V and R

rvee: recreational v programming for R

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Who am I?

Edwin de Jonge

- Statistical Consultant / R&D at Statistics Netherlands / CBS
- Author of some R packages (e.g. `whisker`, `docopt`): https://edwindj.r-universe.dev
- Love R and like programming in general
- http://github.com/edwindj, @edwindjonge

Short summary

- `V` new simple programming language
- `rvee` : https://github.com/edwindj/rvee helps to create R extension in V.
- No runtime and R dependencies.
- Experimental, but works.

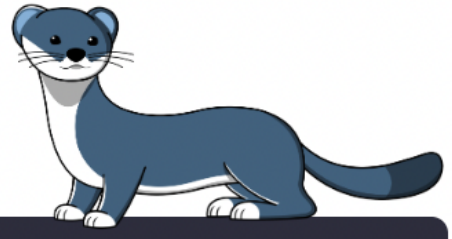
What is V?

- V is a programming language.

  Simple.fase, safe, compiled. For developing maintainable software.

- Website: https://vlang.io/
- young, low-level,
- feels like scripting, but is strongly typed
- Very similar to `Go`, but "improves" on Go: https://vlang.io/compare#go
- Very light weight

{.plain .fragile} Syntax example



```
fn main() {
    areas := ['game', 'web', 'tools', 'science', 'systems',
              'embedded', 'drivers', 'GUI', 'mobile']
    for area in areas {
        println('Hello, $area developers!')
    }
}
```

V is safe

- No `null`, `undefined` values: unexpected `null` causes software damage.
- **immutable** variables by default, making it easier to optimize and reason about code
- **Option**: functions returns `?Type` and compiler generates error is empty return is not handled properly.
- **Result**: functions can return `!Type` and compiler generates error if run-time error is not handled properly.
- Other cases a function always returns a value
- Functions are pure by default (impurity is explicit)

V features

- Easy C-interop (C-backend)
- Fast compilation!
- Zero cost abstractions
- Sum Types
- Generics

Fast compilation

For comparison, space and time required to build each compiler:

	Space	Build time
Go	525 MB	1m 33s
Rust	30 GB	45m
GCC	8 GB	50m
Clang	90 GB [0]	60m
Swift	70 GB [1]	90m
V	< 10 MB [2]	<1s

source: https://vlang.io

Performance (from V lang website)

- As fast as C (V's main backend compiles to human readable C)
- C interop without any costs
- Minimal amount of allocations
- Built-in serialization without runtime reflection
- Compiles to native binaries without any dependencies: a simple web server is only 65 KB

V has different compilation back-ends (like rust and Go)

- native code (includes a REPL)
- readable(!) `C` code
- javascript

R similarities

- V functions are *pure* by default, like R, arguments are immutable by default. Have to be marked `mut`able.
- V has `defer`, like R's `on.exit`
- Simple syntax, very flexible
- Has (some) reflection/code generation. (R beats that one)

V pkgs

- V has a module and pkg system, containing `v` src code (not compiled)
- Typical v-compilation results in one binary
- importing a module means including the v code.
- v can link though to `C`, `CPP` libraries.

What is `rvee`?

- An experimental R package to create R package extensions with functions written in V.
- Similar in concept to RCpp but for V.
- But no *compile-time* and *run-time* dependencies in resulting R package.
- (pkgname `rv` was already claimed for)

Why-o-why

- One of R's great powers is that of a glue language (just like S)
- V is a nice low-level language, so why not?
- Because it is fun :-)

Features `rvee`

Two possible routes for using `v` as extension for R: - Use v compiler to link to `R.so` / `R.dll`, but requires v to be present on CRAN. - Use v transpiler to C and create a "normal" R package. This is `rvee`

`rvee`

- Transpiles v code into C package code, including all wrappers
- include `vpkg:r` with wrapper functions for R's C API (70% complete)

`rvee::rv_export_c`

- Put the v source in `"<pkg>/src/v"` directory
- decorate each function to be exported with `[rv_export]` attribute
- `rvee::rv_export_c("<pkg>")` generates:
  - "./R/rv_export.R": R functions calling the v functions declared in "./src/v/rv_export.v"
  - "./src/v/rv_export.v": v wrapper functions translating input and output to the original v functions.
  - "./src/init.c": registration code for the shared library
  - "./src/.c": the c code generated by v from the source files in the "/src/v" directory.
- And ready! No dependencies what so ever.
- After that `devtools::load_all` (or `R CMD SHLIB`) work. (on the generated C files)

Other v_function

- v_function generates from v src code a working R function that calls that code

```
v_function('fn add(x int, y int, z int) int{
  sum := x + y + z
  return sum
}')

add(1,2,3)
```

vpkg r

- wrapper library for R API.
- helps to transform V strings, arrays into R vectors (and vice versa).

Status `rvee`

- V is a young language, but already quite stable.
- Generated code is in C
- rvee is experimental,
- Help is welcome!
- Experimental, expect (breaking) changes!
- But. . . , hey it works :-)

Thank you!

Interested?

```
remotes::install_github("edwindj/rvee")
```

Or visit:

http://github.com/edwindj/rvee