

SESSION

RDP-, HDX- und Blast- Leistungsmessungen auf Azure-VMs

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Donnerstag · 10:15–11:00 Uhr



D A N K E

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PLATINUM



GOLD





Bernhard Tritsch



- Germany
- Dr. Tritsch IT Consulting
- He/Him/His
- 24 years in the program

Award Category

Windows and Devices

Technology Area

Azure Virtual Desktop,
Windows 365



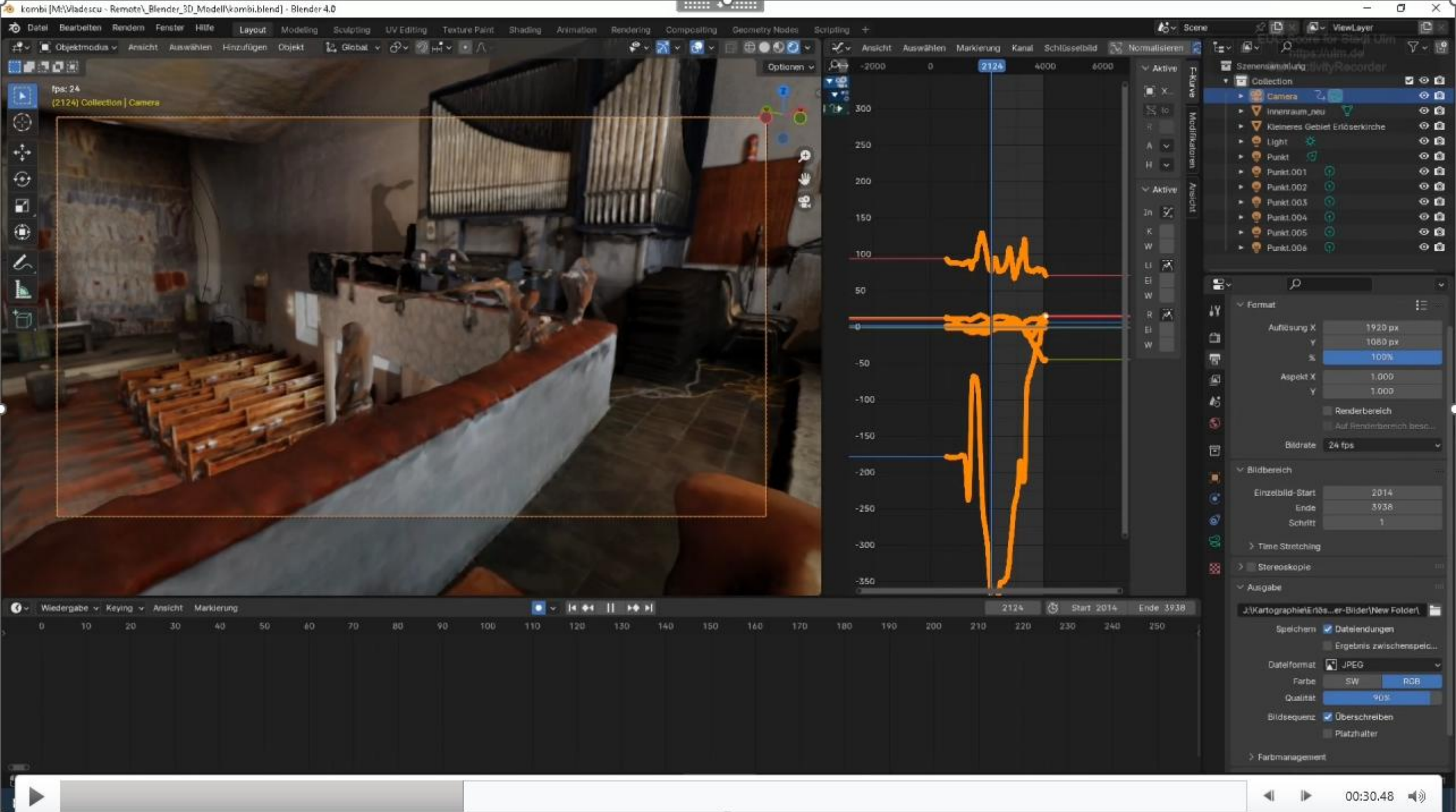
<https://eucforum.de>



Most Valuable Professionals



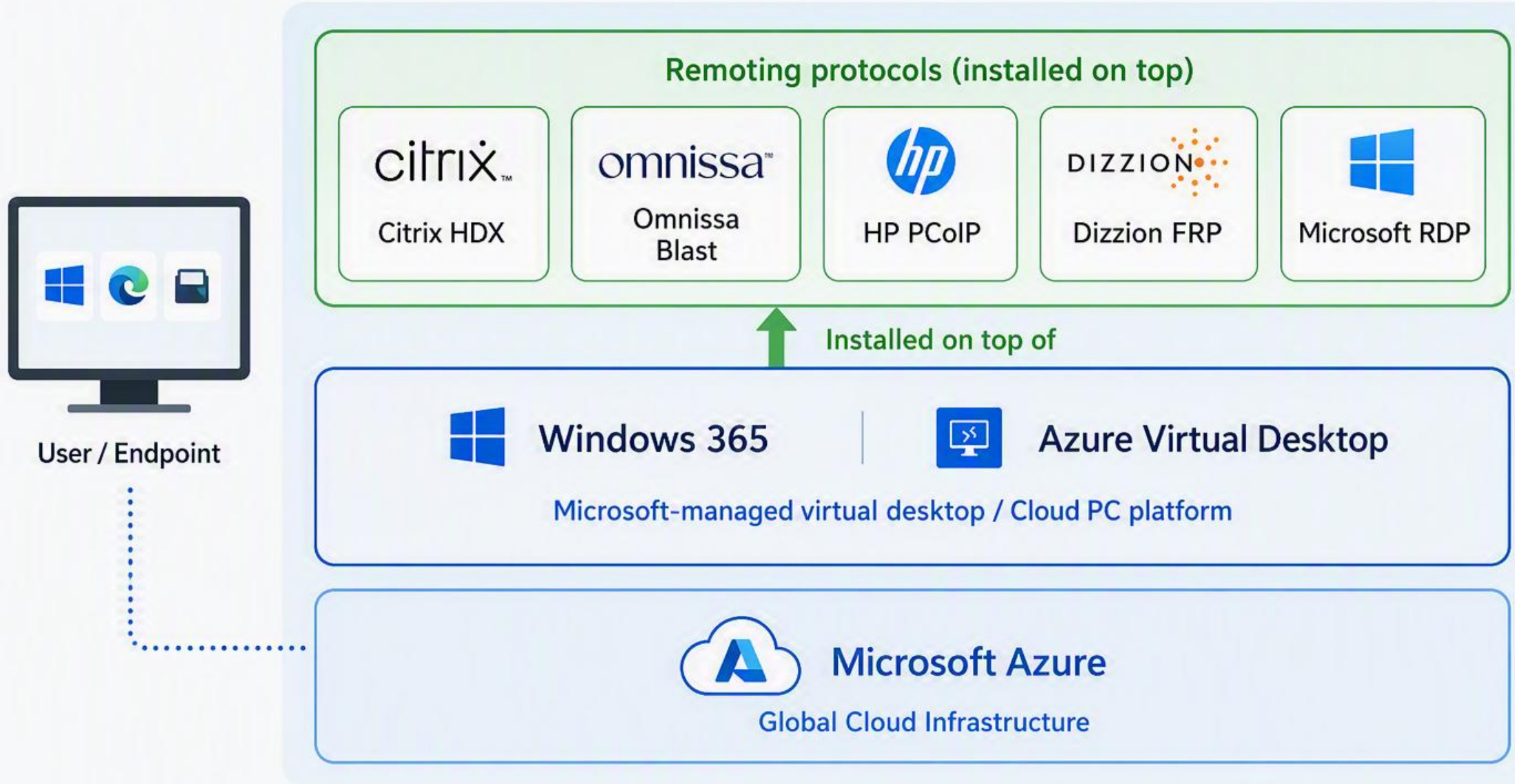
NERDIO VALUED
PROFESSIONAL

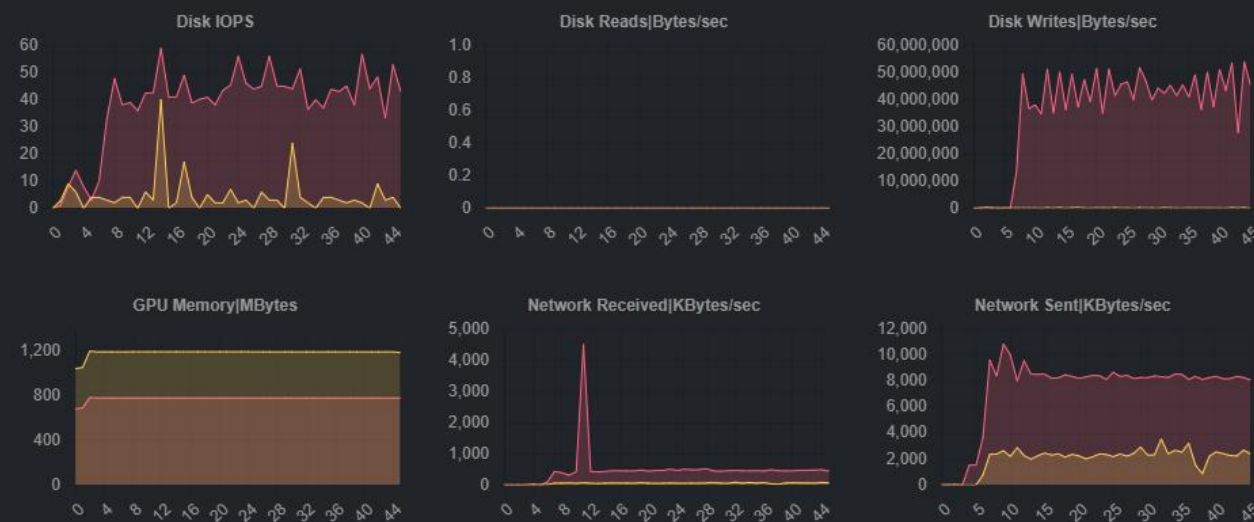
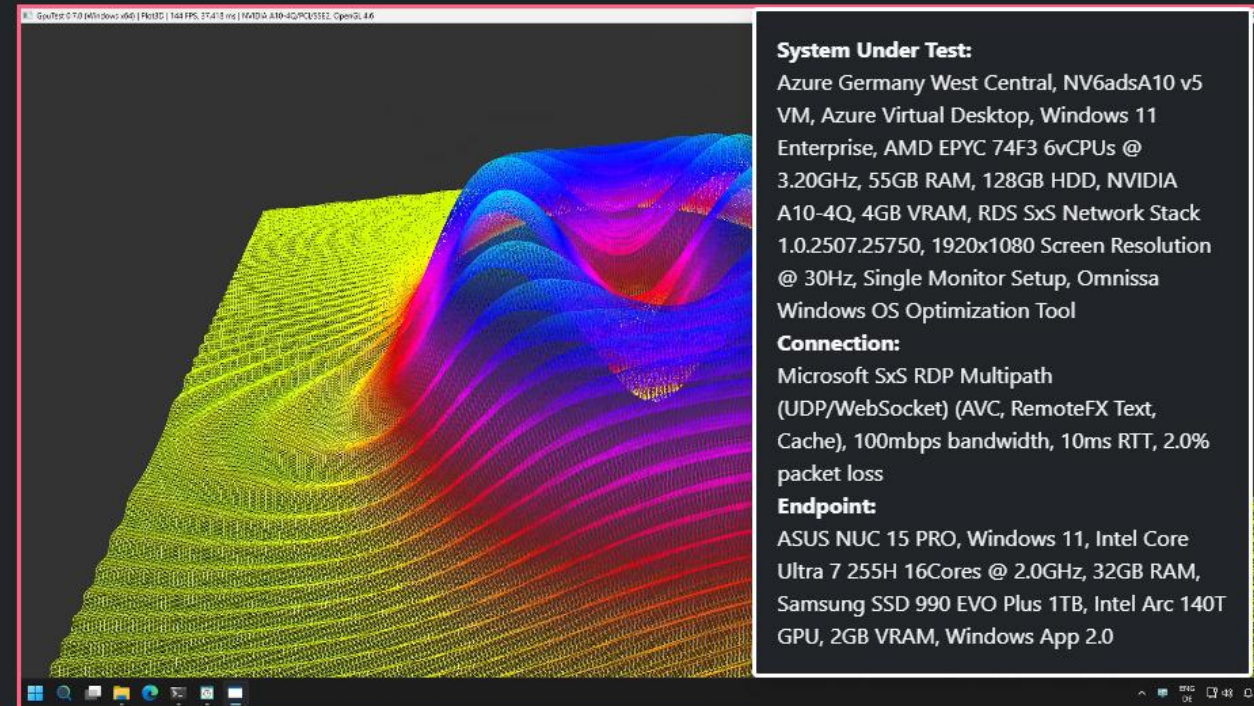
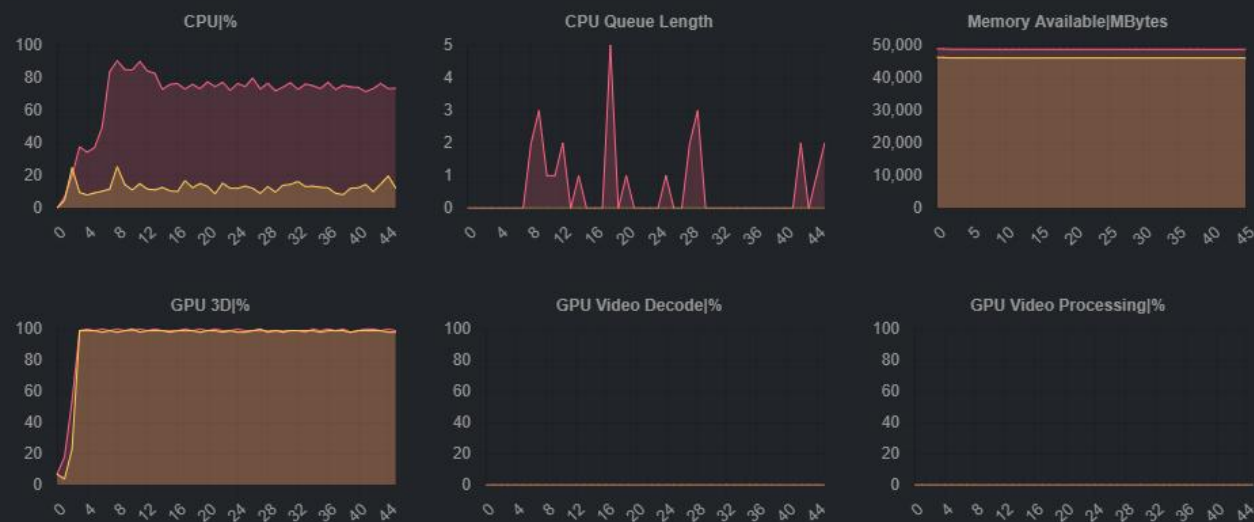
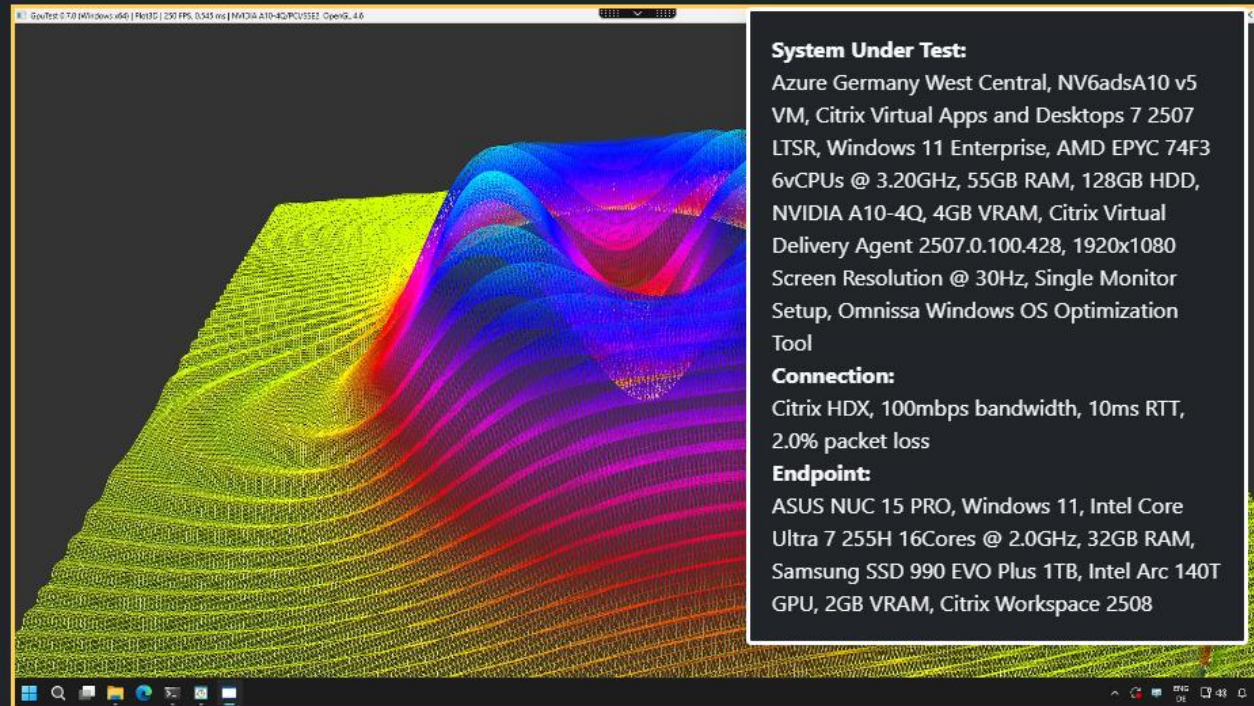


Übersicht

- Eigenschaften der Remoting-Protokolle
- Metriken der Remoting-Protokolle
- Leistungsvergleich und Visualisierung der Testresultate
- Lokalisierung von Leistungszählern
- HDX Graphics Super Resolution Upscaling
- Schlussfolgerungen

Vergleich der Remoting-Protokolle





Eigenschaften der Remoting-Protokolle

Remote Desktop Protocol – Zwei Varianten

Classic RDP

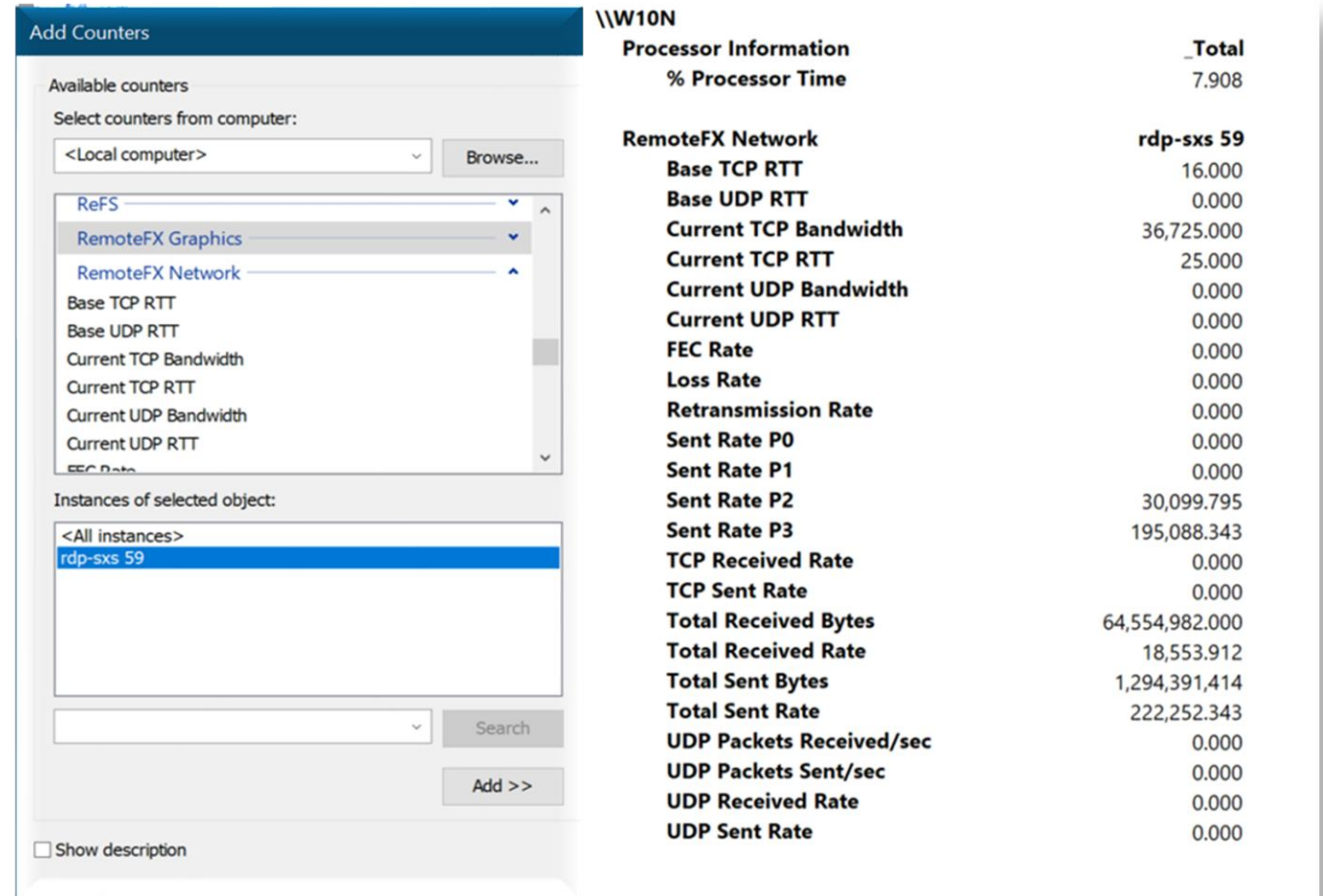
- **“Inbound Connections”**
- Eingeführt: 1998 (RDP 4.0)
- Client: MSTSC (mstscax.dll) – Abgekündigt
- Aktualisierung: Mit Betriebssystem-Updates
- Entwicklungsthemen: Sicherheit, Grafik & Performance (UDP), Konnektivität, Gerät & Eingabe
- Aktueller Schwerpunkt: Sicherheit, Cloud und plattformübergreifend

Side-by-Side (SxS) RDP

- **“Reverse Connections” (outbound)**
- Eingeführt: 2019 mit WVD/AVD
- Client: Windows App
- Installiert als Teil des AVD-Agenten
- (Stille) Aktualisierung: Alle 4 Wochen
<https://learn.microsoft.com/en-us/azure/virtual-desktop/whats-new>
- Basis: URCP (Universal Rate Control Protocol) und WebSockets (TCP)
- RDP Shortpath (STUN, TURN)
- SlimCore (Teams-Optimierung)

Side-by-Side Stack für RDP – Designziele

- Perf-Counter-Instanzen pro Sitzung werden "RDP-SXS sessionID" genannt
- SxS RDP kann zusätzlich zum klassischen RDP-Protokoll (RDP-TCP) und anderen Remoting-Protokollen (HDX, Blast) installiert werden
- Update ohne Server-Neustart oder Benutzertrennung



Universal Rate Control Protocol

- <https://www.microsoft.com/en-us/research/publication/urcp-universal-rate-control-protocol-for-real-time-communication-applications/> (Juni 2013)
- <https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/msrtech-report.pdf>

So sieht es heute aus: Query Session

SxS RDP Session

[User Sessions]

Session1: SessionName=Services, UserName=N/A, SessionID=0, State=Disconnected

Session2: SessionName=Console, UserName=N/A, SessionID=1, State=Connected

Session3: SessionName=**rdp-sxs250225880#0**, **UserName=BernhardTritsch**, **SessionID=3**, **State=Active**

Session4: SessionName=31C5CE94259D4006A9E4, UserName=N/A, SessionID=65536, State=Listen

Session5: SessionName=RDP-Tcp, UserName=N/A, SessionID=65537, State=Listen

Session6: SessionName=rdp-sxs250225880, UserName=N/A, SessionID=65538, State=Listen

Stille Aktualisierung des SxS-RDP-Protokolls

The image displays four overlapping screenshots of the Windows Remote Desktop connection status window, illustrating the process of a silent update of the SxS-RDP protocol. Each window shows connection details, network status, and client information.

Window 1 (Leftmost): Shows a connection quality of "good and UDP". The timestamp is 2024-10-14T06:20:11.801Z. The client version is 1.2.5709.0 (x64). The local OS is Windows 10 Enterprise x64 (10.0, Build 22H2). The transport protocol is UDP. The round-trip time is 10 ms. The available bandwidth is Greater than 113 Mbps. The frame rate is 6 FPS. The remote session type is Remote desktop. The gateway name is Not in use. The gateway logon method is Not in use. The remote computer is cpc-benny-hov0m. The identity verification method is Server Certificate.

Window 2 (Second from left): Shows a connection quality of "good and UDP". The timestamp is 2025-07-14T12:13:02.194Z. The client version is 1.2.6354.0 (x64). The local OS is Microsoft Windows 11 Enterprise x64 (10.0, Build 22H2). The transport protocol is UDP. The round-trip time is 7 ms. The available bandwidth is Greater than 513 Mbps. The frame rate is 0 FPS. The remote session type is Remote desktop. The gateway name is Not in use. The gateway logon method is Not in use. The remote computer is cpc-rdpre-z5nhk. The identity verification method is Server Certificate.

Window 3 (Third from left): Shows a connection quality of "good and Multipath (UDP)". The timestamp is 2026-04-02T09:40:10.733Z. The client version is 1.2.6980.0 (x64). The local OS is Microsoft Windows 11 Enterprise x64 (10.0, Build 22H2). The transport protocol is UDP - Multipath. The round-trip time is 16 ms. The available bandwidth is Greater than 168 Mbps. The frame rate is 2 FPS. The remote session type is Remote desktop. The gateway name is Not in use. The gateway logon method is Not in use. The remote computer is mze-uo-0. The identity verification method is RDSTLS.

Window 4 (Rightmost): Shows a connection quality of "Your network might be slow. You may experience issues. Multipath (UDP/WebSocket) is enabled". The timestamp is 2026-06-04T13:33:07.1078457Z. The client version is 1.2.7207.0 (x64). The local OS is Microsoft Windows 11 Pro x64 (10.0, Build 26200). The transport protocol is Multipath Websocket. The round-trip time is 87 ms. The available bandwidth is 1,85 Mbps. The frame rate is 0 FPS. The remote session type is Remote desktop. The gateway name is Not in use. The gateway logon method is Not in use. The remote computer is cpc-btrit-bzzw6. The identity verification method is Server Certificate.

Eigenschaften – SxS RDP – HDX – Blast

Microsoft SxS RDP

- **Die Referenz für alle Vergleiche**
- Unabhängiger Update-Lebenszyklus
- Reverse-Connect-Modell
- Erweitertes Sicherheitsmodell
- Cloud-native Integration
- Hohe Flexibilität bei der Übertragung
- Modularer Netzwerk-Stack
- Integrierte Diagnose- und Telemetriefunktionen
- Enge Integration in das RDP-Agent-Framework

Citrix HDX

- Basierend auf ICA
- Fokus auf ein hochauflösendes Benutzererlebnis
- Intelligente Umleitung (Client- oder serverseitiges Rendering)
- Adaptive Komprimierung
- Netzwerkoptimierung
- Adaptiver Transport (TCP/UDP)
- Multimedia- und Grafikoptimierung
- Umleitung von Geräten und Peripheriegeräten
- Sitzungszuverlässigkeit
- Dynamische Anpassung an wechselnde Bedingungen
- Umfangreiches Funktionsökosystem
- Über Richtlinien konfigurierbar

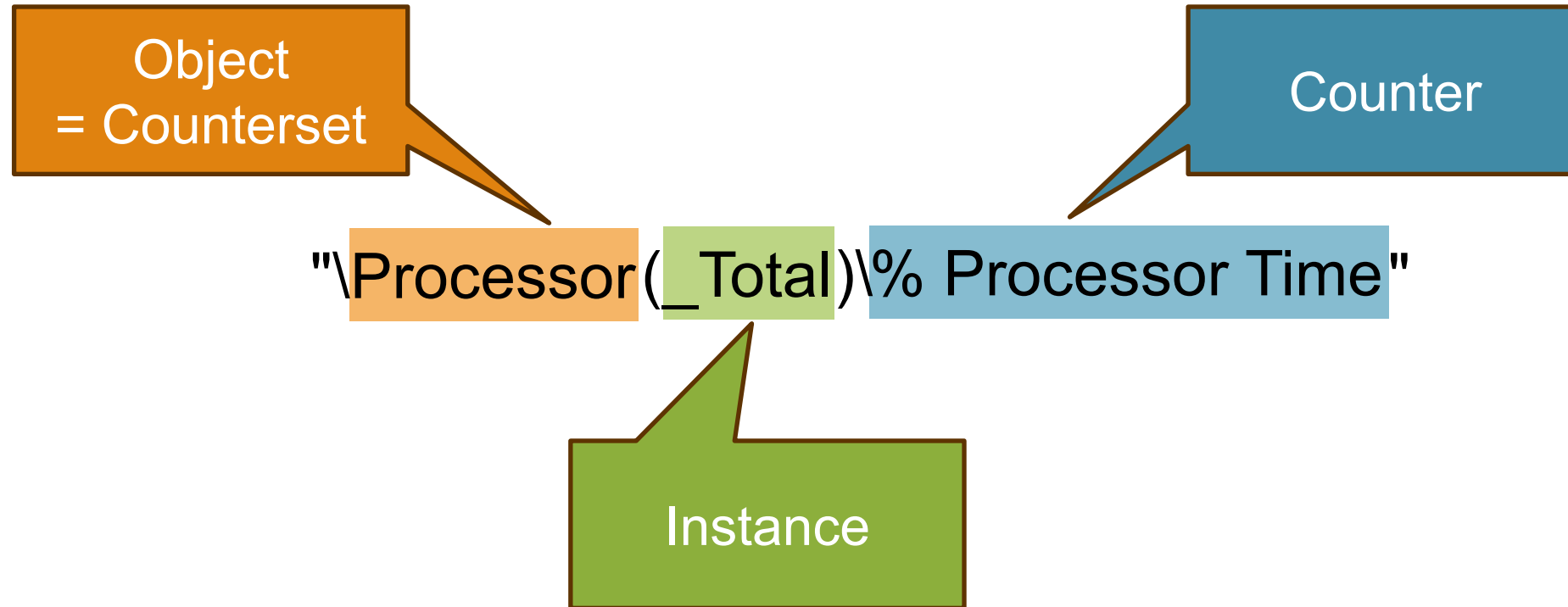
Omnissa Blast (Extreme)

- Hochleistungs-Anzeigeprotokoll
- Transportflexibilität (TCP/UDP)
- Codec-basiertes Streaming (H.264, HEVC/H.265, AV1, BlastCodec) mit GPU-Unterstützung
- Adaptive Bildqualität und Bandbreitenoptimierung
- Optimierung für Multimedia und Grafik
- Umfassende Client- und Geräteunterstützung
- Starkes Sicherheitsmodell
- Modulare Komponenten (Transport + Codec)
- Vereinheitlichter Zugriff und vereinfachte Konnektivität (einzelner Port)

Metriken der Remoting-Protokolle

Metriken: Pfadsyntax der Leistungszähler

\\ComputerName\ObjectName(ObjectInstance)\ObjectCounter



Ein *Counterset* ist eine Gruppierung von Leistungszähler innerhalb eines Providers
Ein *Counter* ist die Definition eines einzelnen Leistungszählers
Eine *Instance* ist eine Entität, über die Leistungsdaten gesammelt werden

C:\Windows\system32\cmd.exe

C:\Users\benny.DARCOLABS>typeperf -q processor

\processor(*)\% Processor Time
\processor(*)\% User Time
\processor(*)\% Privileged Time
\processor(*)\Interrupts/sec
\processor(*)\% DPC Time
\processor(*)\% Interrupt Time
\processor(*)\DPCs Queued/sec
\processor(*)\DPC Rate
\processor(*)\% Idle Time
\processor(*)\% C1 Time
\processor(*)\% C2 Time
\processor(*)\% C3 Time
\processor(*)\C1 Transitions/sec
\processor(*)\C2 Transitions/sec
\processor(*)\C3 Transitions/sec

The command completed successfully.

C:\Users\benny.DARCOLABS>typeperf "\Processor(_Total)\% Processor Time"

"(PDH-CSV 4.0)","\\MERLIN\Processor(_Total)\% Processor Time"
"08/22/2024 09:13:53.884", "1.019657"
"08/22/2024 09:13:54.900", "1.991526"
"08/22/2024 09:13:55.912", "1.445304"
"08/22/2024 09:13:56.918", "1.629610"
"08/22/2024 09:13:57.928", "5.375511"
"08/22/2024 09:13:58.942", "0.992495"
"08/22/2024 09:13:59.956", "3.530964"
"08/22/2024 09:14:00.957", "3.460074"
"08/22/2024 09:14:01.969", "1.571992"
"08/22/2024 09:14:02.977", "2.472840"
"08/22/2024 09:14:03.989", "0.286005"

The command completed successfully.

C:\Users\benny.DARCOLABS>

Relevante RDSH/AVD/Win365 Zähler

\Processor(_Total)\% Processor Time
\System\Processor Queue Length
\System\Context Switches/sec
\System\Processes
\Memory\Available MBytes
\Process(_Total)\Working Set
\PhysicalDisk(_Total)\Disk Read Bytes/sec
\PhysicalDisk(_Total)\Disk Write Bytes/sec
\PhysicalDisk(_Total)\Disk Transfers/sec
\PhysicalDisk(_Total)\Avg. Disk Queue Length

Core Telemetry / Base Counters

\Terminal Services\Active Sessions
\Terminal Services\Total Sessions
\Processor(_Total)\Interrupts/sec
\Processor(_Total)\% Interrupt Time
\System\File Read Operations/sec
\System\File Write Operations/sec
\Memory\Free System Page Table Entries
\Memory\Page Faults/sec
\Memory\Pages/sec
\Memory\Pool Nonpaged Bytes
\Memory\Pool Paged Bytes

Keine Zähler für GPUs

Relevante RDSH/AVD/Win365 Zähler

\Terminal Services Session(RDP-Tcp x)\% Processor Time

\Terminal Services Session(RDP-Tcp x)\Working Set

\User Input Delay per Session(Max)\Max Input Delay

\Network Interface(*)\Output Queue Length

\Network Interface(*)\Current Bandwidth

\Network Interface(*)\Packets Received Unicast/sec

\Network Interface(*)\Packets Received Non-Unicast/sec

\Network Interface(*)\Packets Sent Unicast/sec

\Network Interface(*)\Packets Sent Non-Unicast/sec

\Network Interface(*)\Bytes Received/sec

\Network Interface(*)\Bytes Sent/sec

\Network Interface(*)\Bytes Total/sec

Keine _Total Instanz

RDP Leistungszähler

\RemoteFX Network(*)\Current TCP Bandwidth	TCP Bandwidth detected in bits per second (bps)
\RemoteFX Network(*)\Current TCP RTT	Average TCP round-trip time (RTT) detected in ms
\RemoteFX Network(*)\Current UDP Bandwidth	UDP Bandwidth detected in bits per second (bps)
\RemoteFX Network(*)\Current UDP RTT	Average UDP round-trip time (RTT) detected in ms
\RemoteFX Network(*)\Loss Rate	Loss percentage
\RemoteFX Network(*)\Retransmission Rate	Percentage of packets that have been retransmitted
\RemoteFX Network(*)\TCP Received Rate	Rate in bps at which data is received over TCP
\RemoteFX Network(*)\TCP Sent Rate	Rate in bps at which data is sent over TCP
\RemoteFX Network(*)\UDP Received Rate	Rate in bps at which data is received over UDP
\RemoteFX Network(*)\UDP Sent Rate	Rate in bps at which data is sent over UDP

RDP Leistungszähler

\RemoteFX Graphics(*)\Graphics Compression ratio	Ratio of bytes encoded to bytes input
\RemoteFX Graphics(*)\Average Encoding Time	Average frame encoding time
\RemoteFX Graphics(*)\Frame Quality	Quality of the output frame
\RemoteFX Graphics(*)\Input Frames/second	Number of sources frames
\RemoteFX Graphics(*)\Output Frames/second	Number of frames sent to the client
\RemoteFX Graphics(*)\Source Frames/second	Number of frames composed by source
\RemoteFX Graphics(*)\Frames Skipped/second – Insufficient Client Resources	
\RemoteFX Graphics(*)\Frames Skipped/second – Insufficient Network Resources	
\RemoteFX Graphics(*)\Frames Skipped/second – Insufficient Server Resources	

Citrix HDX Leistungszähler

\\ICA Session(Console (UserName))\\EDT bandwidth available (bps)

\\ICA Session(Console (UserName))\\Input Session Bandwidth

\\ICA Session(Console (UserName))\\Output Session Bandwidth

\\ICA Session(Console (UserName))\\Input Session Compression

\\ICA Session(Console (UserName))\\Output Session Compression

\\ICA Session(Console (UserName))\\Latency - Last Recorded

\\ICA Session(Console (UserName))\\Latency - Session Average

\\ICA Session(Console (UserName))\\EDT RTT

\\ICA Graphics(<n>)\\BitRate - Current

\\ICA Graphics(<n>)\\Frame Rate - Current FPS

\\ICA Graphics(<n>)\\Frame Rate - Input FPS

\\ICA Graphics(<n>)\\Frame Rate - Target FPS

\\ICA Graphics(<n>)\\Thinwire Average Input FPS

\\ICA Graphics(<n>)\\Thinwire Average Output FPS

\\ICA Graphics(<n>)\\Thinwire Bandwidth Estimate (bps)

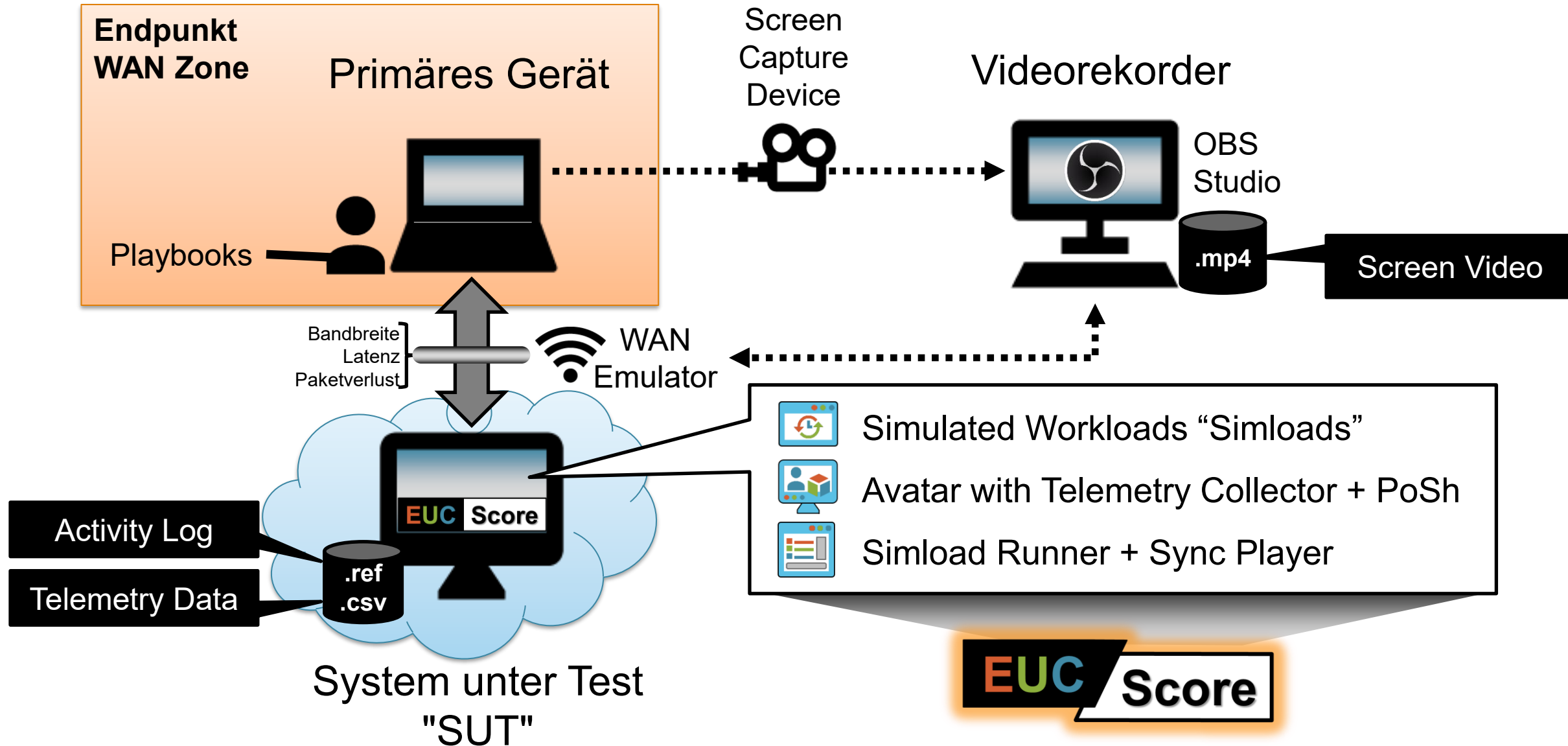
\\ICA Graphics(<n>)\\Thinwire Latency Estimate (ms)

OmniBlast Leistungszähler

\\Horizon Blast Session Counters(Session ID: n; (main))\\Estimated Bandwidth (Uplink)
\\Horizon Blast Session Counters(Session ID: n; (main))\\Instantaneous Transmitted Bytes over TCP
\\Horizon Blast Session Counters(Session ID: n; (main))\\Instantaneous Transmitted Bytes over UDP
\\Horizon Blast Session Counters(Session ID: n; (main))\\Instantaneous Received Bytes over TCP
\\Horizon Blast Session Counters(Session ID: n; (main))\\Instantaneous Received Bytes over UDP
\\Horizon Blast Session Counters(Session ID: n; (main))\\Packet Loss (Uplink)
\\Horizon Blast Session Counters(Session ID: n; (main))\\Jitter (Uplink)
\\Horizon Blast Session Counters(Session ID: n; (main))\\RTT
\\Horizon Blast Session Counters(Session ID: n; (main))\\Automatic Reconnect Count
\\Horizon Blast Imaging Counters(Session ID: n; Channel: Imaging; (main))\\Frames per second
\\Horizon Blast Imaging Counters(Session ID: n; Channel: Imaging; (main))\\Dirty frames per second
\\Horizon Blast Imaging Counters(Session ID: n; Channel: Imaging; (main))\\FBC Rate
\\Horizon Blast Imaging Counters(Session ID: n; Channel: Imaging; (main))\\Poll Rate
\\Horizon Blast Imaging Counters(Session ID: n; Channel: Imaging; (main))\\Outbound Bandwidth (Kbps)
\\Horizon Blast Imaging Counters(Session ID: n; Channel: Imaging; (main))\\Inbound Bandwidth (Kbps)
\\Horizon Blast Imaging Counters(Session ID: n; Channel: Imaging; (main))\\Out Queueing time (us)

Leistungsvergleich und Visualisierung der Testresultate

EUC Score Testlabor



60-90 cloud data centers

MAIN R.

**BENCHMARKING
TEST LAB
OBER-RAMSTADT**

< 10 ms latency

**DE-CIX
FRANKFURT**

Peak (2026): 18.73 Tbit/s

**FRANKENSTEIN
CASTLE**





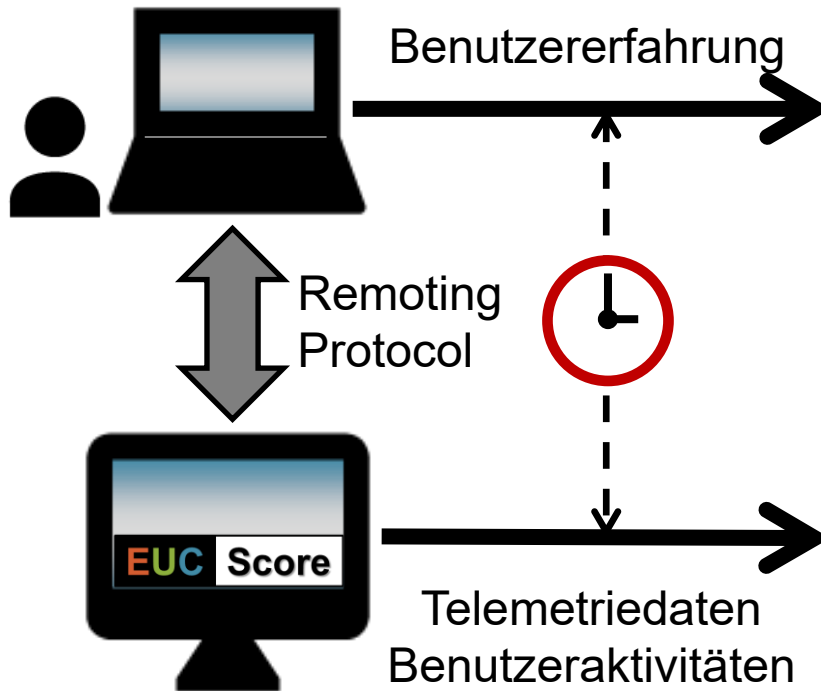
EUC Score Testlabor

Client-Netzwerkeinstellungen – WAN-Emulator

- **Bandbreite** = Datenübertragungsrate in einer kabelgebundenen oder drahtlosen Kommunikationsverbindung oder die maximale Datenmenge, die über eine Internetverbindung in einer bestimmten Zeit übertragen wird
 - Übliche Werte: **100Mbit/s** (LAN), 12Mbit/s, **8Mbit/s**, 4Mbit/s, **2Mbit/s**
- **Latenz** = Die Verzögerung in der Netzwerkkommunikation, auch oft als Round-Trip Time (RTT) bezeichnet
 - Übliche Werte : **0ms**, 20ms, 50ms, **100ms**, **300ms** RTT
- **Paketverlust** = Ein Netzwerkpaket erreicht sein erwartetes Ziel nicht, was zu Informationsverlust führt
 - Übliche Werte : **0%**, 0.1%, 0.2%, 1%, **2%**, **5%**

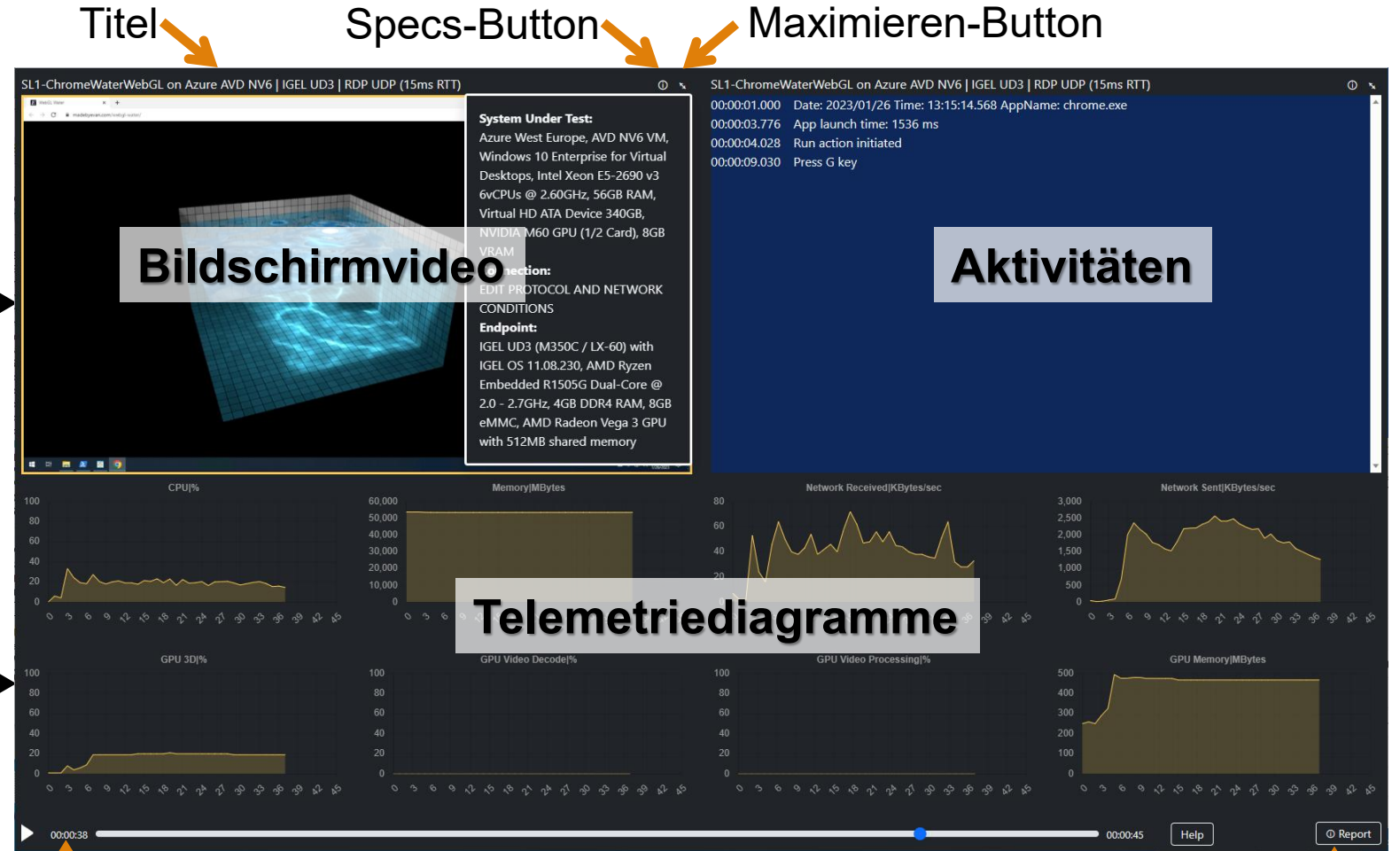
Visuelle Datenanalyse – Sync Player

Primärer Benutzerendpunkt

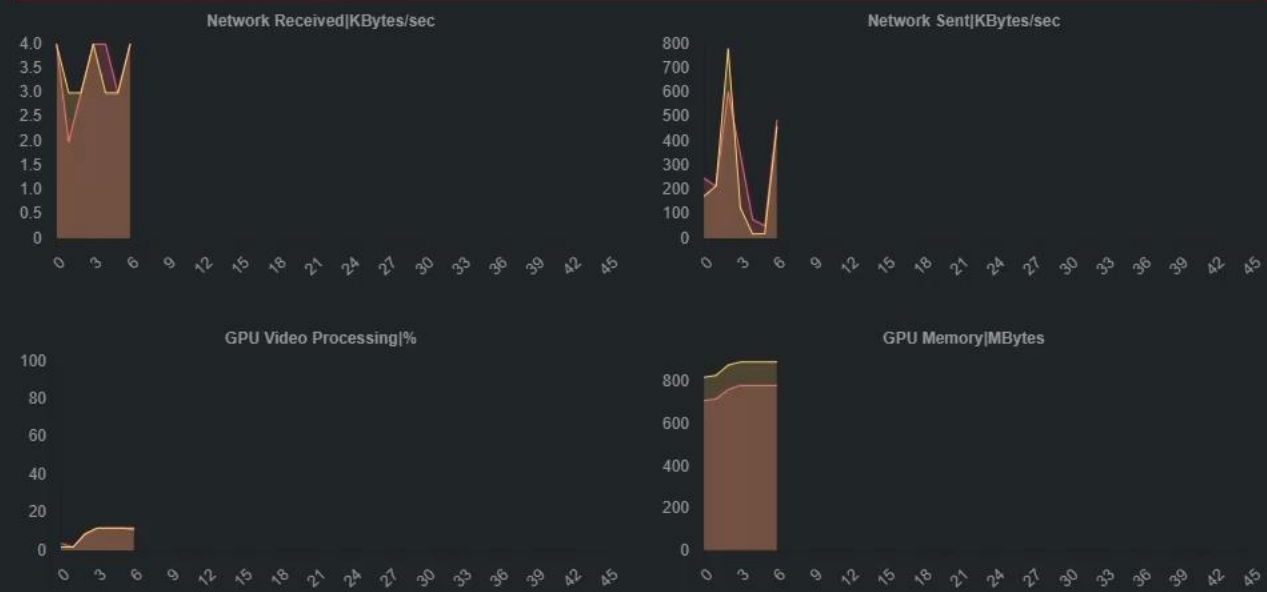
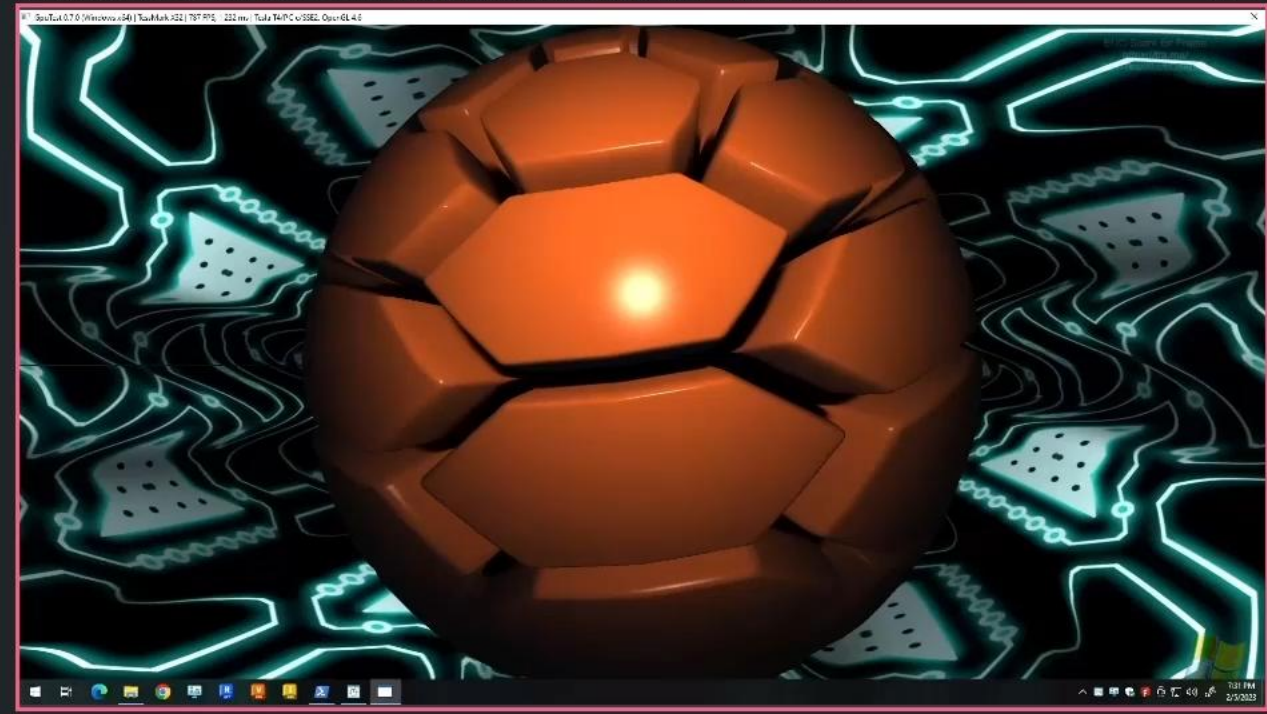
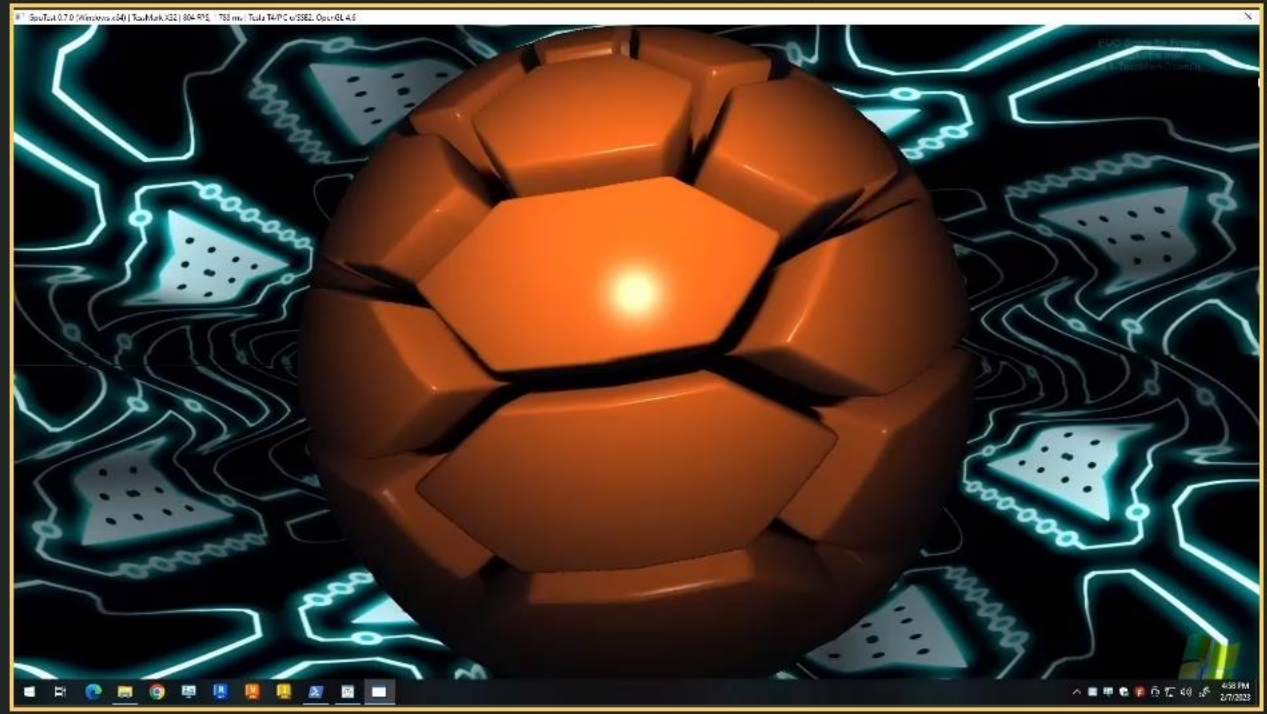


System unter Prüfung

Zeitleiste und Videosteuerung



EUC Score





Show Time

Erkenntnisse

Lokalisierung von Leistungszählern

Lokalisierte Performance-Zählernamen

The image displays three screenshots of the Windows Registry Editor, illustrating the process of localizing performance counter names. Each screenshot shows a different path in the registry tree, with the corresponding values listed in a table.

Screenshot 1: Registry Editor (English)

Path: Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Perflib\CurrentLanguage

Name	Type	Data
(Default)	REG_SZ	(value not set)
Counter	REG_MULTI_SZ	1 1847 2 System 4 Memory 6 % Processor Time 10 File Read Operations/sec 12 File Write Operations/sec 14 File Co...
Help	REG_MULTI_SZ	3 The System performance object consists of counters that apply to more than one instance of a component proce...

Screenshot 2: Registrierungs-Editor (German)

Path: Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Perflib\009

Name	Typ	Daten
(Standard)	REG_SZ	(Wert nicht festgelegt)
Counter	REG_MULTI_SZ	1 1847 2 System 4 Memory 6 % Processor Time 10 File Read Operations/sec 12 File Write Operations/sec 14 File Co...
Help	REG_MULTI_SZ	3 The System performance object consists of counters that apply to more than one instance of a component proc...

Screenshot 3: Registrierungs-Editor (German)

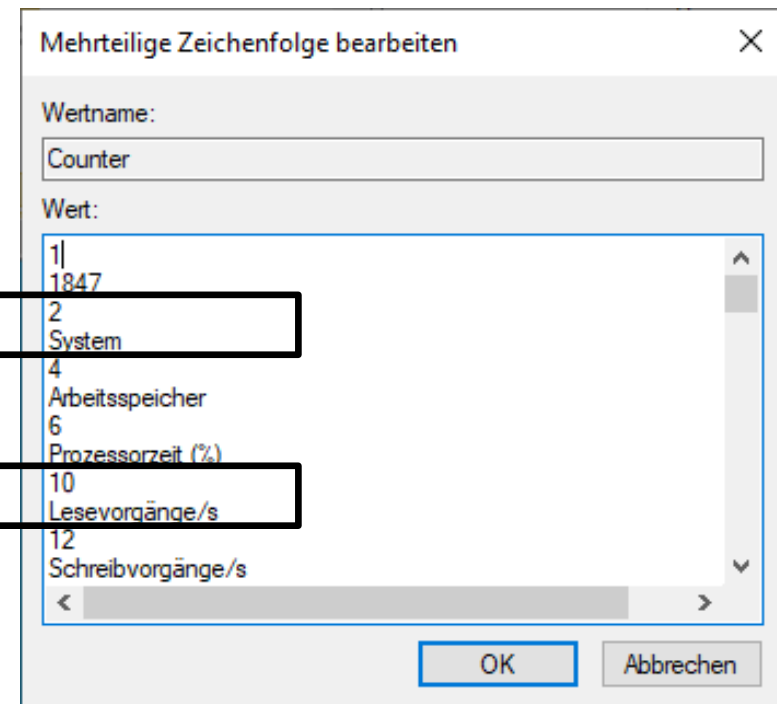
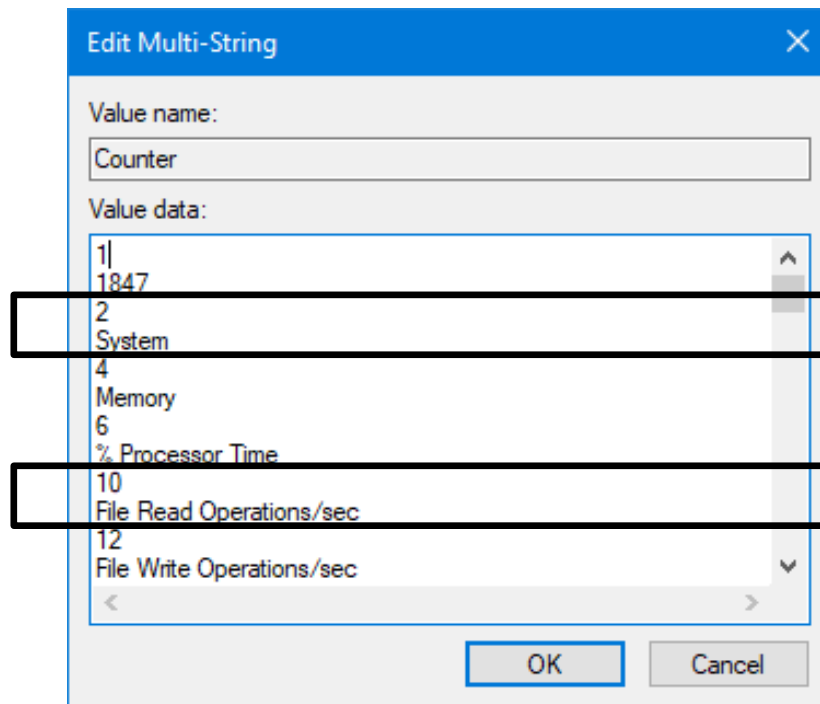
Path: Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Perflib\CurrentLanguage

Name	Typ	Daten
(Standard)	REG_SZ	(Wert nicht festgelegt)
Counter	REG_MULTI_SZ	1 1847 2 System 4 Arbeitsspeicher 6 Prozessorzeit (%) 10 Lesevorgänge/s 12 Schreibvorgänge/s 14 Dateisteuervorg...
Help	REG_MULTI_SZ	3 Das System-Leistungsindikatorenobjekt besteht aus Leistungsindikatoren, die für mehrere Instanzen eines Komp...

Lokalisierte Performance-Zählernamen

Perflib\CurrentLanguage\Counter
auf einem System mit englischer (US) Sprache

Perflib\CurrentLanguage\Counter
auf einem System mit deutscher Sprache



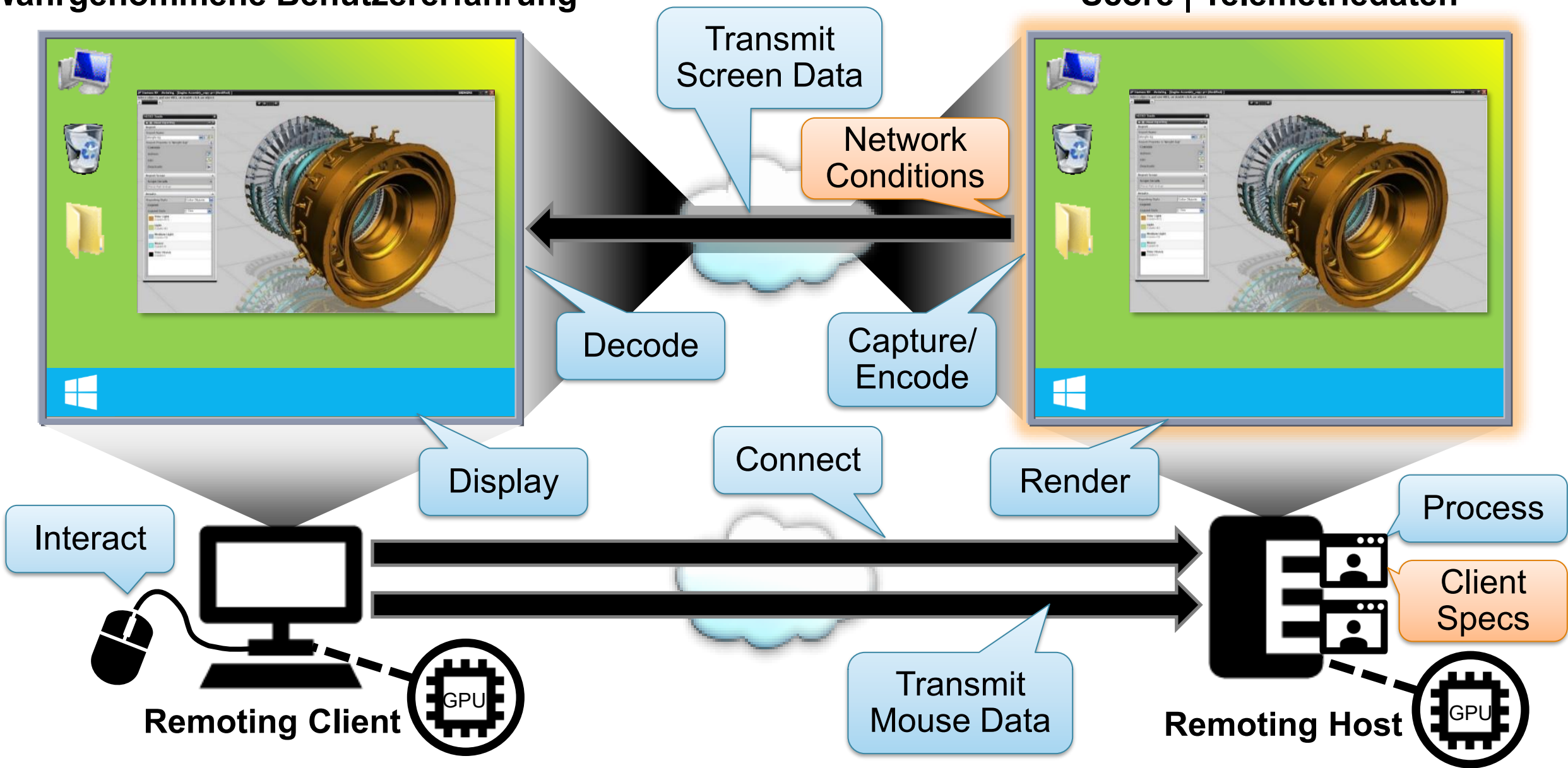
Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Perflib\CurrentLanguage

Erkenntnisse

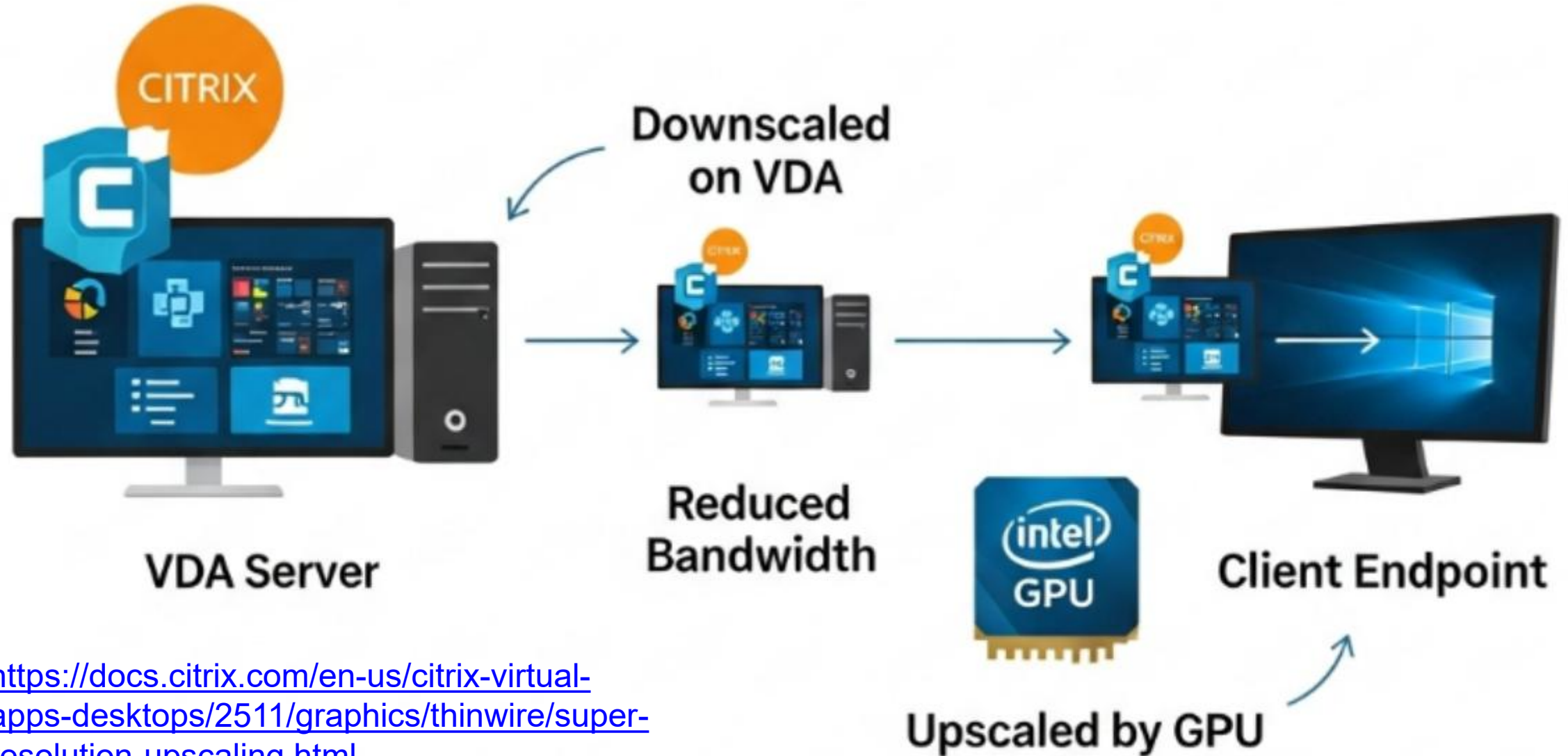
HDX Graphics Super Resolution Upscaling

Wahrgenommene Benutzererfahrung

Score | Telemetriedaten



HDX Graphics Super Resolution Upscaling

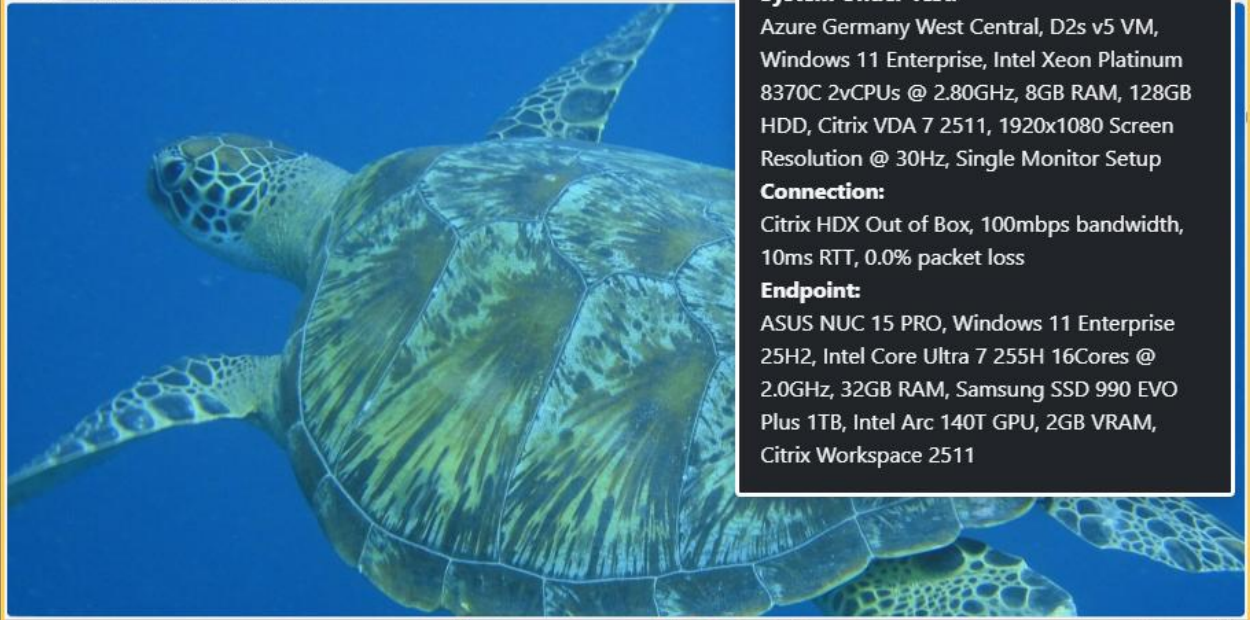


<https://docs.citrix.com/en-us/citrix-virtual-apps-desktops/2511/graphics/thinwire/super-resolution-upscaling.html>

Ken Burns Effect

File

C:\BUCScore\Data\Htm\PhotoGallery\demo\Fullscreen.html



System Under Test:
Azure Germany West Central, D2s v5 VM,
Windows 11 Enterprise, Intel Xeon Platinum
8370C 2vCPUs @ 2.80GHz, 8GB RAM, 128GB
HDD, Citrix VDA 7 2511, 1920x1080 Screen
Resolution @ 30Hz, Single Monitor Setup

Connection:
Citrix HDX Out of Box, 100mbps bandwidth,
10ms RTT, 0.0% packet loss

Endpoint:
ASUS NUC 15 PRO, Windows 11 Enterprise
25H2, Intel Core Ultra 7 255H 16Cores @
2.0GHz, 32GB RAM, Samsung SSD 990 EVO
Plus 1TB, Intel Arc 140T GPU, 2GB VRAM,
Citrix Workspace 2511

Search

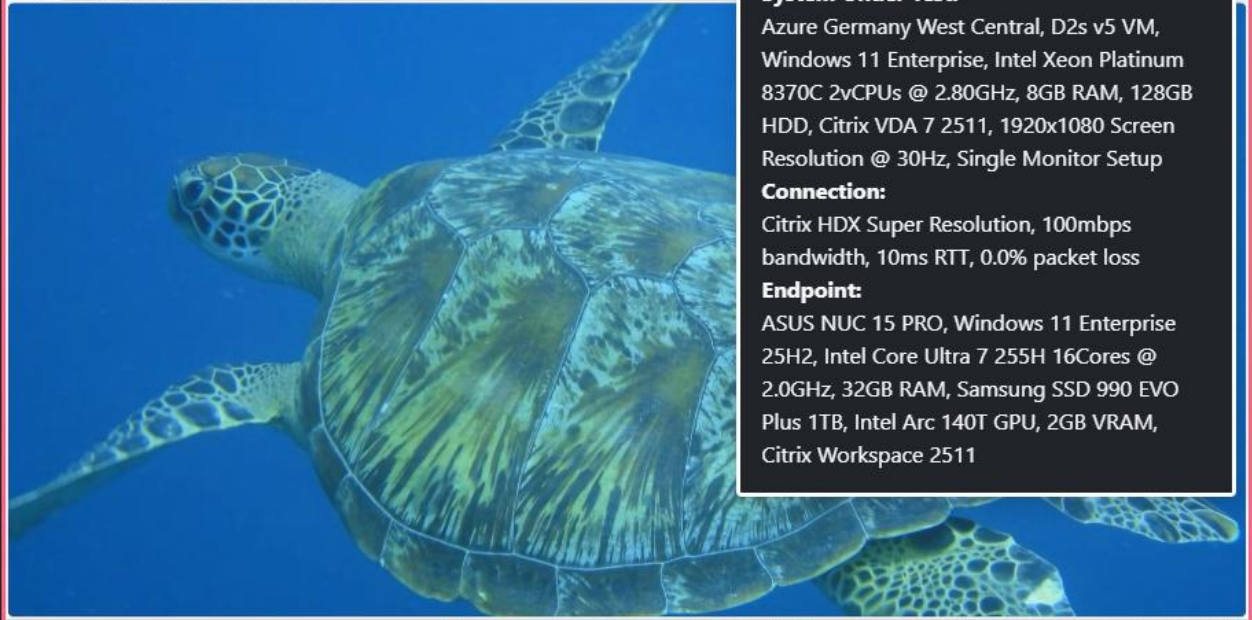
Taskbar icons

5:22 PM 3/7/2024

Ken Burns Effect

File

C:\BUCScore\Data\Htm\PhotoGallery\demo\Fullscreen.html



System Under Test:
Azure Germany West Central, D2s v5 VM,
Windows 11 Enterprise, Intel Xeon Platinum
8370C 2vCPUs @ 2.80GHz, 8GB RAM, 128GB
HDD, Citrix VDA 7 2511, 1920x1080 Screen
Resolution @ 30Hz, Single Monitor Setup

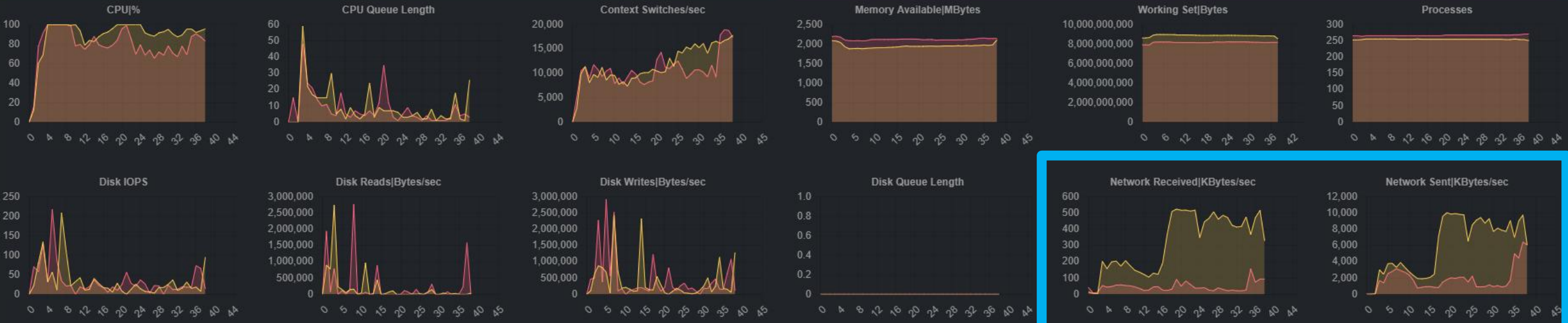
Connection:
Citrix HDX Super Resolution, 100mbps
bandwidth, 10ms RTT, 0.0% packet loss

Endpoint:
ASUS NUC 15 PRO, Windows 11 Enterprise
25H2, Intel Core Ultra 7 255H 16Cores @
2.0GHz, 32GB RAM, Samsung SSD 990 EVO
Plus 1TB, Intel Arc 140T GPU, 2GB VRAM,
Citrix Workspace 2511

Search

Taskbar icons

5:22 PM 3/7/2024



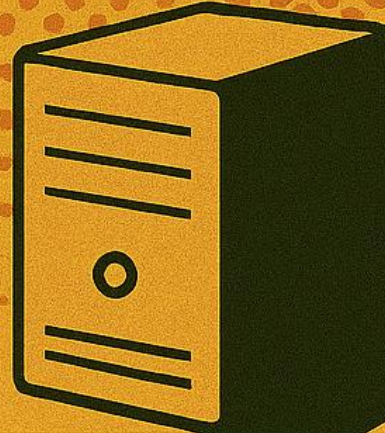
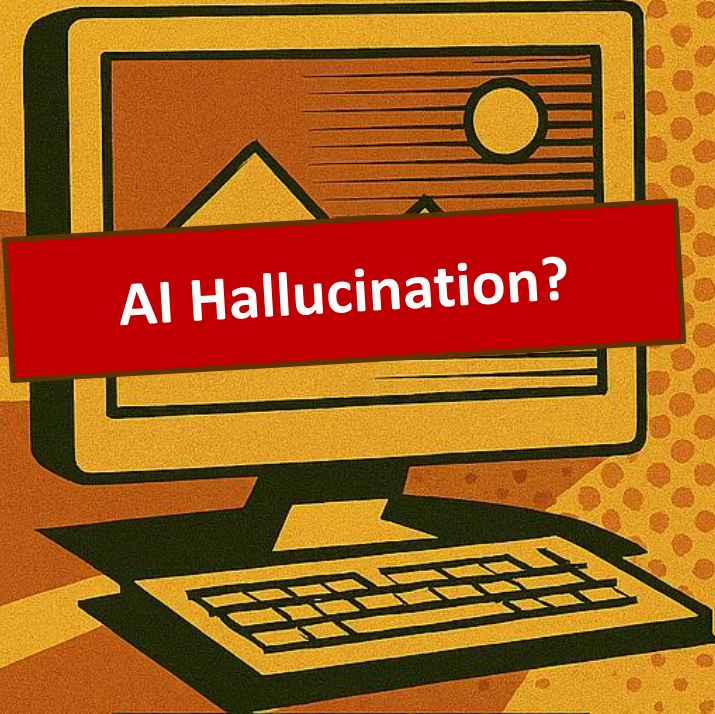
VDI SETUP

IMPROVED GRAPHICS QUALITY
REDUCED ARTIFACTS

AI Hallucination?

ENDPOINT

HOST SYSTEM



Schlussfolgerungen

Warum wahrgenommene Nutzererfahrung schlecht sein könnte

- VM-Spezifikation: CPU, RAM, GPU, Speicher
- Ungeeignetes Remoting-Protokoll und Netzwerkbeschränkungen: Bandbreite, Latenz, Paketverlust
- Endgerätespezifikation und Client-Software des Remoting-Protokolls



Schlussfolgerungen

Remoting-Protokolle – es gibt keinen Gewinner!

- Microsoft verbessert **SxS RDP** ständig (stille Updates)
- Geringer Unterschied zwischen **SxS RDP** und **Classic RDP** bei guten Netzwerkbedingungen
- Die Leistung von Omnissa **Blast** ist besser als erwartet
- Das **Standard-HDX** priorisiert die Bildwiederholrate gegenüber der Bildqualität

EUC-Infrastruktur – Endpunkte, Management und Automatisierung

- Remote-Client-Software für verschiedene Endpunkttypen wird immer wichtiger ("wie lokal")
- Managementkonsolen sind ein entscheidender Unterscheidungsfaktor (auch mit Zusatzprodukten von Herstellern wie Nerdio oder LoginVSI)

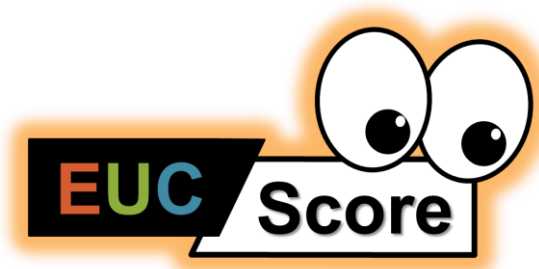
Die Zukunft

- Remoting-Protokolle nutzen Client-Ressourcen (GPUs, NPUs)

Aufruf zum Handeln

Wenn Sie mehr über EUC Score erfahren
möchten, senden Sie mir eine E-Mail

info@eucscore.com



<https://eucscore.com>

HINWEIS: Das EUC Score-Toolset ist
kostenlos für Community-Benchmarking-Tests,
wenn die Ergebnisse der Öffentlichkeit frei
zugänglich gemacht werden



EUC Score Freeware

<https://eucscore.com/freeware/>

Last update: 14 September 2026

EUC Score Base Installation Package v26.09 - includes Primary Base Simloads, 2 Personas, 10 Score Simloads, new versions of Simload Runner and Data Miner, and some supplementary tools

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VIELEN DANK

Fragen? Lass uns sprechen!

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