

# Analyzing Performance, User Experience and Price in Azure Virtual Desktop and Windows 365 Cloud PC

Benny Tritsch, Remote Graphics Ninja



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# About Benny Tritsch

[www.wpninjas.eu](http://www.wpninjas.eu)  
#WPNinjaS

## Focus

EUC Evangelist and Chief Scientist

## From

Dr. Tritsch IT Consulting, Germany

## My Blog

<https://eucscore.com>



## Certifications

Microsoft MVP, Citrix CTP, VMware vExpert, NVIDIA NGCA, Parallels VIPP

## Hobbies

EUC benchmarking and building the EUC Score toolset for the community

## Contact

[info@eucscore.com](mailto:info@eucscore.com)



Thank you, Ruben Spruijt, for running many of the tests and Frame for providing Azure resources

## Key takeaways:

- **Scientific AVD and Windows 365 benchmarking results**
- **Screen video comparisons of perceived user experience**
- **Price/performance ratio**

# Agenda

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- **The science of EUC benchmarking**
- **Testing and comparing local machines, AVD VMs and Windows 365**
- **Analyzing the test results – UX quality criteria**
- **Scoring AVD VMs and Windows 365**
- **Price/performance ratio and other observations**



# Demos and Video Clips

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When things go wrong and unexpected observations

- #1: Block boundary
- #2: Smear artifacts
- #3: Office rendering error
- #4: GDI+ rendering error
- #5: Striping
- #6: False color (CLUT)
- #7: Application crash

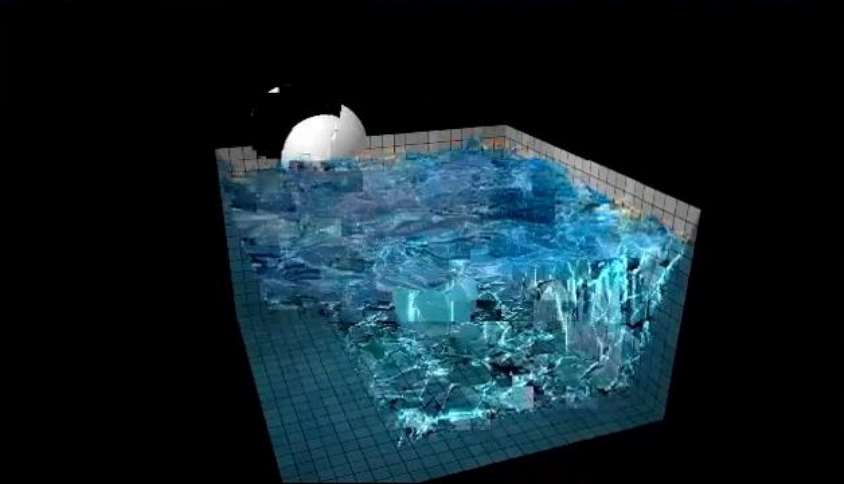








Turkey 80s





## Remoting Protocol Features

Remoting protocols run on top of the Internet Protocol (IP), using Transmission Control Protocol (TCP), User Datagram Protocol (UDP) or a combination a TCP and UDP for different aspects of remoting. While older remoting protocols only used TCP, the modern ones use UDP for the graphics remoting aspect.

TCP is a connection-oriented protocol providing high reliability through error checking, congestion control and a built-in mechanism that rearranges data packets in the order specified. It also guarantees that all data remains intact in the packets transferred. But all this makes TCP relatively heavy-weight, significantly reducing graphics remoting performance on low bandwidth and high latency/packet loss networks.

UDP is a connectionless protocol that flows in a particular direction, and does not guarantee that packets will be received in order or that they will be received at all. It is a lighter-weight protocol than TCP, and is used for applications that require high performance but do not require the reliability of TCP.

But there is more to a remoting protocol, in particular when it comes to extensibility. The concept of virtual channels provides a way to establish separate streams of data communication while taking advantage of the remote session communication already established. Many remoting protocols use virtual channels to add functions that allow a strict separation from the core features or are not yet specified in the protocol. They represent a platform that future developments can be based on without having to modify the communication methods between host and clients. Examples for virtual channel use cases are joint client and server clipboards or redirecting print jobs to local client printers.

Other notable remoting protocol features include bi-directional audio transmission, client side callouts, and the ability to redirect local resources such as printers and drives to the remote host. These features are often implemented as separate virtual channels, allowing them to be added or removed without affecting the core remoting protocol.

## Client Side Rendering versus Host Side Rendering

In a graphics remoting environment, the Windows desktop, including its applications is rendered in a







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)



# Fishbowl

HTML5 Graphics Benchmark



10 Fish

## Fish

10 ▾

## Layers

- ✓ Water
- ✓ Frame
- ✓ Mask
- ✓ Back
- ✓ Fish
- ✓ Front
- ✓ Shine
- ✓ Shadow
- ✓ Audio
- ✓ Logo
- ✓ FPS
- ✓ Needle



Unigine fatal error



HeapPool::init(): can't allocate 33554448 bytes

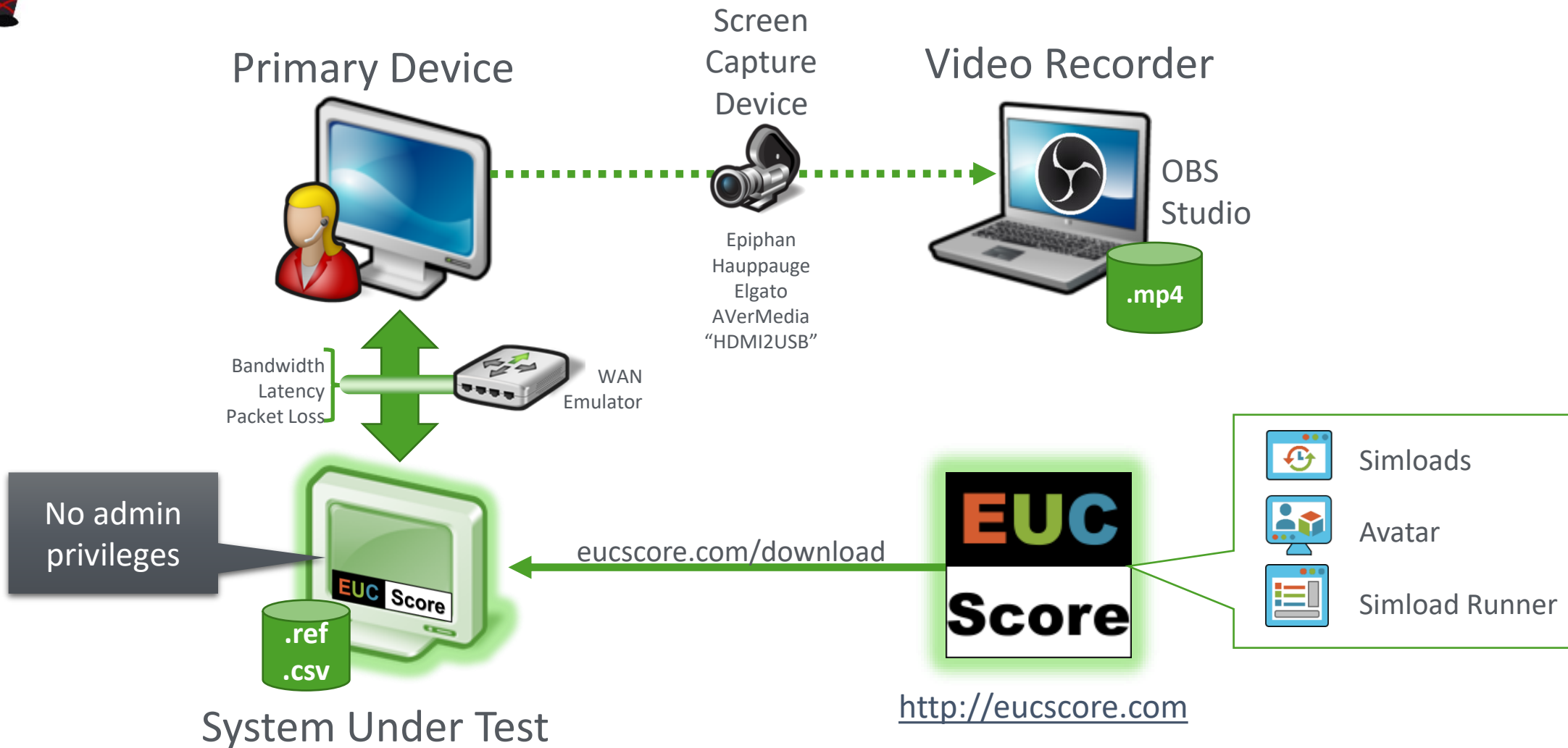
OK





# EUC Score Single-Session Benchmarking

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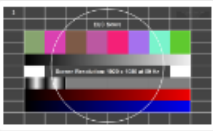



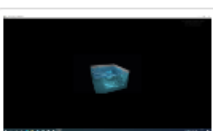
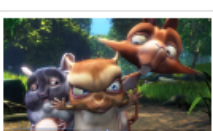





# <https://eucscore.com/gallery.html>

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





# Demo

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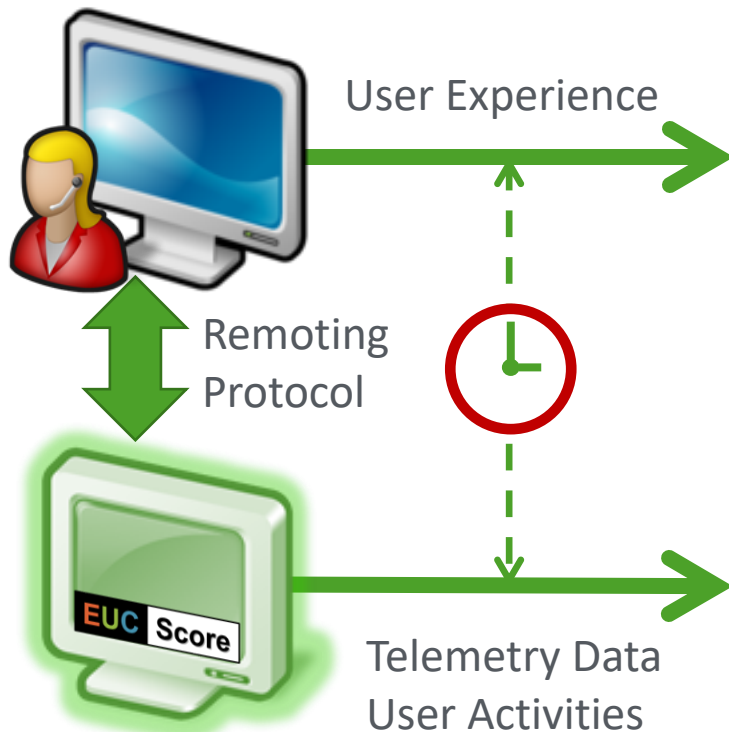
**EUC** Score captures, measures and quantifies perceived end-user experience in Windows remoting and digital workspace environments, both on premises and in the cloud – fast, precise, repeatable and intuitive





# Sync Player – Visual Data Analytics

Primary User Endpoint



System Under Test

Title

Specs Button

Maximize Button

System Under Test:

- Azure West Europe, AVD NV6 VM, Windows 10 Enterprise for Virtual Desktops, Intel Xeon E5-2690 v3 6vCPUs @ 2.60GHz, 56GB RAM, Virtual HD ATA Device 340GB, NVIDIA M60 GPU (1/2 Card), 8GB VRAM
- Connection: EDIT PROTOCOL AND NETWORK CONDITIONS
- Endpoint: IGEL UD3 (M350C / LX-60) with IGEL OS 11.08.230, AMD Ryzen Embedded R1505G Dual-Core @ 2.0 - 2.7GHz, 4GB DDR4 RAM, 8GB eMMC, AMD Radeon Vega 3 GPU with 512MB shared memory

Screen Video

Activities

Telemetry Charts

Timeline and Video Controls

EUC Score

Report Button

# Science of EUC: Performance Influencers

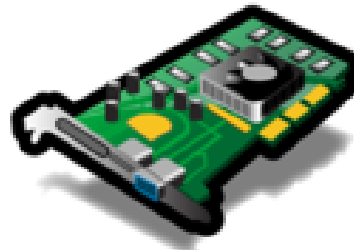
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**VM  
Type**



**Client  
Device**



**GPU**



**Network**



**Remoting  
Protocol**





**Testing and Comparing**



# Azure VM Types under Test without GPU

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Instance	CPU	CPU Base Clock Speed	Max CPU Speed - single-core	vCPUs	RAM	Storage Type	Storage Size	Display	OS
<b>Microsoft Azure</b>									
<b>Azure D2s_v3</b>	Intel Xeon 8272 - Cascade Lake	2.6 GHz	3.7 GHz	2	8 GB	Premium SSD	256GB	FHD	Win10 22H2
<b>Azure D4s_v3</b>	Intel Xeon 8272 - Cascade Lake	2.6 GHz	3.7 GHz	4	16 GB	Premium SSD	256GB	FHD	Win10 22H2
<b>Azure D2s_v5</b>	Intel Xeon 8370C - IceLake	2.8 GHz	3.5 GHz	2	8 GB	Premium SSD	256GB	FHD	Win10 22H2
<b>Azure D2s_v5</b>	Intel Xeon 8370C - IceLake	2.8 GHz	3.5 GHz	2	8 GB	Standard SSD	256GB	FHD	Win10 22H2
<b>Azure D4s_v5</b>	Intel Xeon 8370C - IceLake	2.8 GHz	3.5 GHz	4	16 GB	Premium SSD	256GB	FHD	Win10 22H2
<b>Azure D4s_v5</b>	Intel Xeon 8370C - IceLake	2.8 GHz	3.5 GHz	4	16 GB	Standard SSD	256GB	FHD	Win10 22H2
<b>Win356 Business</b>	AMD EPYC 7763 - Milan	2.45 GHz	3.4 GHz	2	8 GB	HDD	128GB	FHD	Win11 22H2
<b>Azure D8ads_v5</b>	AMD EPYC 7763 - Milan	2.45 GHz	3.4 GHz	8	32 GB	Premium SSD	256GB	FHD	Win11 22H2

SUT: Windows 365 Business “Entry Level”, 2 vCPUs, 8GB RAM, 128 GB Storage, \$45.00 per user per month (= \$0.061/hour)

Alternative: 4 vCPUs, 16GB RAM, 128 GB Storage, \$70.00 per user per month (= \$0.095/hour)



# Azure VM Types under Test with GPU

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Instance	CPU	CPU Base Clock Speed	Max CPU Speed	vCPUs	RAM	Storage Type	Storage Size	GPU	GPU VRAM	Display	OS	GPU Release Year
<b>Microsoft Azure</b>												
Azure NV6	Intel Xeon E5-2690v3	2.6 GHz	3.5 GHz	6	56 GB	Standard SSD	256GB	NVIDIA M60	8 GB	FHD	Win10 22H2	Aug 2015
Azure NV4as_v4	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	4	14 GB	Premium SSD	256GB	AMD MI25	2 GB	FHD	Win10 22H2	Jun 2017
Azure NV8as_v4	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	8	28 GB	Premium SSD	256GB	AMD MI25	4 GB	FHD	Win10 22H2	Jun 2017
Azure NV16as_v4	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	16	56 GB	Premium SSD	256GB	AMD MI25	8 GB	FHD	Win10 22H2	Jun 2017
Azure NV32as_v4	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	32	112 GB	Premium SSD	256GB	AMD MI25	16 GB	FHD	Win10 22H2	Jun 2017
Azure NC4asT4_v3	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	4	28 GB	Premium SSD	256GB	NVIDIA T4	16 GB	FHD	Win10 22H2	Sep 2018
Azure NC8asT4_v3	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	8	56 GB	Premium SSD	256GB	NVIDIA T4	16 GB	FHD	Win11 22H2	Sep 2018
Azure NC16asT4_v3	AMD EPYC 7V12 - Rome	2.45 GHz	3.3 GHz	16	110 GB	Premium SSD	256GB	NVIDIA T4	16 GB	FHD	Win10 22H2	Sep 2018
Azure NV6adsA10_v5	AMD EPYC 74F3 - Milan	3.2 GHz	4.0 GHz	6	55 GB	Premium SSD	256GB	NVIDIA A10 4Q	4 GB	FHD	Win11 22H2	Apr 2021
Azure NV12adsA10_v5	AMD EPYC 74F3 - Milan	3.2 GHz	4.0 GHz	12	110 GB	Premium SSD	256GB	NVIDIA A10 8Q	8 GB	FHD	Win10 22H2	Apr 2021
Azure NV36adsA10_v5	AMD EPYC 74F3 - Milan	3.2 GHz	4.0 GHz	36	440 GB	Premium SSD	256GB	NVIDIA A10 24Q	24 GB	FHD	Win10 22H2	Apr 2021















**Showtime**



# UX Quality Criteria

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	<b>Time to first byte (TTFB)</b>	Measure boot time + logon time + user session load time
	<b>Application load time</b>	Measure time from user starting an application until the content appears and the application is ready for user input
	<b>Application stability</b>	Detect application hangs, freezes, crashes or unhandled exceptions
	<b>User input delay</b>	Measures responsiveness of graphical elements after user-initiated triggers (lag, latency)
	<b>Graphics APIs supported</b>	Detect incompatibilities when running graphics applications using the DirectX, OpenGL, Vulkan and WebGL APIs
	<b>Media formats supported</b>	Detect incompatibilities when opening media files, such as MP4, MPEG, MOV, WMV or AVI
	<b>Distortion of media</b>	Measure media quality, detect compression/decompression artifacts and identify out-of-sync media streams
	<b>Screen refresh rate</b>	Measure the number of times per second that the desktop or application can draw consecutive images on the screen (fps)
	<b>Screen resolution and display size</b>	Determine the number of pixels and density as well as the screen's visual dimensions
	<b>Session availability and resilience</b>	Detect user session hangs, disconnects and reconnects



# Glossary – Screen Artifacts

- 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”) and freeze frames





# Performance Scoring





# Test Apps – CPU-Z

**CPU-Z** Ver. 2.04.0.x64

CPU | Mainboard | Memory | SPD | Graphics | Bench | About

**Processor**

Name: AMD EPYC  
Code Name: Genoa Brand ID:   
Package: Socket SP5 (6096)  
Technology: 7 nm Core VID: 1.550 V

**Specification**  
AMD EPYC 74F3 24-Core Processor

Family	F	Model	1	Stepping	1
Ext. Family	19	Ext. Model	1	Revision	GN-B1

Instructions: MMX(+), SSE, SSE2, SSE3, SSSE3, SSE4.1, SSE4.2, SSE4A, x86-64, AES, AVX, AVX2, FMA3, SHA

**Clocks (Core #0)**

Core Speed	3193.00 MHz
Multiplier	x 16.02
Bus Speed	199.27 MHz
Rated FSB	

**Cache**

L1 Data	18 x 32 KBytes	8-way
L1 Inst.	18 x 32 KBytes	8-way
Level 2	18 x 512 KBytes	8-way
Level 3	32 MBytes	16-way

Selection: Socket #1 Cores: 18 Threads: 36

Tools | Validate | Close

**CPU-Z** Ver. 2.04.0.x64

CPU | Mainboard | Memory | SPD | Graphics | Bench | About

**CPU Single Thread**

This Processor: 548.8  
 Reference

**CPU Multi Thread**

This Processor: 12821.0  
 Reference

Threads: 36 Multi Thread Ratio: 23.36

Benchmark: Version 17.01.64

Bench CPU | Stress CPU | Submit and Compare

This Processor: AMD EPYC 74F3 24-Core Processor  
Reference: <Please Select>

Tools | Validate | Close



# Test Apps – CineBench R23

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CPU (Multi Core) 26897 pts Start

CPU (Single Core) 1310 pts Start

MP Ratio 20.54 x

Your System

Processor AMD EPYC 74F3 24-Core Processor

Cores x GHz 18 Cores, 36 Threads @ 3.2 GHz

OS Windows 10, 64 Bit, Professional Edition (build 19045)

Info

Ranking

CPU (Single Core) Details

1. 4C/8T @ 2.81 GHz, 11th Gen Intel Core i7-1165G7 @ 28v	1532
2. 4C/8T @ 1.69 GHz, 11th Gen Intel Core i7-1165G7 @15W	1382
3. 18C/36T @ 3.2 GHz, AMD EPYC 74F3 24-Core Processor	1310
4. 6C/12T @ 3.2 GHz, AMD EPYC 74F3 24-Core Processor	1309
5. 3C/6T @ 3.2 GHz, AMD EPYC 74F3 24-Core Processor	1273





# Test Apps – Login Enterprise EUX Score

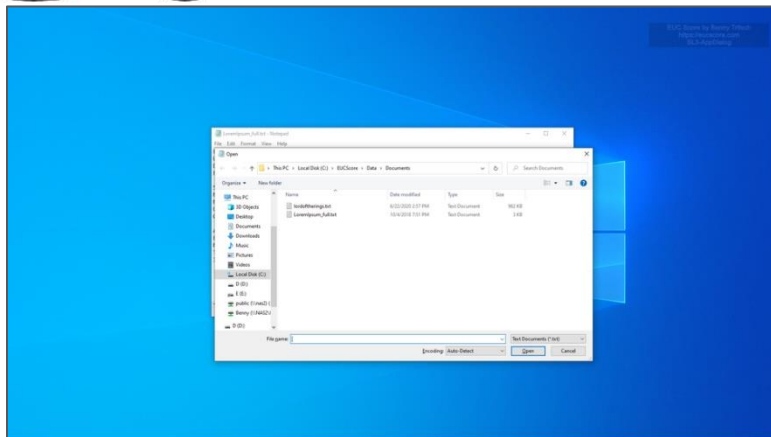
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#WPNinjaS

```
EuxRunner.exe - Shortcut
RUN LocalAppdata: C:\Tools\EUX2023\DiskSpeed.exe folder="C:\Users\Fram\AppData\Local\eux2023" blockSize=50k bufferSize=4K writeMask=0x0C0C cachePct=95 latencyPct=95 threads=1 duration=1000
New measurement: diskappdata_latency = 55555
New measurement: diskappdata = 54535
RUN CPU: C:\Tools\EUX2023\CpuSpeed.exe d=1000 t=2
New measurement: cpuspeed = 100864
RUN Compression: C:\Tools\EUX2023\CompressionSpeed.exe folder="C:\Users\Fram\Documents\eux2023" cachePct=25 writePct=35 duration=1000 threads=1 -high
New measurement: highcompression = 1763
RUN CachedHighCompression: C:\Tools\EUX2023\CompressionSpeed.exe folder="C:\Users\Fram\Documents\eux2023" cachePct=25 writePct=35 duration=1000 threads=1
New measurement: fastcompression = 2064
RUN App: C:\Tools\EUX2023\AppSpeed.exe folder="C:\Users\Fram\Documents\eux2023" duration=10000 launchtimestamp=27468157833
New measurement: appspeed_userinput = 904
New measurement: appspeed = 9523
diskmydocs_latency score: 9.30, result = 3636.36 (20000.00)
diskmydocs score: 9.16, result = 2909.84 (24733.67)
diskappdata_latency score: 9.78, result = 7671.90 (53703.33)
diskappdata score: 9.30, result = 3669.40 (51371.67)
cpuspeed score: 8.76, result = 2018.81 (100940.67)
highcompression score: 7.13, result = 875.73 (2189.33)
fastcompression score: 6.69, result = 730.67 (1826.67)
appspeed_userinput score: 8.51, result = 1809.33 (904.67)
appspeed score: 9.30, result = 3696.00 (9240.00)
Weight 1 of highcompression is converted to 1.15 because of score 7.13 (correction = 1.15)
Weight 1 of fastcompression is converted to 1.34 because of score 6.69 (correction = 1.34)
EUX2022 = 8.40
Press any key to close this window
```

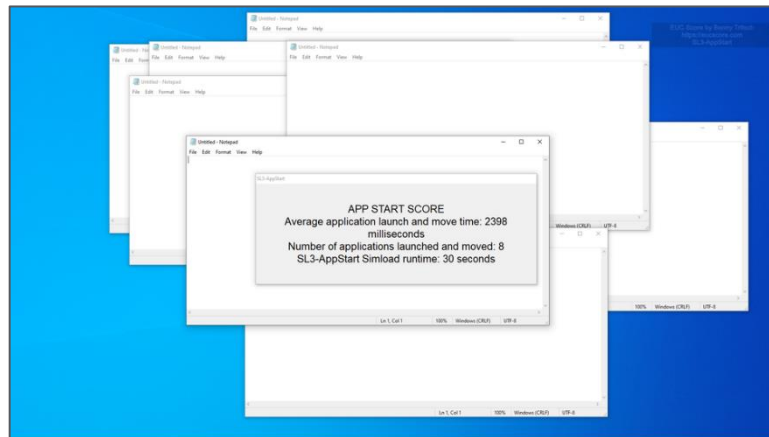


# Test Apps – EUC Score

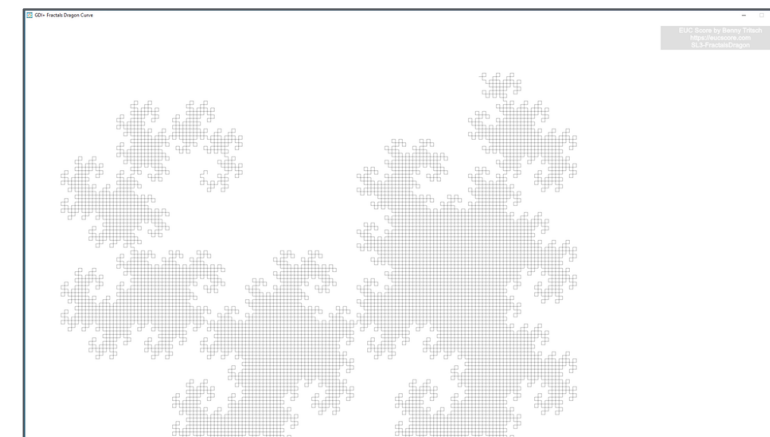
[www.wpninjas.eu](http://www.wpninjas.eu)  
#WPNinjaS



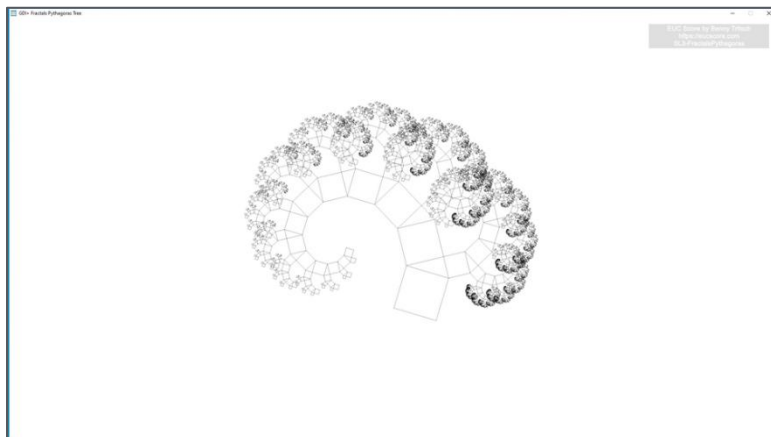
SL3-AppDialog



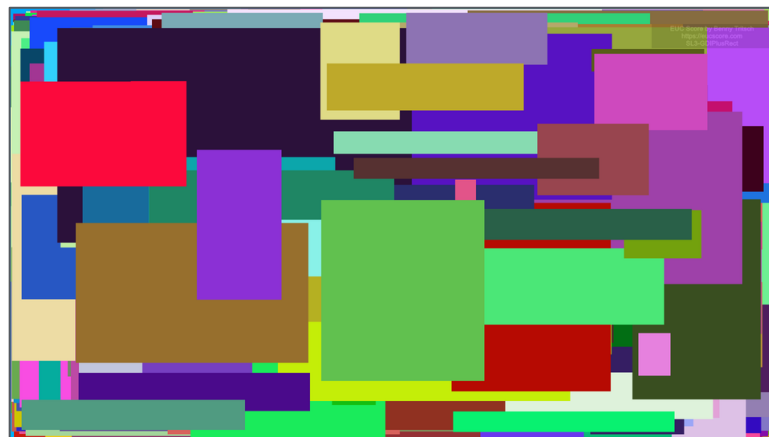
SL3-AppStart



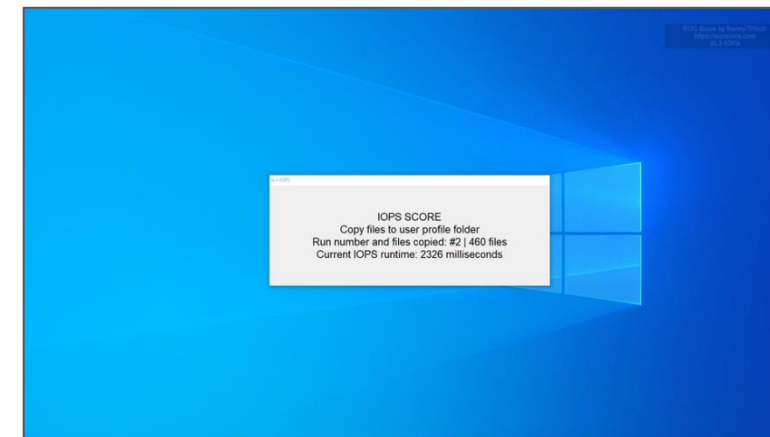
SL3-FractalsDragon



SL3-FractalsPythagorasTree



SL3-GDIPlusRect



SL3-IOPS



# CPU Instances – Performance & Costs

Instance	CPUZ - ST	CPUZ - MT	CBR23 - MC	CBR23 - SC	EUX 2023	EUC Score App Dialog	EUC Score App Start	EUC Score GDI+ Fractals Dragon	EUC Score GDI+ Fractals Pythagoras	EUC Score GDI+ Rectangles	EUC Score IOPS	Price	CPUZ Perf /Price	EUC Score GDI+ /Price	EUX Score /Price
	better ▶	better ▶	better ▶	better ▶	better ▶	◀ better	◀ better	◀ better	◀ better	◀ better	◀ better				
<b>Microsoft Azure</b>															
Azure D2s_v3 - Premium SSD	241.1	427.2	489	N/A	7.37	0.54	0.72	5.68	9.52	6.44	7.82	0.21	1837	34.35	35.10
Azure D4s_v3 - Premium SSD	250.7	817.2	1308	659	7.85	0.31	0.69	3.27	5.57	3.28	6.4	0.42	1886	9.62	18.69
Azure D2s_v5 - Premium SSD	323.4	545.4	1284	N/A	8.23	0.35	0.63	3.12	5.51	3.58	7.62	0.20	3588	20.35	41.15
Azure D2s_v5 - Standard SSD	308.9	570	1216	N/A	7.38	0.33	0.67	3.36	5.06	3.28	10.96	0.20	3492	19.50	36.90
Azure D4s_v5 - Premium SSD	410	1101	2724	1055	8.03	0.3	0.61	1.83	3.31	1.36	6.64	0.41	3443	5.28	19.59
Azure D4s_v5 - Standard SSD	390	1092	2521	960	6.87	0.29	0.59	2.02	3.33	1.55	9.03	0.41	3254	5.61	16.76

Price in US\$/hour (global average)

Quantitative results, no exact science





# GPU Instances – Performance & Costs


Instance	CPUZ - ST	CPUZ - MT	CBR23 - MC	CBR23 - SC	EUX 2023	EUC Score App Dialog	EUC Score App Start	EUC Score GDI+ Fractals Dragon	EUC Score GDI+ Fractals Pythagoras	EUC Score GDI+ Rectangles	EUC Score IOPS	Price	EUC Score GDI+ /Price	EUX Score /Price
	better ▶	better ▶	better ▶	better ▶	better ▶	◀ better	◀ better	◀ better	◀ better	◀ better	◀ better			
<b>Microsoft Azure</b>														
Azure NV6	256	1789	3843	671	7.37	0.28	0.62	8.71	15.31	1.55	5.57	1.33	6.41	5.54
Azure NV4as_v4	348	997	2304	893	7.95	0.29	0.68	106.89	194.31	1.3	14.08	0.47	214.54	16.91
Azure NV8as_v4	375	2107	4673	937	8.25	0.29	0.65	26.52	49.36	1.05	6.34	0.94	27.29	8.78
Azure NV16as_v4	395.7	4246	9445	945	8.03	0.29	0.66	10.36	20.83	1.3	3.98	1.88	5.76	4.27
Azure NV32as_v4	395.4	8414	17896	959	8.37	0.29	0.65	4.3	8.96	1.18	2.88	3.76	1.28	2.23
Azure NC4asT4_v3	365.8	1490	2988	909	8.22	0.28	0.61	4.21	8.58	1.08	11.3	0.81	5.68	10.11
Azure NC8asT4_v3	376.7	3059	7029	942	8.3	0.28	0.61	4.14	8.21	1.12	3.92	1.24	3.62	6.69
Azure NC16asT4_v3	395.9	6020	13959	956	8.28	0.28	0.61	4.52	8.87	1.16	3.67	2.14	2.27	3.87
Azure NV6adsA10_v5	494.4	2105.2	4895	1273	8.41	0.28	0.57	36.32	78.85	0.73	5.26	0.82	47.29	10.29
Azure NV12adsA10_v5	511.7	4016	9818	1309	8.36	0.28	0.57	19.12	36.42	0.82	2.68	1.63	11.50	5.12
Azure NV36adsA10_v5	548.8	12821	26897	1310	8.4	0.28	0.56	3.8	7.91	0.82	1.9	5.47	0.76	1.54



# Test Apps – Blender Benchmark

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Blender Benchmark Launcher

 blender® opendata.blender.org

## Benchmark Complete!

The benchmark finished successfully. Your results and system data that will be submitted to the Blender Open Data website are listed below.  
Learn more about how data is collected at [opendata.blender.org/about](https://opendata.blender.org/about)

Samples per minute:		System info:	
monster:	1566.043040	OS:	Windows (AMD64)
junkshop:	992.518321	CPU:	AMD EPYC 74F3 24-Core Processor
classroom:	867.352839	GPU:	NVIDIA A10-24Q



# Test Apps – SPEC ViewPerf 2020

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## SPECviewperf® 2020 Results

<http://www.spec.org/gwpg>

### Composite Scores (1920x1080)

*SPECviewperf measures the frame rate, or frames per second (FPS), at which your graphics card can render scenes across a wide variety of applications and usage models. Each viewset represents an application or a usage model, and each composite score below is based on a weighted geometric mean of many different scenes and rendering modes.*

### Composites by Viewset

*To explore a viewset in more detail, including the measured frame rate for each test of which the composite score is comprised, click on the viewset name in the menu to the left.*

Viewset	Composite Score	Window
3dsmax-07	144.37	1900 x 1060
catia-06	97.79	1900 x 1060
creo-03	108.25	1900 x 1060
energy-03	86.31	1900 x 1060
maya-06	419.07	1900 x 1060
medical-03	74.63	1900 x 1060
snx-04	451.06	1900 x 1060
solidworks-07	259.86	1904 x 1060





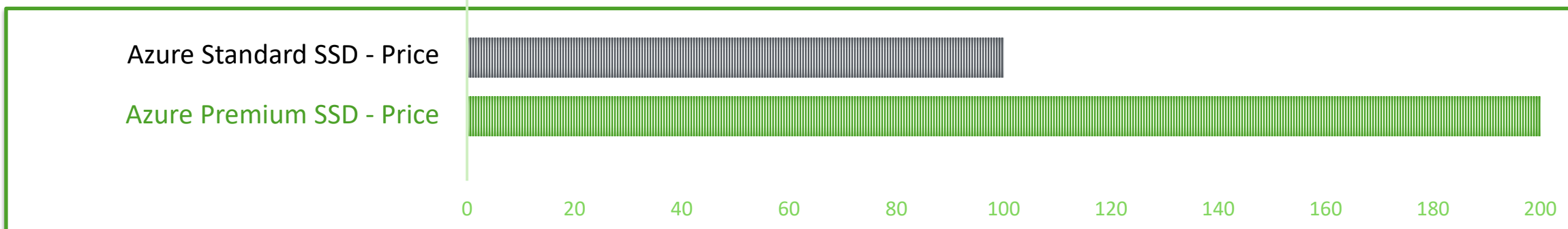
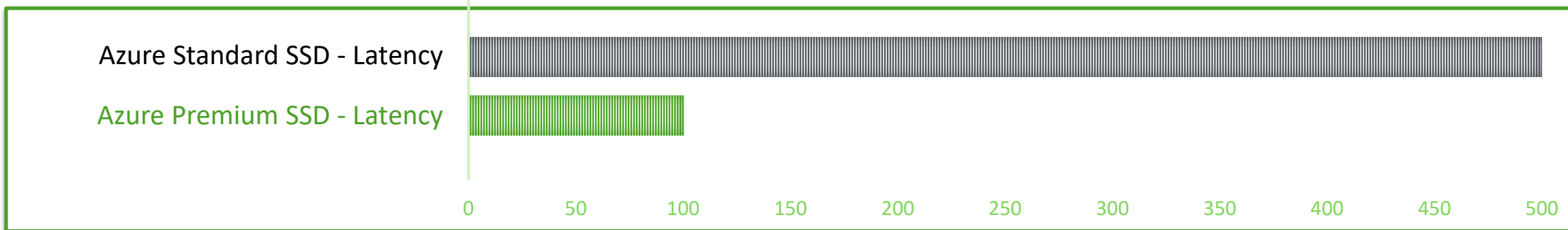
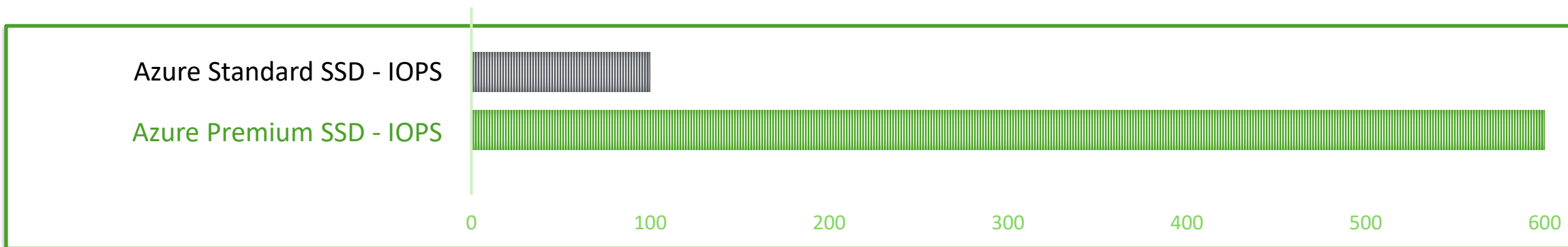
# GPU Instances – Performance & Costs

Instance	Blender CPU Monster	Blender CPU Junkshop	Blender CPU Class	Blender GPU Monster	Blender GPU Junkshop	Blender GPU Class	SPEC 2020 3dsmax	SPEC 2020 catia	SPEC 2020 creo	SPEC 2020 energy	SPEC 2020 maya	SPEC 2020 medical	SPEC 2020 smx	SPEC 2020 solidw	Price	SPEC Perf /Price	GPU Perf /Price
	better▶	better▶	better▶	better▶	better▶	better▶	better▶	better▶	better▶	better▶	better▶	better▶	better▶	better▶			
<b>Microsoft Azure</b>																	
Azure NV6	26.73	16.21	14.2	157	97	79	44.67	43.35	67.31	23.05	151.39	24.73	194	96	1.33	60.6	83.41
Azure NV4as_v4	15.63	9.09	7.8	FAIL	FAIL	FAIL	4.09	4.10	4.22	1.42	12.72	2.22	28	11	0.47	18.1	FAIL
Azure NV8as_v4	33.4	19.53	16.55	78	16	30	9.99	11.95	19.70	25.87	35.47	7.05	59	27	0.94	26.0	43.68
Azure NV16as_v4	66.53	40.07	32.68	162	56	79	23.53	23.64	37.92	37.22	86.62	14.41	120	56	1.88	26.5	52.68
Azure NV32as_v4	134.32	80.9	67.02	358	148	197	69.54	48.36	54.79	49.64	202.09	31.84	277	128	3.76	28.6	62.29
Azure NC4asT4_v3	21.24	12.38	11.04	725	485	465	83.68	64.26	102.26	38.48	241.46	46.62	293	155	0.81	157.5	686.44
Azure NC8asT4_v3	45.94	27.18	23.12	725	485	463	83.64	62.40	92.56	38.55	246.50	46.88	292	155	1.24	102.6	449.59
Azure NC16asT4_v3	90.92	55.74	47.12	709	471	466	84.00	59.04	80.78	39.10	248.49	47.17	295	158	2.14	59.1	256.39
Azure NV6adsA10_v5	32.72	19.74	16.09	FAIL	FAIL	FAIL	14.40	18.09	24.58	11.30	51.07	10.73	51	31	0.82	32.5	FAIL
Azure NV12adsA10_v5	67.11	41.5	33.44	371	216	196	42.69	41.44	51.57	32.51	125.94	21.93	109	67	1.63	37.6	159.75
Azure NV36adsA10_v5	199.24	125.35	97.6	1566	992	867	144.37	97.79	108.25	86.31	419.07	74.63	451	260	5.47	37.5	208.74



# Storage Performance / Cost Observations

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# Observations

- Windows 365 Cloud PC “Entry Level” performs better than expected – it’s ideal for Task Worker and Information Worker workloads at a 24/7 price that is hard to beat (< \$0.07/hour)
- Use Azure v5 VM types instead of v3 – 25% better performance and slightly lower price
- The Azure D4s\_v5 and D8ads\_v5 VM types are my personal favorites for single-session scenarios
- Azure NVv4 VMs do not provide great performance, despite the AMD M25 GPU – low 3D performance, no video encoding / no hardware encoding exposed
- Azure NV4v4 is limited in fps (18 is max) and it may fall behind CPU-only VM types
- Azure NC8asT4 – if you don’t need the vCPUs or RAM, then go for the NC4asT4 – same GPU; SPEC performance almost the same, but 30% cheaper
- Azure NV6adsA10 provides more CPU and RAM at the same price as the NC4asT4; But NC4asT4 provides much better GPU performance because of full GPU vs GPU partition
- CAUTION: NCasT4 VM types with missing certification for CAD applications may be a deal breaker



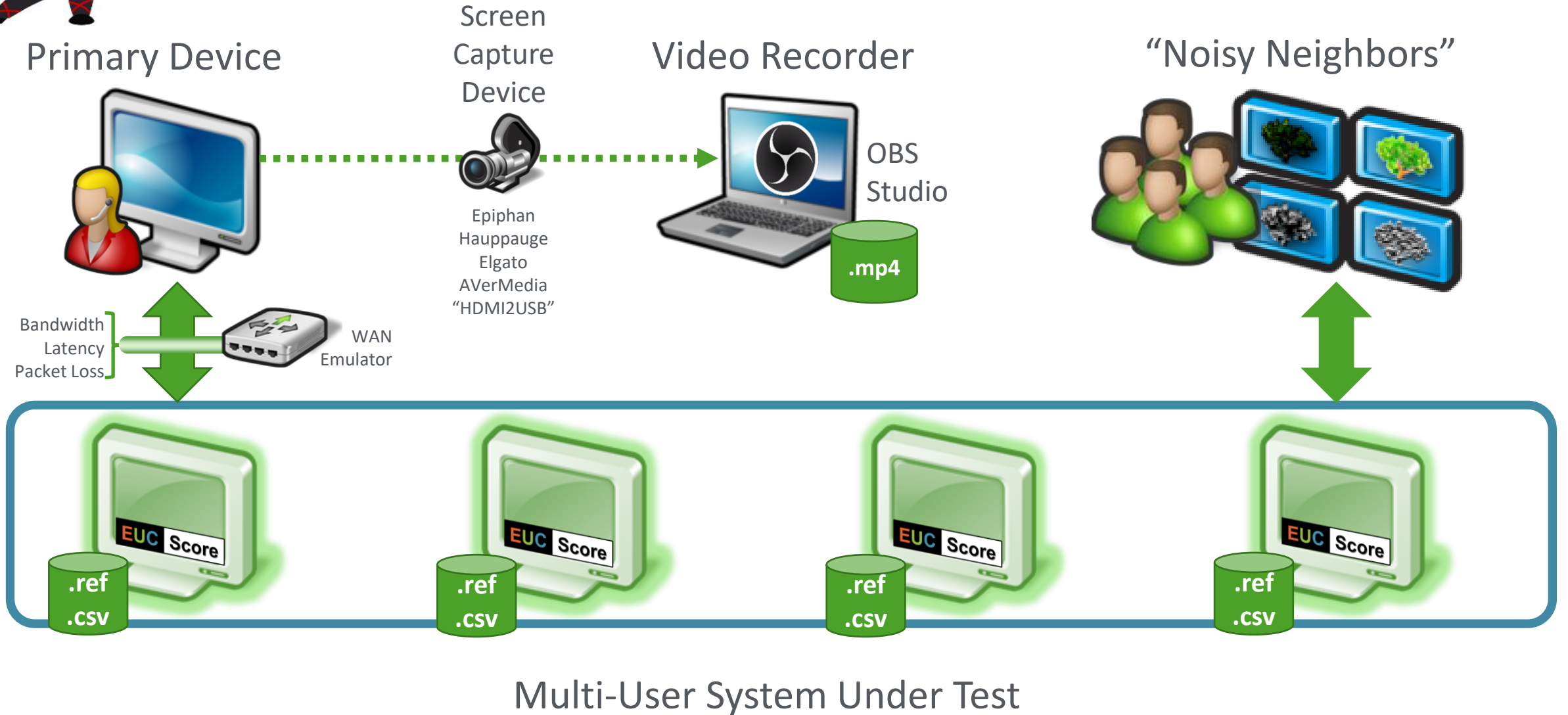


# Personas

	Persona Name	Rendering	IT Workforce	Description
	Task Worker	CPU	25-80%	<p>Windows 365 Entry-Level (2 vCPUs, 4GB RAM)</p> <p>AVD VM with CPU only or with shared GPU</p> <p>AVD VM with dedicated GPU</p>
	Information Worker	CPU or shared GPU	25-80%	
	Knowledge Worker	High-end CPU or shared GPU	10-50% ~400m	
	Power User	Shared GPU or dedicated GPU	5-50% ~200m	
	CAD/CAM Professional Designer	Dedicated GPU	5-25% ~25m	



# Next Step: Multi-Session Testing





# Call to Action

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

[info@eucscore.com](mailto:info@eucscore.com)

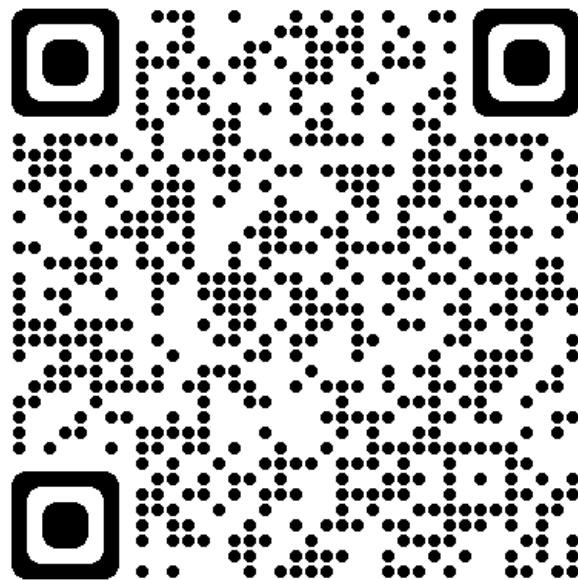


<https://eucscore.com>

**NOTE:** The EUC Score toolset including the Simloads is free for community benchmarks...







## We love Feedback

<https://workplaceninjasummit2023.sched.com/>



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**Thank you**

