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VM BACKUP
Hyper-V | VMware

4 Important Azure IaaS features

Building your Hybrid Cloud

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Webinar content

1 – Introductions

2 – Options are good

3 – Azure Compute

4 – Azure Storage

5 – Connectivity into Azure

6 – Azure Resource Manager (ARM)

7 – Q&A and Wrap-up

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MVP / Technical Sales Lead, MicroWarehouse Ltd

- Technical Sales Lead at an Irish distributor
  - Cloud Solutions Provider / CSP for MS partners
  - Working with Azure for over 3 years
  - Evangelizing, training, pre-sales assistance
- Microsoft Valuable Professional (MVP)
  - Cloud & Datacenter Management (Hyper-V)
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About your host: Andy Syrewicze

MVP (Microsoft Cloud and Datacenter Management) & Technical Evangelist at Altaro

- Technical Evangelist for Altaro Software
- 14+ Years providing technology solutions across several industry verticals
- Main focus: Virtualization, Cloud Services and the Microsoft Server Stack, with an emphasis on Hyper-V and VMware

@asyrewicze

www.altaro.com/hyper-v/
www.altaro.com/vmware/

About Altaro Software

- Altaro is a fast-growing developer of user-friendly backup solutions for small and mid-market businesses.
- Virtual Backup trusted by 30,000+ Customers and 6,000+ Partners and MSPs worldwide.
- Flagship product: Altaro VM Backup – altaro.com/vm-backup

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Gold Application Development

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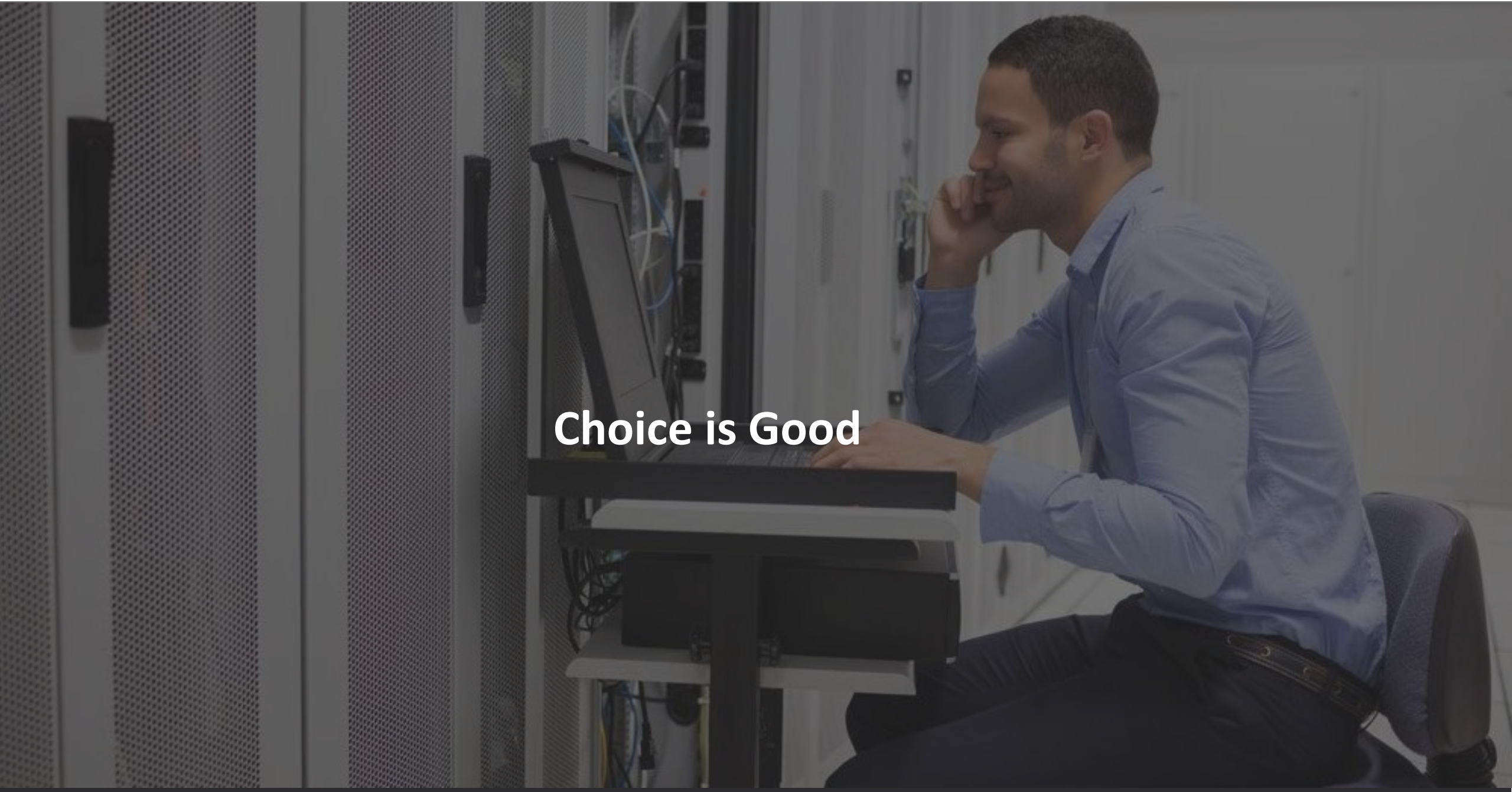
EDITOR'S CHOICE 2017 winmag


Choice is Good

Microsoft Offers Us Options

Their unique selling point

- Amazon
  - "Put everything in the cloud"
- Google
  - "Put everything in the cloud"
- Tech media
  - "Put everything in the cloud"
- Microsoft
  - "Put it where it's best for you"
- Cloud is not where we work – it's how we work

Hybrid Cloud

More than just a network connection

- Network connections are basic
- Offer little value
- There's more to "hybrid"
  - Systems management
  - Collaboration
  - LOB apps
  - Single identity
  - Service availability
  - Burst capacity
  - Backup
  - Disaster recovery
  - Tiered storage
  - Additional functionality
  - Security
  - Single way of developing new systems

Azure Compute

Imagine a HUGE Hyper-V farm …

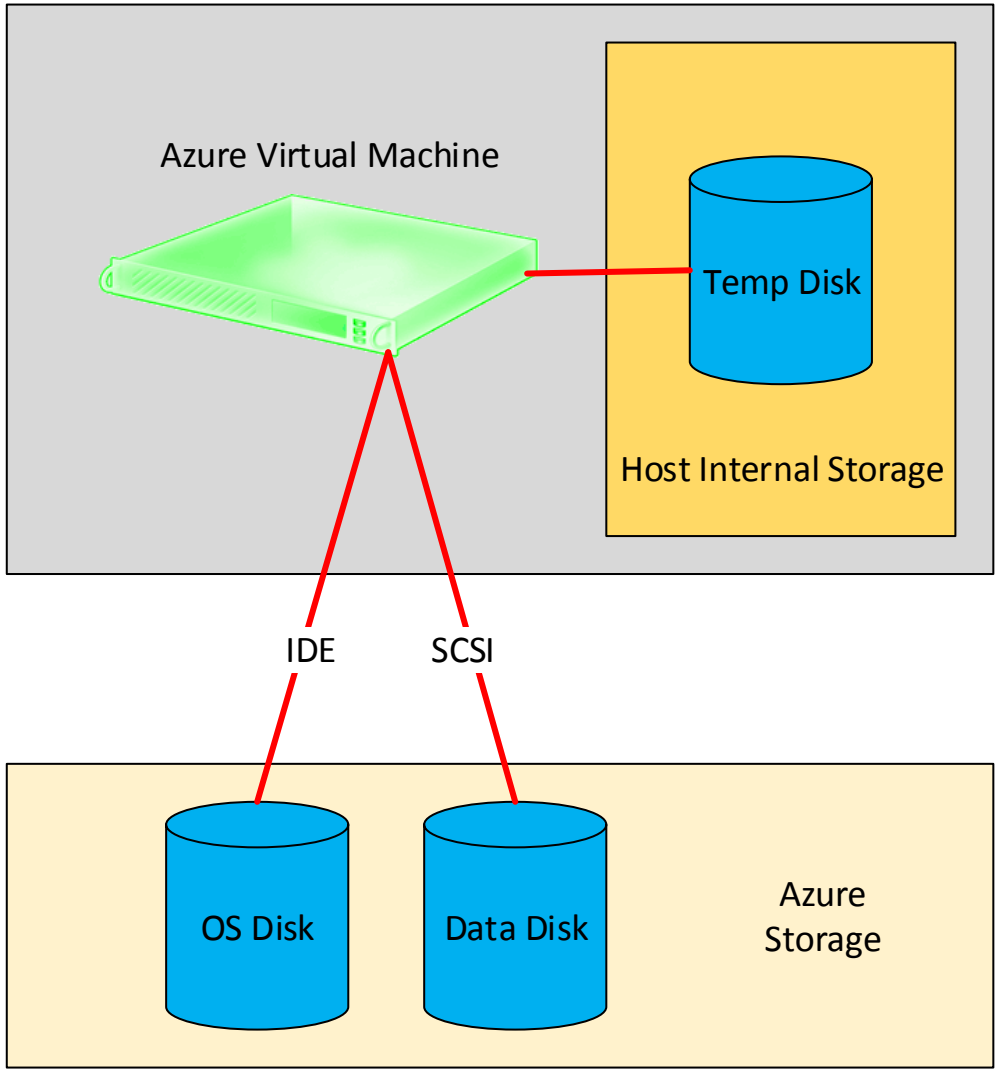
"Really? Hyper can't scale? …"

- Millions of Hyper-V hosts in 40 regions
  - Each region has multiple data centres
  - Clusters of 1,000 nodes each
- The hosts:
  - Manufactured to order
  - Only 5 models (by Jan 2017)
- More on the storage later
- The same Hyper-V that we can use
  - WS2012/R2
  - Some WS2016 recently
  - Wrapped in a huge cloud management system
  - No live migration – there is failover
- But fundamentals of a virtual machine are the same
  - Metadata
  - Virtual hard disks (VHD only)

Virtual Machine Architecture

Pay attention to Temporary Disks

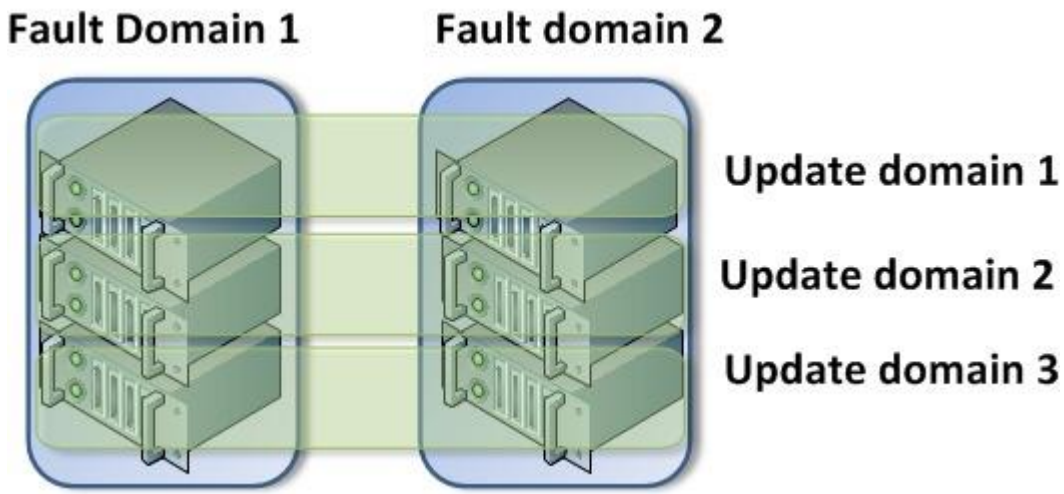
- Generation 1 virtual machine
  - IDE Controller: OS disk
  - SCSI Controller: Data disks
  - All VHD (only) format
- Temporary drive
  - Stored on the host – lower latency
  - Most VM series use SSD
  - Paging file
  - Can be used for SQL TempDB
- Data disks
  - Where you should store all data
  - Better performance than OS disk
  - More scalability than OS disk
  - Higher spec VMs support more data disks



Availability Sets

Uptime and Service Level Agreements (SLAs)

- Azure VMs placed onto clusters
- MS builds fault tolerance using racks (fault domains)
  - A fault in one domain causes failover to other domains
- MS patches nodes one "update domain" at a time
  - Normally 15-30 seconds of downtime
  - Host "warm reboot" works in Azure
- SLA for VMs with "Standard Storage" (HDD)
  - Deploy 2+ VMs doing the same role
  - Spread around fault/update domains using Availability Sets (anti-affinity)
- VMs with only "Premium Storage" (SSD) get SLA without availability sets



Virtual Machine Series

Think DL360, DL380, DL560 … or R430, R730, R930, etc

- Many types of virtual machine in Azure
- Each “series” has special traits
  - You choose a series for a role
  - Choose a size of VM from the series
- Replacement series released occasionally
  - DL380 G7, DL380 Gen8, DL380 G9
  - R710, R720, R730
  - Azure: _v1 (implied), _v2, _v3
  - Azure example: D-Series, D_v2-Series, D_v3-Series
- Beware of “Disk Size”
  - Azure VM pricing pages
  - Azure pricing tools
  - They are showing the Temp Disk size
  - OS & data disks not included (spec or price)

“How much is a VM in the cloud?”

Some Special Codes

These letters in the VM name indicate special features

- S = support for SSD-based Premium Storage
- M = more memory (RAM) than usual
- R = A second RDMA NIC for low CPU impact, low latency, high speed data transfer

Commonly Used VM Series (Entry Level)

Based on what our customers are doing

- "A is the start of the alphabet"
- Basic A-Series (v1)
  - Lowest spec VMs
  - **Simulated** Opteron 4171 HE 2.1 processor
  - No load balancing
  - Data disks limited to 300 IOPS
  - Temp drive on HDD
  - Domain controllers, test/dev
- A_v2-Series
  - Entry level workhorse
  - **Simulated** Opteron 4171 HE 2.1 processor
  - 500 IOPS per data disk (HDD only)
  - Temp drive on HDD

Commonly Used VM Series (Disk & Compute)

Based on what our customers are doing

- D_v2-Series
  - "D is for disk"
  - Database or disk-heavy workloads
  - Xeon E5-2673 v3
  - "S" variants (DS_v2) support Premium Storage (SSD) up to 7,000 IOPS per data disk
  - Temp drive on SSD
- D_v3-Series (New)
  - Newer version of D_v2
  - E5-2673 v4
  - Intel Hyperthreading is used (new in Azure)
  - Up to 28% cheaper than D_v2
- F-Series
  - "High horsepower all around worker like the pickup truck"
  - More cores per GB RAM than D_v2-Series
  - Xeon E5-2673
  - Same SSD options as D_v2-Series

Less Commonly Used Virtual Machine Series

Niche scenarios

- G-Series
  - "G is for Goliath"
  - Previously the largest VM in the cloud (448 GB RAM)
- LS-Series
  - "L is for low latency"
  - Uses host-local SSD storage only
- E_v3-Series (New)
  - Larger vCPU/RAM versions of D_v3
- NV- / NC- / ND-Series
  - NVIDIA Chipsets
  - Virtualization, Compute, Deep Learning (AI)
- H-Series
  - "H is for SAP HANA"
  - OLTP workloads
- M-Series
  - "M is for massive"
  - Up to 128 cores and 2 TB RAM per VM
- D_v3, E_v3, M Notes:
  - Run on WS2016 hosts (New)
  - Supports nested virtualization

Choose a VM Size

You cannot customize the size, but you can choose a different size (reboot)

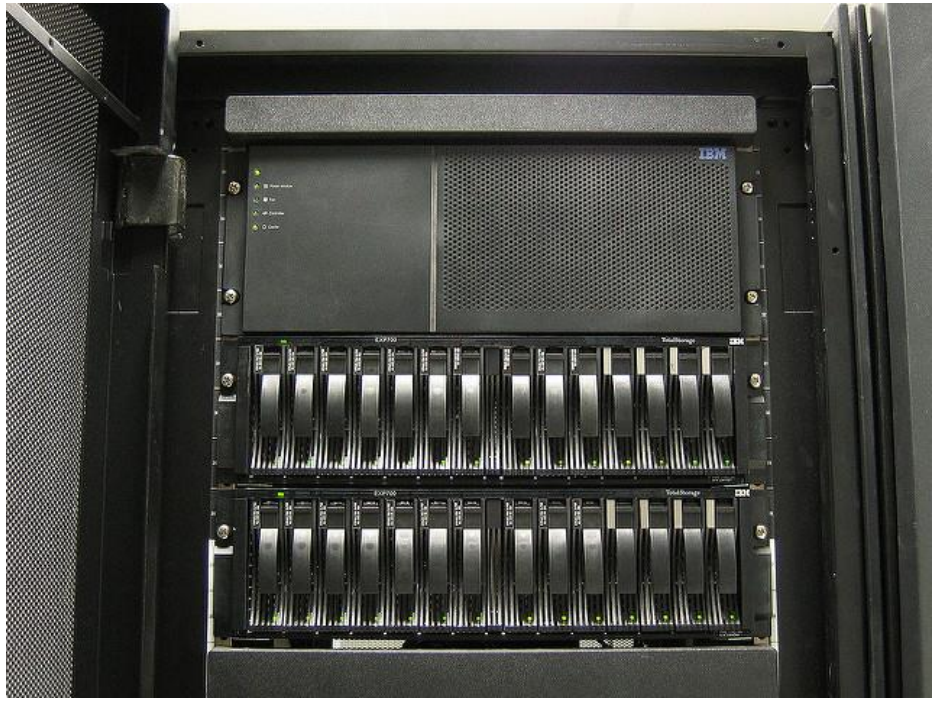
Dsv3-series

Size	CPU cores	Memory: GiB	Local SSD: GiB	Max data disks	Max cached and local disk throughput: IOPS / MBps (cache size in GiB)	Max uncached disk throughput: IOPS / MBps	Max NICs / Expected network performance (Mbps)
Standard_D2s_v3	2	8	16	4	4,000 / 32 (50)	3,200 / 48	2 / moderate
Standard_D4s_v3	4	16	32	8	8,000 / 64 (100)	6,400 / 96	2 / moderate
Standard_D8s_v3	8	32	64	16	16,000 / 128 (200)	12,800 / 192	4 / high
Standard_D16s_v3	16	64	128	32	32,000 / 256 (400)	25,600 / 384	8 / high

Azure Storage

Question

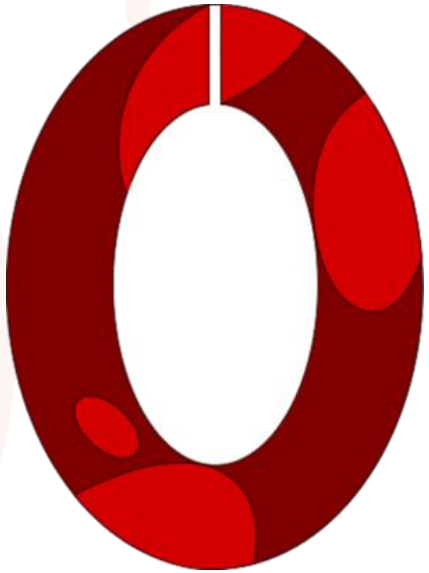
How many SANS are there in the cloud?

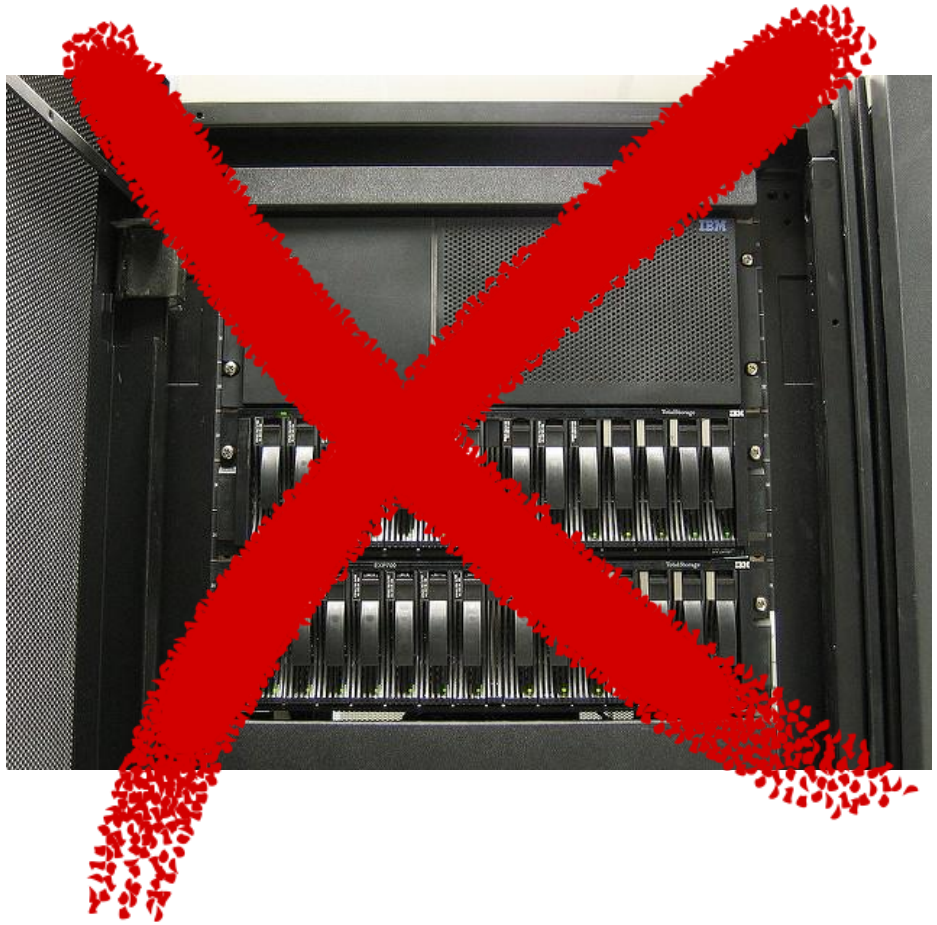


Credit: https://www.flickr.com/photos/tophost/

Answer

How many SANS are there in the cloud?



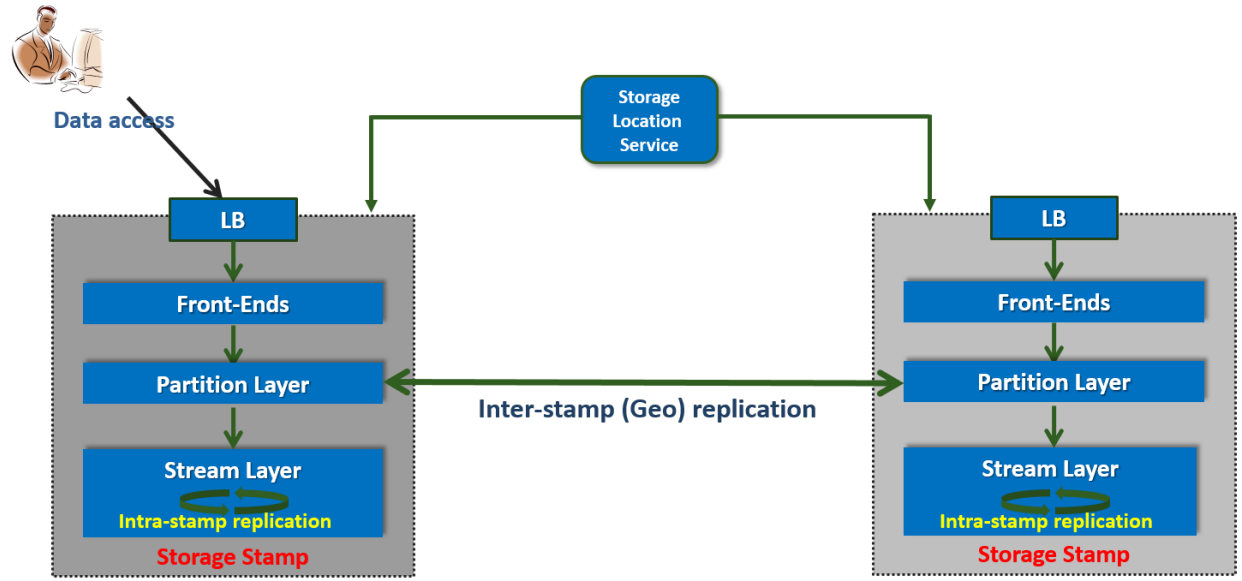


Credit: https://www.flickr.com/photos/tophost/

Software Defined Storage

Storage clusters with replication

- We place virtual hard disks in Azure storage
- Locally redundant storage (LRS):
  - 3 synchronously replicated copies of data
  - All in a single data centre
- Geo-redundant storage (GRS):
  - LRS + 3 asynch replicated copies in *paired* re
    - North Europe <-> West Europe
    - East US <-> West US
  - Facility fault tolerance
- Disaster recovery in the cloud
  - Sounds like we should use GRS?
  - Only replicates disks – not anything else
  - See Azure Site Recovery for Azure VMs instead
  - Always use LRS for VHD storage



Storage Types

Admittedly confusing at first

- General Storage Accounts
  - Storage IO – Block Blob: used by Azure Backup, general file storage, unused VHDs, scripts, etc
  - Files (not a file server replacement): Used as a place to store things like .INI files for legacy apps
  - Disks: VHDs for VMs
  - Queue: Used by developers to queue messages
  - Table: Used by developers for NoSQL data
  - **Up to 20,000 IOPS per storage account**
- Cool Blob storage account
  - Dedicated to blob storage
  - Priced for less than 2 accesses per blob per month
- Hot Blob storage account
  - Dedicated to blob storage
  - Priced for more common access
- In the future
  - Tiered blob storage – auto tiering coming after GA
  - An additional "archive tier"

Virtual Hard Disk Storage Tiers

Focusing on Disk in general storage accounts

- Standard Storage
  - HDD-based shared storage
  - Up to 500 IOPS per data disk
  - LRS or GRS
- Premium Storage
  - SSD-based shared storage
  - Higher throughput than HDD – check max throughput of the VM size
  - Up to 500 – 7,000 IOPS per data disk
  - Bigger disks offer more performance – the nature of larger files on flash storage
  - LRS only
- Premium Storage only available on “S” variants of virtual machines
  - Examples: DS_v2, GS, FS, etc
- A virtual machine can have a mix of Standard and Premium Storage
  - OS on Standard, some data on Standard, and other data on Premium

Un-Managed & Managed Disks

Two ways of storing virtual hard disks

- Un-managed disks
  - You create storage accounts
  - You place disks into storage accounts
- Storage account has max of 20,000 IOPS
  - 40 x 500 IOPS standard disks
  - 4 = 5,000 IOPS premium disks
  - Do you want this management overhead?
- Managed disks
  - No need to create storage accounts for VHDs – Azure takes care of it all
  - Disk placement respects VM availability sets
  - Easier VM template management
  - Ability to checkpoint individual VHDs – create VHDs from templates
  - More management features for managed disks

Choosing a Disk Configuration

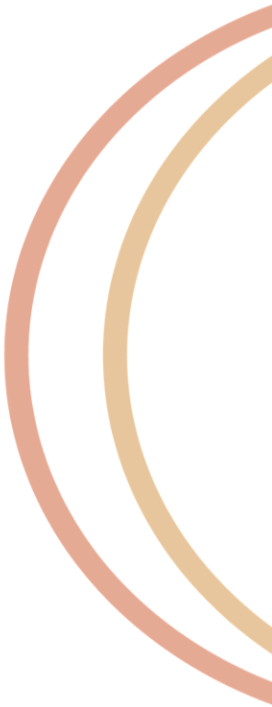
Pricing versus performance versus features

	Un-Managed Disks	Managed Disks
Standard Storage	LRS or GRS Priced based on ***content size***	LRS-only Priced based on disk size
Premium Storage	LRS-only Priced based on disk size	LRS-only Priced based on disk size

Leverage Storage Spaces

Aggregate storage capacity and performance

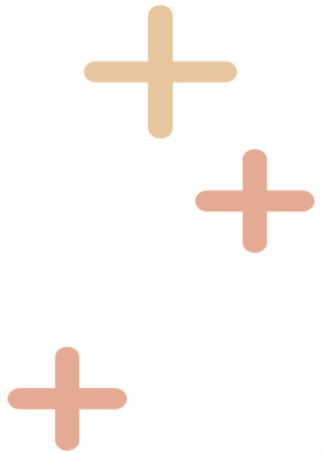
- Max VHD size
  - GA: 1023 GB
  - Preview: 4 TB
- Max IOPS per disk
  - Standard: 500 IOPS
  - Premium GA: 5,000 IOPS
  - Premium preview: 7,000 IOPS
- How to get more? Storage Spaces:
  - 4 x Standard Storage data disks = 4 x 1023 GB and 4 x 500 IOPS
  - Create a Storage Pool
  - Create a simple virtual disk from the pool
  - 3.99 TB volume with up to 20,000 IOPS

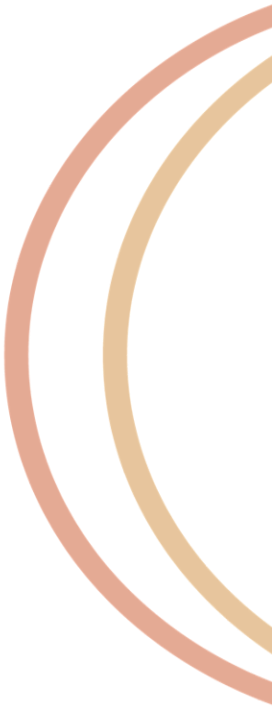


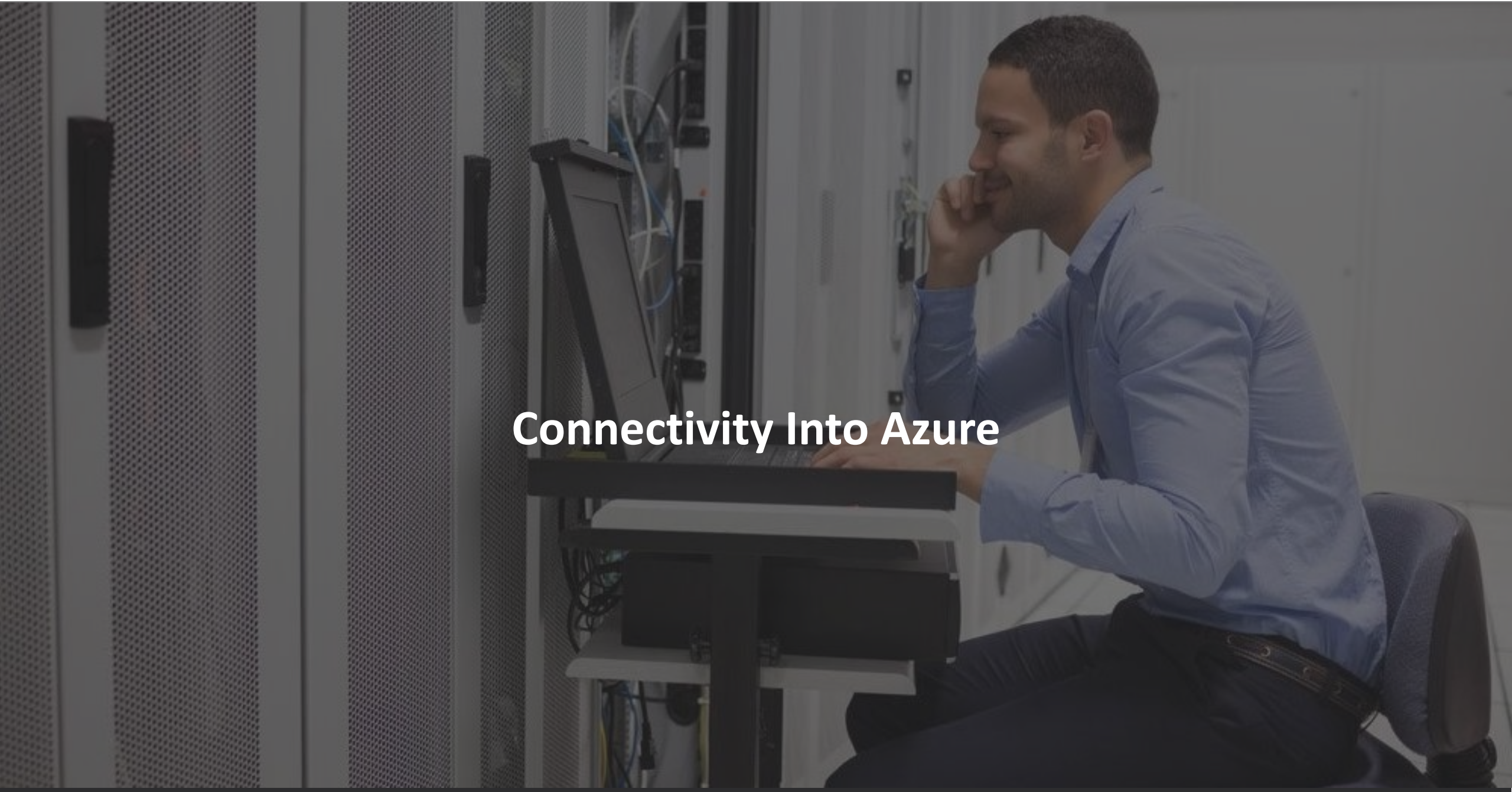
Host-Based Disk Caching

Free performance gain for data disks

- 3 caching modes
  - None: recommended for OS disks
  - Read: recommended for disks with database files
  - Read-write: recommended for applications that force writes to disk without caching
- I've seen read caching boost 4K read IOPS on Standard Storage by 200 IOPS







Connectivity Into Azure

How to Connect To Services Into Azure

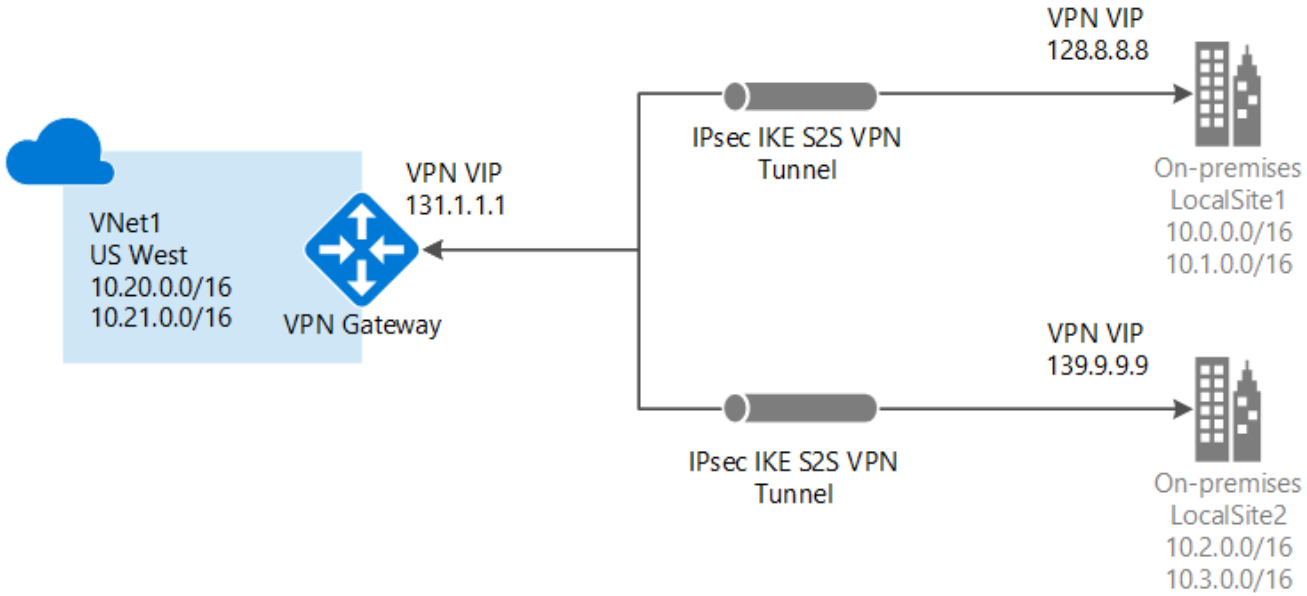
Driven by the hosted services

- Application access – HTTP/HTTPS
- Remote desktop
- Network connection
  - VPN
  - WAN
  - DirectAccess not supported

Gateway Based Connections

Storage clusters with replication

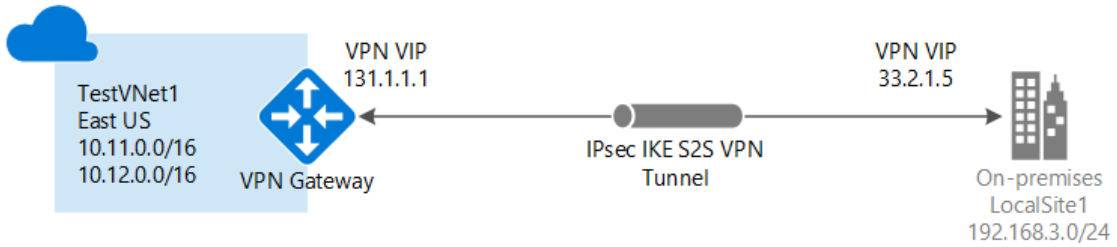
- Network-based connections into a virtual network
  - Point-to-site VPN
  - Site-to-site VPN
  - WAN connections
- A gateway appliance
  - A fault tolerant architecture
  - Max of 1 per virtual network
  - Can support multiple connections *

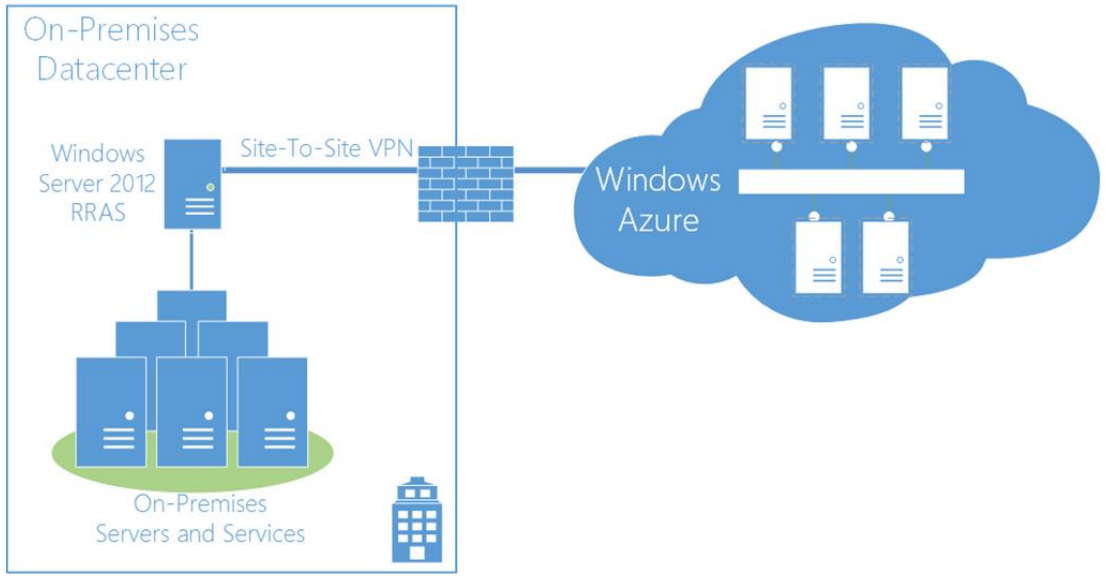


Site-to-Site (S2S) VPN

Commonly used in SME scenarios

- Cost effective
- Relatively easy to set up
  - Search for "Azure VPN devices"
  - Supported set of on-premises appliances
  - Firewall manufacturer instructions for Azure VPN
- Two types of VPN connection – dictates type of gateway
  - Policy-based: Very basic, limited features, 1:1 connection only
  - Route-based: Ideal, supports N:1 connections
- Tip: Always deploy route-based gateway/VPN
  - Some big names (e.g. Cisco ASA) can only do policy-based
  - Workaround: Use Windows Server as on-prem VPN gateway

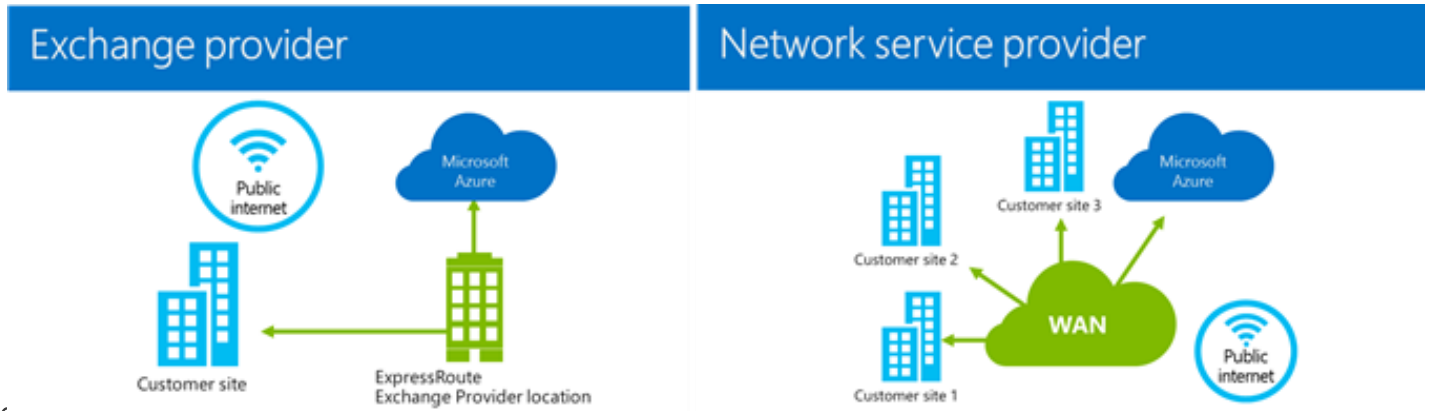




ExpressRoute

Almost never used in SME scenarios

- A WAN connection to Azure
  - Not just virtual networks
- Offers private/SLA network connection
  - Not just the gateway
- Higher speeds of connection to Azure
  - Up to 10,000 Mbps
- Network service provider
  - Azure is added to your MPLS network
  - Large number of sites than S2S VPN (> 30)
- Exchange provider
  - You connect to a hosting company
  - Hosting company connects you to Azure
- Get your pricing from ISP/hosting company
  - I have no customers using ExpressRoute



Azure Resource Manager (ARM)

How do you Order Food In A Restaurant?

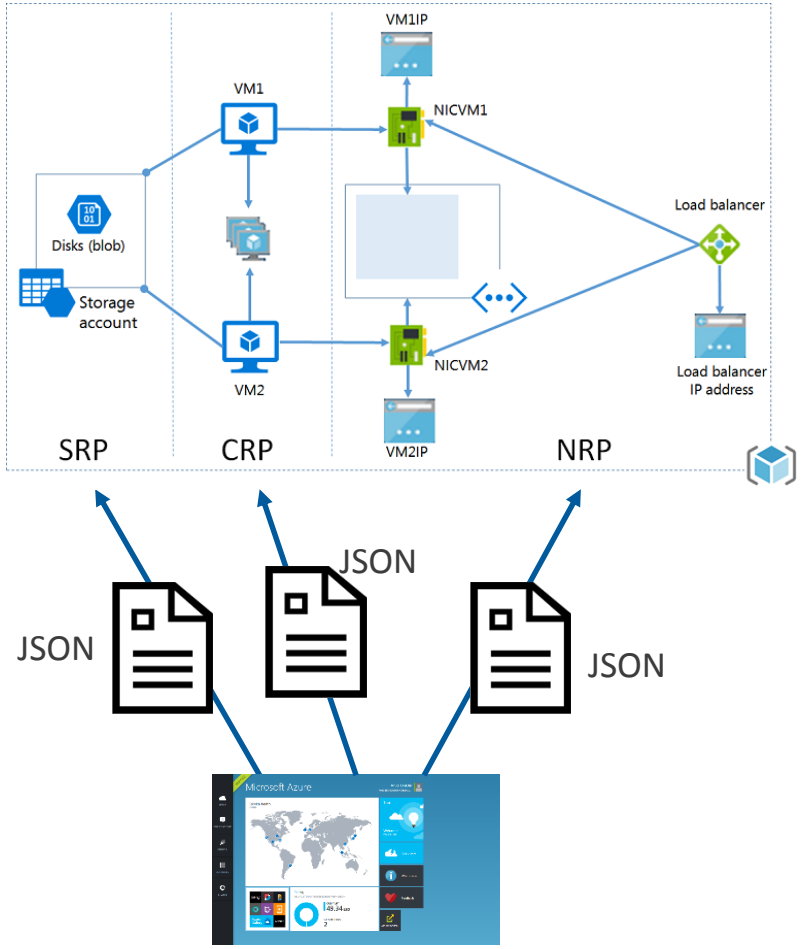
Do you describe each action that the chef should do?

1. Ask the chef to turn on the grill
2. Open the fridge
3. Remove a steak from the fridge
4. Place the steak on the grill
5. Remove fries from the fridge
6. Place fries in a fryer
7. Turn the steak after 3 minutes
8. Wait 3 minutes
9. Take steak from grill
10. Put steak on plate
11. Etc

Azure Resource Manager

An API between Azure management tools and Resource Providers

- Everything you do in Azure is transcribed as JSON
  - Javascript Object Notation
- JSON describes the result
  - Not the actions required to create the result
  - Often referred to as “infrastructure as code”
  - It’s not programming!
- We can bypass the management tools
  - Describe what we want by writing a JSON
  - Send the JSON to Azure
  - Azure deploys what is in the JSON



Not Just for Large Enterprise & Developers

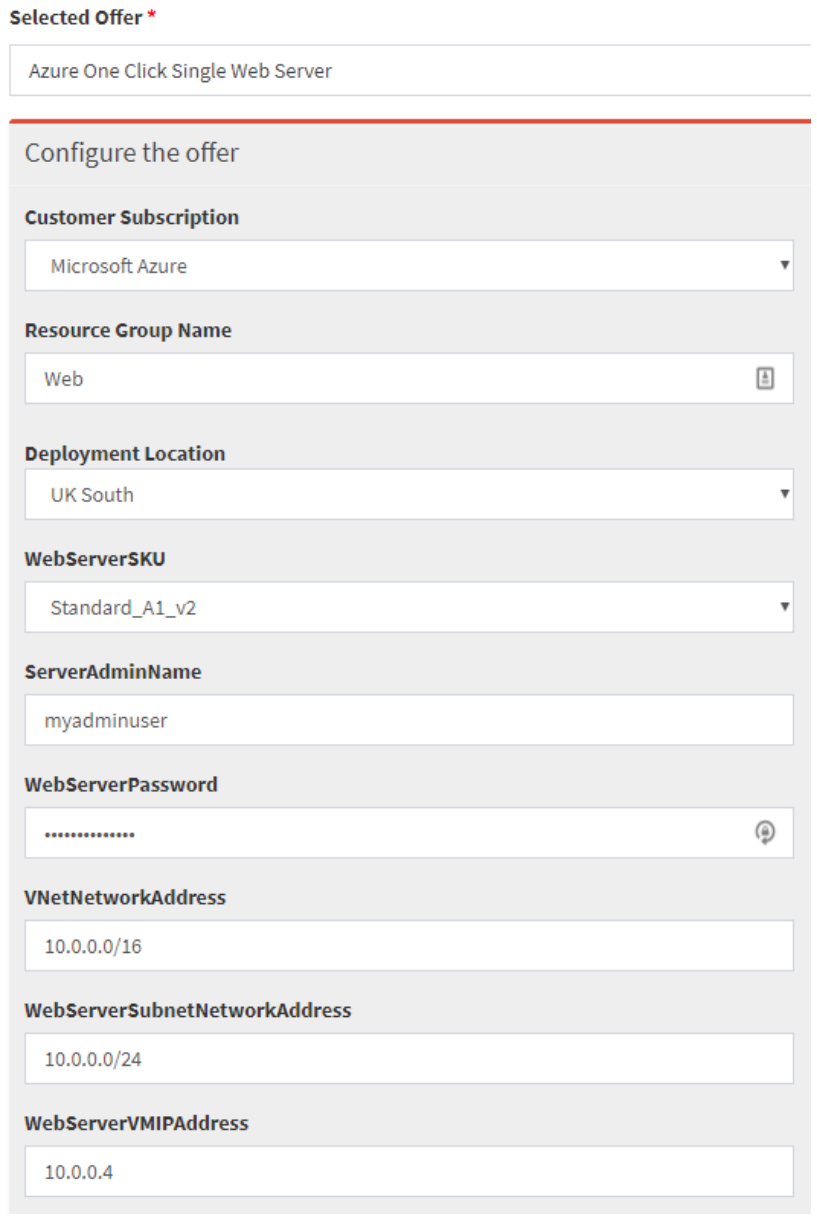
I ignored JSON for years – my mistake!

- JSON is faster than click-click-click & PowerShell
  - Tasks are parallelized
  - An entire solution (network, firewall, NAT rules, storage, VMs) in under 13 minutes
  - Time for me to deploy – 30 seconds
- Re-usable definitions
  - MS partners
  - Test labs
  - Learning labs
  - Test/dev/production
- Format:
  - Parameters: Customize a deployment with questions
  - Variables: Store/format values that are reused
  - Resources: Things that are deployed using parameters and variables
- Delegate deployment to junior staff
  - Senior engineers do the customization

JSON in the Real World

MicroWarehouse One-Click Azure Deployments

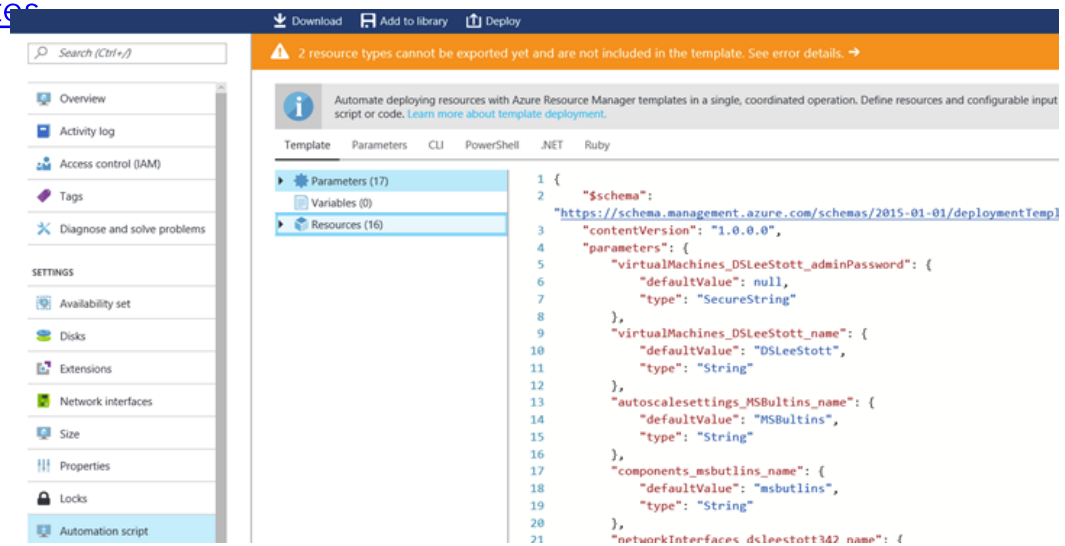
- Our customers are MS partners
- Many are still learning Azure
- We want them to be able to be profitable with Azure now
- Solutions shared as templates in our CSP portal
  1. Choose a solution
  2. Customize the solution, e.g. VM size, username/password
  3. Click a button
  4. Wait 8-12 minutes – the JSON does the Azure deployment
  5. Do normal Windows engineering



Learning Azure JSON

It takes a little time – but worth it

- Use VS Code – free *small* version of Visual Studio
  - Customize it for Azure JSON editing
  - https://www.petri.com/using-vs-code-edit-azure-json-templates
- Deploy something small by hand
  - Virtual network
  - Storage account
- Export the JSON
  - Customize it
  - https://www.petri.com/building-simple-azure-json-file
- Deploy the JSON
  - Templates in the Azure Portal
  - https://www.petri.com/deploying-json-templates-using-azure-portal
  - 2 PowerShell cmdlets
  - https://www.petri.com/deploying-json-template-azure-using-parameters-file
- Experiment & grow the template

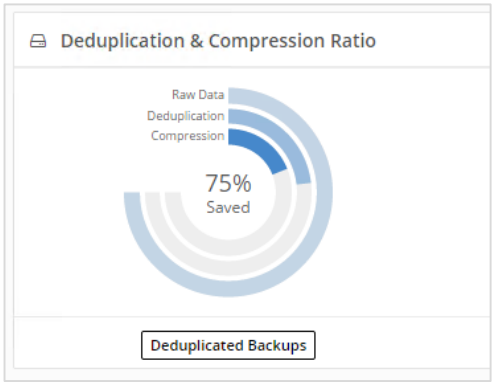


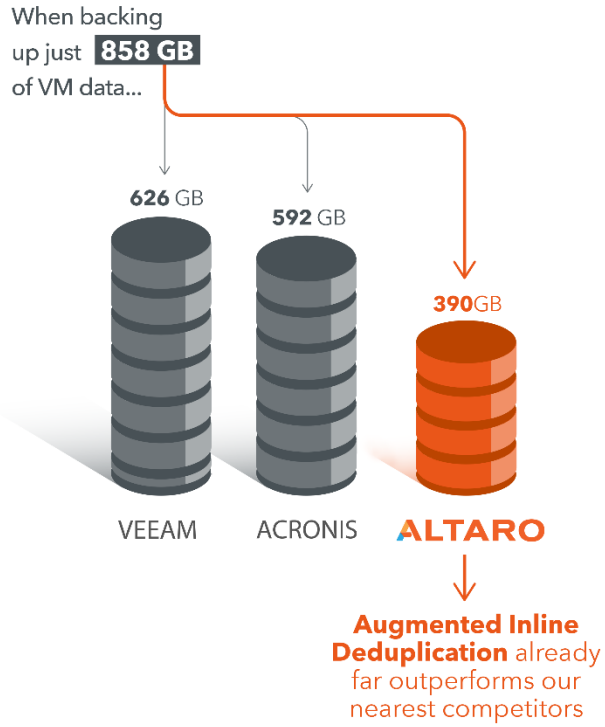
Altaro VM Backup & Azure

Altaro VM Backup v7.5

Virtual backup trusted by 30,000+ SMBs and 6,000+ IT Resellers and MSPs

- **Efficient backup setup** – Easy & quick to setup and use
- **Full control of your backups** – Powerful, flexible and easy to scale
- **Praise-winning Support**
- **Best storage savings in the industry**





For more info & 30-day trial: altaro.com/vm-backup

Altaro VM Backup v7.5 – NEW: Cloud Backup to Azure!

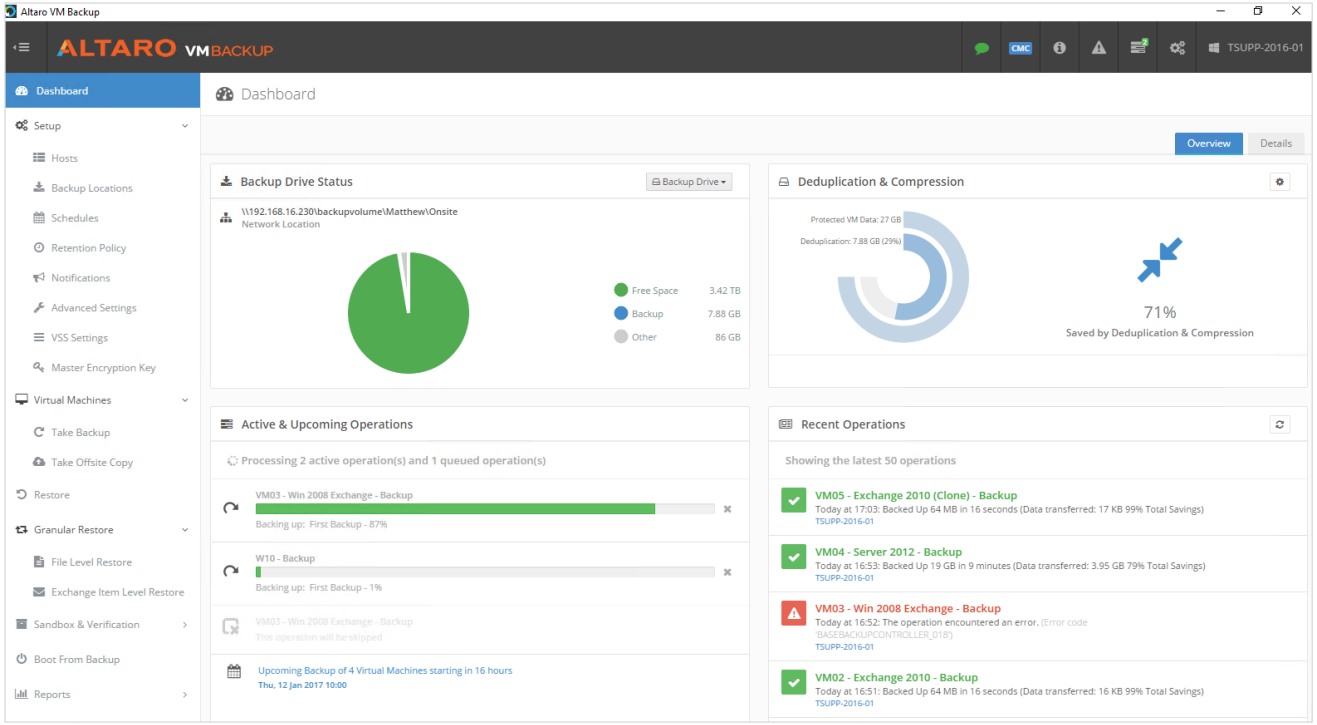
Virtual backup trusted by 30,000+ SMBs and 6,000+ IT Resellers and MSPs

- **Uses Azure Block Blob storage** (most cost-effective Azure storage option)
- **Restores from Azure** to different Altaro VM Backup installations
- Supports Altaro's compression, encryption and industry best deduplication; resulting in **the lowest Azure storage requirements**
- **Does not require a VM running in Azure** - further Azure savings

For more info: altaro.com/azure-backup

Altaro VM Backup v7.5 – Quick demo

Virtual backup trusted by 30,000+ SMBs and 6,000+ IT Resellers and MSPs

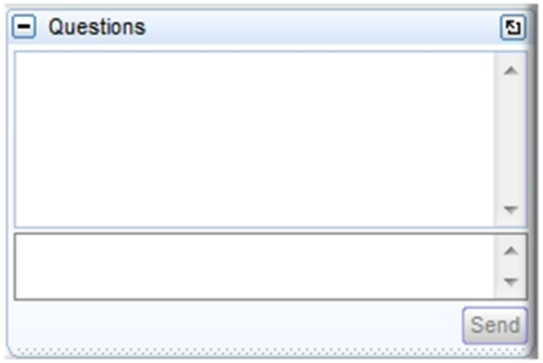


For more info & 30-day trial: altaro.com/vm-backup

LIVE Q&A!

Your turn: Time to answer your questions!

- **What questions do you have on today's topic?** Type your questions in the "Questions" box in GoToWebinar



- **Reminder**
  - Any questions we can't tackle today will be answered in an upcoming blog post on our Hyper-V blog: www.altaro.com/hyper-v/
  - Want to be notified when that's published? Sign up for email updates here: www.altaro.com/hyper-v/sign-up/

Thank you for attending

Have fun with Azure!

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