Measure Perceived VDI User Experience Like a Workplace Ninja

Dr. Benny Tritsch

Independent Performance Data Scientist

EUC Score

Workplace Ninjas

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About Benny Tritsch

My Focus

VDI Benchmarking with EUC Score

My Company

Dr. Tritsch IT Consulting

My Blog

https://drtritsch.com

Community Awards

MVP, Tech Insider, NEPA, VIPP, NVP

Contact

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EUC Score Website

https://eucscore.com

NVIDIA Advisor NVIDIA Enterprise Platform

omnissa TECH INSIDER

NERDIO VALUED PROFESSIONAL

MVP Microsoft Most Valuable Professional

VIPP Very Important Parallels Professional Parallels


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

End User Computing

EUC

“Admin Experience”

Hard Metrics

Digital Employee Experience

DEX

“User Experience”

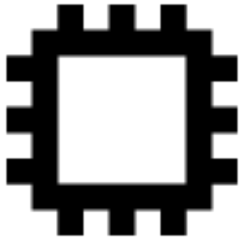
Soft Metrics

VDI User Experience Influencers

Only one inadequate factor can prevent a good perceived user experience

Host System “VM Type”

Client Device “Endpoint”

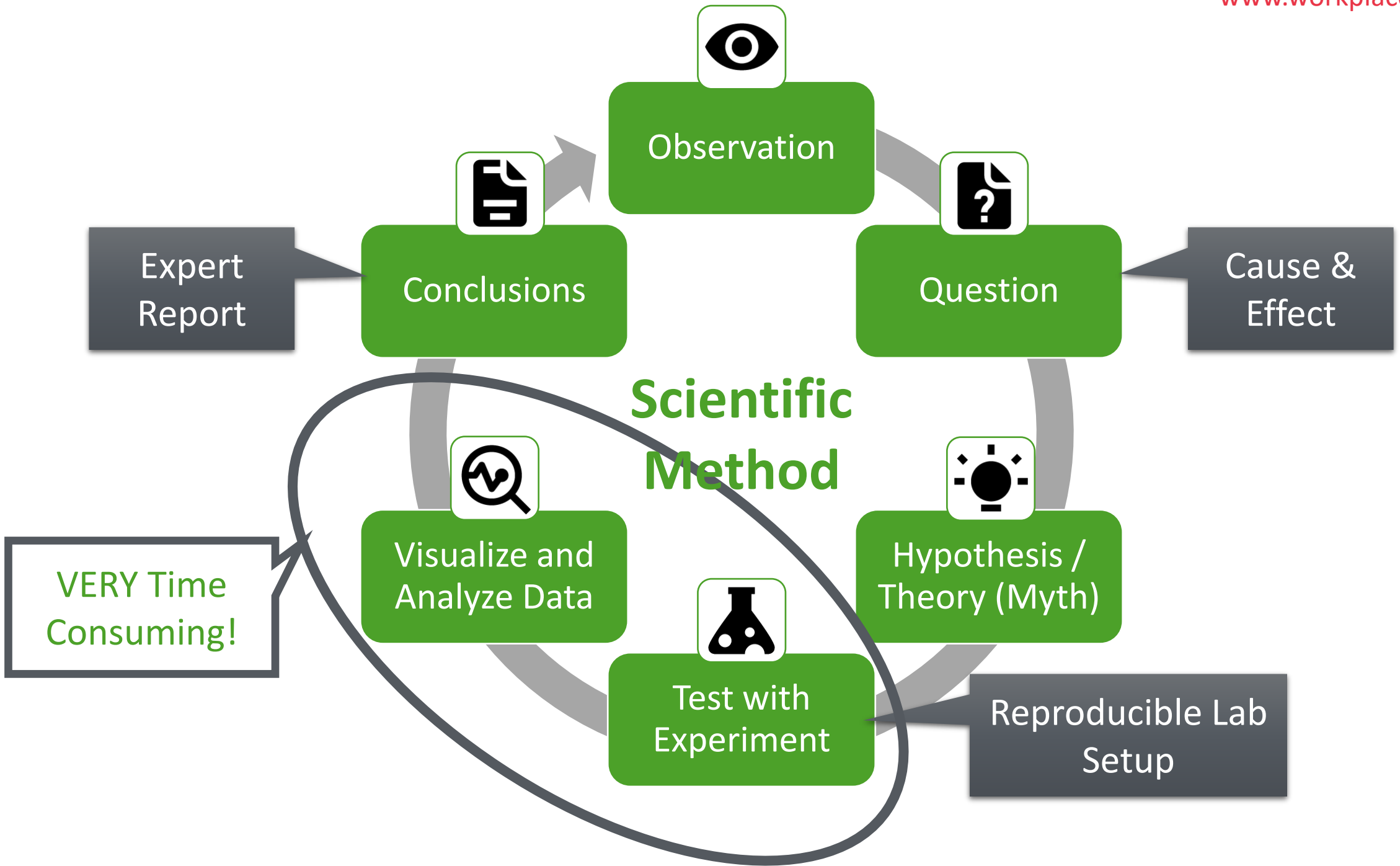


GPUs

Network Parameters

Remoting Protocol

…and sometimes performance counters alone cannot tell you what’s wrong!



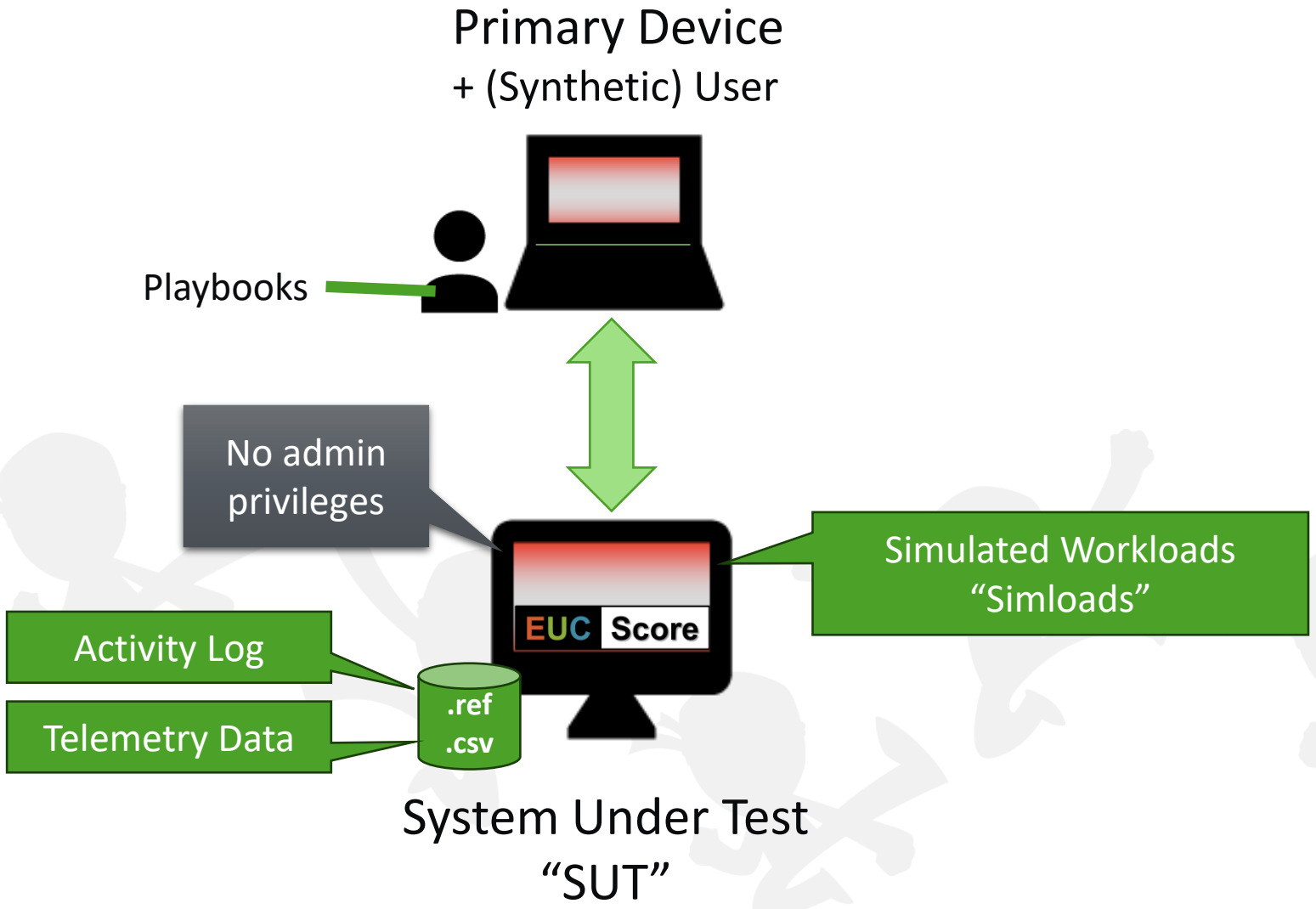
Quality Criteria – Users' Perspective

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.

Measuring Perceived User Experience

Building a very basic test lab

Setting up a simple test lab



Simulated Workloads – “Simloads”

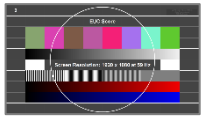
	Type	Description
	**Type 1 Primary**	Test run with an application that highlights a specific graphic or multimedia format (GDI, DirectX, OpenGL or video) – may require a pre-installed application.
	**Type 2 Persona**	Sequence of chained or overlayed user activities, orchestrated in such a way they generate 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.

https://eucscore.com/gallery.html

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

Primary Simloads

Simple / Continuous



TestScreen
System info

NotepadEdit
Simple typing

NotepadMove
Moving app window

WordpadScroll
Office app scrolling

MSEdgeHtmlScroll
HTML doc scrolling

JPEGViewAnim
Simple animation

MSEdgeMonsterHTML5
Simple HTML5 app

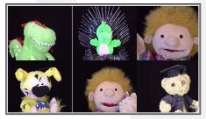
Videos / HTML5

WMPlayer480MP4
480p MP4 video

WMPlayer720MP4
720p MP4 video

WMPlayer180MP4
1080p MP4 video

MSEdgeVideoConf4
4 separate videos



MSEdgeVideoConf6
6 separate videos

MSEdgeVideoGrid9
9 separate videos

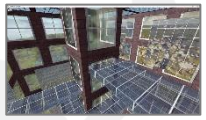
MSEdgeFishbowlHTML5
HTML5 app

Animations

MSEdgeGifScroll1 / 2
Medium animation

MSEdgePhotoGalleryJS
JPG photo gallery

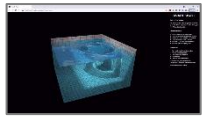
RollercoasterDX9
Medium DirectX 9 app



BSPBlendingDX11
Demanding DirectX 11 app

MSEdgeCarVisualizer
Demanding WebGL app

MSEdgeAquariumWebGL
Demanding WebGL app

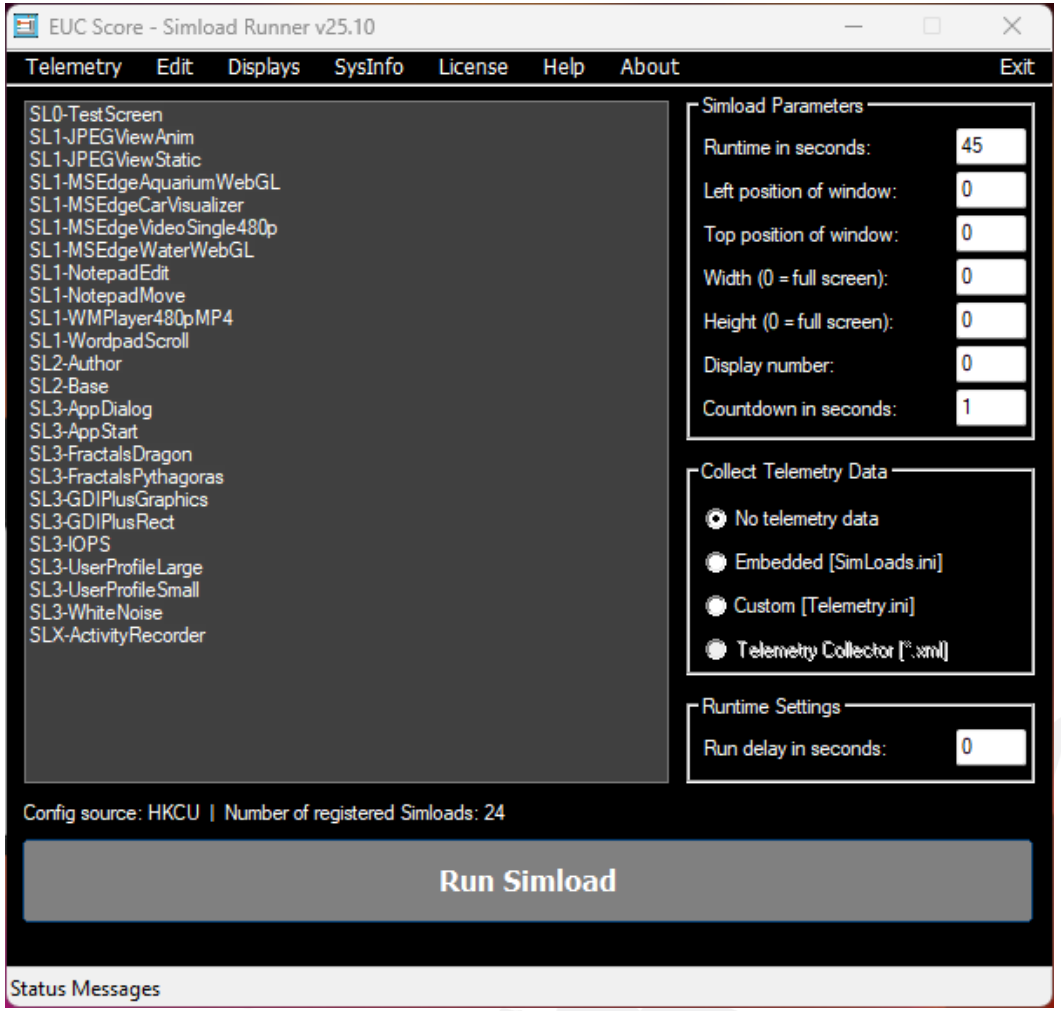


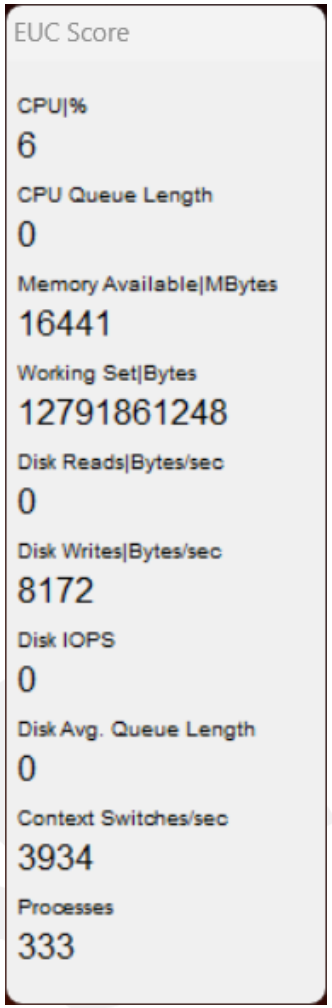
MSEdgeWaterWebGL
Demanding WebGL app

Run Simloads & Collect Perf Counters

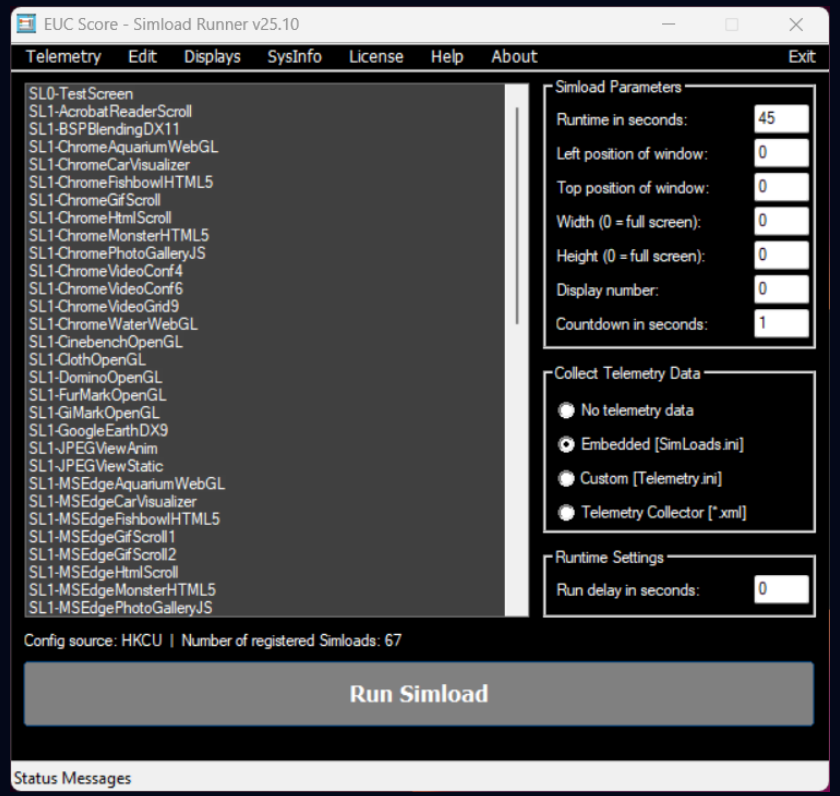
Free Download: EUC Score Base Package

https://eucscore.com/freeware





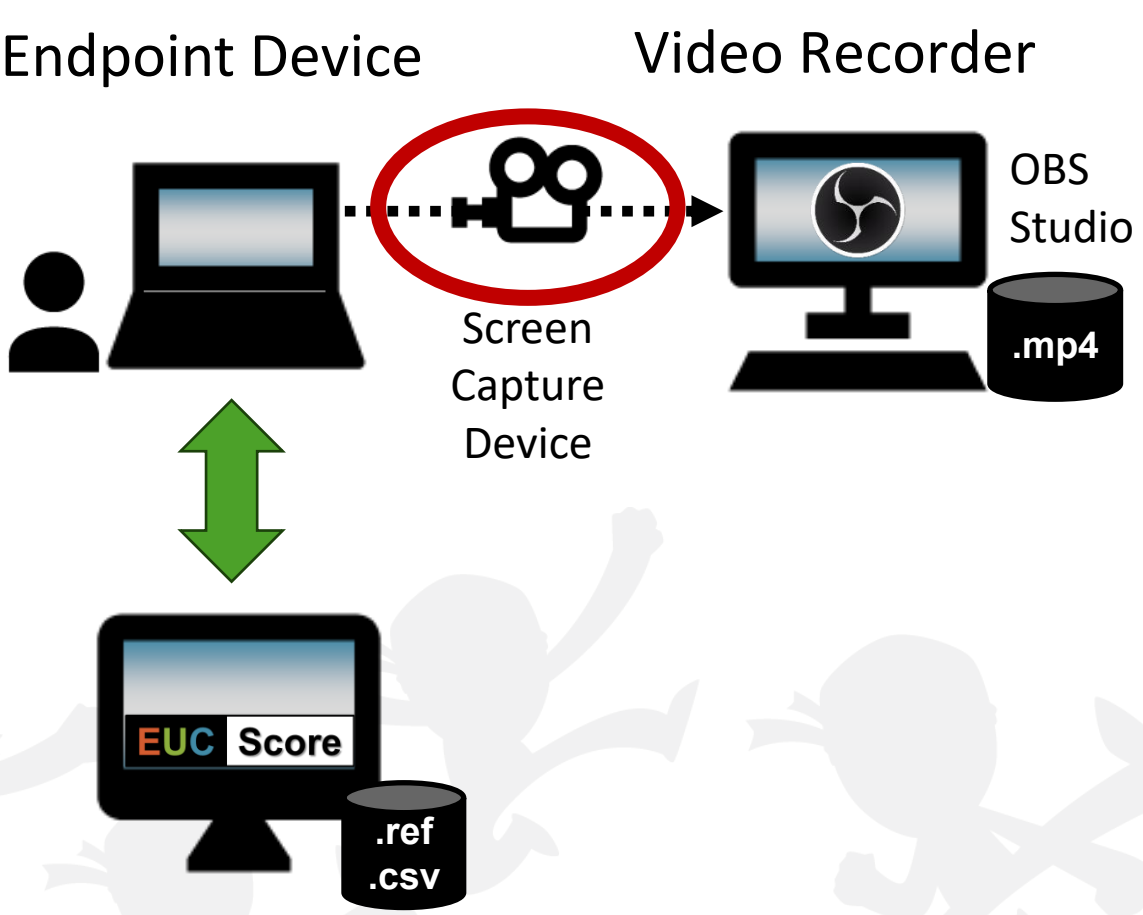
Running Simloads



Measuring Perceived User Experience

Recording screen videos

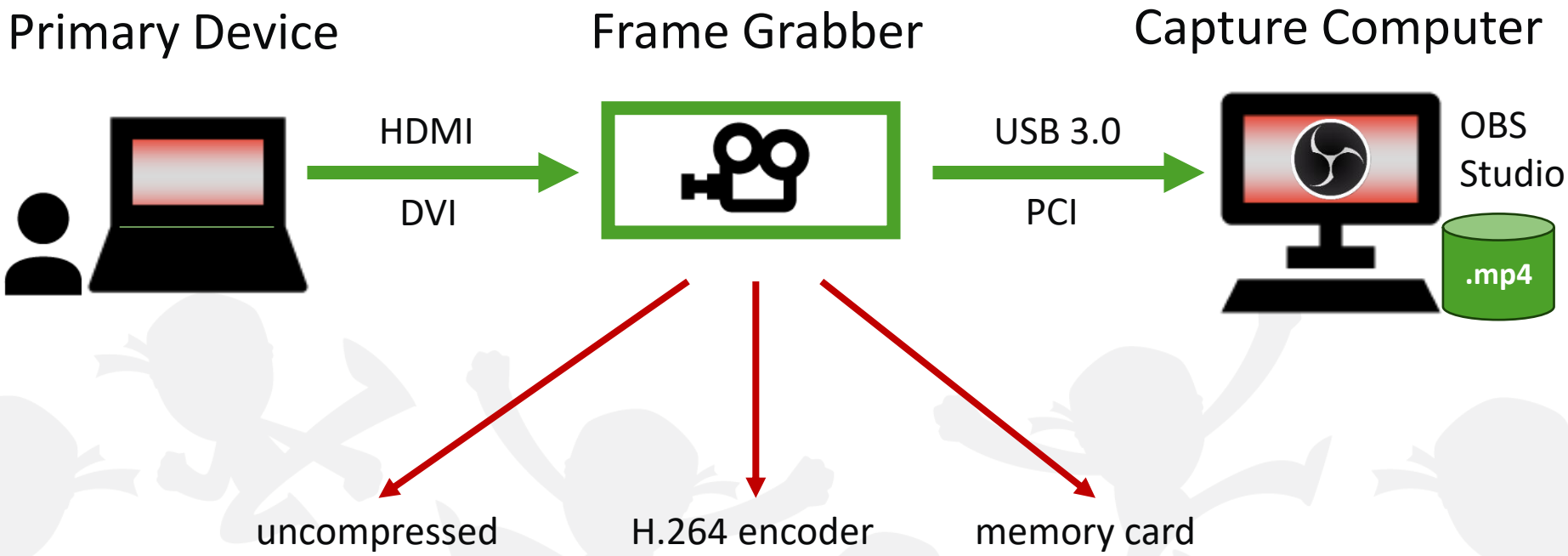
Screen Video Recording Options



Frame Grabbers

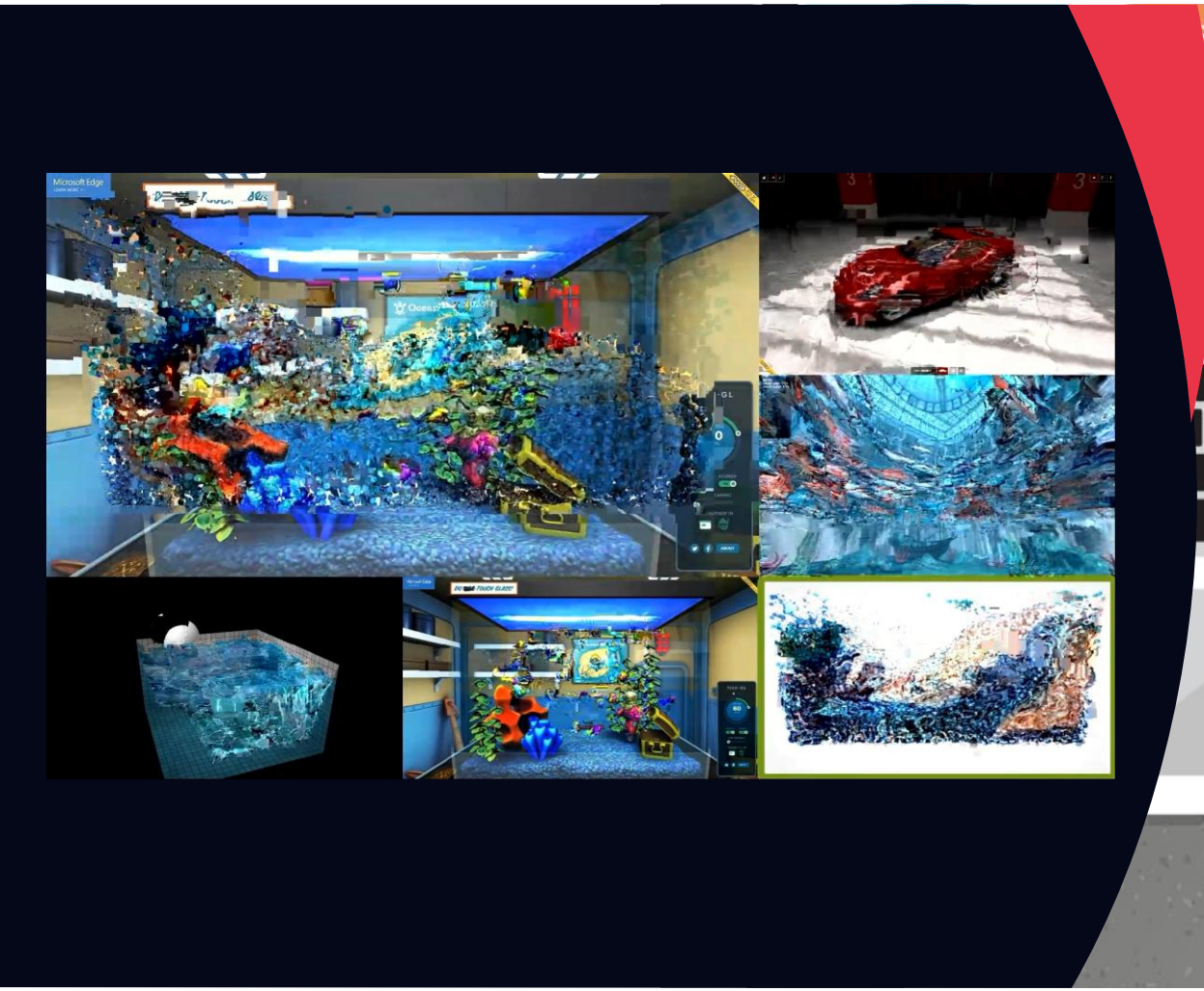
https://eucscore.com/equipment.html#screencapture
https://drtritsch.com/2025/03/31/Capturing-User-Experience-with-Frame-Grabbers.html

Screen Recording: How it works…



Typical resolutions: Full HD (1080p) or 4k @ 30fps or 60fps

Showing screen videos



Measuring Perceived User Experience

Simulating constrained networks

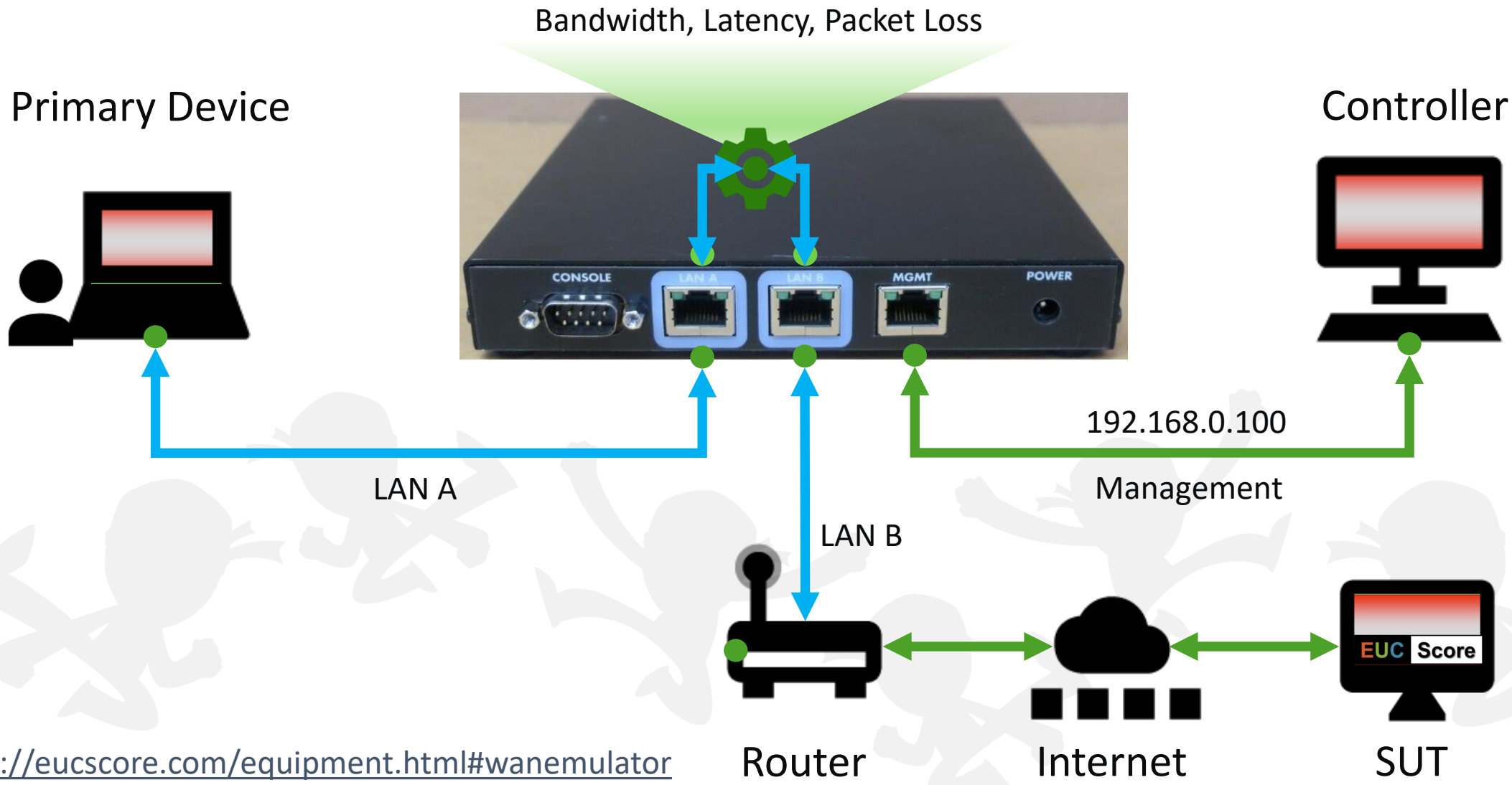
Typical Network Settings

- **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

My Preferred Network Profiles

Name	Bandwidth Limit	Round Trip Time	Packet Loss
Baseline (Unconstrained)	100 Mbit/s	10 milliseconds	0%
High packet loss	100 Mbit/s	10 milliseconds	**2%**
High round trip time	100 Mbit/s	**110 milliseconds**	0%
Low bandwidth	**8 Mbit/s**	10 milliseconds	0%
Very high packet loss	100 Mbit/s	10 milliseconds	**5%**
Very high round trip time	100 Mbit/s	**310 milliseconds**	0%
Very low bandwidth	**2 Mbit/s**	10 milliseconds	0%

WAN Emulator – Linktropy Mini2



https://eucscore.com/equipment.html#wanemulator

linktropy-mini2 (Linktropy Configuration) - Google Chrome

Not secure 192.168.2.254/cgi-bin/init.php#

APPOSITE TECHNOLOGIES

LINKTROPY MINI²

linktropy-mini2 (192.168.2.254)

Emulation On/Off

	Status	Rate	Drops
LAN A	UP (100FD)	150.0 Kbps	53353
LAN B	UP (100FD)	13.08 Kbps	17502

Refresh: 1s

Link Emulation | Bridge / Route | Device Settings | Save / Load | Upgrade | M

	LAN A ⟶ LAN B	LAN B ⟶ LAN A
Bandwidth	100 Mbps	100 Mbps
Delay	Constant / Uniform / Normal; 0 ms	Constant / Uniform / N; 0 ms
Loss	Packet Loss 0.0000 %; BER 0 x 10 - 14	Packet Loss 0.0000 %; BER 0 x 10 - 14

Advanced Parameters [show]

Apply Changes | Clear Changes

Linktropy Monitor - Google Chrome

Not secure 192.168.2.254/monitor.html

APPOSITE TECHNOLOGIES

Statistics | ARP Table | Documentation

Reset

Refresh Interval: 1s

LAN A ⟶ LAN B

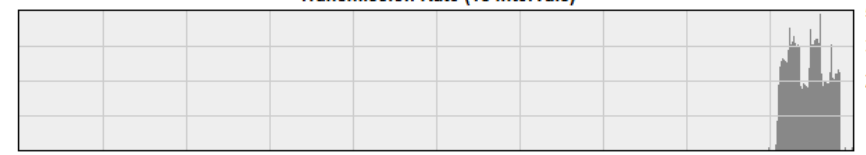
Rate: 100.0 Mbps **Delay:** 0 ms **Loss:** 0% **BER:** 0 **Queue:** 250 ms

Transmission Count		Drops				
Bytes	Frames	Loss	BER	Queue	Total	Percent
183,075,915	155,663	0	0	0	0	0.00%

Average Tx Rate

1 sec	1.287 Mbps
10 sec	3.205 Mbps
1 min	24.39 Mbps
10 min	----- bps

Transmission Rate (1s intervals)



LAN B ⟶ LAN A

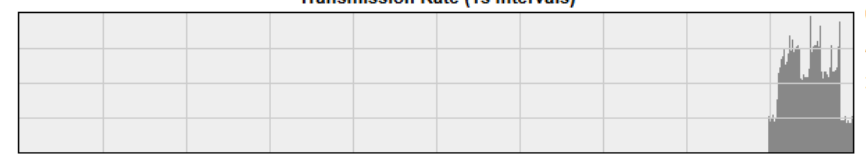
Rate: 100.0 Mbps **Delay:** 0 ms **Loss:** 0% **BER:** 0 **Queue:** 250 ms

Transmission Count		Drops				
Bytes	Frames	Loss	BER	Queue	Total	Percent
262,142	1,223	0	0	0	0	0.00%

Average Tx Rate

1 sec	16.09 Kbps
10 sec	18.45 Kbps
1 min	34.46 Kbps
10 min	----- bps

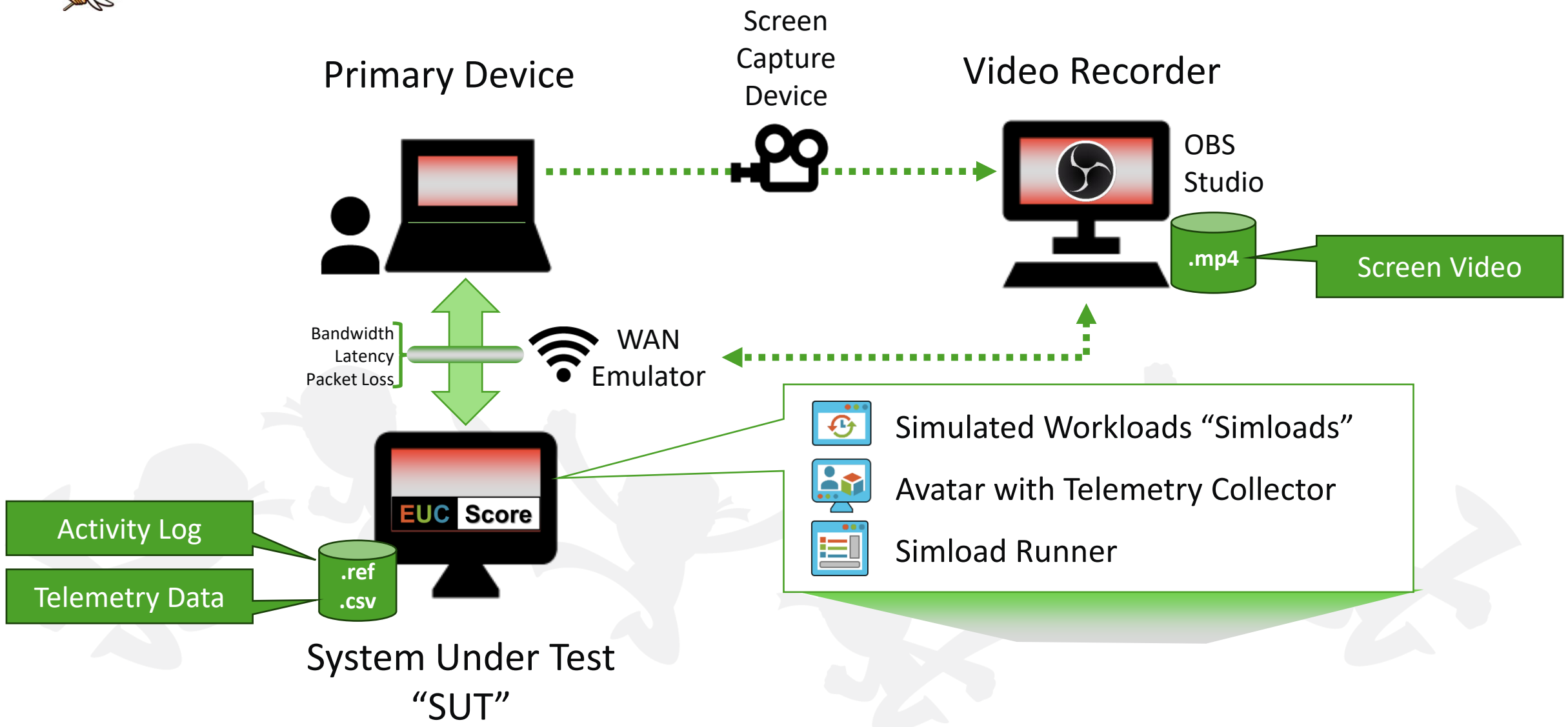
Transmission Rate (1s intervals)

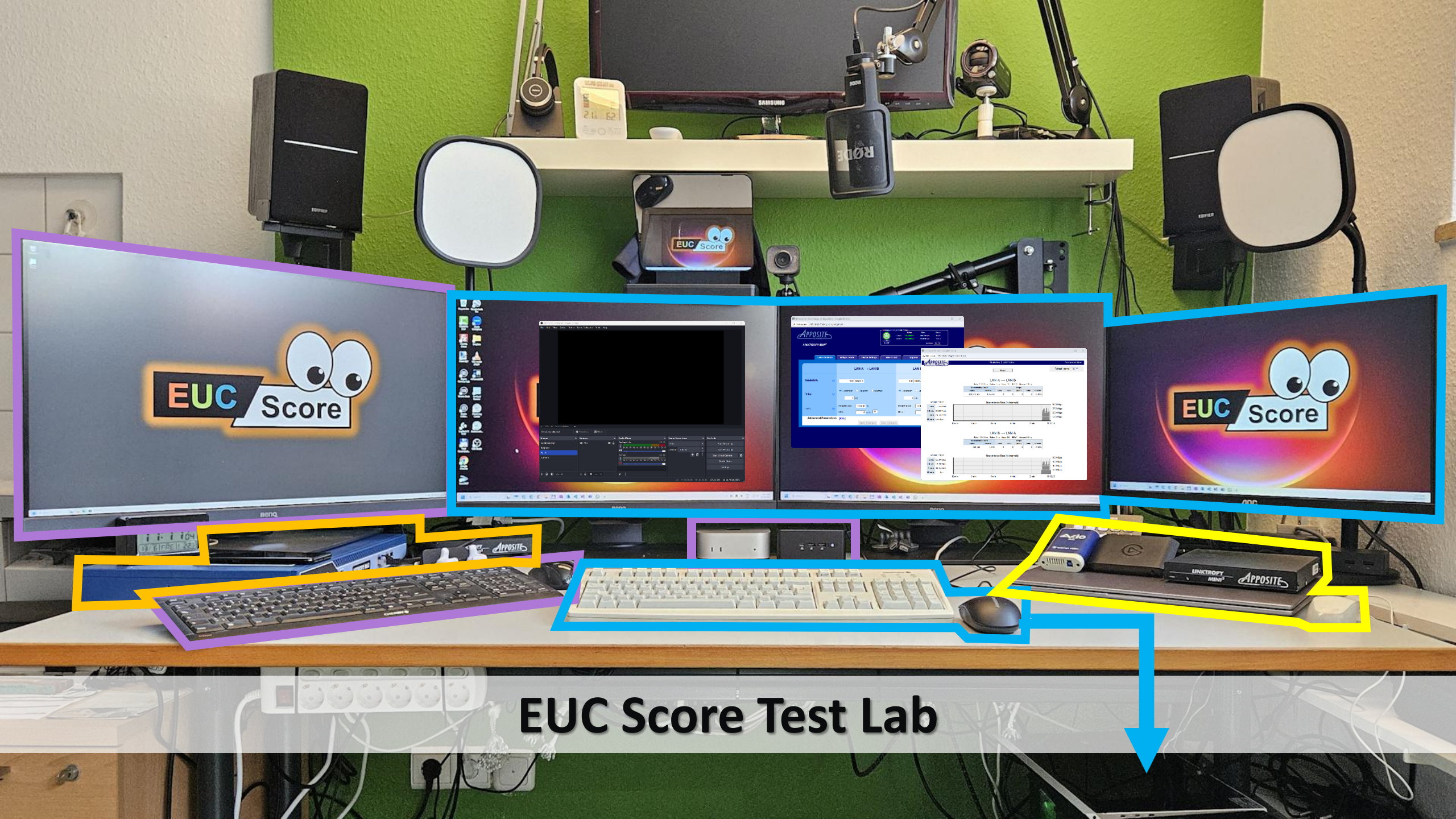


Measuring Perceived User Experience

…and now all together

EUC Score Test Lab





EUC Score Test Lab

Cloud Desktops Under Test

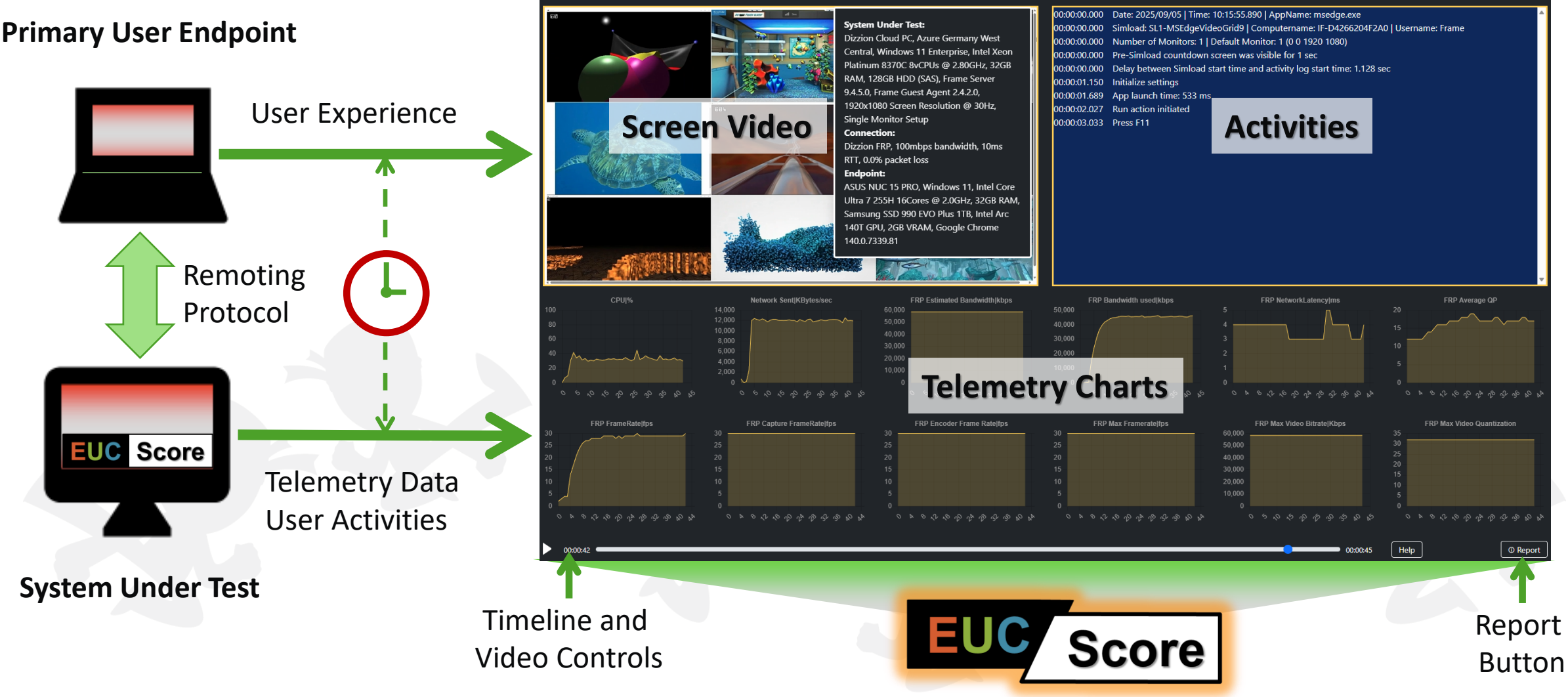
VM profiles benchmarked with EUC Score during the last 15 months

1. **Windows 365** Cloud PC, Windows 11, 4 vCPUs (AMD), 16GB RAM, **SxS RDP**
2. **Windows 365** Cloud PC, Windows 11, 8 vCPUs (Intel), 32GB RAM, **SxS RDP**
3. **Azure D8s v5**, Windows 11, 8 vCPUs (Intel), 32GB RAM, **RDP (classic)**
4. **Dizzion "Cloud PC"**, Azure D4s v5, Windows 11, 4 vCPUs (Intel), 16GB RAM, **FRP**
5. **Dizzion "Cloud PC"**, Azure D8s v5, Windows 11, 8 vCPUs (Intel), 32GB RAM, **FRP**
6. **Citrix for Windows 365**, Windows 11, 8 vCPUs (Intel), 32GB RAM, **EDT/HDX**
7. **Citrix on Azure D8s v5**, Windows 11, 8 vCPUs (Intel), 32GB RAM, **EDT/HDX**
8. **Omnissa Horizon with Windows 365**, Windows 11, 8 vCPUs (Intel), 32GB RAM, **Blast**
9. **Windows 365** GPU Super (NVIDIA A10-12Q), 18 vCPUs (AMD), 220GB RAM, **SxS RDP**
10. **Windows 365** GPU Standard (NVIDIA A10-8Q), 12 vCPUs (AMD), 110GB RAM, **SxS RDP**
11. **HP on Azure NC4as_T4_v3** (NVIDIA T4), Windows 11, 4 vCPUs (AMD), 28GB RAM, **PCoIP**

Measuring Perceived User Experience

Visualization and analysis

Visual Data Analytics – Sync Player



Left Title – Side-by-Side View Mode (i)(z)

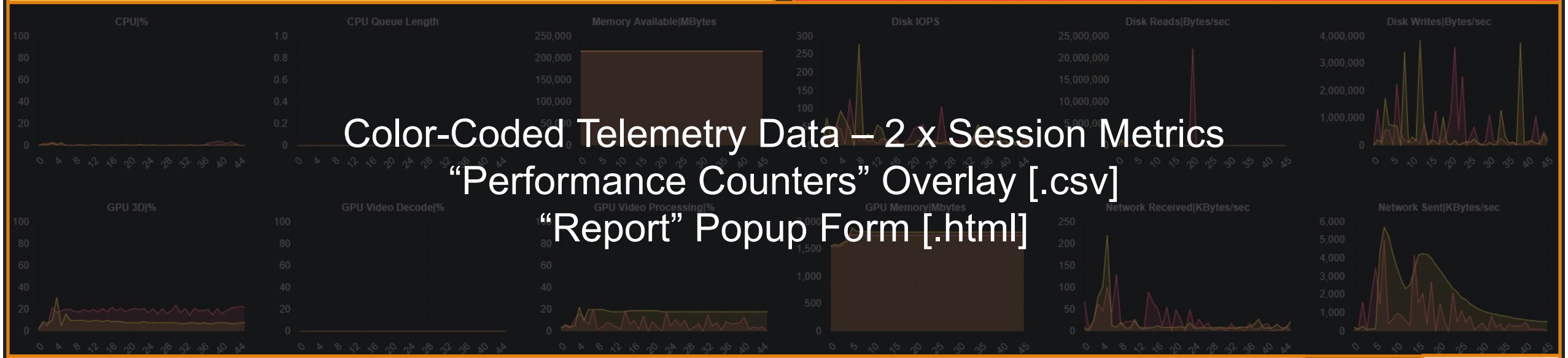
Right Title – Side-by-Side View Mode (i)(z)

Left Media Tile
“Pacemaker” Video
[.mp4]

Description

Right Media Tile
Comparison Video
[.mp4]

Description



Color-Coded Telemetry Data – 2 x Session Metrics
“Performance Counters” Overlay [.csv]
“Report” Popup Form [.html]

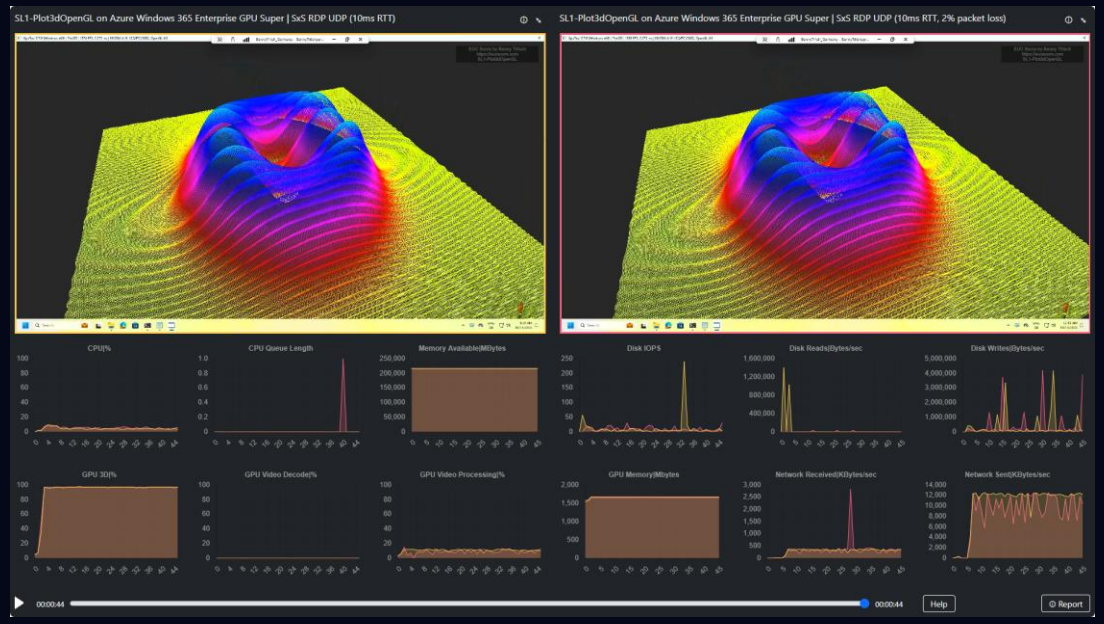
Video & Data Animation Controls

00:00:45 00:00:45

Help

Report

Sync Player Clips



User Personas

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

Conclusion

Why would you want to have such a test lab?

- Produce the data to stay educated on the EUC market
- Evaluate new EUC solutions or remoting protocols
- Deliver guided proof-of-concept projects
- Plan or review Cloud migrations
- Assign the right VM types to different user groups (personas)
- Measure the effect of infrastructure and software changes
- Produce visual evidence for support cases
- Reproduce unwanted effects in a user session

Call to Action

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

info@eucscore.com

https://eucscore.com
https://eucscore.com/results

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

EUC Score Links

https://eucscore.com

Home Page

https://eucscore.com/freeware

Freeware Download

- Blog articles: https://drtritsch.com
- 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

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Thank You!

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EUC Score

Workplace Ninjas