Package ‘V8’

May 1, 2021

Type Package
Title Embedded JavaScript and WebAssembly Engine for R
Version 3.4.2
Description An R interface to V8: Google's open source JavaScript and WebAssembly engine. This package can be compiled either with V8 version 6 and up, a NodeJS shared library, or the legacy 3.14/3.15 branch of V8.
License MIT + file LICENSE
BugReports https://github.com/jeroen/v8/issues
SystemRequirements V8 engine version 6+ is needed for modern JS and WASM support. On Debian / Ubuntu install either libv8-dev or libnode-dev, on Fedora use v8-devel. The readme has instructions for installing backports on Ubuntu Xenial and Bionic. It is still possible to build this package against the legacy libv8 version 3.14 branch, but these engines only support traditional JavaScript (ES5).
NeedsCompilation yes
VignetteBuilder knitr
Imports Rcpp (>= 0.12.12), jsonlite (>= 1.0), curl (>= 1.0), utils
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JS

Mark character strings as literal JavaScript code

Description

This function `JS()` marks character vectors with a special class, so that it will be treated as literal JavaScript code. It was copied from the htmlwidgets package, and does exactly the same thing.

Usage

`JS(...)`

Arguments

... character vectors as the JavaScript source code (all arguments will be pasted into one character string)

Author(s)

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Examples

```r
ct <- v8()
ct$eval("1+1")
ct$eval(JS("1+1"))
ct$assign("test", JS("2+3"))
ct$get("test")
```

---

V8

Run JavaScript in a V8 context

Description

The `v8()` function (formerly called `new_context`) creates a new V8 context. A context provides an execution environment that allows separate, unrelated, JavaScript code to run in a single instance of V8, like a tab in a browser.
Usage

v8(global = "global", console = TRUE, typed_arrays = TRUE)

engine_info()

Arguments

global character vector indicating name(s) of the global environment. Use NULL for no name.

console expose console API (console.log, console.warn, console.error).

typed_arrays (deprecated) enable typed arrays in legacy libv8. Deprecated because typed arrays are natively supported in recent versions of libv8.

Details

A V8 context cannot be saved or duplicated, but creating a new context and sourcing code is very cheap. You can run as many parallel v8 contexts as you want. R packages that use V8 can use a separate V8 context for each object or function call.

The name of the global object (i.e. global in node and window in browsers) can be set with the global argument. A context always have a global scope, even when no name is set. When a context is initiated with global = NULL, the global environment can be reached by evaluating this in the global scope, for example: ct$eval("Object.keys(this)").

V8 Context Methods

## ctx <- v8()
<V8 engine 9.0.257.17>
$assign(name, value, auto_unbox = TRUE, ...)
$call(fun, ..., auto_unbox = TRUE)
$console()
$eval(src, serialize = FALSE)
$get(name, ...)
$reset()
$source(file)
$validate(src)

The ct$eval method evaluates a string of JavaScript code in the same way as eval in JavaScript. By default eval() returns a string with console output; but when the serialize parameter is set to TRUE it serializes the JavaScript return object to a JSON string or a raw buffer.

The ct$get, ct$assign and ct$call functions automatically convert arguments and return value between R and JavaScript (using JSON). To pass literal JavaScript arguments that should not be converted to JSON, wrap them in JS(), see examples.

The ct$validate function is used to test if a piece of code is valid JavaScript syntax within the context, and always returns TRUE or FALSE.

In an interactive R session you can use ct$console() to switch to an interactive JavaScript console. Here you can use console.log to print objects, and there is some support for JS tab-completion. This is mostly for testing and debugging, it may not work perfectly in every IDE or R-frontend.
Data Interchange

JSON is used for data interchange between R and JavaScript. Therefore you can (and should) only exchange data types that have a sensible JSON representation. One exception is raw vectors which are converted to/from Uint8Array buffers, see below. All other arguments and objects are automatically converted according to the mapping described in Ooms (2014), and implemented by the jsonlite package in `fromJSON()` and `toJSON()`.

As for version 3.0 of this R package, Raw vectors are converted to Uint8Array typed arrays, and vice versa. This makes it possible to efficiently copy large chunks binary data between R and JavaScript, which is useful for running wasm or emscripten.

Note about Linux and Legacy V8 engines

This R package can be compiled against modern (V8 version 6+) libv8 API, or the legacy libv8 API (V8 version 3.15 and below). You can check `V8::engine_info()` to see the version that is running. The legacy version does not support modern JS (ES6) or WASM, but it is still the default on older versions of Ubuntu and CentOS. The latest versions of all major Linux distributions now provide a modern version of V8. For Ubuntu 16.04 and 18.04 we provide backports of libv8 (via libnode-dev), see the readme for details.

References


Examples

```r
# Create a new context
cctx <- v8();

# Evaluate some code
cctx$eval("var foo = 123")
cctx$eval("var bar = 456")
cctx$eval("foo+bar")

# Functions and closures
ctx$eval("JSON.stringify({x:Math.random()})")
cctx$eval("(function(x){return x+1;})(123)

# Objects (via JSON only)
cctx$assign("mydata", mtcars)
cctx$get("mydata")
outlist <- cctx$get("mydata", simplifyVector = FALSE)
outlist[1]

# Assign JavaScript
cctx$assign("foo", JS("function(x){return x*x}()
ctx$assign("bar", JS("foo(9)"))
ctx$get("bar")

# Validate script without evaluating
```
ctx$validate("function foo(x){2*x}" ) #TRUE  
ctx$validate("foo = function(x){2*x}" ) #TRUE  
ctx$validate("function(x){2*x}" ) #FALSE  
  
# Use a JavaScript library  
ctx$source(system.file("js/underscore.js", package="V8"))  
ctx$call("_.filter", mtcars, JS("function(x){return x.mpg < 15}"))  
  
# Example from underscore manual  
ctx$eval("_.templateSettings = {interpolate: /\{\{(.+?)\}\}/g}"")  
ctx$eval("var template = _.template(‘Hello {{ name }}!’)")  
ctx$call("template", list(name = "Mustache"))  
  
# Call anonymous function  
ctx$call("function(x, y){return x * y}" , 123, 3)  
  
## Not run:  
#CoffeeScript  
ct2 <- v8()  
ct2$source("http://coffeescript.org/v1/browser-compiler/coffee-script.js")  
jscode <- ct2$call("CoffeeScript.compile", "square = (x) -> x * x", list(bare = TRUE))  
ct2$eval(jscode)  
ct2$call("square", 9)  
  
# Interactive console  
ct3 <- v8()  
ct3$console()  
# //this is JavaScript  
# var test = [1,2,3]  
# JSON.stringify(test)  
# exit  
## End(Not run)  

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wasm

Experimental WebAssembly

Description

Experimental wrapper to load a WebAssembly program. Returns a list of exported functions. This will probably be moved into it’s own package once WebAssembly matures.

Usage

wasm(data)

Arguments

data either raw vector or file path with the binary wasm program
Examples

# Load example wasm program
if(engine_info()$version > 6){
  instance <- wasm(system.file('wasm/add.wasm', package = 'V8'))
  instance$exports$add(12, 30)
}
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