

Mutant Go compilers

A short talk by [Elliott Stoneham](#) at GopherCon on 26th April 2014



Write your own Go compiler
blog.golang.org/fosdem14

**Go is addictive,
I want it everywhere...**

**...mutant compilers take Go to places
that the current compilers cannot reach
(having fun along the way)**

The 3 phases of a mutant Go compiler

original Go program to be compiled =>

(1) Use standard library packages to create an intermediate form that entirely describes the original Go program

=> Abstract Syntax Tree (AST) or Single Static Assignment form (SSA) =>

(2) Generate new code with the same behaviour

=> target bitcode or language (e.g. JavaScript) =>

(3) Use normal target compiler or interpreter (e.g. NodeJS)

open-source mutant Go compilers

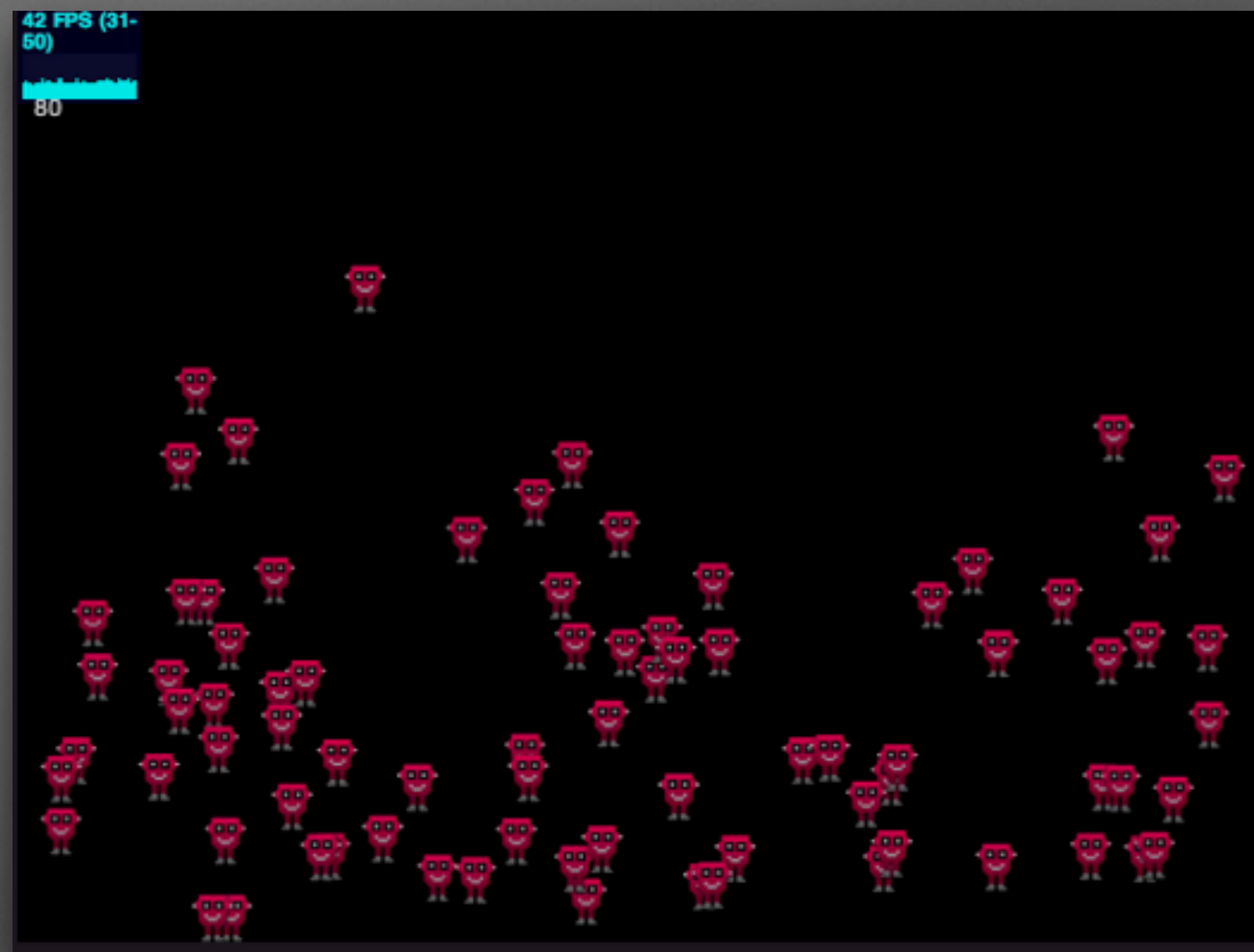
	AUTHORS	PROJECT FIRST PUBLISHED	GITHUB STARS	TARGET
GOPHERJS	Richard Musiol + others	November 2013	400+	JavaScript
LLGO	Andrew Wilkins + others	October 2011	450+	LLVM bitcode
TARDISGO	Elliott Stoneham	January 2014	100+	JS, Flash, Java, C++, C# & PHP via Haxe

compilation sequences

<u>GopherJS</u>	<u>llgo</u>	<u>TARDIS Go</u>
Go source => go/* libraries => AST		
AST => go.tools/go/types => types.Info		
AST + types.Info => GopherJS => JavaScript	AST+types.Info=>go.tools/go/ssa=>SSA	
	SSA+types.Info => llgo => LLVM module	SSA+types.Info => tardisgo => Haxe (haxe.org)
	LLVM modules => llgo-build => executable	Haxe => JavaScript, Flash, Java, C++, C#, PHP & Neko

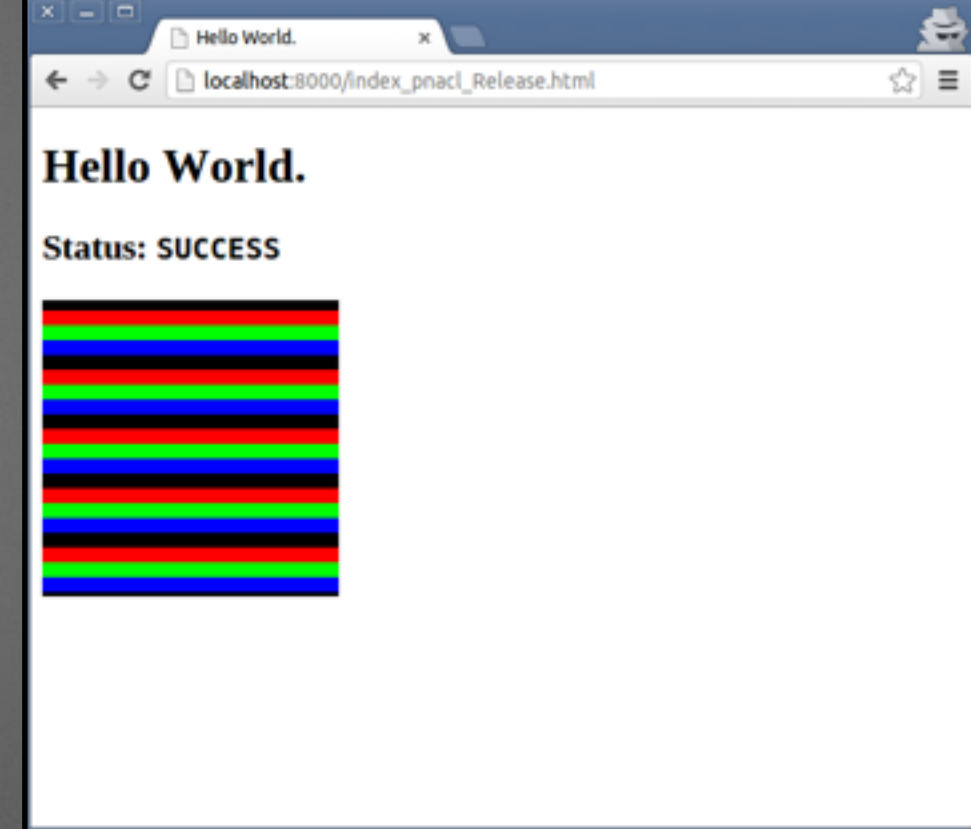
GopherJS

- Most immediately useful
- Active user community
- See: ajhager.com/enj/
- jQuery and AngularJS bindings
- Now runs over 5x faster for fannkuch.go benchmark
- ...but no goroutines or channels yet





Ilgo



- On-track to become a mainstream Go implementation
- Fastest Go execution speed for some benchmarks
- Portable Native Client (PNaCl)? Emscripten=>asmJS?
- Now using libgo, thanks to Peter Collingbourne
- ...but still some stabilisation and bug fixes to do



TARDIS Go 8 Concurrent Gophers

TARDIS Go example; see tardisgo.github.io

All animated gophers are running the Go code on the right. The logos show where the 2 above gophers each are in that code now. This Go code is running live, transpiled into: neko

```
func gopher(x, y *float64, state *int, in, out chan int) {  
    for {  
        cartLoad := pickBooks(x, y, state, in)  
        pushBooks(x, y, state, cartLoad)  
        fireBooks(x, y, state, cartLoad, out)  
        moreBooks(x, y, state)  
    }  
}
```

Inspired by "Concurrency is not Parallelism (it's better)" - Rob Pike
<http://concur.rspace.googlecode.com/hg/talk/concur.html>

A grid of 12 gopher icons and stacks of books, illustrating the concurrent execution of the Go code. The gophers are shown in various states of activity, with some carrying stacks of books. The stacks of books are arranged in a grid, with some gophers standing next to them and others carrying them.

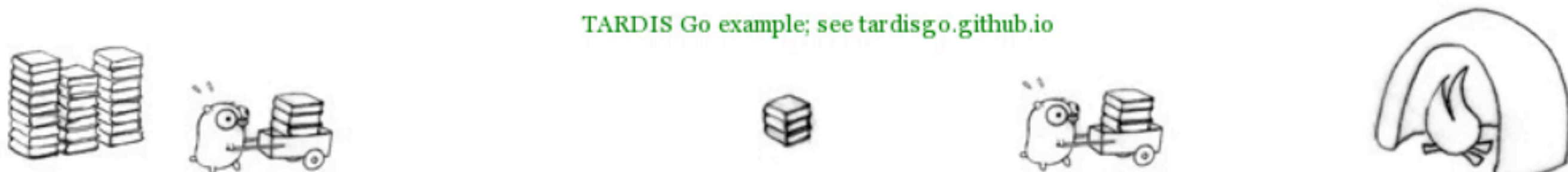
HTML5, Flash, Windows, Mac, Linux, iOS,
Android, BlackBerry, Tizen, webOS, Xbox,
PlayStation and Emscripten

[Gopher images by Renee French]

tardisgo.github.io

TARDIS Go Concurrent Gophers

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Both animated gophers are running the code on the right. The 2 logos show where they each are in that code now. This code is running live, targeting: neko

Inspired by "Concurrency is not Parallelism (it's better)" - Rob Pike
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- The most target environments, with cross-platform UI
- Go core spec, including goroutines and channels
- ...but slowest overall compile times, limited Go library support, single threaded, and no run-time optimisation

WWX 2014

WORLD WIDE HAXE CONFERENCE
MAY 23-24-25-26 PARIS FRANCE

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multimédia

 **HAXE**
FOUNDATION

 **SILEX LABS**

“TARDIS: Go for Haxe!”

<http://wwx.silexlabs.org/2014/>

Help a mutant Go compiler ...or write your own!

GopherJS		<u>github.com/gopherjs/gopherjs</u>
llgo		<u>github.com/go-llvm/llgo</u>
tardisgo		<u>github.com/tardisgo/tardisgo</u>
your project here		<u>blog.golang.org/fosdem14</u>