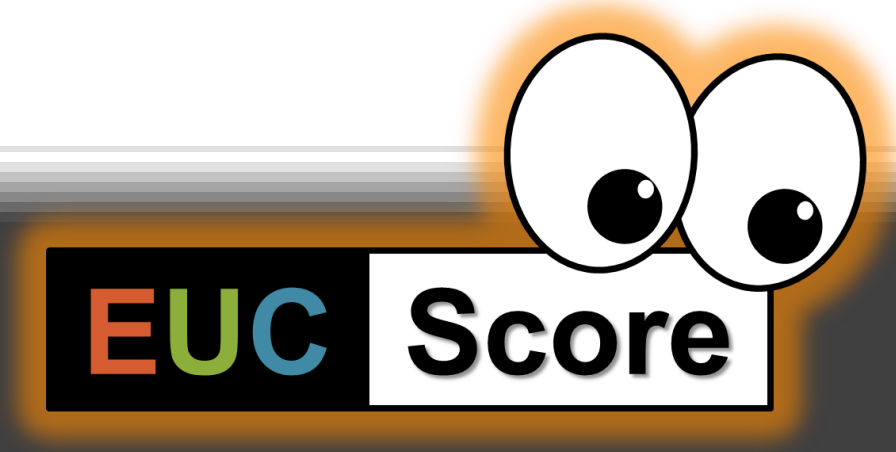


A practical guide on how to get started with user experience benchmarking

E2EVC 2024, Barcelona

Benny Tritsch | info@eucscore.com

Benny Tritsch

Dr. Tritsch IT Consulting

EUC Score

GO-EUC

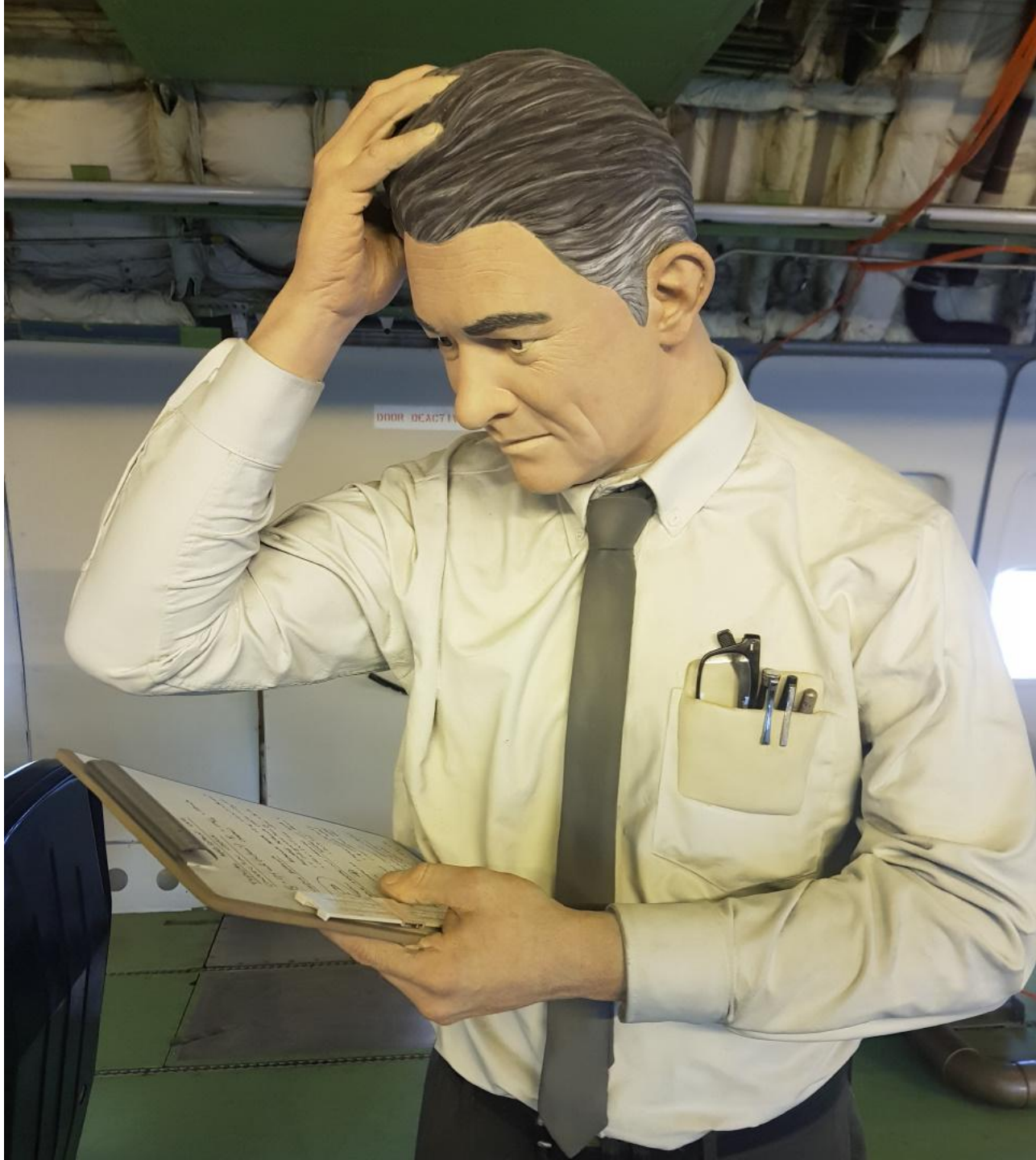
TeamRGE
Remoting Graphics Experts

DE EUC FORUM

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

info@drtritsch.com
info@eucscore.com

E2EVC Virtualization Conference
www.e2evc.com



Agenda

- Intro into Digital Employee Experience (DEX)
- Recording Screen Videos
- Collecting Telemetry Data
- Visualizing Data Using HTML5


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

Play

1:29

1x


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
Julian von Schleinitz/ Felix Loch 2018
-30
0
30
-60
60
-90
90
-120
120
Roll Angle

And now let’s talk about Windows

Gaming platform

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

Science of DEX – Human Timings

Nervous System

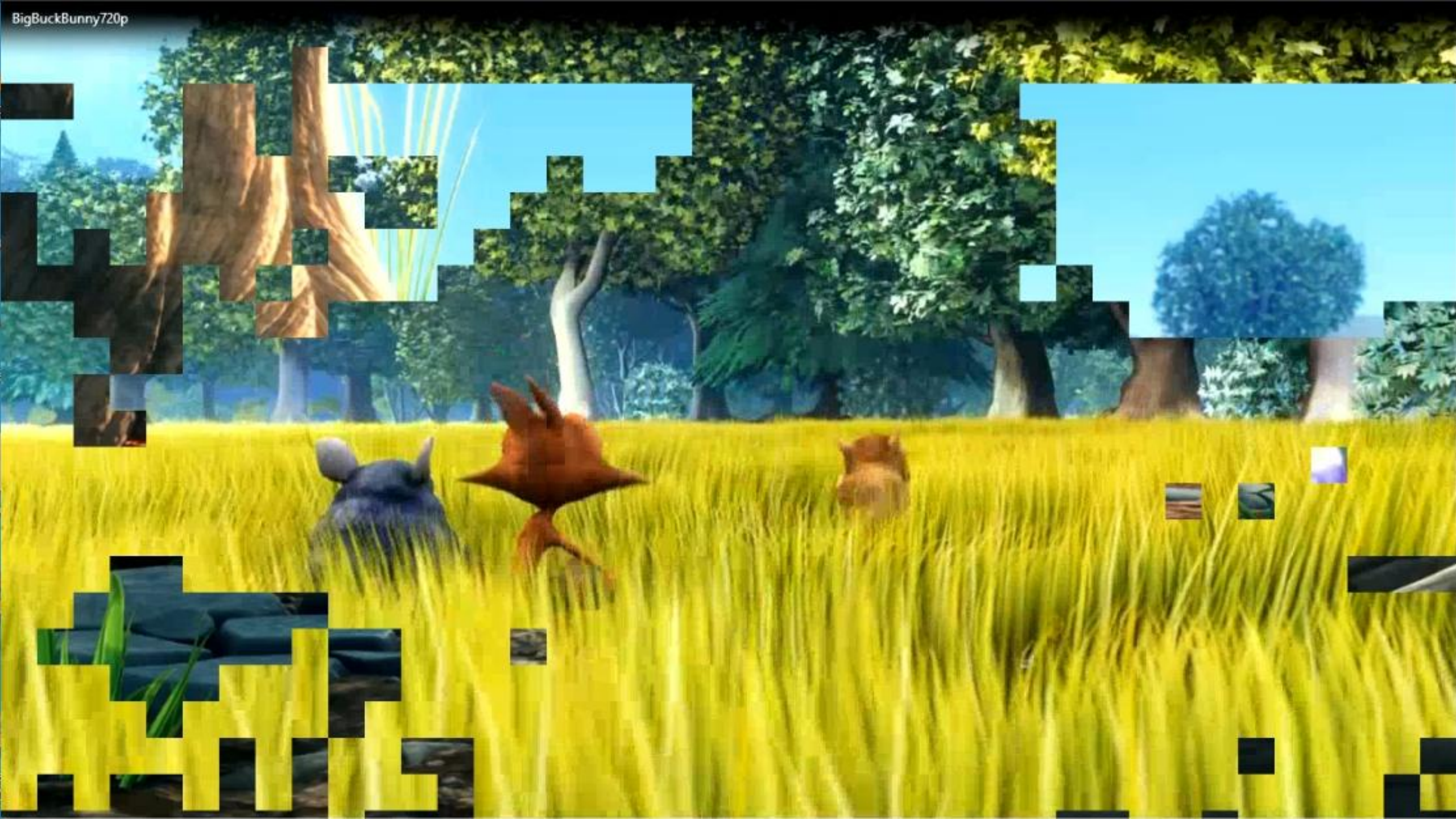
- Speed of nerve impulse is 120 meters per second
- Human response time is 150-300ms (varies with age)
- Equals to 15,000 – 30,000 km of fiber cables

Visual System

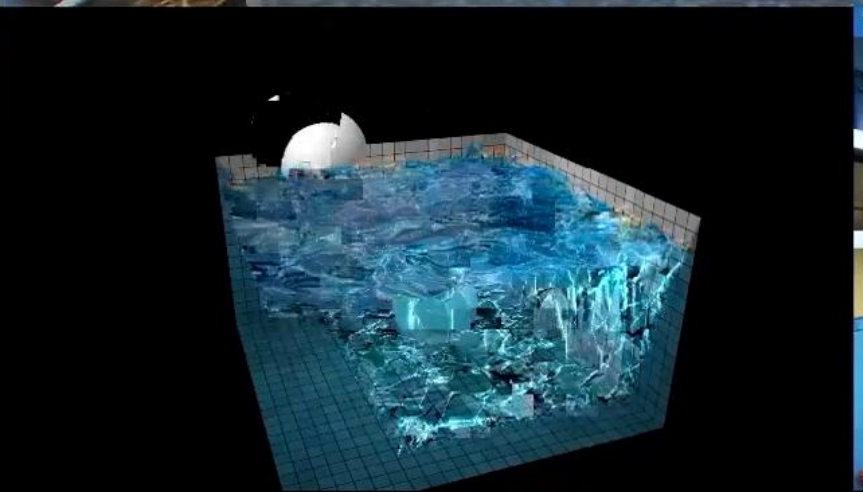
- 24 to 30 frames per second are required for video or motion
- Most desktop monitors' refresh rate is 60 Hz (=16ms)
- Eye blink: 100-150ms
- The brain can process visual data from a single image in 13ms
- Flicker up to 500 Hz

Auditory System

- Range of human hearing is 20 to 20,000 Hz (varies with age)
- Decibel (dB) measures the force of the sound wave (0-120dB, log.)
- Minimal time interval between two sounds is 3-30ms
- Interaural: 10-20µs


BigBuckBunny720p


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




Microsoft Edge
DO 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)

EUC
“Admin Experience”
Hard Metrics

DEX
“User Experience”
Soft Metrics

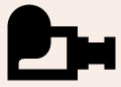
From a User's Perspective: Quality Criteria

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.

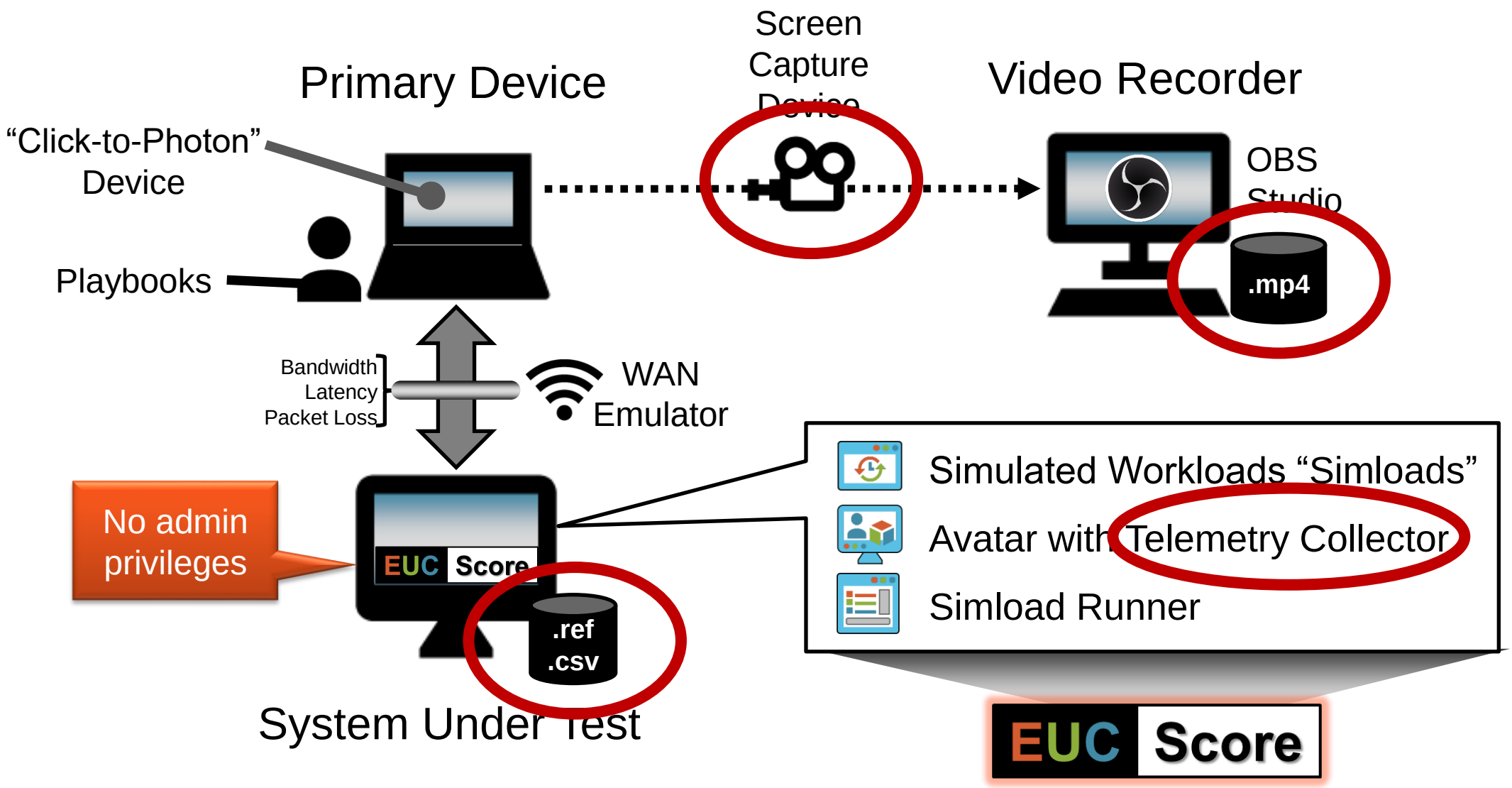
Soft Metrics – Screen Artifacts / Anomalies

- 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

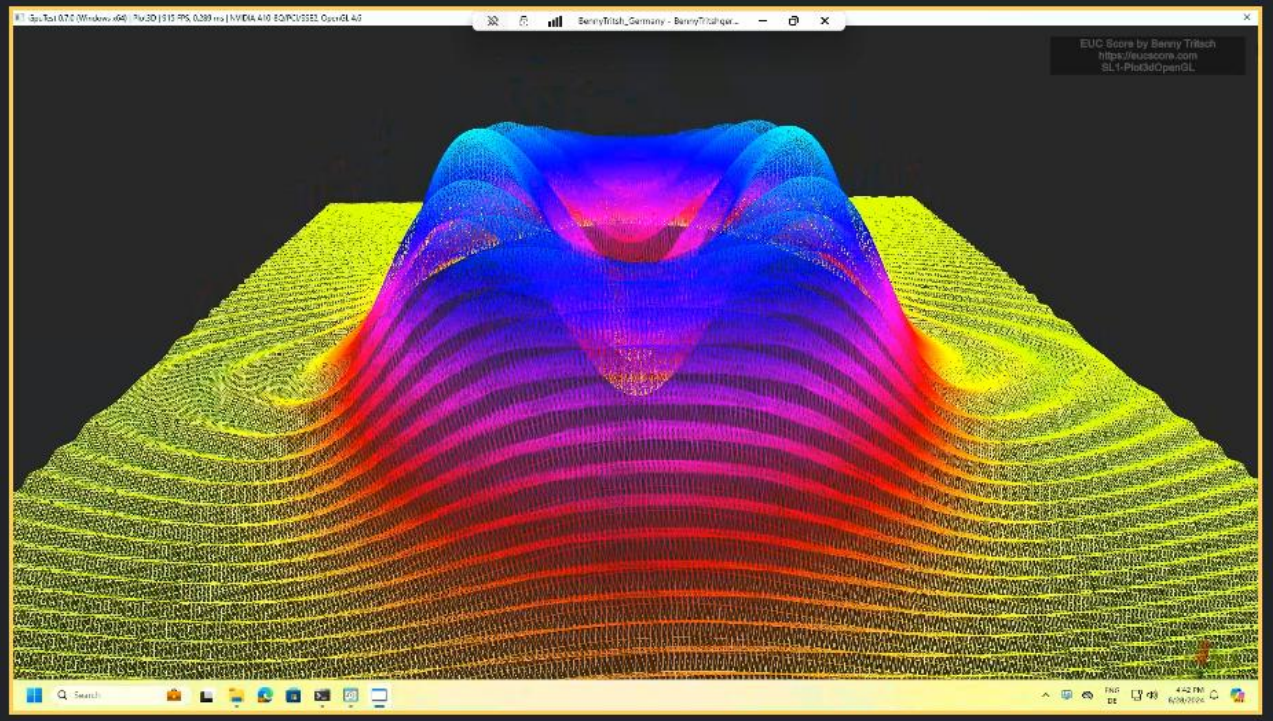
People have different roles at work

	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

Experience Analysis with EUC Score

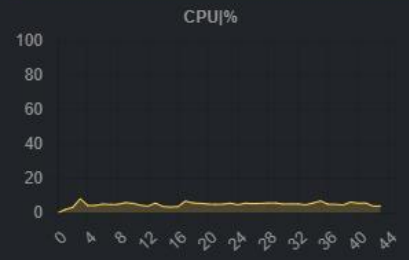


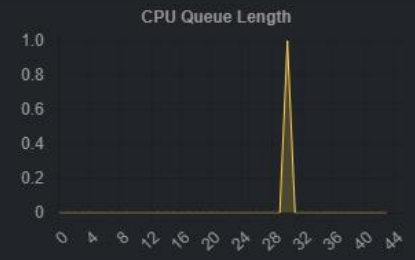
SL1-Plot3dOpenGL on Azure Windows 365 Enterprise GPU Standard | SxS RDP UDP (10ms RTT)

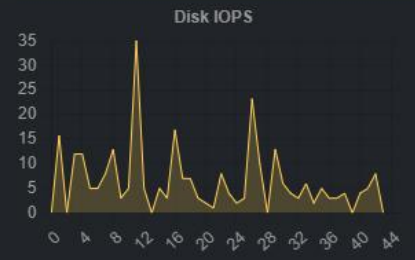


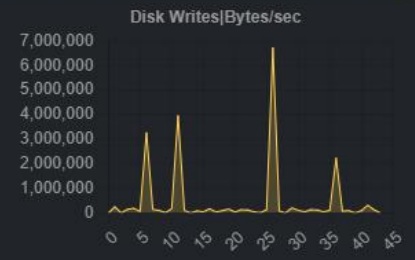
SL1-Plot3dOpenGL on Azure Windows 365 Enterprise GPU Standard | SxS RDP UDP (10ms RTT)

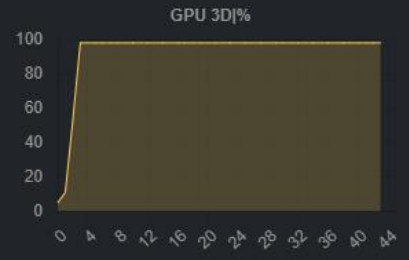
```
00:00:00.000  Date: 2024/08/28 | Time: 16:42:14.717 | AppName: GpuTest.exe
00:00:00.000  Simload: SL1-Plot3dOpenGL | Computername: CPC-Benny-Y7UNR | Username: BennyTritshgermany
00:00:00.000  Number of Monitors: 1 | Default Monitor: 1 (0 | 0 | 1920 | 1080)
00:00:00.000  Pre-Simload countdown screen 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
```

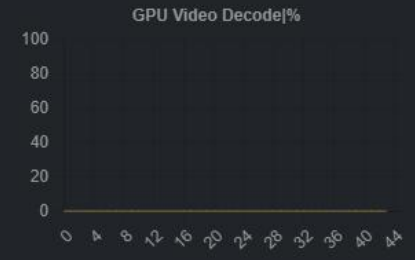


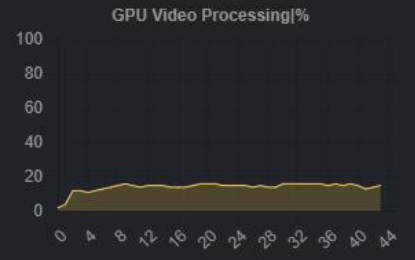


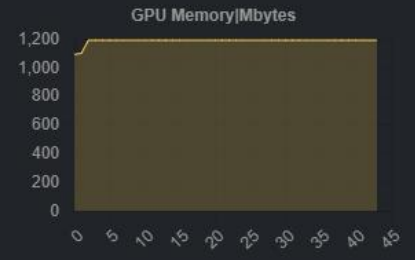


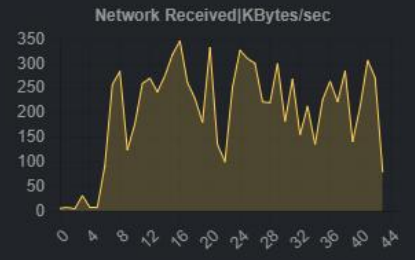


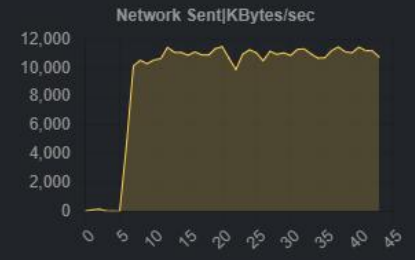








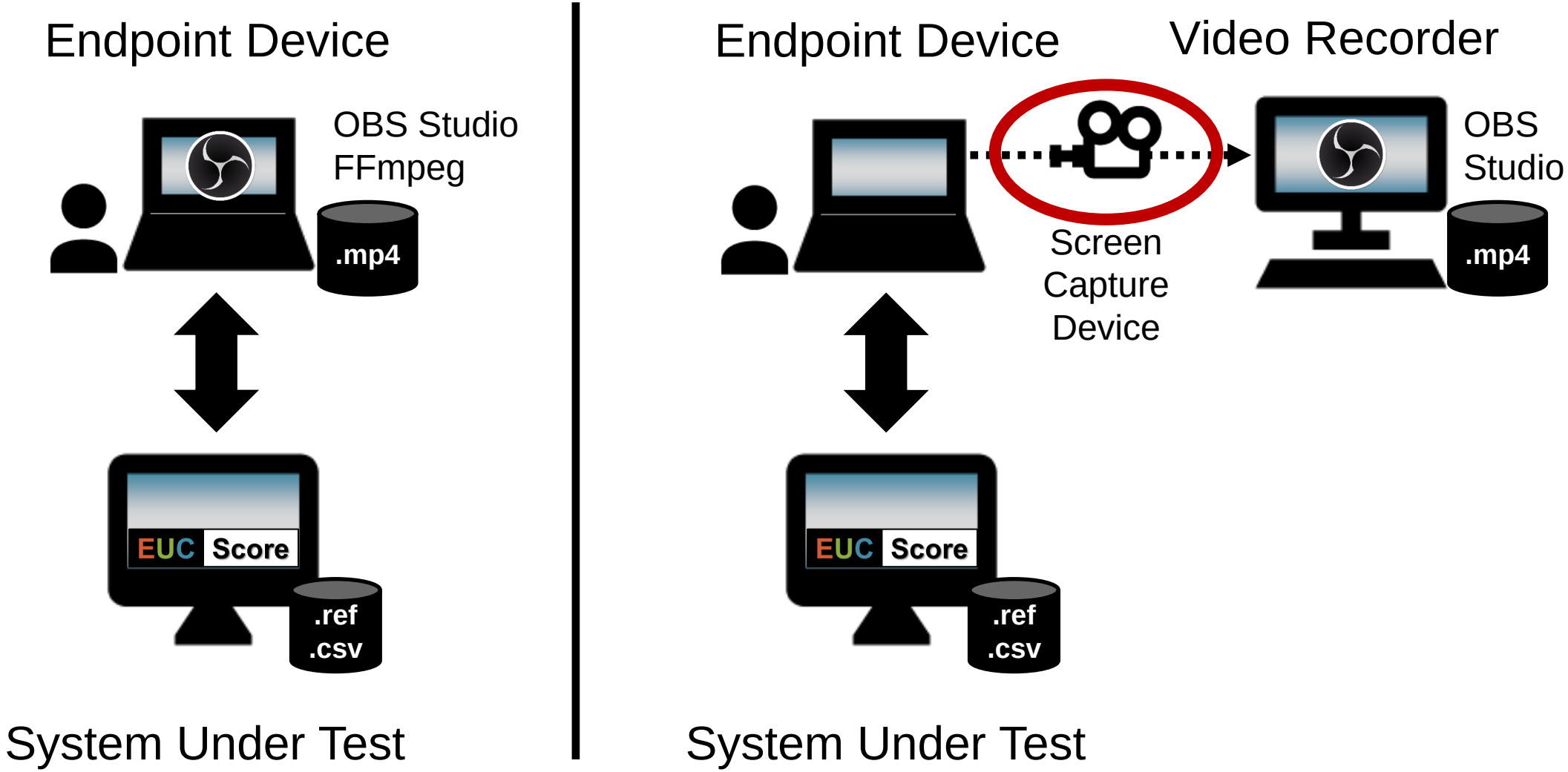




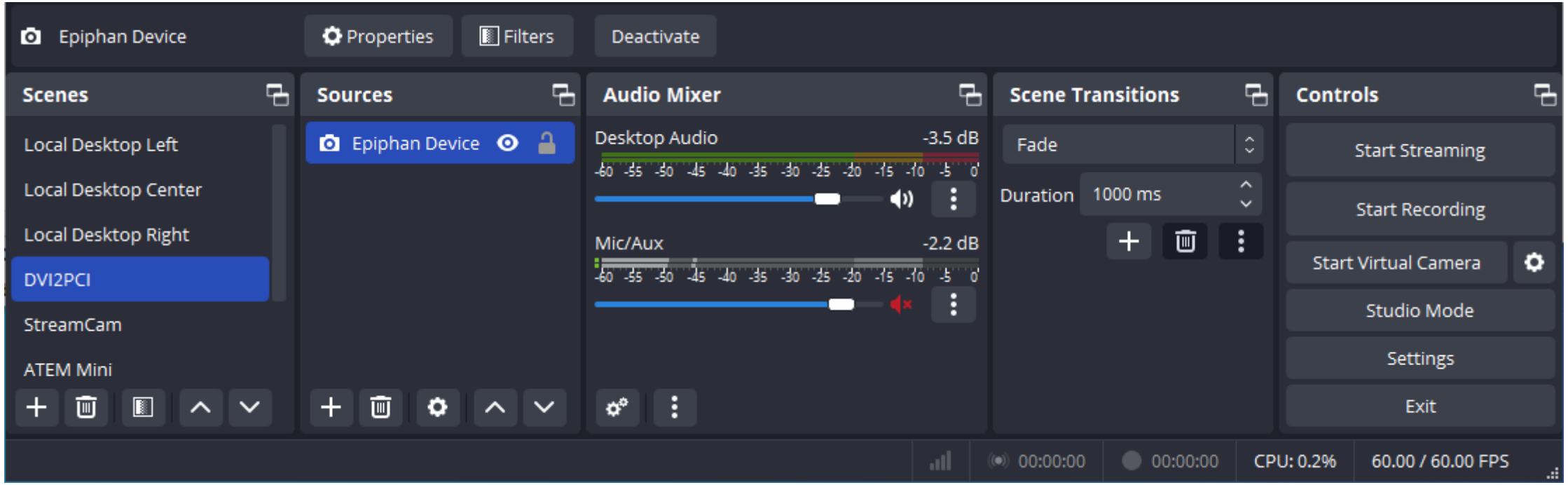
00:00:43 00:00:45 Help Report

Recording Screen Videos

Screen Video Recording Options

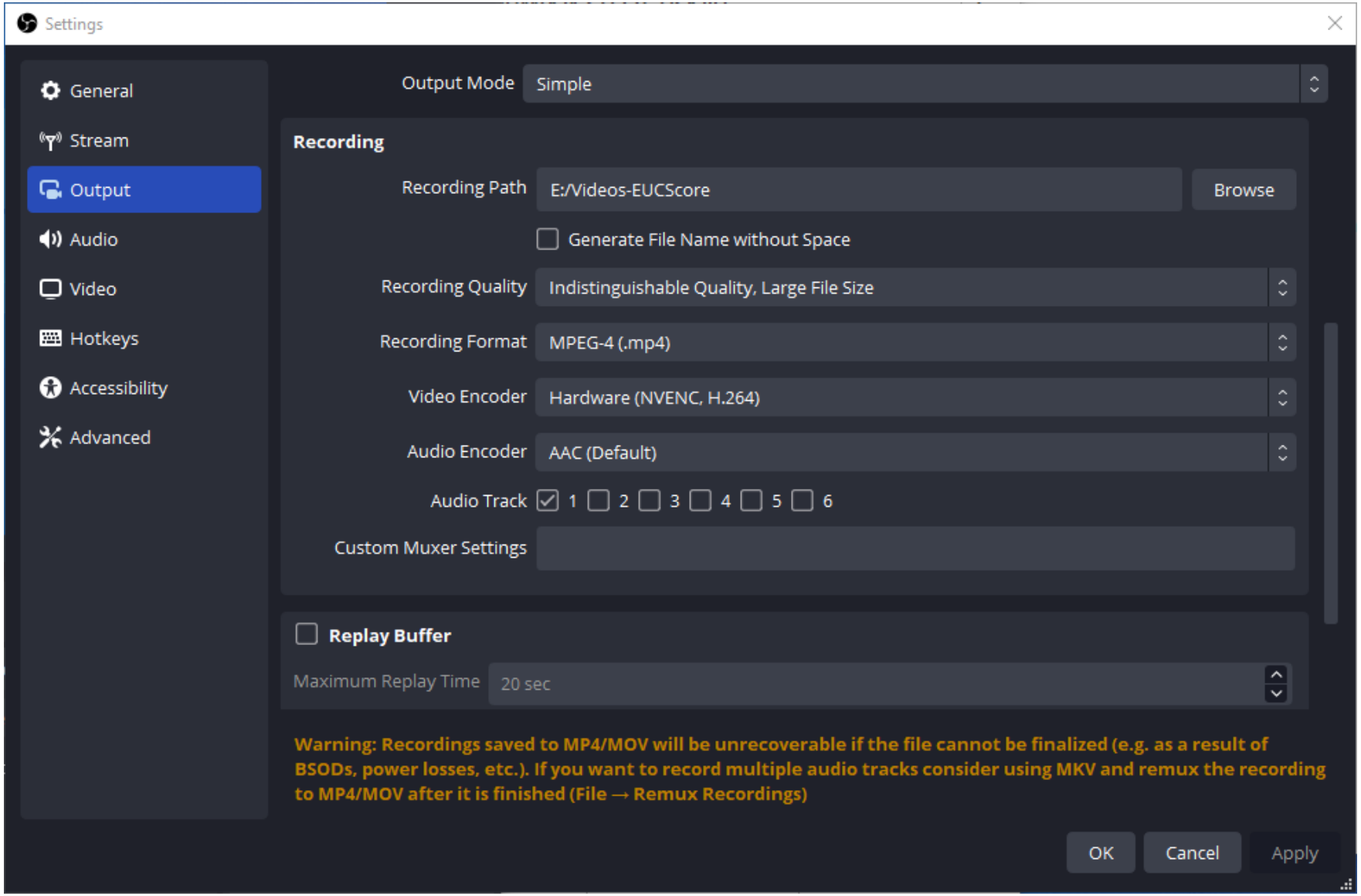


OBS Studio

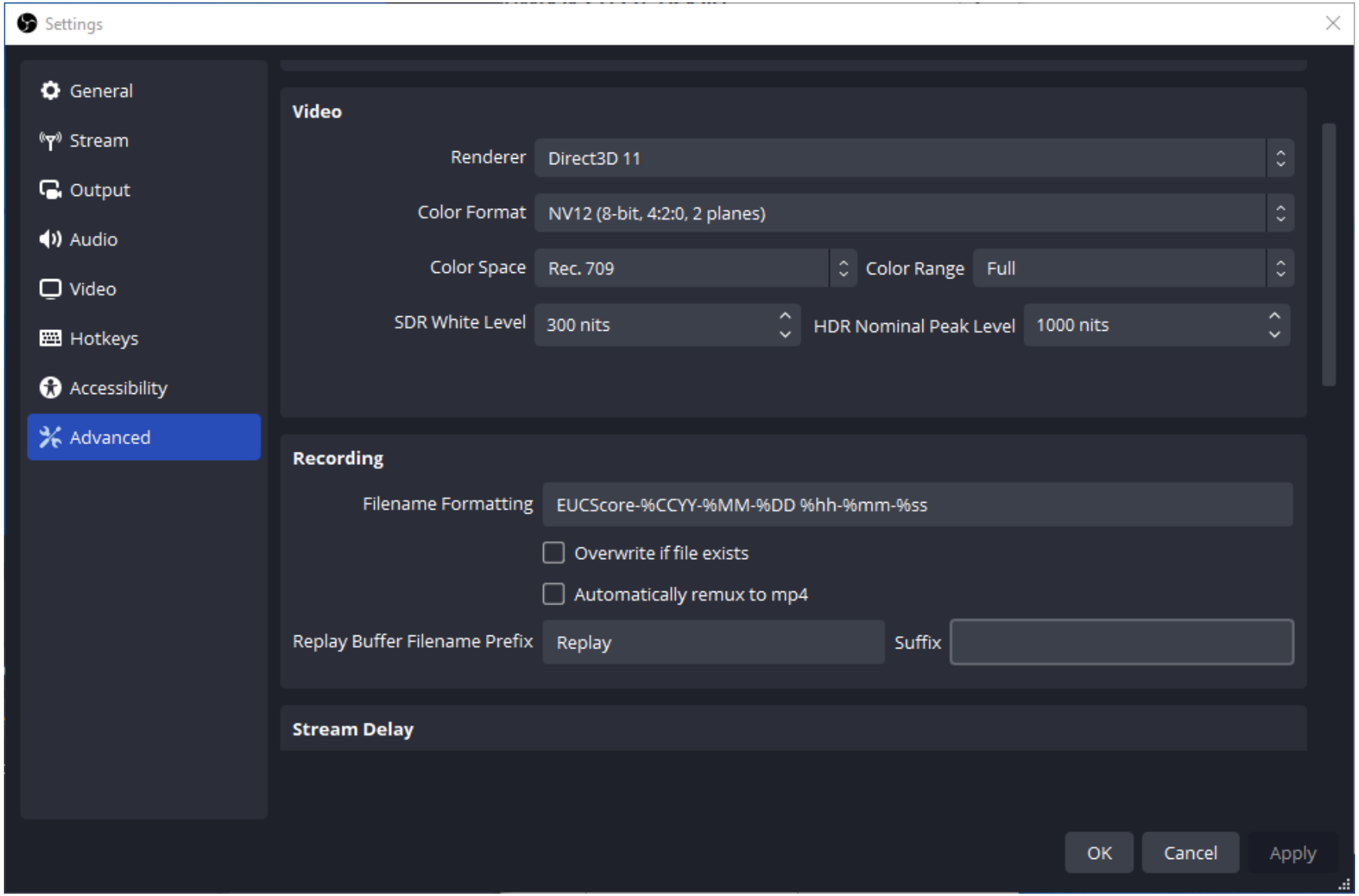


https://obsproject.com/

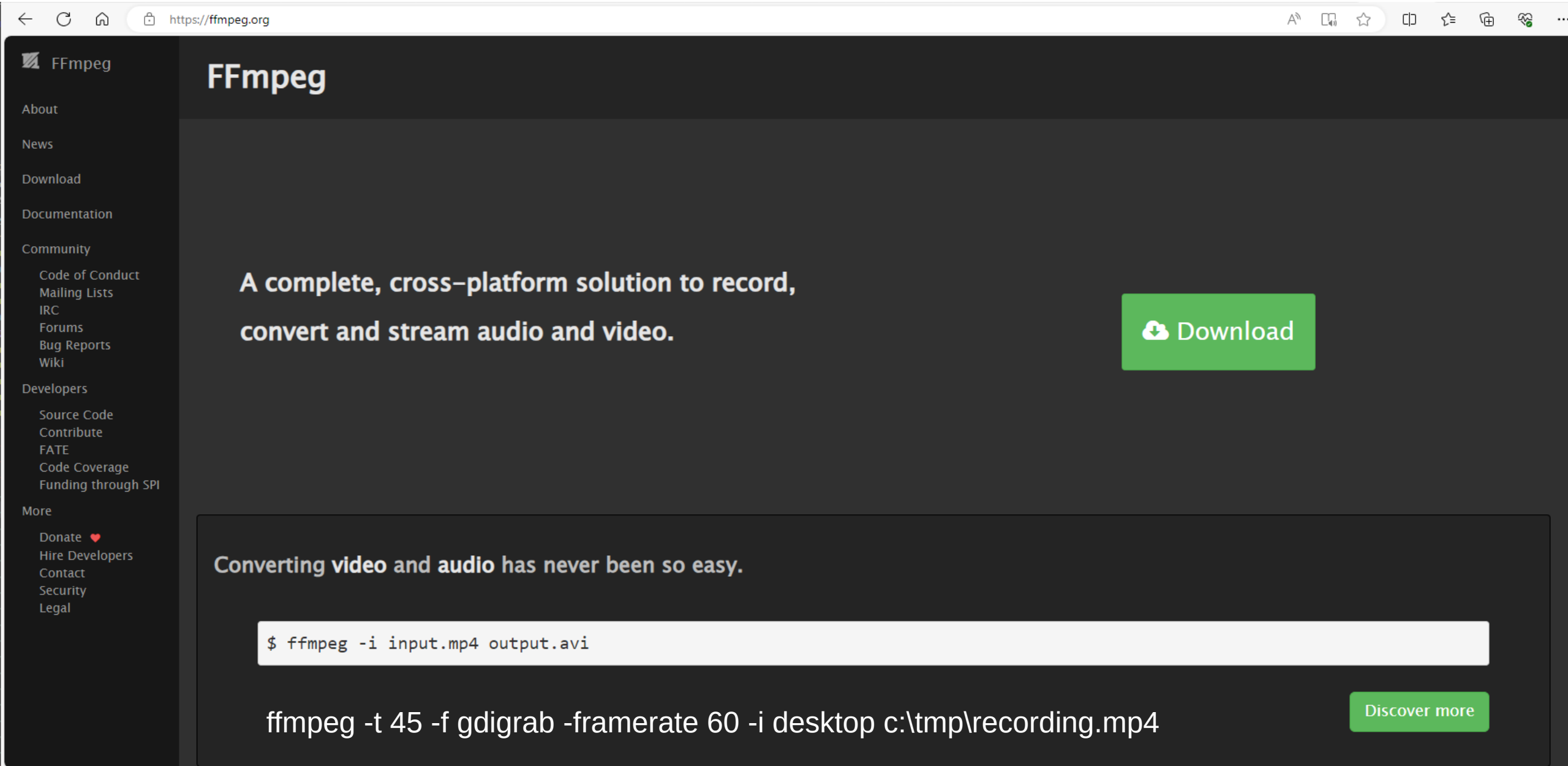
OBS Studio


Settings
General
Stream
Output
Audio
Video
Hotkeys
Accessibility
Advanced
Output Mode
Simple
Recording
Recording Path
E:/Videos-EUCScore
Browse
Generate File Name without Space
Recording Quality
Indistinguishable Quality, Large File Size
Recording Format
MPEG-4 (.mp4)
Video Encoder
Hardware (NVENC, H.264)
Audio Encoder
AAC (Default)
Audio Track
1
2
3
4
5
6
Custom Muxer Settings
Replay Buffer
Maximum Replay Time
20 sec
Warning: Recordings saved to MP4/MOV will be unrecoverable if the file cannot be finalized (e.g. as a result of BSODs, power losses, etc.). If you want to record multiple audio tracks consider using MKV and remux the recording to MP4/MOV after it is finished (File → Remux Recordings)
OK
Cancel
Apply

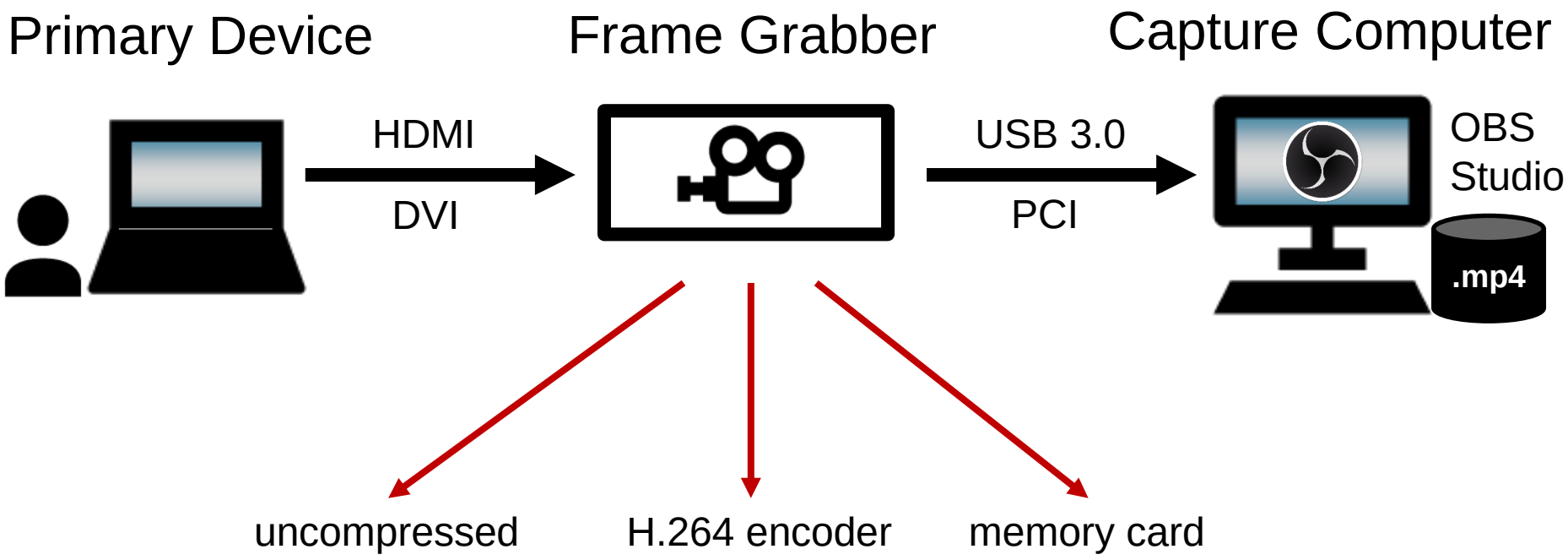
OBS Studio


Settings
General
Stream
Output
Audio
Video
Hotkeys
Accessibility
Advanced
Video
Renderer
Direct3D 11
Color Format
NV12 (8-bit, 4:2:0, 2 planes)
Color Space
Rec. 709
Color Range
Full
SDR White Level
300 nits
HDR Nominal Peak Level
1000 nits
Recording
Filename Formatting
EUCScore-%CCYY-%MM-%DD %hh-%mm-%ss
Overwrite if file exists
Automatically remux to mp4
Replay Buffer Filename Prefix
Replay
Suffix
Stream Delay
OK
Cancel
Apply

Alternative Video Recorder: FFmpeg.org



Screen Recording: How it works…



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

High-End Screen Capture

- **Epiphan AV.io 4K** (€580) or AV.io HD (€450) http://www.epiphan.com
- Epiphan DVI2PCIe (€1,400) or DVI2USB 3.0 (€800)
- **Elgato 4K X** (€250) https://www.elgato.com/us/en/p/game-capture-4k-x
- Elgato Game Capture 4K60 S+ (€400), including built-in HEVC/H.264 encoder
- Elgato Game Capture 4K60 Pro MK.2, 4K60FPS HDR Capture, PCIe Card
- Hauppauge HD PVR Pro 60 4K (€170), 1080p 60fps downscaler and built-in HEVC/H.264 encoder
- Hauppauge HD PVR 2 Gaming Edition Plus, Hardware H.264 Encoder
- Blackmagic Design Atem Mini (€350)
- Blackmagic Intensity Pro 4K PCIe Card (€200)
- Blackmagic Design DeckLink Quad HDMI Recorder 4 x 4K (€520)

Low-Cost Frame Grabbers

- Elgato Game Capture HD60 S or HD60 S+ (€140)
- AVerMedia Live Gamer Portable 2 Plus, 4K Pass-Through, 4K Full HD 1080p60 USB Game Capture, Stand-alone Mode using Memory Card (€130)
- TerraTec 130653 PVR Grabster Extreme HD Converter (€120)
- ClearClick HD Capture Box (€120)
- HDMI Video Capture Device USB 3.0 1080P 60 FPS Video & Audio Grabber
- MYPIN 1080P HD 60fps USB 3.0 Type C HDMI Game Video Capture Card
- MiraBox USB 3.0 HDMI Game Capture Karte 1080P 60fps Portable HD Video Recorder

https://eucscore.com/equipment.html

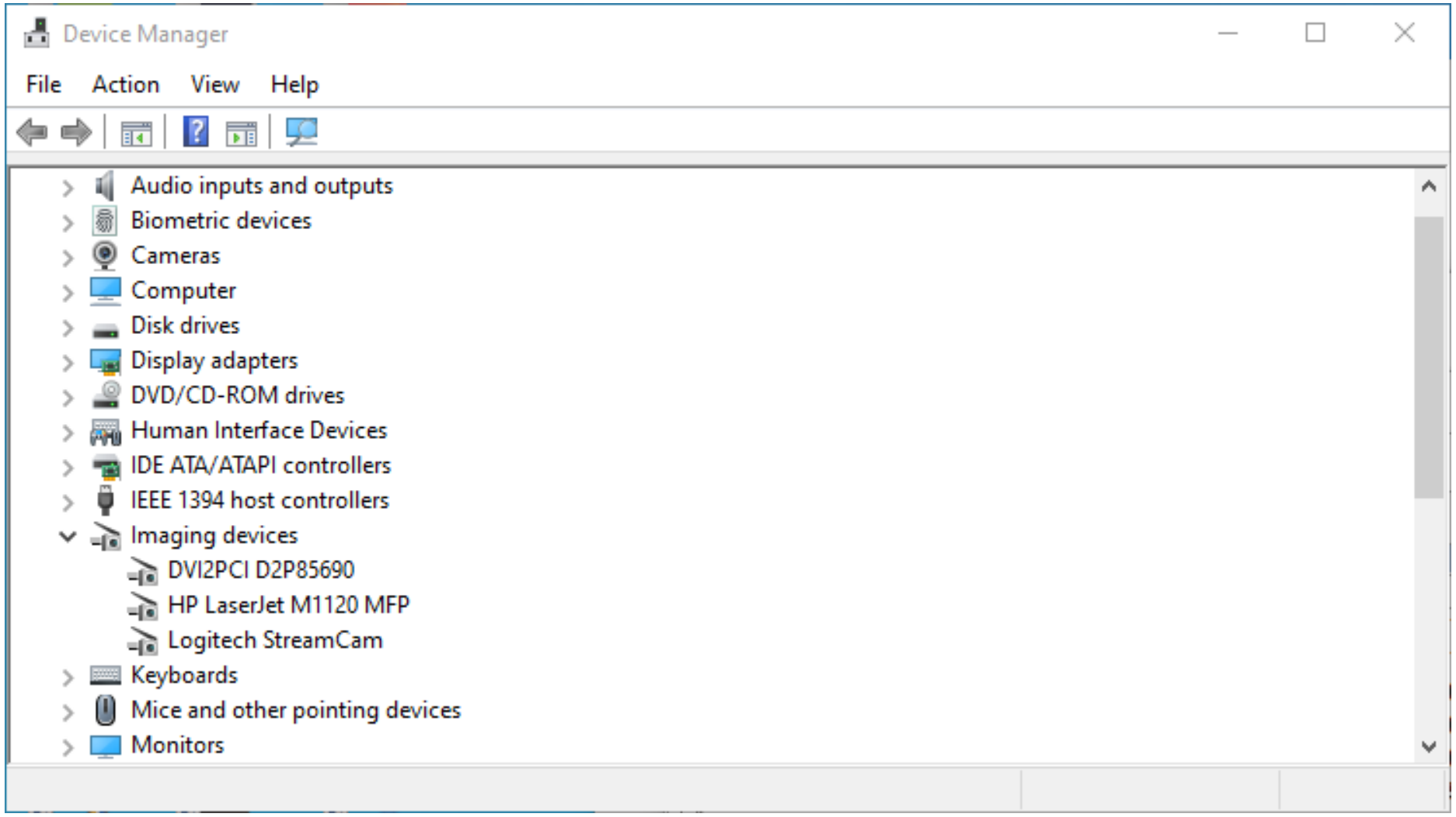
Elgato 4K X

Epiphan AV.io

Uncompressed video capture

Epiphan DVI2PCI Duo

Epiphan DVI2PCI

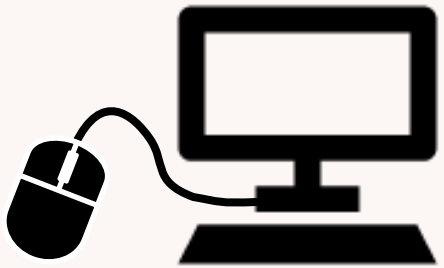


Collecting Telemetry Data

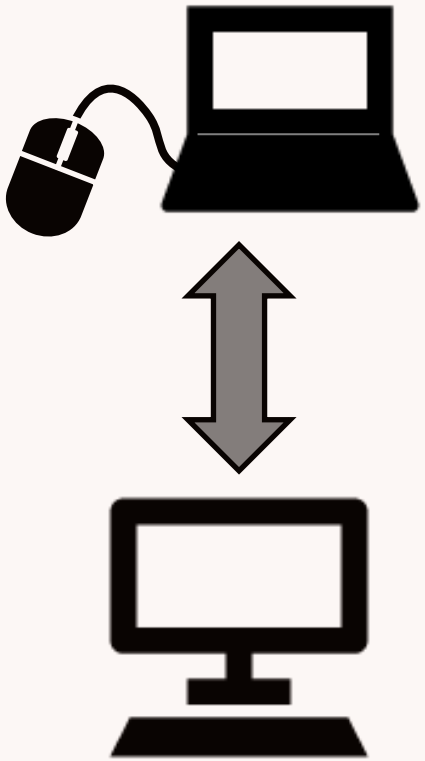
Why Performance Counters Matter

Less control over Windows-specific telemetry data

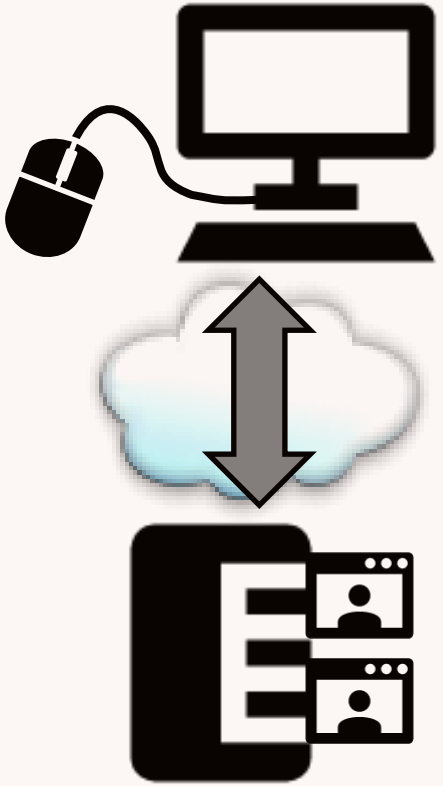
On-Prem Windows



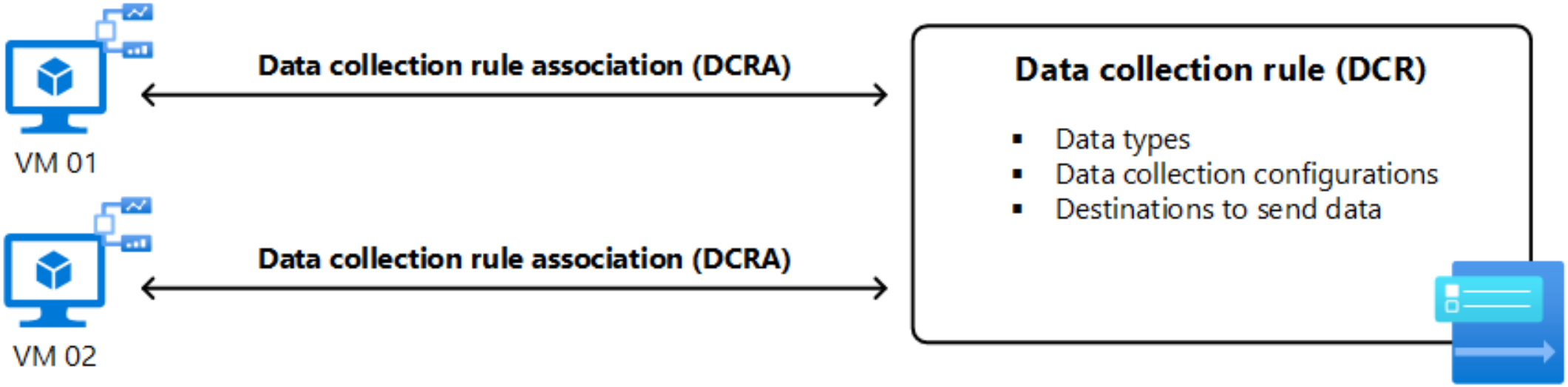
VDI / RDSH on LAN



AVD / Win365



Azure Monitor Agent



https://learn.microsoft.com/en-us/azure/azure-monitor/agents/azure-monitor-agent-overview

Azure monitoring was not designed for Windows telemetry data

Project Hydra | OneDrive Dev Cent... | Screenshot provided by Marcel Meurer | All Bookmarks

Microsoft Azure | Search resources, services, and docs (G+/) | Copilot | mm-admin@ITProClou... ITPROCLOUD.DE

Home > Data collection rules > microsoft-avdi-westeurope

Data collection rules
ITProCloud.de

Create | Manage view | ...

Filter for any field...

We are previewing a new Browse experience. Click to switch.

Name

- hydra-itpc-dev
- microsoft-avdi-westeurope

Page 1 of 1

microsoft-avdi-westeurope | Data sources
Data collection rule

Search

- Overview
- Activity log
- Access control (IAM)
- Tags
- Settings
  - Locks
- Configuration
  - Data sources
  - Resources
- Automation
  - Policies (Preview)
  - CLI / PS
  - Tasks (preview)
  - Export template
- Security
  - Identity
- Monitoring
  - Alerts
  - Metrics
  - Diagnostic settings
  - Logs
- Help
  - Support +

Add | Delete

Filter by name...

Data source
Performance Counters
Windows Event Logs

Add data source

Azure Monitor Agent
Azure Log Analytics
AVD Insights

*Data source | Destination

Select which data source type and the data to collect for your resource(s).

Data source type *: Performance Counters

Choose Basic to enable the collection of performance counters. Choose Custom if you want more control over which performance counters are collected.

None | Basic | Custom

Configure the performance counters to collect, and how often they should be sampled:

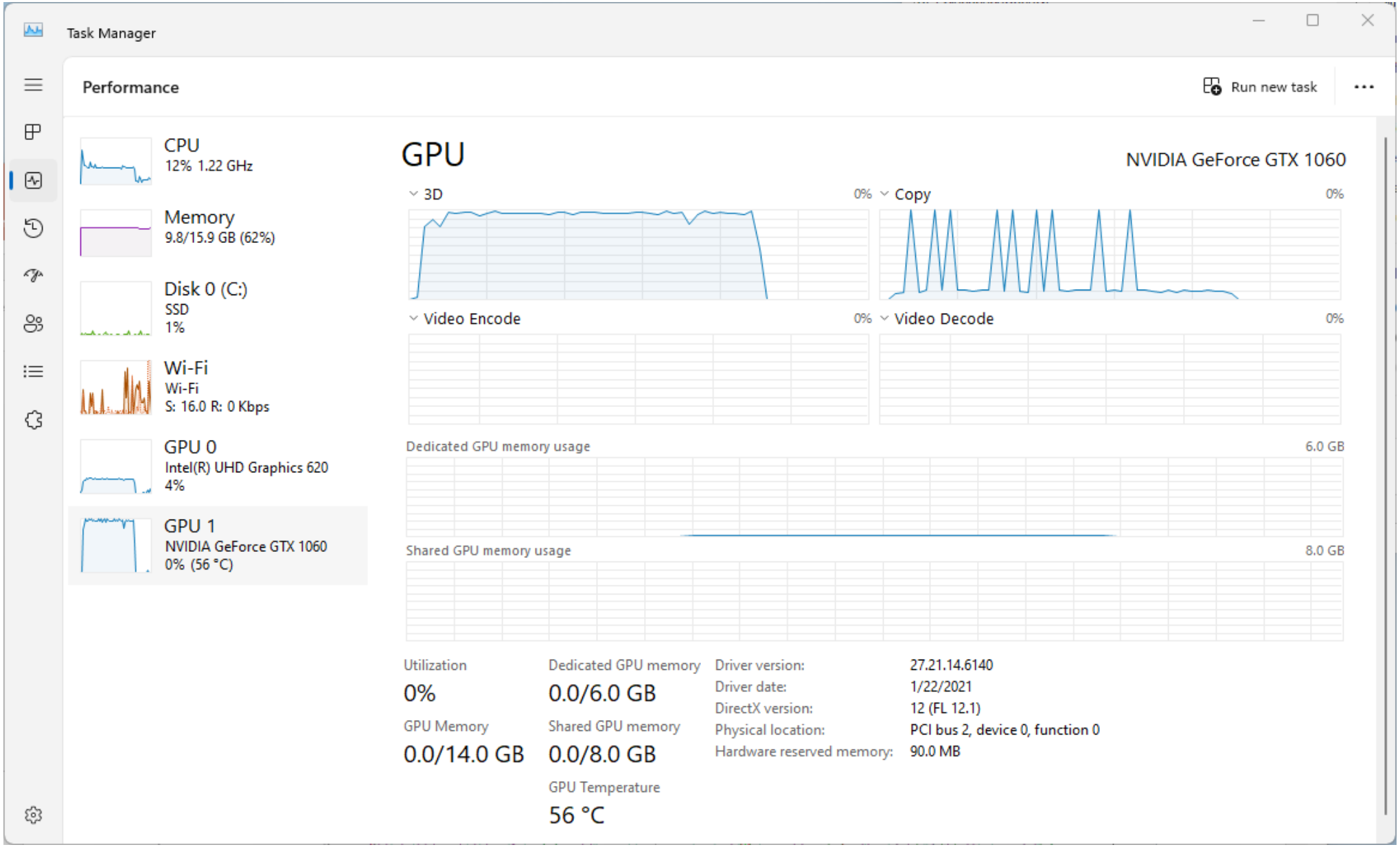
Add

Performance counter	Sample rate (seconds)
\Memory\% Committed Bytes In Use	30
\Memory\Available Bytes	60
\Memory\Committed Bytes	60
\Memory\Cache Bytes	60
\Memory\Pool Paged Bytes	60
\Memory\Pool Nonpaged Bytes	60
\Memory\Pages/sec	30
\Memory\Page Faults/sec	30
\Process(_Total)\Working Set	60
\Process(_Total)\Working Set - Private	60

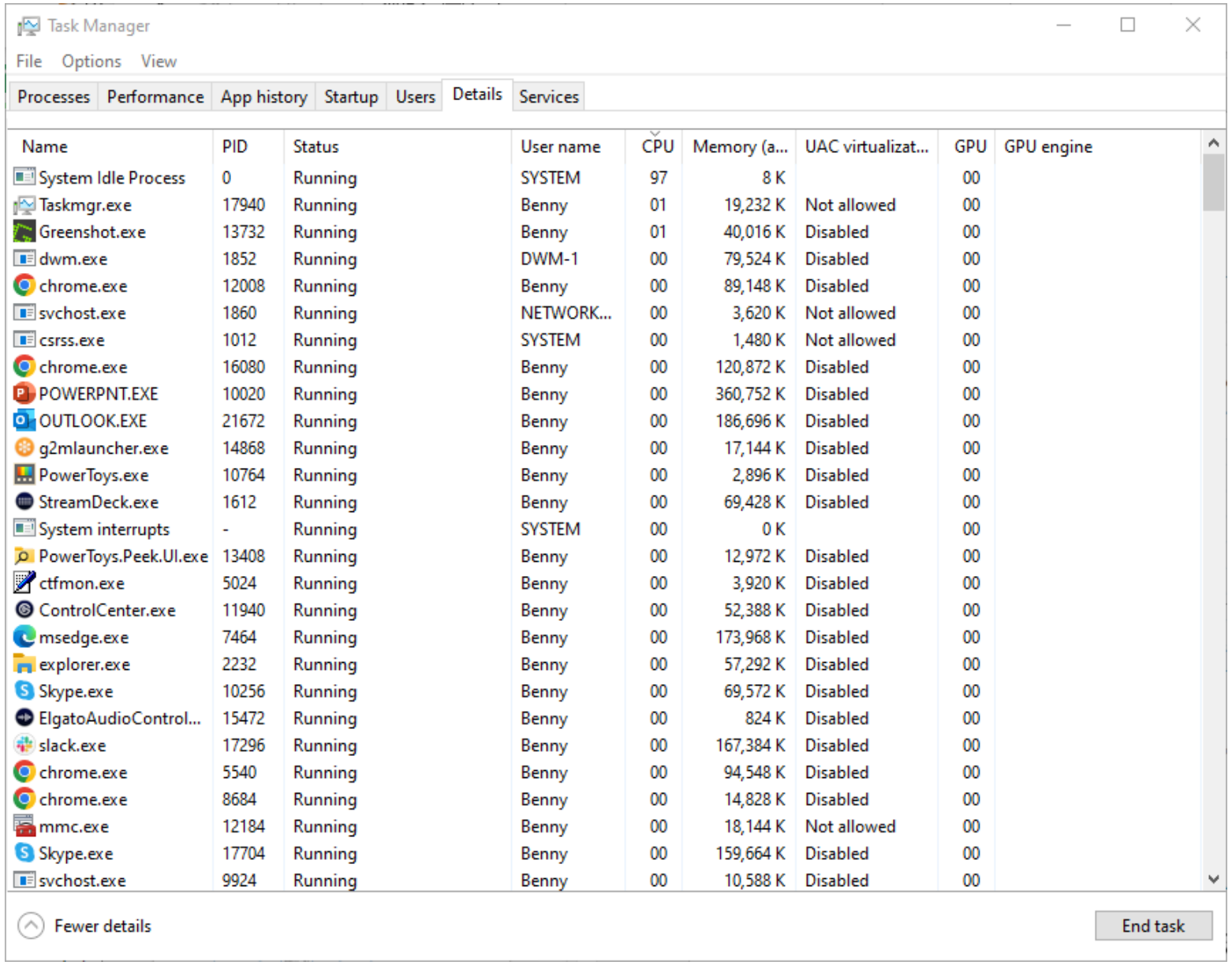
Showing 11 - 20 of 59 results. < 1 2 3 4 5 >

Save | Next : Destination > | Cancel

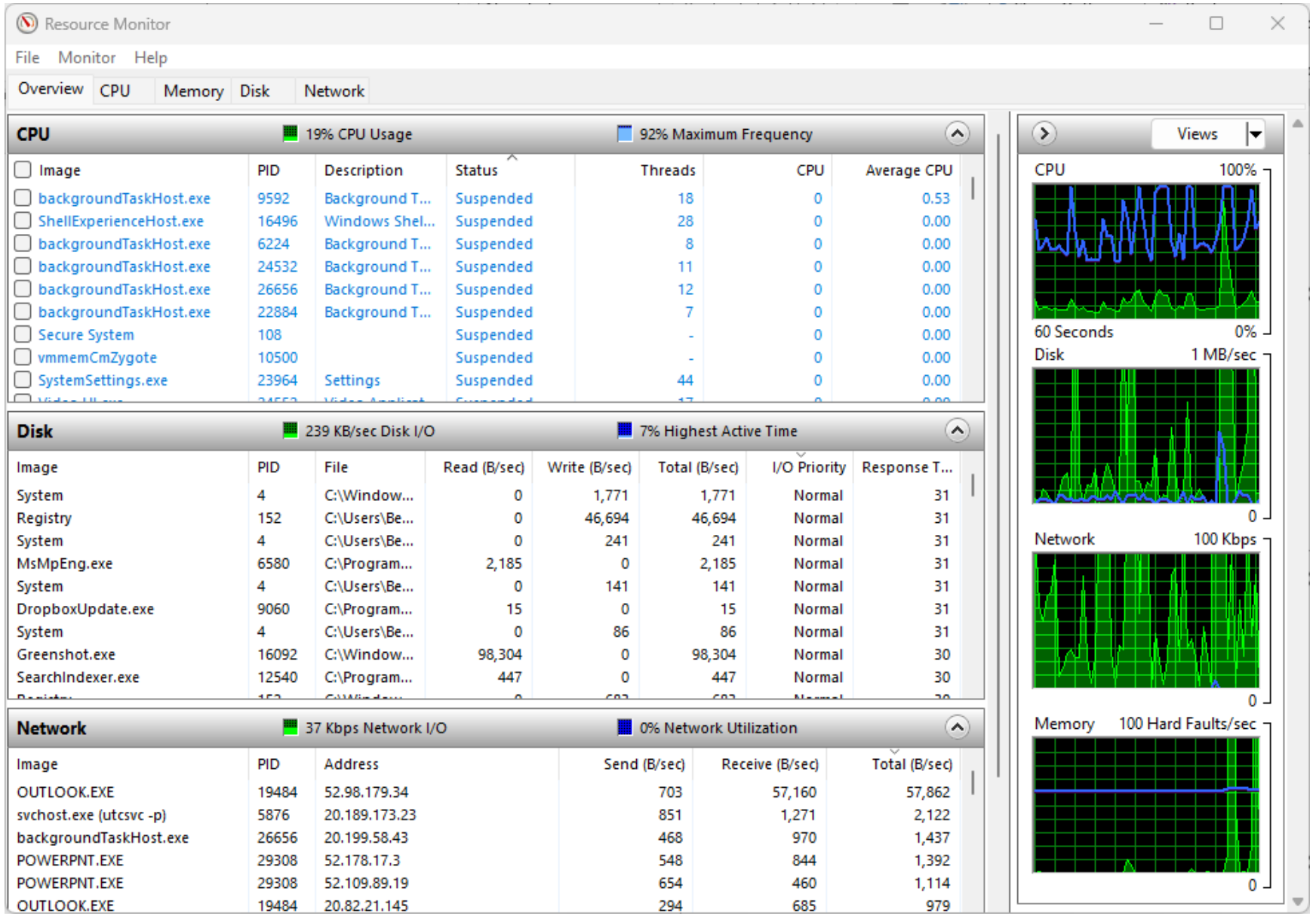
Task Manager – Performance Tab



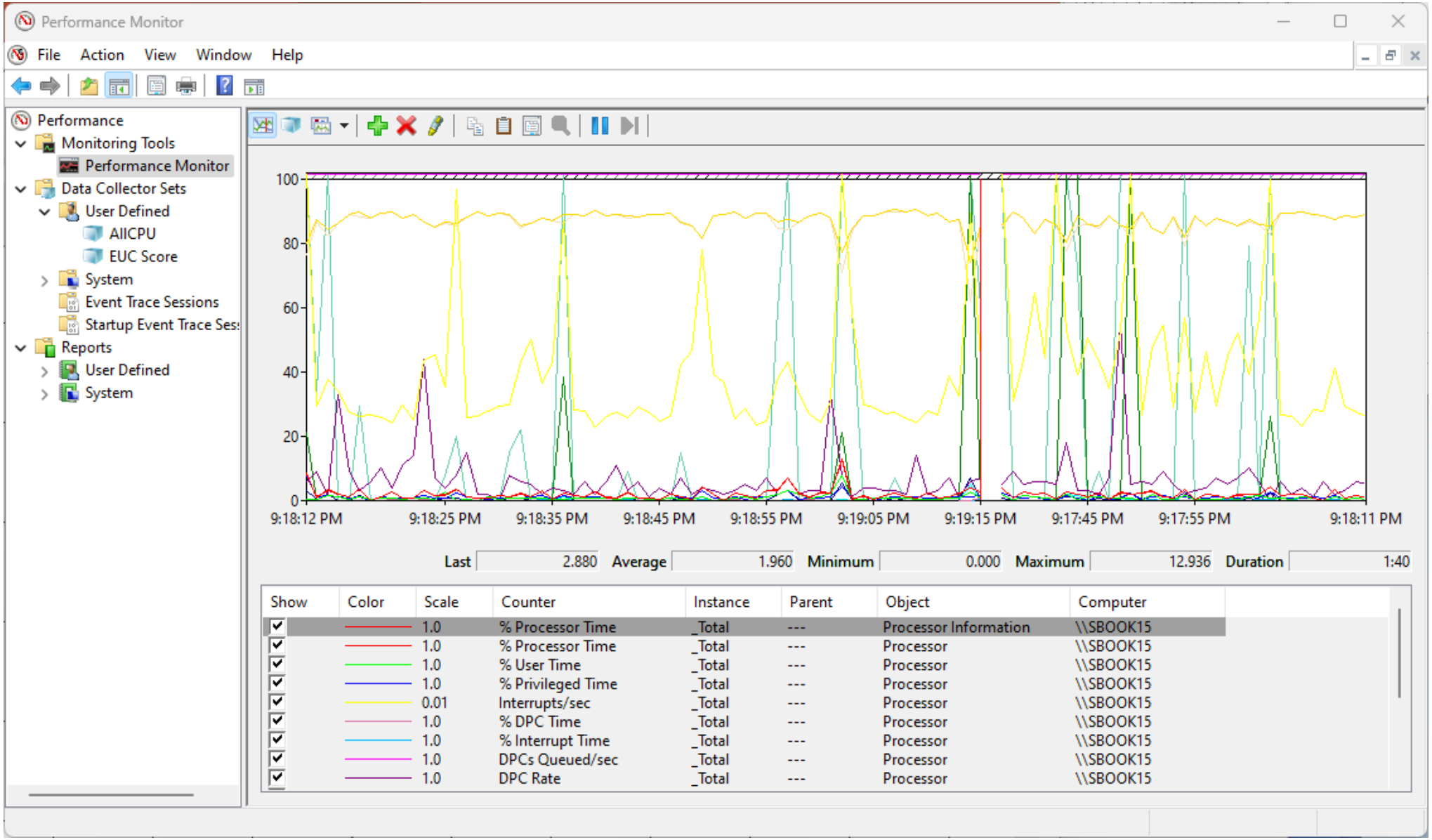
Task Manager – Detail Tab



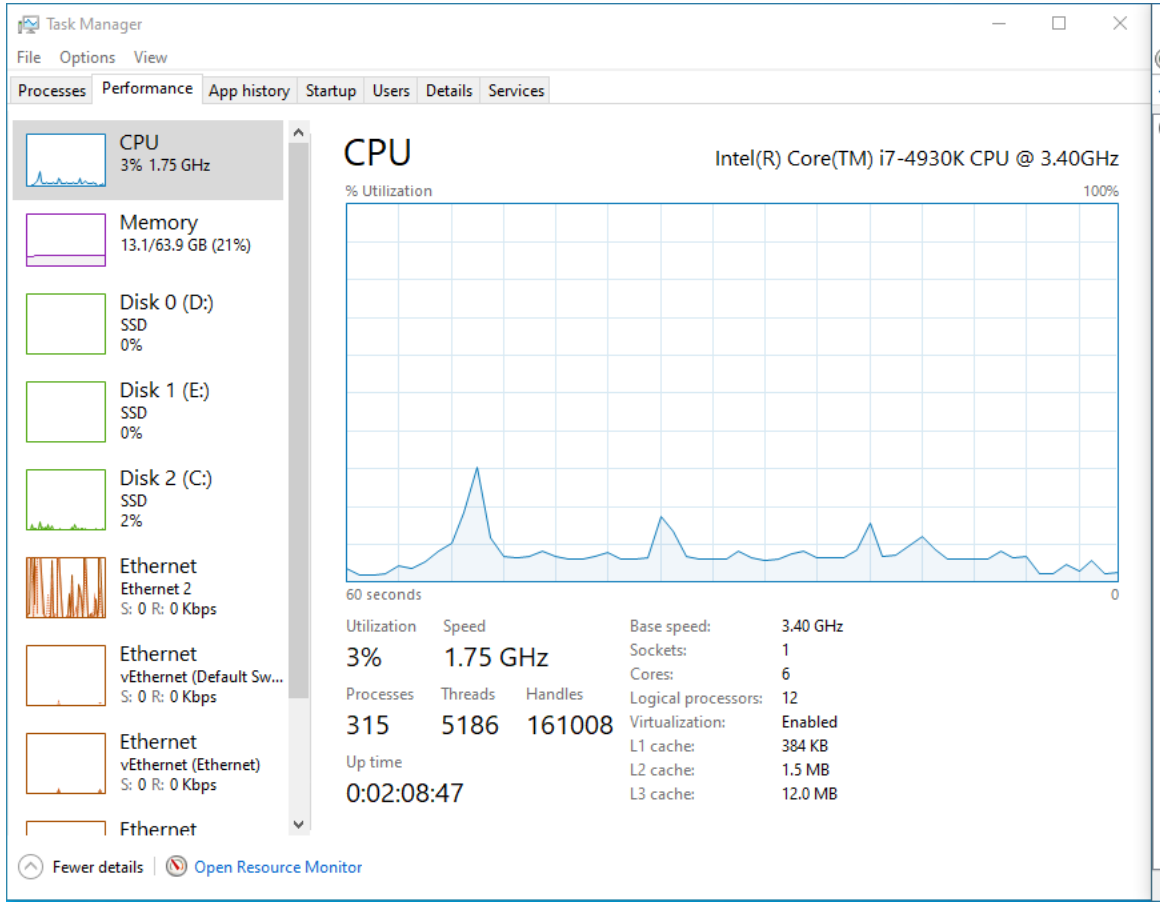
Resource Monitor

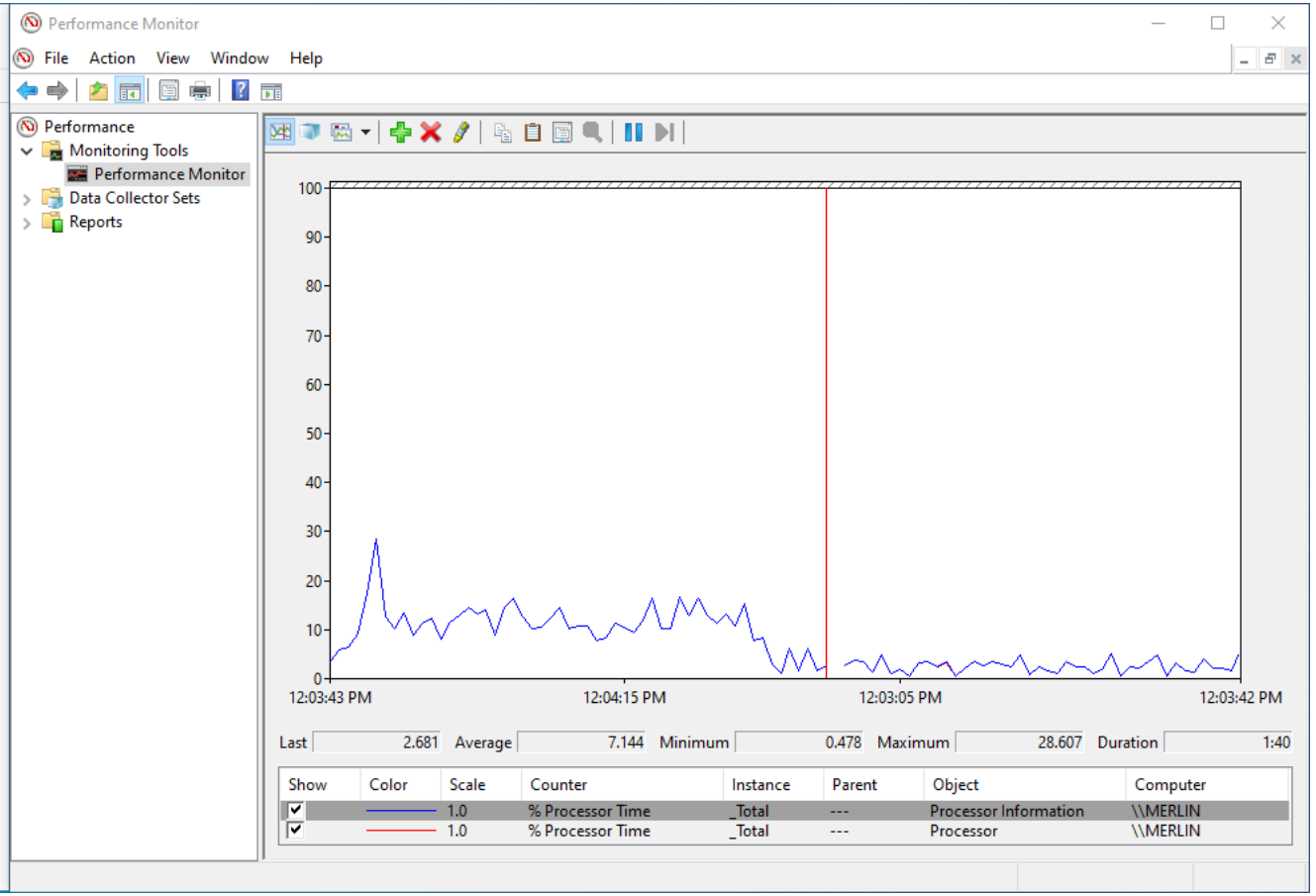


Performance Monitor



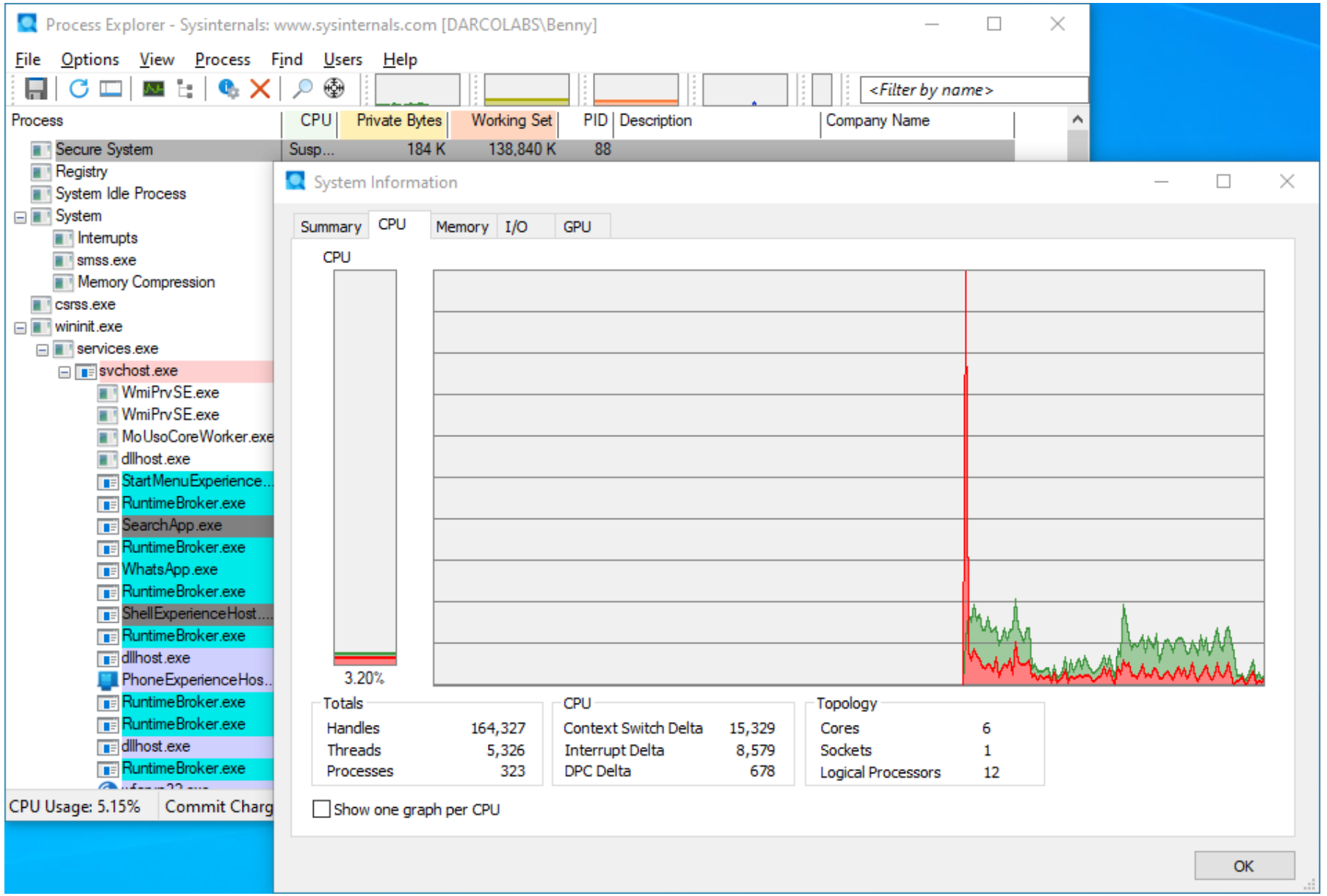
TaskMan versus PerfMon



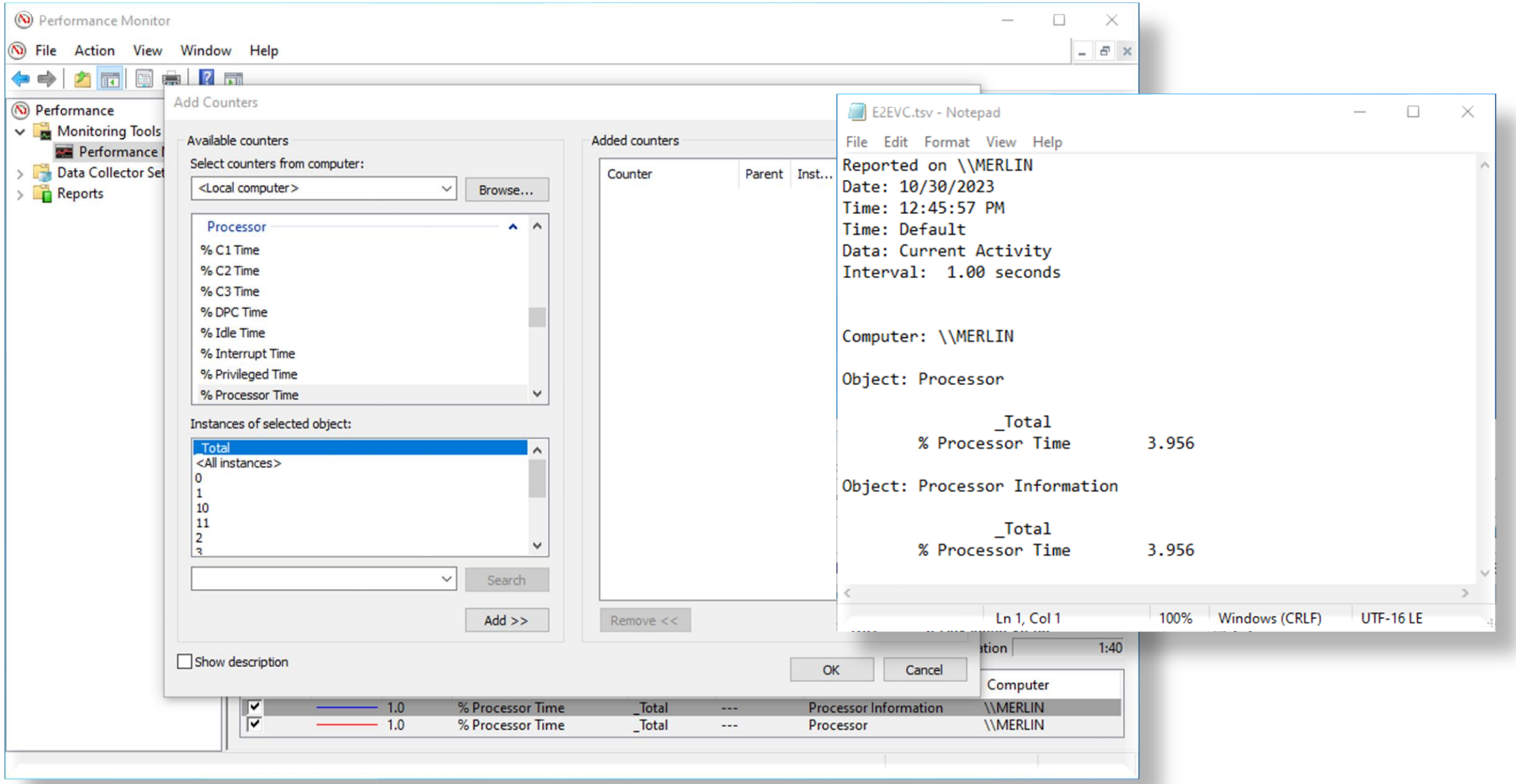


Windows 10 Task Manager '% CPU' skew – A Tale of Two Metrics by Jeff Stokes
https://illuminati.services/2021/03/17/windows-10-task-manager-cpu-inaccurate-a-tale-of-two-metrics/
Task Manager's CPU numbers are all but meaningless by Aaron Margosis
https://aaron-margosis.medium.com/task-managers-cpu-numbers-are-all-but-meaningless-2d165b421e43

Sysinternals Process Explorer

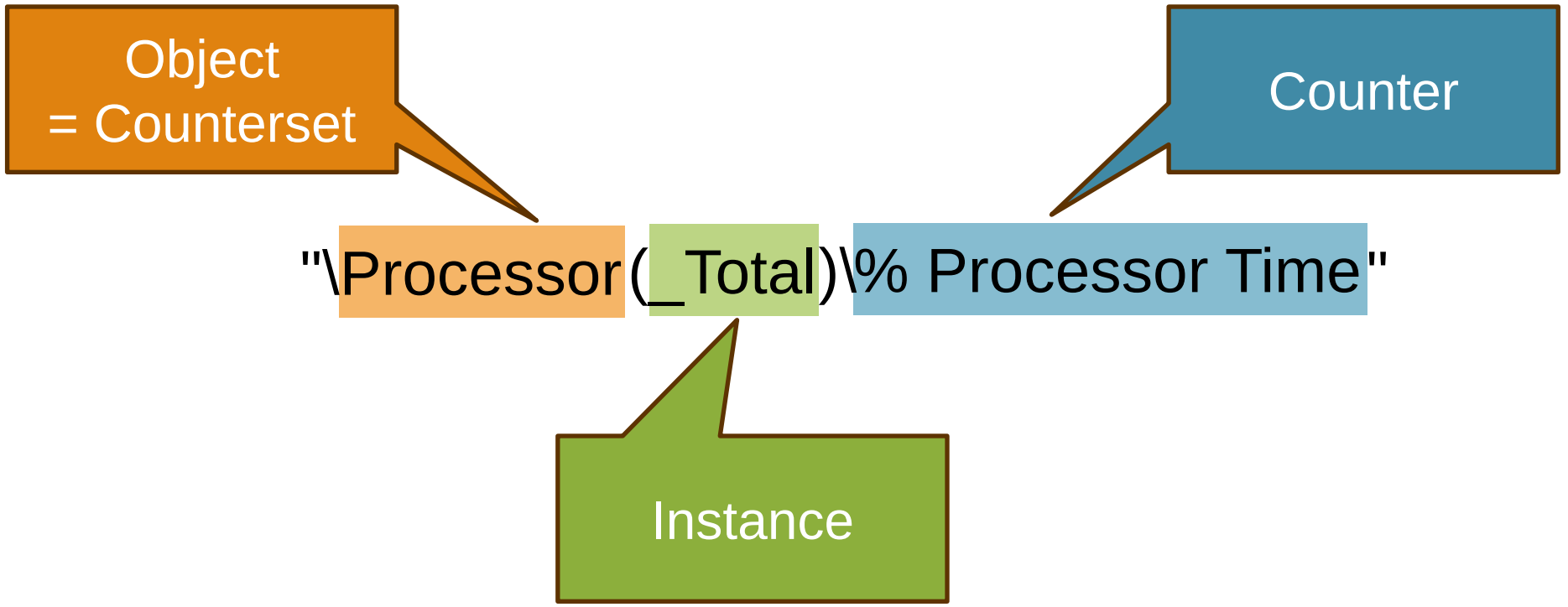


PerfMon: Add Counters and Save Settings



Performance Counter Path Syntax

\\ComputerName\ObjectName(ObjectInstance)\ObjectCounter



A *counterset* is a grouping of performance data within a provider
A *counter* is the definition of single piece of performance data
An *instance* is an entity about which performance data is reported

Relevant RDSH/AVD/Win365 Perf Counters

\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

Relevant RDSH/AVD/Win365 Perf Counters

\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

Relevant RDSH/AVD/Win365 Perf Counters

\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

Relevant RDSH/AVD/Win365 Perf Counters

\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

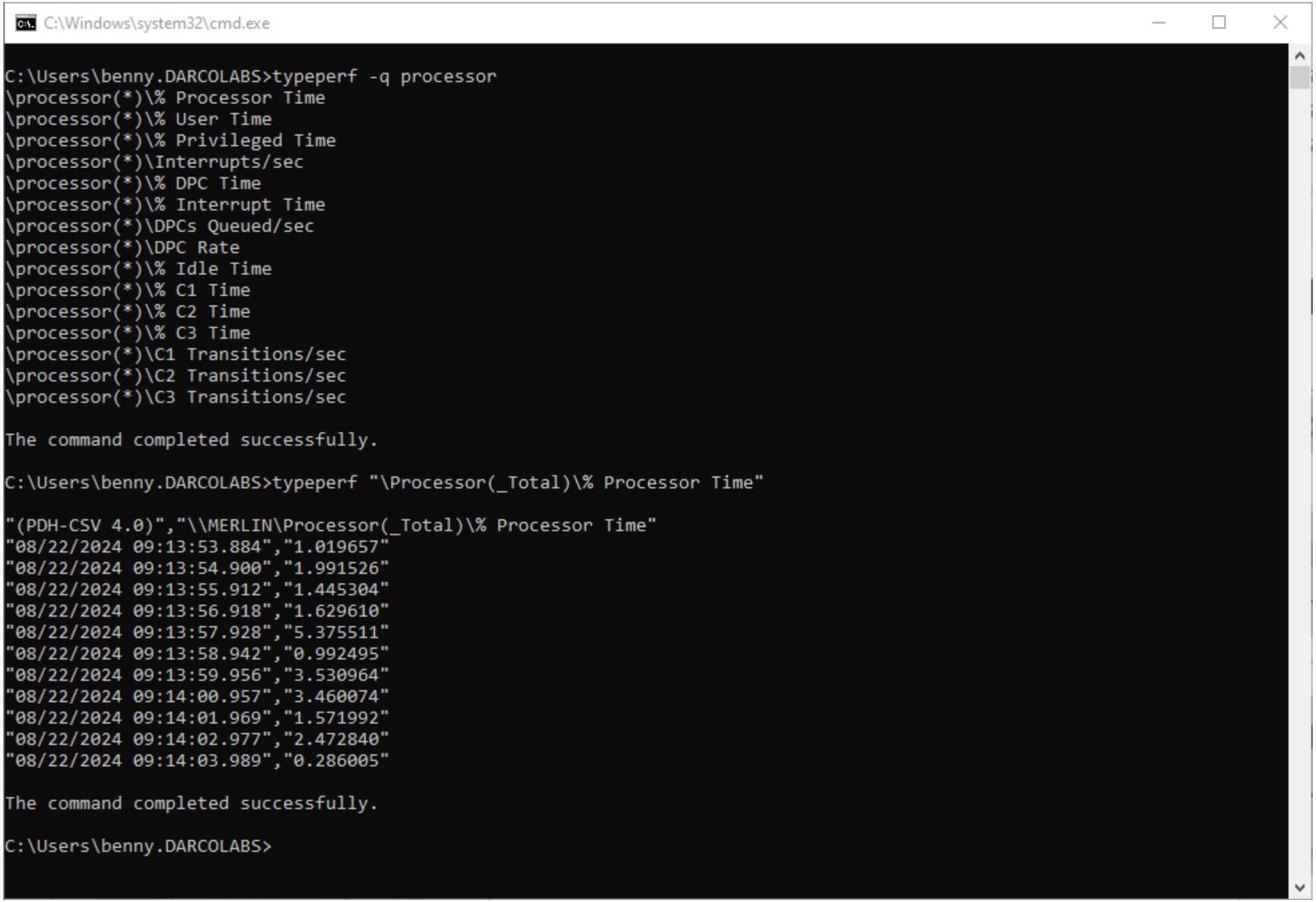
\RemoteFX Graphics(*)\Frames Skipped/second – Insufficient Network Resources

\RemoteFX Graphics(*)\Frames Skipped/second – Insufficient Server Resources

Command Line Tools

- **Typeperf** writes performance data to the command window or to a log file https://learn.microsoft.com/en-us/windows-server/administration/windows-commands/typeperf
- **Logman** creates and manages Event Trace Session and Performance logs and supports many functions of Performance Monitor from the command line
- **Relog** extracts performance counters from performance counter logs into other formats, such as text-TSV (for tab-delimited text), text-CSV (for comma-delimited text), binary-BIN (BLG), or SQL

These tools are very powerful, but not easy to use


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>

PowerShell

Performance Counters

- Get-Counter -ListSet "Processor"
- (Get-Counter -ListSet "Processor").Paths
- (Get-Counter -ListSet "Processor").PathsWithInstances
- Get-Counter -Counter "\Processor(_Total)\% Processor Time" -SampleInterval 2 -MaxSamples 3
- $CounterList = "\Processor(_Total)\% Processor Time", "\System\Processor Queue Length", "\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)\Current Disk Queue Length", "\System\Context Switches/sec", "\System\Processes“
- Get-Counter -Counter $CounterList -SampleInterval 1 -MaxSamples 20

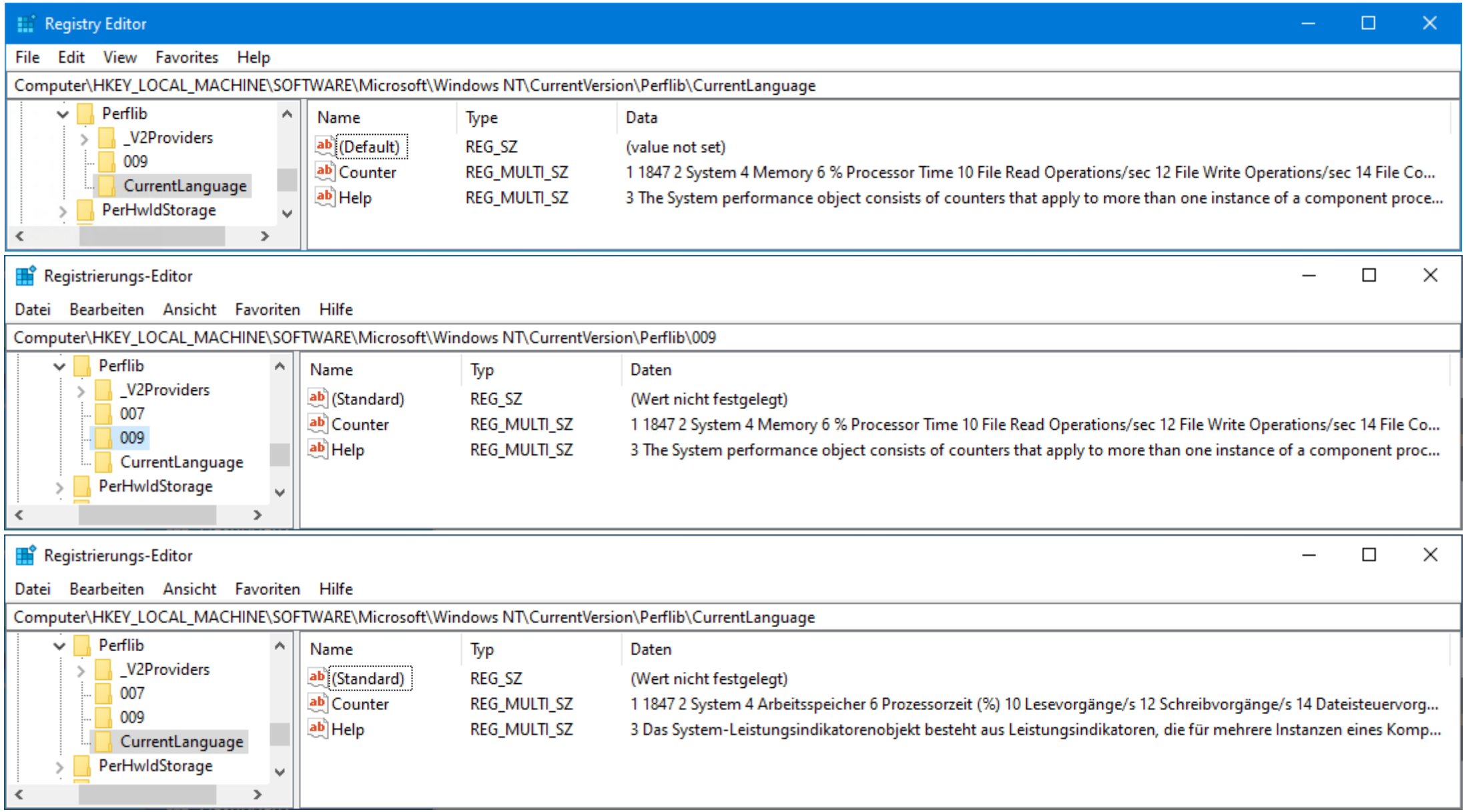
Dealing With Localized Counter Names

- The most severe limitation of Get-Counter are the localized counter names
- There are two API functions you can use to convert localized counter names to id numbers and vice versa
  - Get-PerformanceCounterId takes a localized performance counter name and translates it to a language-agnostic id number
  - Get-PerformanceCounterLocalName does the opposite and translates the id number to the appropriate local name

https://powershell.one/tricks/performance/performance-counters

https://powershellmagazine.com/2013/07/19/querying-performance-counters-from-powershell/

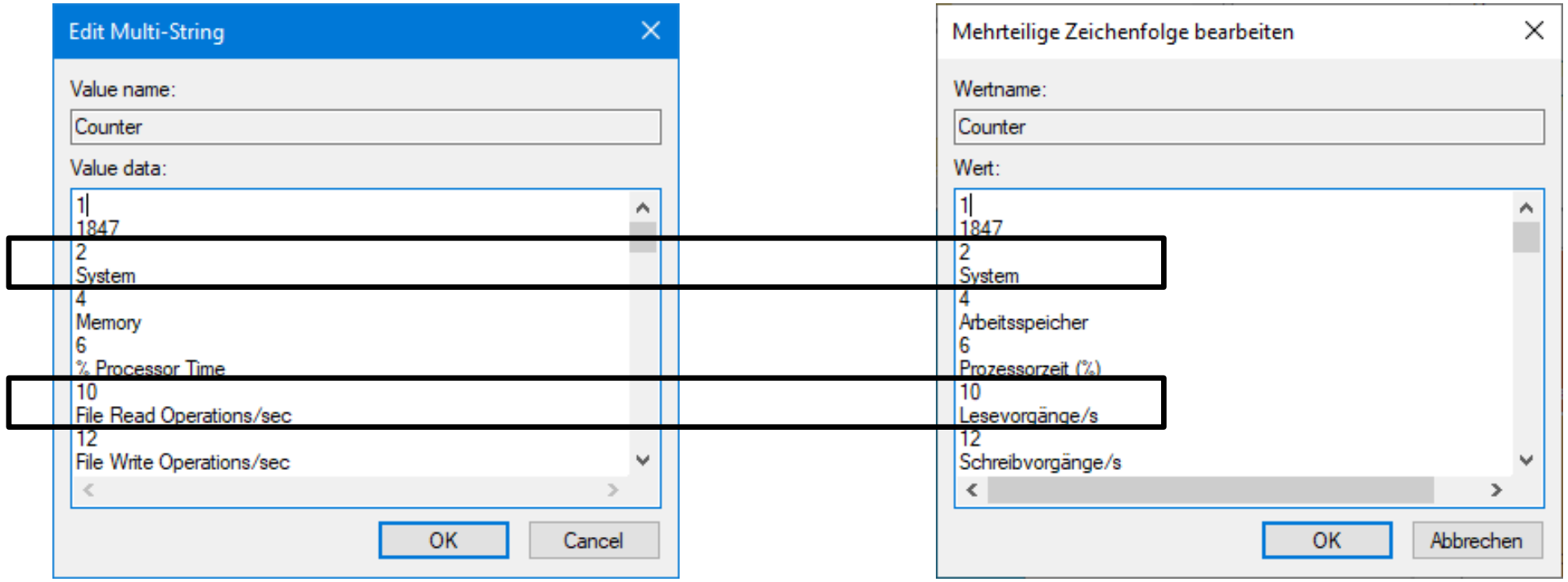
Localized Perf Counter Names



Localized Perf Counter Names

Perflib\CurrentLanguage\Counter
on a system with English (United States) language

Perflib\CurrentLanguage\Counter
on a system with German language



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

Get-PerformanceCounterId

```powershell
function Get-PerformanceCounterId
{
    param(
        [Parameter(Mandatory)]
        [string] $Name,
        $ComputerName = $env:COMPUTERNAME
    )

    $code = '[DllImport("pdh.dll", SetLastError=true, CharSet=CharSet.Unicode)]public static extern
UInt32   PdhLookupPerfIndexByName(string szMachineName, string szNameBuffer, ref uint
dwNameIndex);'
    $type = Add-Type -MemberDefinition $code -PassThru -Name PerfCounter2 -Namespace Utility

    [UInt32]$Index = 0
    if ($type::PdhLookupPerfIndexByName($ComputerName, $Name, [Ref]$Index) -eq 0)
    {
      $index
    }
    else
    {
      throw "Cannot find '$Name' on '$ComputerName'."
    }
}
```

Localized Perf Counter Names

```
PS F:\> Get-Counter -Counter "\System\File Read Operations/sec"

Timestamp                 CounterSamples
---------                 --------------
7/30/2020 2:24:42 PM      \\host1\system\file read operations/sec :
                          359.52894517603



PS F:\> Get-Counter -Counter "\2\10"

Timestamp                 CounterSamples
---------                 --------------
7/30/2020 2:24:51 PM      \\host1\2\10 :
                          341.618616976008
```

Unfortunately, about half of the “localized” counter IDs do not work with Get-Counter

Language-Agnostic Counters

Simload.ini

```
[Telemetry]
Name1=CPU|%
Counter1=\Processor(_Total)\% Processor Time
Name2=CPU Queue Length
Counter2=\System\Processor Queue Length
Name3=Memory Available|MBytes
Counter3=\Memory\Available MBytes
Name4=Working Set|Bytes
Counter4=\Process(_Total)\Working Set
Name5=Disk Reads|Bytes/sec
Counter5=\PhysicalDisk(_Total)\Disk Read Bytes/sec
Name6=Disk Writes|Bytes/sec
Counter6=\PhysicalDisk(_Total)\Disk Write Bytes/sec
Name7=Disk IOPS
Counter7=\PhysicalDisk(_Total)\Disk Transfers/sec
Name8=Disk Avg. Queue Length
Counter8=\PhysicalDisk(_Total)\Avg. Disk Queue Length
Name9=Context Switches/sec
Counter9=\System\Context Switches/sec
Name10=Processes
Counter10=\System\Processes
```

AutoIt Code Base
Only single-instance counters

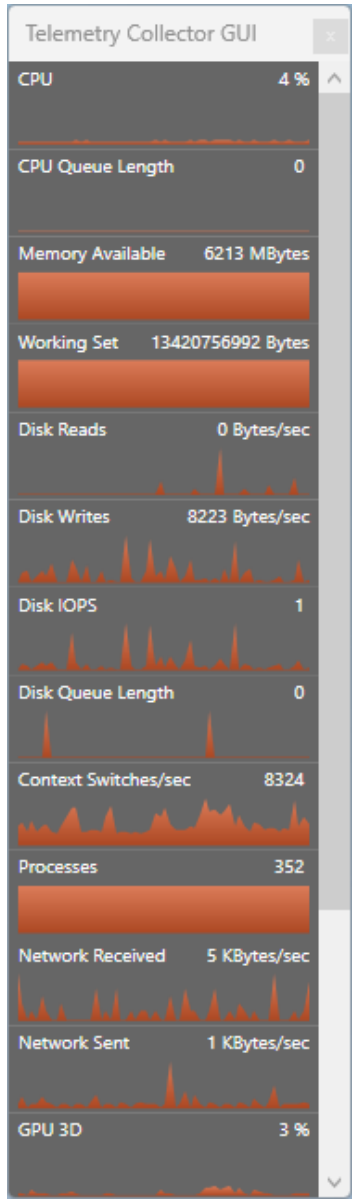
```
Name1=CPU|%
Counter1:238\6\(_Total)
Name2=CPU Queue Length
Counter2=:2\44\
Name3=Memory Available|MBytes
Counter3=:4\1382\
Name4=Working Set|Bytes
Counter4=:230\180\(_Total)
Name5=Disk Reads|Bytes/sec
Counter5=:234\220\(_Total)
Name6=Disk Writes|Bytes/sec
Counter6=:234\222\(_Total)
Name7=Disk IOPS
Counter7=:234\212\(_Total)
Name8=Disk Avg. Queue Length
Counter8=:234\1400\(_Total)
Name9=Context Switches/sec
Counter9=:2\146\
Name10=Processes
Counter10=:2\248\
```

CSV Result Files

TimeStamp|1000	CPU|%	CPU Queue Length	Memory Available|MBytes	Working Set|Bytes	Disk Reads|Bytes/sec	Disk Writes|Bytes/sec	Disk IOPS	Disk Queue Length	Context Switches/sec	Processes
2024.08.08 10:30:36.730	0	1	48828	1.721609E+10	0	0	0	0	0	350
2024.08.08 10:30:37.802	16.0371	0	48808	1.72669E+10	1589410	623872.5	96.00307	0	41422.38	351
2024.08.08 10:30:38.823	16.24802	0	48806	1.728885E+10	2385041	0	19.6916	0	55233.54	352
2024.08.08 10:30:39.823	12.55208	0	48804	1.728939E+10	1083131	354221.5	30.81559	0	24862.56	352
2024.08.08 10:30:40.834	14.79185	0	48810	1.728841E+10	0	158669.5	26.8188	0	25856.44	352
2024.08.08 10:30:41.850	13.87708	0	48808	1.729144E+10	1009577	204725.7	46.0234	0	32820.31	352
2024.08.08 10:30:42.861	8.800934	1	48804	1.728834E+10	0	89528.84	6.960476	0	29901.39	352
2024.08.08 10:30:43.859	13.36615	0	48805	1.728833E+10	0	159098.4	26.89124	0	34092.06	352
2024.08.08 10:30:44.886	17.26958	0	48796	1.729805E+10	0	124779.1	24.56684	0	44967.18	352
2024.08.08 10:30:45.888	15.71634	0	48800	1.729505E+10	0	162253	24.73013	0	41759.28	352
2024.08.08 10:30:46.913	14.22636	0	48800	1.729274E+10	0	622944	21.60948	0	34674.31	352
2024.08.08 10:30:47.895	9.426932	0	48798	1.729646E+10	0	421994.3	42.42533	0	32910.01	352
2024.08.08 10:30:48.913	9.435274	0	48801	1.729297E+10	0	181588.1	34.47602	0	32947.26	352
2024.08.08 10:30:49.922	12.37798	0	48800	1.732194E+10	0	232905.4	36.62416	0	32353.19	353
2024.08.08 10:30:50.965	14.22228	0	48790	1.732325E+10	94723.96	146031	19.42027	0	32691.35	353
2024.08.08 10:30:51.940	13.66384	0	48792	1.732352E+10	0	182360	30.35652	0	34137.27	353
2024.08.08 10:30:52.945	12.97976	0	48784	1.733555E+10	0	216170.4	31.86481	0	33511.35	353
2024.08.08 10:30:53.964	8.67326	0	48781	1.733713E+10	0	81109.59	14.8483	0	29580.76	353
2024.08.08 10:30:54.988	9.81427	0	48784	1.733138E+10	0	63610.1	5.824227	0	32242.77	353
2024.08.08 10:30:55.981	7.289457	0	48784	1.733362E+10	0	140021.6	16.08899	0	31924.67	353

Beyond Standard Performance Counters

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)



Normalized CSV Files

1. CPU|%
2. CPU Queue Length
3. Memory Available|MBytes
4. Working Set|Bytes
5. Disk Reads|Bytes/sec
6. Disk Writes|Bytes/sec
7. Disk IOPS
8. Disk Queue Length
9. Context Switches/sec
10. Processes
11. Network Received|KBytes/sec
12. Network Sent|KBytes/sec
13. GPU 3D|%
14. GPU Video Decode|%
15. GPU Video Processing|%
16. GPU Memory|Mbytes
17. Session CPU|%
18. Normalized Total CPU
19. Total Network Received|KBytes
20. Total Network Sent|KBytes

Visualizing Test Data

Left Title – Single View Mode (i)(z)

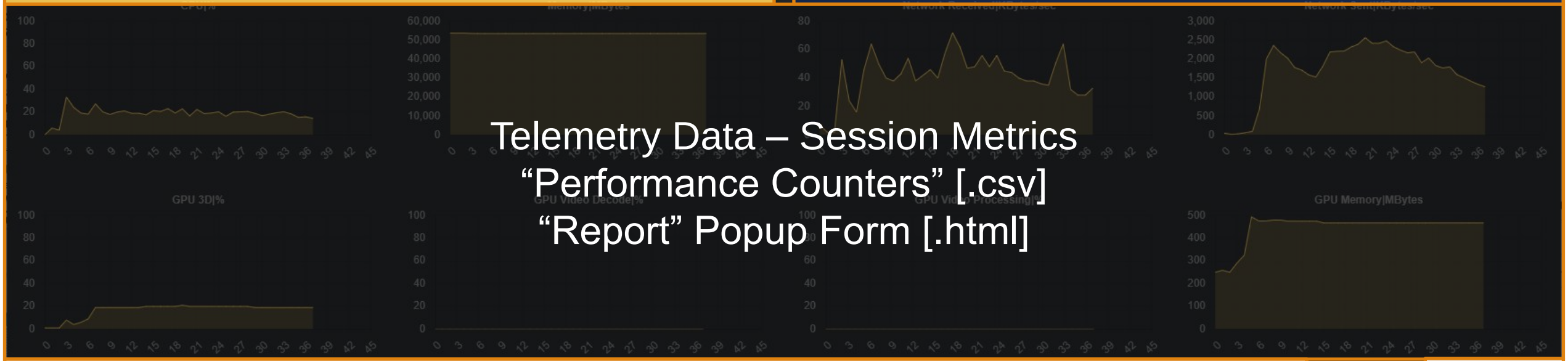
Right Title – Single View Mode (i)(z)

Left Media Tile
“Screen Recording”
[.mp4]

Description

00:00:03.776 App launch time: 1536 ms
00:00:04.028 Run action initiated
00:00:09.030 Press G key

System & User Activities
[.ref]



Telemetry Data – Session Metrics
“Performance Counters” [.csv]
“Report” Popup Form [.html]

Video & Data Animation Controls

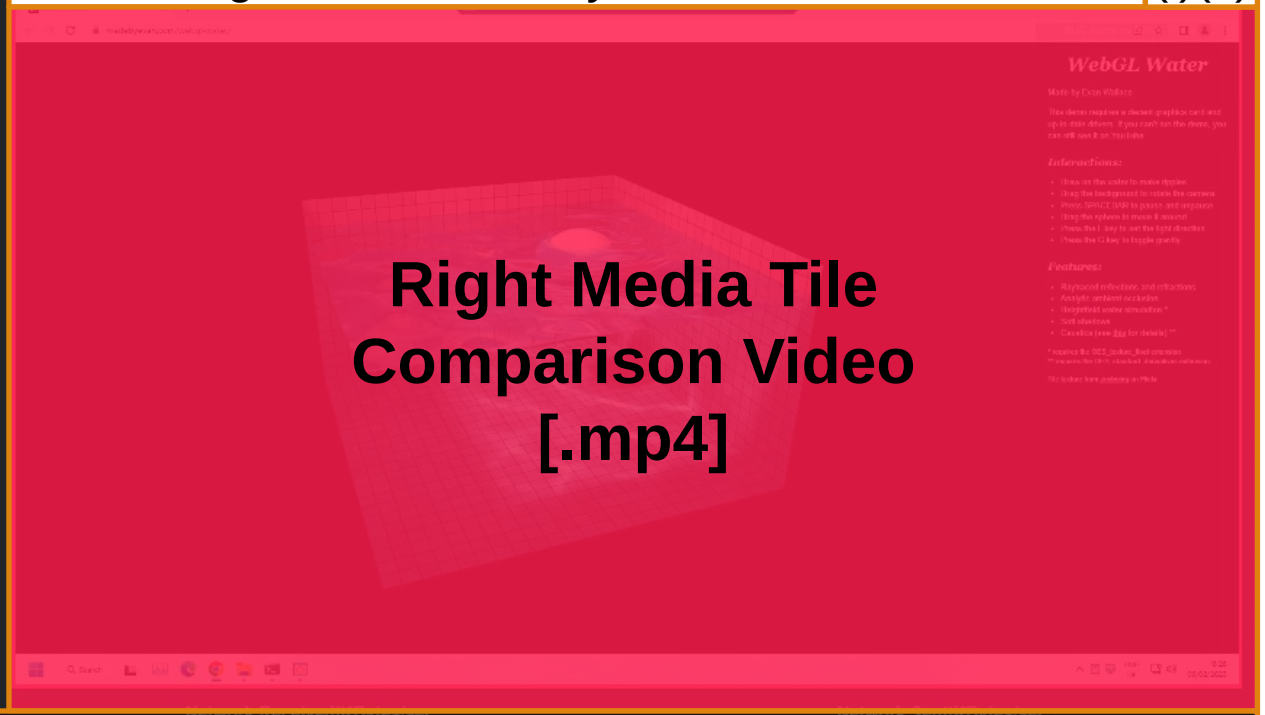
00:00:38 00:00:45

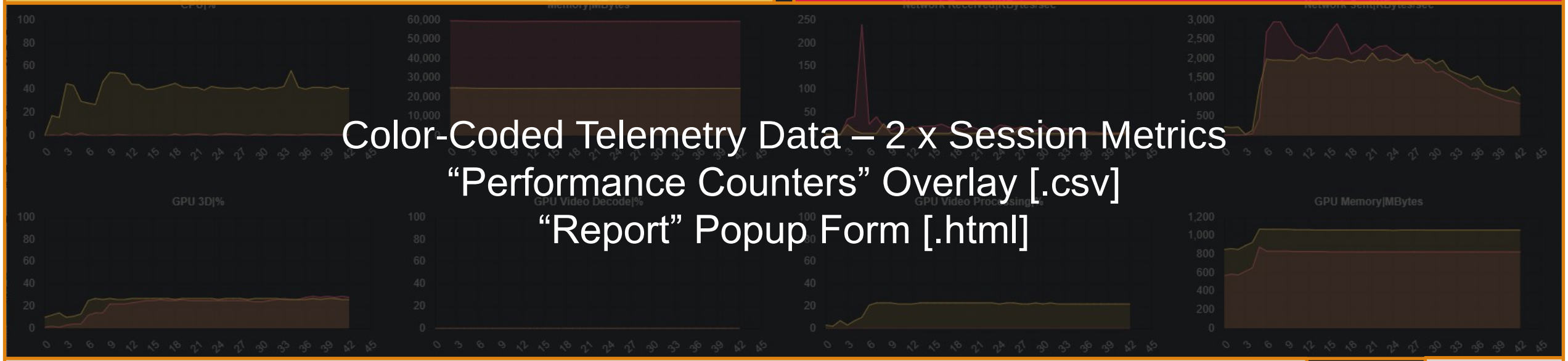
Help

Report

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

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



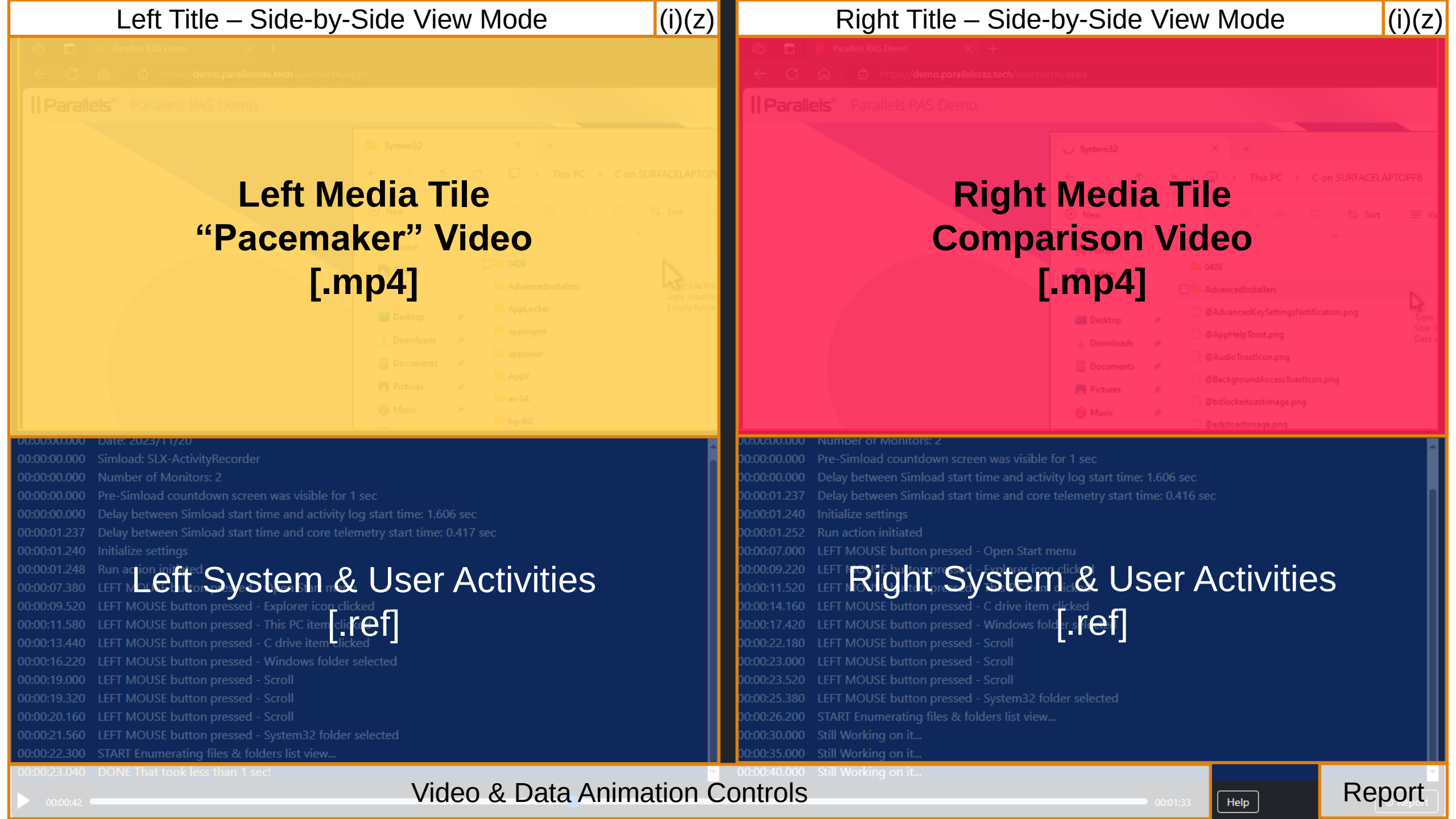


Video & Data Animation Controls

00:00:41 00:00:45

Help

Report


Left Title – Side-by-Side View Mode
(i)(z)
Right Title – Side-by-Side View Mode
(i)(z)
Left Media Tile
“Pacemaker” Video
[.mp4]
Right Media Tile
Comparison Video
[.mp4]
00:00:00.000 Simload: SLX-ActivityRecorder
00:00:00.000 Number of Monitors: 2
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: 1.606 sec
00:00:01.237 Delay between Simload start time and core telemetry start time: 0.417 sec
00:00:01.240 Initialize settings
00:00:01.248 Run action initiated
00:00:07.380 LEFT MOUSE button pressed - Open Start menu
00:00:09.520 LEFT MOUSE button pressed - Explorer icon clicked
00:00:11.580 LEFT MOUSE button pressed - This PC item clicked
00:00:13.440 LEFT MOUSE button pressed - C drive item clicked
00:00:16.220 LEFT MOUSE button pressed - Windows folder selected
00:00:19.000 LEFT MOUSE button pressed - Scroll
00:00:19.320 LEFT MOUSE button pressed - Scroll
00:00:20.160 LEFT MOUSE button pressed - Scroll
00:00:21.560 LEFT MOUSE button pressed - System32 folder selected
00:00:22.300 START Enumerating files & folders list view...
00:00:23.040 DONE That took less than 1 sec!
Left System & User Activities
[.ref]
00:00:00.000 Number of Monitors: 2
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: 1.606 sec
00:00:01.237 Delay between Simload start time and core telemetry start time: 0.416 sec
00:00:01.240 Initialize settings
00:00:01.252 Run action initiated
00:00:07.000 LEFT MOUSE button pressed - Open Start menu
00:00:14.160 LEFT MOUSE button pressed - C drive item clicked
00:00:22.180 LEFT MOUSE button pressed - Scroll
00:00:23.000 LEFT MOUSE button pressed - Scroll
00:00:23.520 LEFT MOUSE button pressed - Scroll
00:00:25.380 LEFT MOUSE button pressed - System32 folder selected
00:00:26.200 START Enumerating files & folders list view...
00:00:30.000 Still Working on it...
00:00:35.000 Still Working on it...
00:00:40.000 Still Working on it...
Right System & User Activities
[.ref]
00:00:42
00:01:33
Video & Data Animation Controls
Help
Report

Sync Player HTML5 Templates

- Template-VidRef-8Charts.html → 1 video + 1 activity + 8 charts
- Template-VidRef-12Charts.html → 1 video + 1 activity + 12 charts
- Template-VidVid-8Charts.html → 2 side-by-side videos + 8 charts
- Template-VidVid-12Charts.html → 2 side-by-side videos + 12 charts
- Template-VidVid-RefRef.html → 2 side-by-side videos + 2 activities
- Template-Report.html → overlay of the lower half of the page on button click
- Template-LinkList.html → list of links to Sync Player clips in a test sequence
- Template-Index.html → all links to Sync Player clips in a run collection

HTML5 Templates

```
<!-- Style Sheets -->
   <link href="../../_libs3/bootstrap.min.css" rel="stylesheet">
   <link href="../../_libs3/custom.css" rel="stylesheet">

<!-- Load Bootstrap, Chart and JQuery JS files -->
   <script src="../../_libs3/bootstrap.bundle.min.js"></script>
   <script src="../../_libs3/chart.min.js"></script>
   <script src="../../_libs3/jquery.min.js"></script>
```

New! Never-Ending Support for Bootstrap →

Build fast, responsive sites with Bootstrap

Powerful, extensible, and feature-packed frontend toolkit. Build and customize with Sass, utilize prebuilt grid system and components, and bring projects to life with powerful JavaScript plugins.

```
$ npm i bootstrap@5.3.3
```

Read the docs

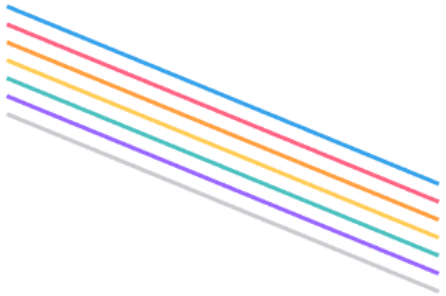
Currently **v5.3.3** · Download · All releases

https://www.chartjs.org

Chart.js

Simple yet flexible JavaScript charting library for the modern web

Get Started | Samples | Ecosystem | GitHub



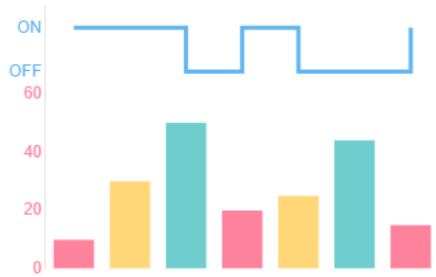
New in 4.0 **Colors plugin**

Default palette of Chart.js brand colors is available as a built-in time-saving zero-configuration plugin.

New in 4.0 **Tree-shaking**

JavaScript bundle size can be reduced by dozens of kilobytes by registering only necessary components.

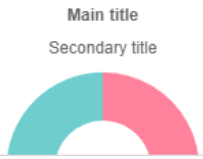
```
- dist/index.dcb2e865.js  48 KB
+ dist/index.78hd8h8x.js  14 KB
```



New in 3.5 **Scale stacking**

Layout boxes can be stacked and weighted in groups.

New in 3.4 **Subtitle plugin**



A secondary title plugin with all the same options

jQuery

write less, do more.

Lightweight Footprint

Only 30kB minified and gzipped. Can also be included as an AMD module

CSS3 Compliant

Supports CSS3 selectors to find elements as well as in style property manipulation

Cross-Browser

Chrome, Edge, Firefox, IE, Safari, Android, iOS, and more

Download jQuery
v3.7.1
The 1.x and 2.x branches no longer receive patches.

View Source on GitHub →
How jQuery Works →

What is jQuery?

jQuery is a fast, small, and feature-rich JavaScript library. It makes things like HTML document traversal and manipulation, event handling, animation, and Ajax much simpler with an easy-to-use API that works across a multitude of browsers. With a combination of versatility and extensibility, jQuery has changed the way that millions of people write JavaScript.

Resources

- jQuery Core API Documentation
- jQuery Learning Center
- jQuery Blog
- Contribute to jQuery
- Browse or Submit jQuery Bugs

A Brief Look

DOM Traversal and Manipulation

Get the `<button>` element with the class 'continue' and change its HTML to 'Next Step...'

```
1 | $( "button.continue" ).html( "Next Step..." )
```

Event Handling

Show the `#banner-message` element that is hidden with `display:none` in its CSS when any button in `#button-container` is clicked.

Custom JS Files

```
<!-- Load custom JS files -->
    <script src="../../_libs3/charts.js"></script>
    <script src="../../_libs3/player.js"></script>
```

- Charts.js defines the standard values of the charts
- Player.js implements an HTML5 video player
- Placeholders in the HTML templates
- PowerShell scripts to import data and replace placeholders

PowerShell Build Scripts

1. Create-SimloadFolders.ps1 → create folder structure from raw data files
2. Create-IniSingle.ps1 → Create an .ini used by consecutive build scripts
3. Optional: Convert-CsvFileByIni.ps1 → Replace decimal separator “,” to “.”
4. Create-CsvNormalized.ps1 → Create normalized .csv files
5. Create-CsvSingle.ps1 → Create .csv files according to Telemetry settings
6. Create-HtmlSingle.ps1 → Create single-view Sync Player clips
7. Create-IniDouble.ps1 → Create an .ini used by consecutive build scripts
8. Create-HtmlDouble.ps1 → Create side-by-side Sync Player clips
9. Create-Index.ps1 → Create a start page with links to all Sync Player clips

Sync Player

https://eucscore.com/docs/syncplayer.html

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

Thank You

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