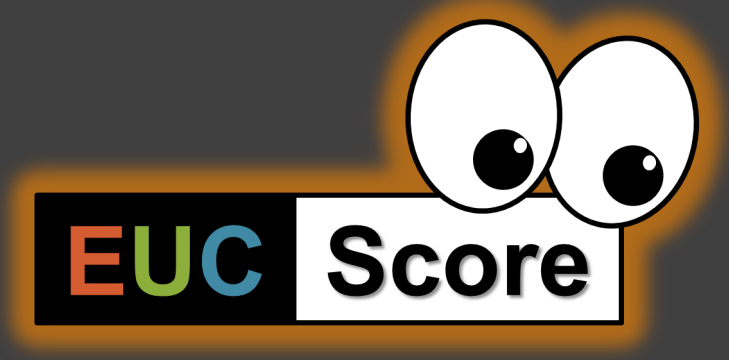
End User Computing User Group Sweden



Measuring and Analyzing Perceived Windows Desktop User Experience

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Benny Tritsch

Dr. Tritsch IT Consulting

EUC Score

GO-EUC

TeamRGE
Remoting Graphics Experts

DE EUC FORUM

Performance Data Scientist
EUC Documentary Cameraman
MVP | CTP | NVP | EUC Expert | NEPA

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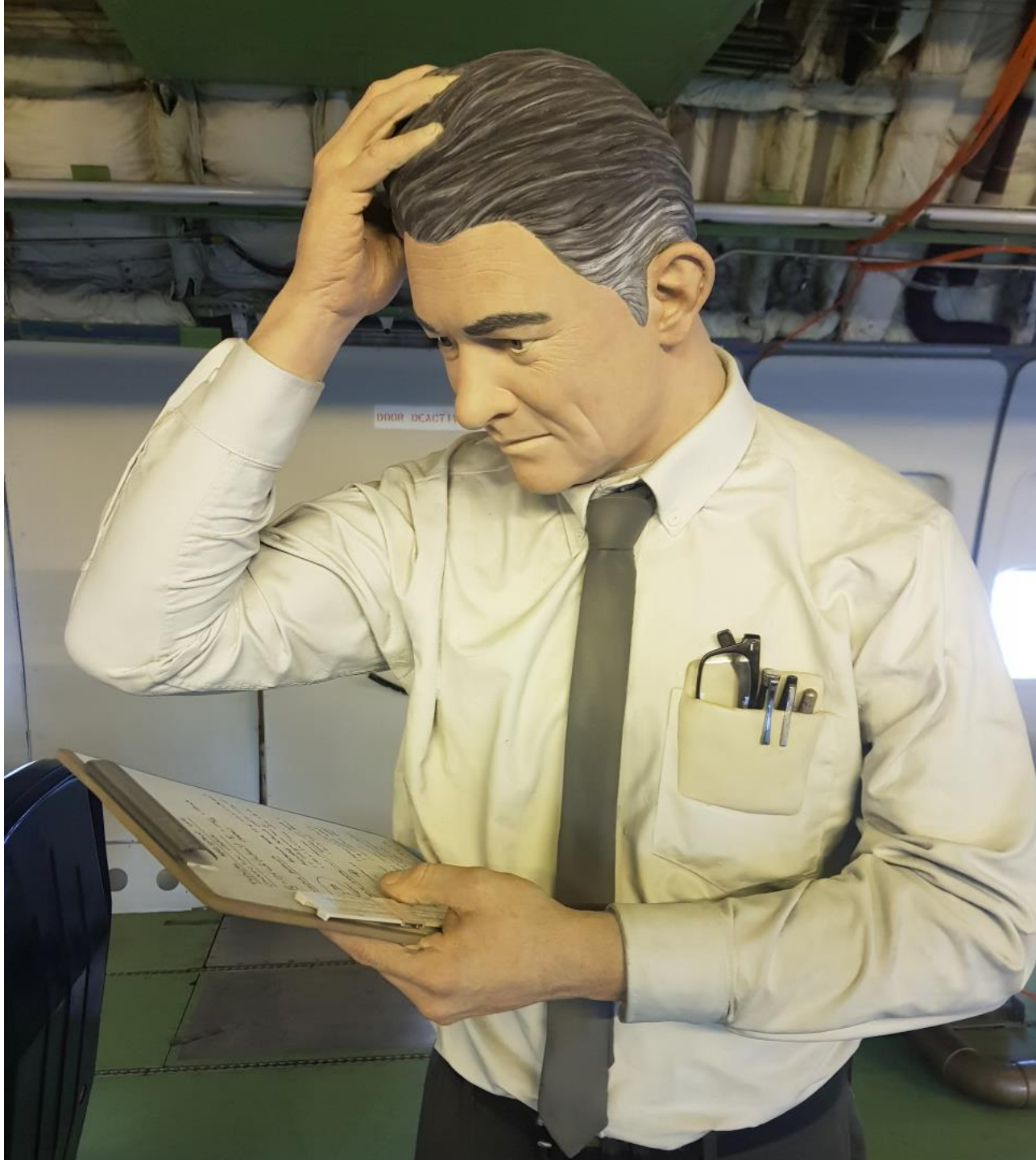


Intro

EUC
“Admin Experience”
Hard Metrics

DEX
“User Experience”
Soft Metrics


0:00.000
Official Time
60
80
40
100
20
120
5
km/h
0
140
0 m
400 kg
300 kg
200 kg
100 kg
0kg
-50 kg
1.0g
G-Force
Steering
-30
0
30
-60
60
-90
90
-120
120
Roll Angle
Julian von Schleinitz/ Felix Loch 2018

And now let’s talk about Windows

Gaming platform
“DirectX”

Media and
entertainment center

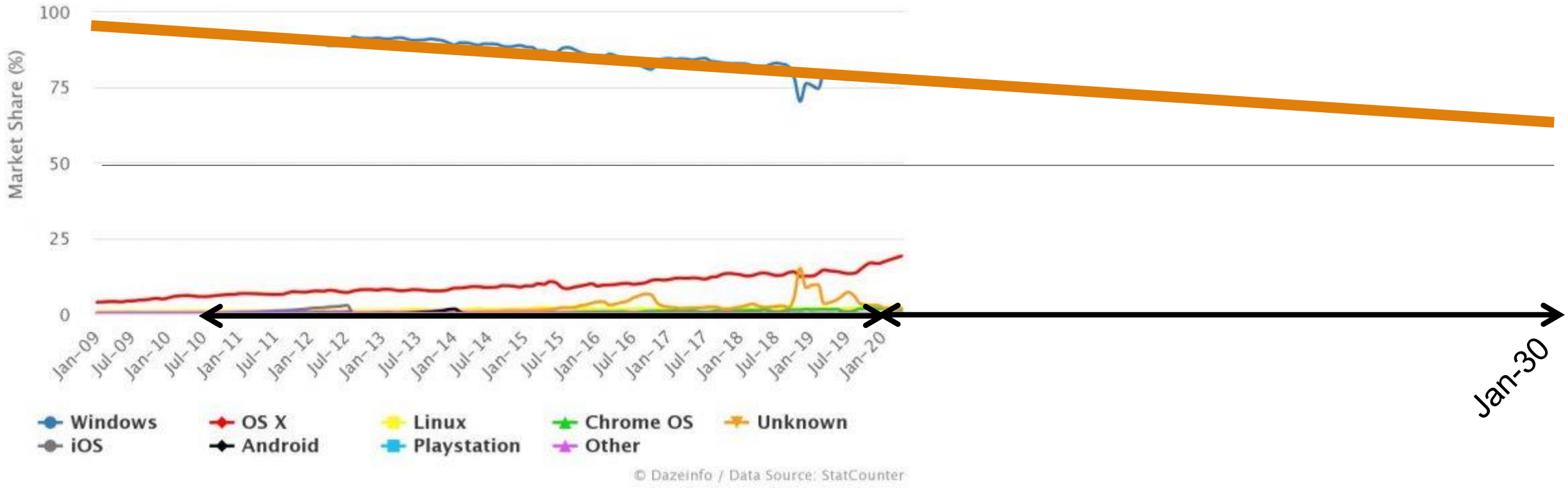
Information search and
storage hub

Digital workspace for
business apps

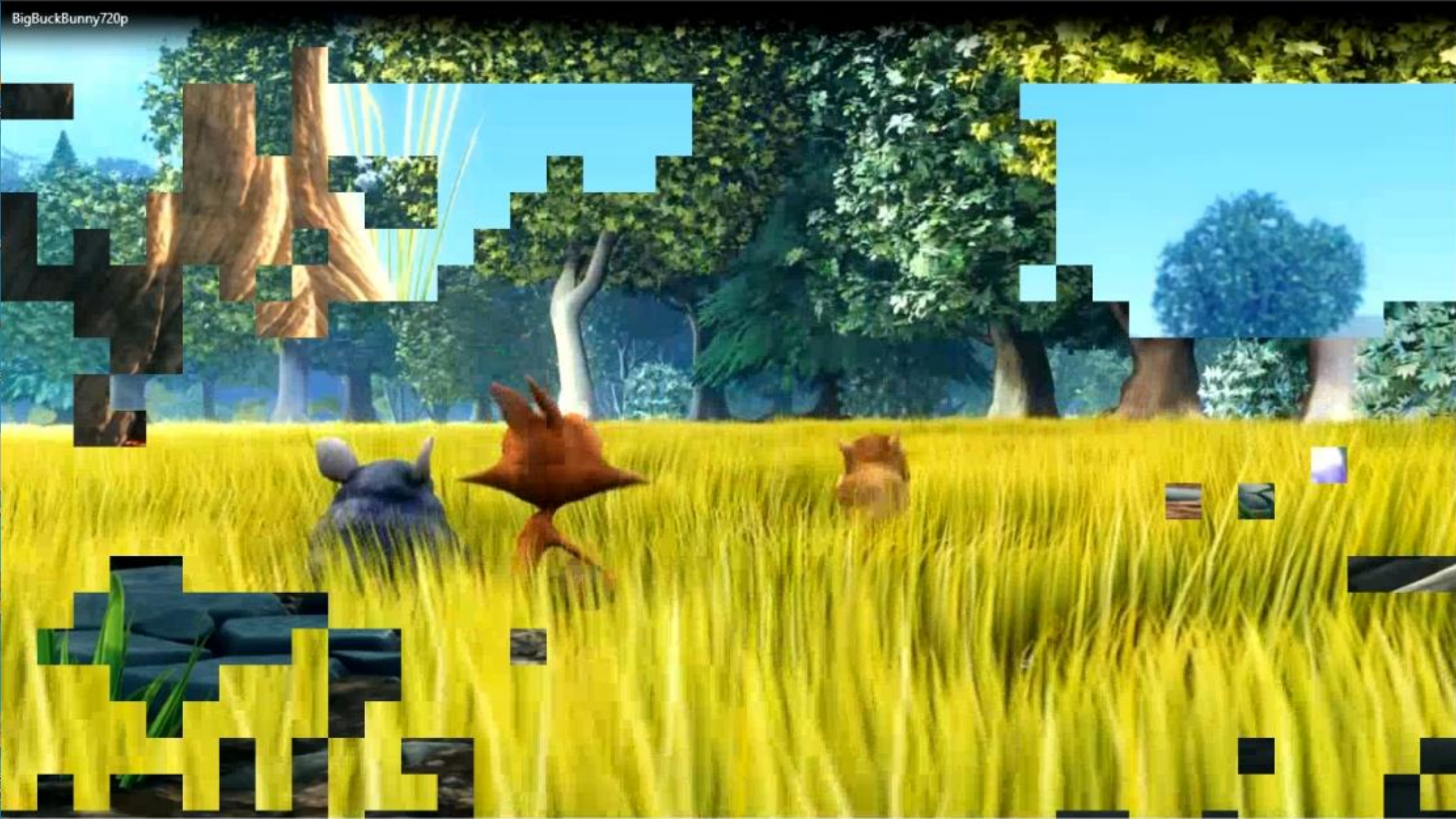
The first version of DirectX was released in September 1995 as the Windows Game SDK

Windows = Foundation with Standard Interfaces

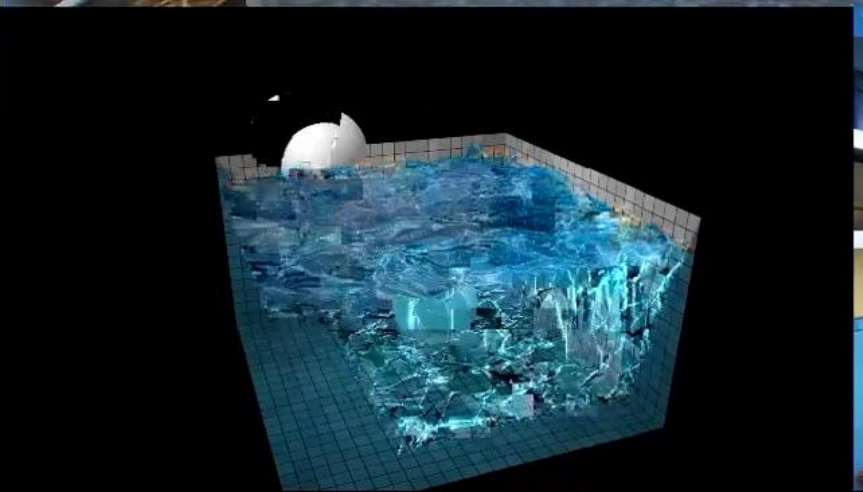
Desktop OS Market Share Worldwide




It’s
alive!


BigBuckBunny720p


Microsoft Edge
LEARN MORE
-GL
FISH
0
SOUNDS
ON
CLEANING
OUTSIDE IN
ABOUT




DO NOT TOUCH GLASS!
FISH-GL
60


1920x1017
EUC Score for AWS
https://aws.amazon.com/
SL1-RollercoasterDX9
CPU
7% 2.11 GHz
Memory
3.8/15.9 GB (24%)
Disk 0 (C:)
SSD
0%
Ethernet
Ethernet 2
S: 0.1 R: 6.5 Mbps
GPU 0
Intel(R) HD Graphi...
0%
GPU 1
Radeon RX Vega ...
1% (47 °C)


Gartner defines DEX as a strategy that focuses on employees, their experience, and their use of technology

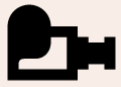
From a User's Perspective: EUC Quality Criteria

	**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.

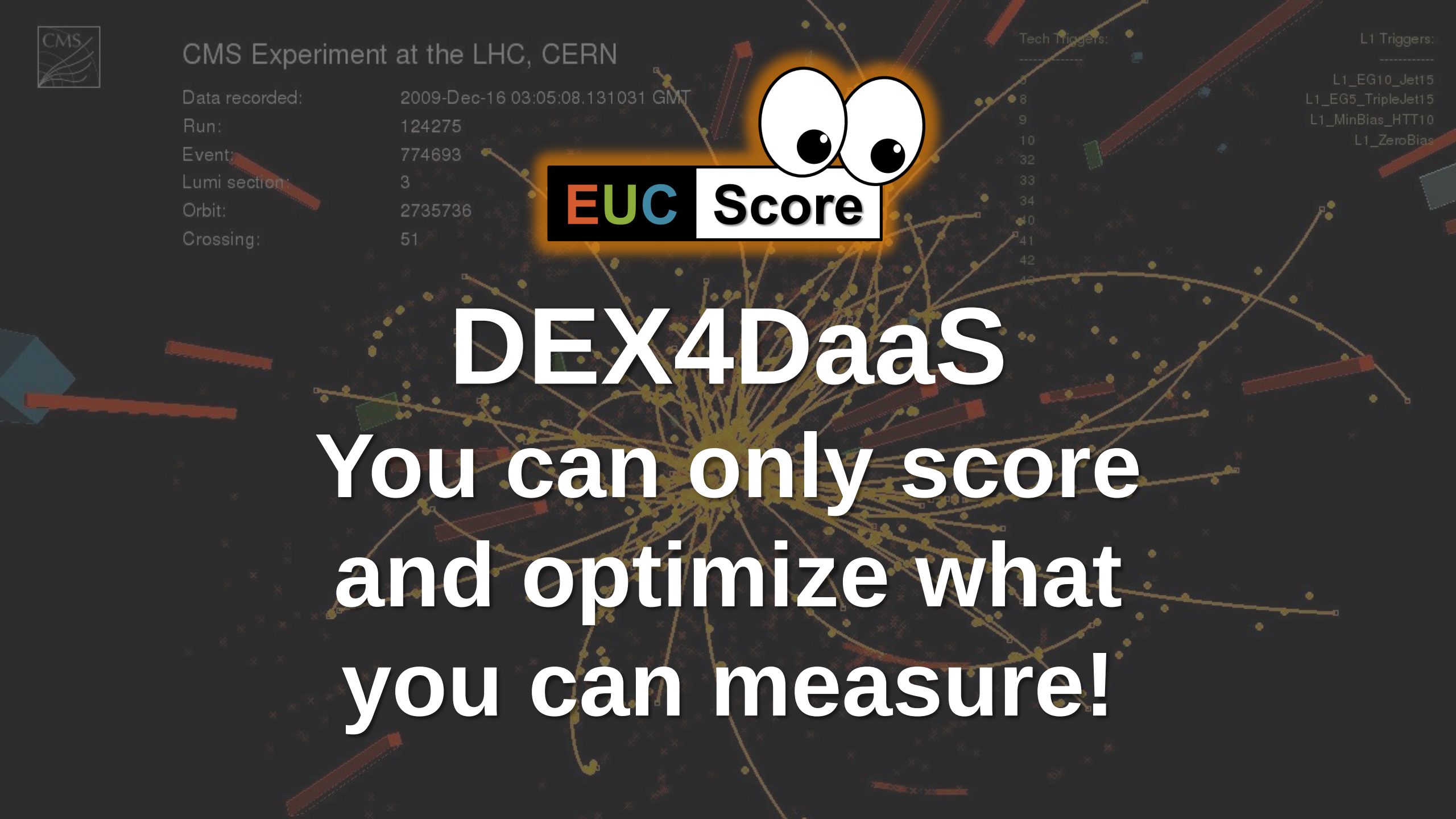
Soft Metrics – Screen Artifacts / Anomalies

- 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

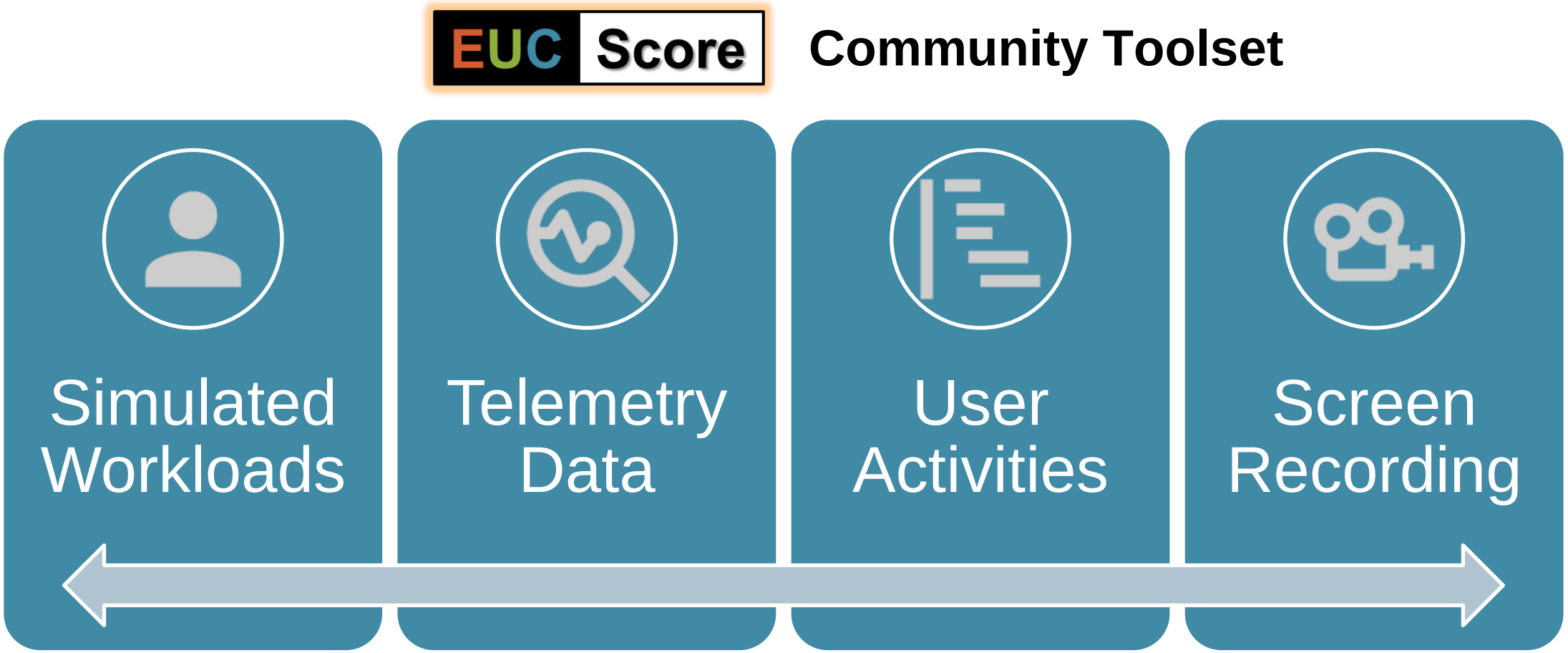
People have different roles at work

	Persona Name	VM Specs	Network	VM Type Examples
	**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

EUC Score


CMS Experiment at the LHC, CERN
Data recorded: 2009-Dec-16 03:05:08.131031 GMT
Run: 124275
Event: 774693
Lumi section: 3
Orbit: 2735736
Crossing: 51
Tech Triggers:
8
9
10
32
33
34
40
41
42
L1 Triggers:
L1_EG10_Jet15
L1_EG5_TripleJet15
L1_MinBias_HTT10
L1_ZeroBias
EUC Score
DEX4DaaS
You can only score and optimize what you can measure!

User Experience Benchmarking

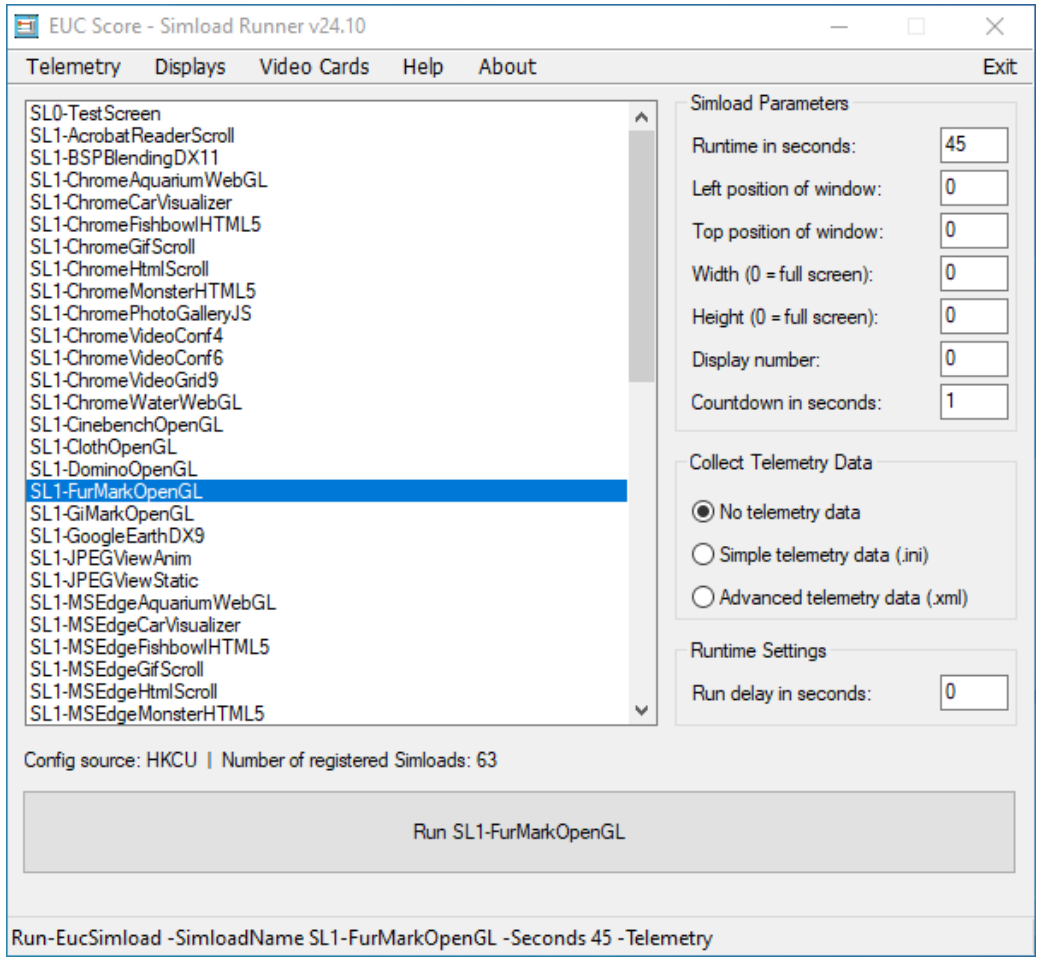


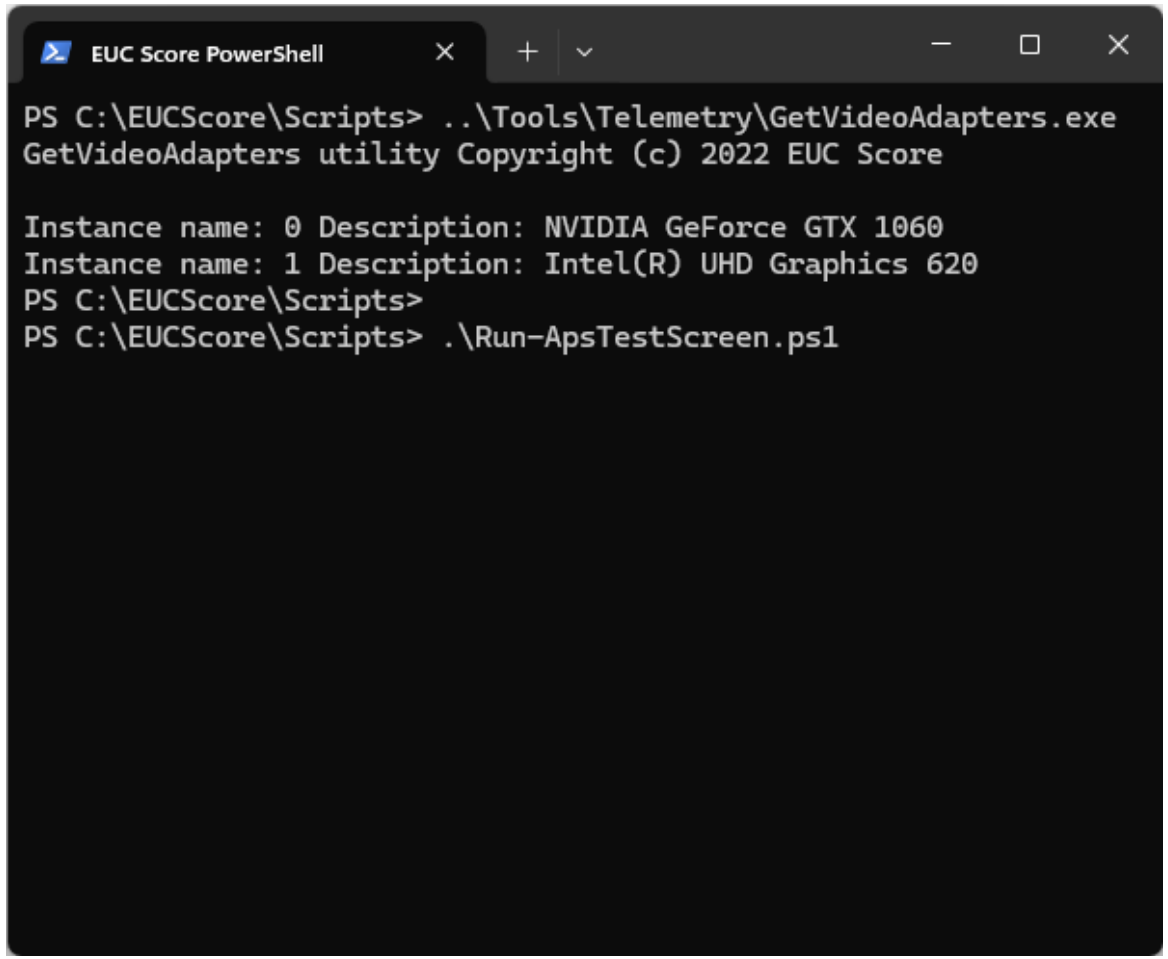
Simulated Workloads – “Simloads”

Type		Description
	**Type 1 Primary**	Test run with an application that highlights a specific graphic or multimedia format (GDI, DirectX, OpenGL or video) – may require a pre-installed application.
	**Type 2 Persona**	Sequence of chained or overlayed user activities, orchestrated in such a way they generate the characteristic behavior and consistent load pattern of a predefined interactive user type.
	**Type 3 Score**	Measures predefined system metrics used to produce a number (= score) that represents the performance. Typically, each Score Simload is associated with a specific theme.

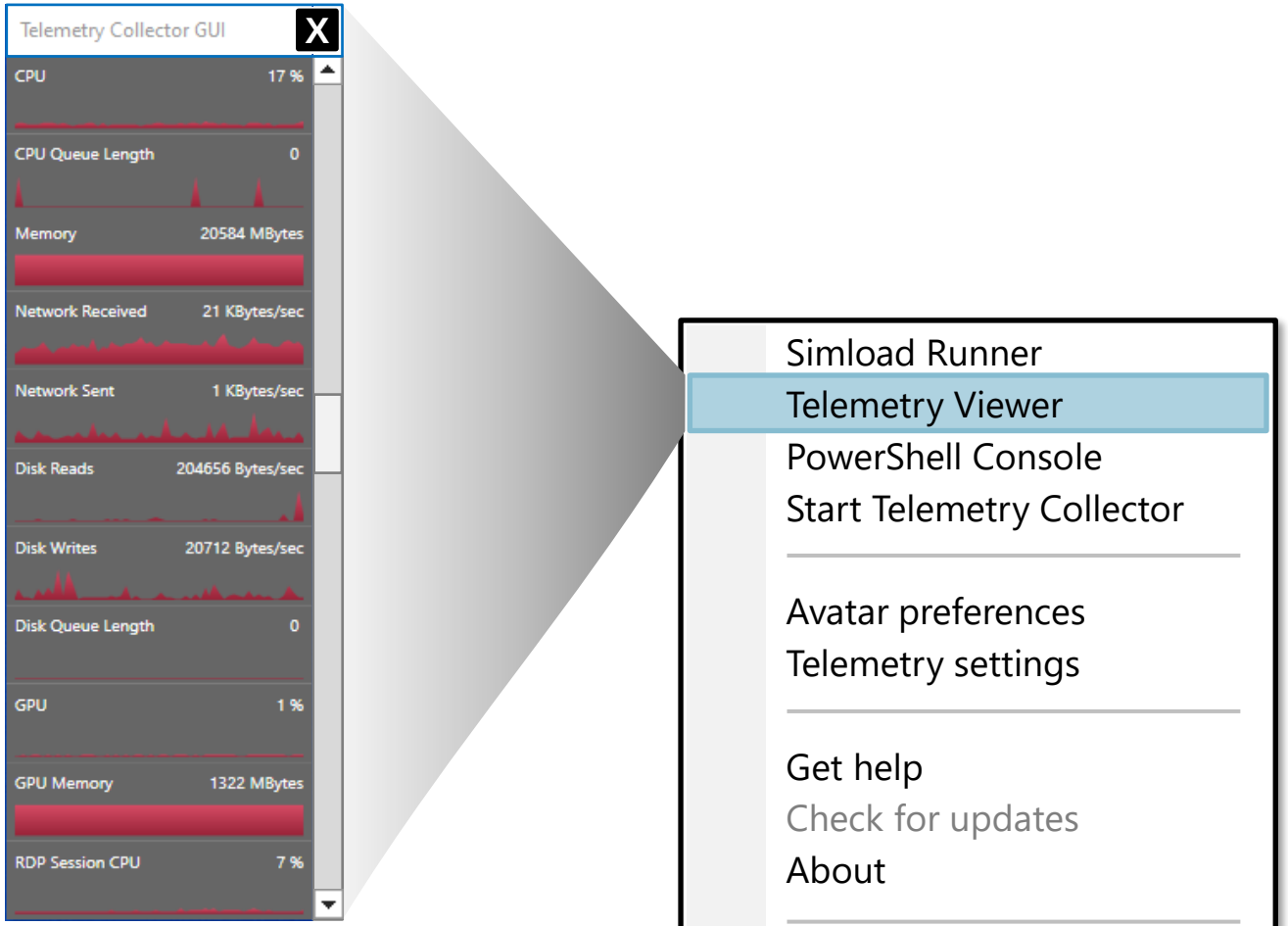
NOTE: Each Simload stores system and user activities in a .ref file and may collect telemetry data into a .csv file if configured accordingly

Run Simloads and Collect Test Data





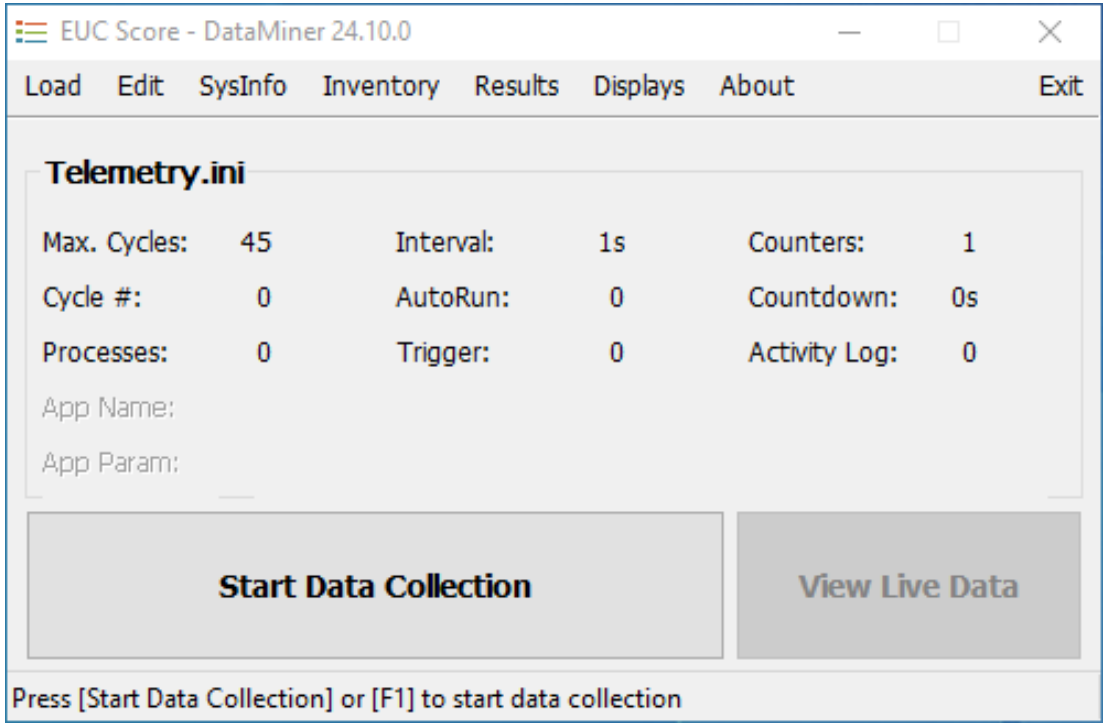
EUC Score Avatar



Avatar

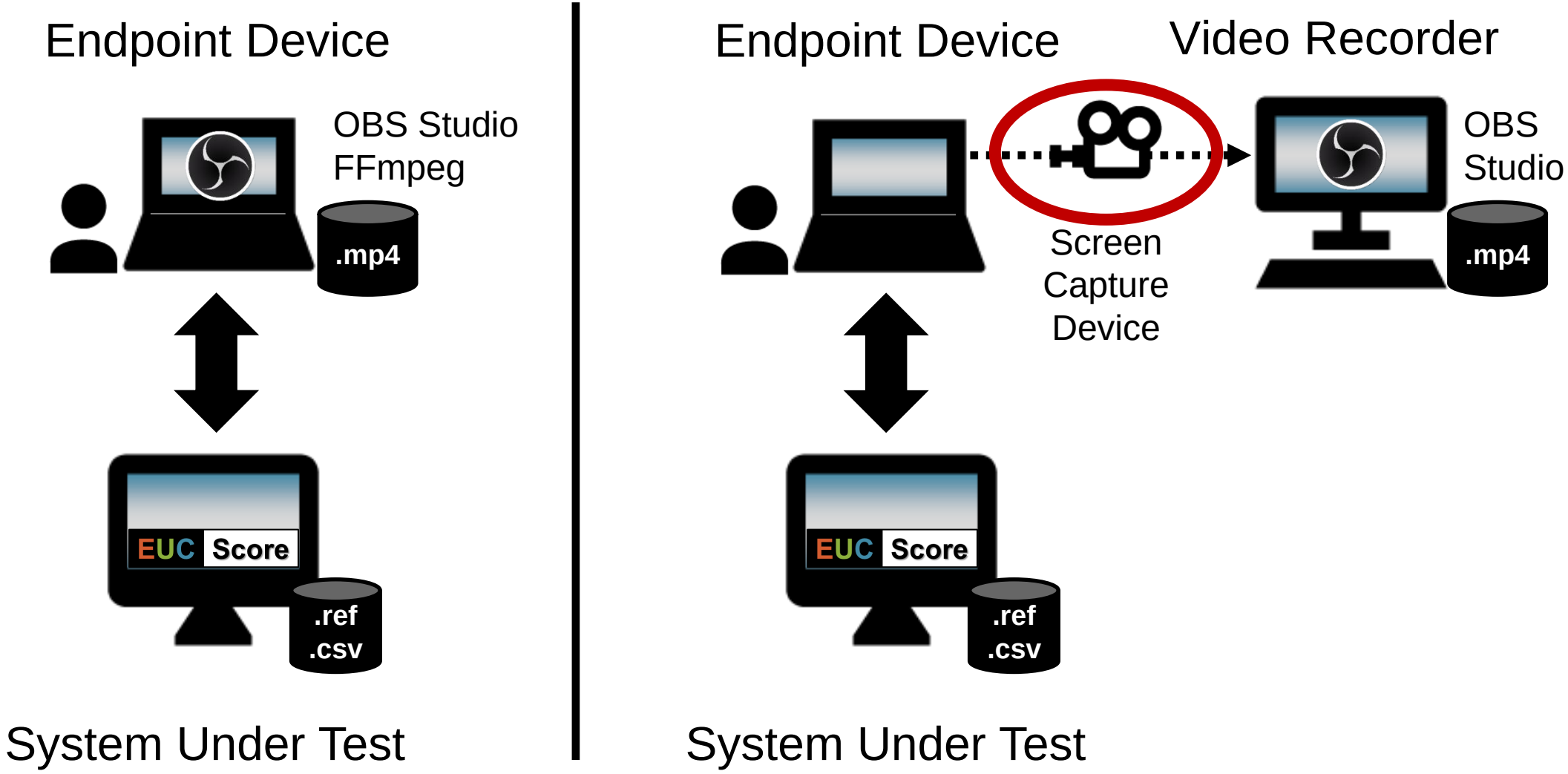
EUC Score Data Miner

- Data Miner integrates several supplementary tools
  - Collects performance counters independently of Simloads
  - Writes system information to a text file in the results folder
  - Writes multiple CSV files with inventory data in the results folder
  - Collects process information
  - Launches applications
- Data Miner can be used stand-alone by copy & paste deployment

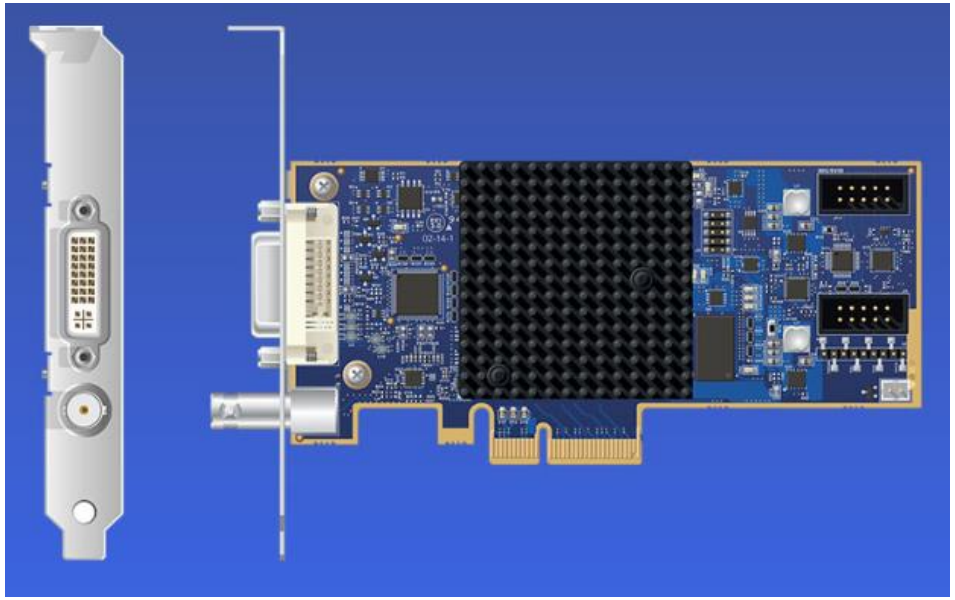


Data Miner runs both with a GUI and from the command line

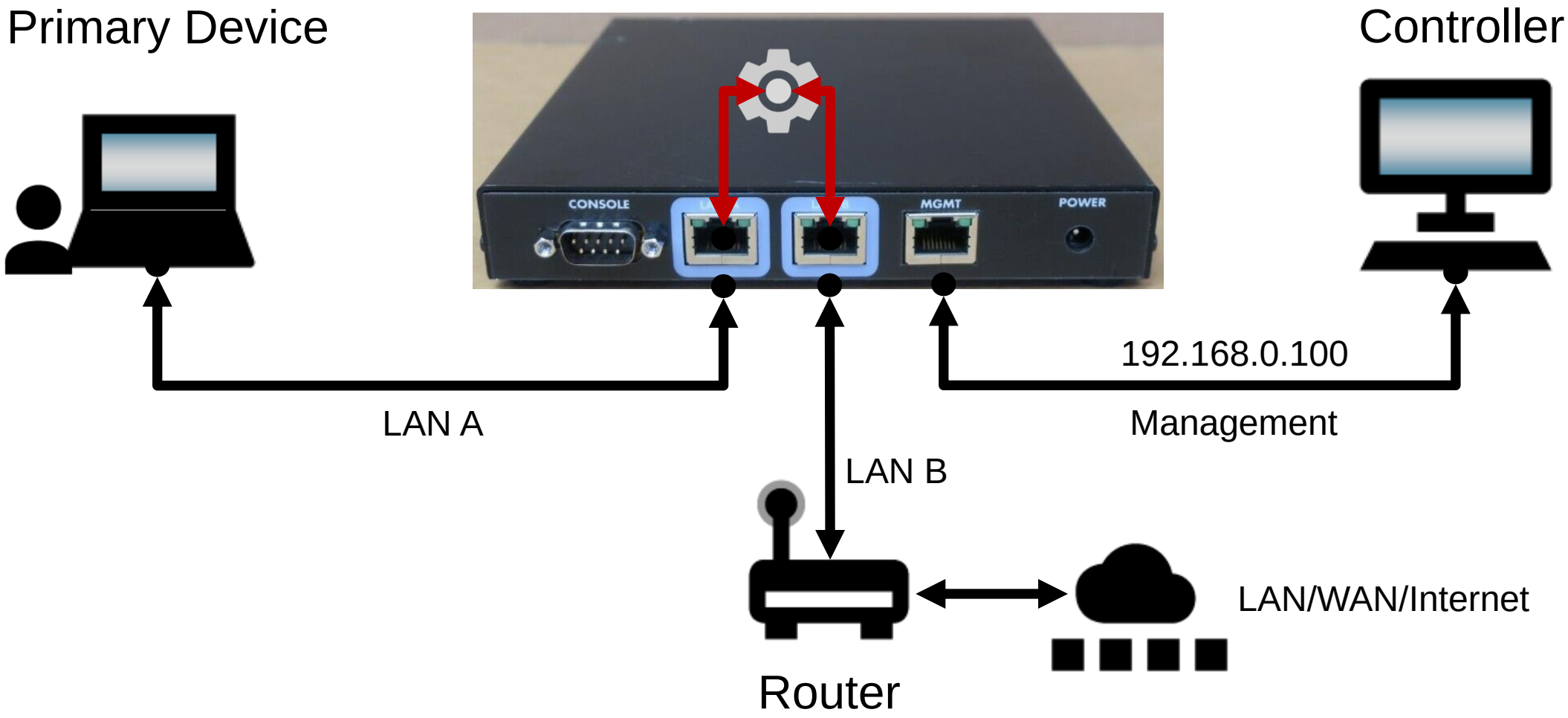
Screen Video Recording Options



Screen Capture Devices – HDMI-to-USB



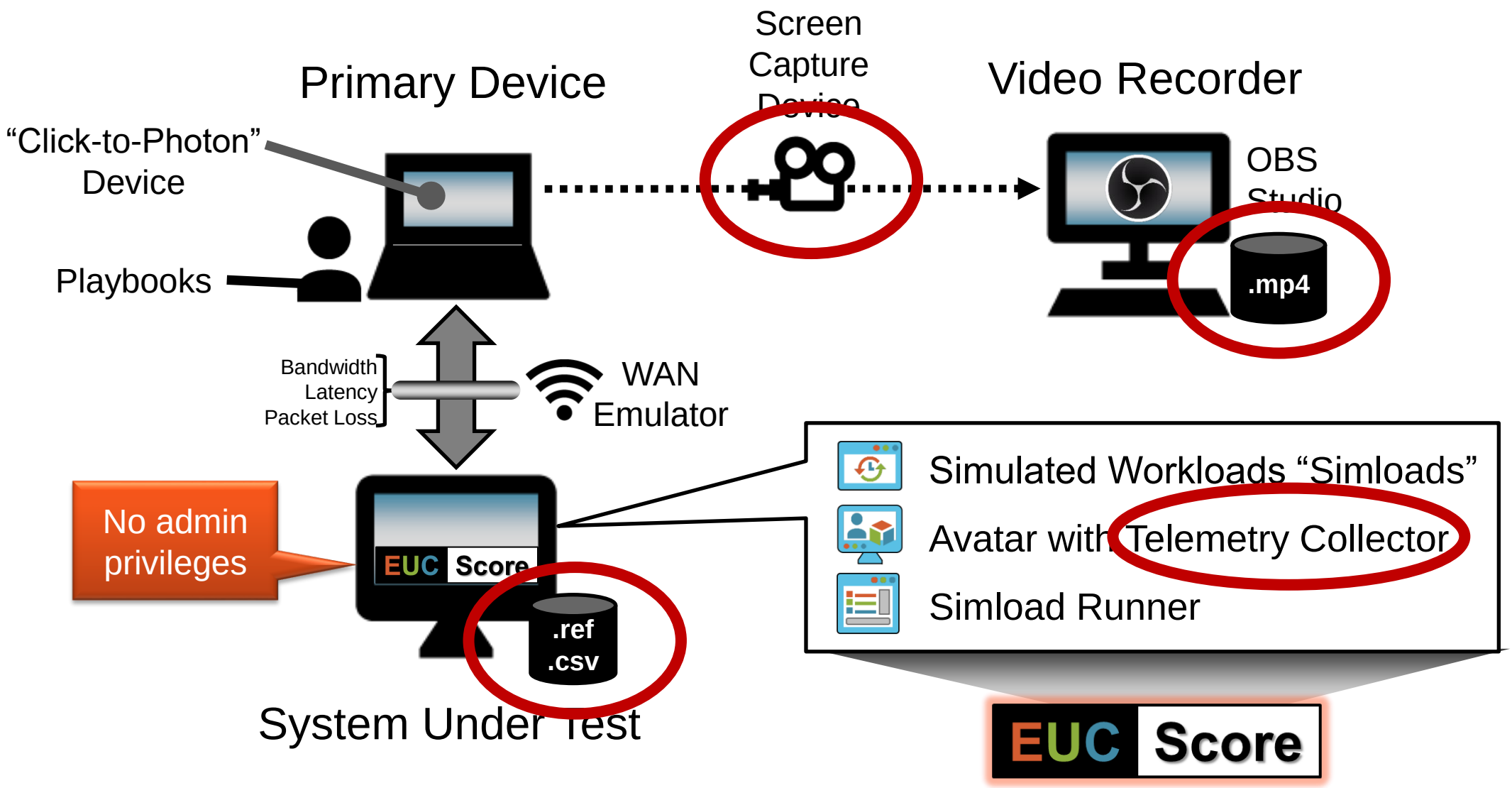
WAN Emulator Network Connections



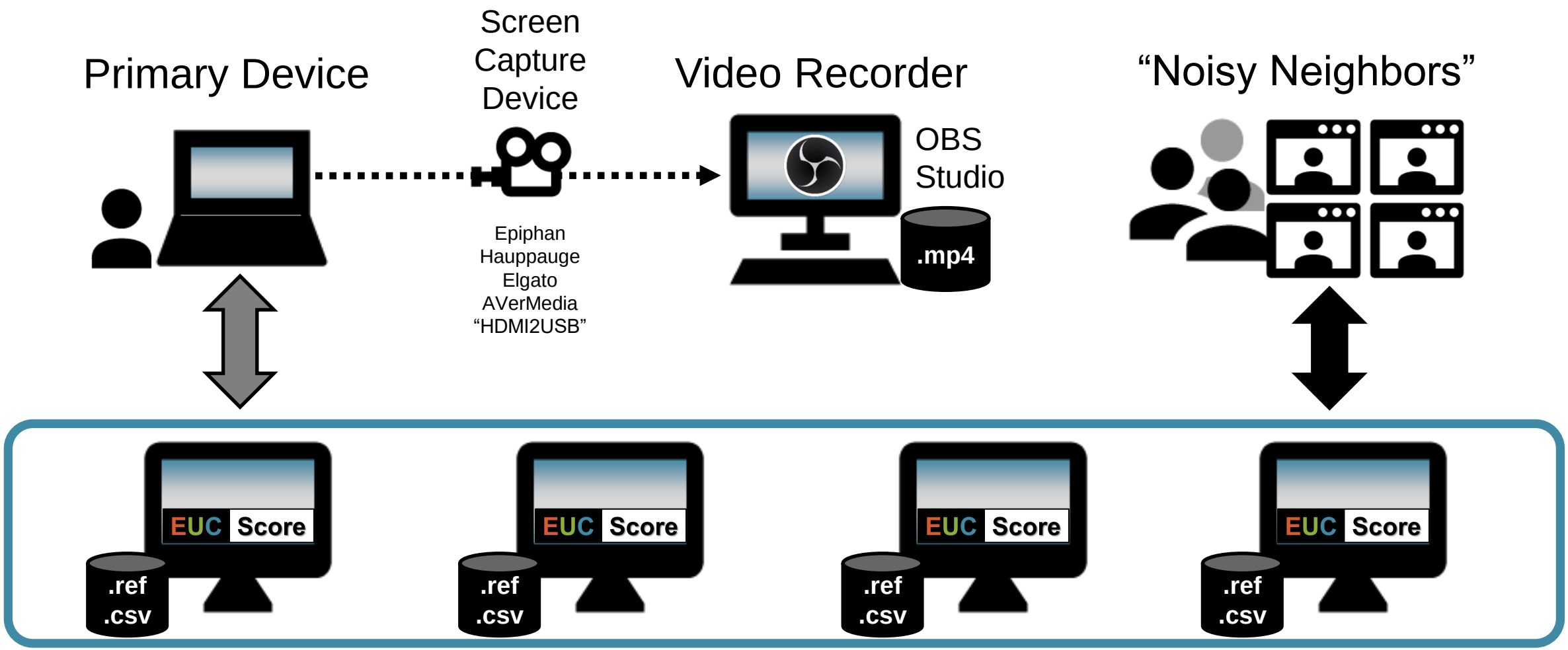
Typical Network Settings

- **Bandwidth** = data transfer rate in a wired or wireless communication link or the maximum amount of data transmitted over an internet connection in a given amount of time
  - Common values: 100Mbit/s (LAN), 12Mbit/s, **8Mbit/s**, 4Mbit/s, 2Mbit/s
- **Latency** = the delay in network communication, also often referred to as round-trip time (RTT)
  - Common values: 0ms, 20ms, 50ms, **100ms**, 300ms RTT
- **Packet Loss** = a network packet fails to reach its expected destination, resulting in information loss
  - Common values: 0%, 0.1%, 0.2%, 1%, **2%**, 5%
- **Jitter** = the variation in time delay between when a signal is transmitted and when it's received over a network connection

EUC Score Lab Setup

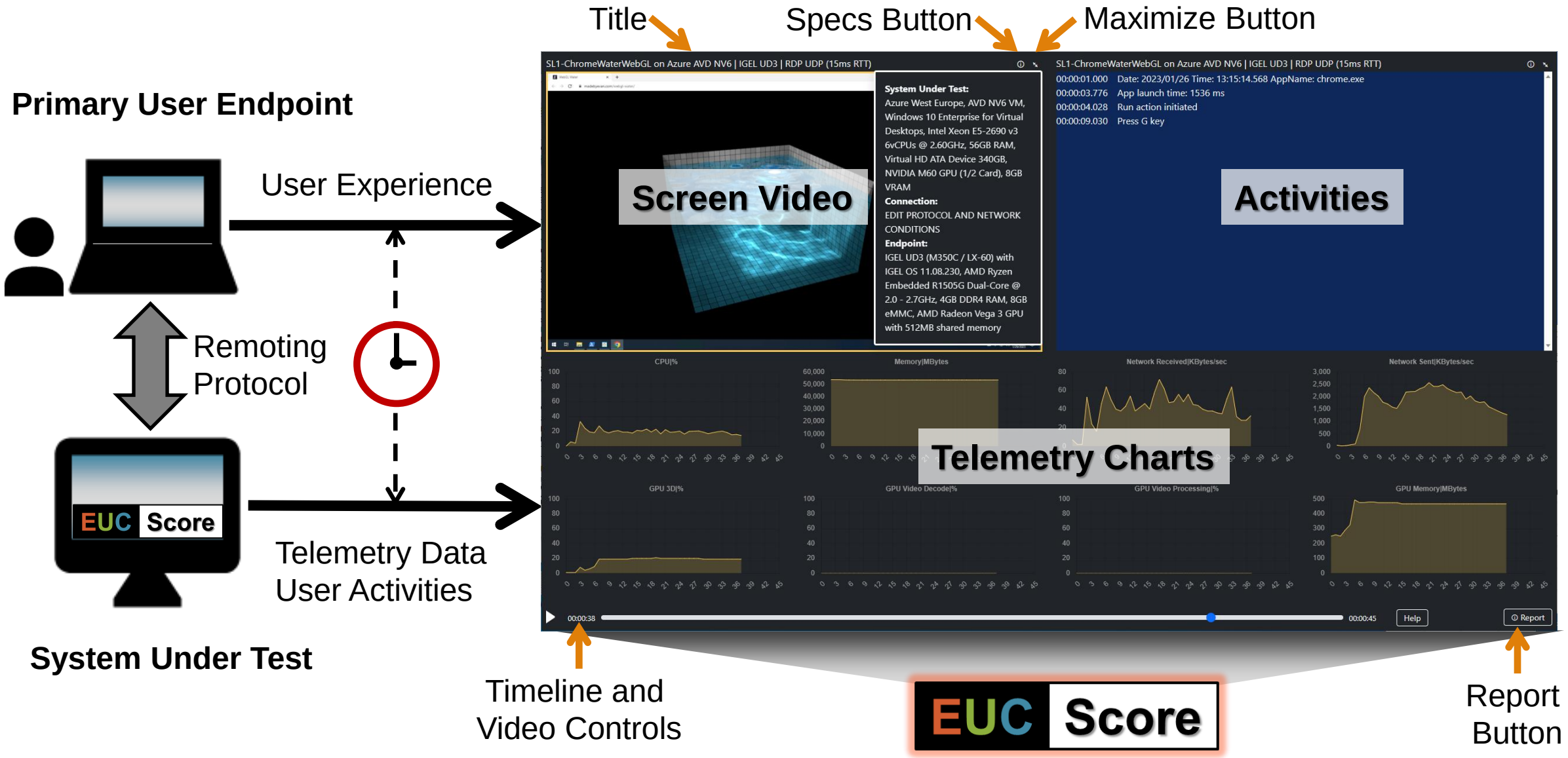


Building a Multi-User Test Lab

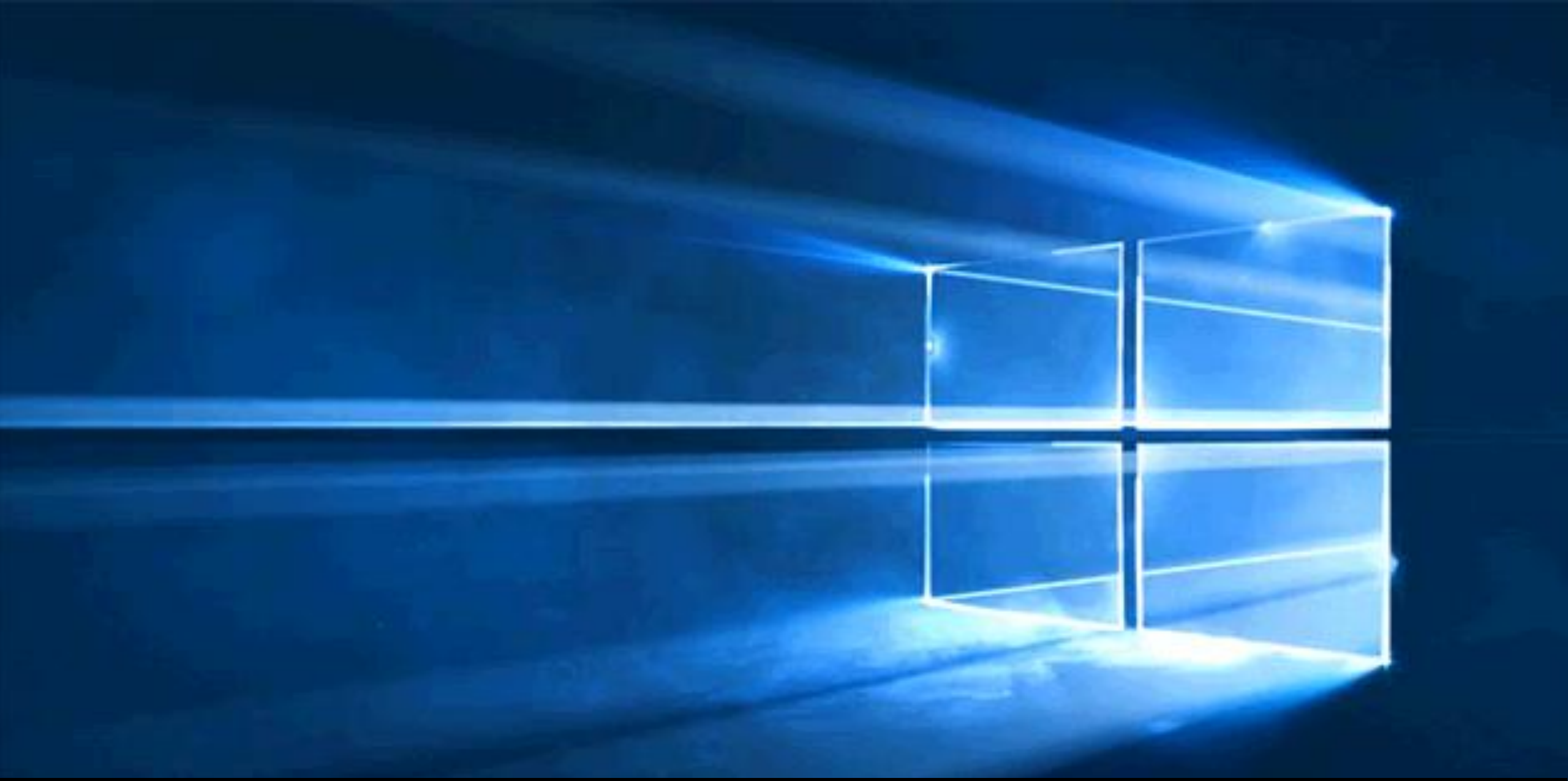


Multi-User System Under Test

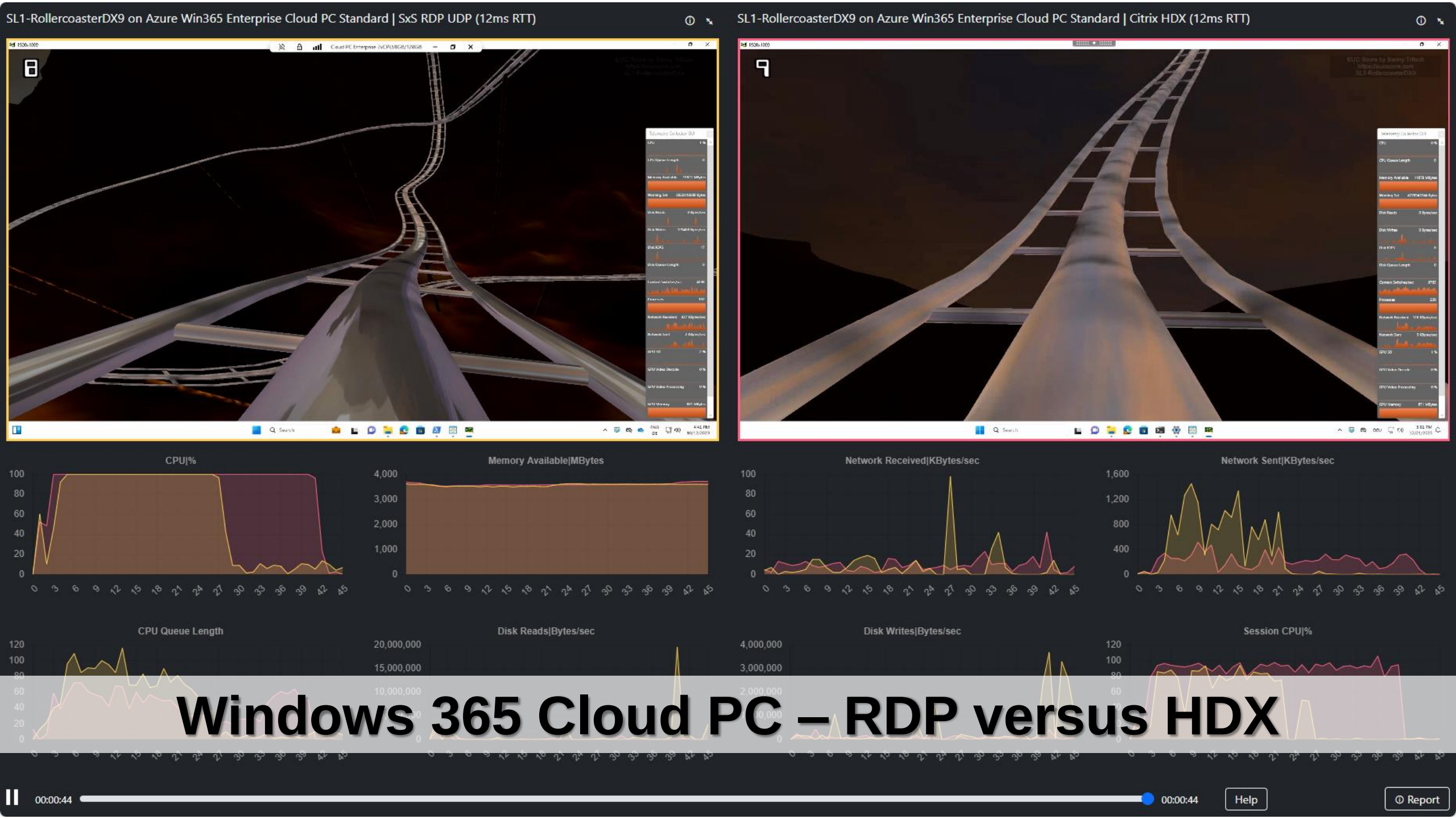
Visual Data Analytics – Sync Player

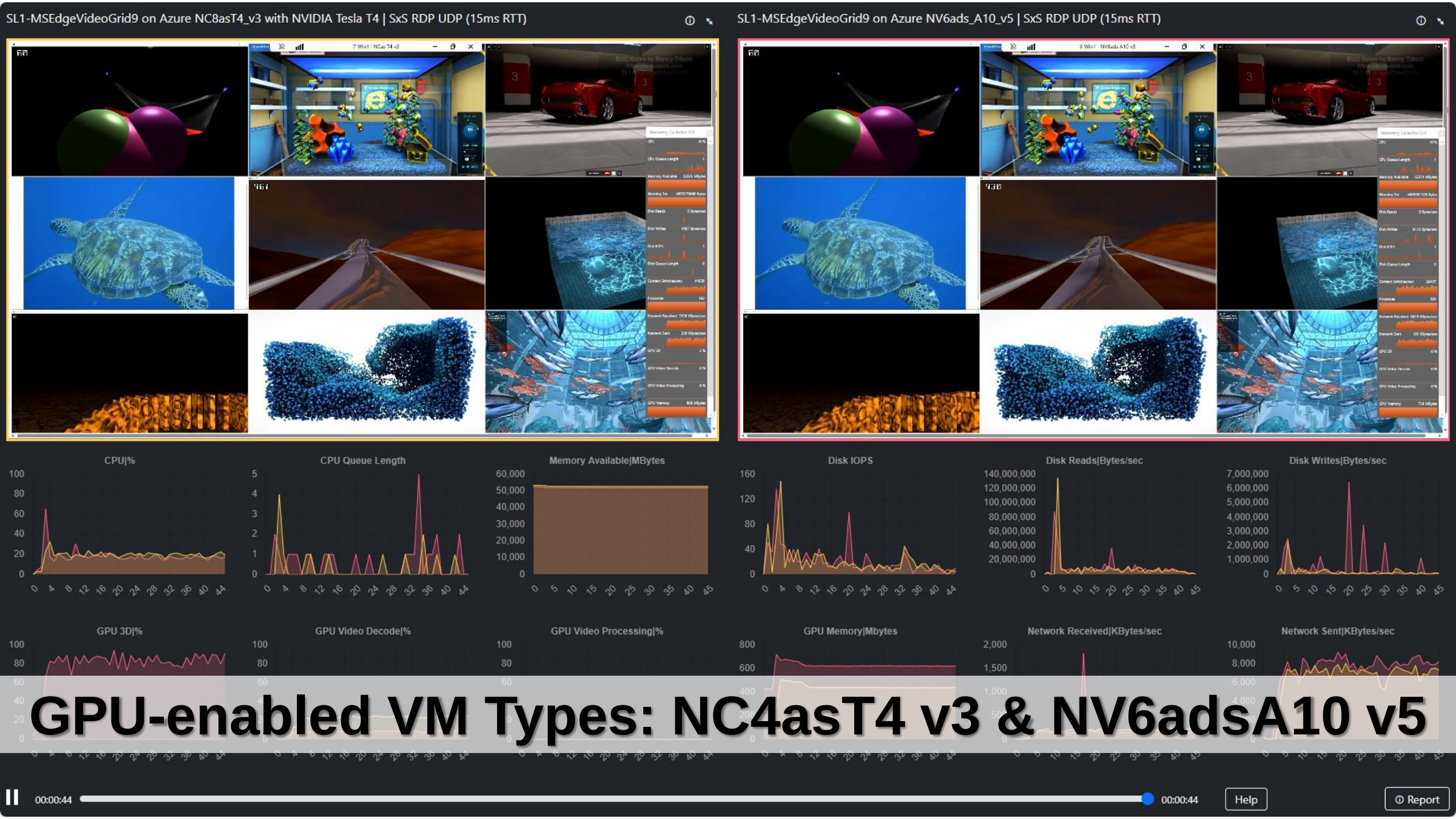


Selected Test Results

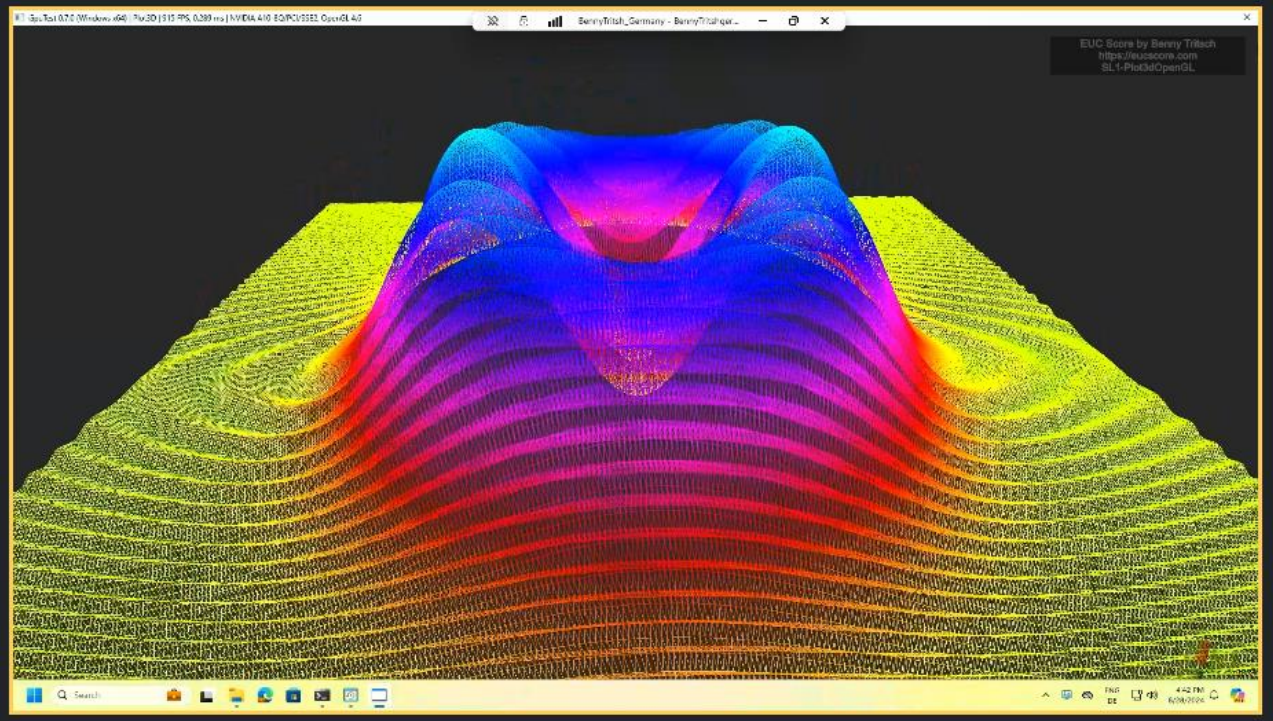


Show Time


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

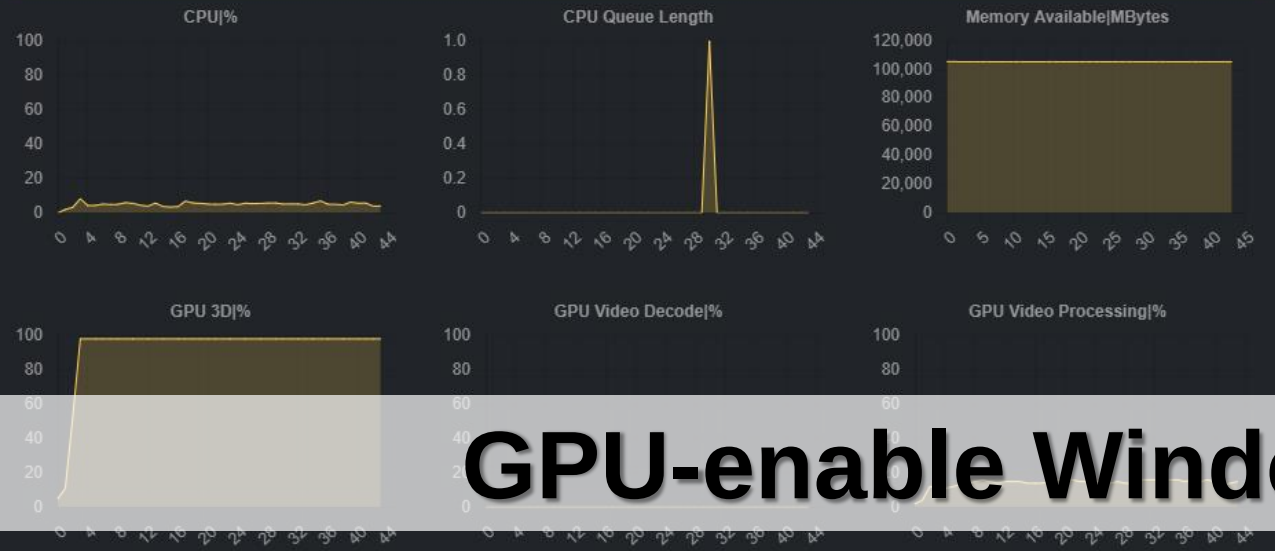

SL1-MSEdgeVideoGrid9 on Azure NC8asT4_v3 with NVIDIA Tesla T4 | SxS RDP UDP (15ms RTT)
SL1-MSEdgeVideoGrid9 on Azure NV6ads_A10_v5 | SxS RDP UDP (15ms RTT)
CPU|%
CPU Queue Length
Memory Available|MBytes
Disk IOPS
Disk Reads|Bytes/sec
Disk Writes|Bytes/sec
GPU 3D|%
GPU Video Decode|%
GPU Video Processing|%
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)



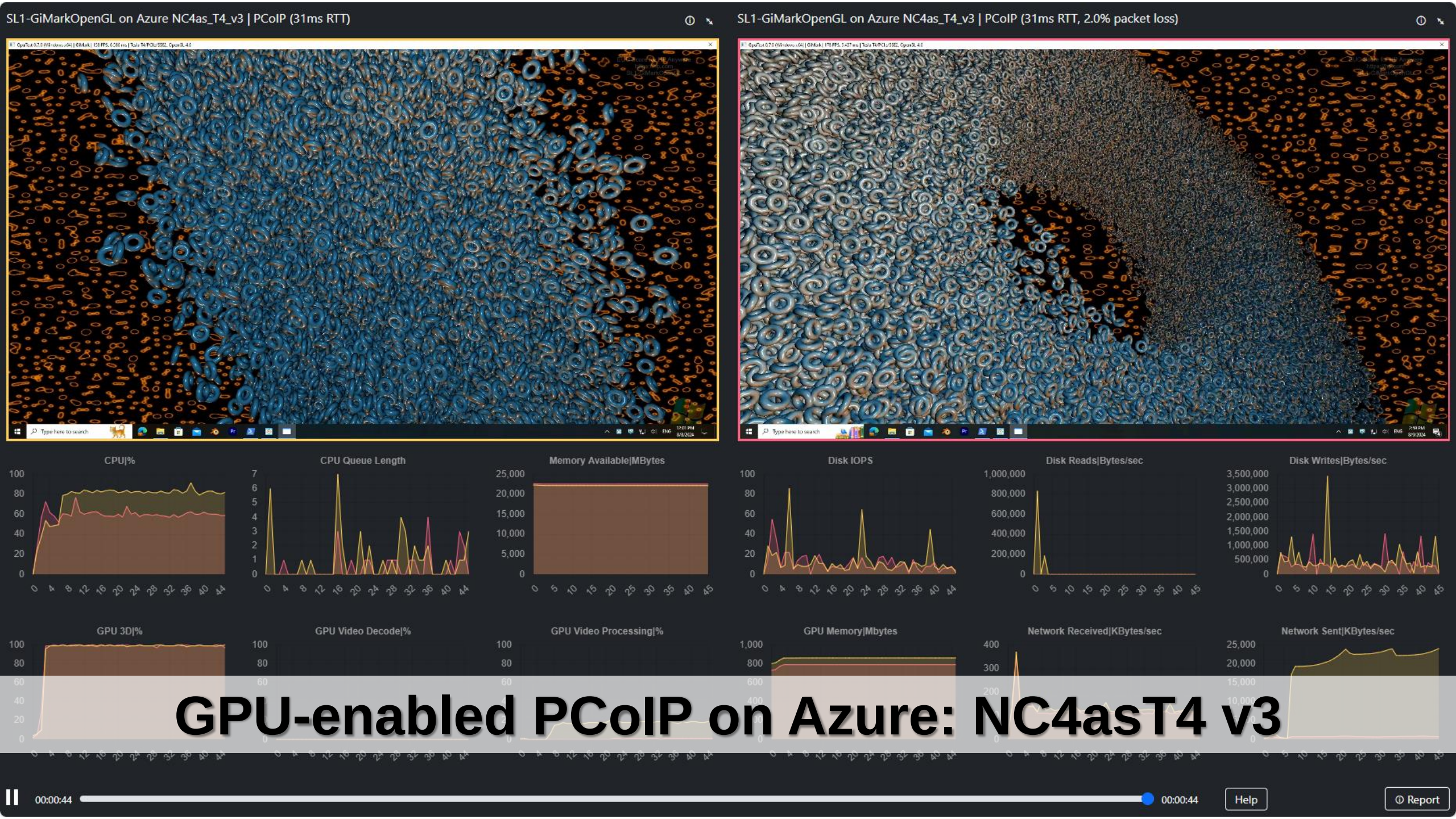
SL1-Plot3dOpenGL on Azure Windows 365 Enterprise GPU Standard | SxS RDP UDP (10ms RTT)

```
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
```

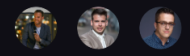


GPU-enable Windows 365 Cloud PC

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

11 min read Nov 29, 2024



Benchmarking HP Anyware PCoIP on a GPU-enabled Azure VM


Benny Tritsch

Table of Contents

Is PCoIP an interesting remoting protocol and what are the use cases where it works well and where it does not? In this benchmarking research, the performance of the HP Anyware PCoIP (PC-over-IP) solution is evaluated. This technology is designed to deliver high-quality remote desktop experiences. The focus of the evaluation is on assessing its

Windows 365 Link

EUC Score Editions

Why would you want to use EUC Score?

Diagnose end-user pain symptoms and solve IT support sorrows with proactive synthetic testing

Identify potential pain
Pre-production capabilities, performance and load testing

Examine existing pain
Ad-hoc diagnostics in production environments

Prevent new pain
What-if analysis and comparison of system designs and migration scenarios = “Guided POCs”

Quantify pain relief success
Before-after analysis of system optimizations and software updates

Measure chronic pain
DaaS and VDI service level agreement management

Deliver less pain by design
EUC software quality assurance and quality control

EUC Score Components	Freeware Edition Free Download	Community Edition Requires Free License	Pro Edition (Single User) Requires License	Enterprise Edition Requires License
Base Simloads (single app)	✓	✓	✓	✓
Simple Personas (multiple apps)	✓	✓	✓	✓
Score Simloads	✓	✓	✓	✓
Simload Runner	✓	✓	✓	✓
Core Telemetry / Base Counters	✓	✓	✓	✓
Command-Line Automation	✓	✓	✓	✓
Data Miner	✓	✓	✓	✓
Shared Results	(✓)	✓	—	—
For Community Usage	(✓)	✓	—	—
Advanced Simloads (single app)		✓	✓	✓
Advanced Personas (multiple apps)		✓	✓	✓
Avatar (tray app)		✓	✓	✓
Telemetry Collector (CSV file & GUI)		✓	✓	✓
PowerShell Object & Automation		✓	✓	✓
Sync Player		✓	✓	✓
Protected Results			✓	✓
For Individual Commercial Usage			✓	✓
Simload SDK				✓
Online Training (2h/quarter)				✓
For Enterprise Commercial Usage				✓
Support	Community	Community	Email	Email
Subscription Fee	Free	Free	€495/year €149/quarter	€5,000/year €1,500/quarter

Commercial Options

- Enterprise (Vendor): Quarterly or annual subscription fee, no services
- Partner (Consulting): Hourly or daily rates for contributions of guided POCs
- Customer Project: Hourly or daily rates + 3-month usage fee (SOW)
- Community Project: Discounted hourly or daily rates, free license

Guided POC details

1. EUC Score consulting partner builds and optimizes POC environment
2. EUC Score consulting partner installs EUC Score toolset (requires EUC Score license)
3. Dr. Tritsch IT Consulting conducts EUC Score benchmarking tests as part of the guided POC project, including visualizations, analysis and comparisons to reference systems
4. EUC Score consulting partner presents POC details and EUC Score benchmarking results to the customer

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

Thank You

Benny Tritsch | info@eucscore.com