

Porównanie wydajności i możliwości współczesnych silników do gier komputerowych

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Promotor

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Plan prezentacji

- 1 Definicje
- 2 Narzędzia
- 3 Źródła

Gra komputerowa

Aplikacja dostępna na platformie "Steam" oznaczona typem "Game"

Silnik do gier

Oprogramowanie
zaprojektowane i stworzone do
kreacji gier komputerowych





Ponad 1000 gier w tej
dekadzie na platformie "Steam"

Database of everything on Steam.

This third-party website gives you better insight into the [Steam](#) platform and everything in its database.

[Look through our frequently asked questions](#) to learn more about SteamDB, [join our Discord](#).

Most Played Games →

		Players Now	24h Peak
	Counter-Strike 2	1,377,575	1,497,245
	Dota 2	724,492	727,309
	PUBG: BATTLEGROUNDS	561,363	638,250
	Apex Legends	397,021	454,900
	HELLDIVERS™ 2	275,983	429,446
	Palworld	245,004	271,963
	NARAKA: BLADEPOINT	235,353	290,359
	Last Epoch	226,050	226,097
	Source SDK Base 2007	172,573	201,592
	Grand Theft Auto V	159,338	165,422
	Baldur's Gate 3	124,702	146,223
	Wallpaper Engine	112,404	121,959
	ELDEN RING	111,857	112,406
	Rust	105,657	122,824
	War Thunder	100,474	100,770


Trending Games

		Last 7 days	Players Now
	Astral Party 		29,930
	Secrets of Grindea 		3,392
	WRC 7 		9,990
	Welcome to ParadiZe		2,292
	Blackwake		1,893
	Space Crew: Legendary Edition 		1,922
	Tom Clancy's Rainbow Six Siege - T...		1,099
	Detroit: Become Human		5,246
	Supermarket Simulator 		34,143
	Age of Wonders 4		5,574
	PICO PARK		2,253
	Mount & Blade: Warband		15,413
	Middle-earth™: Shadow of Mordor™		1,315
	Smudge Coin Run	Trending on SteamDB	
	BRoS - Battle Royale of Survival	Trending on SteamDB	

Popular Releases →

		24h Peak	Price
	Astral Party	24,287	Free

Hot Releases

		Rating	Price
	Mina's Lagoon	88.23%	6/31

▼ **Type**

<input checked="" type="checkbox"/> Game	103615
<input type="checkbox"/> DLC	50204
<input type="checkbox"/> Music	6363
<input type="checkbox"/> Application	1885
<input type="checkbox"/> Video	1603
<input type="checkbox"/> Series	350
<input type="checkbox"/> Unknown	151
<input type="checkbox"/> Tool	57
<input type="checkbox"/> Demo	46
<input type="checkbox"/> Beta	11



▼ **Release Year**

<input checked="" type="checkbox"/> 2025	35
<input checked="" type="checkbox"/> 2024	3898
<input checked="" type="checkbox"/> 2023	14359
<input checked="" type="checkbox"/> 2022	12092
<input checked="" type="checkbox"/> 2021	11004
<input checked="" type="checkbox"/> 2020	9373
<input type="checkbox"/> 2019	7671
<input type="checkbox"/> 2018	7901
<input type="checkbox"/> 2017	6107
<input type="checkbox"/> 2016	4273

Show more



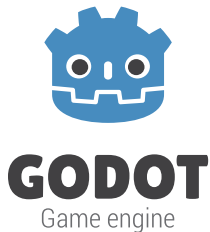
▼ **Technologies**

🔍 SteamDB detects used tech

Engine.

<input type="checkbox"/> Engine.Unity	24964
<input type="checkbox"/> Engine.Unreal	7569
<input type="checkbox"/> Engine.GameMaker	2631
<input type="checkbox"/> Engine.RPGMaker	1683
<input type="checkbox"/> Engine.PyGame	1550
<input type="checkbox"/> Engine.RenPy	1520
<input type="checkbox"/> Engine.Godot	1032
<input type="checkbox"/> Engine.Cocos	391
<input type="checkbox"/> Engine.XNA	355
<input type="checkbox"/> Engine.KiriKiri	178

Wybrane silniki - start



Ren'Py



Wybrane silniki

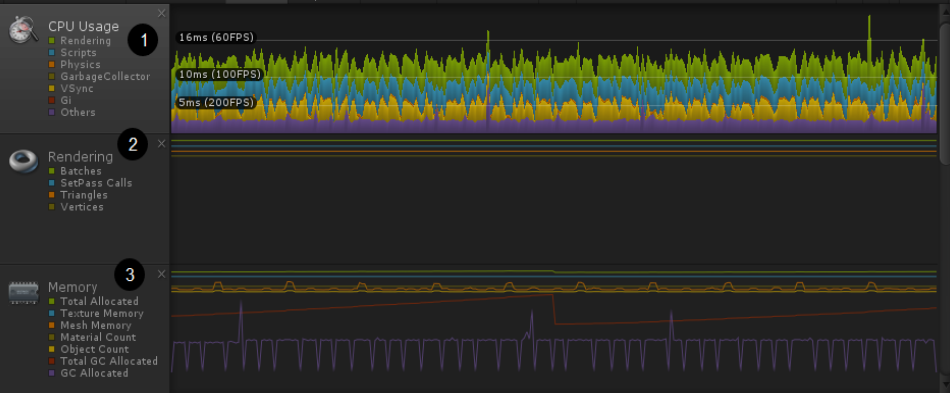
- Wyeliminowanie nie generycznych - Ren'Py, RPGMaker
- Wybór najpopularniejszych - Unity, Unreal

Wydajność silnika

- Klatki na sekundę (FPS)
- Zużycie CPU, GPU, RAM i VRAM
- Liczba draw calls
- Czas ładowania assetów
- Czas odpowiedzi na interakcję gracza

Możliwości Silnika

- Renderowanie grafiki
- Silnik Fizyczny
- Multiplatformowość (VR)
- Skryptowanie logiki gier (AI)
- Gry online
- Sklepy z assetami



Hierarchy

CPU:11.53ms GPU:0.00ms Frame Debugger

Overview

	Total	Self	Calls	GC Alloc	Time ms	Self ms
▶ Camera.Render	48.7%	16.3%	7	0 B	5.62	1.88
▶ BehaviourUpdate	24.5%	9.7%	1	1.3 KB	2.83	1.11
Overhead	11.6%	11.6%	1	0 B	1.33	1.33
UIPanel.LateUpdate()	3.8%	3.8%	2	64 B	0.44	0.44
▶ Physics.Processing	3.7%	2.2%	2	0 B	0.43	0.26
TextRendering.Cleanup	1.2%	1.2%	19	0 B	0.14	0.14
▶ GUI.Repaint	0.8%	0.2%	1	0.9 KB	0.10	0.02
Profiler.FinalizeAndSendFrame	0.7%	0.7%	1	0 B	0.08	0.08
TrackFollower2.FixedUpdate()	0.7%	0.7%	20	0 B	0.08	0.08
Train.LateUpdate()	0.6%	0.6%	1	0 B	0.07	0.07
MonoBehaviour2.FixedUpdate()	0.6%	0.6%	620	0 B	0.07	0.07
▶ AudioManager.Update	0.5%	0.4%	1	0 B	0.06	0.05
▶ Physics.ProcessReports	0.2%	0.0%	2	0 B	0.03	0.00
Physics.FetchResults	0.2%	0.2%	2	0 B	0.03	0.03

Select Line for per-object breakdown

Window

This Application Owner: wes.burn, 1 Instance(s)

Terminate Session

Instance	Type	Device	Platform	Status
Z3913-9908		Z3913	Windows	Running

Console

Automation

Profiler

Load Save Data Preview Live preview Data Capture Statistics FPS Chart Settings



Search stats or groups

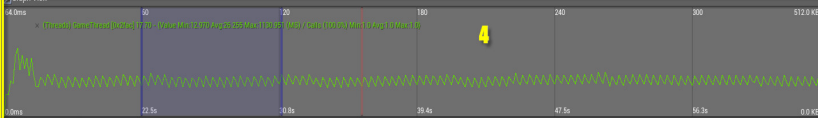
Group by Group Name

Sort by Stat Name

Hier Float Int Mem

- ALEOS (2) (0)
- AIBehaviorTree (1) (0)
- Anim (12) (0)
- AsyncIO (1) (0)
- AsyncLoad (1) (0)
- Audio (10) (0)
- Canvas (6) (0)
- Collision (1) (0)
- CPUStats (2) (0)
- D3D11RH (20) (0)
- DDC (3) (0)
- Engine (13) (0)
- Game (19) (0)
- GPUParticles (8) (0)
- InitViews (18) (0)
- KismetCompiler (11) (0)
- LightRendering (10) (0)
- LinkerLoad (3) (0)
- LoadTime (12) (0)
- Memory (20) (0)
- MemoryAllocator (4) (0)
- MemoryPlatform (11) (0)
- MemoryStaticMesh (4) (0)
- Navigation (1) (0)
- NoGroup (2) (0)
- Object (11) (0)
- ParticleMem (10) (0)
- Particles (21) (0)
- Physics (1) (0)
- Profiler (11) (0)
- Quick (32) (0)
- RenderThreadCommands (81) (0)
- RHI (12) (0)

Graph View

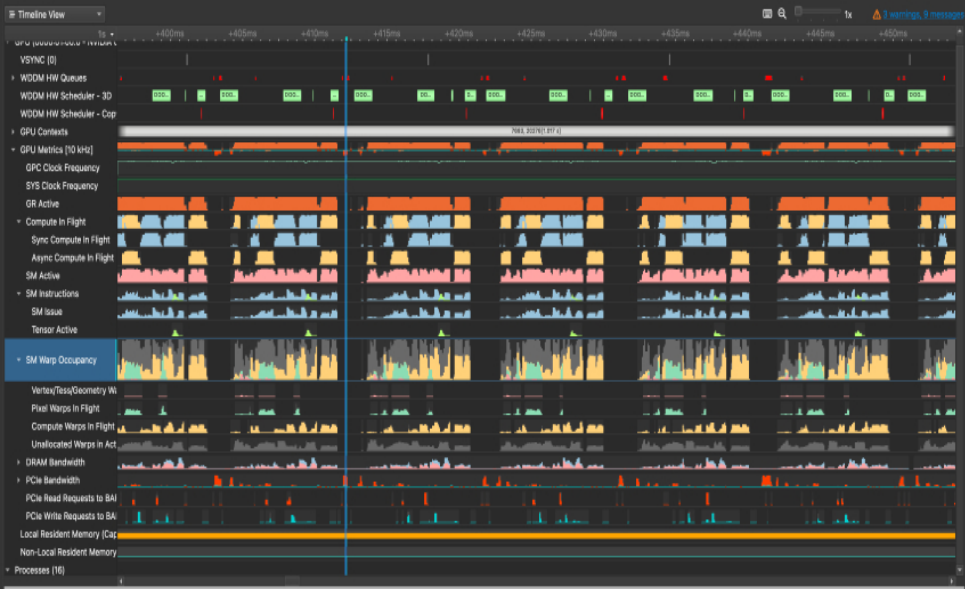


Z3913-9908

Type oneFrame Average Maximum View mode Hierarchical Inclusive Exclusive

Calling Functions	Current Function	Called Functions
	Render Thread	
		RenderThread.FDrawSceneCommand, 80.4% (16.728 ms)
		RenderThread.StateDrawWindowsCommand, 9.6% (1.991 ms)
		RenderThread.CPU Stall - Wait For Event, 6.7% (1.392 ms)
		RenderThread.ParticleUpdateDataCommand, 2.3% (0.468 ms)
		RenderThread.BeginFrame, 0.4% (0.092 ms)

Event Name	Inc Time (MS)	Inc Time (%)	Exc Time (MS)	Exc Time (%)	Calls	Avg Calls % of Thread	% of Frame
StateThread [0x6c]	20.829 ms	99.9%	0.000 ms	0.0%	1.0	0.0	100.0%
RenderThread [0x2534]	20.801 ms	99.7%	0.000 ms	0.0%	1.0	0.0	100.0%
RenderThread.FDrawSceneCommand	16.728 ms	80.4%	0.005 ms	0.0%	1.0	0.0	80.4%
RenderThread.StateDrawWindowsCommand	1.991 ms	9.6%	0.006 ms	0.3%	2.0	0.0	9.6%
CPU Stall - Wait For Event	1.392 ms	6.7%	0.000 ms	0.0%	32	0.0	6.7%
RenderThread.ParticleUpdateDataCommand	0.468 ms	2.3%	0.005 ms	1.1%	52.0	0.0	2.3%
RenderThread.BeginFrame	0.092 ms	0.4%	0.009 ms	9.5%	1.0	0.0	0.4%
RenderThreadCommands (81) (0)	0.053 ms	0.3%	0.046 ms	87.9%	6.0	0.0	0.3%
RHI (12) (0)	0.038 ms	0.2%	0.038 ms	49.6%	0.3	0.0	0.2%



Expert System View

Settings

CUDA Async Memory with Pageable Memory

The following APIs use PAGEABLE memory which causes asynchronous CUDA memory operations to block and be executed synchronously. This leads to low GPU utilization.

Suggestion: If applicable, use PINNED memory instead.

CL command:

SKIPPED: /Users/hnd/Downloads/Vulkantrace.sglite could not be analyzed because it does not contain the required CUDA data. Does the application use CUDA runtime libraries?

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Nsight - Analiza FPS

▼ Frame duration (Target FPS: 30 Hz)

▶ CPU frame duration

GeForce RTX 2080 Ti

Showing 108 of 2113 CPU frames | avg 4.08ms | min 2.82ms | max 6.98ms | FPS 245.09 | 99%<6.64ms



Nsight - Analiza FPS

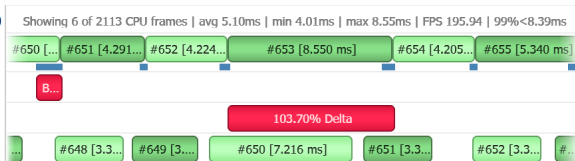
▼ Frame duration (Target FPS: 30 Hz)

▼ CPU frame duration

Frame health

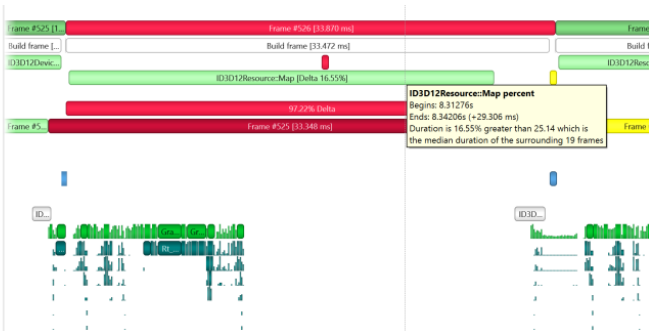
Stutter

GeForce RTX 2080 Ti

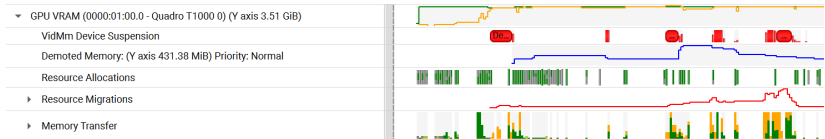


Nsight - Analiza FPS

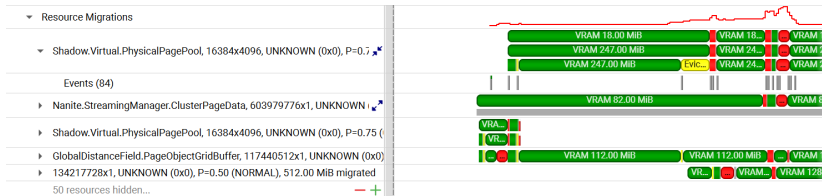
- ▼ Frame duration (60 FPS)
- ▼ CPU frame duration
 - Frame Action
- ▼ Frame health
- ▼ Stutter
- ▶ GPU frame duration
- ▼ DX12
 - ▶ Command Lists Creation
 - Swap Chain 0
 - ▼ Command Queue 0 (Direct)
 - API
 - Workload
- ▼ GPU Command List Markers



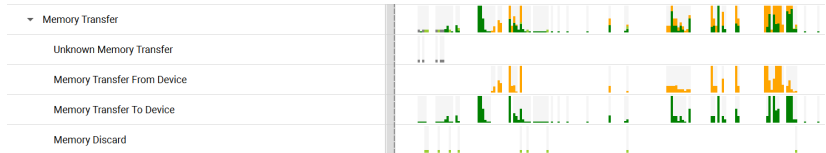
Nsight - Zużycie VRAM



Nsight - Zużycie VRAM



Nsight - Zużycie VRAM



Jak porównywać?

- Stworzenie gry na obu
- Porównywanie istniejących gier
- Porównanie samych edytorów



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Wybór gatunku

FPS:

- Wystarczająco skomplikowany
- Grafika
- Fizyka
- Klasyczny benchmark

Problem

Inklinacja Silnika

- $\frac{2478}{39713} \approx 6\%$ gier Unity to FPS
- $\frac{1765}{11158} \approx 15\%$ gier Unreal to FPS

Źródło: steamdb.info

Wybór gatunku

Bullet hell:

- Wystarczająco skomplikowany
- Grafika
- Czas jest ważny

2,270,270

HP

2

100%

HIGH SCORE

50,000,000

B' B' B'



Wyzwania

- Sprzęt
- Umiejętności
- Podobne wersje silnika
- Inklinacja Silnika
(3% Unity, 2.4% Unreal)

Ocena łatwości użycia

- Dokumentacja
- Intuicyjność
- Materiały
- Zasoby (Assets)
- Dostępne funkcje

Po stworzeniu

Przejsć obie gry, monitorując przy
użyciu Nvidia Nsight i porównać wyniki

Źródła

- <https://steamdb.info/>
- <https://docs.nvidia.com/nsight-systems>
- An Overview Study of Game Engines, Faizi Noor Ahmad
- Game Engine Architecture, Jason Gregory

Źródła obrazów

- Crysis - kanał youtube Thronefull
- BulletHell - kanał youtube Beat that boss