

COULD RAY-TRACING BE USED TO DEVELOP GRAPHICS HARDWARE BENCHMARKING TOOLS WHICH PROVIDE THE USER WITH MORE USEFUL INSIGHT?

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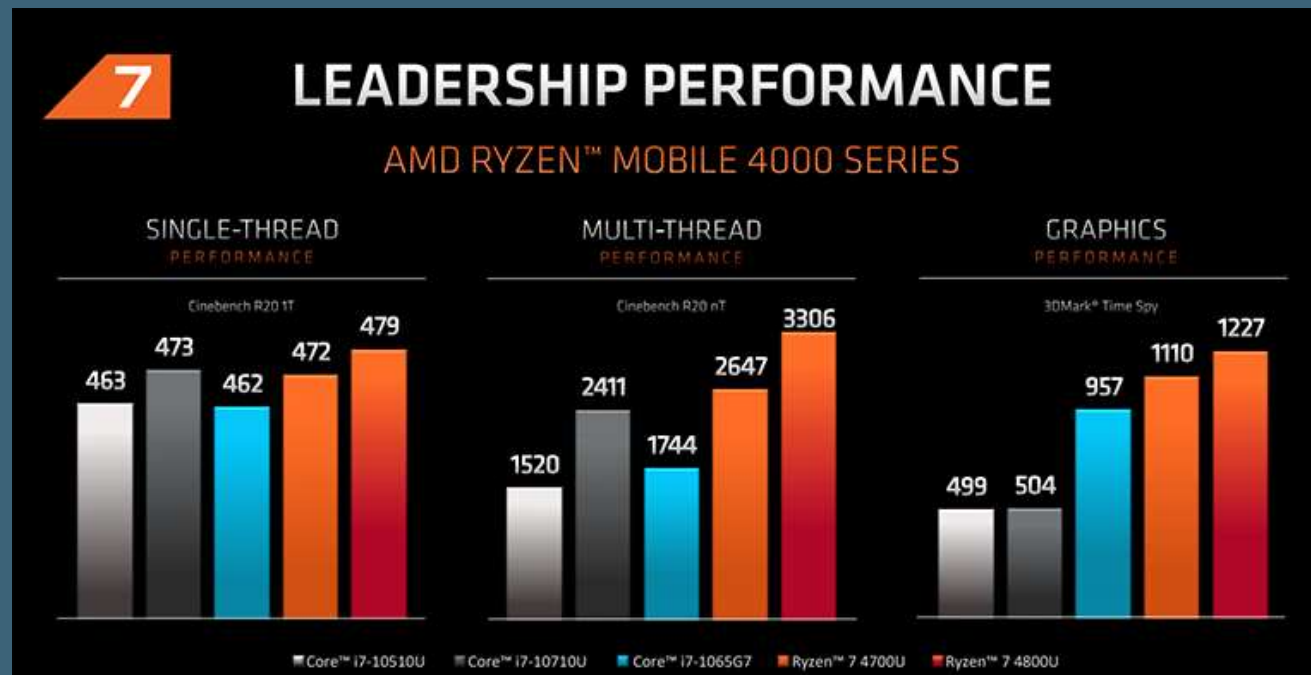
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Introduction

- This project proposal is looking into how graphics benchmarks can be improved
- This will be done by taking what people dislike about the existing benchmarking tools
- Then building upon them to create a new one
- An interest was developed due to many complaints seen on a day-to-day basis

What are benchmarks?

- Benchmarking, in simple terms, is the comparison of a product, service, and procedure to those of other businesses that are seen as leaders in a particular industry or set of industries. (13)



What is Ray Tracing? – Software based

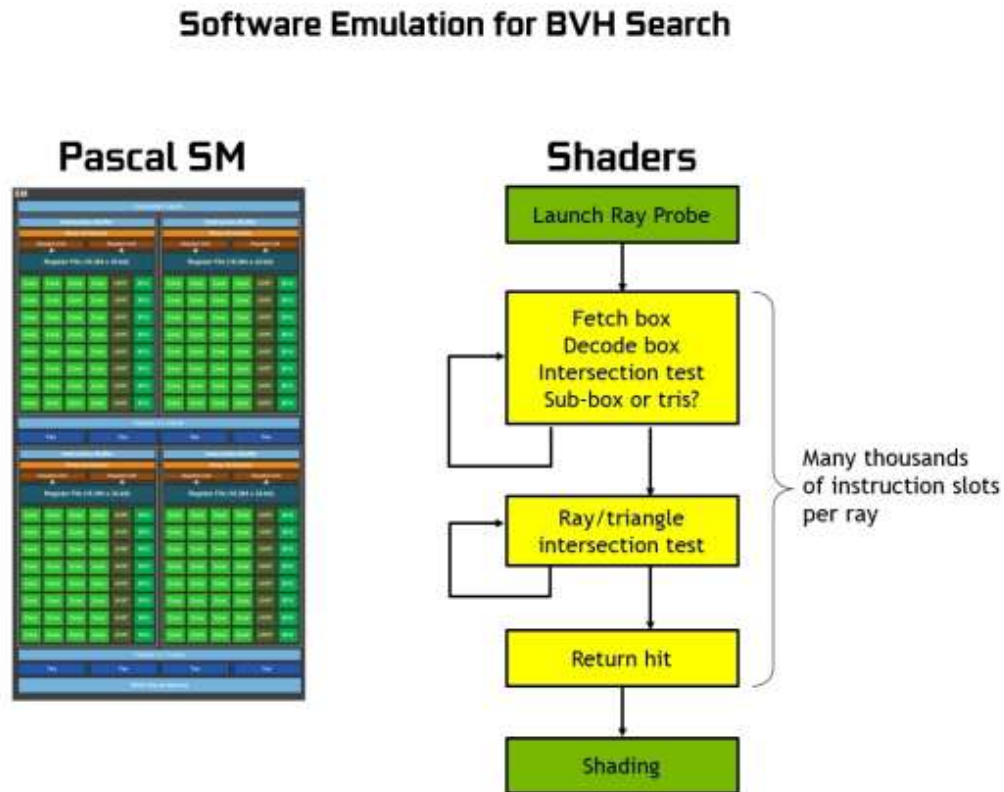
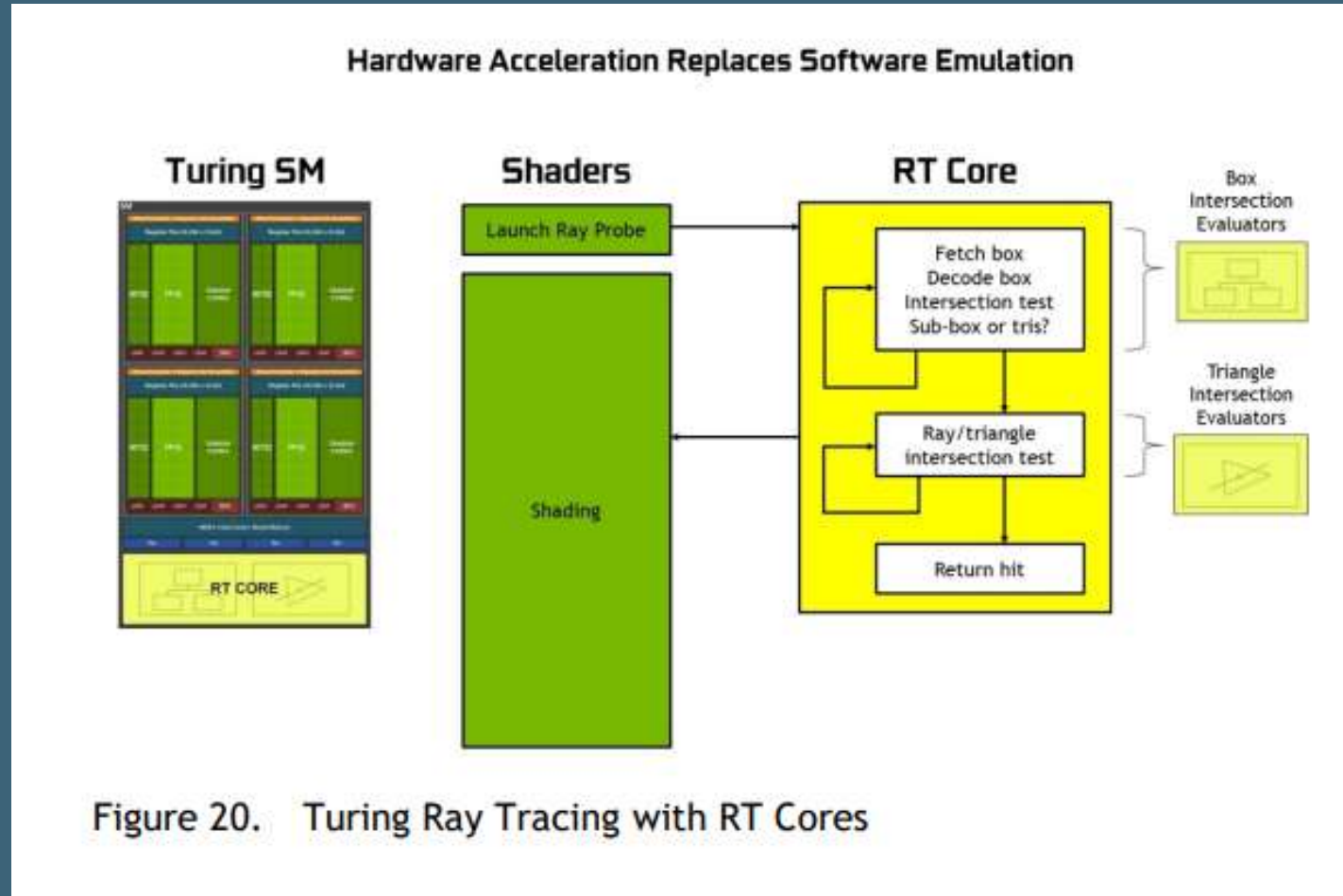


Figure 19. Ray Tracing Pre Turing

What is Ray Tracing? – Hardware based



What is Ray Tracing?



What Graphics APIs Exist? – DX12

- DirextX12 is a complete redesign of the continuously improved DirectX APIs used in games e.g., DX11. (10)
- DX12 removes the burden on drivers with queuing, scheduling and synchronization of tasks within hardware. (10)
- DX12 Ultimate builds upon DX12 by brining DXR Ray Tracing. (11)

What Graphics APIs Exist? – Vulkan



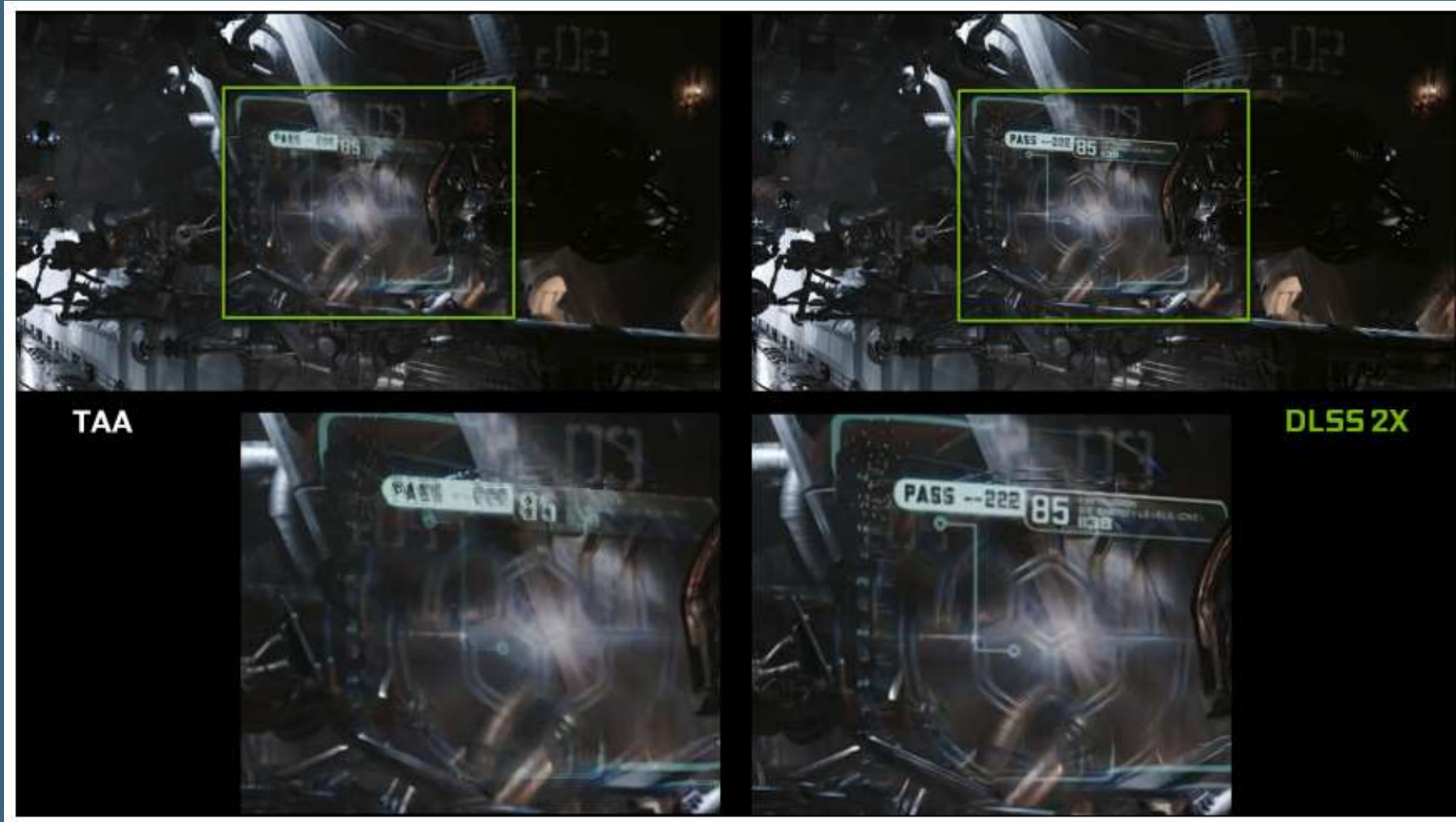
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What is Image Reconstruction/Upscaling and What APIs Exist?

- The easiest and most basic upscaling technique is to stretch a lower quality image onto a bigger monitor. (14)
- Filtering is used to smooth the image and round out any jagged edges. (14)

NVidia Deep Learning Super Sampling



AMD Fidelity FX Super Resolution

WHY USE AMD FIDELITYFX SUPER RESOLUTION 1.0?



Super Resolution

Generates "super resolution" image each input frame.

Support for any area scale factor between 1X and 4X.

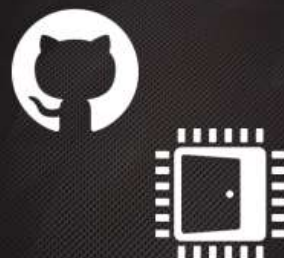
Large performance improvements over native rendering.



Cross-platform

Run on a wide variety of GPUs including older architectures.

Can be ported onto multiple platforms without restriction.



Open source

Provided on GPUOpen under an MIT license.



Easy to integrate

Full source provided.

Native samples and UE4 patch provided.

Also available in Xbox GDKX.

Requires no historical context.



Highly optimized

Hand-optimized for great performance across a wide variety of GPUs.

What Game Engines Support These APIs? - Unity

Advantages:

- Easy to make small games vs other engines, for example, Unreal (8)
- More popular and has more guides on websites like YouTube (8)
- Uses C# which is easier instead of C++ like others, for example, Unreal (8)

Disadvantages:

- Graphics side of the engine is not as good as other engines e.g. Unreal (8)
- Rendering times are slow, for example, light rendering (8)
- Source code is only given out under certain conditions and also comes with a cost (8)

What Game Engines Support These APIs? – Unreal Engine

Advantages:

- Has a built-in visual scripting solution (8)
- Can produce the best quality graphics (8)
- Unreal is open source (8)

Disadvantages:

- Visual scripting cannot do everything and will require C++ knowledge (8)
- Smaller asset store (8)

What Benchmarking Tools Exist? – 3DMark

- Benchmarking tool that aims to measure the performance of devices over many different platforms.
- Each benchmark being designed for those platforms to scale over phone to high performance PCs.
- These benchmarks aim to test the hardware to the best of they're abilities.

What Benchmarking Tools Exist? – Unigine Superposition

- Superposition is one of the newest benchmarks released by Unigine over the last few years.
- Unigine are well known for their benchmarking tools
- Superposition once again builds on top of Heaven and Valley by adding even more advanced rendering techniques

Conclusion

- Hardware benchmarks are the very tools used by companies such as AMD, Intel and Nvidia.
- Many benchmarks over the years have been created over the years to take full advantage of these new technologies.
- This has come with some downside such as bias in scoring as well as scores that literally make zero sense.
- This is why this project is proposing to create a new graphics benchmark using a game engine that is open to anyone to use for their games, this being Unity.

Aim 1: Discover existing computer benchmarking tools and conclude where they could be improved

Objective 1:

- Research online existing benchmarks to gain enough information to create surveys

Objective 2:

- Conduct a survey asking computer enthusiasts what they like and dislike about existing solutions

Objective 3:

- Analyse findings to conclude how they could be improved given the project's time frame.

Aim 2: Discover existing tools and technologies used by games and new and emerging technologies gaining traction

Objective 1:

- Research online existing technologies and research online existing tools

Objective 2:

- Research online new and emerging technologies.

Objective 3:

- Analyse findings to draw conclusions on how they could be integrated into the project given the time frame.

Aim 3: Design and develop a new hardware benchmarking tool based on research carried out in the first two aims

Objective 1:

- Design GUI for the main application and the portable HTML file to show results, incorporating what was found out in the last two aims.

Objective 2:

- Develop the main application, portable HTML web page and small game scene within Unity with all the basics needed.

Objective 3:

- Test the solution on many different pieces of hardware to see if the main application, portable HTML document and the unity demo all work as intended.

Objective 4:

- Make any improvements, if necessary, based on what was found from the testing stage.

Aim 4: Review and survey of proposed tool to gather feedback

Objective 1:

- Design and create survey with final solution attached.

Objective 2:

- Release survey out to the previous participants and wait for results to come back for analysis.

Objective 3:

- Once feedback has returned, analyse to conclude the effectiveness of the new solution too.

Research Methods

- Interpretivism
- Inductive
- Action Research and Grounded Theory
- Longitudinal
- Questionnaire

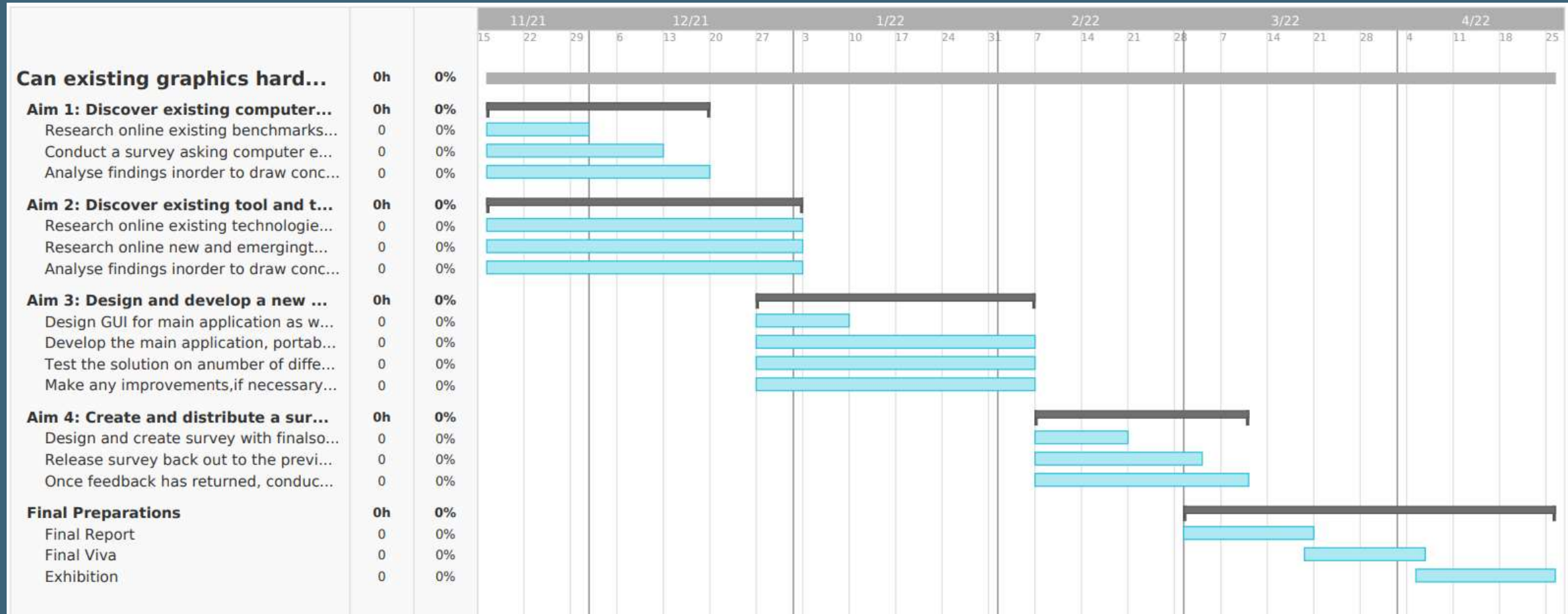
Resources Needed - Hardware

- For this project to be carried out a computer equipped with a DX12 Ultimate/DXR compatible graphics card.
- The CPU will also need to support the X64 architecture with the addition of SSE2 instruction set support as stated by Unity on their website.

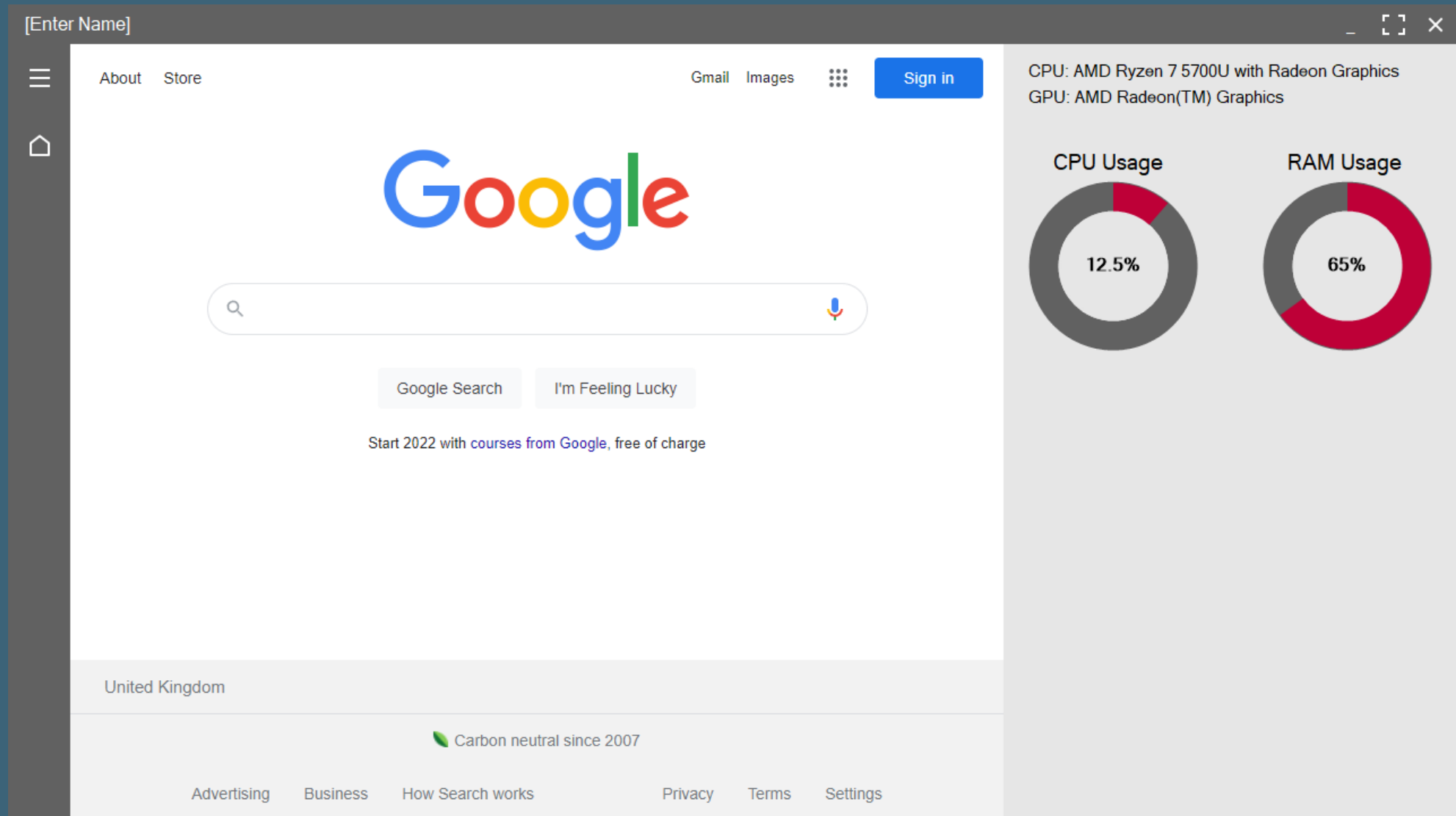
Resources Needed - Software

- The project will require, the latest version of Unity to create the actual 3D ray tracing demo to test the graphics hardware.
- It will also require APIs such as OpenHardwareMonitor.
- To create the GUI for the user to select the benchmark they wish to run Visual Studio will be required.

Project Plan



Paper Prototype



Any Questions?

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