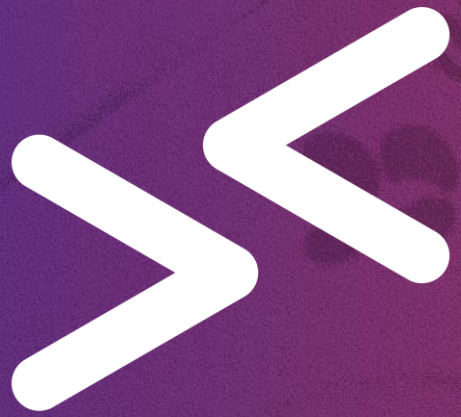
Microsoft control up nerdio UNICON LG stratodesk PQR



AVD TECH FEST 2024

hosted by control up

How to select the right Azure Virtual Desktop and Windows 365 Cloud PC VM type

Benny Tritsch

EUC Score

Benny Tritsch

Dr. Tritsch IT Consulting

EUC Score

Parallels

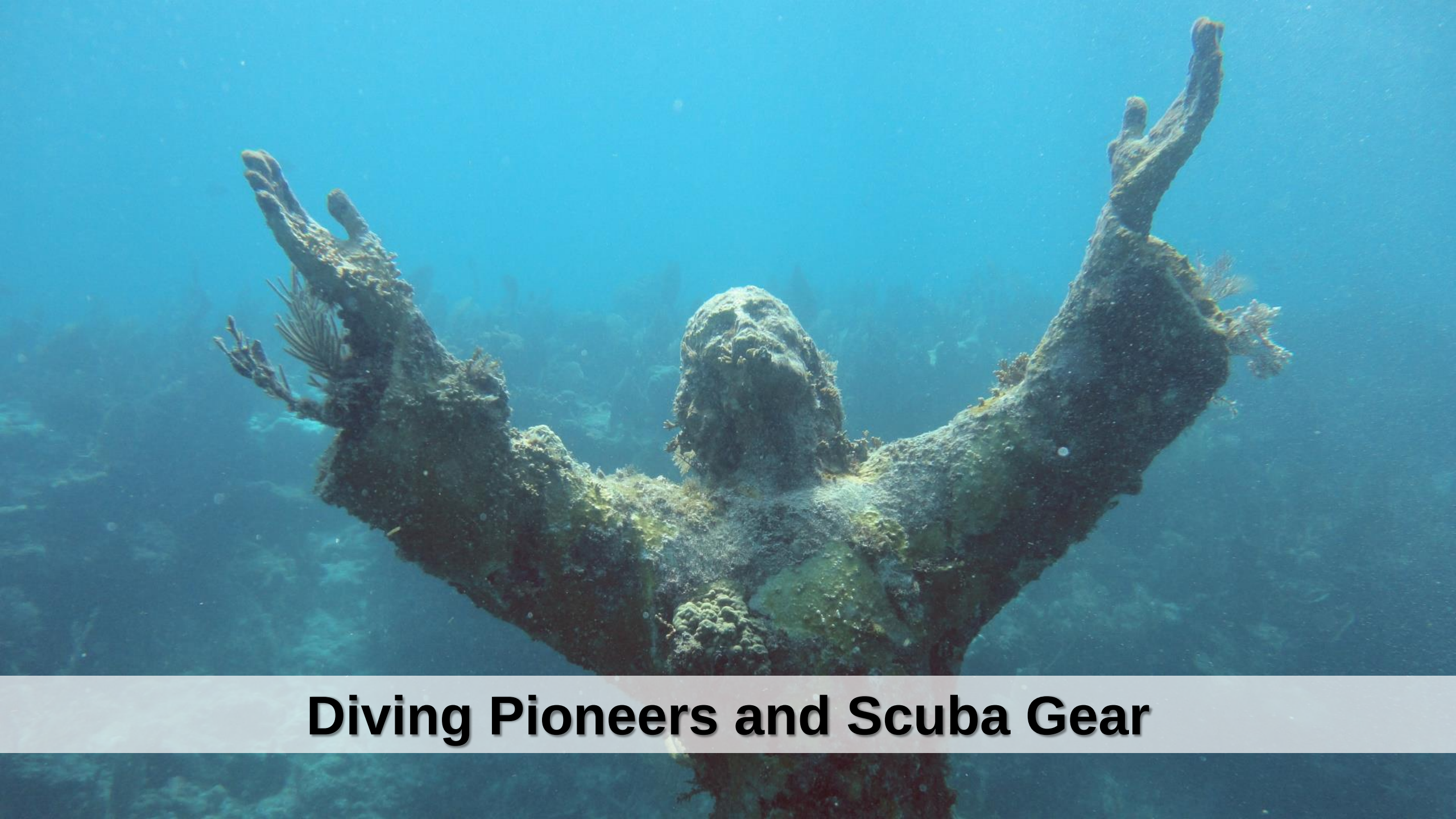
GO-EUC

TeamRGE
Remoting Graphics Experts

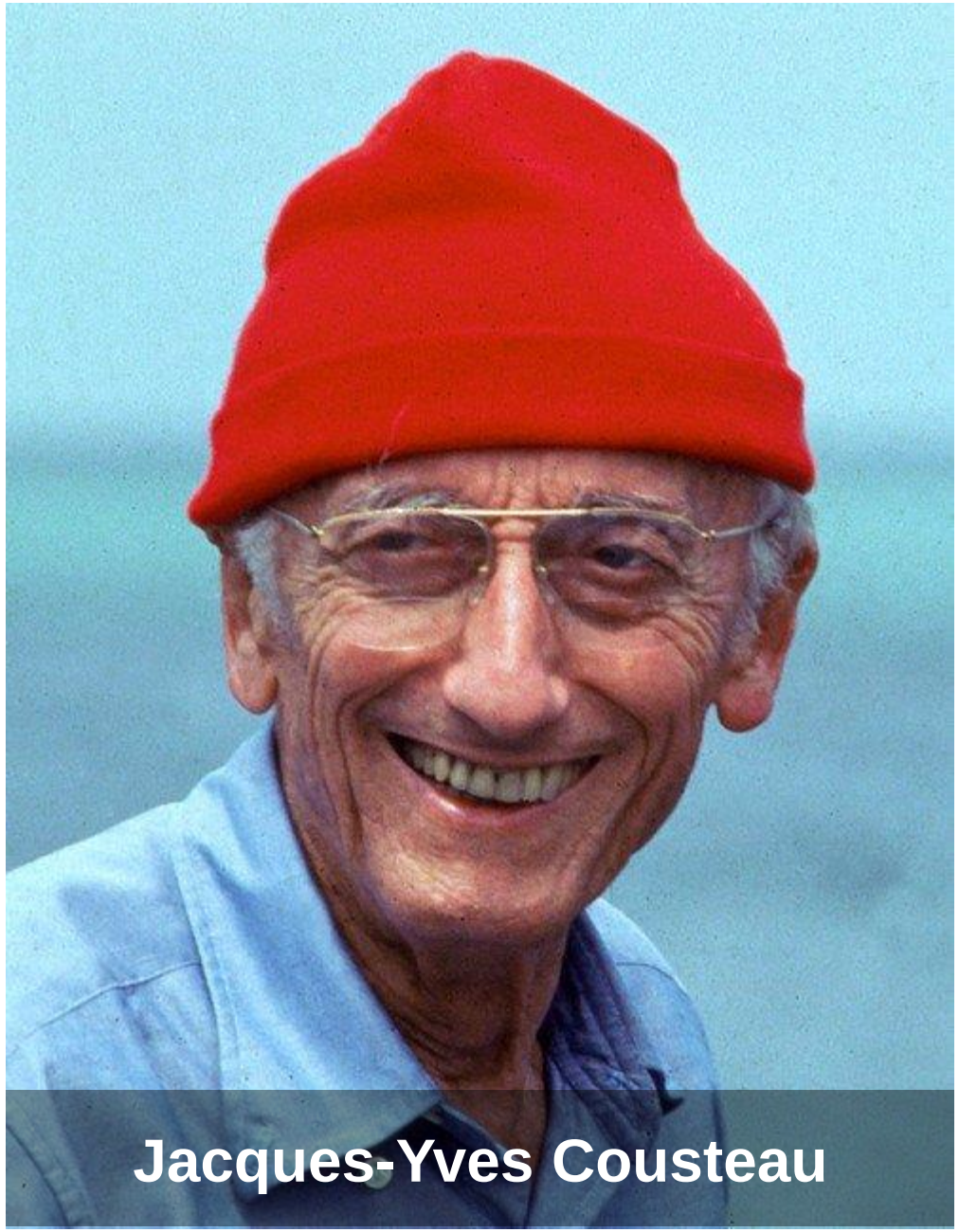
DE EUC FORUM

Performance Data Scientist
EUC Documentary Cameraman
MVP | CTP | Tech Expert | NGCA

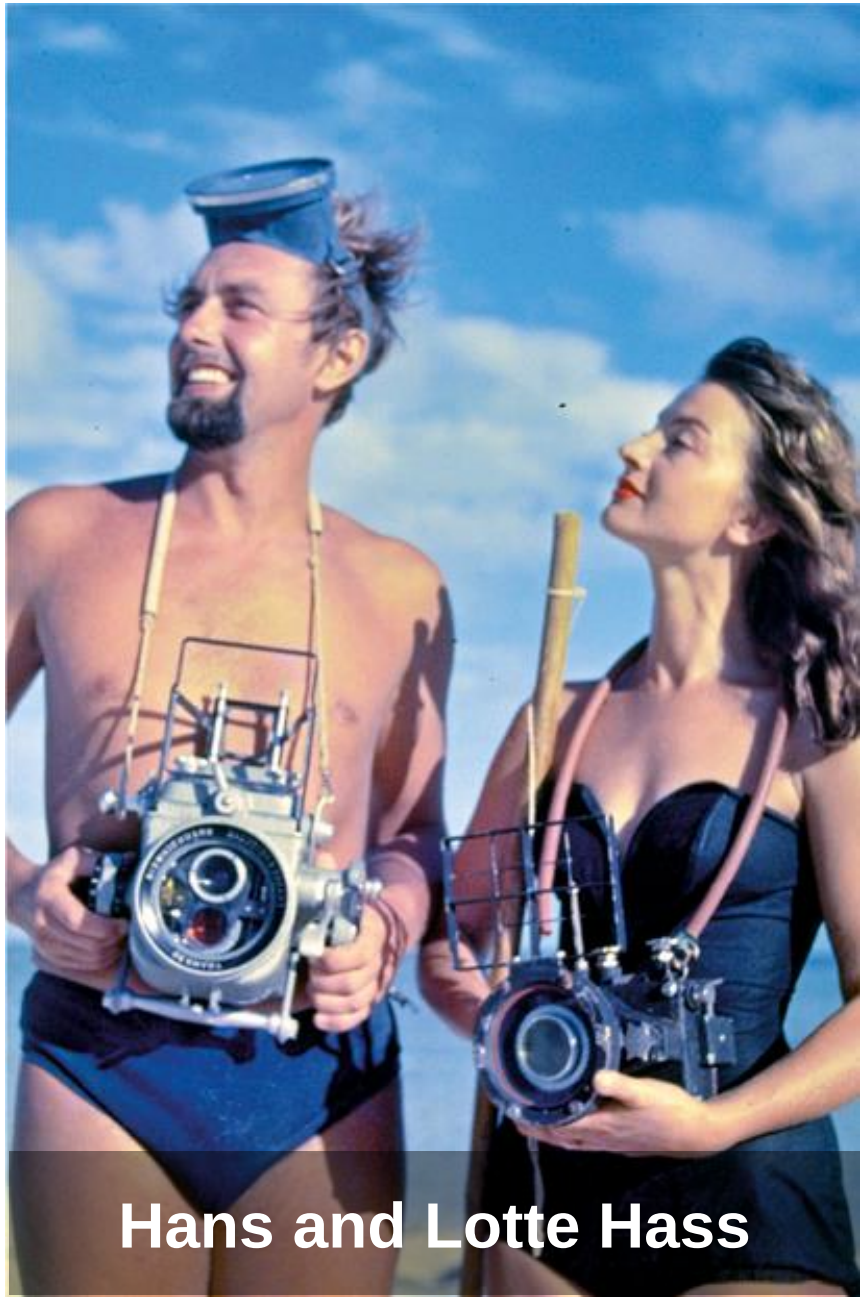
info@drtritsch.com
info@eucscore.com



Diving Pioneers and Scuba Gear



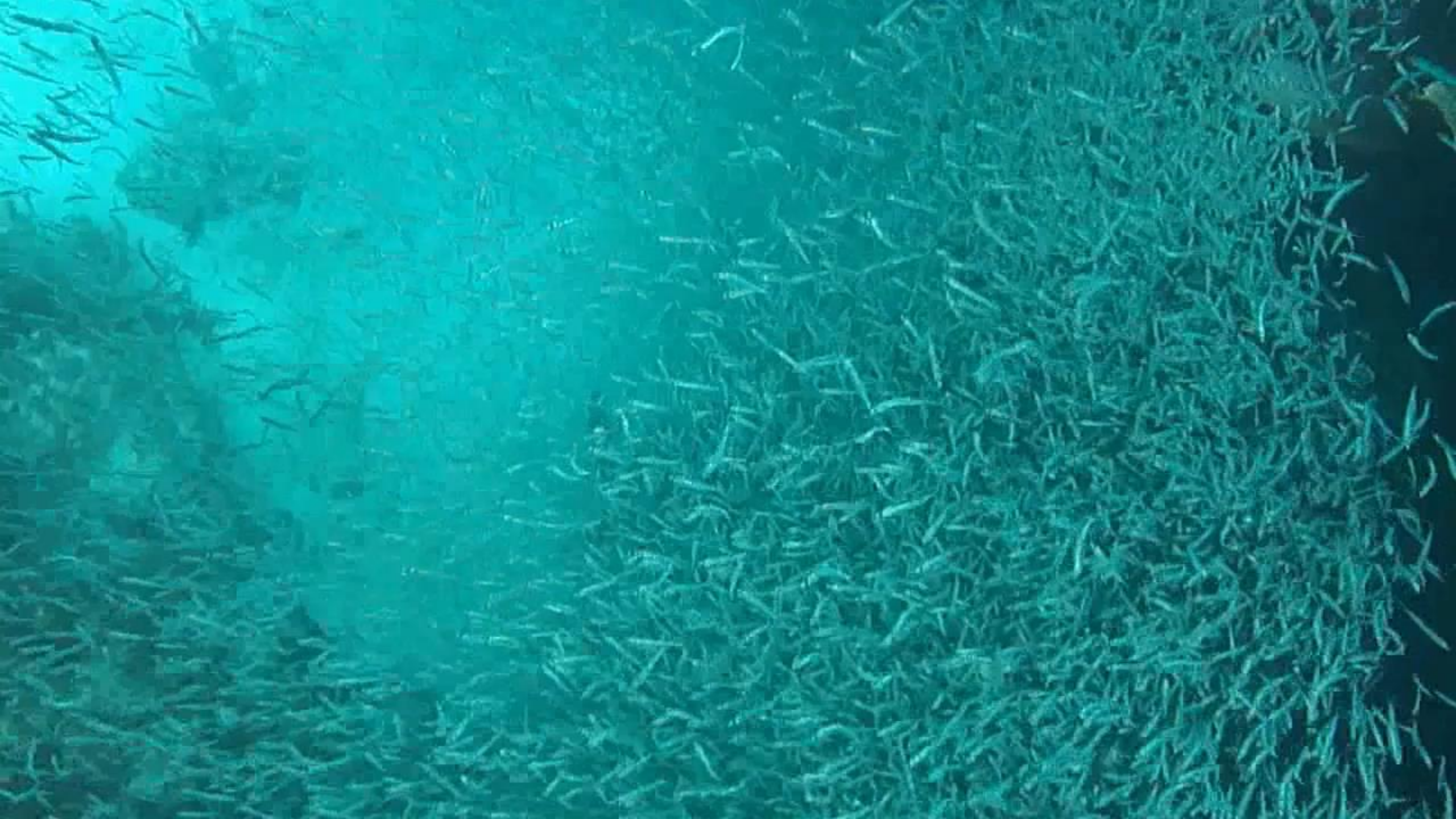
Jacques-Yves Cousteau

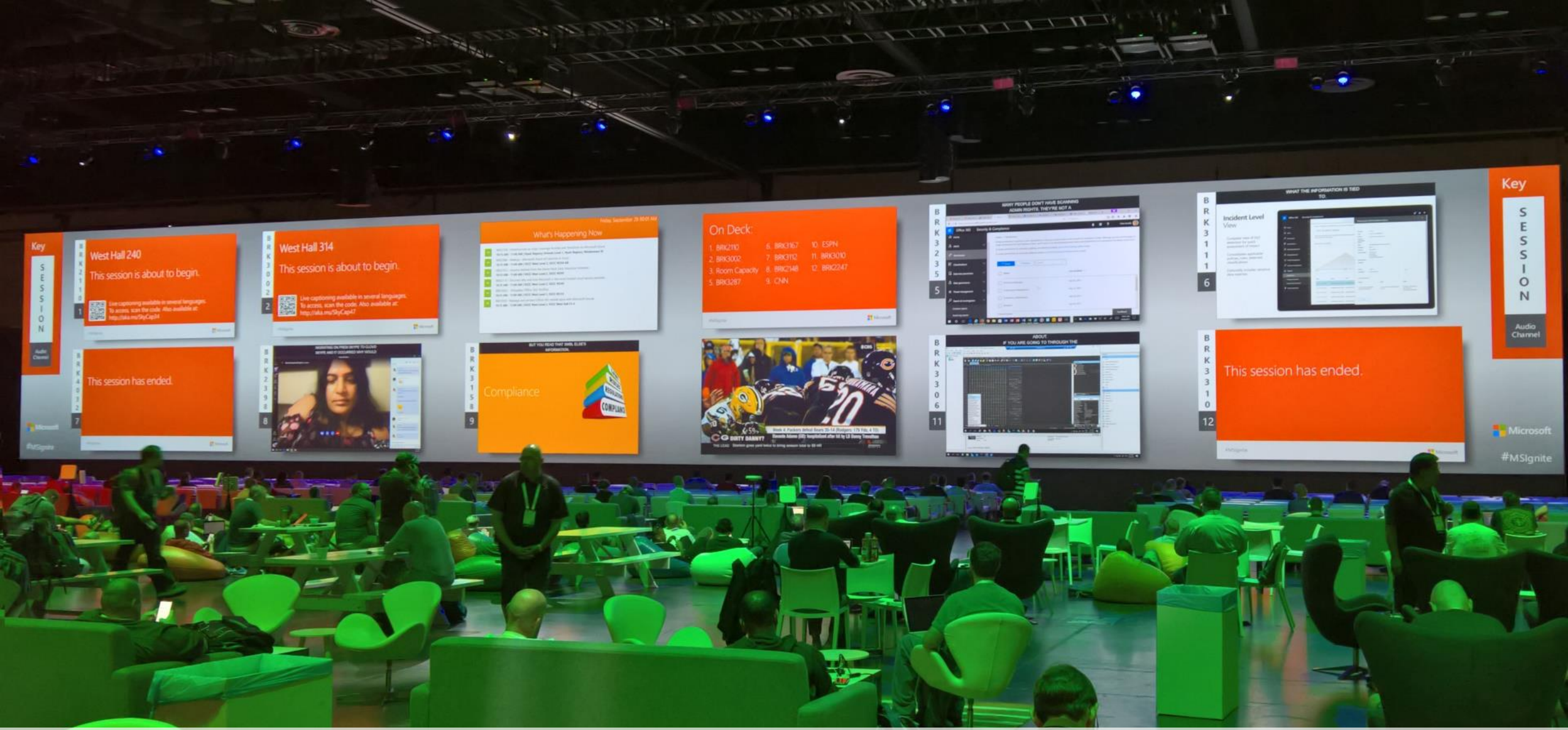


Hans and Lotte Hass

SCUBA GEAR


BCD
REGULATOR
OCTOPUS
INSTRUMENTS
COMPUTER
LIGHT
DIVE SUIT
MASK
SNORKEL
FINS
TANK
KNIFE
CRESSI

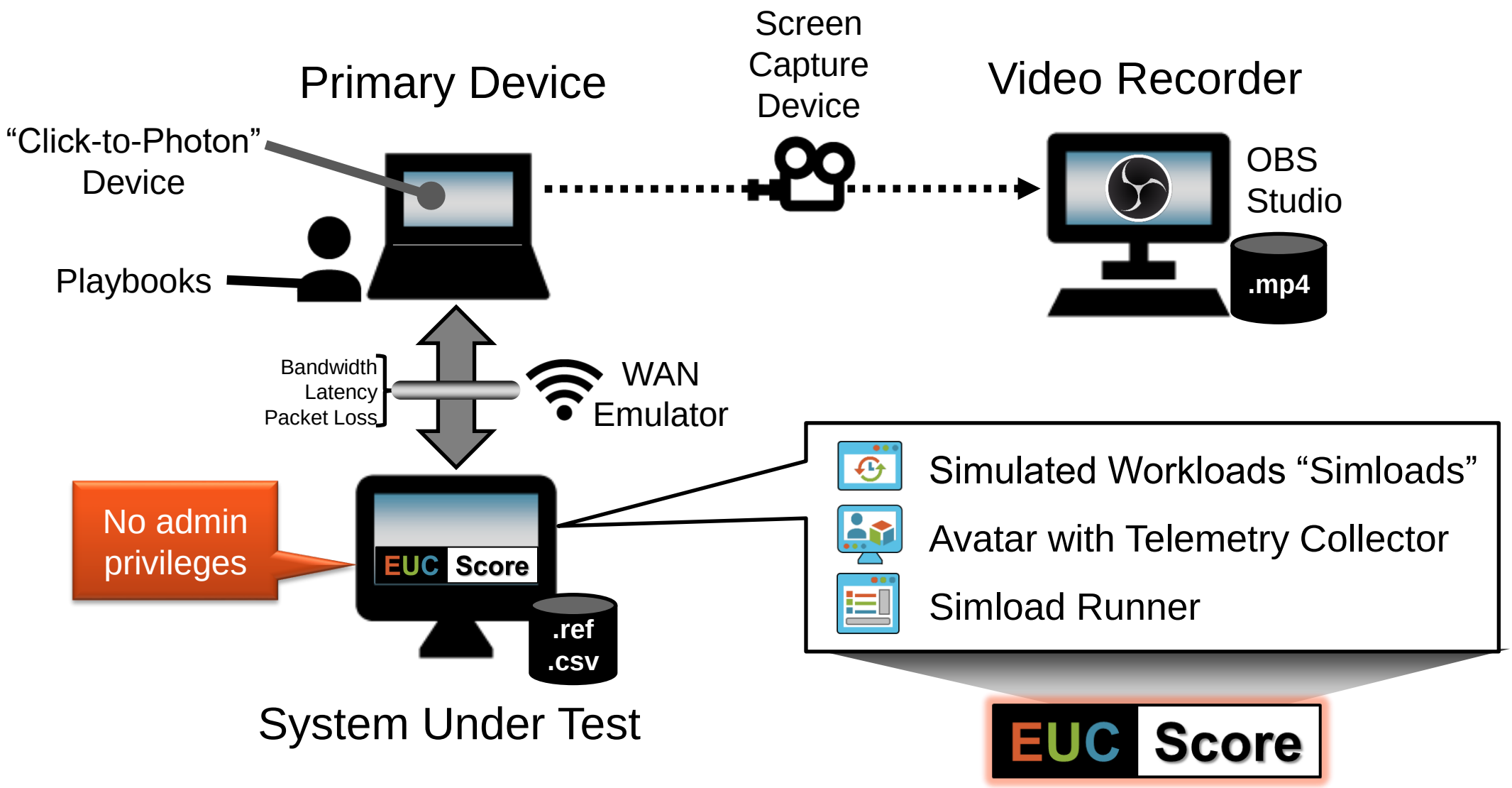




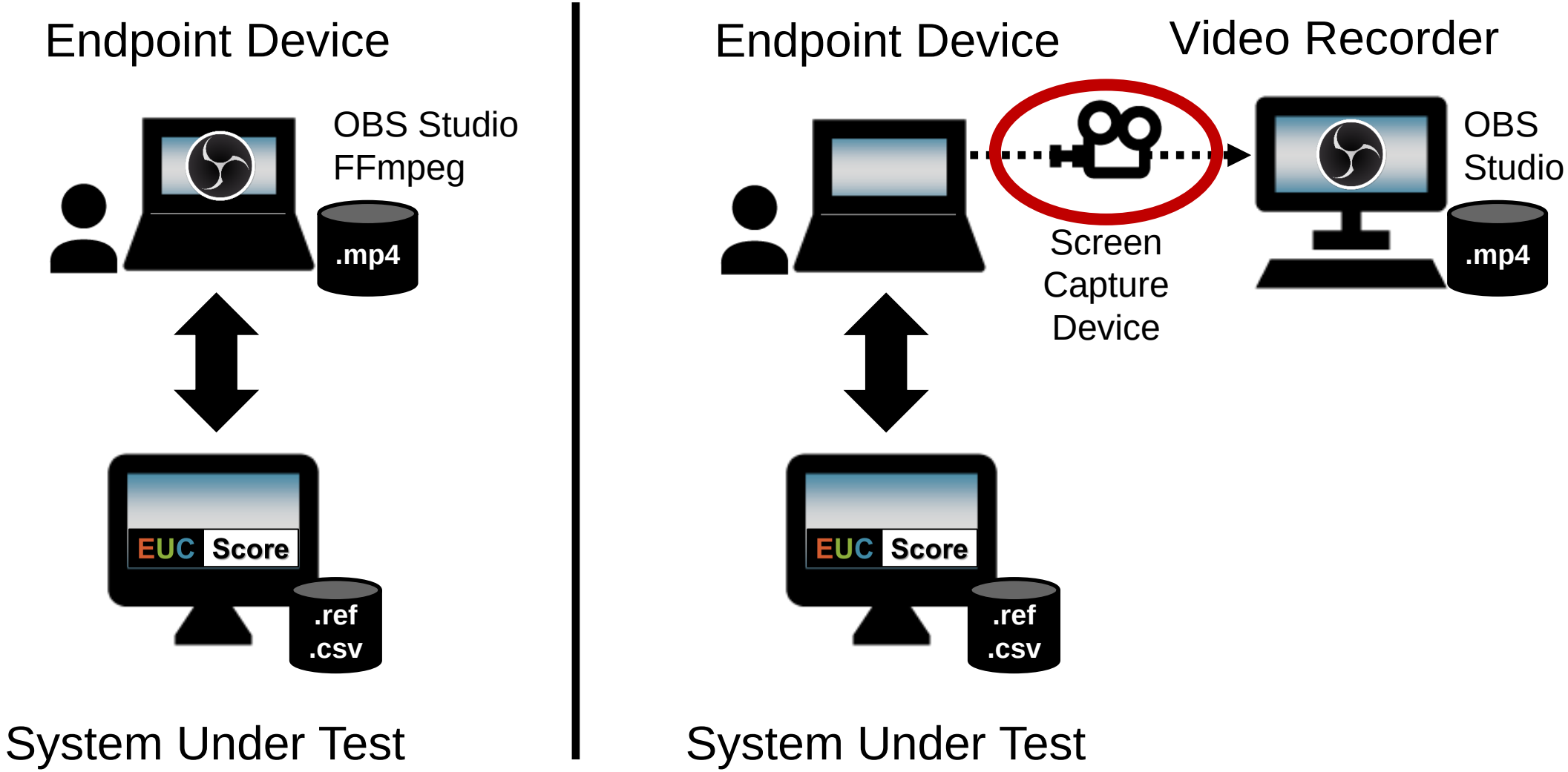
EUC Performance Test Equipment


It’s
alive!

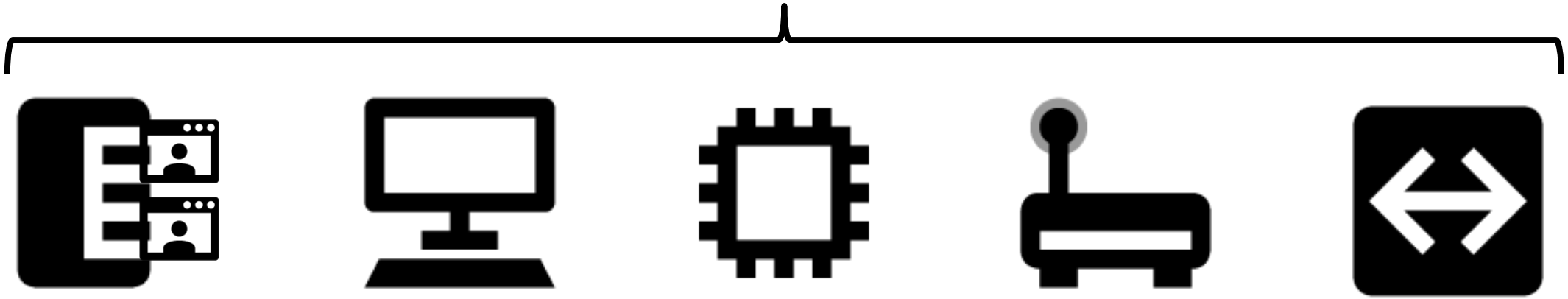
DEX Test Lab Equipment



Screen Video Recording Options



User Experience Influencers



Host System
“VM Type”

Client Device
“Endpoint”

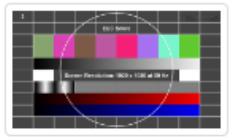
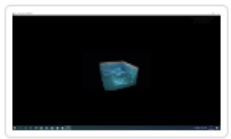
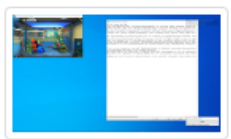
GPUs

Network

Remoting
Protocol

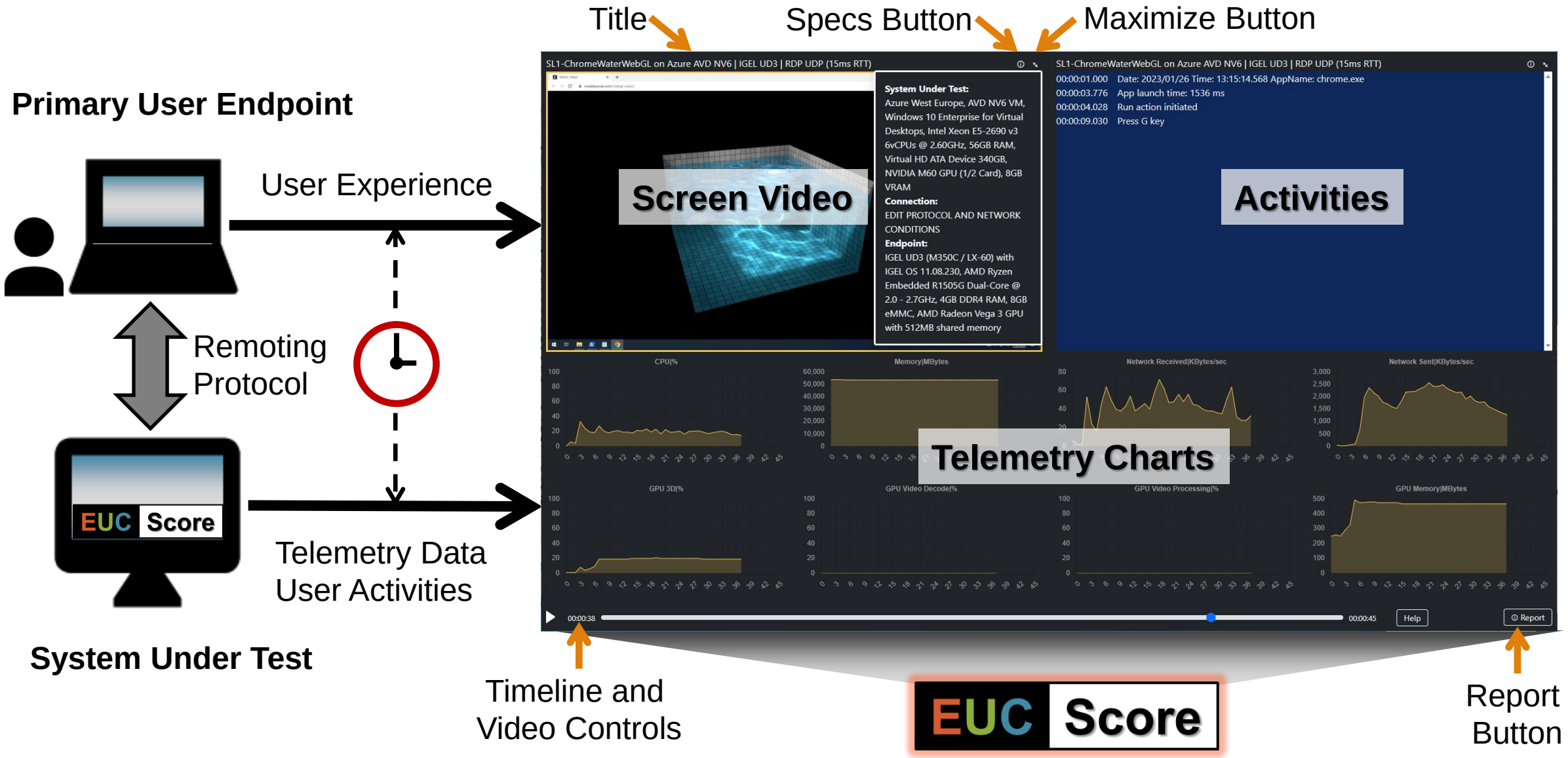
EUC Score Simload Gallery: https://eucscore.com/gallery.html

https://eucscore.com/gallery.html

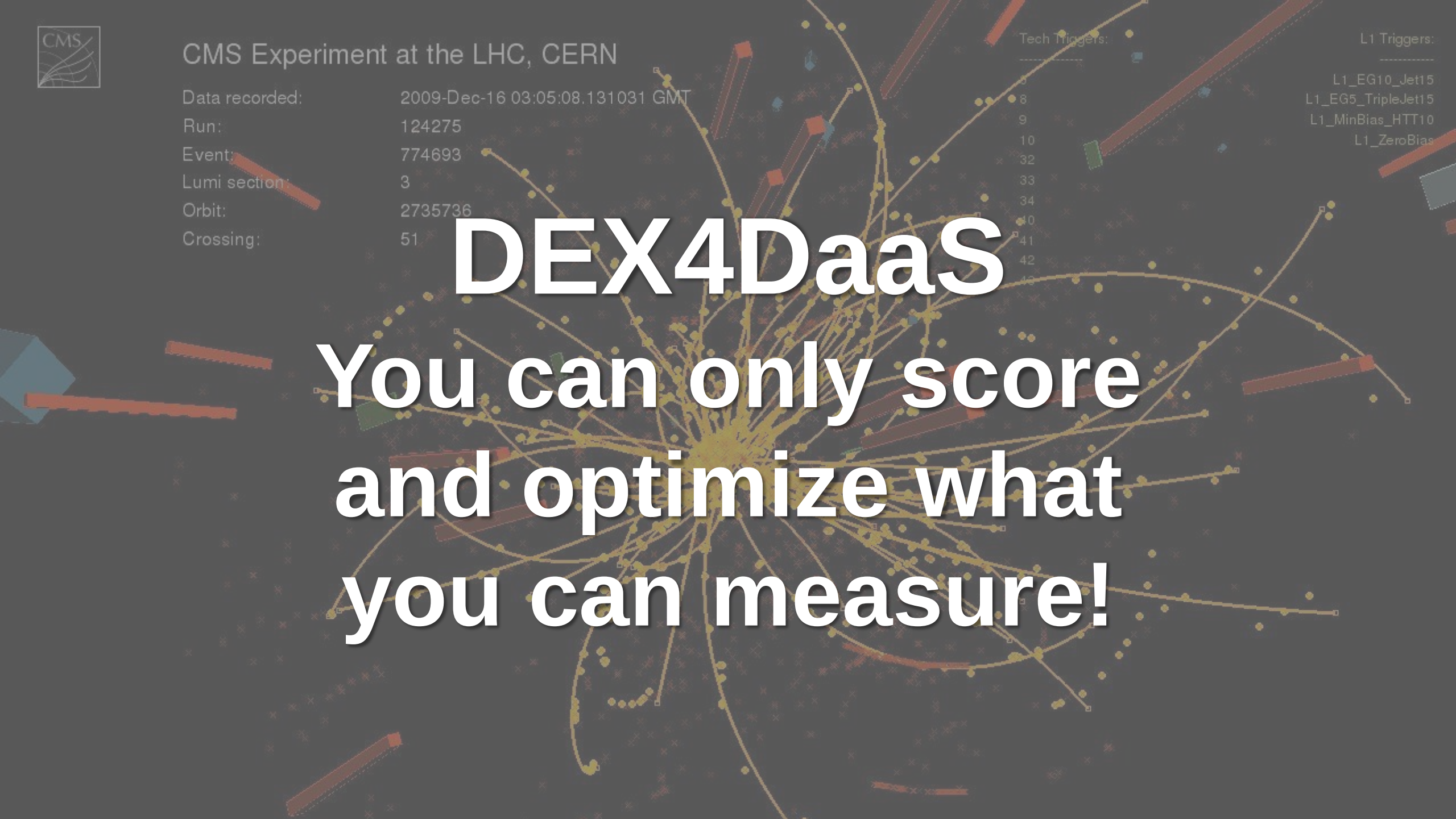
Thumbnail	Simload Type	Description
	**System**	**SL0-TestScreen** Open a test pattern screen and save system information.
	**Primary** Base	**SL1-NotepadEdit** Open Microsoft Notepad and start writing a novel with random type speed.
	**Primary** Base	**SL1-WordpadScroll** Open local DOCX file with PNG images in Wordpad and randomly move pages up and down every second.
	**Primary** JPEGView	**SL1-JPEGViewStatic** Open JEPG image in JEPG View. **NOTE**: This is the most basic Simload as it includes neither animations nor user interactions.
	**Primary** JPEGView	**SL1-JPEGViewAnim** Open animated GIF image in JEPG View.
	**Primary** WMPlayer	**SL1-WMPlayer480pWMV** Open local 480p WMV video in Windows Media Player, switch from windowed to fullscreen mode.
	**Persona** Base	**SL2-Base** **Foreground**: SL3-AppDialog **Background**: SL1-JPEGViewAnim

+ custom or manual Simloads with real user playbooks

Visual Data Analytics – Sync Player

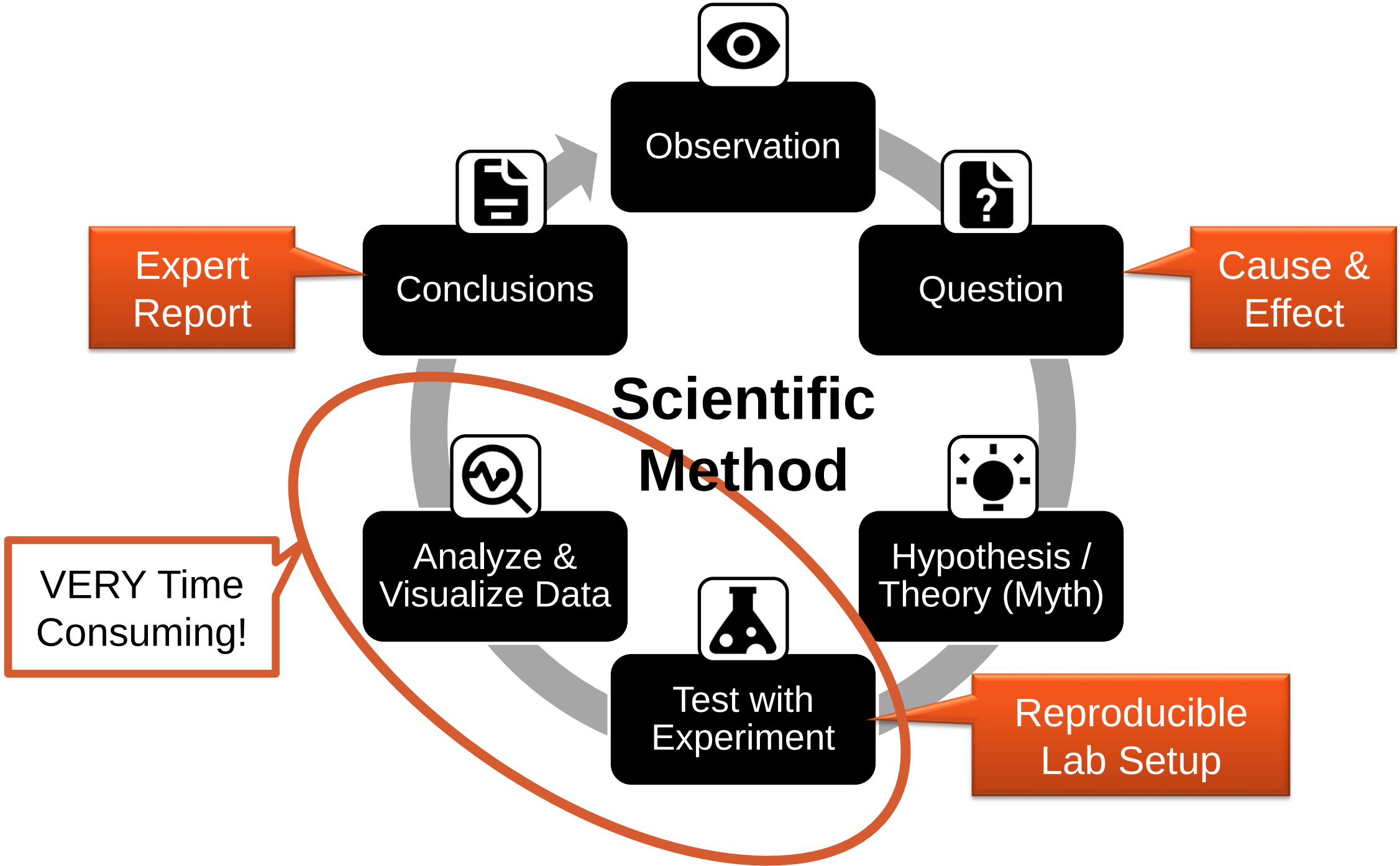


Testing Methodology

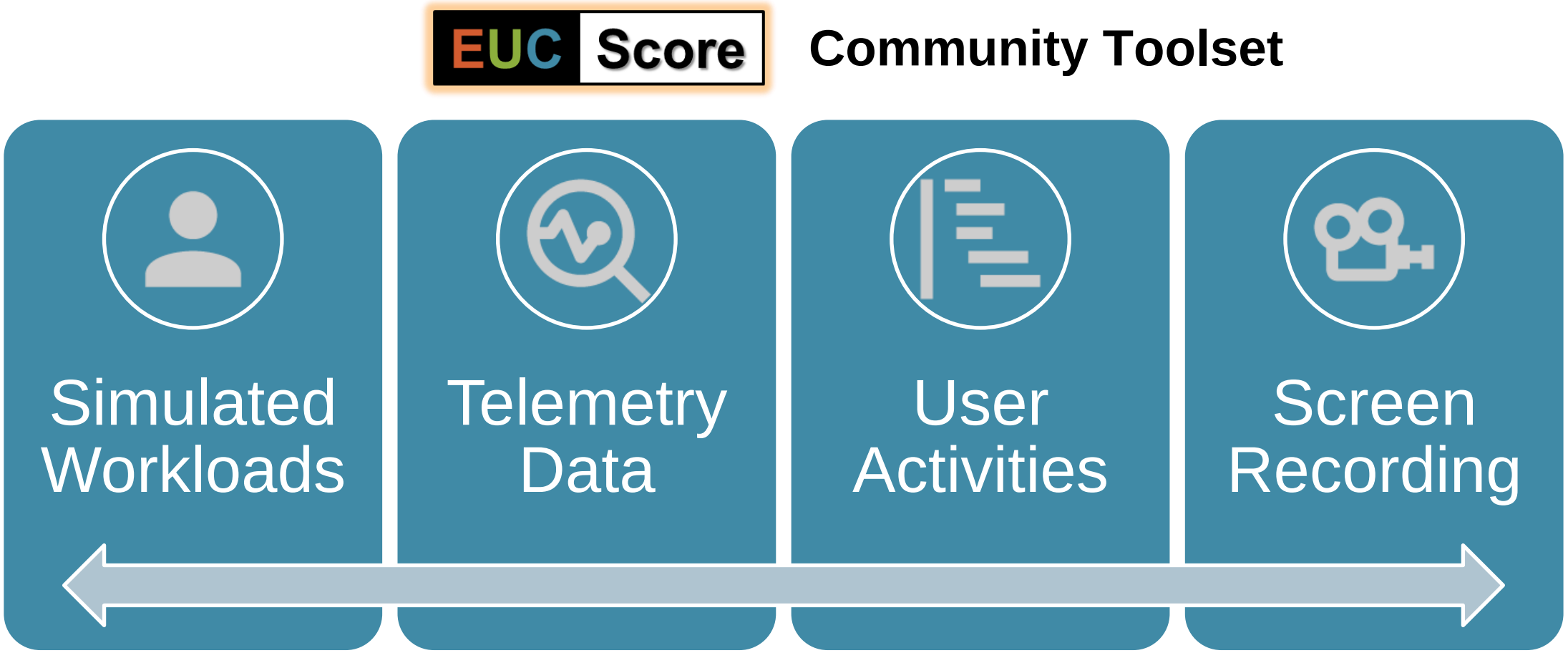


DEX4DaaS

You can only score and optimize what you can measure!


Observation
Question
Cause & Effect
Hypothesis / Theory (Myth)
Test with Experiment
Reproducible Lab Setup
Analyze & Visualize Data
VERY Time Consuming!
Conclusions
Expert Report
Scientific Method

User Experience Benchmarking



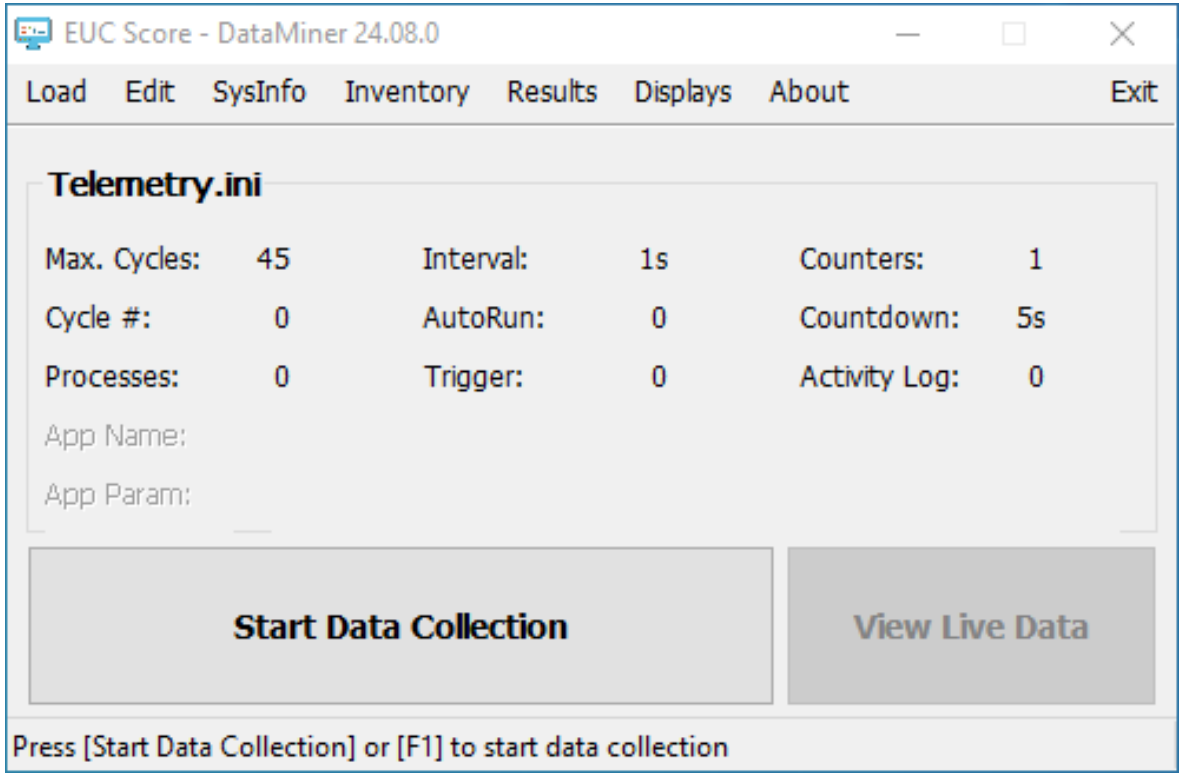
DEX4DaaS Quality Criteria

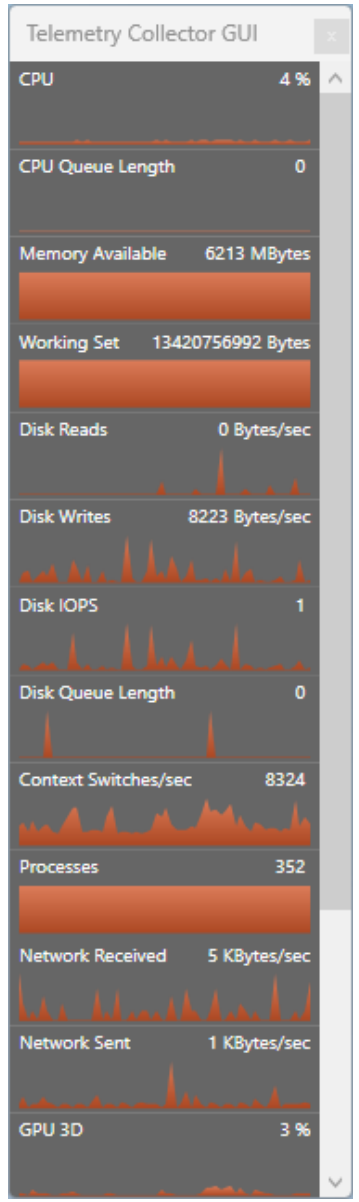
Boot and logon duration	Measure boot time + logon time + user session load time until it is ready for user interaction. Includes identity management and authentication methods.
Application and content load time	Measure time from user starting an application until the content appears and the application is ready for user input, including access to the storage system.
User input delay (“Lag”)	Measures responsiveness of graphical elements after user-initiated triggers = “time from mouse click to screen update” (lag, latency, system response time).
Graphics APIs supported	Detect incompatibilities when running graphics applications using the DirectX, OpenGL, Vulkan and WebGL APIs.
Media formats supported	Detect incompatibilities when opening and playing media files, such as MP4, MPEG, MOV, WMV or AVI.
Distortion of media	Measure media and screen output quality. Detect image, animation, and audio/video compression and decompression artifacts and anomalies.
Screen refresh rate	Measure the number of times per second that the desktop or application can draw consecutive images on the screen and in the host frame buffer (frames per sec = fps).
Endpoint specs and quality	Determine the screens’ number of pixels, density, and visual dimensions – frame buffer requirements grow with resolution and screen number. Detect periphery incompatibilities.
Application reliability and stability	Detect application hangs, freezes, crashes or unhandled exceptions. Measure consistency, dependability and robustness of applications.
Session consistency and resilience	Check if user state is preserved across subsequent sessions. Measure session disruptions, hangs, disconnects/reconnects, availability, timeouts and redundancy.

Soft Metrics – Screen Artifacts / Anomalies

- Block boundary – mosaicking, pixelating, quilting, checkerboarding
- Tiling, striping – rendering each section of an image grid, a tile, or a stripe separately
- Smear artifact – grime, smudge, airbrush effect
- Blurriness – out of focus, fuzziness, unsharpness
- Color artifacts – false colors, color bleeding
- Mosquito noise – edge busyness
- Ringing – echoing, ghosting
- Choppy – laggy, jumpy, jerky
- Floating – illusory motion in certain regions while the surrounding areas remain static
- Jitter – loss of transmitted data between network devices
- Flickering – fine-grain flickering and coarse-grain flickering
- Slow motion
- Video stuttering (“micro stutters”)
- Freeze frames

Hard Metrics – Collecting Telemetry Data





Windows Telemetry Data (Core Set)

Components	Performance Counters
CPU	\Processor(_Total)\% Processor Time \System\Processor Queue Length
Memory	\Memory\Available Mbytes \Process(_Total)\Working Set
Storage	\PhysicalDisk(_Total)\Disk Read Bytes/sec \PhysicalDisk(_Total)\Disk Write Bytes/sec \PhysicalDisk(_Total)\Disk Transfers/sec (IOPS) \PhysicalDisk(_Total)\Current Disk Queue Length
System	\System\Context Switches/sec \System\Processes
Network	TC::network received(_Total) TC::network sent(_Total)
GPU	TC::GPU load(_Total)\3D TC::GPU load(_Total)\Video Decode TC::GPU load(_Total)\Video Processing TC::GPU frame buffer(_Total)

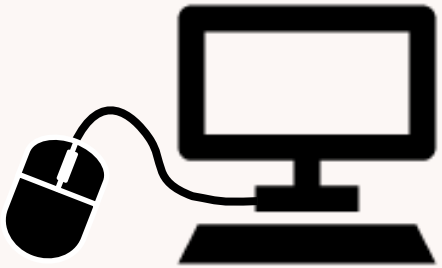
Different Personas – Different Requirements

	Persona Name	Rendering	IT Workforce	Description
	**Task Worker**	CPU	25-80%	Well-defined, repetitive, and delineated tasks, using a limited number of applications
	**Information Worker**	CPU or shared GPU	25-80%	Find facts quickly, create documents, edit, write & process information
	**Knowledge Worker**	High-end CPU or shared GPU	10-50% ~400m	Tasks include accessing the Internet, using email, and creating complex documents, presentations, and spreadsheets
	**Power User**	Shared GPU or dedicated GPU	5-50% ~200m	People who use multiple compute, network and graphics-intensive applications
	**CAD/CAM Professional Designer**	Dedicated GPU	5-25% ~25m	People who use graphically-intense applications for computer-aided design (CAD) and computer-aided manufacturing (CAM)

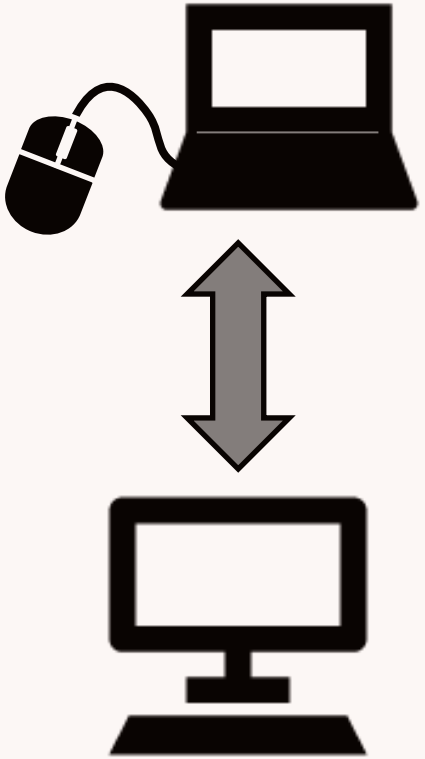
Pick a Test Scenario

End User Computing

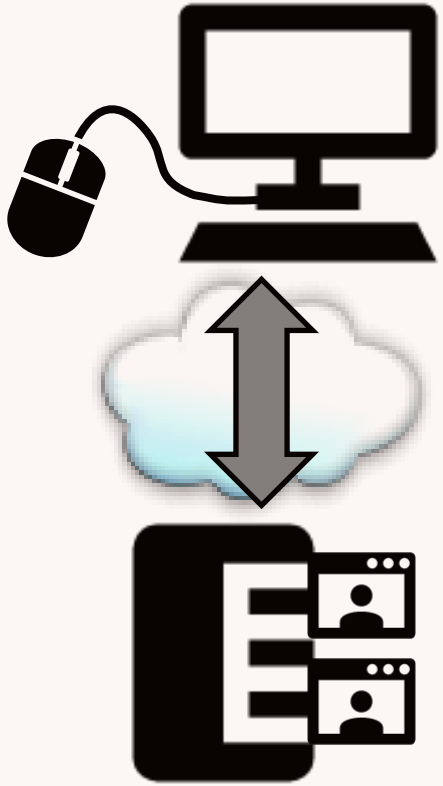
On-Prem Windows



VDI / RDSH on LAN



AVD / Win365



No GPU: VM Types Across Multiple Clouds

Instance	CPU	CPU Base Clock Speed	Max CPU Speed - single-core	vCPUs	RAM	Storage Type	Storage Size
Microsoft Azure							
Azure D2s_v3	Intel Xeon 8272 - Cascade Lake	2.6 GHz	3.7 GHz	2	8 GiB	Premium-SSD	256GB
Azure D4s_v3	Intel Xeon 8272 - Cascade Lake	2.6 GHz	3.7 GHz	4	16 GiB	Premium-SSD	256GB
Azure D2s_v5	Intel Xeon 8370C - IceLake	2.8 GHz	3.5 GHz	2	8 GiB	Premium-SSD	256GB
Azure D2ads_v5	AMD EPYC 7763v - Genoa	2.8 GHz	3.5 GHz	2	8 GiB	Premium-SSD	256GB
Azure D4s_v5	Intel Xeon 8370C - IceLake	2.8 GHz	3.5 GHz	4	16 GiB	Premium-SSD	256GB
Azure D4ads_v5	AMD EPYC 7763v - Genoa	2.8 GHz	3.5 GHz	4	16 GiB	Premium-SSD	256GB
Amazon Web Services							
AWS t3.medium	Intel Xeon 8259 – Cascade Lake	2.5 GHz	3.5 GHz	2	4 GiB	EBS GP3	256GB
AWS t3.large	Intel Xeon 8259 – Cascade Lake	2.5 GHz	3.5 GHz	2	8 GiB	EBS GP3	256GB
AWS t3.xlarge	Intel Xeon 8259 – Cascade Lake	2.5 GHz	3.5 GHz	4	16 GiB	EBS GP3	256GB
AWS m6i.large	Intel Xeon 8375C - IceLake	2.9 GHz	3.5 GHz	2	8 GiB	EBS GP3	256GB
AWS m6i.xlarge	Intel Xeon 8375C - IceLake	2.9 GHz	3.5 GHz	4	16 GiB	EBS GP3	256GB
AWS m6i.2xlarge	Intel Xeon 8375C - IceLake	2.9 GHz	3.5 GHz	8	32 GiB	EBS GP3	256GB
Google Cloud Platform							
GCP N1-Standard-2-Win	Intel Xeon - Skylake	2.0 GHz	3.5 GHz	2	7.5 GiB	Zonal SSD PD	256GB
GCP N1-Standard-4-Win	Intel Xeon - Skylake	2.0 GHz	3.5 GHz	4	15 GiB	Zonal SSD PD	256GB
GCP E2-Standard-2-Win	Intel Xeon - Broadwell	2.2 GHz	3.7 GHz	2	8 GiB	Zonal SSD PD	256GB
GCP E2-Standard-4-Win	Intel Xeon - Broadwell	2.2 GHz	3.7 GHz	4	16 GiB	Zonal SSD PD	256GB
GCP N2d-Standard-2-Win	AMD EPYC - Rome	2.25 GHz	3.3 GHz	2	8 GiB	Zonal SSD PD	256GB
GCP N2d-Standard-4-Win	AMD EPYC - Rome	2.25 GHz	3.3 GHz	4	16 GiB	Zonal SSD PD	256GB

GPU: VM Types Across Multiple Clouds

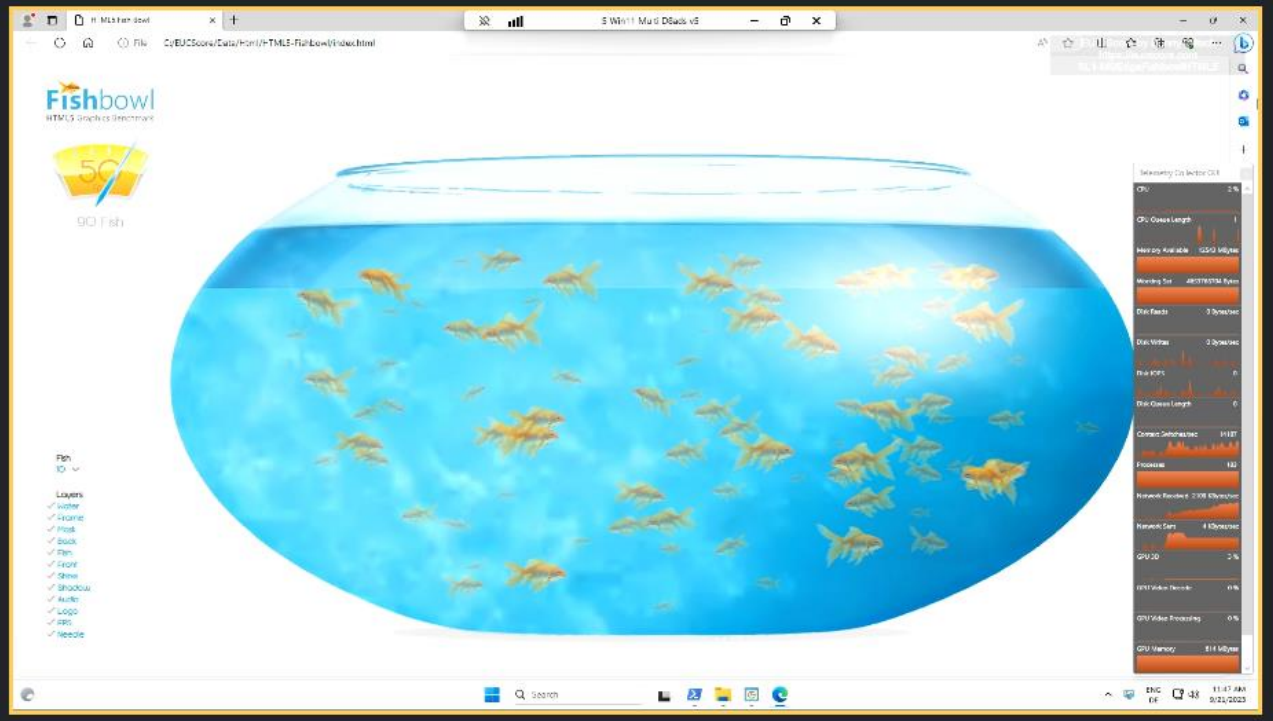
Instance	CPU	CPU Base Clock Speed	Max CPU Speed	vCPUs	RAM	Storage Type	Storage Size	GPU	GPU VRAM	GPU Release Year
Microsoft Azure										
Azure NV6	Intel Xeon E5-2690v3 - Haswell	2.6 GHz	3.5 GHz	6	56 GiB	Standard-SSD	256GB	NVIDIA M60	8 GB	Aug 2015
Azure NV4as_v4	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	4	14 GiB	Premium-SSD	256GB	AMD MI25	2 GB	Jun 2017
Azure NV8as_v4	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	8	28 GiB	Premium-SSD	256GB	AMD MI25	4 GB	Jun 2017
Azure NV16as_v4	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	16	56 GiB	Premium-SSD	256GB	AMD MI25	8 GB	Jun 2017
Azure NV32as_v4	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	32	112 GiB	Premium-SSD	256GB	AMD MI25	16 GB	Jun 2017
Azure NC4asT4_v3	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	4	28 GiB	Premium-SSD	256GB	NVIDIA T4	16 GB	Sep 2018
Azure NC8asT4_v3	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	8	56 GiB	Premium-SSD	256GB	NVIDIA T4	16 GB	Sep 2018
Azure NC16asT4_v3	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	16	110 GiB	Premium-SSD	256GB	NVIDIA T4	16 GB	Sep 2018
Azure NV6adsA10_v5	AMD EPYC 74F3 - Milan	3.2 GHz	4.0 GHz	6	55 GiB	Premium-SSD	256GB	NVIDIA A10 4Q	4 GB	Apr 2021
Azure NV12adsA10_v5	AMD EPYC 74F3 - Milan	3.2 GHz	4.0 GHz	12	110 GiB	Premium-SSD	256GB	NVIDIA A10 8Q	8 GB	Apr 2021
Azure NV36adsA10_v5	AMD EPYC 74F3 - Milan	3.2 GHz	4.0 GHz	36	440 GiB	Premium-SSD	256GB	NVIDIA A10 24Q	24 GB	Apr 2021
Amazon Web Services										
AWS G4ad.XL	AMD EPYC 7R32 - Rome	2.8 GHz	3.3 GHz	4	16 GiB	EBS GP3	256GB	AMD V520	8 GB	Dec 2020
AWS G4ad.2XL	AMD EPYC 7R32 - Rome	2.8 GHz	3.3 GHz	8	32 GiB	EBS GP3	256GB	AMD V520	8 GB	Dec 2020
AWS G4ad.4XL	AMD EPYC 7R32 - Rome	2.8 GHz	3.3 GHz	16	64 GiB	EBS GP3	256GB	AMD V520	8 GB	Dec 2020
AWS G4ad.8XL	AMD EPYC 7R32 - Rome	2.8 GHz	3.3 GHz	32	128 GiB	EBS GP3	256GB	AMD V520 x2	8 GB	Dec 2020
AWS G4dn.XL	Intel Xeon 8259 - Cascade Lake	2.5 GHz	3.5 GHz	4	16 GiB	EBS GP3	256GB	NVIDIA T4	16 GB	Sep 2018
AWS G4dn.2XL	Intel Xeon 8259 - Cascade Lake	2.5 GHz	3.5 GHz	8	32 GiB	EBS GP3	256GB	NVIDIA T4	16 GB	Sep 2018
AWS G4dn.4XL	Intel Xeon 8259 - Cascade Lake	2.5 GHz	3.5 GHz	16	64 GiB	EBS GP3	256GB	NVIDIA T4	16 GB	Sep 2018
AWS.G4dn.8XL	Intel Xeon 8259 - Cascade Lake	2.5 GHz	3.5 GHz	32	128 GiB	EBS GP3	256GB	NVIDIA T4	16 GB	Sep 2018
AWS G5.xl	AMD EPYC 7R32 - Rome	2.8 GHz	3.3 GHz	4	16 GiB	EBS GP3	256GB	NVIDIA A10G	24 GB	Apr 2021
AWS G5.2xl	AMD EPYC 7R32 - Rome	2.8 GHz	3.3 GHz	8	32 GiB	EBS GP3	256GB	NVIDIA A10G	24 GB	Apr 2021
AWS G5.4xl	AMD EPYC 7R32 - Rome	2.8 GHz	3.3 GHz	16	64 GiB	EBS GP3	256GB	NVIDIA A10G	24 GB	Apr 2021
AWS G5.8xl	AMD EPYC 7R32 - Rome	2.8 GHz	3.3 GHz	32	128 GiB	EBS GP3	256GB	NVIDIA A10G	24 GB	Apr 2021
Google Cloud Platform										
GCP N1-STD-2-GPU-T4	Intel Xeon 3647 – Skylake	2.0 GHz	3.5 GHz	2	8 GiB	Zonal SSD PD	256GB	NVIDIA T4	16 GB	Sep 2018
GCP N1-STD-4-GPU-T4	Intel Xeon 3647 – Skylake	2.0 GHz	3.5 GHz	4	16 GiB	Zonal SSD PD	256GB	NVIDIA T4	16 GB	Sep 2018
GCP N1-STD-8-GPU-T4	Intel Xeon 3647 – Skylake	2.0 GHz	3.5 GHz	8	30 GiB	Zonal SSD PD	256GB	NVIDIA T4	16 GB	Sep 2018
GCP N1-STD-16-GPU-T4	Intel Xeon 3647 – Skylake	2.0 GHz	3.5 GHz	16	60 Gib	Zonal SSD PD	256GB	NVIDIA T4	16 GB	Sep 2018

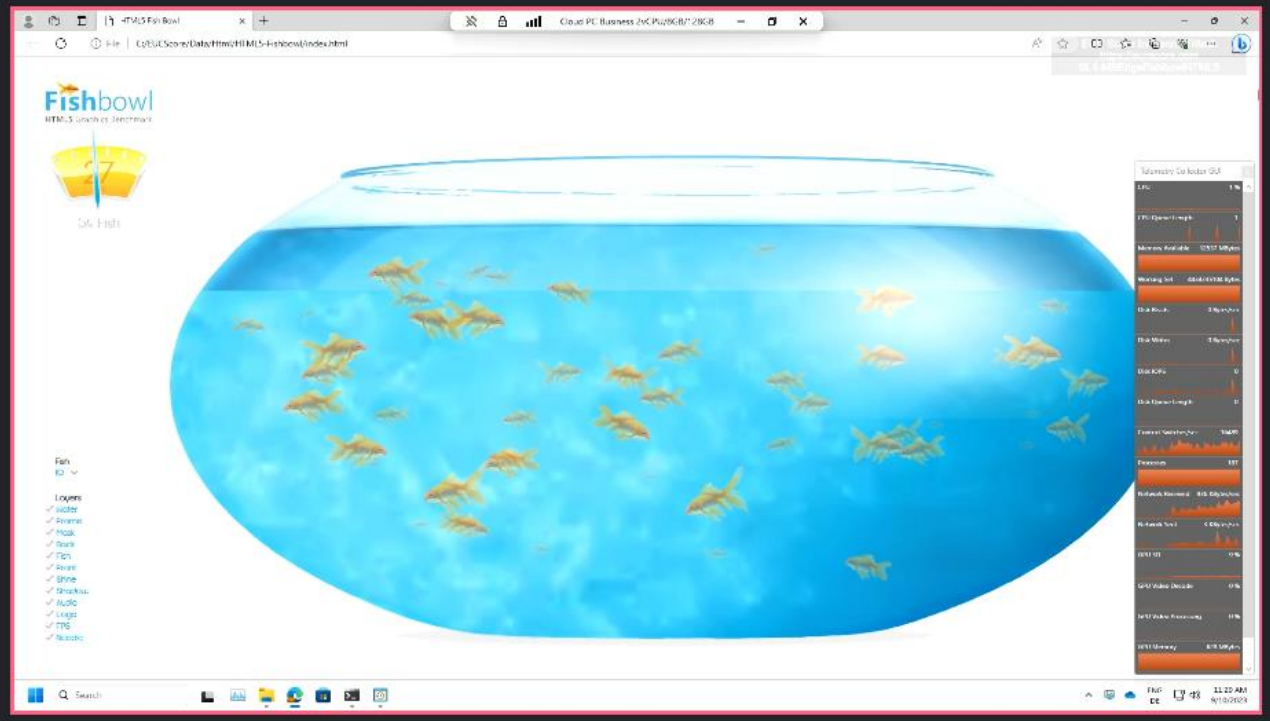
Azure Cloud PC – Windows 356

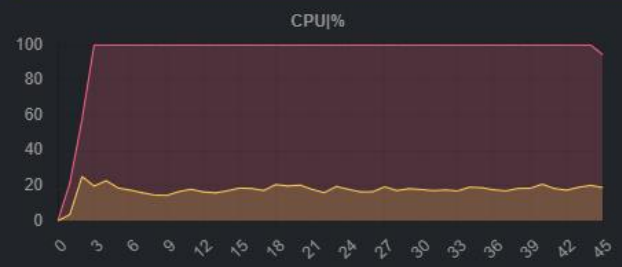
Instance	vCPUs	RAM	Storage Size	GPU	GPU VRAM
Microsoft Azure					
Windows 365 Basic	2	4 GiB	64-256GB	No	--
Windows 365 Standard	2	8 GiB	128-256GB	No	--
Windows 365 Premium	4	16 GiB	128-512GB	No	--
Windows 365 Premium+	8	32 GiB	128-512GB	No	--
Windows 365 Premium++	16	64 GiB	512GB – 1TB	No	--
Windows 365 GPU Standard	4	16 GiB	512GB	Yes	8GB
Windows 365 GPU Super	8	56 GiB	1TB	Yes	12GB
Windows 365 GPU Max	16	110 GiB	1TB	Yes	16GB

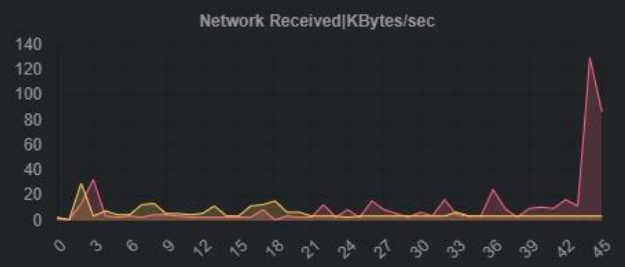
SL1-MSEdgeFishbowlHTML5 on Azure D8ads_v5 | RDP-SxS UDP (15ms RTT)

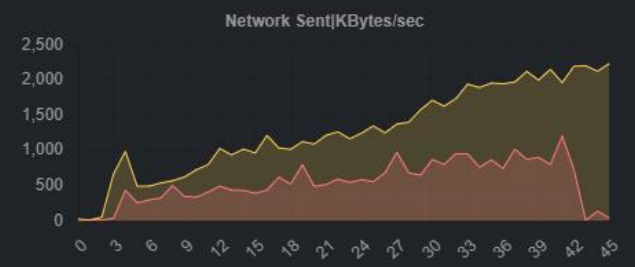
SL1-MSEdgeFishbowlHTML5 on Azure Win365 Cloud PC Standard | SxS RDP UDP (15ms RTT)

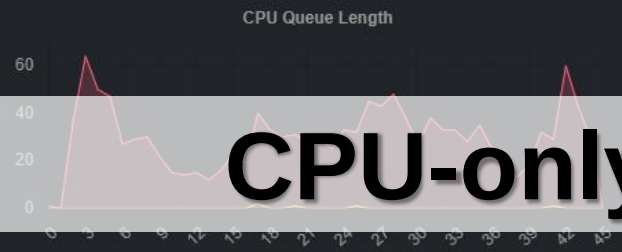


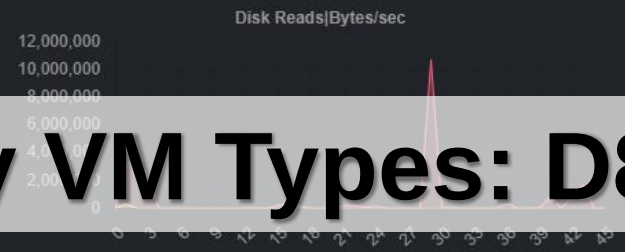


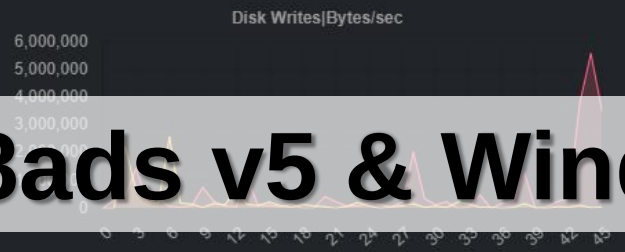


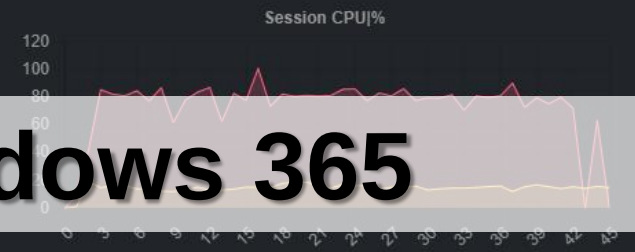






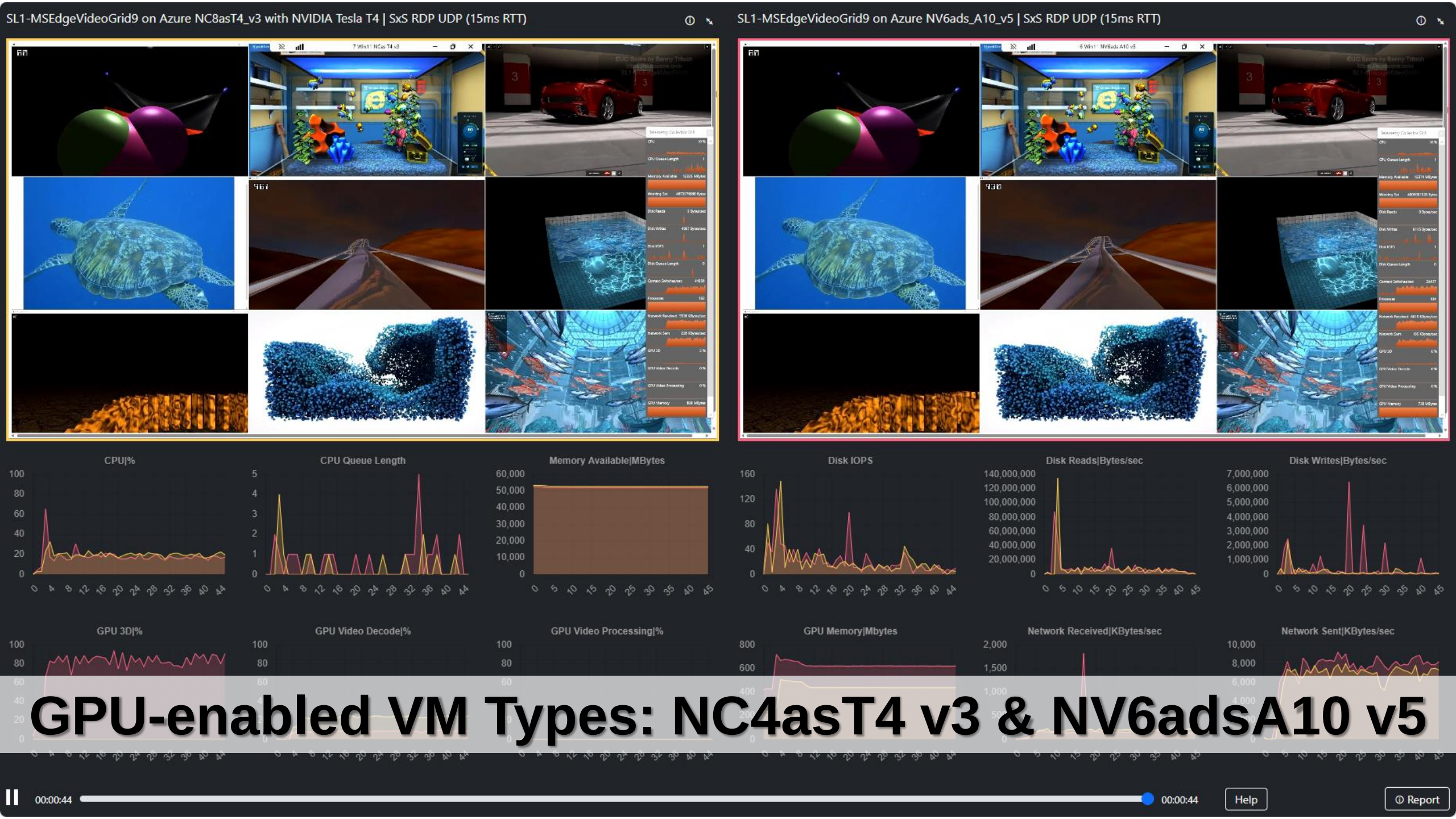




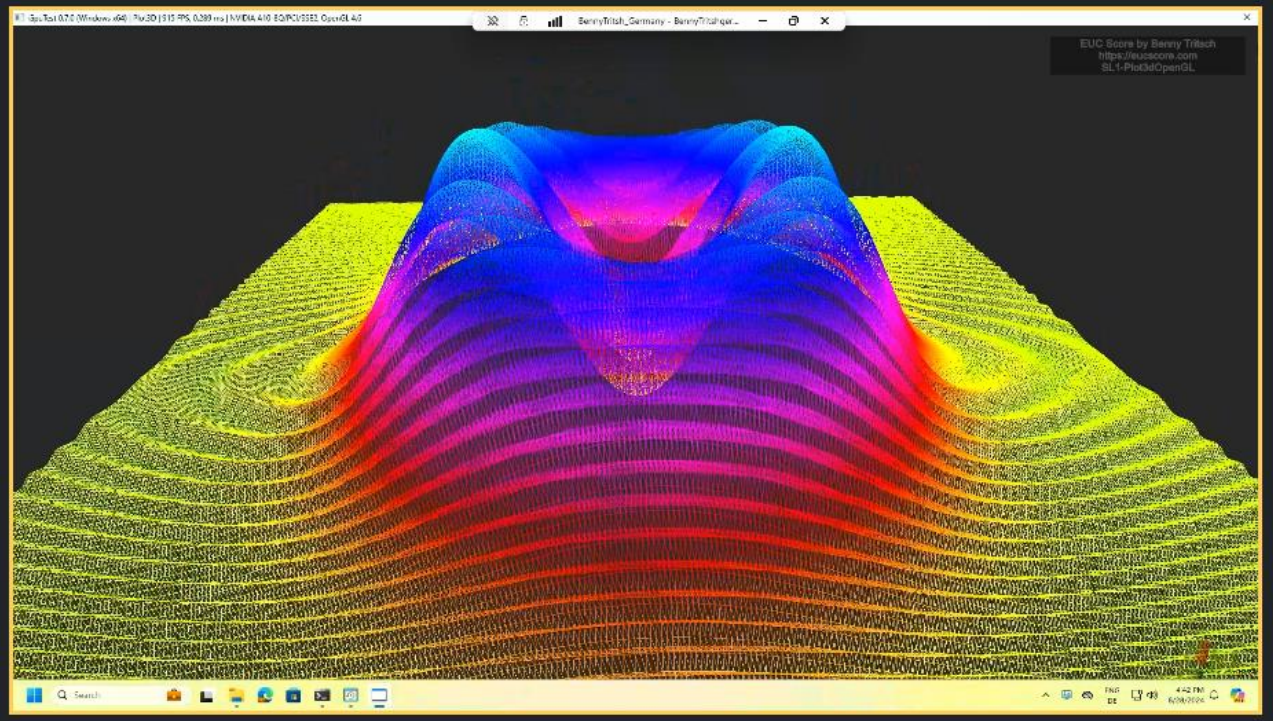


CPU-only VM Types: D8ads v5 & Windows 365

00:00:44 00:00:44 Help Report

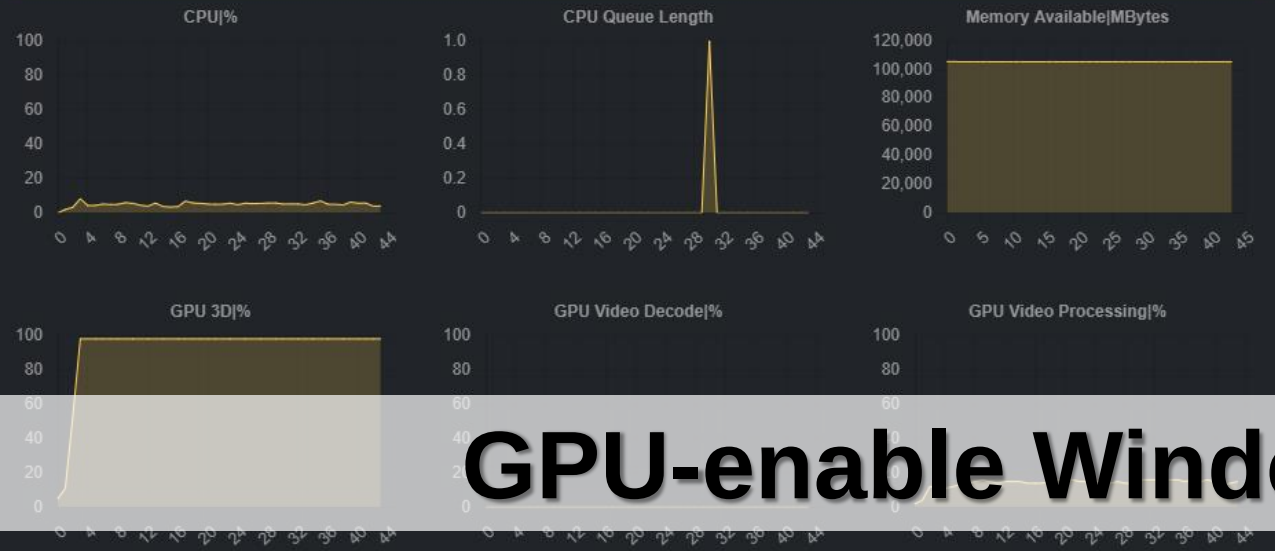

SL1-MSEdgeVideoGrid9 on Azure NC8asT4_v3 with NVIDIA Tesla T4 | SxS RDP UDP (15ms RTT)
SL1-MSEdgeVideoGrid9 on Azure NV6ads_A10_v5 | SxS RDP UDP (15ms RTT)
CPU|%
CPU Queue Length
Memory Available|MBytes
Disk IOPS
Disk Reads|Bytes/sec
Disk Writes|Bytes/sec
GPU 3D|%
GPU Video Decode|%
GPU Video Processing|%
GPU Memory|Mbytes
Network Received|KBytes/sec
Network Sent|KBytes/sec
GPU-enabled VM Types: NC4asT4 v3 & NV6adsA10 v5
00:00:44
00:00:44
Help
Report

SL1-Plot3dOpenGL on Azure Windows 365 Enterprise GPU Standard | SxS RDP UDP (10ms RTT)



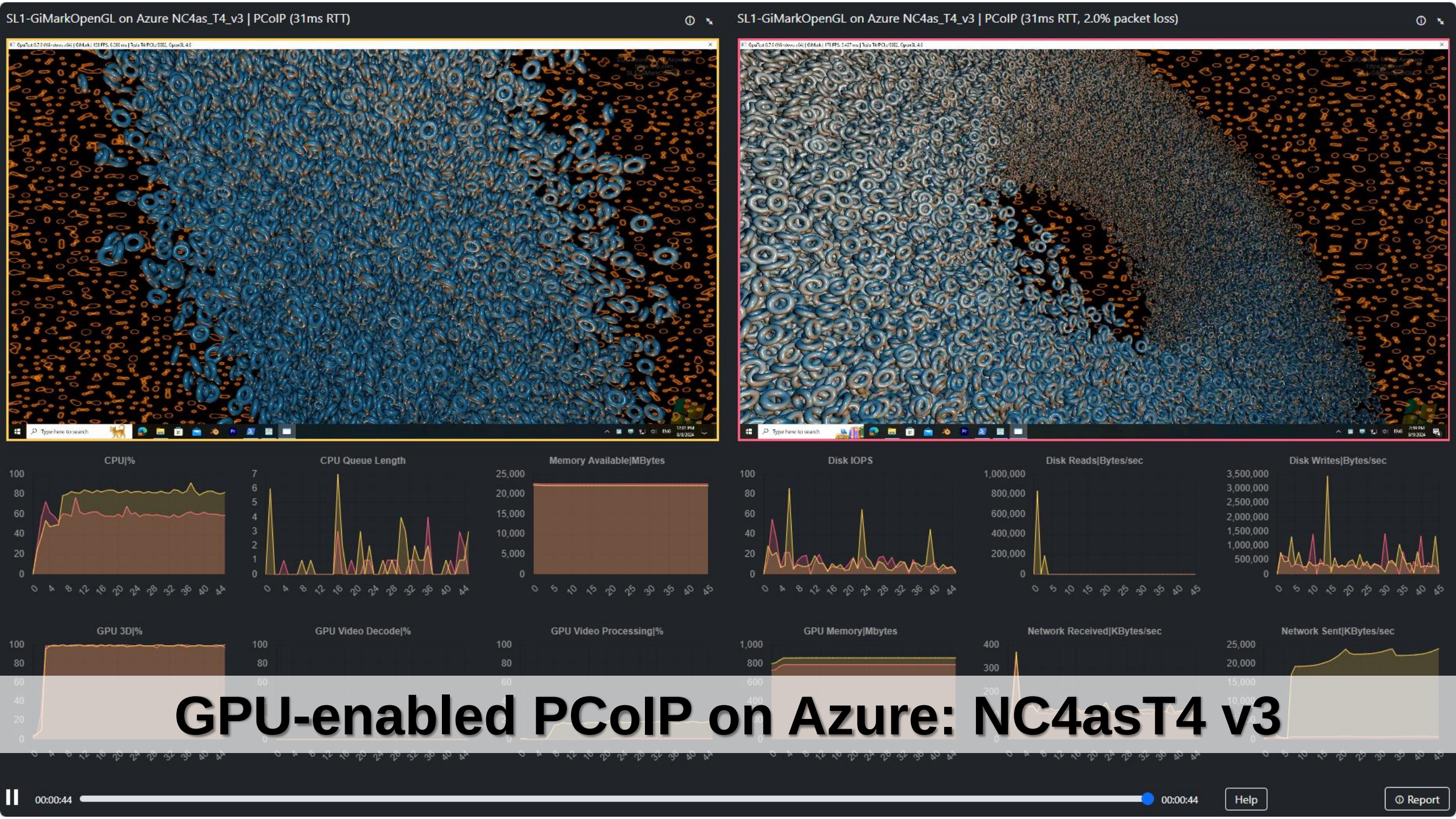
SL1-Plot3dOpenGL on Azure Windows 365 Enterprise GPU Standard | SxS RDP UDP (10ms RTT)

```
00:00:00.000  Date: 2024/08/28 | Time: 16:42:14.717 | AppName: GpuTest.exe
00:00:00.000  Simload: SL1-Plot3dOpenGL | Computername: CPC-Benny-Y7UNR | Username: BennyTritshgermany
00:00:00.000  Number of Monitors: 1 | Default Monitor: 1 (0 | 0 | 1920 | 1080)
00:00:00.000  Pre-Simload countdown screen was visible for 1 sec
00:00:00.000  Delay between Simload start time and activity log start time: 1.093 sec
00:00:01.684  App launch time: 578 ms
00:00:01.947  Run action initiated
```



GPU-enable Windows 365 Cloud PC

00:00:43 00:00:45 Help Report

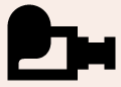

SL1-GiMarkOpenGL on Azure NC4as_T4_v3 | PCoIP (31ms RTT)
SL1-GiMarkOpenGL on Azure NC4as_T4_v3 | PCoIP (31ms RTT, 2.0% packet loss)
CPU|%
CPU Queue Length
Memory Available|MBytes
Disk IOPS
Disk Reads|Bytes/sec
Disk Writes|Bytes/sec
GPU 3D|%
GPU Video Decode|%
GPU Video Processing|%
GPU Memory|Mbytes
Network Received|KBytes/sec
Network Sent|KBytes/sec
GPU-enabled PCoIP on Azure: NC4asT4 v3
00:00:44
00:00:44
Help
Report

Findings

Azure Observations

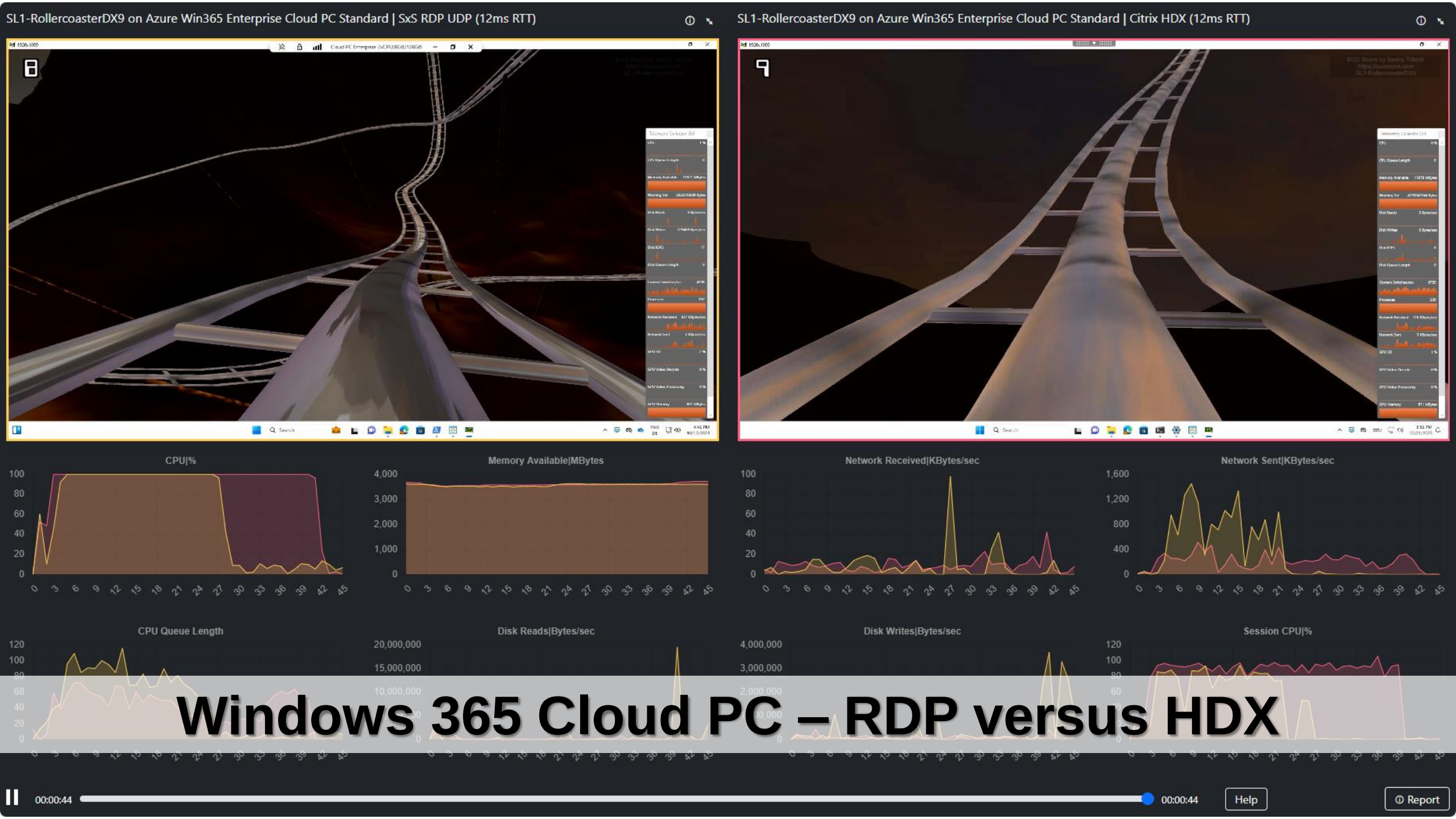
- Windows 365 Standard Cloud PC (“Entry Level”) performs better than expected – it’s ideal for Task Worker workloads at a 24/7 price that is hard to beat (< $0.07/hour)
- Use Dsv5 machines instead of v3, they provide 25% better performance at a lower price
- The Azure D4s_v5 and D8ads_v5 VM types are my personal favorites for Information Worker and Knowledge Worker single-session scenarios
- Azure NVv4 VMs do not provide great performance, despite the AMD M25 GPU – low 3D performance, no video encoding / no hardware encoding exposed; NV4v4 VMs are limited 18fps max and it may fall behind CPU-only VM types
- Azure NC8asT4 – if you don’t need the vCPUs or RAM, then go for the NC4asT4 – same GPU; SPEC performance almost the same, but 30% cheaper
- Azure NV6adsA10 provides more CPU and RAM at the same price as the NC4asT4
- NC4asT4 provides better GPU performance because of full GPU vs GPU partition, but missing certification for CAD applications may be a deal breaker
- GPU-enabled Windows 365 Cloud PCs provide outstanding performance, but protocol settings can make a big difference

Summary – Recommendations

	Persona Name	VM Specs	Network	VM Types
	**Task Worker**	CPU 2-4 vCPUs Memory minimum of 2GB GPU no	Bandwidth low Latency 0-200ms Packet loss 0-2%	Win365 Basic or Standard Azure D2s_v5, D2ads_v5
	**Information Worker**	CPU 2-4 vCPUs Memory minimum of 4GB GPU no	Bandwidth low Latency 0-100ms Packet loss 0-1%	Win365 Standard or Premium Azure D4s_v5, D4ads_v5
	**Knowledge Worker**	CPU 4-8 vCPUs Memory minimum of 8GB GPU no or shared	Bandwidth medium Latency 0-50ms Packet loss 0-0.5%	Win365 Premium or GPU Standard Azure D8s_v5, D8ads_v5 NG8ads_V620_v1
	**Power User**	CPU 4-16 vCPUs Memory minimum of 16GB GPU shared or dedicated	Bandwidth medium Latency 0-50ms Packet loss 0-0.1%	Win365 Premium+ or GPU Standard Azure D16s_v5, D16ads_v5 NG16ads_V620_v1, NC4as_T4_v3
	**CAD/CAM Designer**	CPU 8-16 vCPUs Memory minimum of 16GB GPU high-end	Bandwidth high Latency 0-20ms Packet loss 0%	Win365 GPU Super or GPU Max Azure NG16ads_V620_v1 NC8as_T4_v3, NC16as_T4_v3
	**Media Designer**	CPU 8-16 vCPUs Memory minimum of 16GB GPU high-end	Bandwidth very high Latency 0-30ms Packet loss 0%	Win365 GPU Super or GPU Max Azure NG16ads_V620_v1 NC16as_T4_v3, NC16as_T4_v3

Microsoft control up nerdio UNICON LG stratodesk PQR

Welcome Simon Binder to the stage


SL1-RollercoasterDX9 on Azure Win365 Enterprise Cloud PC Standard | SxS RDP UDP (12ms RTT)
SL1-RollercoasterDX9 on Azure Win365 Enterprise Cloud PC Standard | Citrix HDX (12ms RTT)
CPU|%
Memory Available|MBytes
Network Received|KBytes/sec
Network Sent|KBytes/sec
CPU Queue Length
Disk Reads|Bytes/sec
Disk Writes|Bytes/sec
Session CPU|%
Windows 365 Cloud PC – RDP versus HDX
00:00:44
00:00:44
Help
Report

Call to Action

If you want to learn more about the EUC Score toolset, send an email to

info@eucscore.com

EUC Score

https://eucscore.com

NOTE: The complete EUC Score toolset is free for community benchmarking tests if the results are made freely available to the public

EUC Score Links

Home Page

Freeware Download

- Toolset documentation: https://docs.eucscore.com
- Test Methodology: https://eucscore.com/methodology.html
- Simload Gallery: https://eucscore.com/gallery.html
- Test Results (Sync Player): https://eucscore.com/results
- Terminology (Glossary): https://eucscore.com/terminology.html
- Lab Equipment: https://eucscore.com/equipment.html

Microsoft control up nerdio UNICON LG stratodesk PQR

Thank You

Benny Tritsch | info@eucscore.com