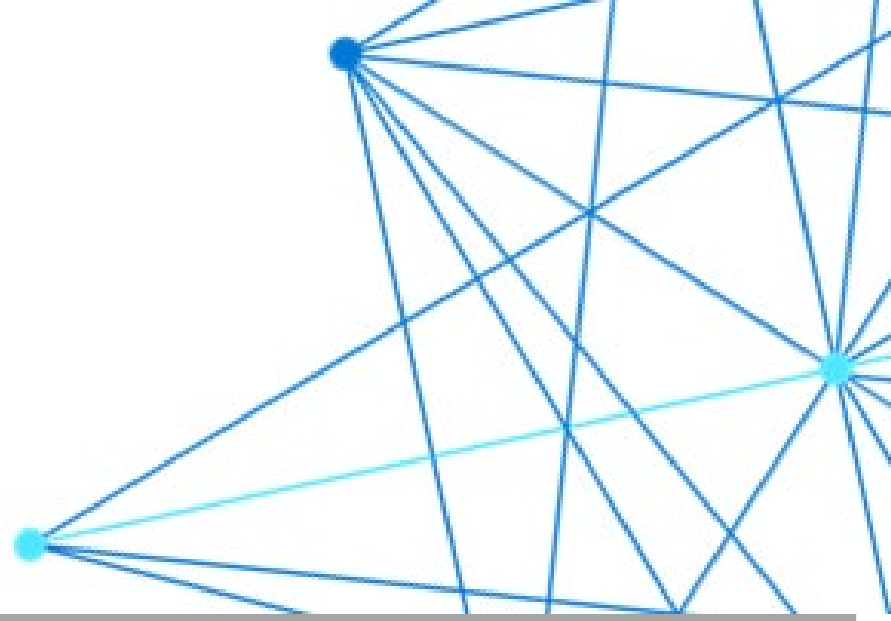
# Azure Architects Connect:

# Azure Virtual Desktop – Architektur Design Session

Herzlich Willkommen zur heutigen Veranstaltung!
In wenigen Minuten geht es los….

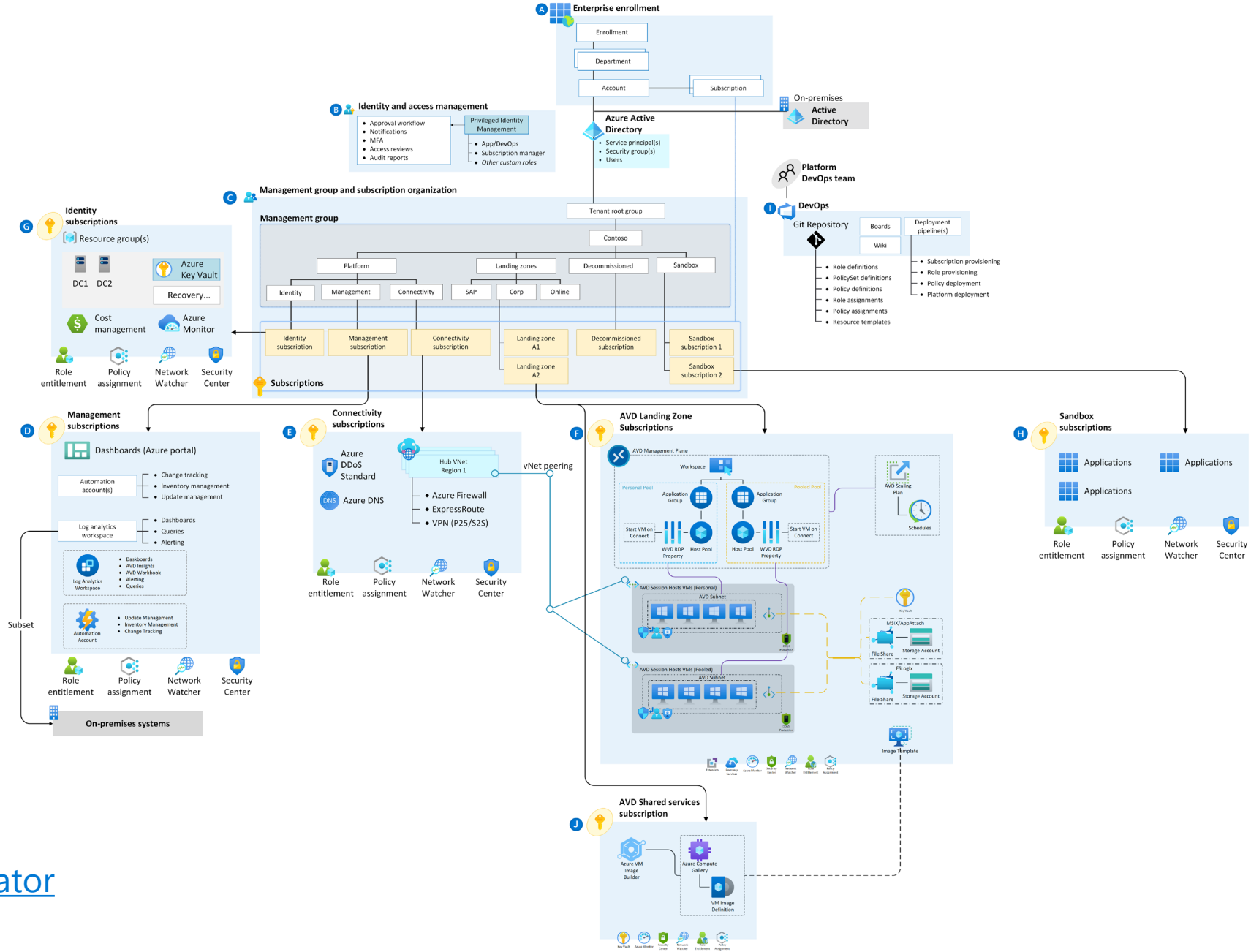


## AGENDA

| |
|---|
| Einführung |
| Wie sieht eine Azure Virtual Desktop Architektur nach Enterprise-scale aus? |
| Welche Sicherheitsfunktionen sollten aktiviert werden? |
| Wie kann eine Hochverfügbarkeit gewährleistet werden? |
| Ist es möglich die Azure Virtual Desktop Umgebung zu automatisieren? |
| Wie können die Kosten optimiert werden? |
| Q & A |

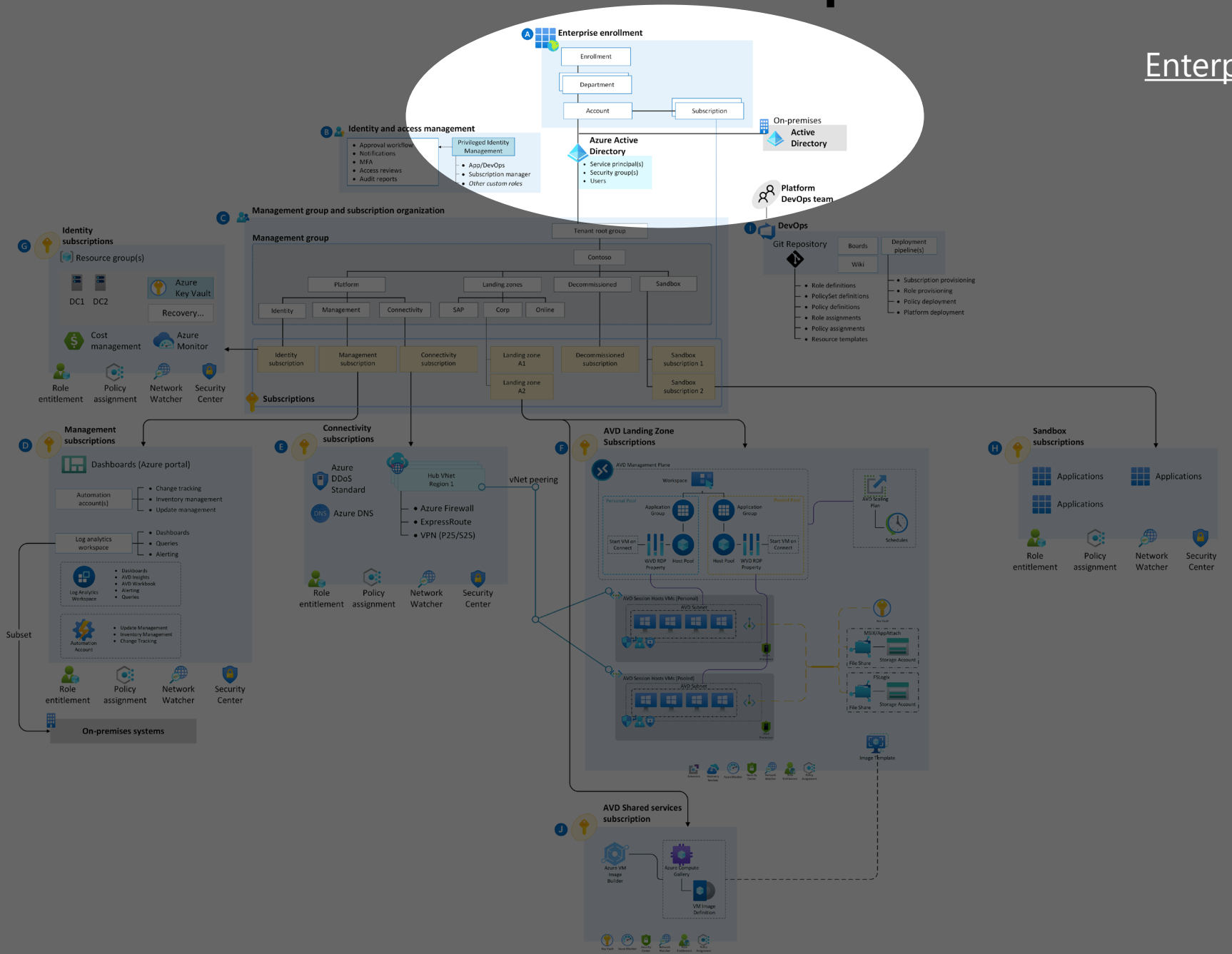
# Azure Virtual Desktop at Enterprise Scale

# Azure Virtual Desktop at Scale




[AVD Accelerator]

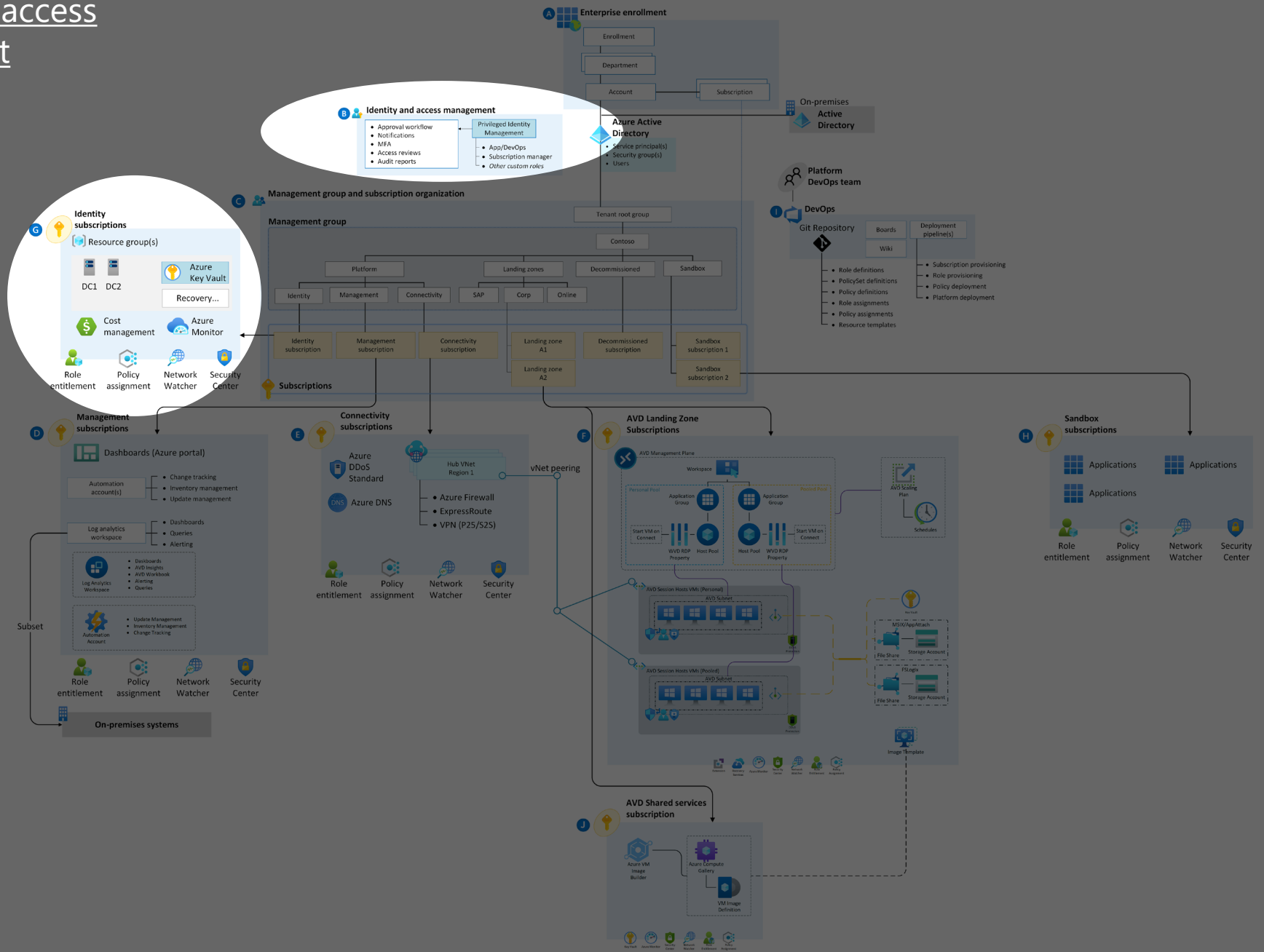
# Azure Virtual Desktop at Scale



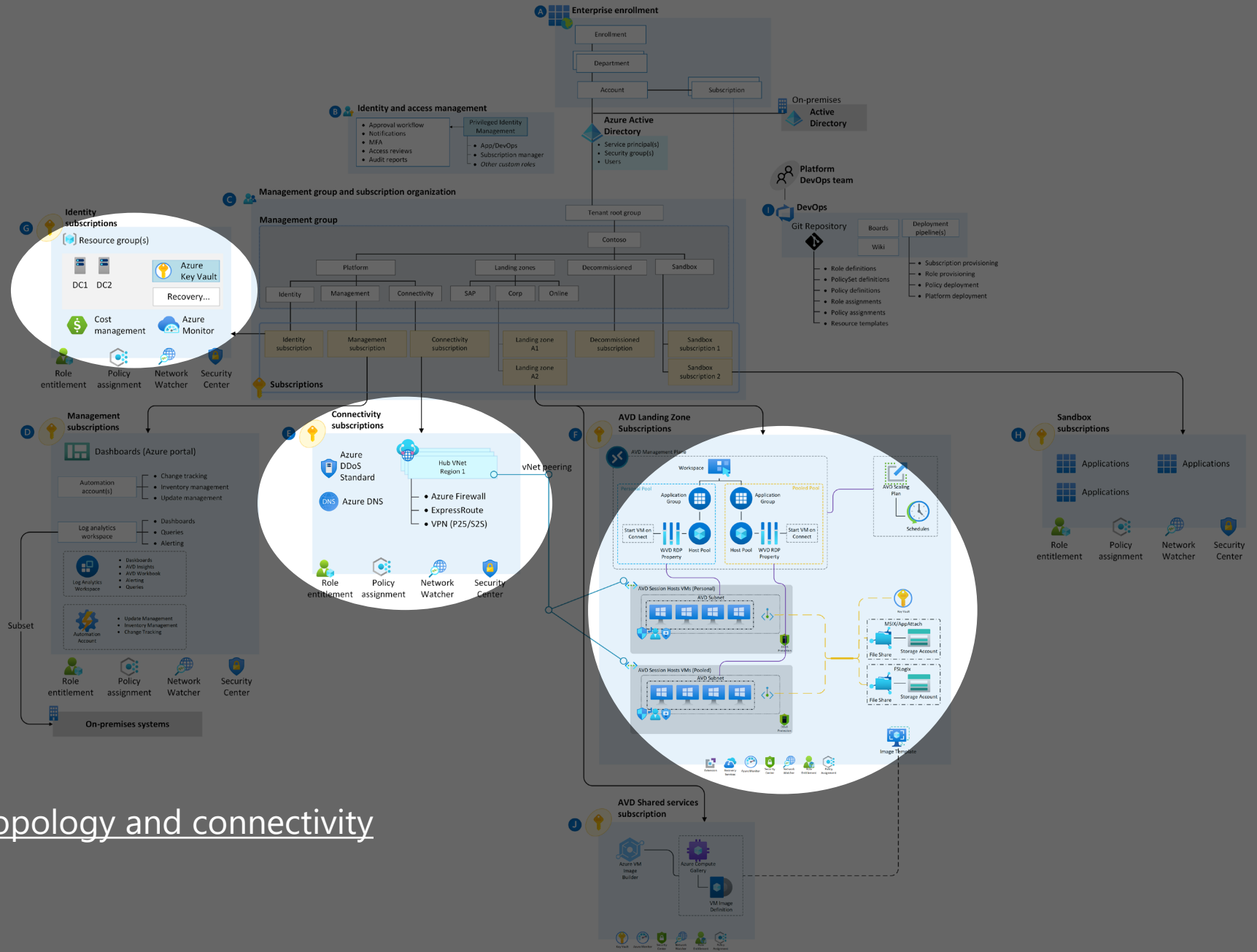

Enterprise enrollment

# Azure Virtual Desktop at Scale

## Identity and access management

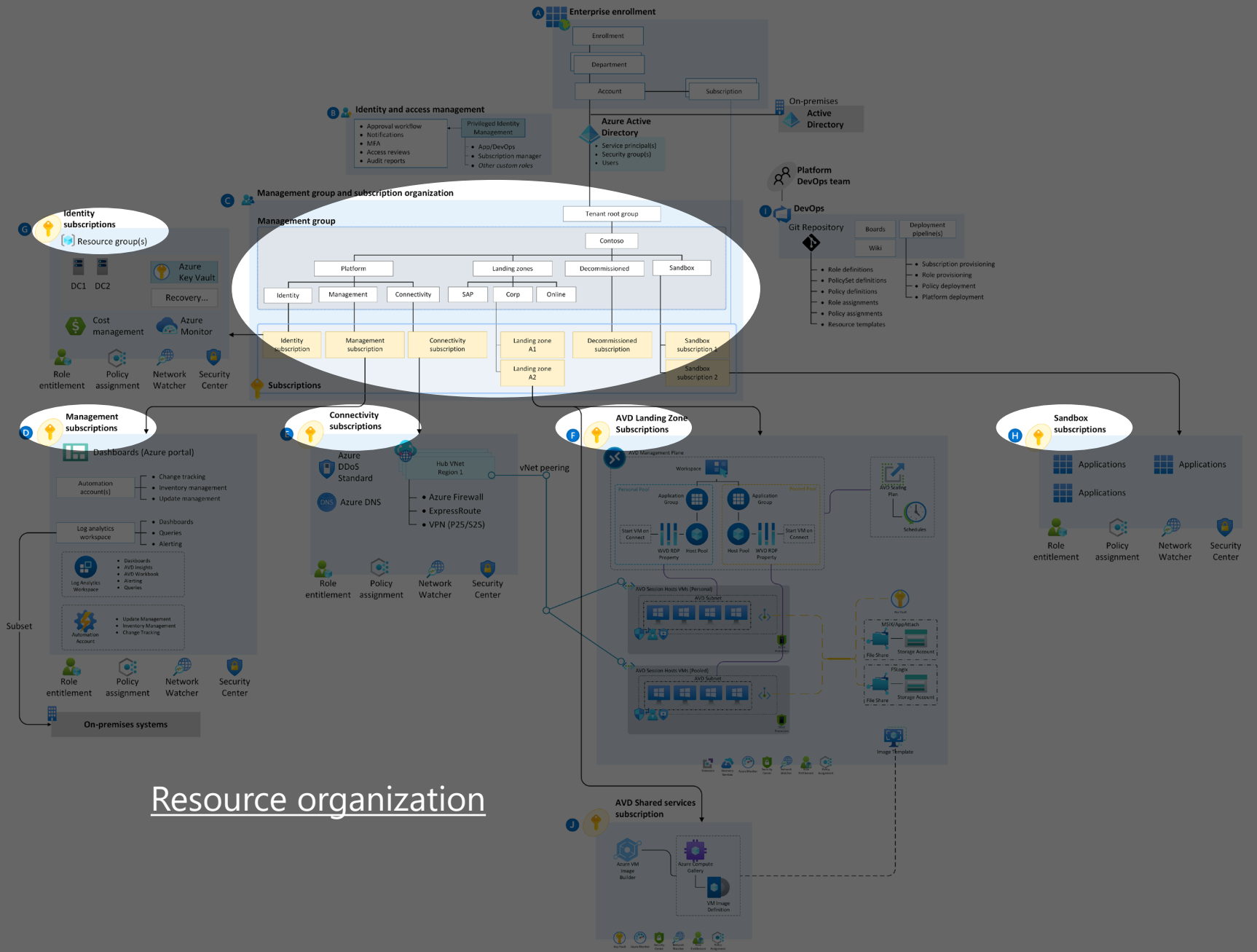


# Azure Virtual Desktop at Scale



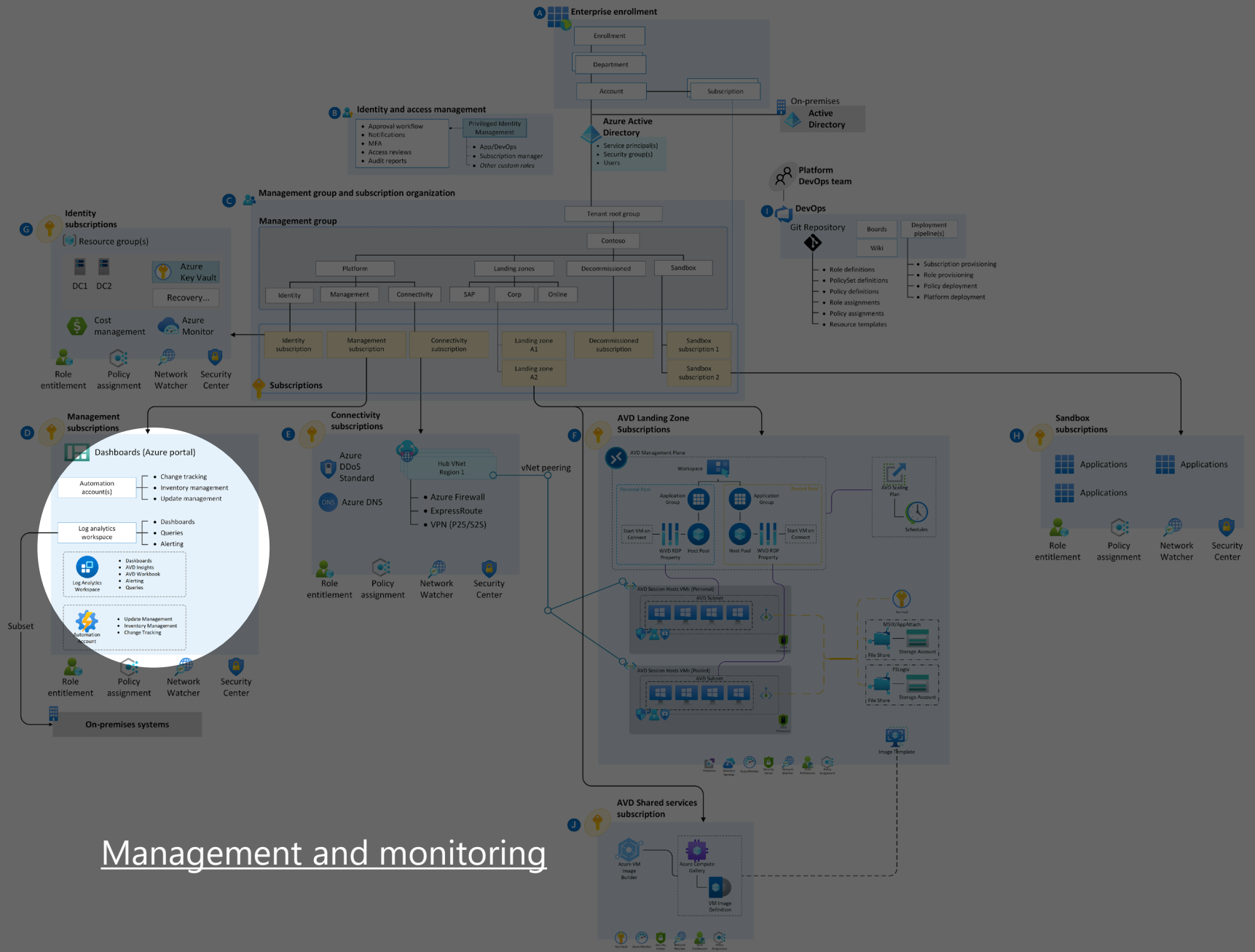

[Network topology and connectivity]

# Azure Virtual Desktop at Scale



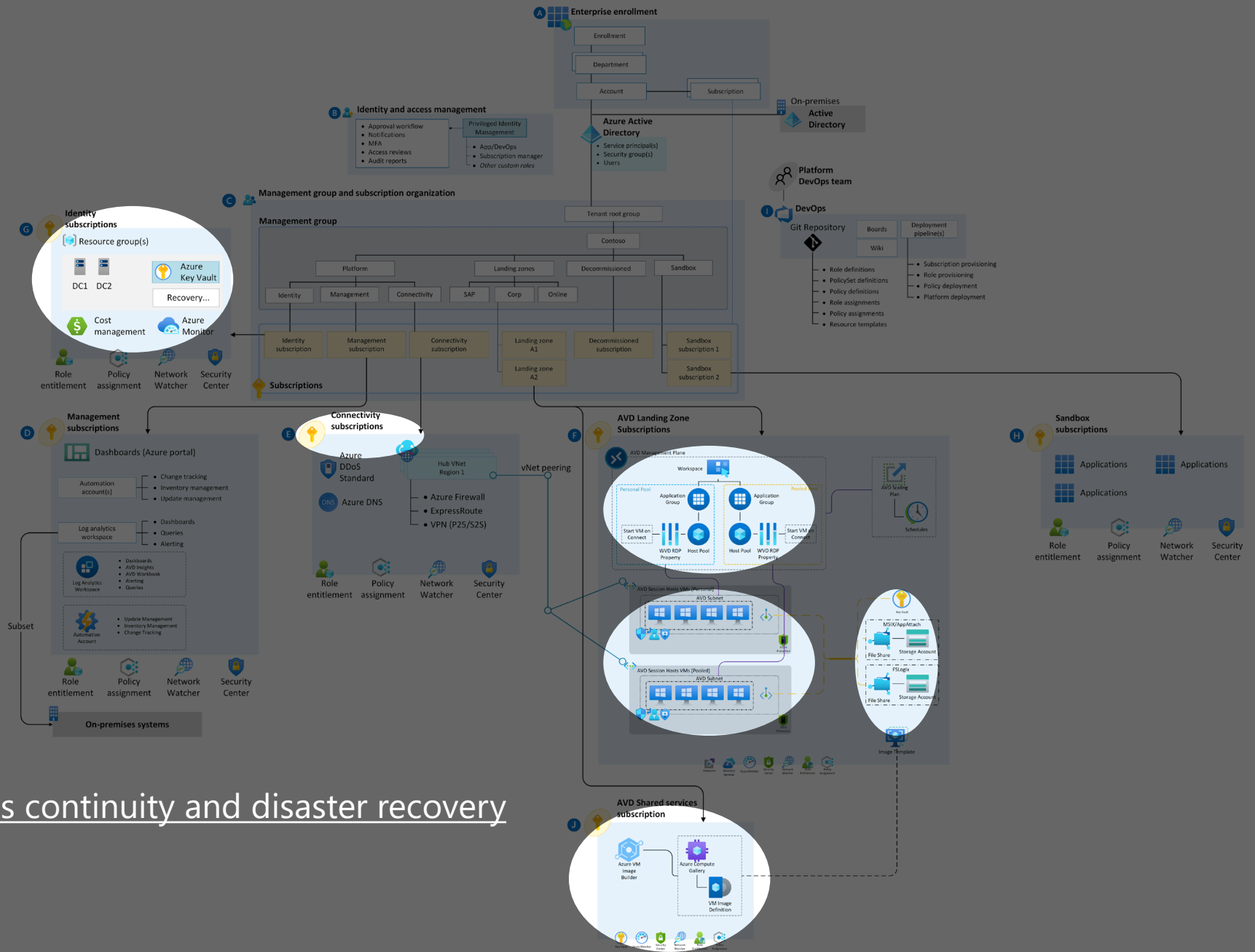

Resource organization

# Azure Virtual Desktop at Scale



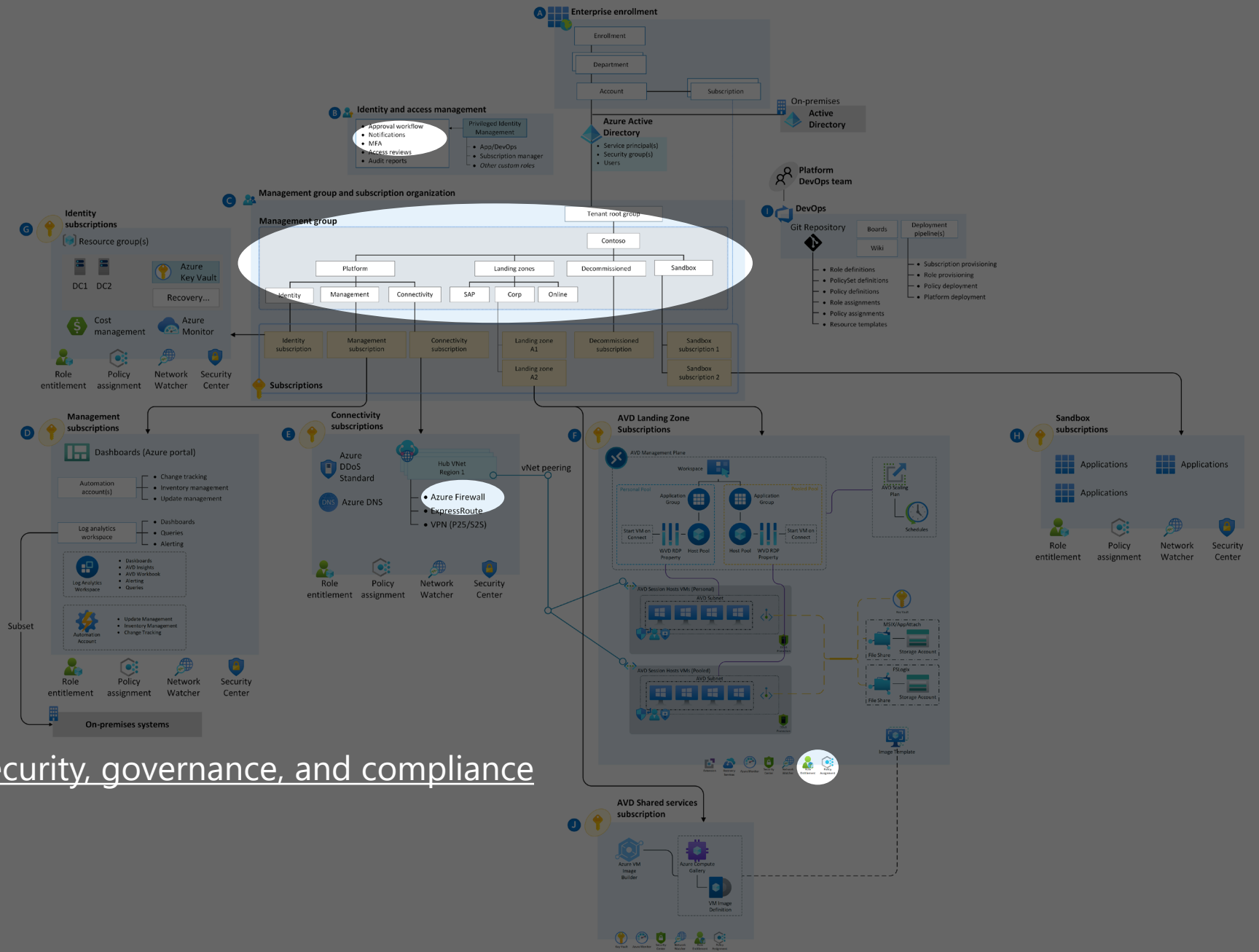

[Management and monitoring]

# Azure Virtual Desktop at Scale




Business continuity and disaster recovery

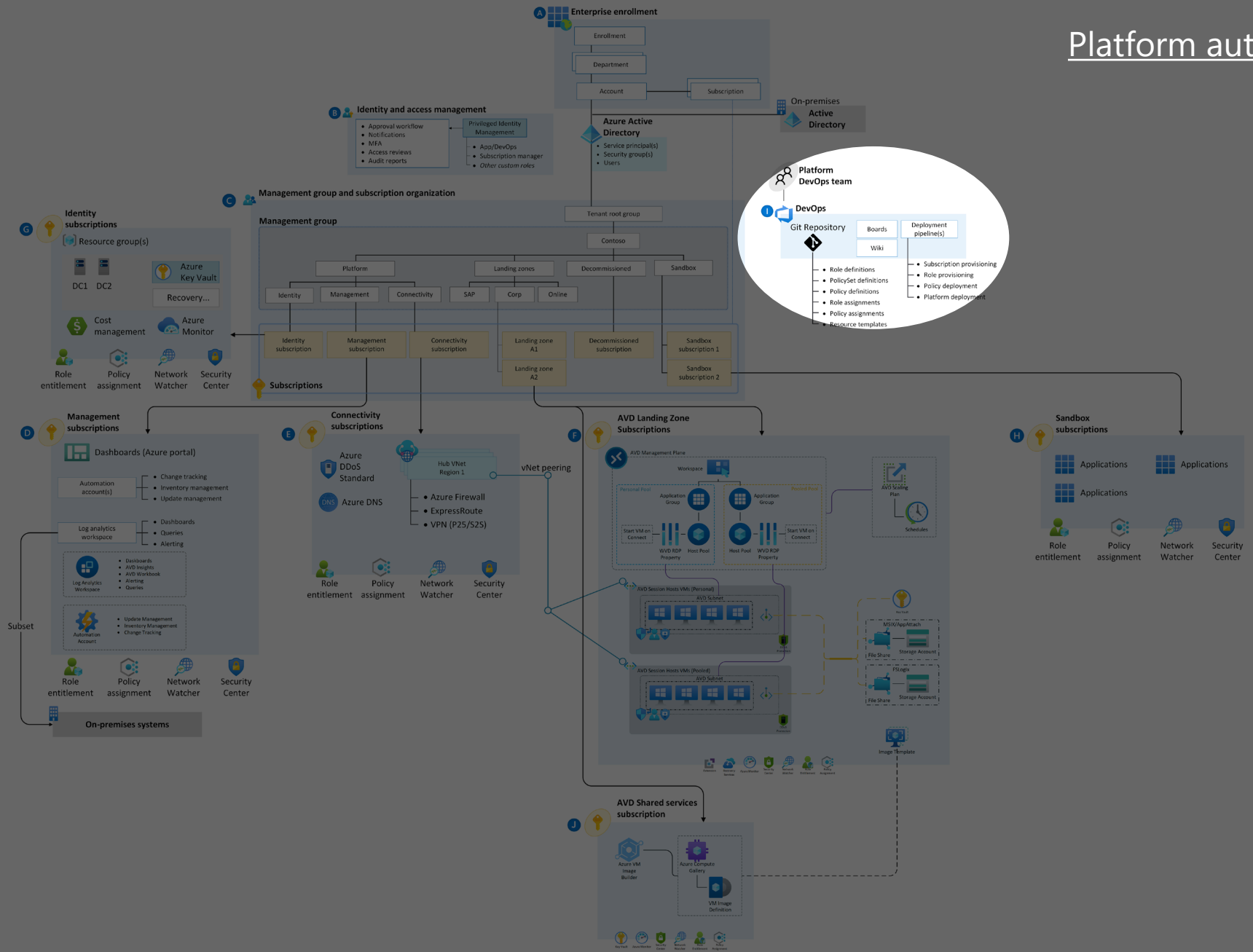
# Azure Virtual Desktop at Scale



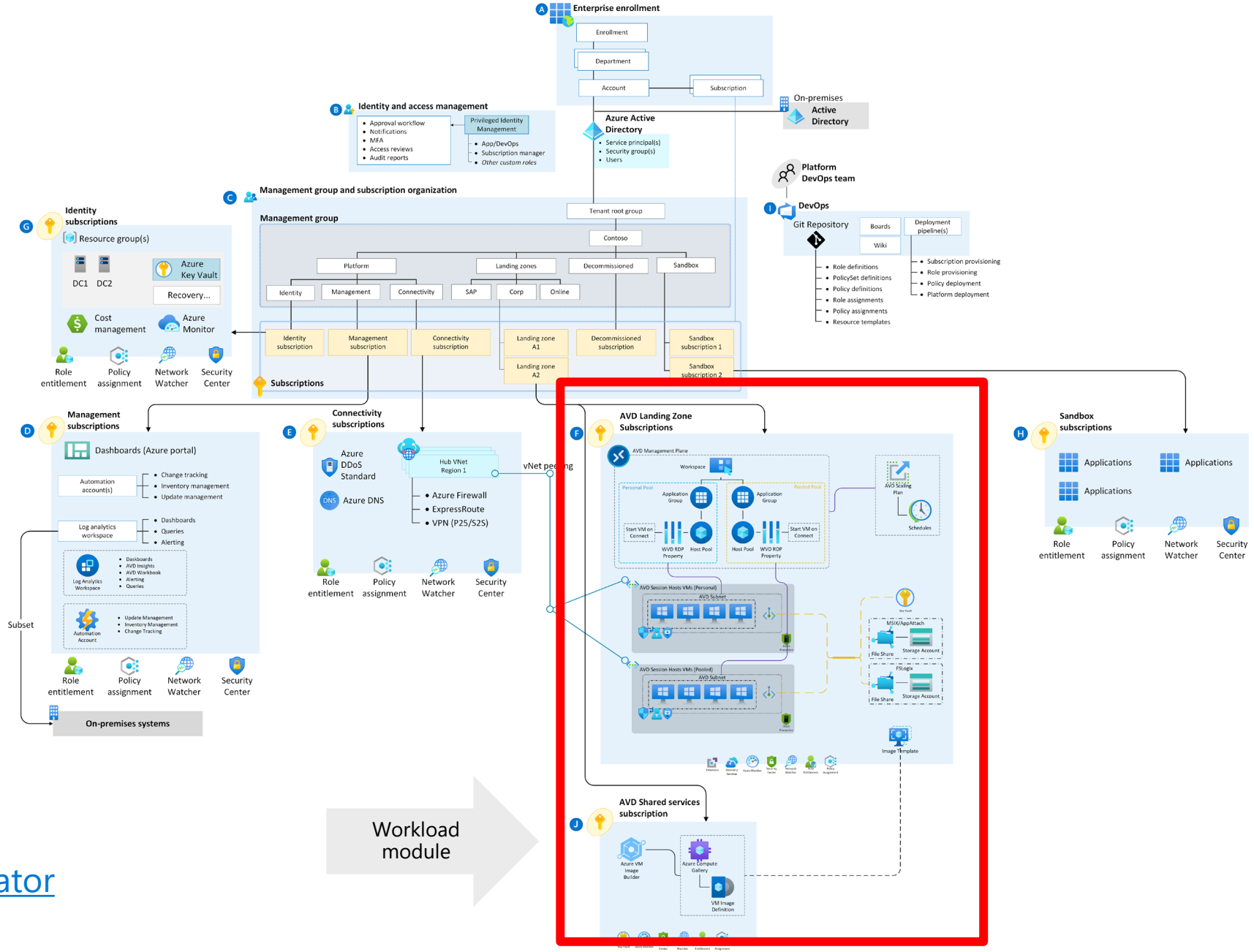

Security, governance, and compliance

# Azure Virtual Desktop at Scale

Platform automation and DevOps

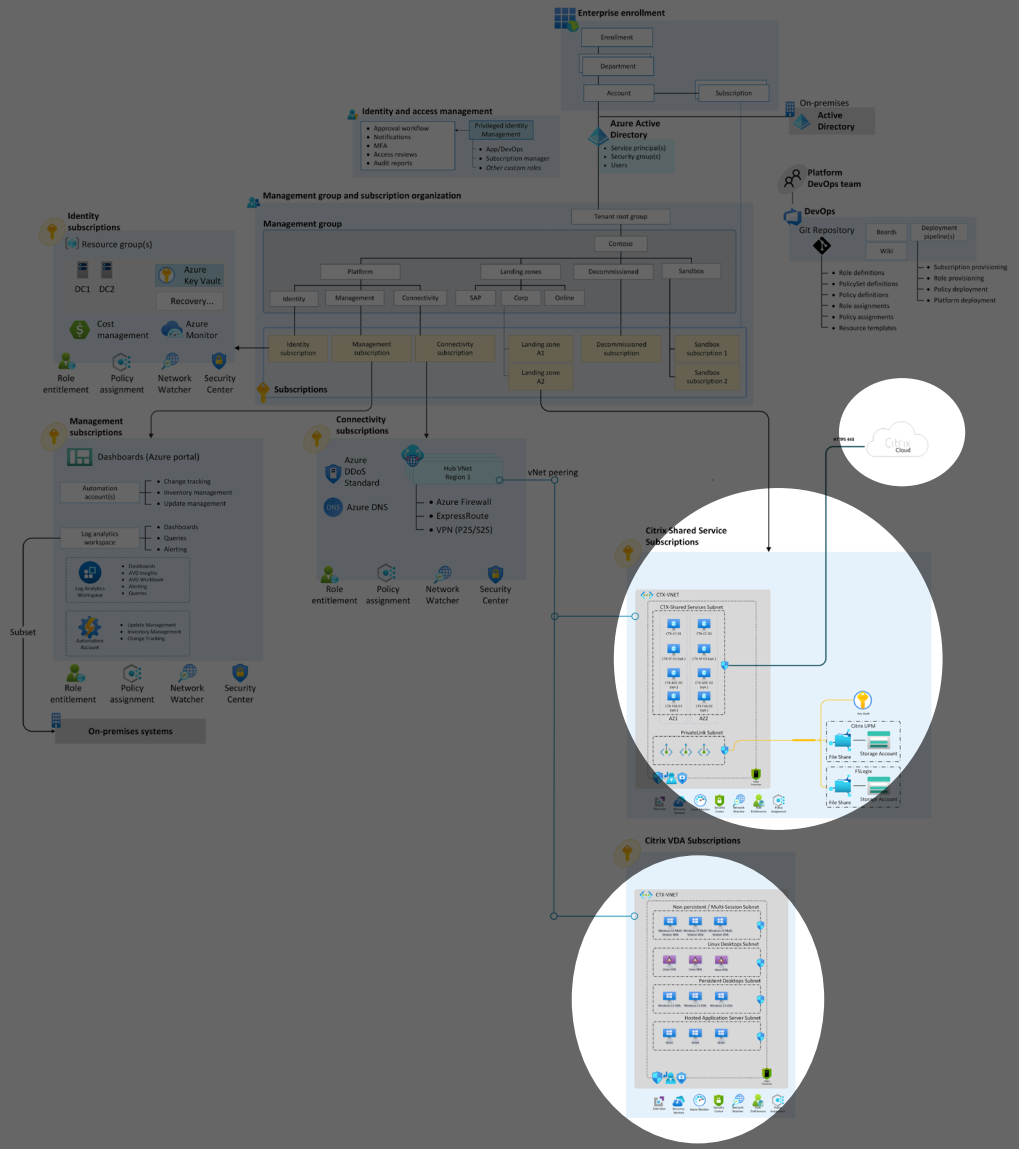


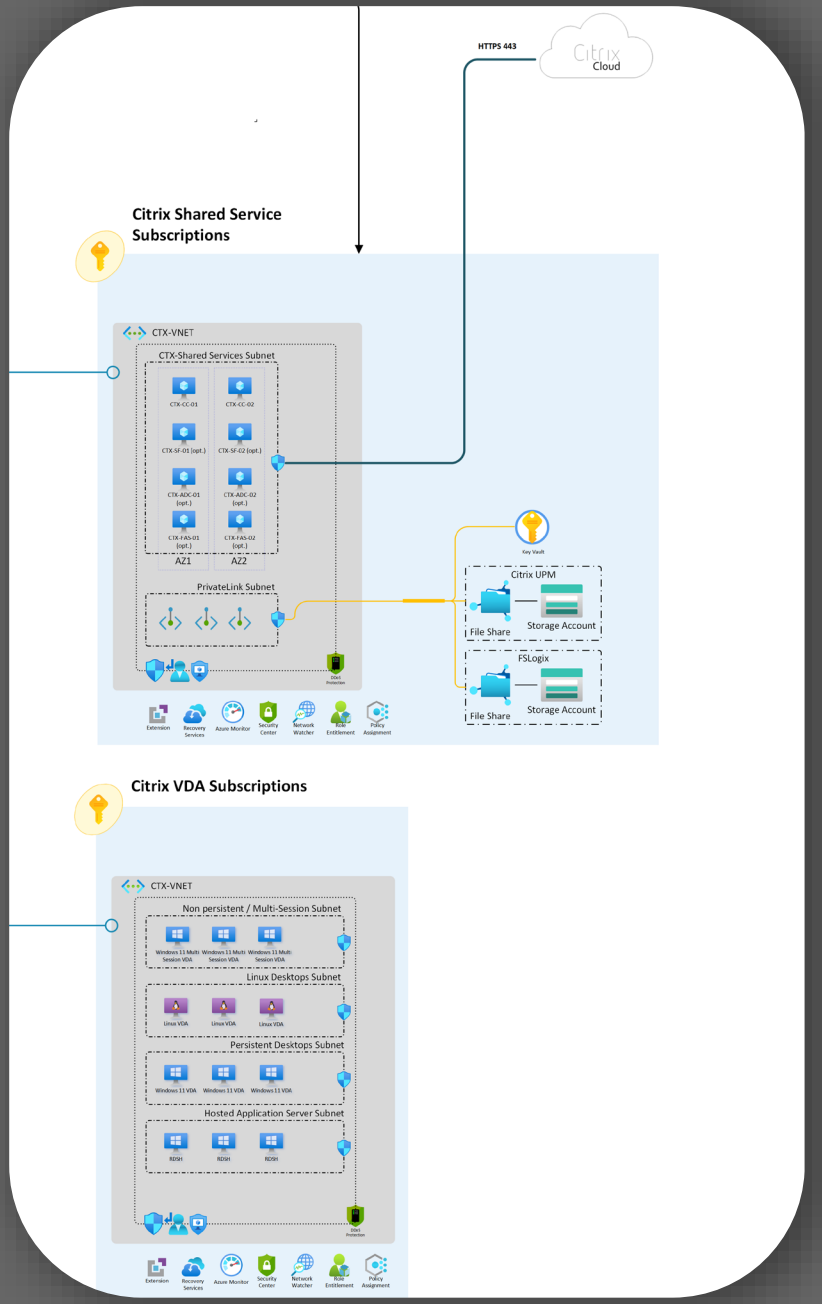
# Azure Virtual Desktop at Scale




[AVD Accelerator]

# Citrix on Azure

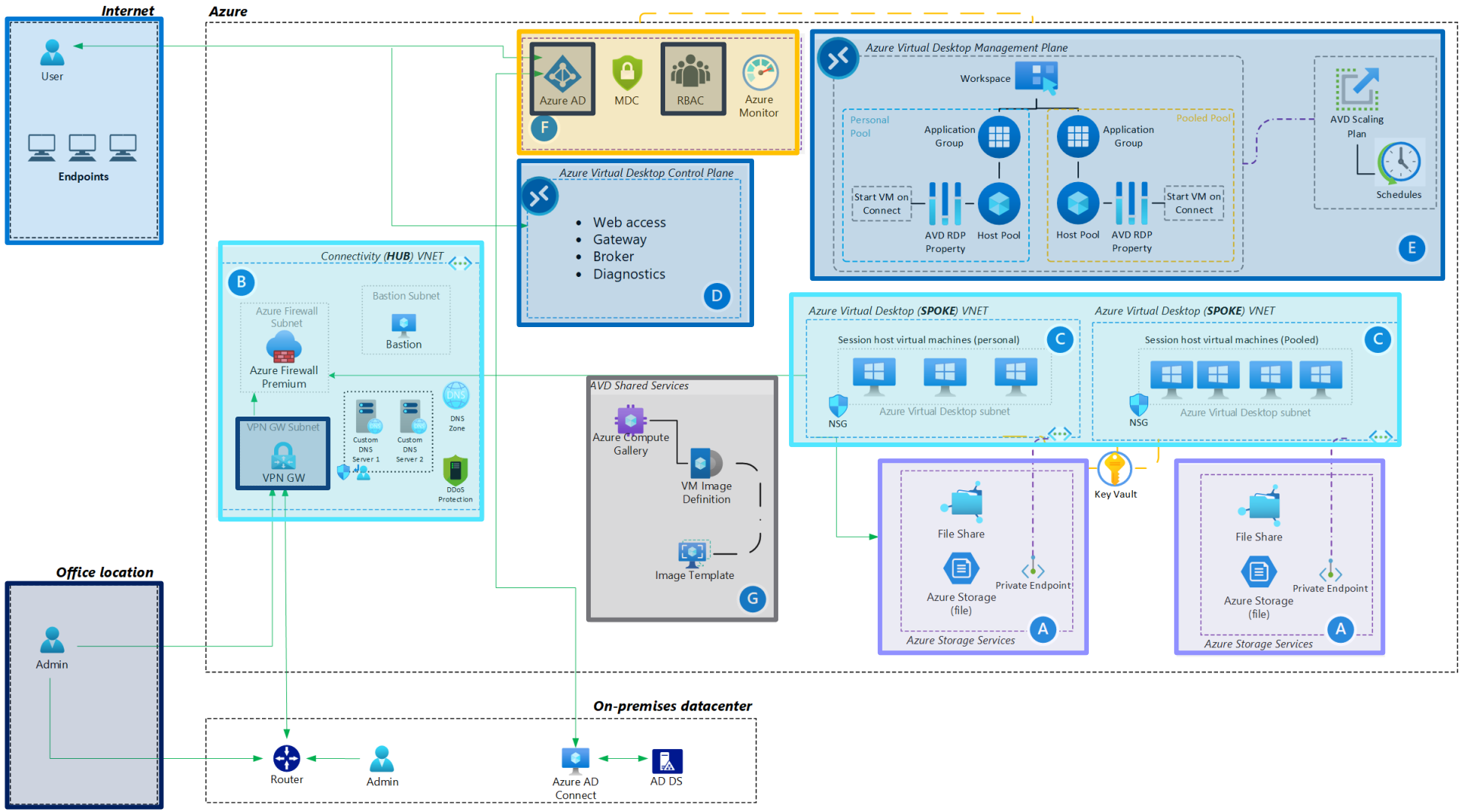



[Citrix on Azure Accelerator]

# Azure Virtual Desktop Zero Trust

# Azure Virtual Desktop Zero Trust



# How can high availability be guaranteed?

# 99.997%

Azure single-instance VM uptime

(rolling 12-month average, to April 2021)

# Outages can strike across any one of the layers of your infrastructure

## Your workload

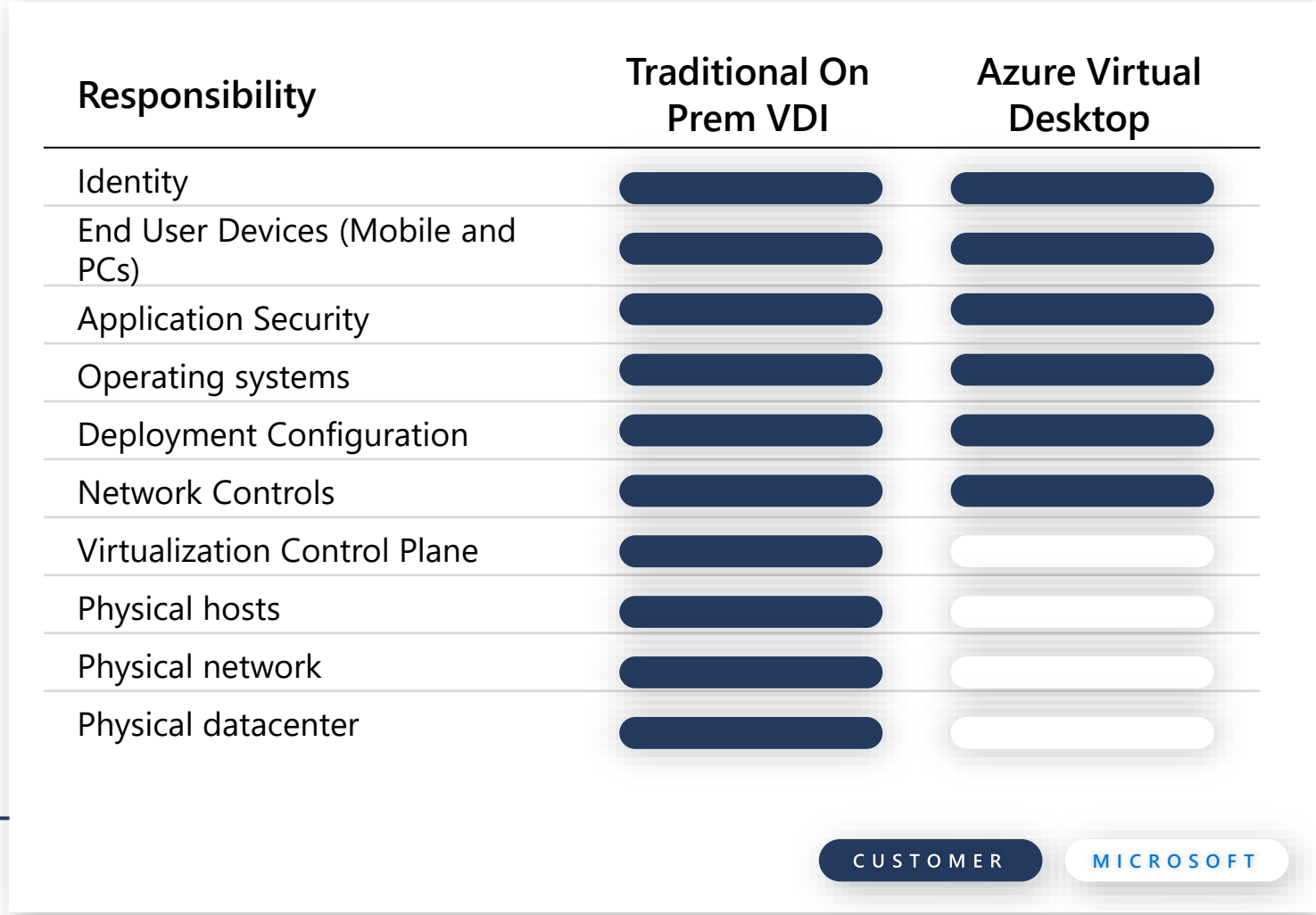
Your **workload** architecture, built on the below entities.

## Resilient services

**Built-in** Azure services for high availability, disaster recovery and backup.

## Resilient foundation

Resilient cloud **platform** on how the foundation is designed, operated, and monitored to ensure availability.



# Azure datacenter design

Microsoft has invested billions of dollars in building a highly secure, scalable, available, and sustainable cloud infrastructure on which customers can rely

**Obvious redundancies** — power utility feeds, onsite generators, battery arrays, as well as heating, ventilation and air conditioning (HVAC)

**Expanding Availability Zones (AZs)** — isolated power, networking, and cooling to provide redundancy against DC-level failures, launched in the 10 largest regions

**Open Compute Project** — sharing hardware designs with the community to learn from feedback, including our datacenter buildings and server specifications

# Why do bad things happen?

## Hardware will fail

We incorporate physical redundancies wherever possible

## Software will have bugs

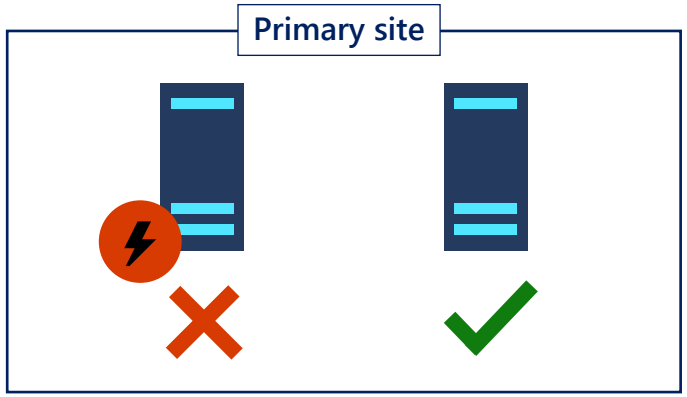
We deploy code changes cautiously to reduce the impact

## People will make mistakes

We automate people out of the equation where it makes sense

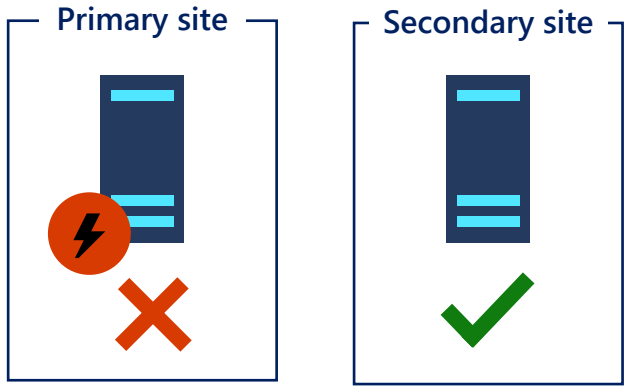
# High Availability vs. Disaster Recovery vs. Backup

These are not about avoiding failure—they're about responding to failure appropriately



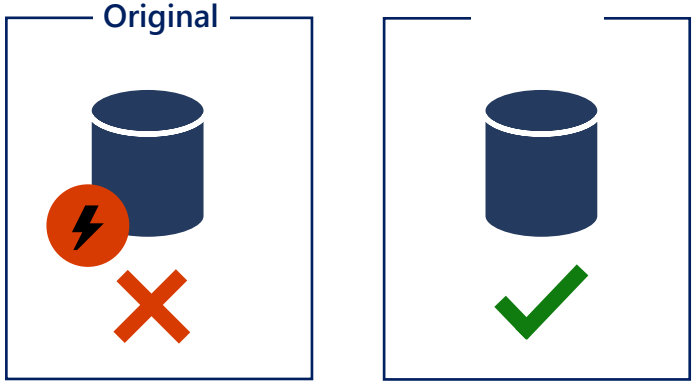

## High availability

When your applications have a catastrophic failure, run a second instance.



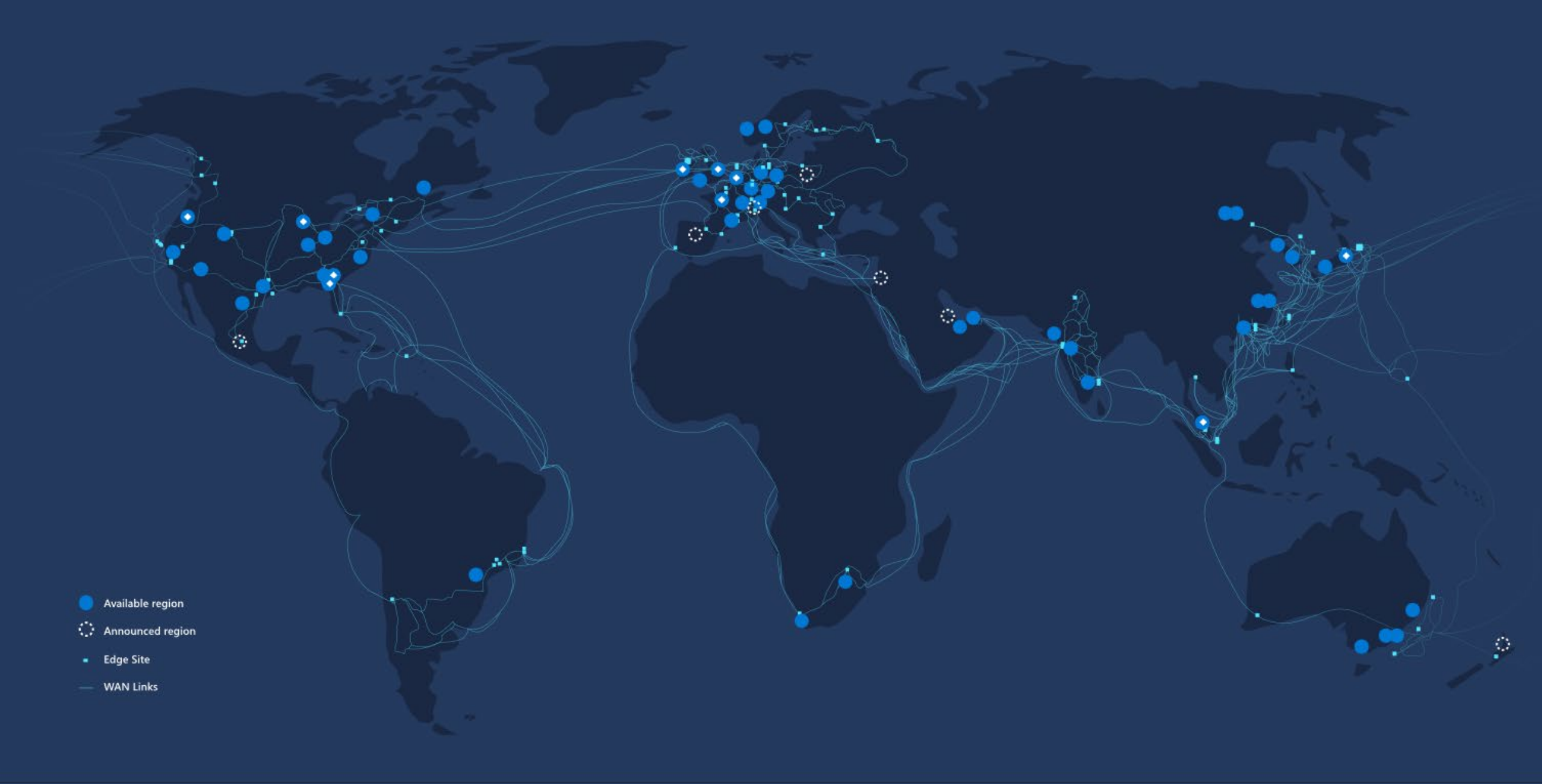

## Disaster recovery

When your applications have a catastrophic failure, run them in Azure or a secondary datacenter.




## Backup

When your data is corrupted, deleted, or lost, you can restore it.

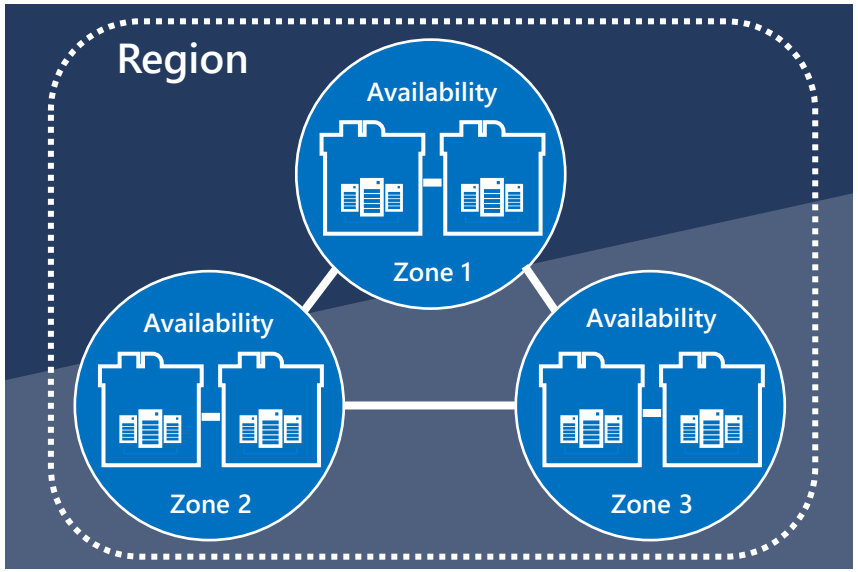

Available region
Announced region
Edge Site
WAN Links

# Azure protection options for all scenarios

Resilient from hardware, datacenter, and regional outages

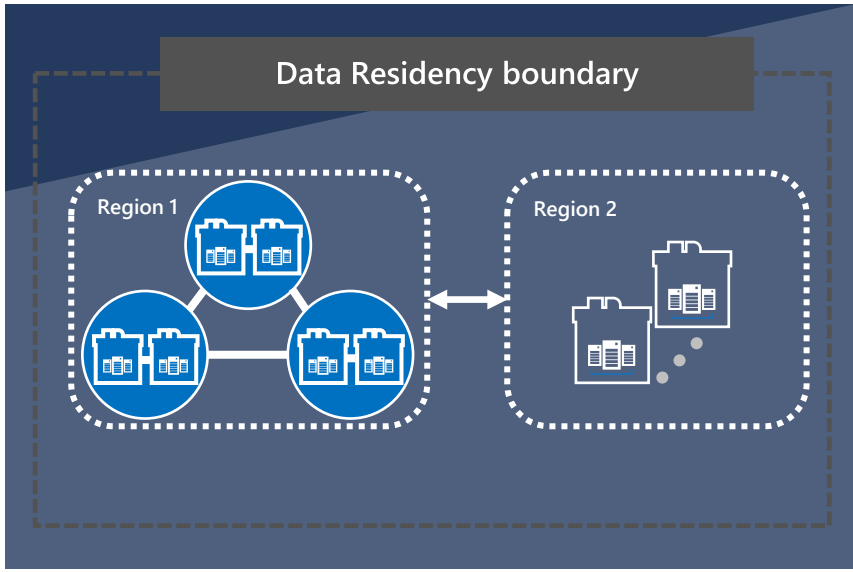

## Availability Sets

High Availability protection from hardware failures in a datacenter.




## Availability Zones

High Availability protection against loss of datacenters. Multiple datacenters per physically separated zone. Each zone features independent network, cooling, and power.

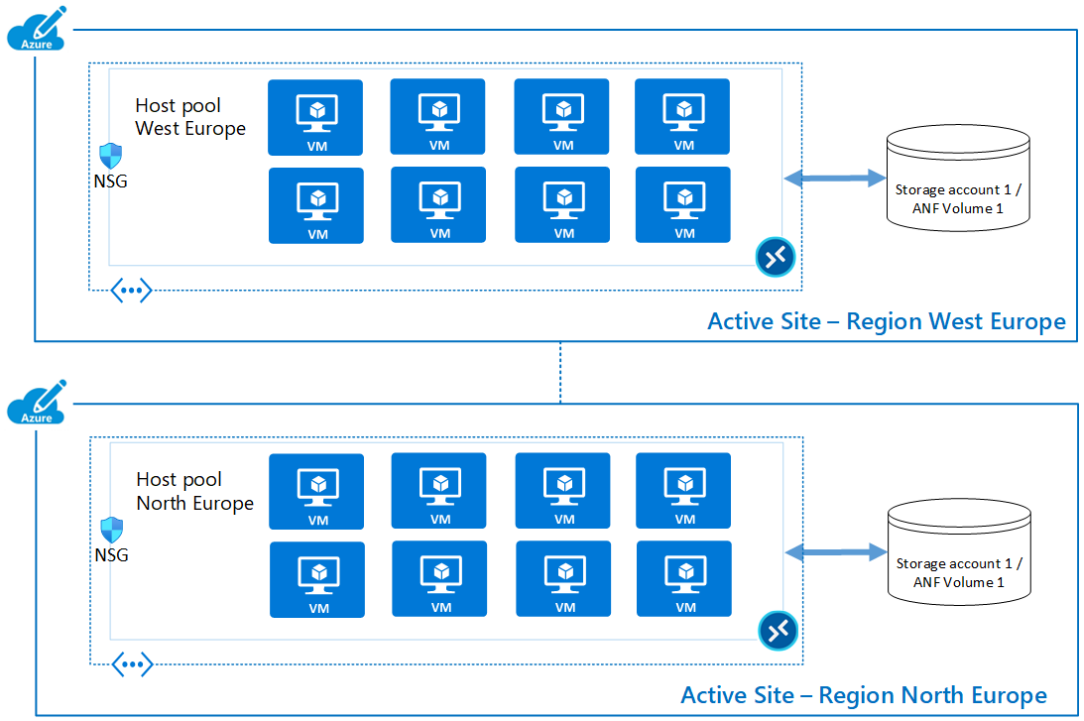



## Region Pairs

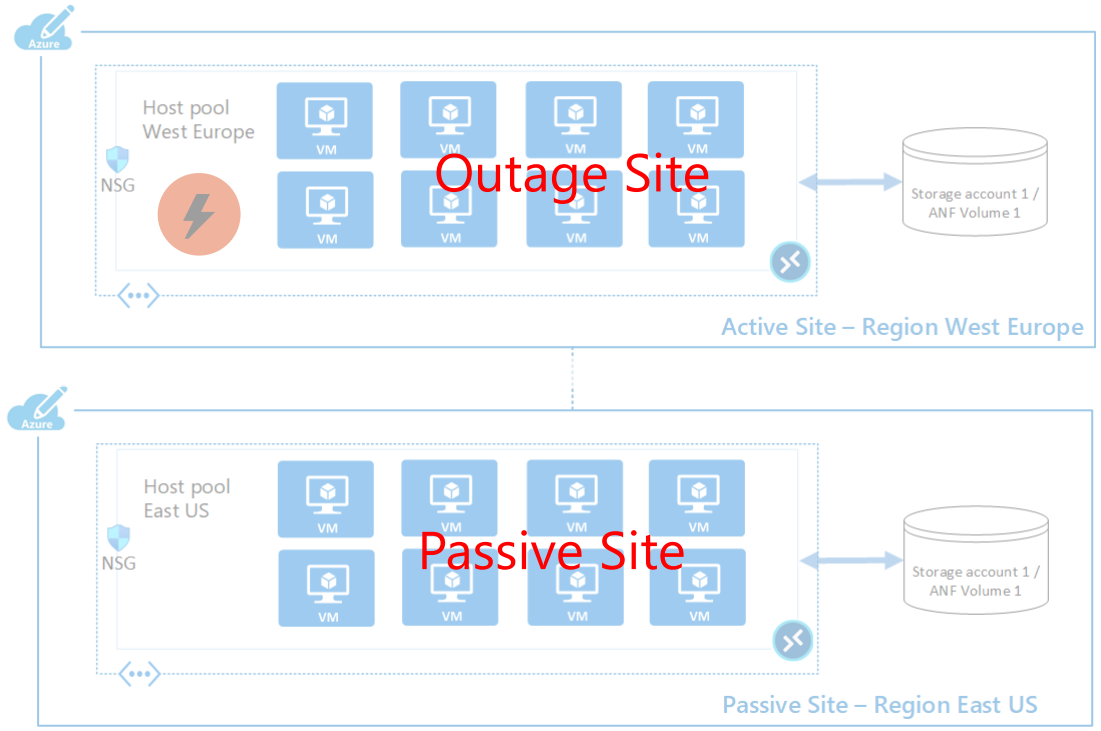
Protection for your data and applications from the loss of an entire region with Geo-redundant storage (GRS) and Azure Site Recovery.

# High-Availablity for AVD - Design considerations

Host pool active-active vs. active-passive




Host pool active-active




Host pool active-passive

https://aka.ms/avdmrbcdr

# Demo

# Is it possible to automate the Azure Virtual Desktop environment?

# What can you automate?

**AVD Objects**
Host Pools
Application Groups
Workspaces

**Session Host Deployments**

**Custom Image**

**Azure File Share for FSLogix Containers**

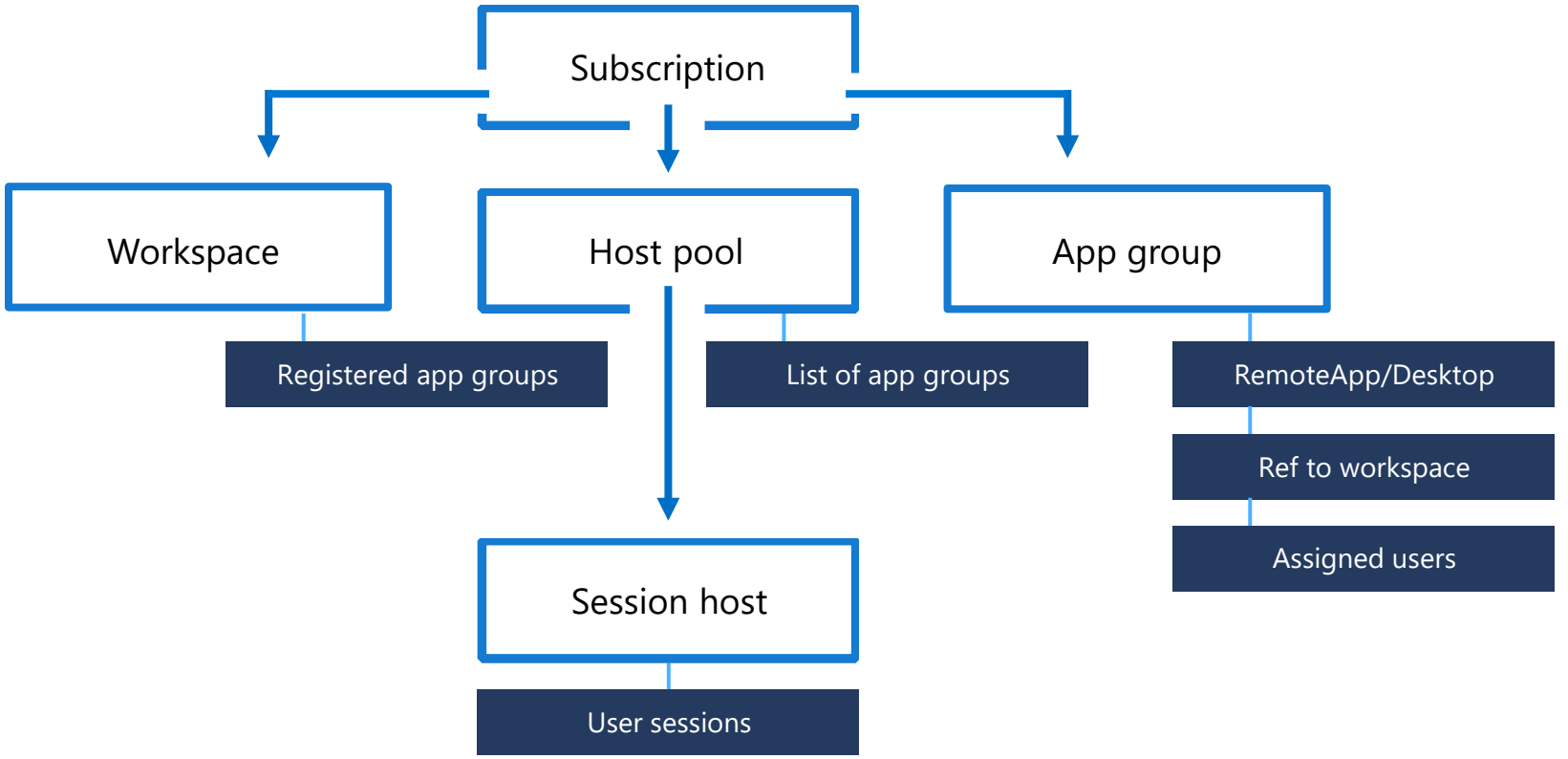
# Azure Resource Manager object model

**Workspaces** organize all AVD ARM objects (**host pool**, **workspace** and **app group**) have locations associated with them

To be associated, they all need to be in the **same location**

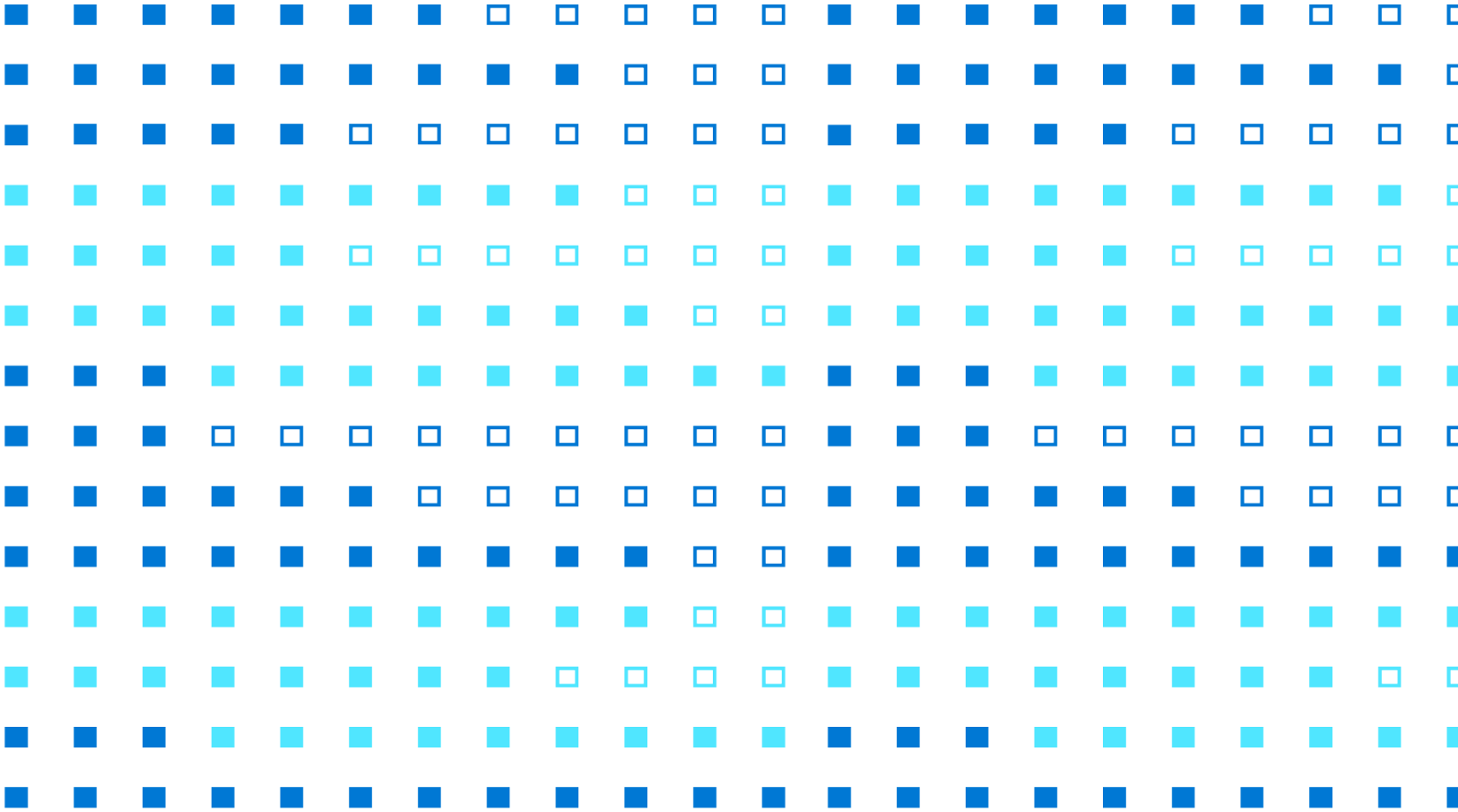
For users to access remote resources they should be **assigned to an app group**

The app group must be **registered to a workspace**



# Demo

# Pricing & licensing



# Most customers are already eligible for Azure Virtual Desktop

## Client

Customers are eligible to access Windows 10 and 11 single and multi session with Azure Virtual Desktop if they have one of the following licenses*:

| | |
|---|---|
| Microsoft 365 E3/E5 | Windows 10/11 Enterprise E3/E5 |
| Microsoft 365 A3/A5/Student Use Benefits | |
| Microsoft 365 F3 | Windows 10/11 Education A3/A5 |
| Microsoft 365 Business Premium | Windows 10/11 VDA per user |

*Customers can access Azure Virtual Desktop from their non-Windows Pro endpoints if they have a Microsoft 365 E3/E5/F3, Microsoft 365 A3/A5 or Windows 10/11 VDA per user license.

## Server

Customers are eligible to access Server workloads with Azure Virtual Desktop if they have one of the following licenses:

RDS CAL license with active Software Assurance (SA)

Pay only for the virtual machines (VMs), storage, and networking consumed when the users are using the service

Take advantage of options such as one-year or three-year Azure Reserved Virtual Machine Instances, which can save up to 72 percent versus pay-as-you-go pricing. Now with monthly payment options!

*Cost-advantaged licensing*

# Management service included with the licenses you already own

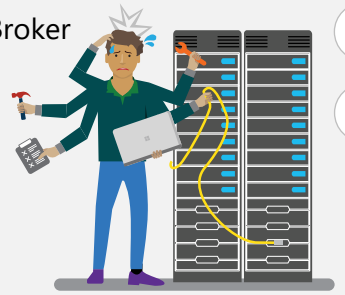
- AVD management service included with the licenses* most Microsoft customers own
- Eliminate the infrastructure cost associated with on-prem management services

## On-prem Virtualization

### Management Services deployed by IT

**Management service deployment**

- Web access
- Gateway
- Broker
- Licensing (server)
- Management
- Load balancing
- Diagnostics

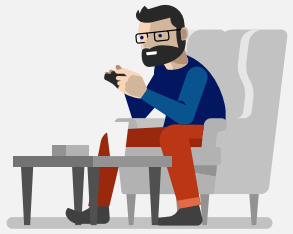


## AVD

### Management Services provided by AVD

**Management Service**

***Provided by AVD***



## Economic Benefit

***No management infrastructure needed***

***No additional licenses required***

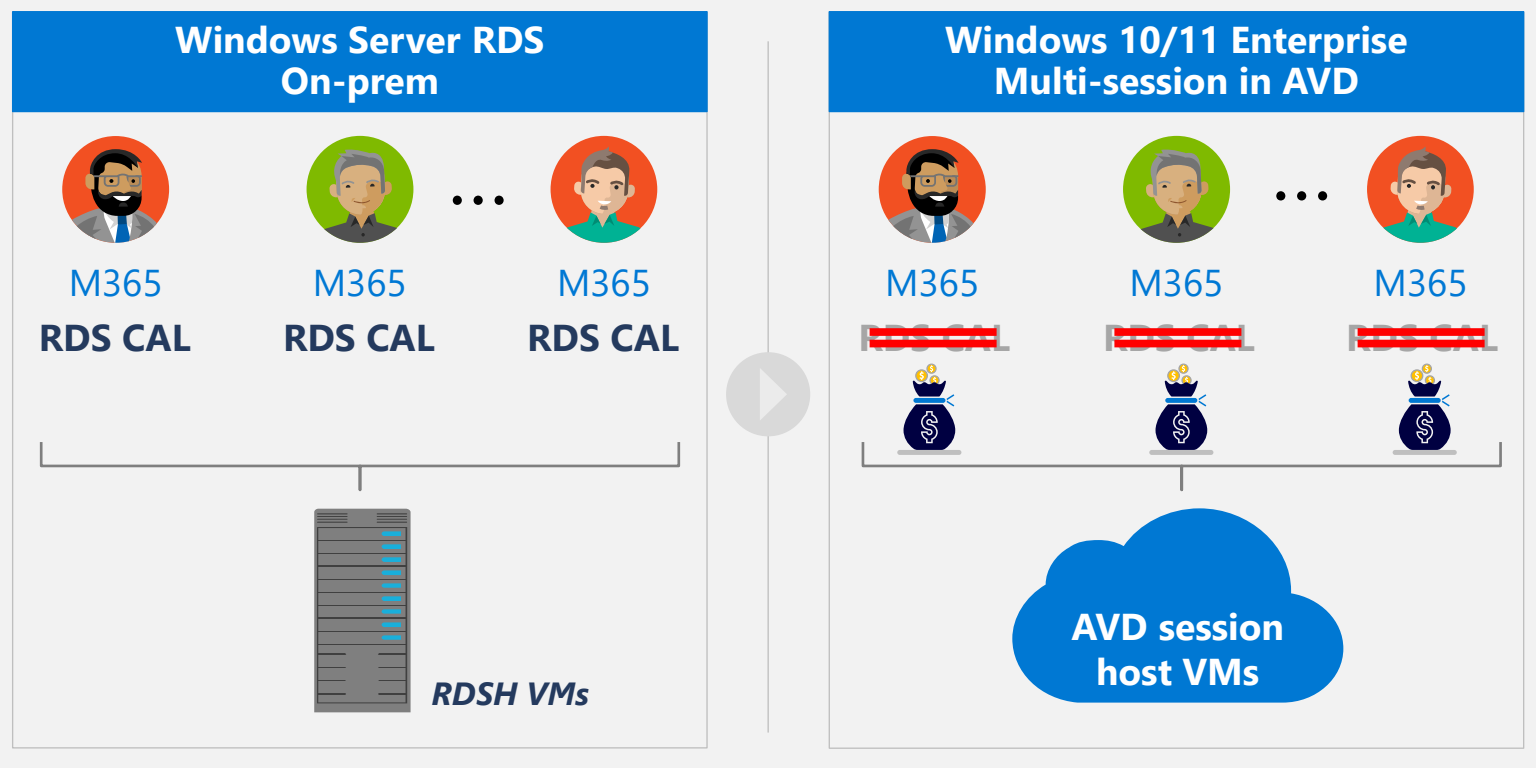
***Reduced labor cost***

*See Appendix for AVD Client licensing requirements, including specific SKUs
Note: Figures are illustrative and based on pre-configured assumptions; actual savings vary by user requirements and current licensing position
Note: Customers who require Citrix or VMware management services to meet their needs will incur additional cost

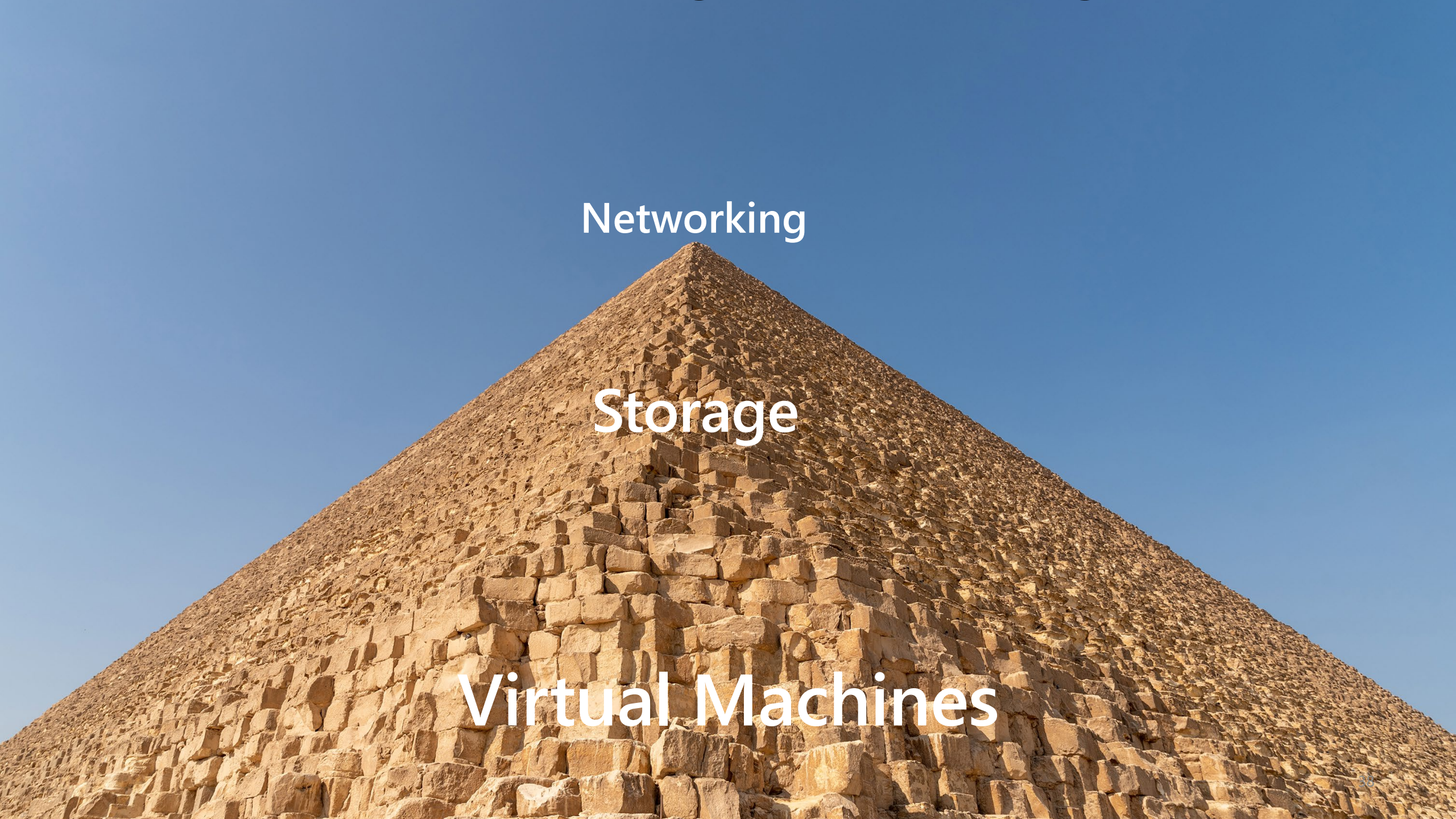
Microsoft Azure

# Savings on RDS CAL with Multi-session Deployment

Save on RDS CAL when migrating from Windows Server RDS on-prem to Windows 10/11 Enterprise multi-Session* in AVD




*Customers can leverage the license (e.g. M365 E3/E5, Win 10 E3/E5) they already own. See Appendix for a complete list of AVD licensing requirements
Note: Figures are illustrative and based on pre-configured assumptions; actual savings vary by user requirements and current licensing position
Note: Customers need to fully refactor desktops and apps when migrating from Windows Server deployment to Windows 10 multi-session in AVD


Networking
Storage
Virtual Machines

# Virtual Machines

## Virtual Machine type

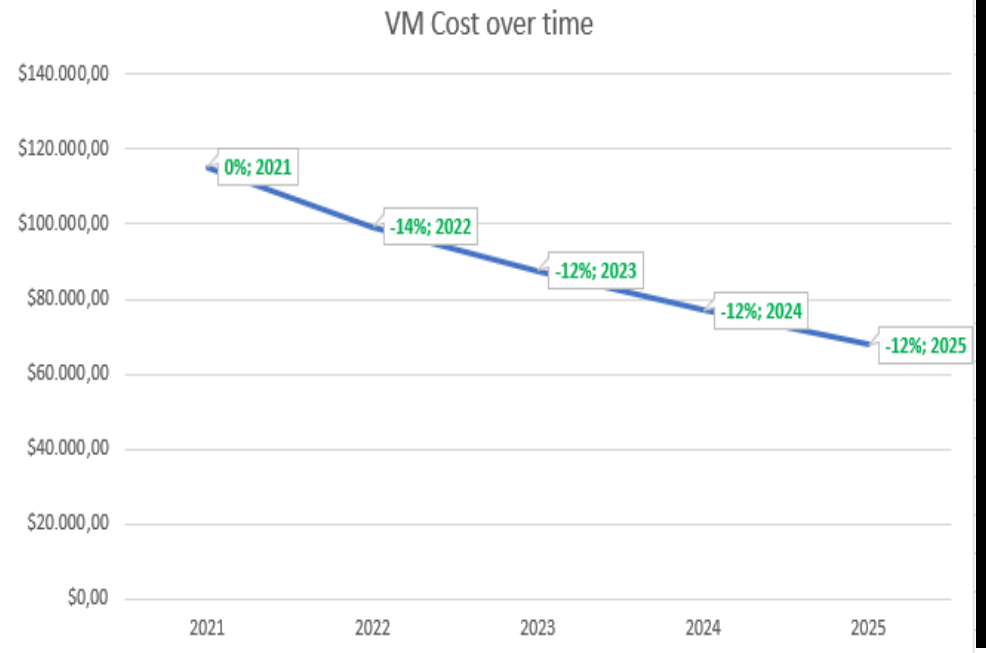
Azure resources can be optimized with scale to offer cost savings. In the case of Azure Virtual Desktop the most important resource is the VM (compute)

If we start by looking at a popular VM series for Azure Virtual Desktop, the D-series, VMs get more powerful and could be optimized to become cheaper.

Over time it can offer great cost savings (aka.ms/AzureMakesAVDCheaperOverTime)

**Select the newest VM families to help get the optimal price/performance ratio**

| | | Ds8 v3 | Ds8 v4 | Ds8 v5 | Ds8 v6? | Ds8 v7? |
|---|---|---|---|---|---|---|
| **Number of users** | **1000** | | | | | |
| **Number of users per VM** | **11** | | | | | |
| ACU increase (worst case) | | 0% | 10% | 10% | 10% | 10% |
| Number of hosts (VMs) required | | 91 | 82 | 74 | 66 | 60 |
| **Running hours** | **220** | | | | | |
| Cost of VM per hour | | $0,48 | $0,46 | $0,45 | $0,44 | $0,43 |
| | | | | | | |
| Cost per month | | $9.600,00 | $8.280,00 | $7.290,00 | $6.415,20 | $5.642,46 |
| Cost per year | | $115.200,00 | $99.360,00 | $87.480,00 | $76.982,40 | $67.709,52 |
| **Savings$ per year** | | **$0,00** | **$15.840,00** | **$11.880,00** | **$10.497,60** | **$9.272,88** |
| **Savings% per year** | | **0%** | **-14%** | **-12%** | **-12%** | **-12%** |
| | | **2021** | **2022** | **2023** | **2024** | **2025** |
| **Cummulative savings** | | **$0,00** | **$15.840,00** | **$27.720,00** | **$38.217,60** | **$47.490,48** |



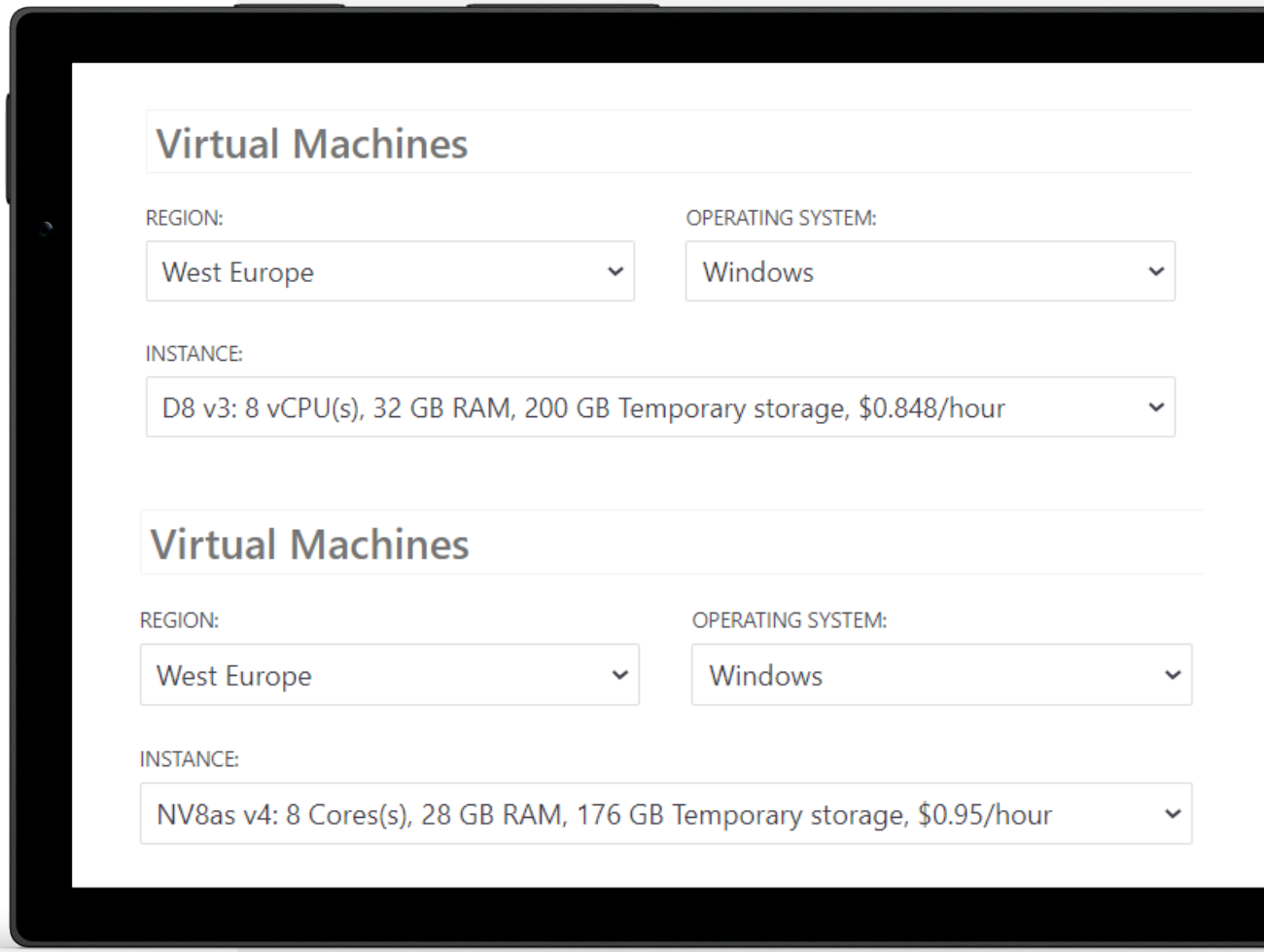
# Virtual Machines

## Virtual Machine type

Azure offers many different Virtual Machine types, where the D, F and N (with GPU) series are the most used with Azure Virtual Desktop

Because the N series VMs (aka.ms/GPUOptimizedVMSizes) have a GPU, they not only offer better graphical performance, but also offload the CPU significantly. Even if you have a moderately graphically intense workload, it'll help increase your density with a minimal increment in cost

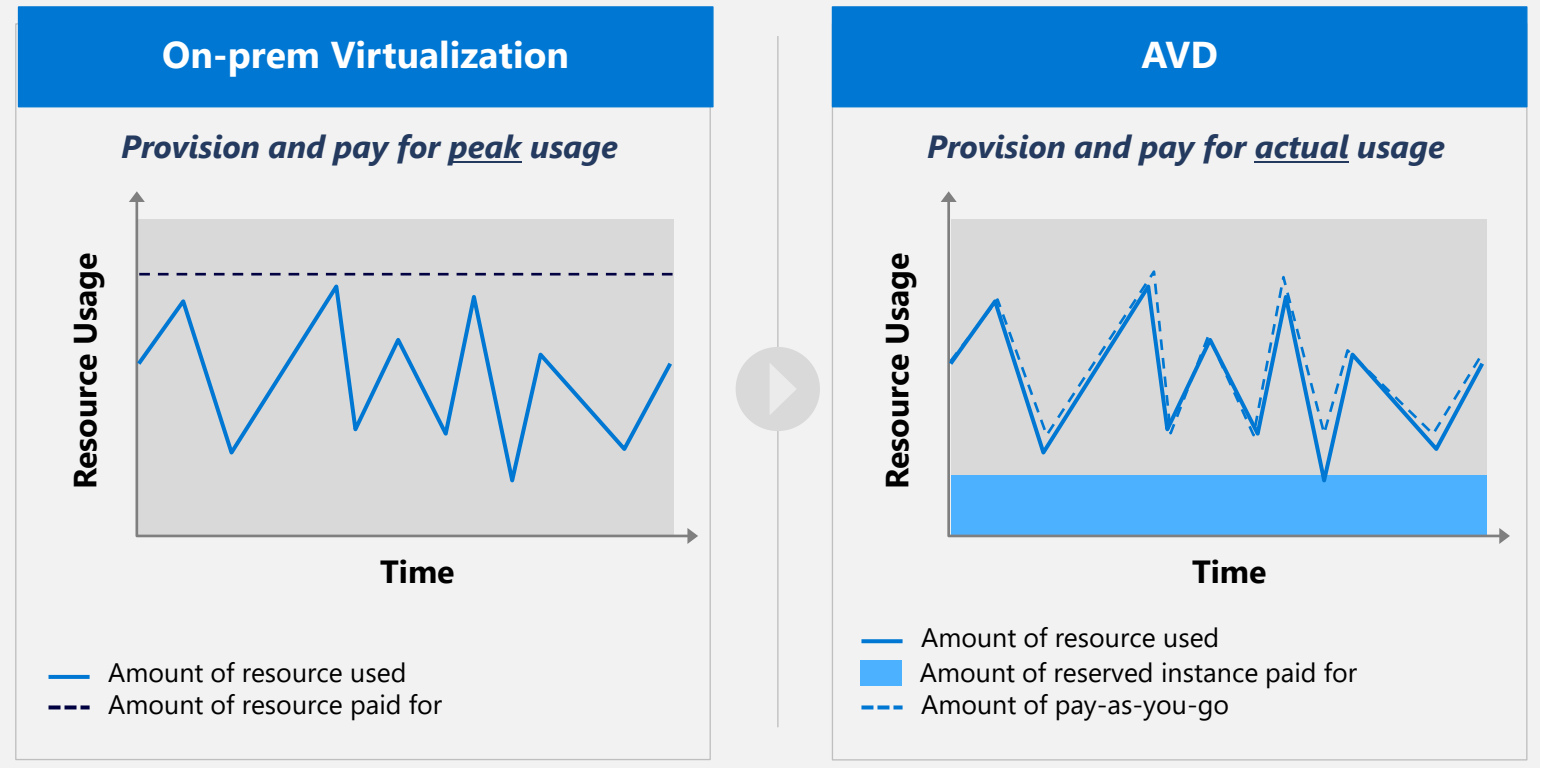
**Investigate if the N series lowers the average cost per user for your workload**



# Virtual Machines

## Usage

Pay for actual usage instead of peak usage; optimize compute by using both Pay-as-you-go and Reserved Instance




*When using Azure NetApp Files or Azure Files for storage, customers pay for actual consumed storage (vs. pay for fixed-sized disks)
Note: Figures are illustrative and based on pre-configured assumptions; actual savings vary by user requirements and infrastructure configuration

# Virtual Machines

## Reserved VM Instances

A Reserved VM Instance (aka.ms/AzureReservedVMInstances) is a 1 or 3 year—24/7, 365 days per year—reservation discount for a VM type of your choosing

Reserved instances or pay as you go?

From ~300 work hours per month a 3-year reserved instance is more financially attractive or from ~450 work hours per month for a 1-year reserved instance

| Instance size flexibility group | ArmSkuName | Ratio |
|---|---|---|
| DSv3 Series | Standard_D2s_v3 | 1 |
| DSv3 Series | Standard_D4s_v3 | 2 |
| DSv3 Series | Standard_D8s_v3 | 4 |
| DSv3 Series | Standard_D16s_v3 | 8 |
| DSv3 Series | Standard_D32s_v3 | 16 |
| DSv3 Series | Standard_D48s_v3 | 24 |
| DSv3 Series | Standard_D64s_v3 | 32 |

**But did you know that for reserved instances you can:**

- Scope across subscription(s) with tagging, enrollment/account
- Pay per month with 0% interest
- Exchange reservations
- Cancel

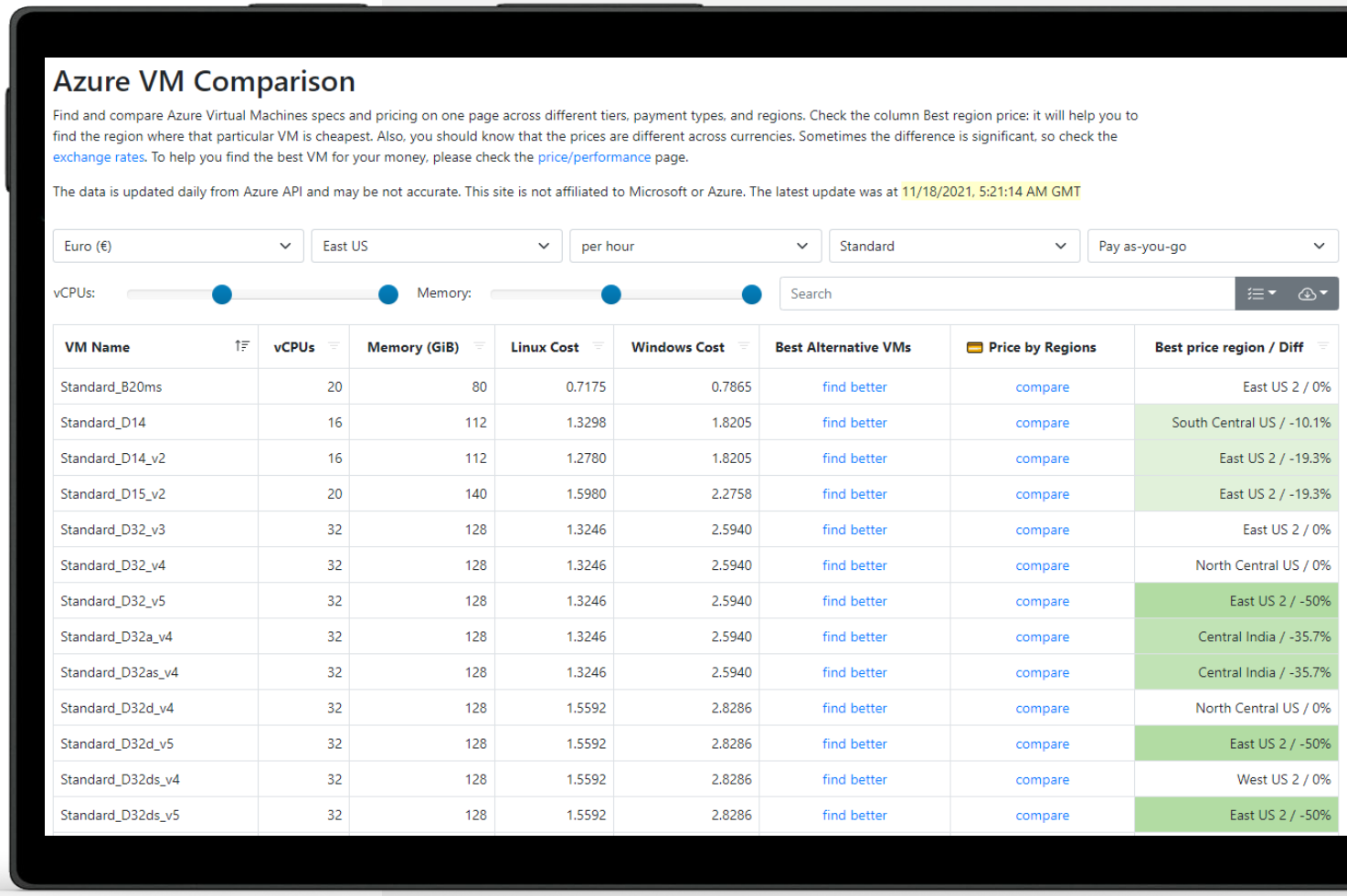
**Seriously consider Reserved VM Instances for (part of your) Azure Virtual Desktop workload**

# Virtual Machines

## Azure region

Usually, the single most important thing for the user experience is to have the virtual machines as close to the user as possible, but it's important to be aware of the different prices (aka.ms/AzureVMPriceComparison) of VMs in the different Azure regions

**Investigate if you can run a VM cheaper in another Azure region without impacting the end user experience**



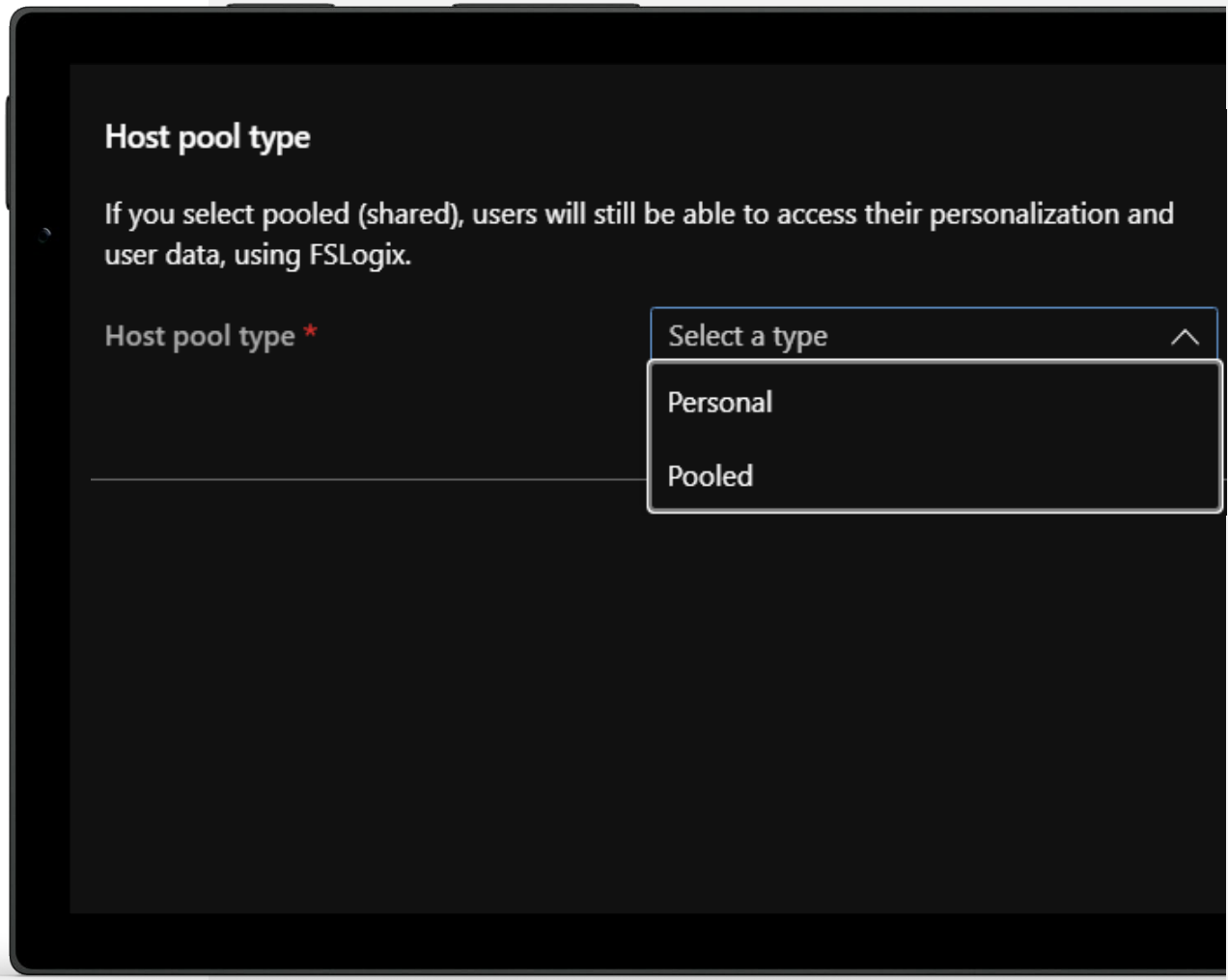

| VM Name | vCPUs | Memory (GiB) | Linux Cost | Windows Cost | Best Alternative VMs | Price by Regions | Best price region / Diff |
|---|---|---|---|---|---|---|---|
| Standard_B20ms | 20 | 80 | 0.7175 | 0.7865 | find better | compare | East US 2 / 0% |
| Standard_D14 | 16 | 112 | 1.3298 | 1.8205 | find better | compare | South Central US / -10.1% |
| Standard_D14_v2 | 16 | 112 | 1.2780 | 1.8205 | find better | compare | East US 2 / -19.3% |
| Standard_D15_v2 | 20 | 140 | 1.5980 | 2.2758 | find better | compare | East US 2 / -19.3% |
| Standard_D32_v3 | 32 | 128 | 1.3246 | 2.5940 | find better | compare | East US 2 / 0% |
| Standard_D32_v4 | 32 | 128 | 1.3246 | 2.5940 | find better | compare | North Central US / 0% |
| Standard_D32_v5 | 32 | 128 | 1.3246 | 2.5940 | find better | compare | East US 2 / -50% |
| Standard_D32a_v4 | 32 | 128 | 1.3246 | 2.5940 | find better | compare | Central India / -35.7% |
| Standard_D32as_v4 | 32 | 128 | 1.3246 | 2.5940 | find better | compare | Central India / -35.7% |
| Standard_D32d_v4 | 32 | 128 | 1.5592 | 2.8286 | find better | compare | North Central US / 0% |
| Standard_D32d_v5 | 32 | 128 | 1.5592 | 2.8286 | find better | compare | East US 2 / -50% |
| Standard_D32ds_v4 | 32 | 128 | 1.5592 | 2.8286 | find better | compare | West US 2 / 0% |
| Standard_D32ds_v5 | 32 | 128 | 1.5592 | 2.8286 | find better | compare | East US 2 / -50% |

# Virtual Machines

## Pooled vs. personal

| | Pooled<br>Windows 10/11<br>multi-session | Pooled<br>Win10/11<br>single session | Personal<br>Win10/11 |
|---|---|---|---|
| Application compatibility | ●● | ●●● | ●●●● |
| Windows 10/11 experience | ●●● | ●●● | ●●● |
| User can install applications | ● | ● | ●●● |
| Low cost | ●●●●●● | ●●● | ● |

Use pooled wherever possible



Introducing

# Azure Virtual Desktop for Azure Stack HCI (preview)

## Extending the benefits of cloud-managed VDI to on-premises

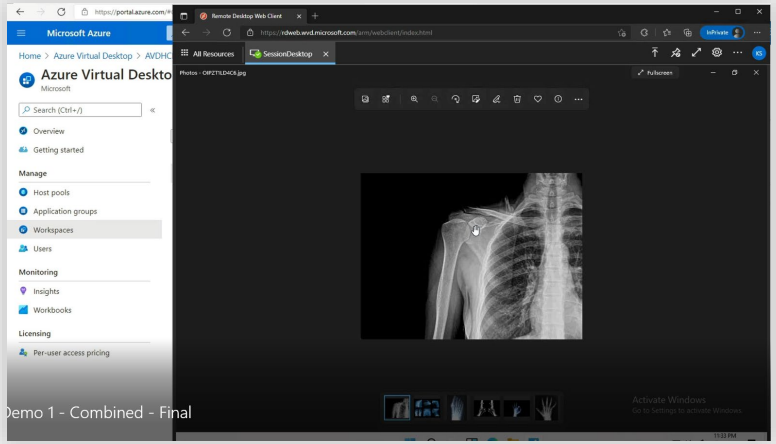
Meet unique performance and data locality requirements with on-premises desktop and app virtualization

Centralized, cloud-based management for virtual desktops and applications

The only VDI solution with full Windows 10 or 11 multi-session support for cost optimization

Seamless integration with Microsoft 365 and Teams

End-user access from virtually anywhere




Microsoft Azure

# Virtual Machines

## Pooled OS: Windows 10/11 multi-session vs. Windows Server

| | Win10/11 multi-session | Windows Server |
|---|---|---|
| **RDCAL with SA required?** | **No** | **Yes** |
| Microsoft 365 Apps Support end date | No | Yes (Oct 2026) |
| Best application compatibility | Yes | No |
| Regular feature updates | Yes | No |

Use Windows 10/11 multi-session whenever possible

**If you have applications that do not work on Windows 10/11 multi-session, you can use the AppAssure (aka.ms/AppAssure) program to get free help to make it work**

Use Microsoft AppAssure to increase your usage of Windows 10/11 multi-session

# Virtual Machines

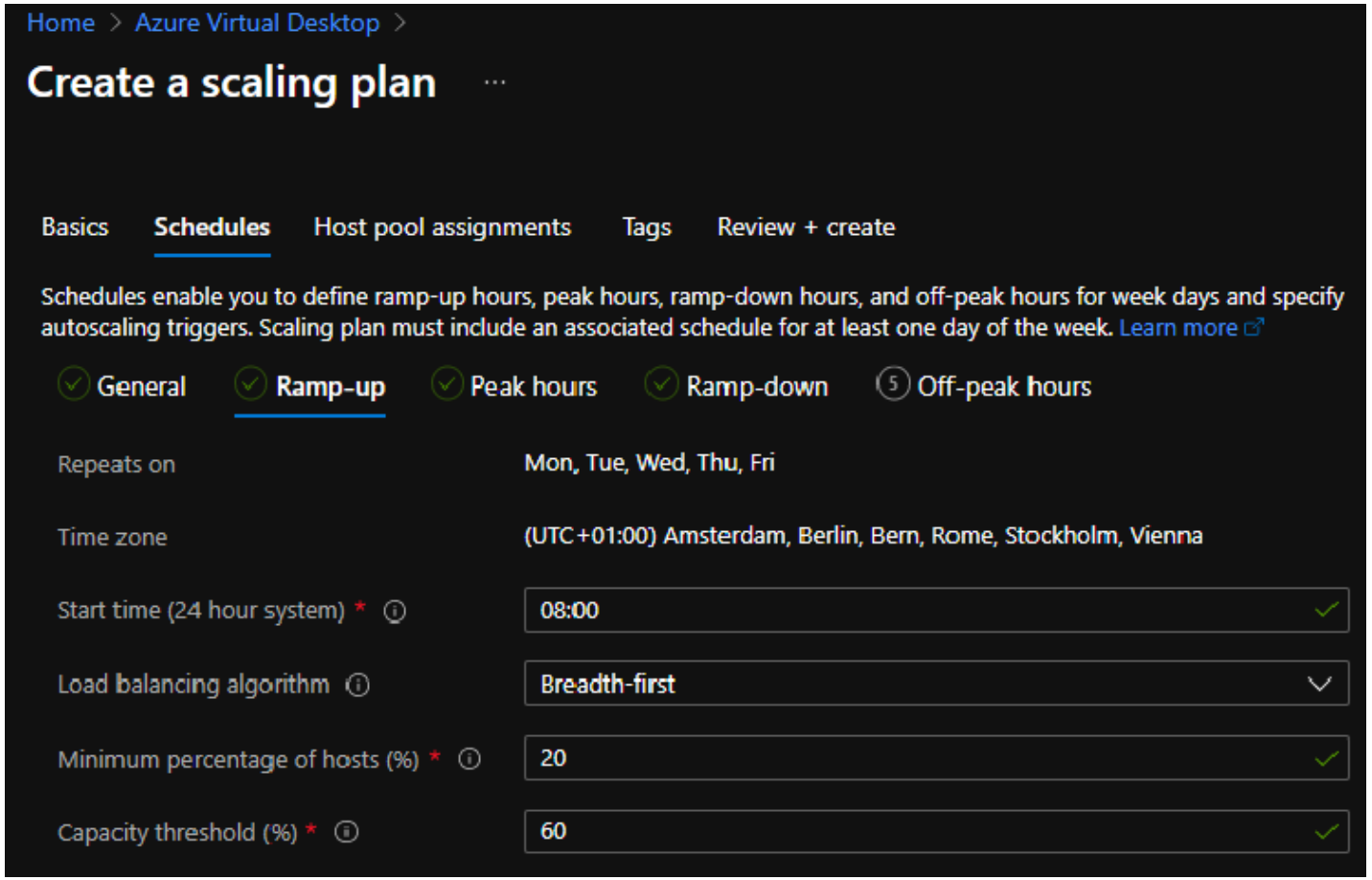
## Scaling & load balancing


### For pooled scenarios:

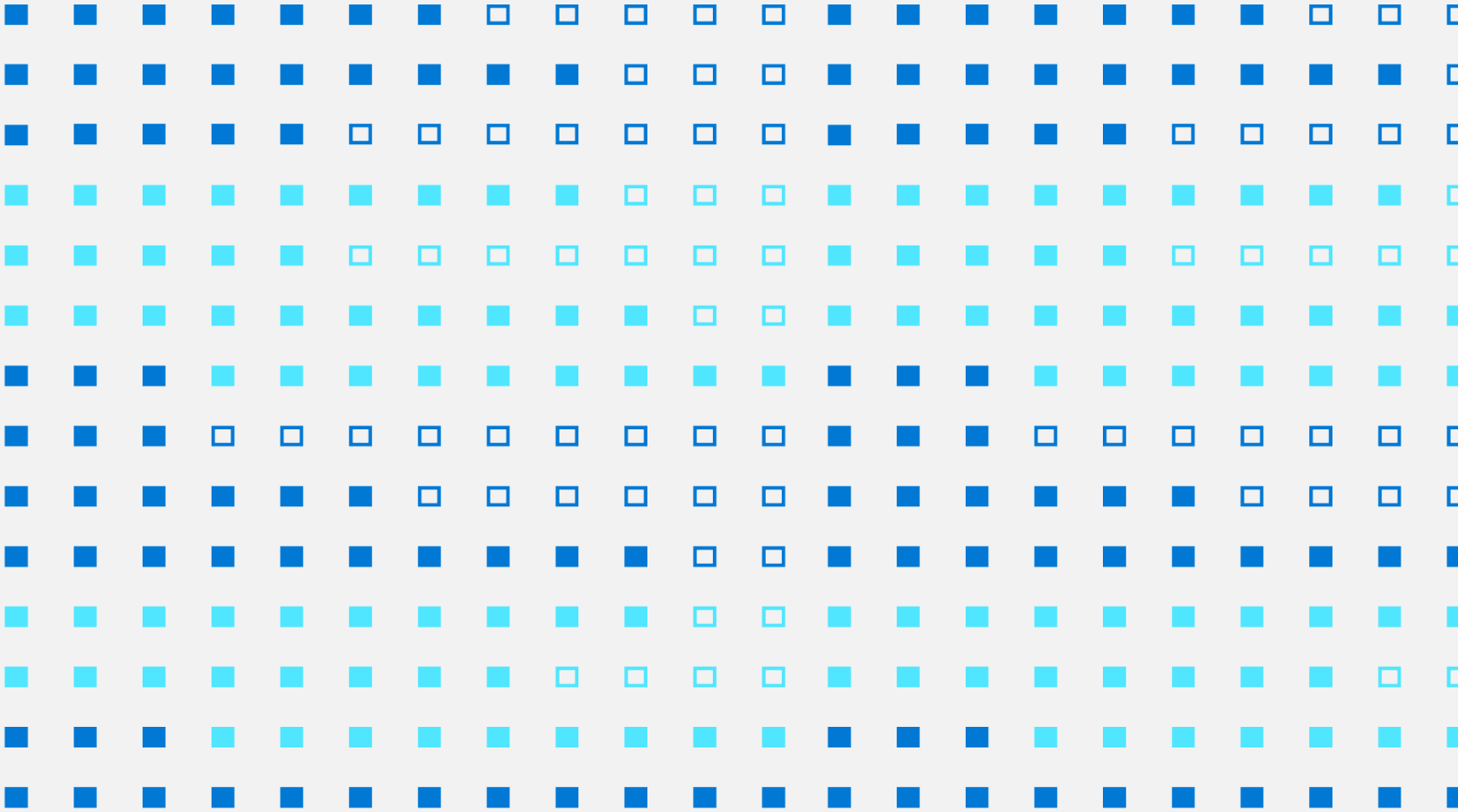
- Use Azure Virtual Desktop scaling plans to help achieve optimal mix of available hosts and lowest costs

### For personal scenarios:

- Use power on connect to only start personal desktops when users need them
- Shut down & deallocate personal desktops when they are not being used



# Storage



# Storage

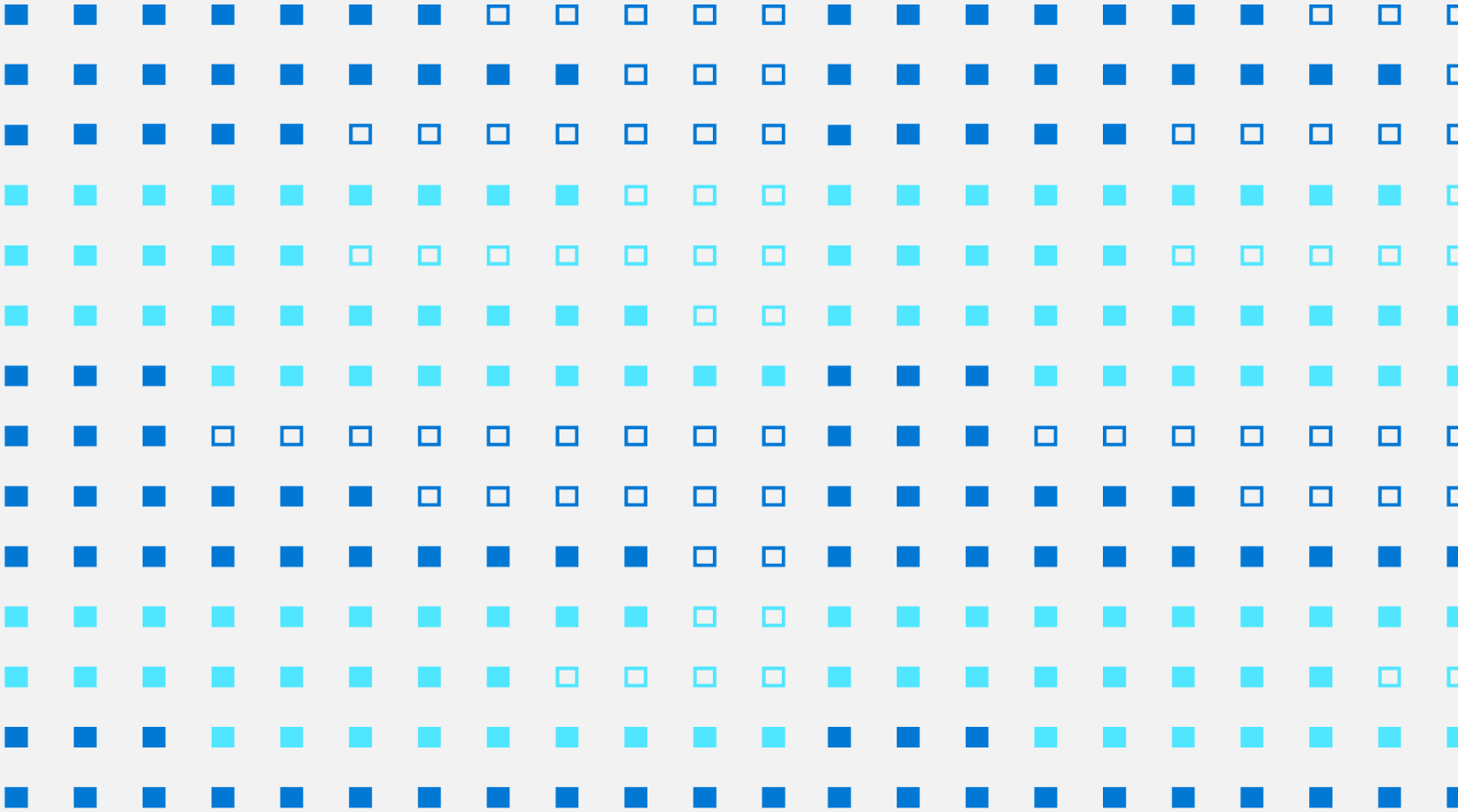
## OS disk type

Each Azure Virtual Desktop VM needs an OS disk. The table below compares the different options at a high level (more details here (aka.ms/AzureManagedDiskTypes)

| | Premium SSD | SSD | HDD | *Ephemeral Disk |
|---|---|---|---|---|
| SLA + HA | ●●● | ●● | ●● | ● |
| IOPS & throughput | ●● | ●● | ● | ●●● |
| Flexibility | ●●● | ●● | ●● | ● |
| Low cost | ● | ●● | ●●● | ●●●●● |

*Use Ephemeral disks (free) to save costs if your scenario allows it

# Networking

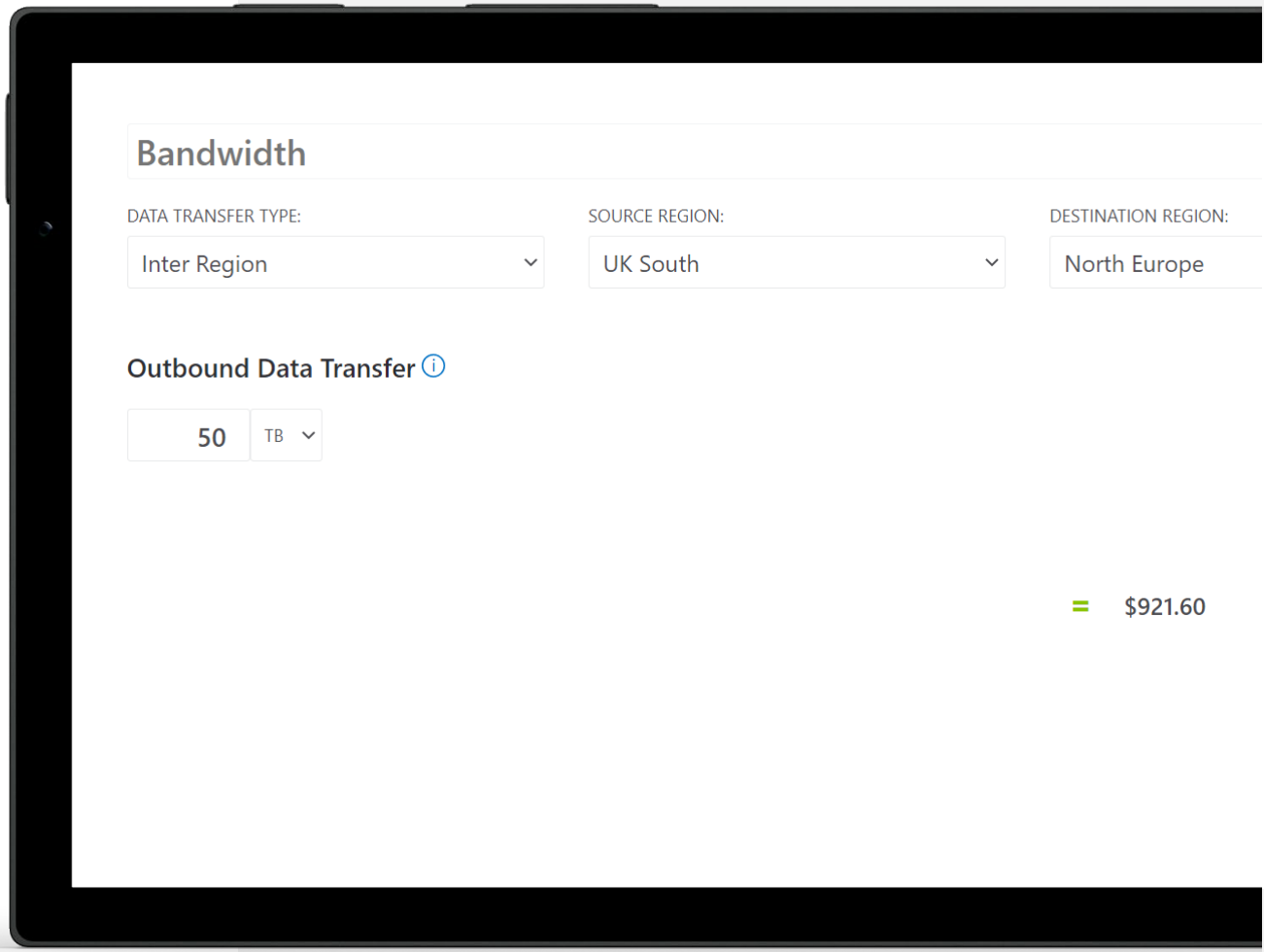


Microsoft Azure

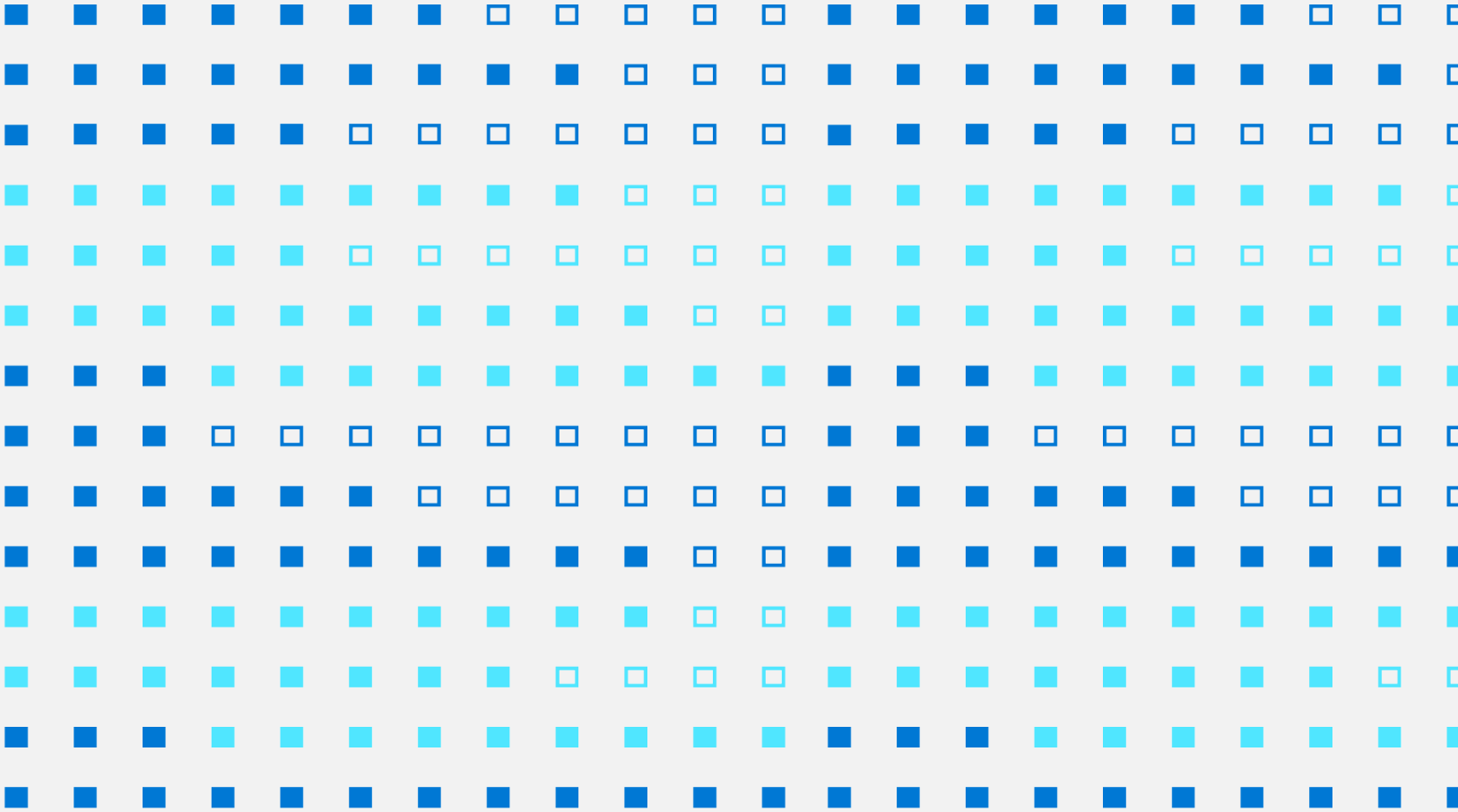
# Networking

## Inter-Azure traffic

- Try to place VMs in an Azure region where there is an Azure Virtual Desktop Control Plane, if possible
- Investigate if you can meet your security requirements without forced tunneling to an on-premises environment
- For large deployments, calculate (aka.ms/AzureExpressRoutePricing) if an unlimited Express Route is cheaper



# Cost estimation and tracking



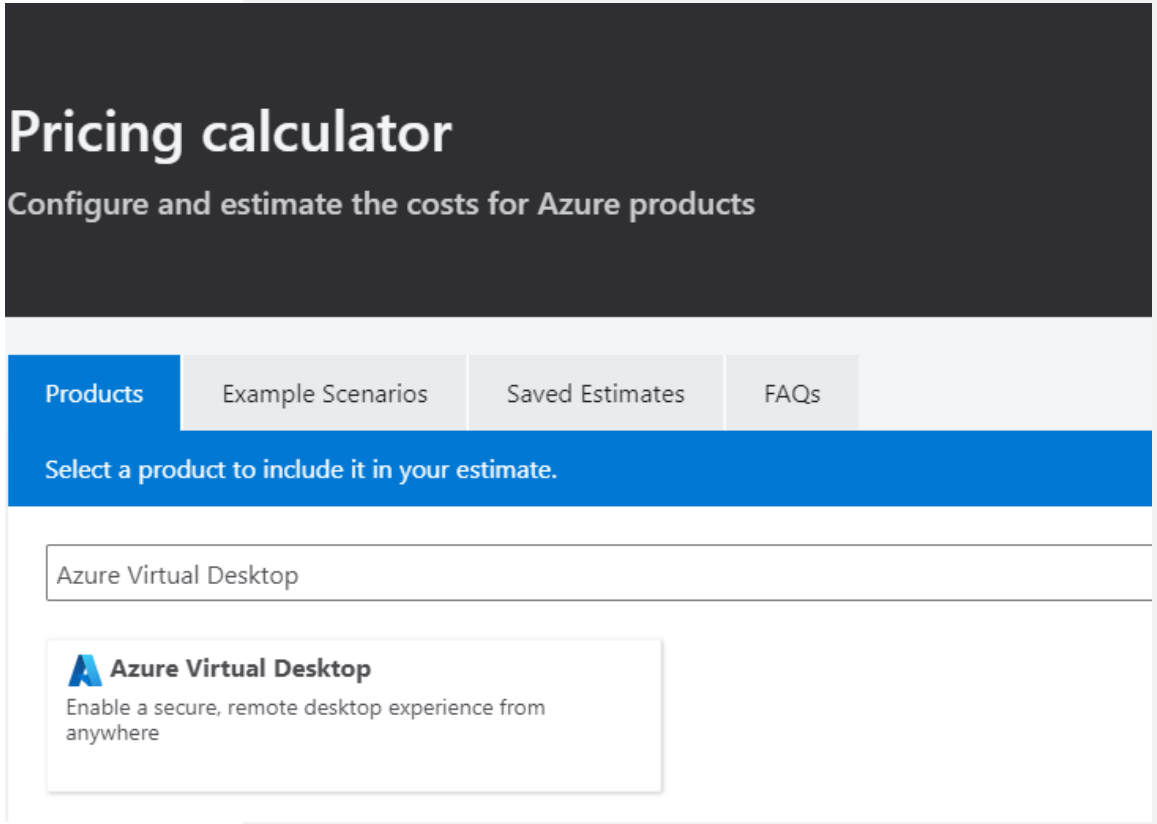
# Cost estimation and tracking (1/2)

Before your deployment you can estimate your costs using the Azure Pricing Calculator. It has a dedicated calculator for AVD that includes VM, Disks, FSLogix storage and networking

- Use the Azure Pricing Calculator to make your personal estimations for your AVD deployment(s)

After (during) your deployment you should use tagging (aka.MS/TagAVDResources), so you can accurately track the costs of your Azure Virtual Desktop deployment

- Use the tagging to accurately track the cost of (the different components) of your AVD deployment



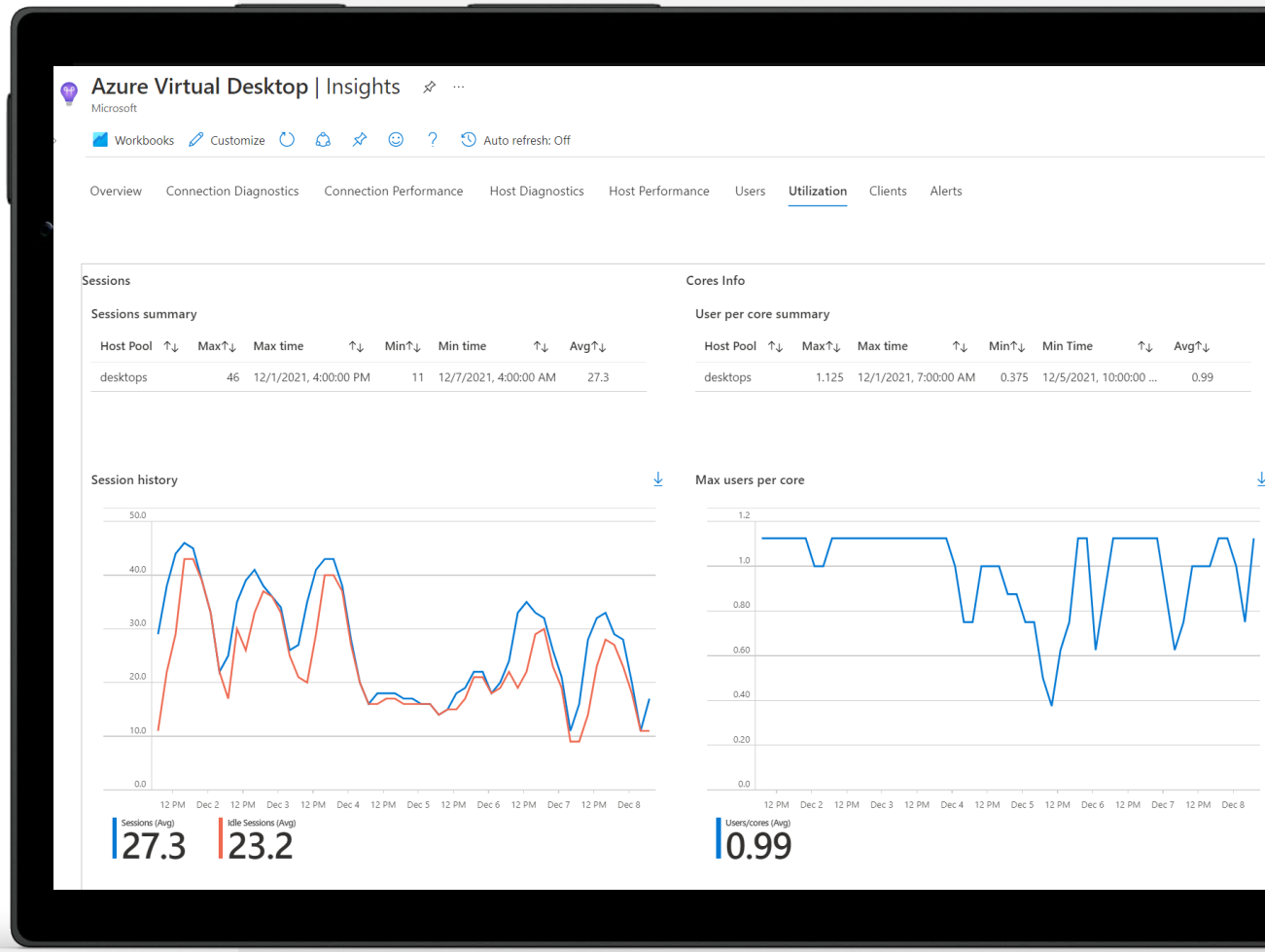
# Use Azure Monitor for Azure Virtual Desktop

Azure Monitor for Azure Virtual Desktop (Insights) is a dashboard built on Azure Monitor Workbooks that helps you understand your Azure Virtual Desktop environment

It can help save cost directly and indirectly

**Here are just some of the examples:**

- Showing how (under)utilized your VMs are
- Allowing you to spot usage patterns so you can optimize scaling and load balancing
- Determining if there are session hosts that are unhealthy but are powered on (incurring cost)
- Informing you about a bad user experience (which is an indirect support cost)



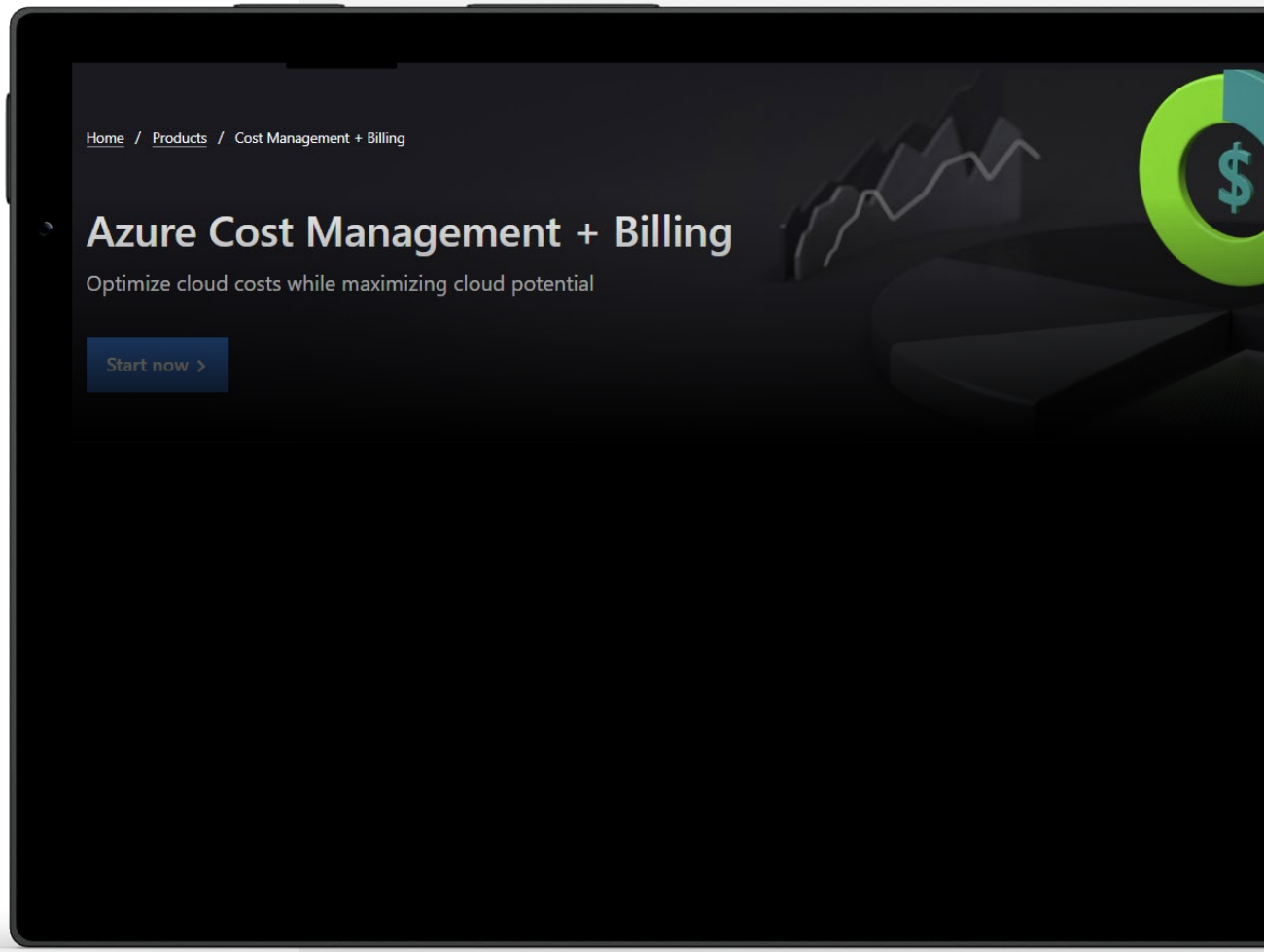

## Start using Azure Monitor for Azure Virtual Desktop (Insights)

# Cost estimation and tracking (2/2)

Take advantage of the tools included in your Azure subscription to get more value out of the cloud and help implement financial governance in your organization

Both services are at no additional cost, so there is no reason not to use them!

- [Regularly review Azure Cost Management + Billing](aka.ms/AzureCostManagementAndBilling) (aka.ms/AzureCostManagementAndBilling)
- [Use Azure Advisor](aka.ms/ReduceCostsWithAzureAdvisor) (aka.ms/ReduceCostsWithAzureAdvisor)



# Resources

Azure Virtual Desktop pricing (aka.ms/AVDpricing)

Azure pricing calculator—Azure Virtual Desktop

(aka.ms/AzurePricingCalculator)

Michel Roth blog—Cost optimization
(aka.ms/AzureMakesAVDCheaperOverTime)

Total Economic Impact study by Forrester—Azure Virtual Desktop

(aka.ms/AVDForresterConsultingTEI)

# Resources

**Explore:**
Learn more, trial new features, and provide feedback

Aka.ms/avdwhatsnew

Azure Academy - YouTube

**Find a partner:**
Find an Azure Virtual Desktop Certified Partner

Aka.ms/AVDFindPartner

**Dive Deeper:**
Get started with Enterprise Scale Landing Zones in Azure:
Azure Virtual Desktop Landing Zone Accelerator
Enterprise-Scale Support for AVD

Get Azure Virtual Desktop Certified
aka.ms/AVDCert;
get 50% off with aka.ms/30daysToLearnIT

Check out Azure Virtual Desktop Documentation:
aka.ms/AVDDocumentation

Learn about Azure Virtual Desktop
aka.ms/AVDEventsandWebinars

**Watch the on-demand Ignite Sessions:**

New ways to optimize flexibility, improve security, and reduce costs with Azure Virtual Desktop

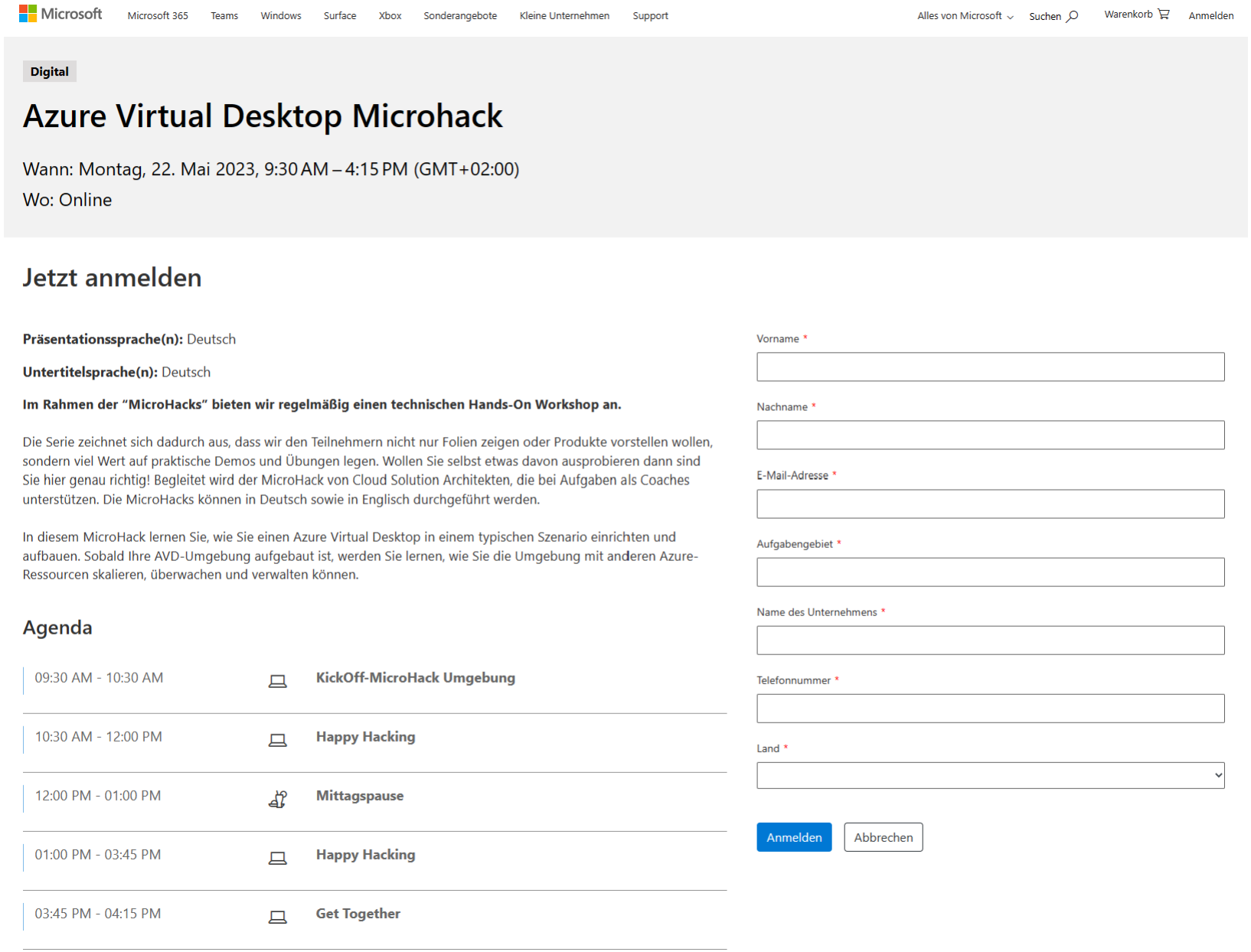
Experience Windows in the cloud with Azure Virtual Desktop and Windows 365

Aka.ms/AVDIgnite2022

# AVD MicroHack

[Microhack Landingpage]

[AVD Microhack 22.05.]



Microsoft 365

# Q&A