

inovasys 

Desktop As a Service

Discover everything your business needs
in the world of Azure Virtual Desktop



PRESENTED BY
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Cloud VDI can provide a flexible, cost-effective way to address current IT challenges and unlock new use cases



Data security

Improve regulatory compliance and IP protection via data centralization and a reduced threat surface.



High-capacity computing

Cloud-scale compute and storage to support specialized workloads like design and development.



BYOPC programs

Enable secure virtual desktops, even on personal devices.



Disaster recovery

Help ensure continuity and access for your workforce and company data even in the most challenging circumstances.



Temporary workforces

Simplify and accelerate the onboarding and offboarding process for elastic workforces.



Mergers & Acquisitions

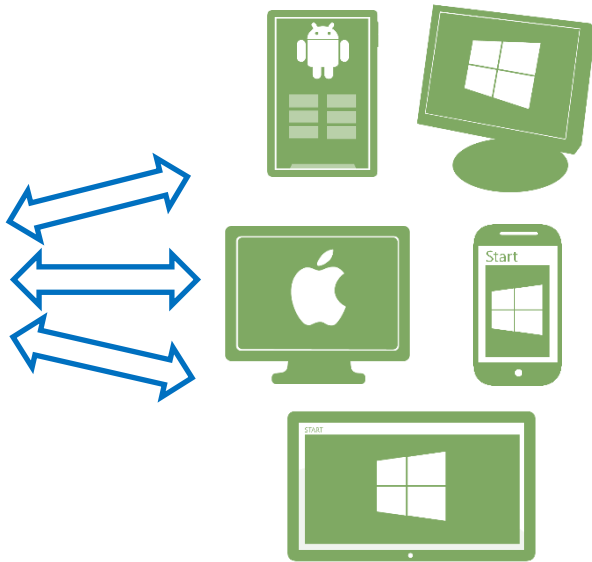
Provide seamless transitions and access for growing businesses.

Today's challenges



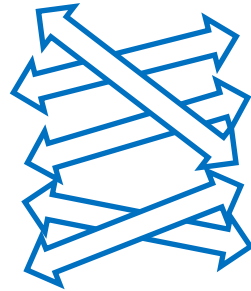
Users

Users expect to be able to **work in any location** and have access to all their work resources.



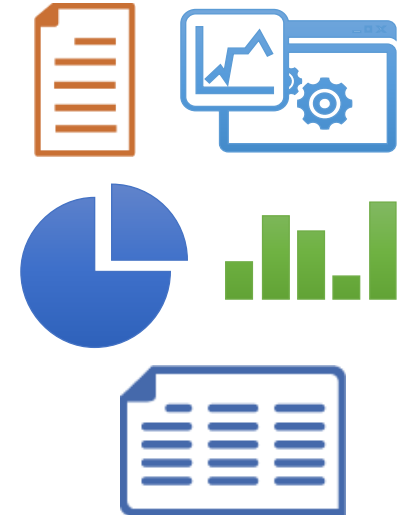
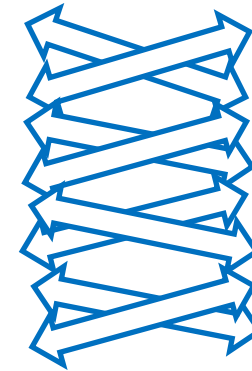
Devices

The **explosion of devices** is eroding the standards-based approach to corporate IT.



Apps

Deploying and managing applications **across platforms** is difficult.

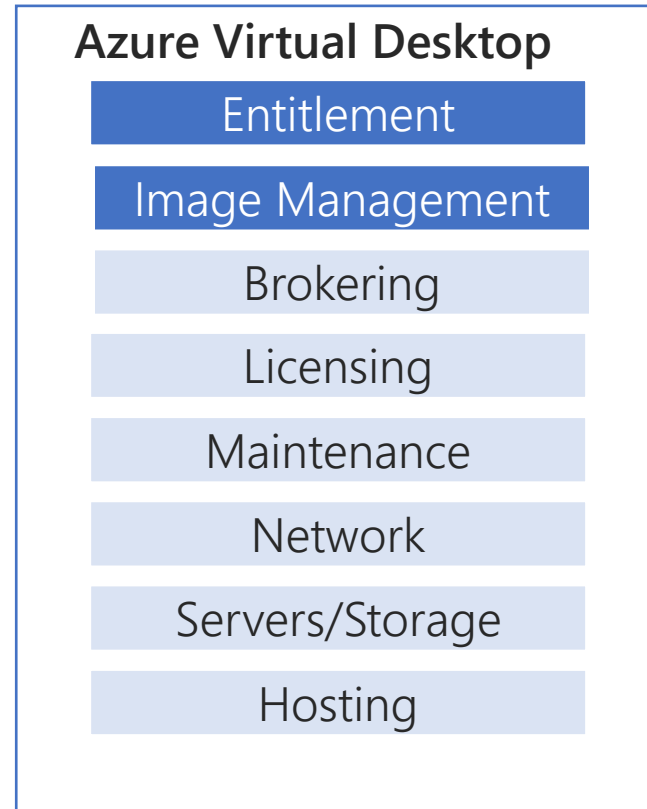
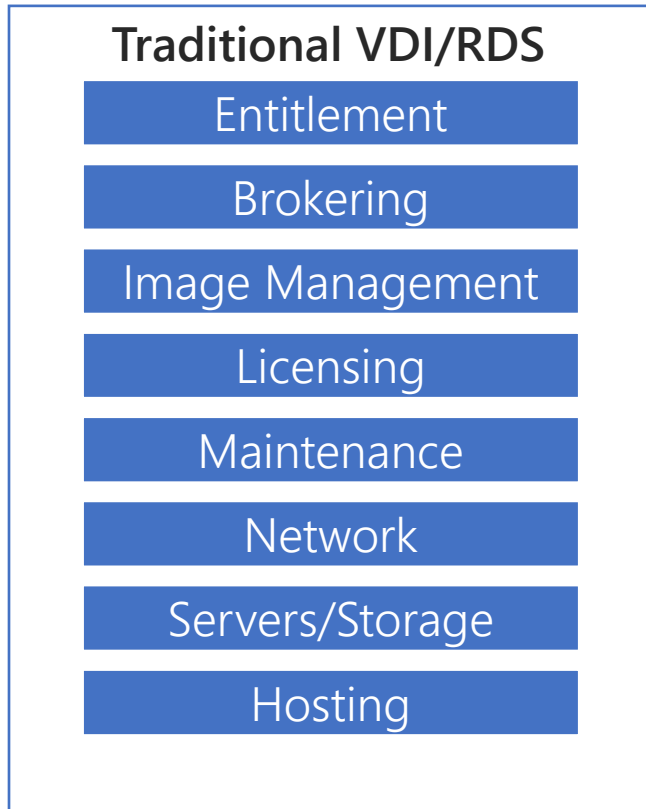


Data

Users need to be productive while **maintaining compliance and reducing risk**.



Traditional VDI/RDS vs. Azure Virtual Desktop



Managed by Inovasys

Managed by Microsoft



Virtualization hosts today

Windows Server Desktop Experience

Scalable multi – session legacy
Windows environment

Windows Server

Multiple sessions

Win32

Office Perpetual

Long-Term Servicing Channel

Windows 11 Enterprise

Native single – session modern
Windows experience

Windows 11

Single session

Win32, UWP

Office 365 ProPlus

Semi-Annual Channel

Windows for hybrid work

Delivery options for maximum flexibility



Windows 11



Native on a
PC or Tablet

across price points and form factors



Cloud VDI with
Azure Virtual Desktop

*optimized for **flexibility** and **control***



Cloud PC on any device
with **Windows 365**

*optimized for **simplicity** and **experience***

Virtualization hosts of the future

Windows Server
RD Session Host

Scalable multi-session **legacy**
Windows environment

Windows Server

Multiple sessions

Win32

Office 2019 Perpetual

Long-Term Servicing Channel



Windows 11 Enterprise
multi-session

Scalable multi-session **modern**
Windows user experience with
Windows 10 Enterprise security

Windows 11

Multiple sessions

Win32, UWP

Office 365 ProPlus

Semi-Annual Channel

Windows 10, 11
Enterprise

Native single-session **modern**
Windows experience

Windows 11

Single session

Win32, UWP

Office 365 ProPlus

Semi-Annual Channel

An optimized computing platform

High-level service architecture

- Can connect to on-premises resources via VPN
- User authentication using Azure Active Directory identities
- Integrates with Systems Center Configuration Manager and Microsoft Intune
- Supports devices running non-Windows operating systems with Linux thin-client SDK and other tools

Your subscription—your control

Desktops and remote apps



Full Desktop



RemoteApp



Windows 10/11 Enterprise multi-session



Windows 10/11 Enterprise



Windows Server 2012 R2 and newer



Windows 7 Enterprise Full Desktop

Management and policies



Image, app, and profile management



User density, VM sizing, and scaling policies



User management and identity



Networking policies

Managed by Microsoft

Azure Virtual Desktop Service



Clients



Diagnostics



Gateway



Management



Broker



Load balancing

Infrastructure



Compute



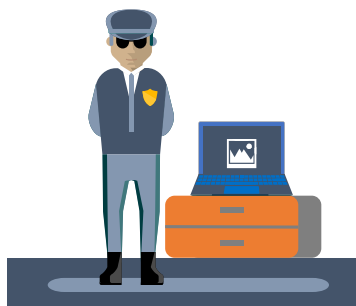
Storage



Networking

Enhanced Security with Simplified Configuration

Azure AD Security Services



Sophisticated security services easily configured through Azure AD (e.g. MFA, CA, etc.)

Reduced Attack Surface



Reverse connect technology eliminates the need to open inbound ports to the VMs

Granular Access Control



Multiple admins can be assigned role-based access control

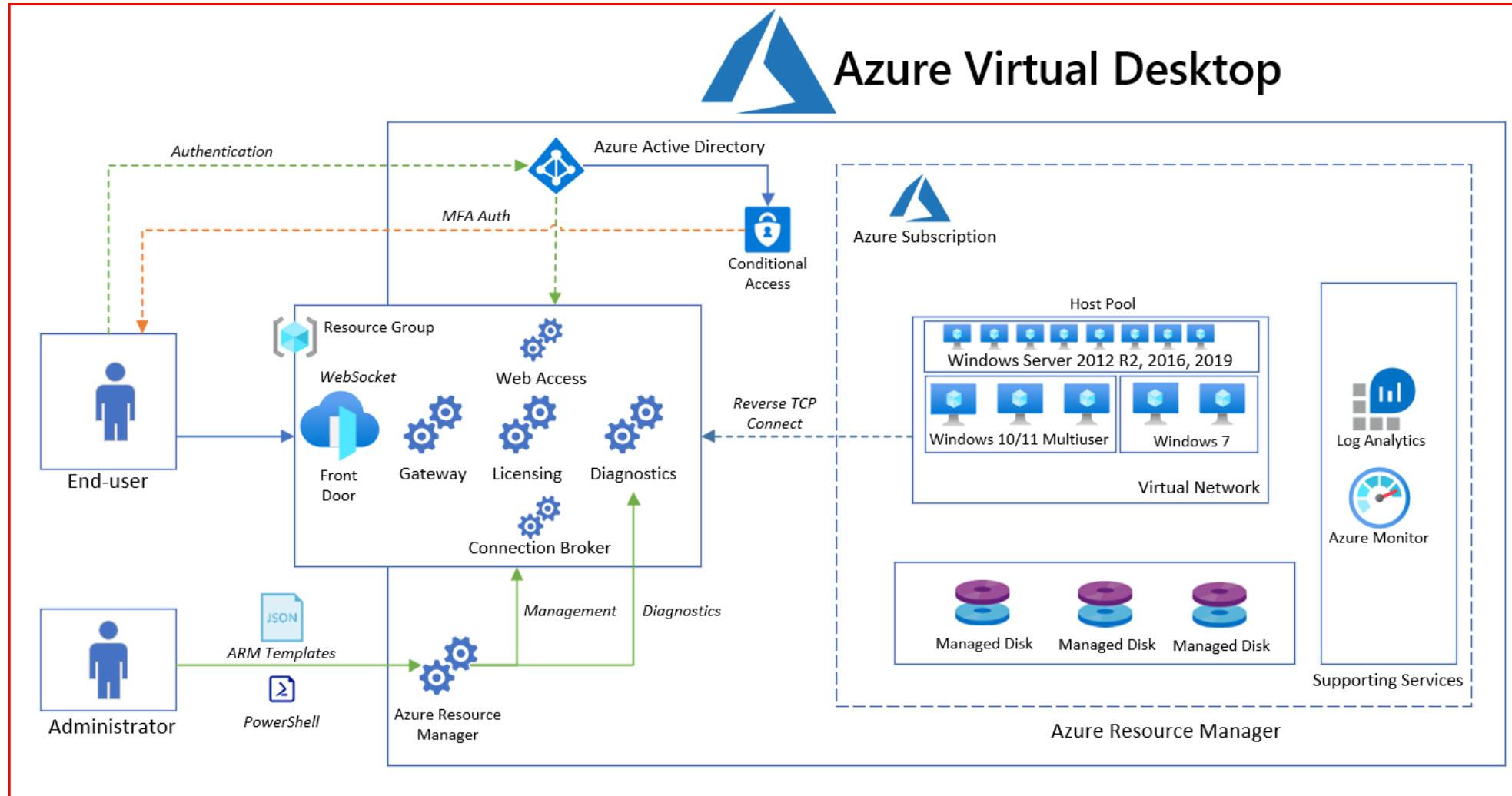
Isolated User Sessions



Isolated user sessions in both single and multi-session environments



Azure Virtual Desktop | Architecture



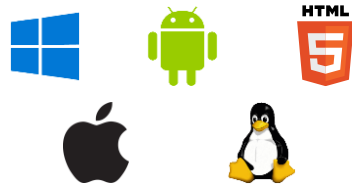
New Azure Virtual Desktop security features help protect your data and your employees wherever they are working.

- **Watermarking** helps protect sensitive information from capture on client endpoints. When watermarking is enabled, QR code watermarks appear as part of remote desktops. The QR code contains the connection ID of a remote session that admins can use to trace the session.
- **Confidential virtual machines** offer VM memory encryption with integrity protection, which strengthens guest protections to deny the hypervisor and other host management components code access to the VM memory and state.
- **Trusted Launch** protects against advanced and persistent attack techniques. This feature allows you to securely deploy your VMs with verified boot loaders, OS kernels, and drivers. Trusted Launch also protects keys, certificates, and secrets in VMs.
- **Private Link** with Azure Virtual Desktop allows users to establish secure connections to remote resources using private endpoints. With Private Link, traffic between your virtual network and the Azure Virtual Desktop service is routed through the Microsoft *backbone* network eliminating the need to expose your service to the public internet and enhancing the overall security of your infrastructure. By keeping traffic within this protected network, Private Link adds an extra layer of security for your Azure Virtual Desktop environment.



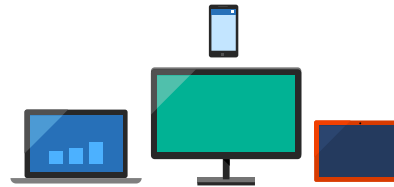
Best Virtualized End-user Experience

Platform of your choice



- Connect from any device of your choice (Windows, MacOS / iOS, HTML5, Android, Linux)

Windows differentiation



- Like-local Windows experience
- Extensive support for devices

Enhanced protocol



- Support for Windows Hello for Business
- Dynamically adapting bandwidth utilization

Isolated User Profiles



- Containerized User Profiles (FSLogix) with fast VHD load times

Native O365 performance



- Uncompromised O365 email and calendar performance, Real-time Outlook search
- Persistent and non persistent environments

Teams Enhancements

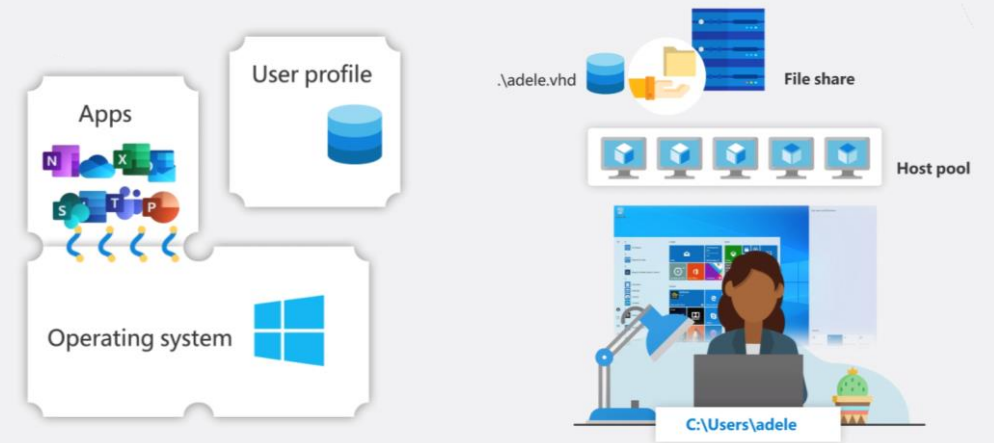


- Best conferencing and media experience
- Multimedia redirection capability, high-performance, low latency audio & video calling

Roaming user profiles get us half-way there

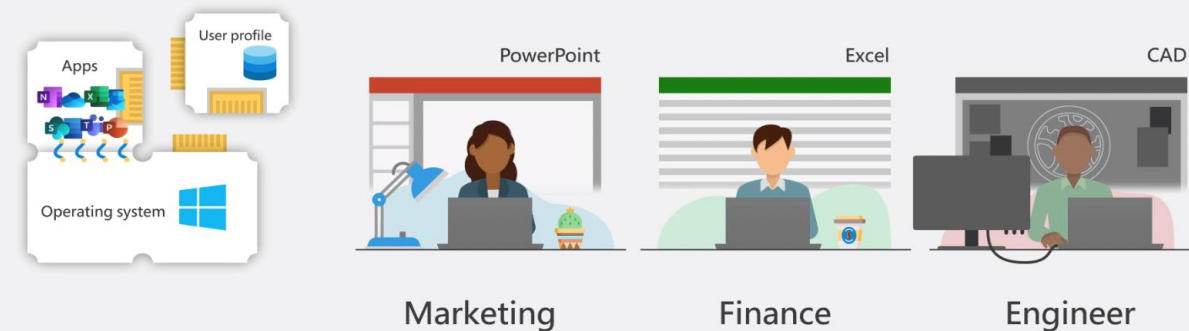
With FSLogix we've separated the user profile layer from the virtual machine

To the user it feels like you're saving and accessing files from a local disk



But—what about the apps?

- In a shared or pooled virtual machine, this is a challenge
- Each user might need a different set of apps
- They can be assigned to a different VM with each logon



Current options

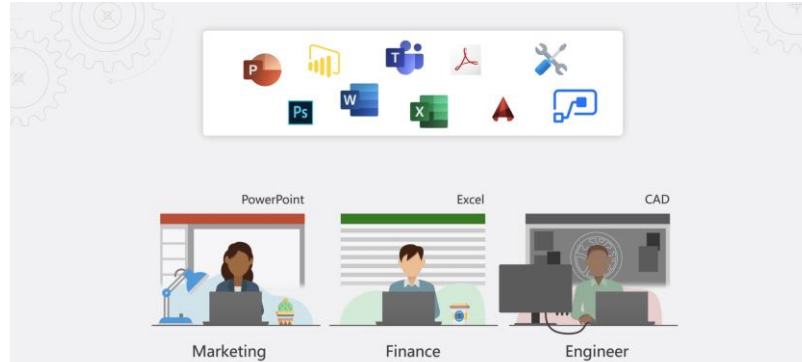


Current option 1: [Multiple images by role](#)

OPTION 1

Multiple images by role

- Manage numerous VM pools customized for different users' roles
- These images would all need to be individually maintained and patched
- High overhead

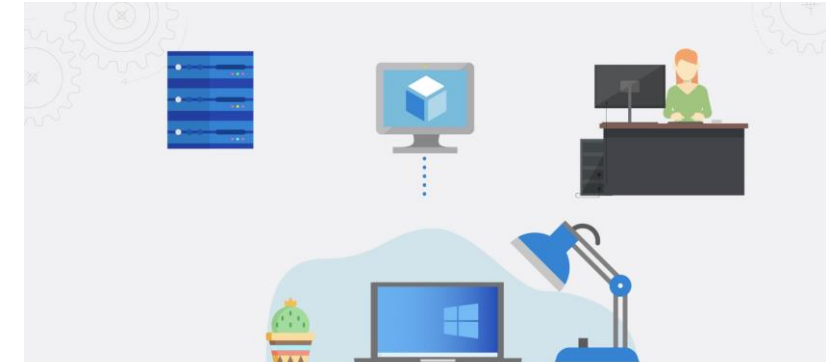


Current option 2: [Mega single image with hidden apps](#)

OPTION 2

Traditional App layering

- Image can get bloated
- Additional policies
- App licensing could be challenging



Current option 3: [Streaming apps](#)

OPTION 3

App streaming

- Requires apps to get cached into OS during user session
- Need to manage app streaming infra
- Possible need to repackage/sequence the app



Profile Container



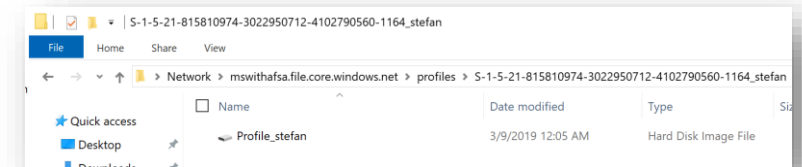
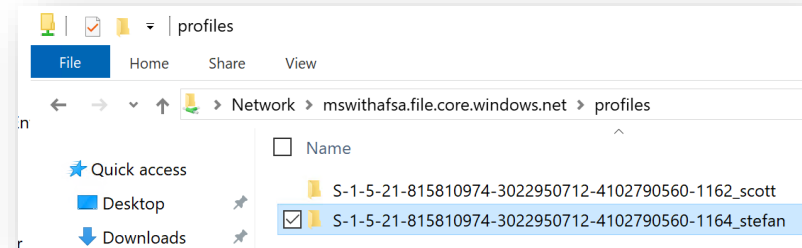
Office 365 Container



App Masking



Java Redirection



Places entire user profile in network-based container

Extremely fast sign-in times

Helps to eliminate profile corruption

Works alongside existing User Environment Management platforms

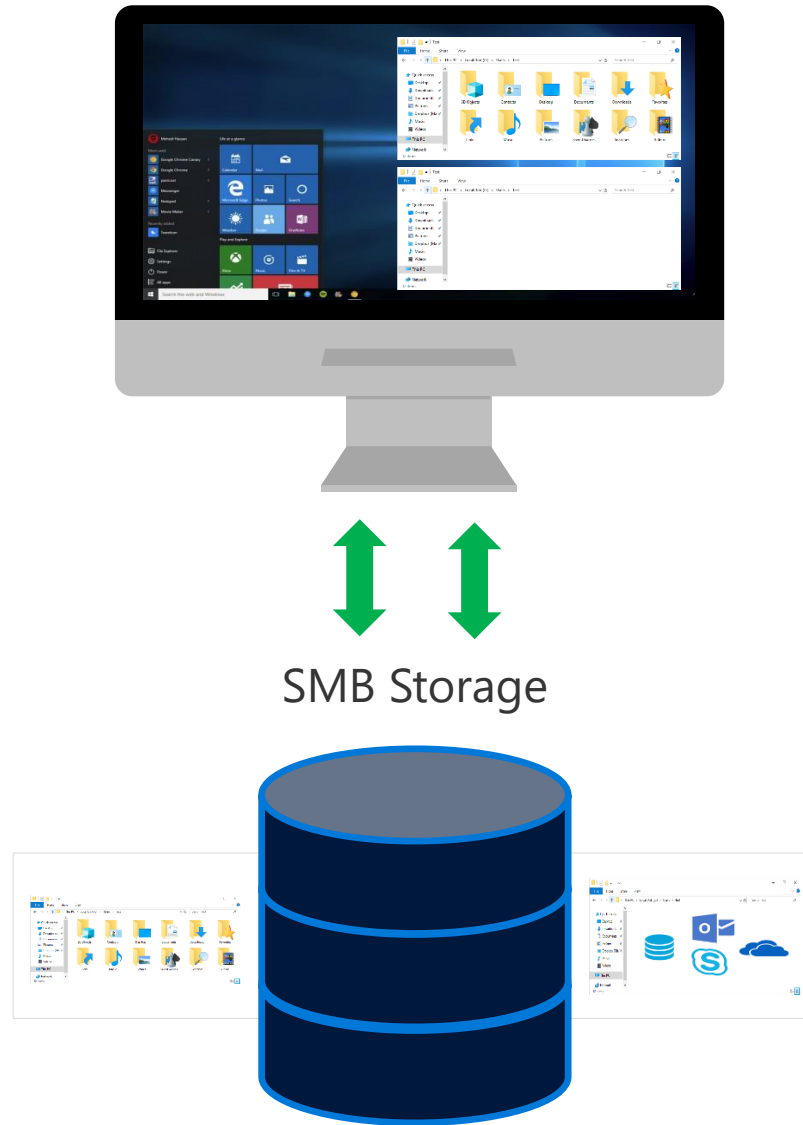
Benefits

Profile Container

Office 365 Container

App Masking

Java Redirection



Places Office 365 cache data in network-based container

Enables roaming of Outlook OST, OneDrive cache, Windows Search, and more

Office apps have native performance and behavior

Works alongside other profile management platforms

Benefits



Profile Container



Office 365 Container



App Masking



Java Redirection



Application management without sequencing, snapshotting, packaging, or virtualization

All apps installed in base image

- Only apps a user is entitled to are revealed
- App entitlements can be changed in real time
- Works with fonts, plugins, and more
- Excellent app compatibility

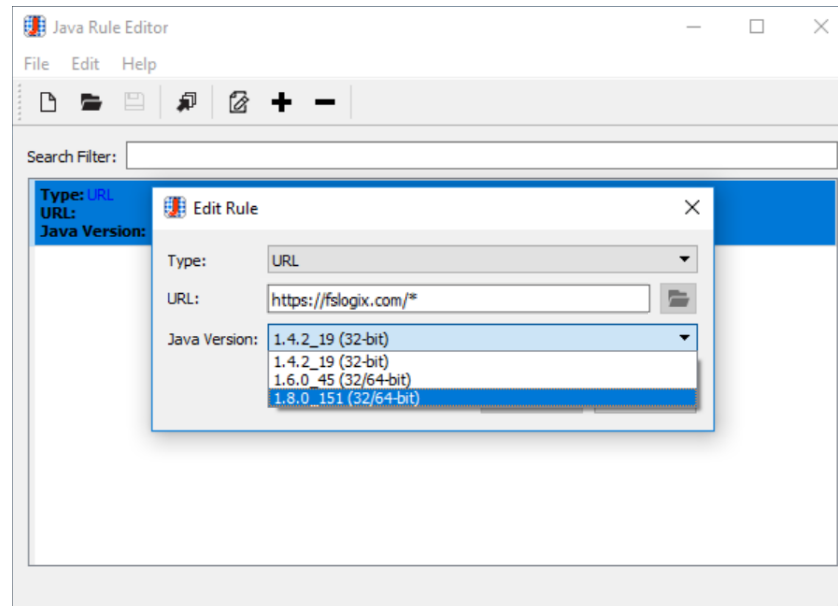
Massively reduces the number of gold images to maintain

Profile Container

Office 365 Container

App Masking

Java Redirection



Securely co-locate multiple versions of Java on the same base image

Run each app or website with the specific version of Java required for full functionality

Use FSLogix App Masking to hide unused versions of Java when not needed



Best Desktop as a Service (DaaS) in 2023

Microsoft recognized as a Leader in 2023 Gartner® Magic Quadrant™ for Desktop as a Service

According to Gartner, DaaS is defined as “the provision of virtual desktops by a public cloud or service provider” and encompasses a variety of cloud solutions, such as Azure Virtual Desktop and Windows 365, which are described in a way that is familiar to customers of varying backgrounds and technical expertise.

Given the newness to the market of Microsoft’s two offerings in this space, it’s incredible to see Microsoft leading in this category (ahead of the golden players like Citrix and VMware).

Figure 1: Magic Quadrant for Desktop as a Service



Source: Gartner



Microsoft cloud solution options



Azure Virtual Desktop

A cloud VDI platform that delivers hosted desktops and apps with maximum flexibility and control



Windows 365

A complete SaaS solution that securely streams your personalized Windows desktop, apps, settings, and content from the Microsoft Cloud, to any device

	Azure Virtual Desktop Cloud VDI	Windows 365 Cloud PC
OS Support	Windows 11, Windows 10, single- or multi-session, Windows Server	Windows 11 or Windows 10
Admin	<ul style="list-style-type: none"> Azure Portal VMware or Citrix management plane 	<ul style="list-style-type: none"> Microsoft Endpoint Manager (Enterprise) Web self-service (Business)
Service	PaaS: granular controls over configuration and management	SaaS: complete end-to-end Microsoft service
Pricing	Consumption-based	Per-user, per-month
Scale	Unlimited based on consumption	Unlimited based on subscription
End-user	Single or multi-user, pooled, remote app	Full Windows like-local experience





Azure Virtual Desktop

Most customers are already eligible for AVD



Client

Customers are eligible to access Windows 10 or 11 single and multi session and Windows 7 with Azure Virtual Desktop (AVD) if they have one of the following licenses*:

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

*Customers can access Windows Virtual Desktop from their non-Windows Pro endpoints if they have a Microsoft 365 E3/E5/F1, Microsoft 365 A3/A5 or Windows 10 VDA per user license.



Server

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

- **RDS CAL license with active Software Assurance (SA) or RDS User Subscription Licenses**

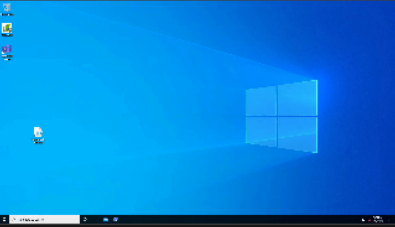
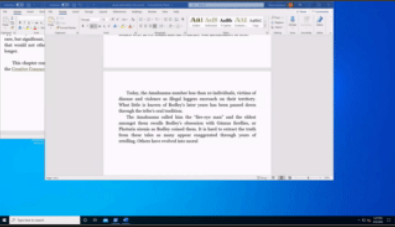
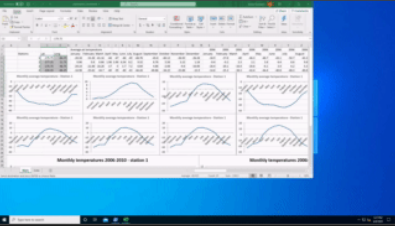
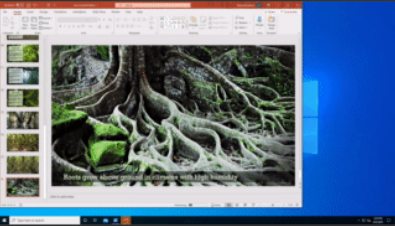


Pay only for the virtual machines (VMs), storage, and networking consumed when the users are using the service

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!](#)



AVD - Estimating Bandwidth Utilization

Scenario	Default mode	H.264/AVC 444 mode	Thumbnail	Description of the scenario
Idle	0.3 Kbps	0.3 Kbps		User is paused their work and there's no active screen updates
Microsoft Word	100-150 Kbps	200-300 Kbps		User is actively working with Microsoft Word, typing, pasting graphics and switching between documents
Microsoft Excel	150-200 Kbps	400-500 Kbps		User is actively working with Microsoft Excel, multiple cells with formulas and charts are updated simultaneously
Microsoft PowerPoint	4-4.5 Mbps	1.6-1.8 Mbps		User is actively working with Microsoft PowerPoint, typing, pasting. User also modifying rich graphics, and using slide transition effects

Web Browsing	6-6.5 Mbps	0.9-1 Mbps		User is actively working with a graphically rich website that contains multiple static and animated images. User scrolls the pages both horizontally and vertically
Image Gallery	3.3-3.6 Mbps	0.7-0.8 Mbps		User is actively working with the image gallery application. browsing, zooming, resizing and rotating images
Video playback	8.5-9.5 Mbps	2.5-2.8 Mbps		User is watching a 30 FPS video that consumes 1/2 of the screen
Fullscreen Video playback	7.5-8.5 Mbps	2.5-3.1 Mbps		User is watching a 30 FPS video that maximized to a fullscreen



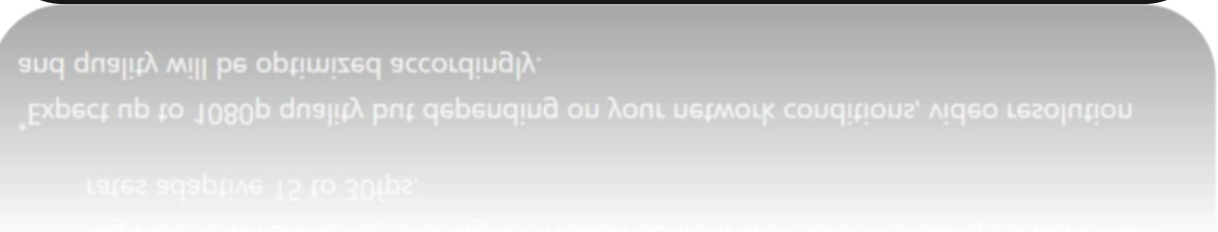
AVD - Estimating Bandwidth Utilization

Modality	Bandwidth requirements (bitrate kilobit/s up/down)		
	Minimum	Recommended	Best performance
Audio			
One-to-one	10/10	58/58	76/76
Meetings	10/10	58/58	76/76
Video			
One-to-one	150/150	1,500/1,500	4,000/4,000
Meetings	150/200	2,500/4,000	4,000/4,000
Screen sharing			
One-to-one	200/200	1,500/1,500	4,000/4,000
Meetings	250/250	2,500/2,500	4,000/4,000
Together Mode			
One-to-one	N/A	N/A	N/A
Meetings	1,000/1,500	1,500/2,500	2,500/4,000

Minimum, Recommended, and Best performance bandwidth requirements are based on per-endpoint usage. Typically, there's one endpoint per user, such as a computer or mobile device. However, if a user joins a Teams meeting on *both* a computer *and* a mobile device, two endpoints are associated with that user.

- **Minimum** Bandwidth requirements for video calls are up to 240p resolution, screen sharing content frame rates adaptive 1.875 to 7.5fps, and Together Mode/Large Gallery video up to 540p resolution.
- **Recommended** Bandwidth requirements for video calls are up to 1080p resolution*, screen sharing content frame rates adaptive 7.5 to 30fps, and Together Mode/Large Gallery video up to 1080p resolution*.
- **Best Performance** Guidance allows higher fidelity video for larger attendee meetings, high loss environments, and higher motion content with screen sharing content frame rates adaptive 15 to 30fps.

*Expect up to 1080p quality but depending on your network conditions, video resolution and quality will be optimized accordingly.



VM sizing recommendations

Multi Session

This table shows examples of standard or larger user workloads with 20 or more users

Workload type	Maximum users per vCPU	vCPU/RAM/OS storage minimum	Example Azure instances*	Profile container storage minimum
Light	6	8 vCPUs, 16 GB RAM, 16 GB storage	D8s_v5, F8s_v2, D8as_v5, D16s_v5, F16s_v2, D16as_v5	30 GB
Medium	4	8 vCPUs, 16 GB RAM, 32 GB storage	D8s_v5, F8s_v2, D8as_v5, D16s_v5, F16s_v2, D16as_v5	30 GB
Heavy	2	8 vCPUs, 16 GB RAM, 32 GB storage	D8s_v5, F8s_v2, D8as_v5, D16s_v5, F16s_v2, D16as_v5	30 GB
Power	1	6 vCPUs, 56 GB RAM, 340 GB storage	D8s_v5, F8s_v2, D8as_v5, D16s_v5, F16s_v2, D16as_v5, NV12, NVv4	30 GB

Single Session

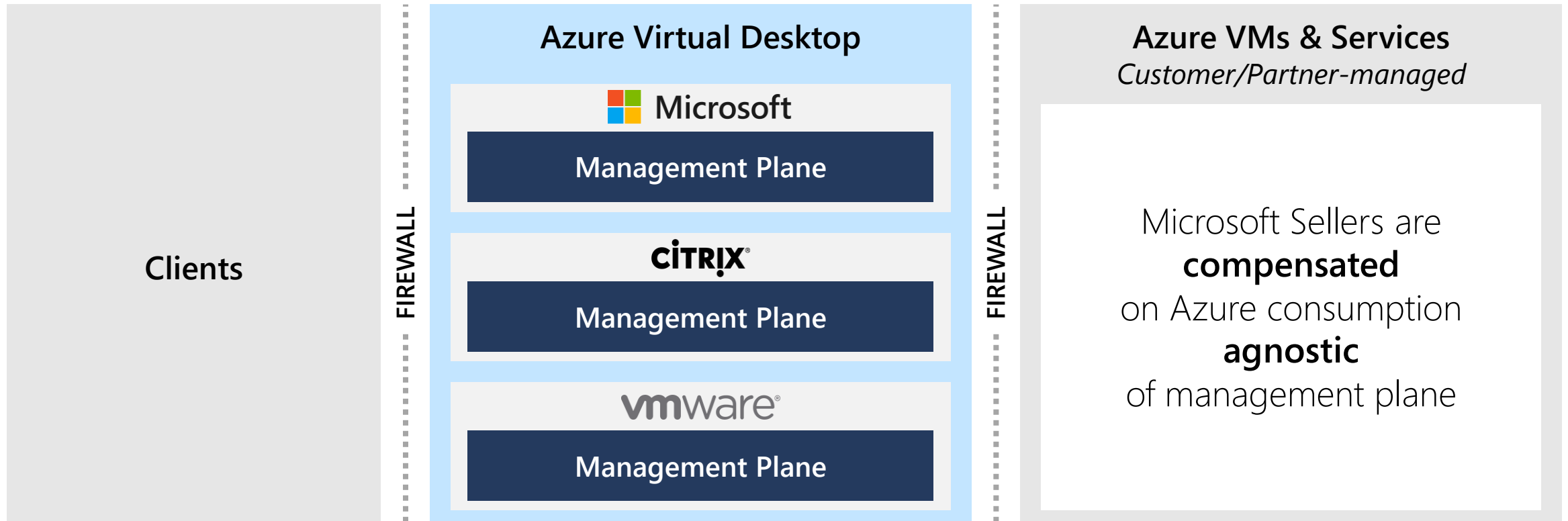
We recommend at least **two physical CPU cores** per VM (**typically four vCPUs with hyperthreading**). For RAM **8 GB** is the standard in virtual desktop environments. An example Azure instance for single session is D2s_v5.

Ds_v5 and Fs_v2 Azure instances are powered by Intel processors which provides a good balance of memory, vCPU and include local storage for most workloads.

aka.ms/avdsizingrecommendations



Citrix & VMware integration



- Citrix and VMware provide value add to AVD (e.g. hybrid deployment management)
- Windows 10 or 11 multi-session is also available with Citrix & VMware management planes
- Customer ultimately decides the management plane(s) of choice



Migration | Pooled Resources

Steps to Migration

User identity

- ✓ Sync user identities and password hash from on-premises Active Directory (AD) to Azure Active Directory (AAD)
- ✓ Setup AD instance on Azure or continue using on-premises AD

Virtual Machines

- ✓ Bring your own image from on-premises and create new VMs on Azure
- ✓ Lift and shift VMs from on-premises
- ✓ Register them with Azure Virtual Desktop infrastructure

User and app data

- ✓ Convert UPD into Profile Container using Convert Tools
- ✓ Sync to Azure using Azure file sync or file server replication

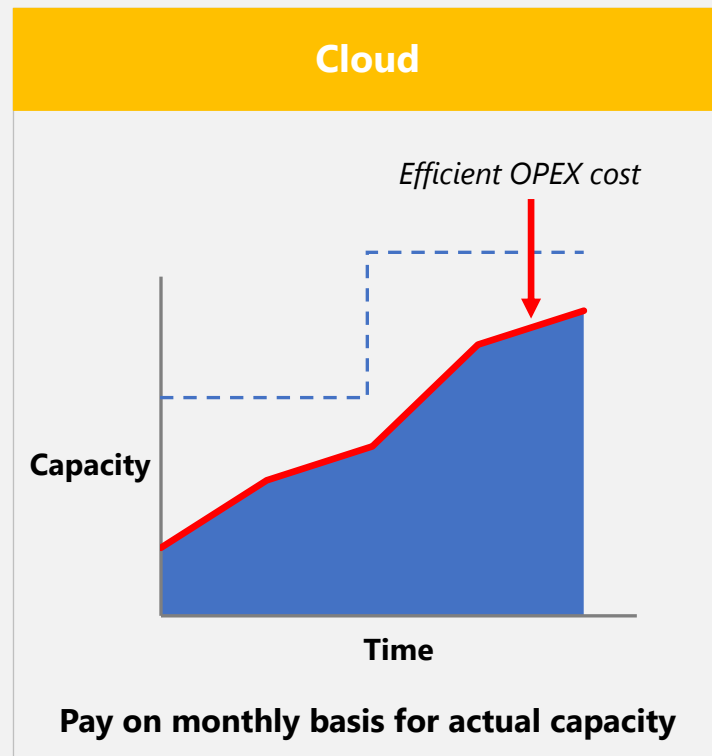
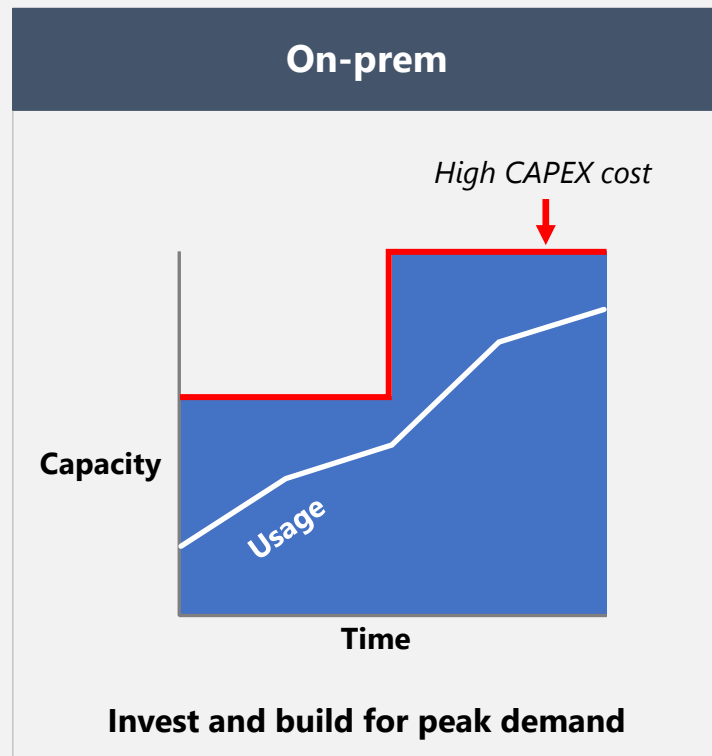
Client (end-user) capabilities

- ✓ Download Azure Virtual Desktop client for Windows or use web client
- ✓ Continue using existing RD clients available through app stores

Cost-optimized infrastructure Opex Spend Aligned to Business Usage

Customer Scenario – On-prem to Cloud

- From up-front Capex commitment to flexible Opex investment



Economic Benefit

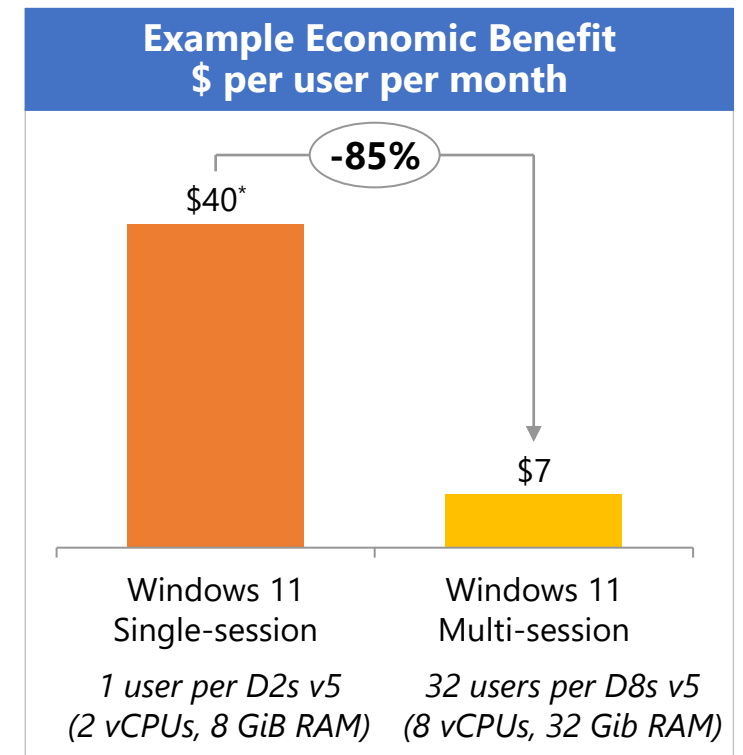
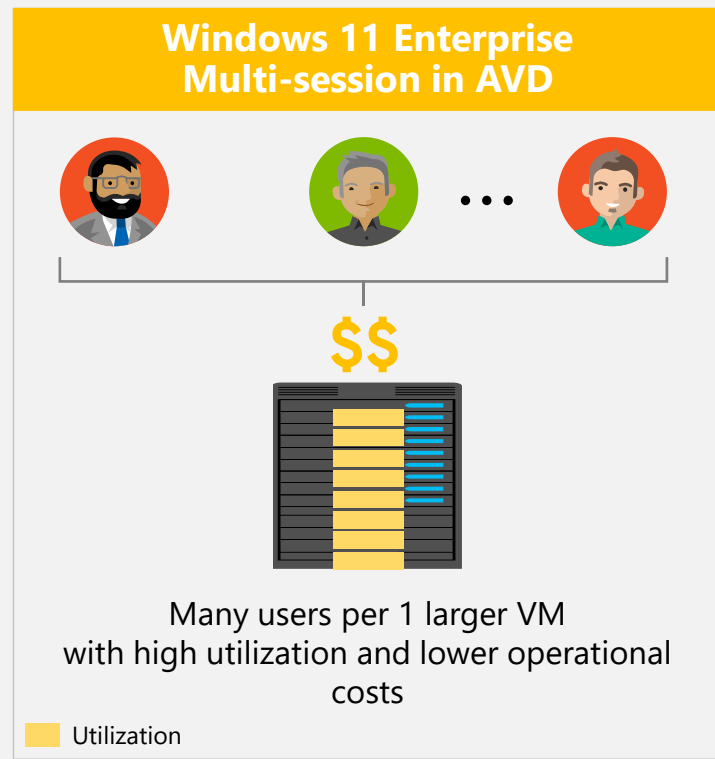
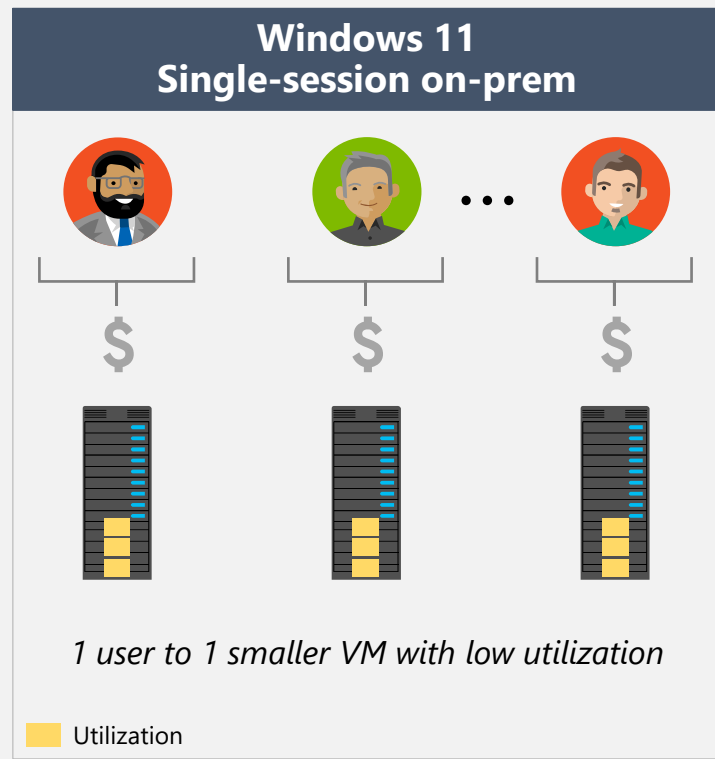
- Avoid large upfront financial commitments and deployment projects*
- Match capacity to operational needs*
- Align IT HW, SW, and services with changing business requirements*
- Enable accurate departmental cross-charge and COGS alignment*

Note: Figures are illustrative and based on pre-configured assumptions; actual savings vary by user requirements and infrastructure configuration

Windows 11 Experience at Multi-session Cost **Cost-optimized infrastructure**

Customer Scenario – From Windows 11 single-session on-prem to Windows 11 multi-session in AVD

- Trade many small dedicated VMs for few large shared VMs (with higher utilization and lower operational costs)



Note: AVD is the only way to run Windows 11 Multi-Session

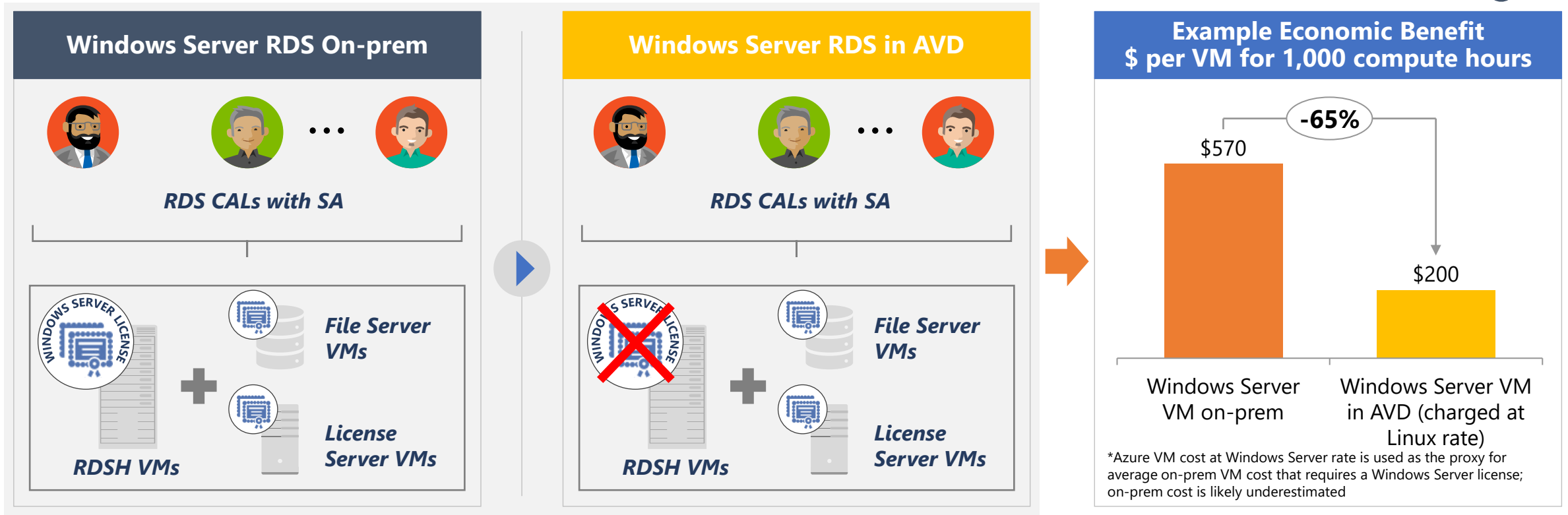
Note: Figures are illustrative and based on pre-configured assumptions; actual savings vary by user requirements and infrastructure configuration

*The \$40 PUPM for single session cost is modeled for a common configuration: Windows 11 single-session in AVD starts at ~\$15 per user per month for 1 vCPU, 2 GiB RAM configuration

Best Value Compute Rate *Cost-optimized infrastructure*

Customer Scenario – From Windows Server on-prem to Windows Server in AVD

- AVD doesn't require Windows Server license for session host VMs (i.e. Session host VMs charged at Linux compute rate)



Note: Non-session host VMs still require Windows Server license (only if Azure Hybrid Benefits are not available)

Note: With Azure NetApp Files or Azure Files, customers also save the cost of Windows Server license and its hosting VM that would otherwise be required by File Server

Note: Figures are illustrative and based on pre-configured assumptions; actual savings vary by user requirements and infrastructure configuration


3-year Win7 ESU Included *Cost-advantaged licensing*

Customer Scenario – From Windows 7 on-prem to Windows 7 in AVD

- With AVD, 3-year Extended Security Update is included for Windows 7 VMs running on Azure*



On-prem

 Windows 7


↓

Pricing for extended security updates

Year	ESU Cost (/ device)	
	Enterprise	Pro
2020	\$25	\$50
2021	\$50	\$100
2022	\$100	\$200



AVD

 Windows 7

↓

Year	ESU Cost (/ device)	
	Enterprise	Pro
2020	\$25	\$50
2021	\$50	\$100
2022	\$100	\$200

Economic Benefit

\$25-200 Savings
Per device per year

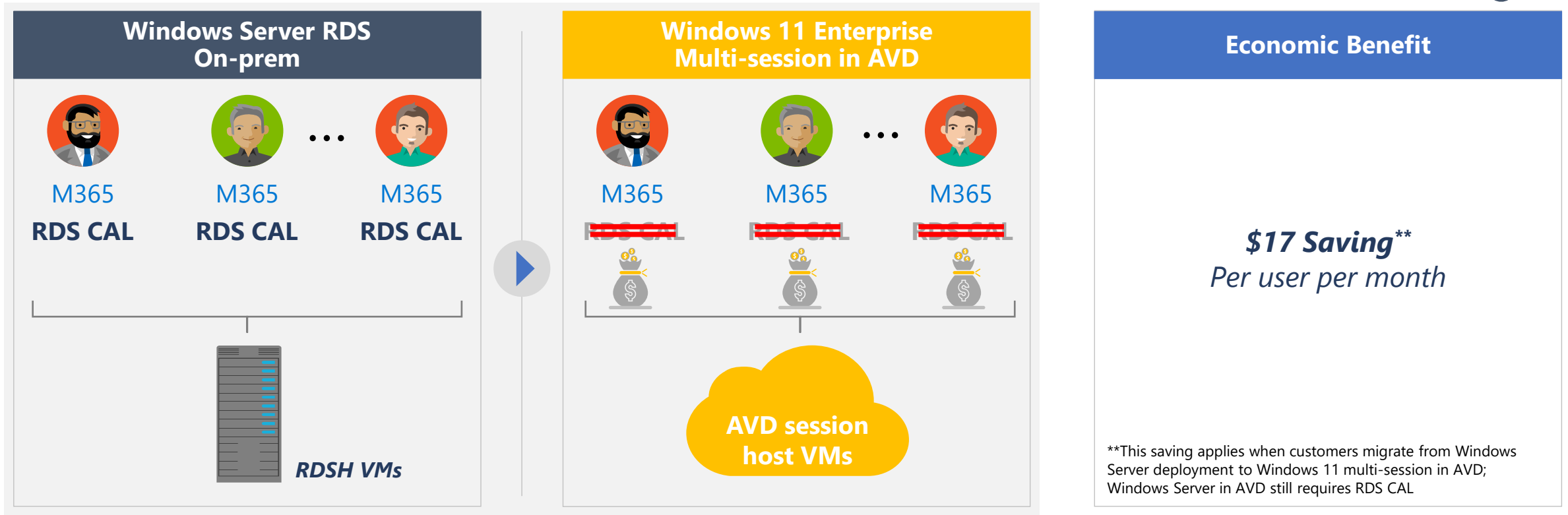
*Benefit not applicable to Windows 7 running on local devices

Note: Figures are illustrative and based on pre-configured assumptions; actual savings vary by user requirements and current licensing position

Savings on RDS CAL with Multi-session Deployment *Cost-advantaged licensing*

Customer Scenario – From Windows Server RDS on-prem to Windows 11 Enterprise Multi-session in AVD

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



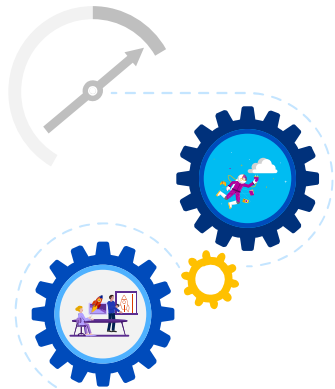
*Customers can leverage the license (e.g. M365 E3/E5, Win 10 E3/E5) they already own. See Appendix for a complete list of AVD licensing requirements

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 11 multi-session in AVD

Superior Economics from Significant Cost Savings

Infrastructure



**~70%*
Savings**

- Windows 11 experience at multi-session cost
- Cost effective compute and storage
- Flexible network provisioning
- Best value compute rate
- Opex spend aligned to business usage

Licensing



**~60%*
Savings**

- AVD management service included with the licenses you already own
- Savings on RDS CAL with multi-session deployment
- 3-year Windows 7 ESU included

Skilling



~60%
Savings**

- Lower skilling cost because compute and storage move to cloud
- Lower skilling cost when you use PaaS services

Note: Infrastructure includes compute, storage (IaaS/PaaS), and networking

*See [Example Scenario: AVD Economic Benefits](#)

** industry analysis

AVD Infrastructure Cost* at a Glance



Customer Requirements

- User Type: Medium (Microsoft Office apps users)
- # of Users: 1000
- Peak Concurrency: 80%
- Profile Storage Requirement: 30GB / user
- Network egress: 100 kpbs / user

Key Infrastructure Assumptions

• Compute:

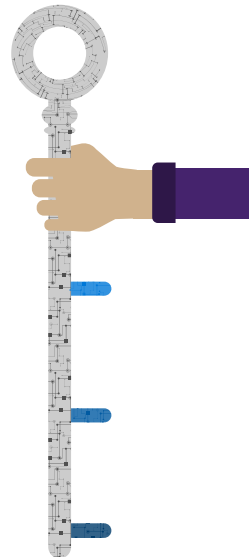
- East US
- 3-year Reserved Instance
- D8s v5 (for multi-session)
- 4 users/vCPU (for multi-session)
- D2s v5 (for single-session)

• Storage:

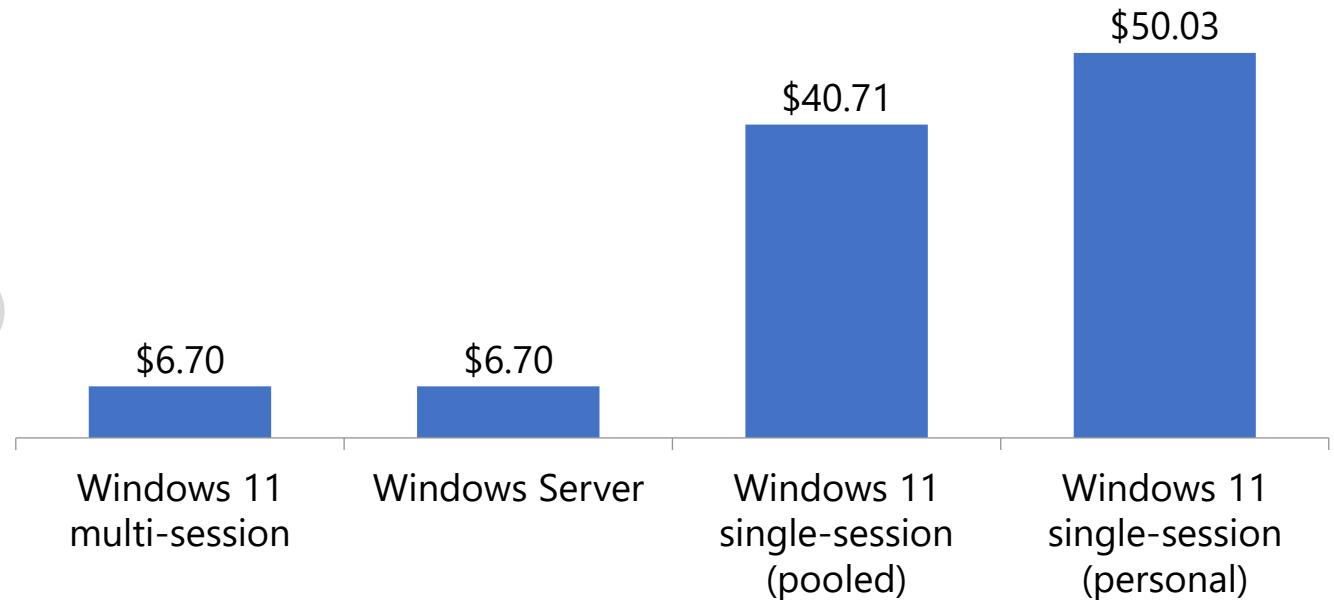
- Azure NetApp Files

• Networking:

- Virtual Network (Same Region)



AVD Cost* Per User Per Month



Note: Results generated by AVD Solution Configurator, an excel-based tool for sizing AVD opportunities; figures are rounded for simplicity

*License cost not included; Many customers already own licenses that qualify them for AVD (e.g. Win10 E3/E5, M365 E3/E5, VDA) and incur no additional license cost for AVD



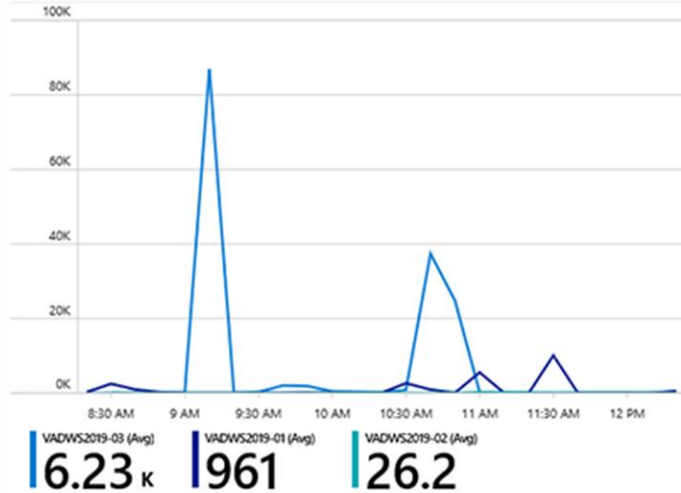
AVD - Monitoring



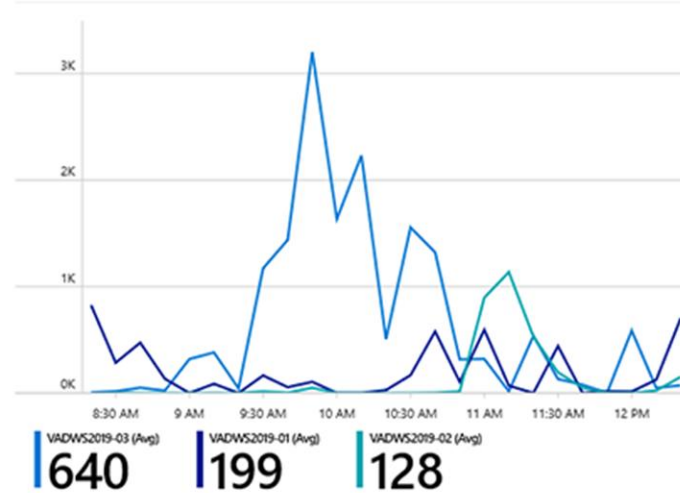


Bandwidth Monitoring

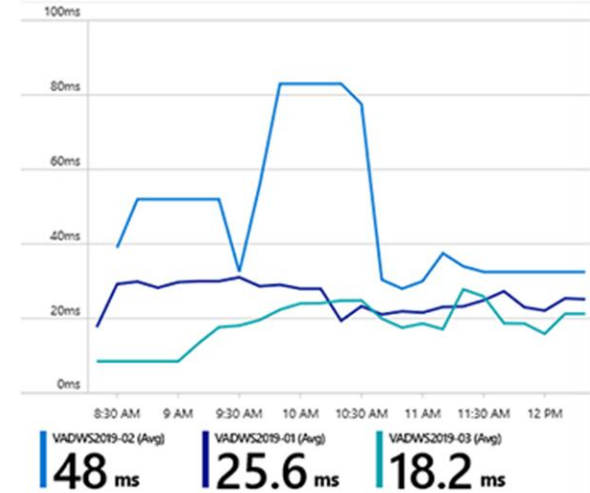
Average output bandwidth by session host (bit/s)



Average input bandwidth by session host (bit/s)



Average latency by session host (ms)



Average output bandwidth by user (bit/s)

Search

User	OutputBandwidth
h	26.069K
jt	6.326K
n	5.604K
n	484.987
n	88.955
s	71.802

Average input bandwidth by user (bit/s)

Search

User	InputBandwidth
hr	4.152K
m	593.91
jh	586.847
sf	488.79
m	258.343
m	207.967

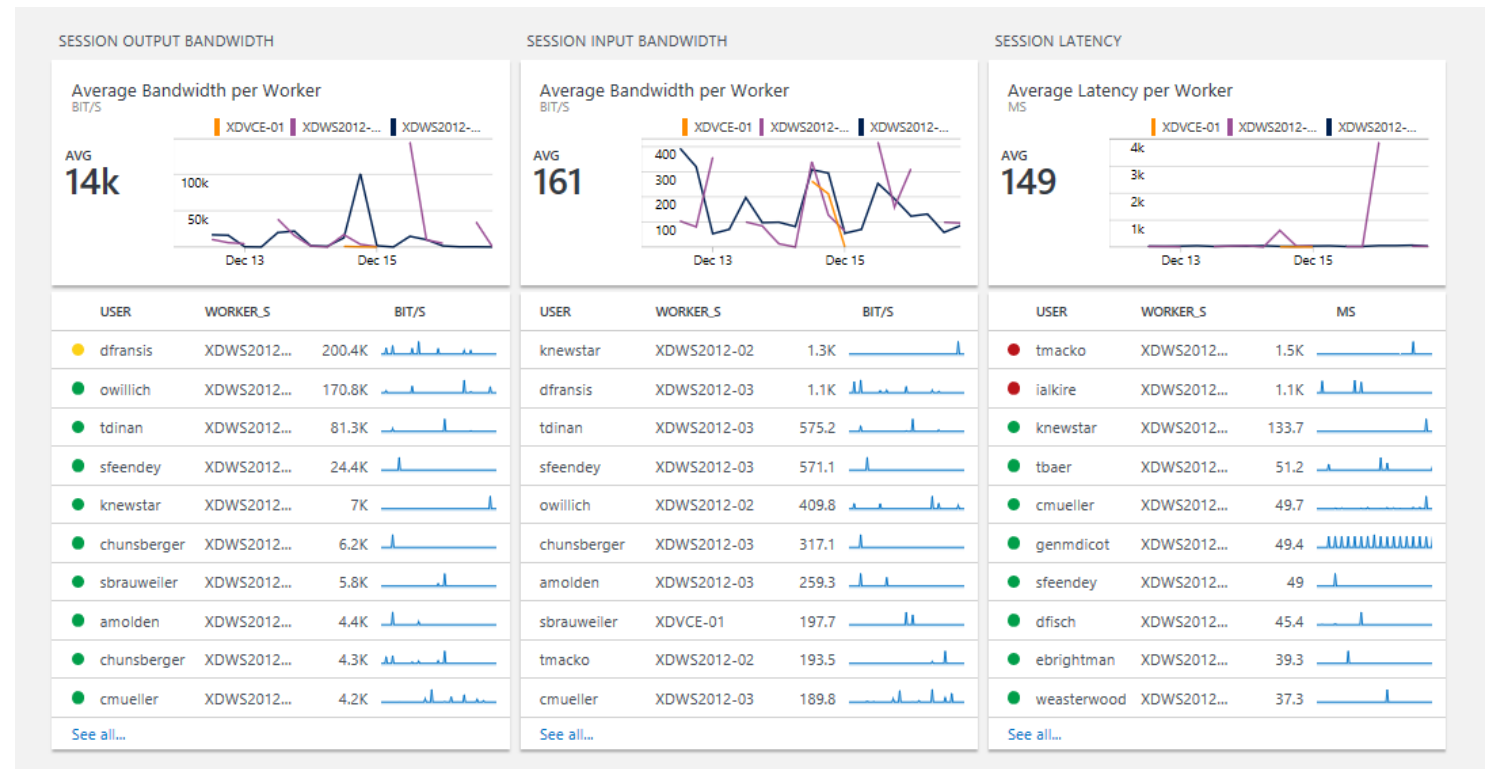
Average latency by user (ms)

Search

User	Latency
c	94.492m
n	40.786m
s	38.42ms
h	38.267m
jt	35.839m
n	35.552m

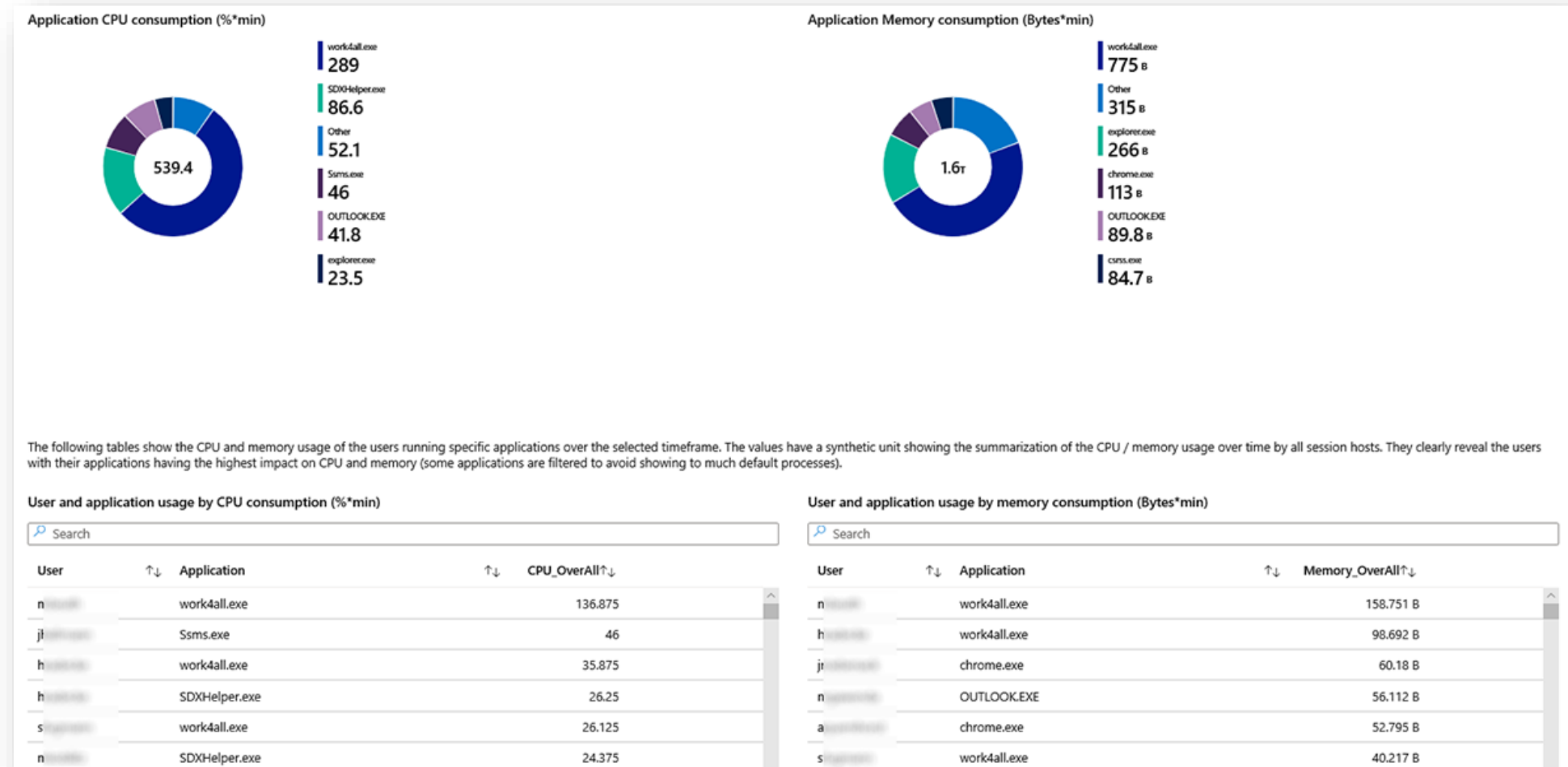
Gives you all information about your AVD

- ✓ This includes e.g. bandwidth and latency for each single user and session on your site.
- ✓ Gives you detailed information about performance data of the worker. For example: CPU usage, memory consumption, etc.

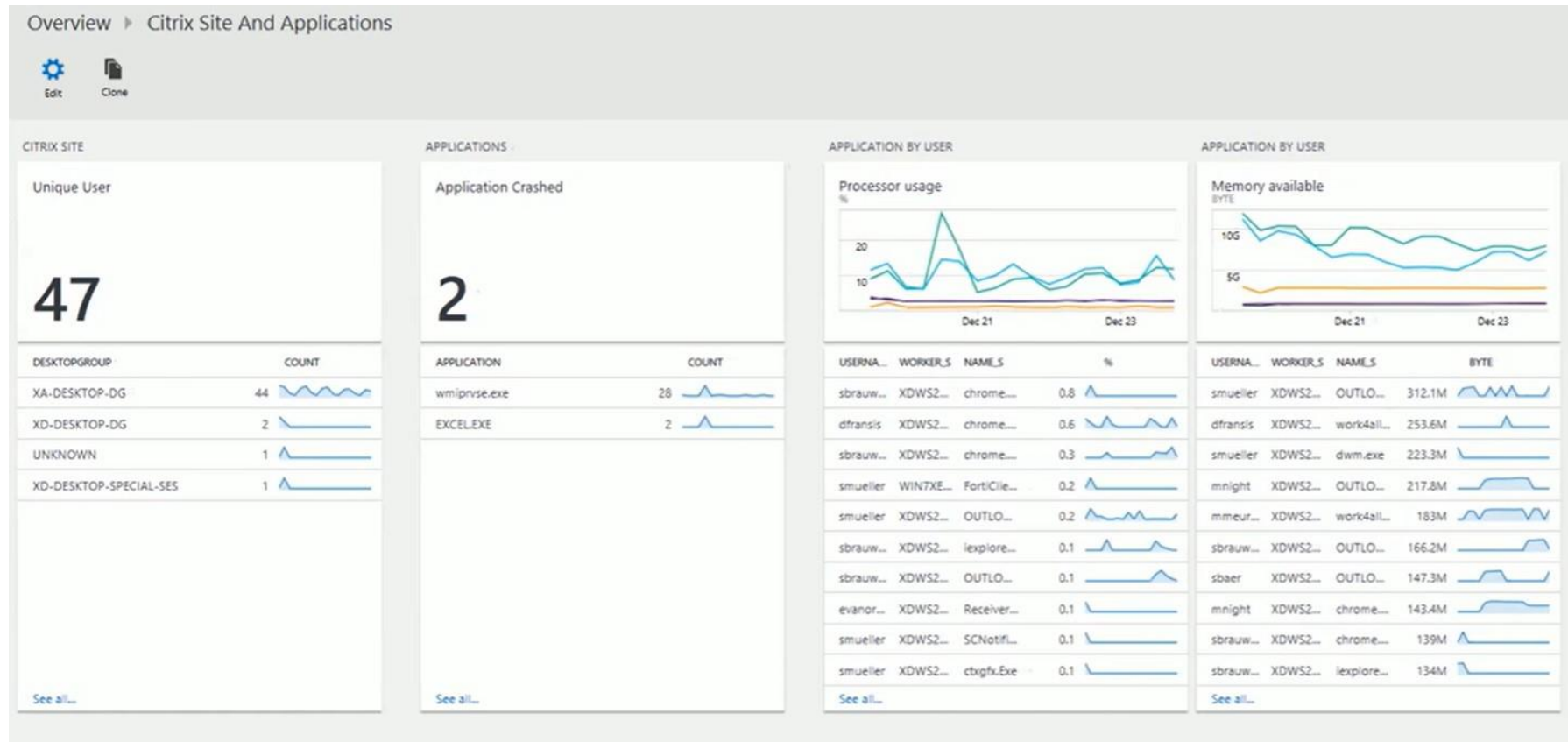




Application CPU & Memory Monitoring

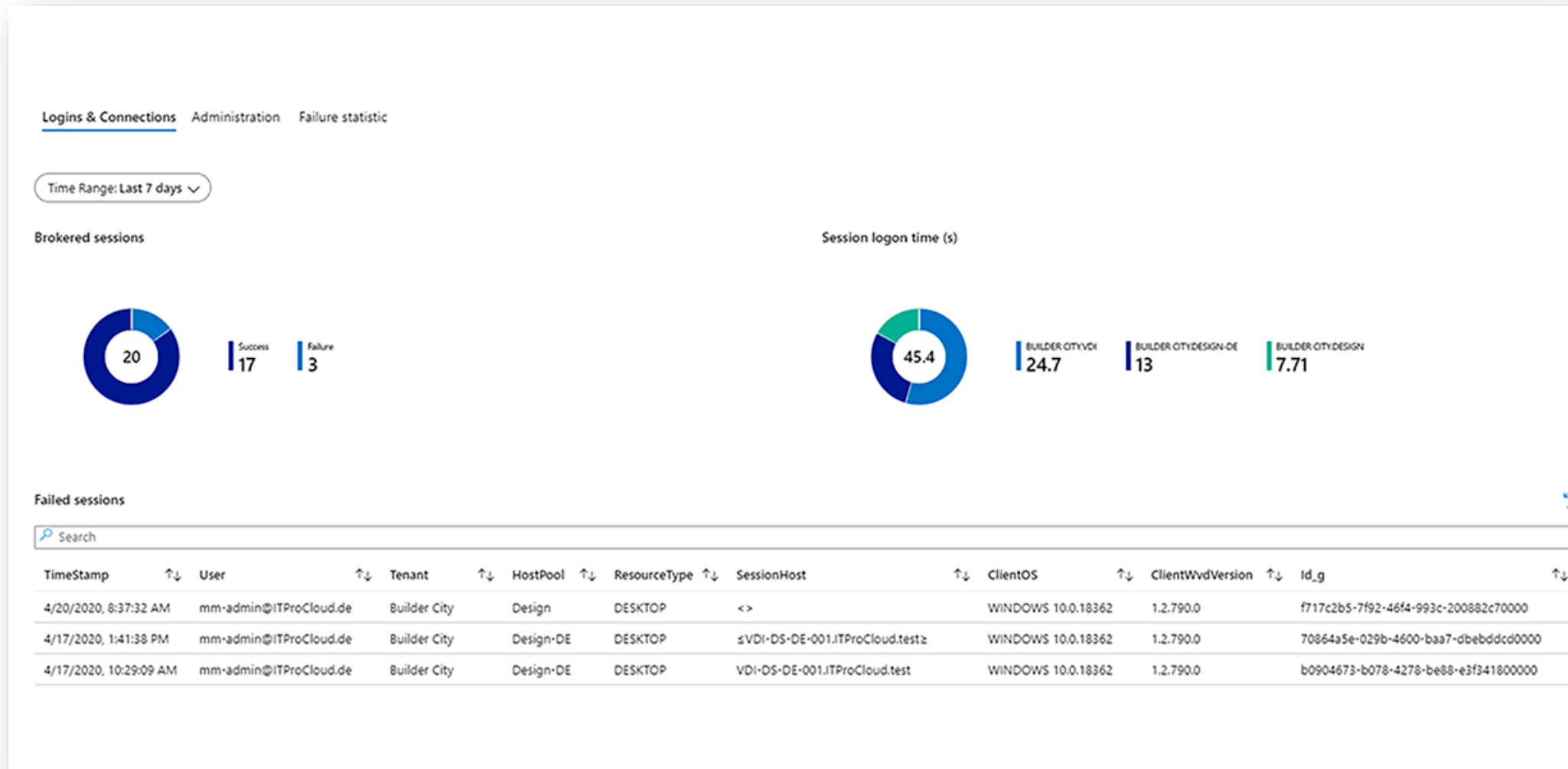


Applications Monitoring





Session Failures & Success Monitoring



Looking forward
Thank You

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