Outlook

Request for Guidance on JavaScript-to-C++ Transpiler Project

À partir de Simon Bandiera <sb2440@kent.ac.uk>
Date Mar 17/06/2025 16:43
À Stefan Marr <S.Marr@kent.ac.uk>
Cc Hugo Galan <hg310@kent.ac.uk>

Hello Stefan,

I hope you're doing well.
My name is Simon Bandiera, I'm a French exchange student currently finishing my MSc in AI at the University of Kent. I'm reaching out regarding my end of study project of my French studies that I'm doing at Epitech. With 2 others studens, I've been working on building a transpiler from JavaScript to C++. We began the project last September and have since implemented most of the ECMAScript 5.1 specification (link). We have for objective to keep the simplicity of high-level programming but still have performance equal to low-level languages.

As part of the project requirements, we are encouraged to seek feedback from professionals in related fields. Based on your University of Kent profile, we thought you might be interested in taking a look at our work and potentially offering some feedback or suggestions for improvement.

The project is fully open-source, and you can find the main repository here:
- https://github.com/JS-CMP/JS-CMP
We also have related components in our GitHub organization:
- https://github.com/JS-CMP/
And an early POC website (still in development):
- https://js-cmp.github.io/web/

If you're open to a brief exchange, either in person (if you're still at the university) or via email/Teams, we would be very grateful for your insights.

Thank you for your time ,

Simon Bandiera

Outlook

Re: Request for Guidance on JavaScript-to-C++ Transpiler Project

À partir de Stefan Marr <S.Marr@kent.ac.uk>
Date Mar 17/06/2025 16:59
À Simon Bandiera <sb2440@kent.ac.uk>
Cc Hugo Galan <hg310@kent.ac.uk>

Hi Simon:

Do you have a more complete write up of how things work?

I'd be curious how you deal with garbage collection for instance, and what you success criteria are.
I suspect performance is the key goal?

Have you tried running any of the JavaScript benchmark suites?

I have my own benchmarks, which are meant to allow comparing between languages, so, there's a JavaScript and C++ versions for the same set of benchmarks here:
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It has different goals than the Computer Language Benchmark game, so, things are a bit different.

I am still at Kent, yes. Am around for most of this week, or Thursday/Friday next week, if you want to have a chat.

Best regards
Stefan

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Re: Request for Guidance on JavaScript-to-C++ Transpiler Project

À partir de Simon Bandiera <sb2440@kent.ac.uk>
Date Mar 17/06/2025 17:35
À Stefan Marr <S.Marr@kent.ac.uk>
Cc Hugo Galan <hg310@kent.ac.uk>

Hi Stefan,

Thanks for the quick answer !

Since right now we are focusing on replicating all JavaScript features before switching our attention to runtime features such as garbage collector, network management and such things, we don't have a dedicated one for now.

Indeed, the key goal is performance, completing the project in its entirety and for it to be able to handle basic JS API transpiling is a first step we are focusing on reaching. I can start to work on a graph representing the different interactions between classes and stuff like that if you find that interesting.

For testing, we are using test262 right now, you can take a look at our custom runner than only execute tests that have features of the ECMAScript 5: https://github.com/JS-CMP/Tester.

Your benchmarks looks really interesting ! Once the project is a bit more advanced and we have a complete pipeline to transpile the JavaScript code we will for sure use it to compare the binary to raw C++ and JavaScript, it will give us good inside on where we stand performance wise.

Best,
Simon

From: Stefan Marr <S.Marr@kent.ac.uk>
Sent: Tuesday, June 17, 2025 4:59 PM
To: Simon Bandiera <sb2440@kent.ac.uk>
Cc: Hugo Galan <hg310@kent.ac.uk>
Subject: Re: Request for Guidance on JavaScript-to-C++ Transpiler Project

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Re: Request for Guidance on JavaScript-to-C++ Transpiler Project

À partir de	Stefan Marr <S.Marr@kent.ac.uk>
Date	Mar 17/06/2025 18:33
À	Simon Bandiera <sb2440@kent.ac.uk>
Cc	Hugo Galan <hg310@kent.ac.uk>

Hi Simon:

> On 17 Jun 2025, at 16:35, Simon Bandiera <sb2440@kent.ac.uk> wrote:
>
> Since right now we are focusing on replicating all JavaScript features before switching our attention to runtime features such as garbage collector, network management and such things, we don't have a dedicated one for now.

Hm, garbage collection isn’t really like network support though.
It’s an intrinsic property of the language.

While you could always use something like this: https://eur01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgithub.com%2Fivmai%2Fbdwgc&data=05%7C02%7Chg310%40kent.ac.uk%7Cbaf74e7ae08b4dfa82fb08ddadbcba1a%7C51a9fa563f32449aa7213e3f49aa5e9a%7C0%7C0%7C638857748273073315%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIwLjAuMDAwMCIsIlAiOiJXaW4zMiIsIkFOIjoiTWFpbCIsIldUIjoyfQ%3D%3D%7C0%7C%7C%7C&sdata=lr%2FLAIkMQHkRruX53weGyCENetTOu3OhVUrzEOcZCOE%3D&reserved=0
Or perhaps https://eur01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fv8.dev%2Fblog%2Foilpan-library&data=05%7C02%7Chg310%40kent.ac.uk%7Cbaf74e7ae08b4dfa82fb08ddadbcba1a%7C51a9fa563f32449aa7213e3f49aa5e9a%7C0%7C0%7C638857748273100801%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIwLjAuMDAwMCIsIlAiOiJXaW4zMiIsIkFOIjoiTWFpbCIsIldUIjoyfQ%3D%3D%7C0%7C%7C%7C&sdata=bd36MJw40Ky9k2bwxksBWtIjKagjmWT8UT%2FTng4mIHk%3D&reserved=0

I think you will make many design decisions that may make it harder to consider proper GC support at a later point.

There are some other projects which offer prices garbage collection:
- https://eur01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgithub.com%2Fwingo%2Fwhippet&data=05%7C02%7Chg310%40kent.ac.uk%7Cbaf74e7ae08b4dfa82fb08ddadbcba1a%7C51a9fa563f32449aa7213e3f49aa5e9a%7C0%7C0%7C638857748273116576%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIwLjAuMDAwMCIsIlAiOiJXaW4zMiIsIkFOIjoiTWFpbCIsIldUIjoyfQ%3D%3D%7C0%7C%7C%7C&sdata=2njbYtNCipq2SvOkrhyCvO%2FP5mjORrXF42lkb5DWaM8%3D&reserved=0
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SdE0BWRqvOzXr%2FFq61ZXkdya6EKTlyJvmDxHzI%3D&reserved=0

Might be worth considering this more actively.
Without GC, it’s not really ECMAScript.
And if you want to have performance that’s better than V8, you’ll likely need a precise GC.

> Indeed, the key goal is performance, completing the project in its entirety and for it to be able to handle basic JS API transpiling is a first step we are focusing on reaching.

Have you looked at other projects compiling JavaScript ahead of time?

Here’s one:
https://eur01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww-sop.inria.fr%2Fmembers%2FManuel.Serrano%2Fpubli%2Fserrano-dls18.pdf&data=05%7C02%7Chg310%40kent.ac.uk%7Cbaf74e7ae08b4dfa82fb08ddadbcba1a%7C51a9fa563f32449aa7213e3f49aa5e9a%7C0%7C0%7C638857748273145442%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIwLjAuMDAwMCIsIlAiOiJXaW4zMiIsIkFOIjoiTWFpbCIsIldUIjoyfQ%3D%3D%7C0%7C%7C%7C&sdata=dT35kgngEVztA4%2FhHs%2BXlAeCzaKp%2Bhoh4Z4r8KHnXCc%3D&reserved=0

Might give you some inspiration.

From my experience, going for full support of the language is a huge amount of work, and only later caring for performance is not going to lead to the outcome you hope for.
My recommendation would be to balance the two key goals, performance and completeness.

Focusing on only one of them, might make you go down a path that you might not be able to come back from easily.

Best regards
Stefan

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Stefan Marr
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