What is the V8 Engine and the future of 5G submitted to Liverpool Hope University

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Abstract

This paper will explain How does the v8 engine work? With the advent of 5G what services may be provided in the future that are currently not Possible? The paper explains what both 5G and the V8 engine is. In addition, explains how the v8 engine works in depth including the runtime environment node.js. This paper also discussed how 5G is currently being used today along with the importance of 5G, why it's needed which was particularly focused on the ultra-light latency. The importance of the V8 engine and Node.js was explained especially for the use of serverless functions and Cloudflare workers. The future of both these technologies was discussed covering topics such as medicine and autonomous vehicles with 5G and the exciting improvements to be made within the v8 engine to create a flawlessly smooth system.

Contents

Intro

This paper will discuss what the v8 engine is and how it is used, in addition to what future services that are currently not possible may become a possibility thanks to the advent of 5G. First in order to do this, an understanding of what 5G and the v8 engine is.

What is 5G?

5G is the 5th generation mobile network, it is a new global wireless standard after 4G. 5G is designed to connect practically everyone and everything together.5G wireless technology has the aim to supply a higher ultra-low latency, multi-Gbps peak data speeds, increased availability, better reliability and a better user experience. It has the potential to boost many technologies into a new frontier. The benefits for media such as gaming and streaming will be immense, however this is just the beginning and this paper will explain in detail where 5G is today and The possible future technologies it leads to.

What is the V8 engine?

The V8 engine gets its name because it is fast and powerful like an eight-cylinder car engine, is a JavaScript engine that's open source developed by the chromium project for google chrome and chromium web browsers, it is currently the backbone of these browsers. The reason it was created was to improve the performance of JavaScript execution, originally created for execution by web browsers but now however is able to execute JS code outside the browser enabling server-side scripting. The V8 translates JS code to a more efficient machine code rather than using an interpreter, this is done to achieve faster JS execution speeds. These features allowed Edge service providers like StackPath use the V8 engine to provide better serverless scripting services. An edge service is a component which is exposed to the public internet. It acts as a gateway to all other services, which we will refer to as platform services.

Area of focus

How the V8 engine works

The V8 engine does not produce any intermediate code and that's what makes it unique, then it executes the translated, or compiled, code. V8 optimises JavaScript execution as well. Chrome V8 performs what is called just-in-time compilation. Instead of compiling JavaScript in advance, it compiles the code at the same time that it is executed.

A key feature of the V8 engine is sandboxing, "sandbox" is an environment in which executing software becomes isolated from other environments including those on the same machine. Each process is sandboxed, this will ensure that the JS functions will run separately from one another, ensuring that the execution of one piece of code will not affect any other code, and the V8 does this without slowing performance.

Node.js

Built Using the V8 engine Node.js was created, it is a runtime environment for executing JS code. Just like the v8 engine node.js is open source and free however something the v8 has and ode.js lack is the built-in sandboxing. Node.js is asynchronous, meaning that it can have more than one process start as opposed to waiting for one process to complete before starting another.

5G today

The average individual if asked what 5G is would give an answer along the lines of cell phone technology that's faster and essentially in today's world that is fairly accurate. 5G is not yet widely available, it's mainly available in areas where the technology is being tested. Attached with 5G comes with the stigma that it's dangerous which is simply not true and has had a minor hindrance in development. However, there are issues with 5G, particularly security issues. 5G requires the installation of millions of small cell sites in neighbourhoods and communities across the globe before it can truly achieve its goal of connecting everyone and everything together. These sites intend to emit higher frequency radio waves than that of 4G, so why all the additional cell sites? It's simple, the higher the frequency, the shorter the wave burst. What this means is that there will be higher quality at the cost of range and thus the extra cells must be installed.

Results and findings

Why are V8 and Node.js important for serverless computing?

Node.js has become an extremely useful tool for serverless functions in the modern day. It's a necessity for serverless functions to execute when they are triggered, this is where node.js comes into action as many serverless computing vendors offer Node.js as a runtime for serverless JS functions. Serverless functions let developers develop and update a piece of code during the running of a computer program without interrupting the run. This in turn can then be executed in response to an event, much easier such as a user interacting with an element on a web application. This makes scaling the code easier and cost efficient for implementing microservices.

However, Cloudflare workers run directly on the v8 engine. Cloudflare workers offers the ability to run JS in hundreds of its data centres around the globe, with the use of a worker, this provides the ability to modify a site's HTTP requests and responses. There are multiple reasons for Cloudflare workers to run directly on the v8, one reason is cold starts. Cold starts are speed of execution for functions that have not been used recently. This is where v8 comes in as cold starts are an issue in serverless computing the v8 gives it the ability to jump start the execution typically within 5ms. The issue with using node.js in this situation is the extra overhead adding additional ms longer to the execution. Additionally, the v8 increases security by sandboxing JS functions automatically.

Why 5G is important

Other than the supersonic fast upload and download speeds, 5G will give very little latency or delay when you do things that require it. Some examples are gaming on phones and video calling. Gaming on phones will have very little latency or lag and gives an overall better experience. Numbers taken from 2018 state 2.3 billion gamers across the globe spent $137.9 billion on games. That's a lot of money and a lot of people. It's difficult to deny that 5G could possibly expand this market even further. This shows that 5G is important for both the economy and the comfort of users, reducing stress with less latency issues.

Video calling is good but now you can video call with higher quality with no reduction in actual call quality and use your camera's full potential when we're video calling instead of the image being compressed and becoming much lower quality on the receiving end.

Analysis

The Future of V8

The primary goal of the v8 engine is to make JS run as fast as possible. One crucial task for the v8 engine is improving a distributed system where it's possible for an individual unit to shut down while the rest of the units continue to by taking over the functionality. This creates a more robust system similar to cloud system architecture where the system continues smoothly even if a single device were to crash.

The Future of 5G

As mentioned in the previous section of this paper a major role of 5G is ultra-low latency. Ultra-low latency could lead to some fascinating technologies in the future, one in particular that will be discussed is remote surgery. What is remote surgery? To put it simply a surgeon would not need to be in the same room as their patient. The surgeon could simply make use of VR, put on a headset and straight to work. However ultra-low latency is still latency, it's virtually non-existent, not non-existent and surgery is a delicate matter so how can this technology be used? One major benefit of this technology would be for emergency surgery where there are no surgeons available. Another benefit would be for training purposes, a surgeon could go into a VR simulation on a fake patient but could be programmed to be lifelike while ensuring surgeons are precise. This would be particularly useful for Medical school. Another magnificent possibility that may arise from 5G could be autonomous vehicles on the road. These vehicles would require lots of data in fact they would rely on it. They are already partially in use today such as Tesla's autopilot, which is impressive, but has a long way to go and 5G might just be the saving grace.

Conclusion

In conclusion to this paper the technologies discussed are both extremely exciting premises for the future. With 5G on the path to connecting the world the possibilities the technologies it may lead to are in abundance with the likes of remote monitoring bringing modern surgery into a new frontier. Finally, self-driven cars that can be relied upon.

In addition to the v8 engine which one day could make a flawless distributed system that could function even if another system were to fail or maybe even one day have all types of web pages load at extremely high speeds no matter the location or content. Not to mention perhaps even in ways that right now couldn't even be imagined.

By no means whatsoever does this paper cover all future technologies of 5G or all the uses of the v8 engine. This paper delivered what it was intended to cover how the v8 engine works and the future of 5G. The result of which has shown a clear shift to come in modern technologies.