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)
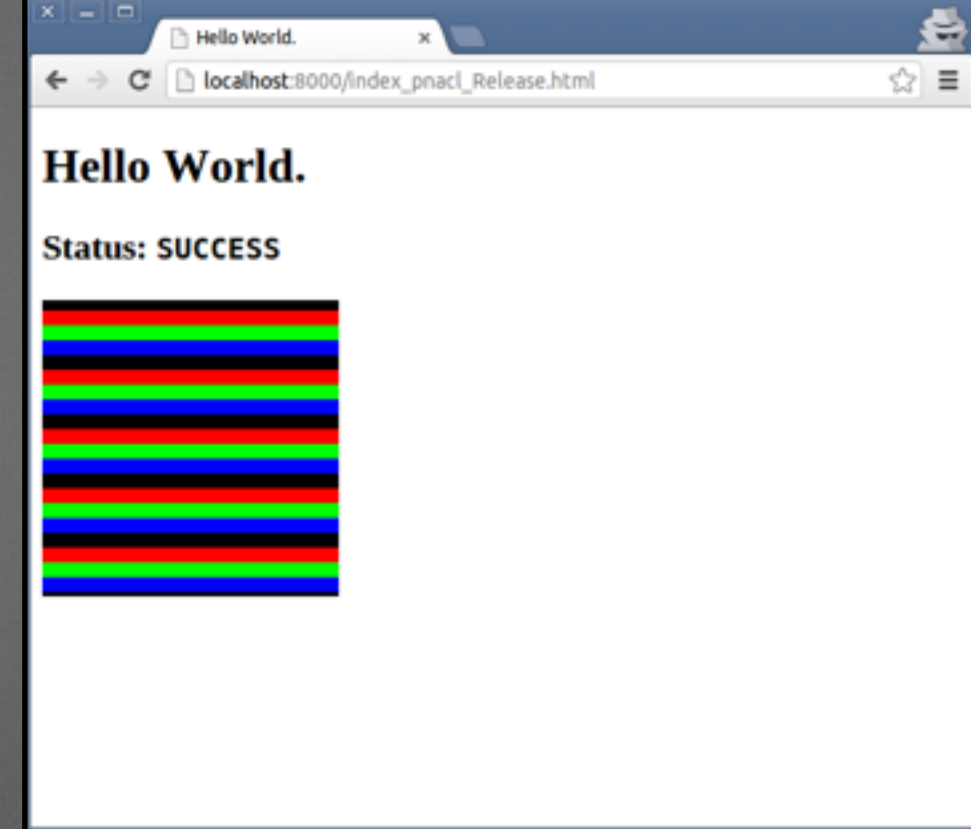
open-source mutant Go compilers

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

compilation sequences

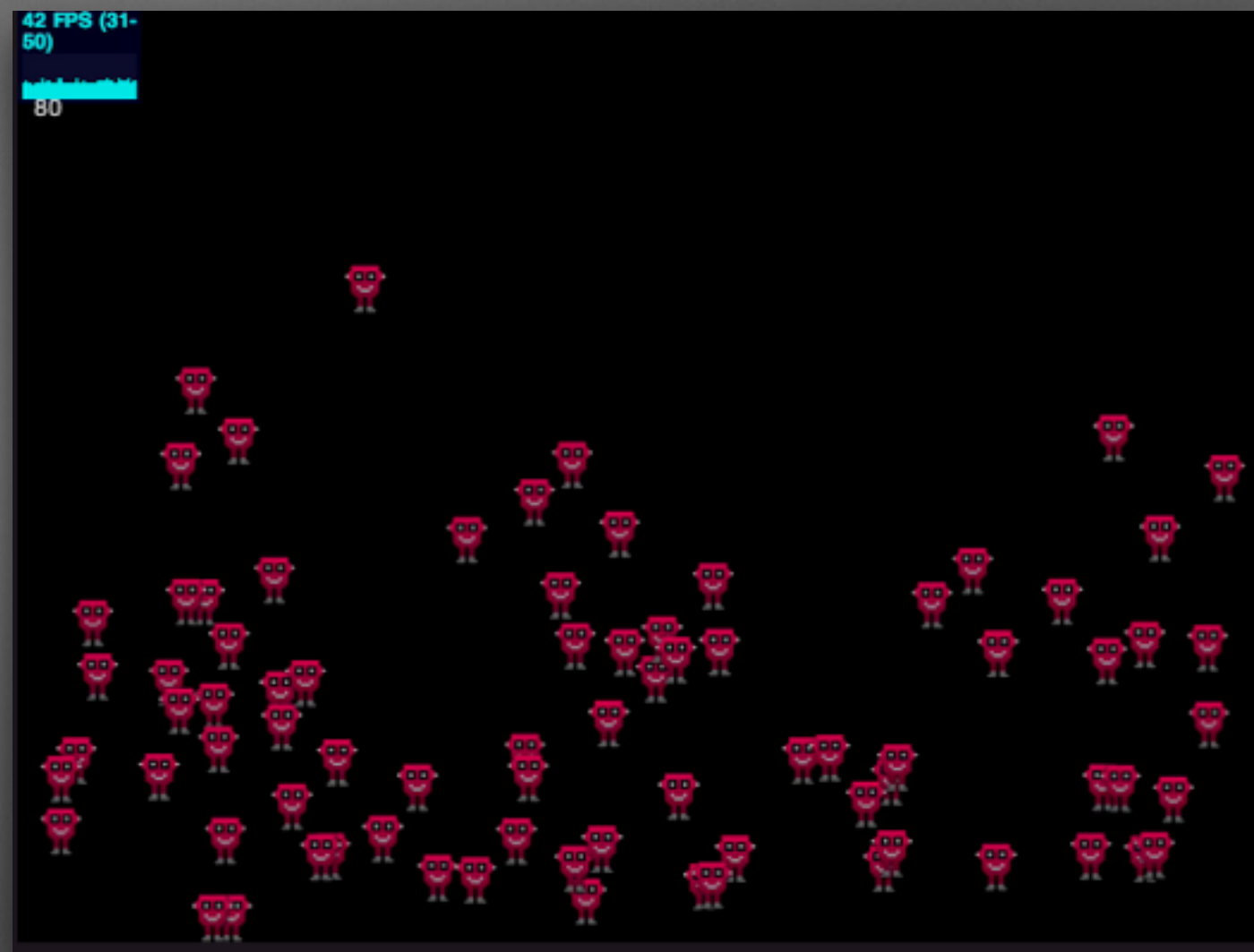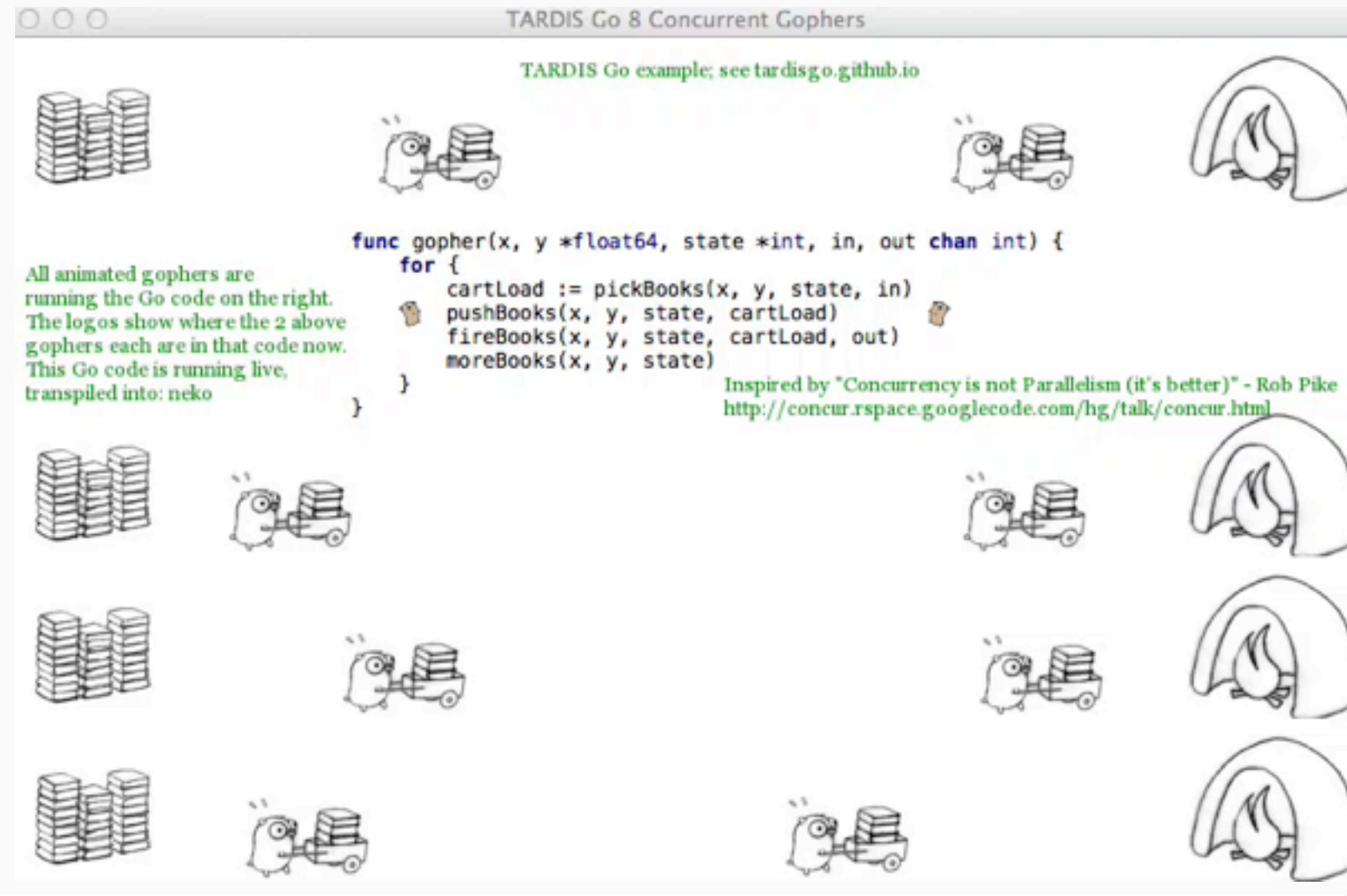| TARDIS Go	IIgo	GopherJS
Go source => go/* libraries => AST		
AST => go.tools/go/types => types.Info		
AST+types.Info=>go.tools/go/ssa=>SSA		
SSA+types.Info => tardisgo => Haxe (haxe.org)	SSA+types.Info => IIgo => LLVM module	AST + types.Info => GopherJS => JavaScript
Haxe => JavaScript, Flash, Java,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

llgo

Hello World.

Status: SUCCESS

- 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

GopherJS

- Most immediately useful

- Active user community

- See: ajhager.com/enj/

- jQuery and AngularJS bindings

- Now runs over 5x faster for fannkuch.go benchmark
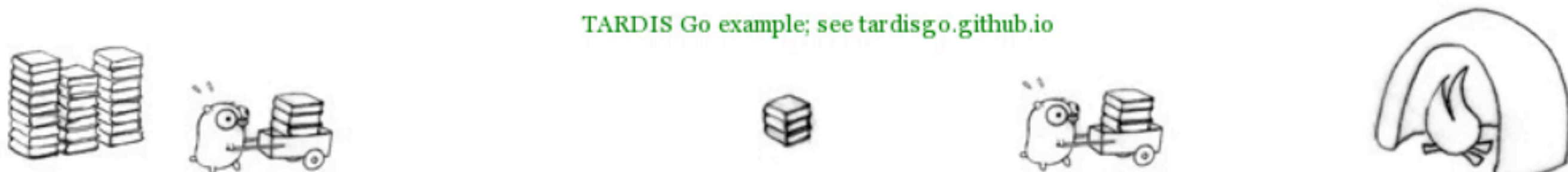
- …but no goroutines or channels yet

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

TARDIS Go example; see tardisgo.github.io

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

```
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

- 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

"TARDIS: Go for Haxe!"

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

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

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