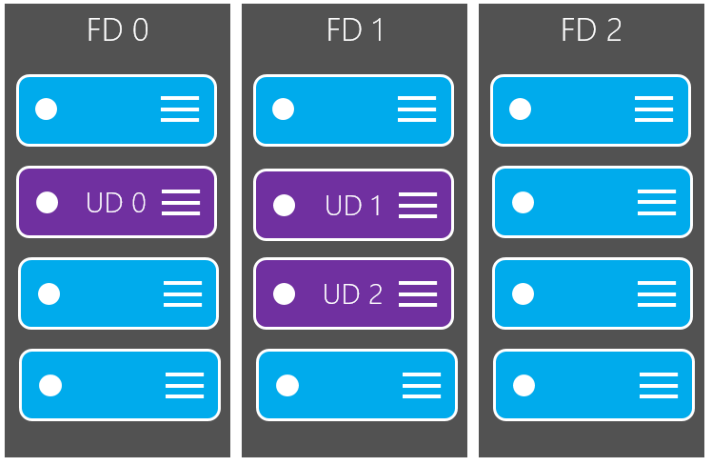
Advanced Scenarios

- **Availability Sets** and **Load Balancers** are **linked**
- You really have to **plan** this out. Especially when it comes to layering with Network Security Groups.

Availability Sets

- Availability Sets (AS) protected against unplanned hardware maintenance, unexpected downtime, and planned maintenance.
- Uses **UPDATE** and **FAULT** domains.
- UPDATE domains (5) per AS. The reboot sequence is not sequential. 30 minute gap between each.
- FAULT domain relates to physical nodes in the Azure datacentre.
- SLA will guarantee that “at least one” VM in an AS set will be online.



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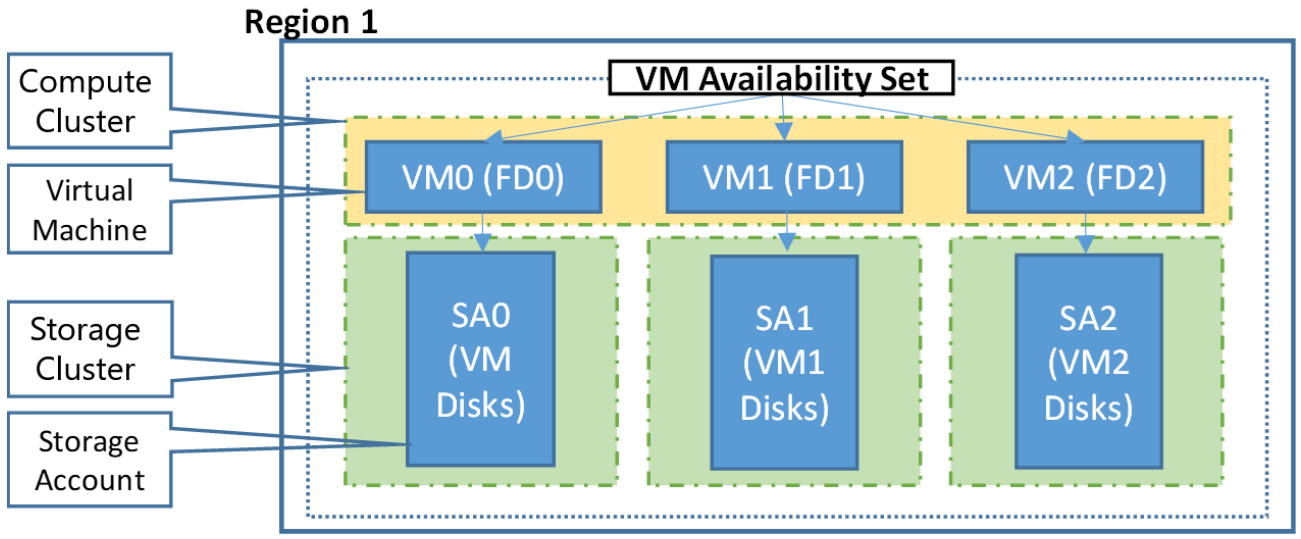
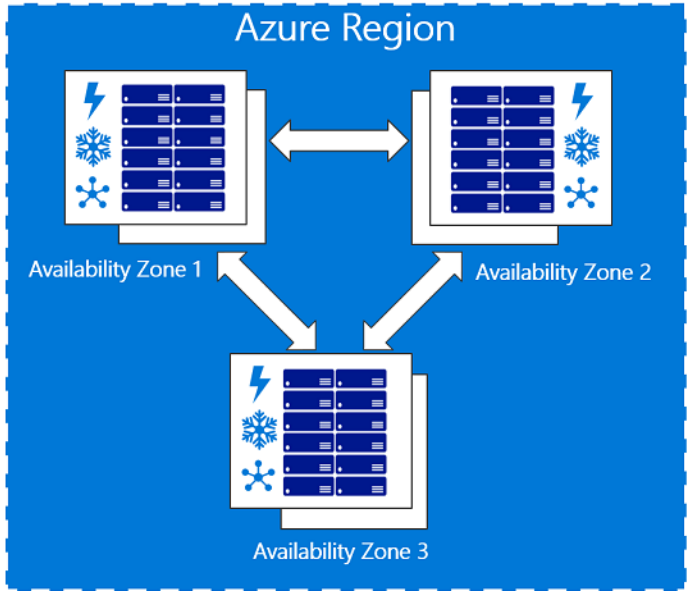
Availability Sets and Managed Disk

- Availability Sets work with Managed Disks to spread disks across multiple storage accounts.
- You used to do this manually before Managed Disks were released



Availability Zones (Preview)

- Just announced and with limited availability in regions and supported technology.
- Each Azure Region will have THREE availability zones with independent:
  - Power Source
  - Network
  - Cooling
- There are multiple separate datacentres in physical sites e.g. Dublin has 3 or 4 datacentres. Making use of this as a way of reducing datacentre loss risk.
- Will it reduce need for Azure Site Recovery? Reckon it will.



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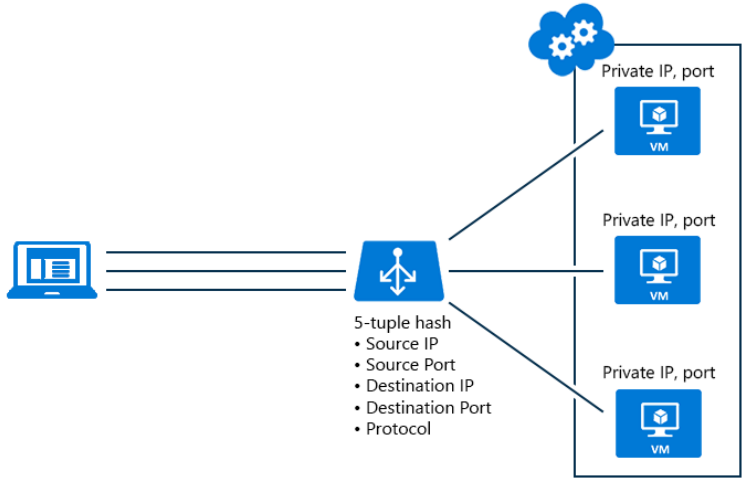
Load Balancers

- Layer 4 devices in Azure. TCP and UDP.
- We will look at Basic Load Balancers. There is a “Standard” Load Balancer in Preview.
- There are two types of Load Balancer:
  - Internal (ILB)
  - External (ELB)
- Used quite a lot as Azure does not have shared IP functionality across VM Network cards.



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Load Balancers

- LB's either PORT FORWARD or HASH-based distribution
- HASH-based distribution is basic. Has basic source IP session affinity.
- LBs use TCP probes to see if a VM is alive.

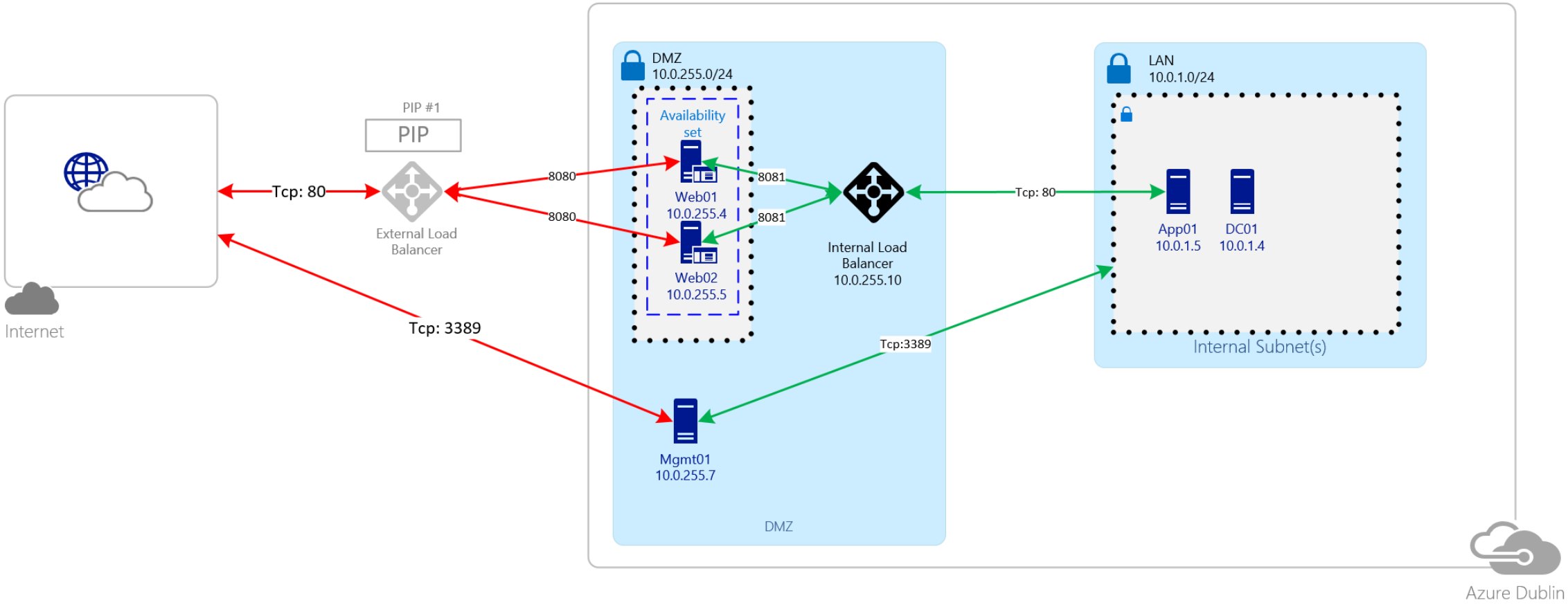
Demo:

Availability Set and Load Balancer

LAB WORK:

Create the ELB and ILB for your LAB

Lets build this



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LAB WORK:

Remove all NSG from VMs and build subnet based NSG