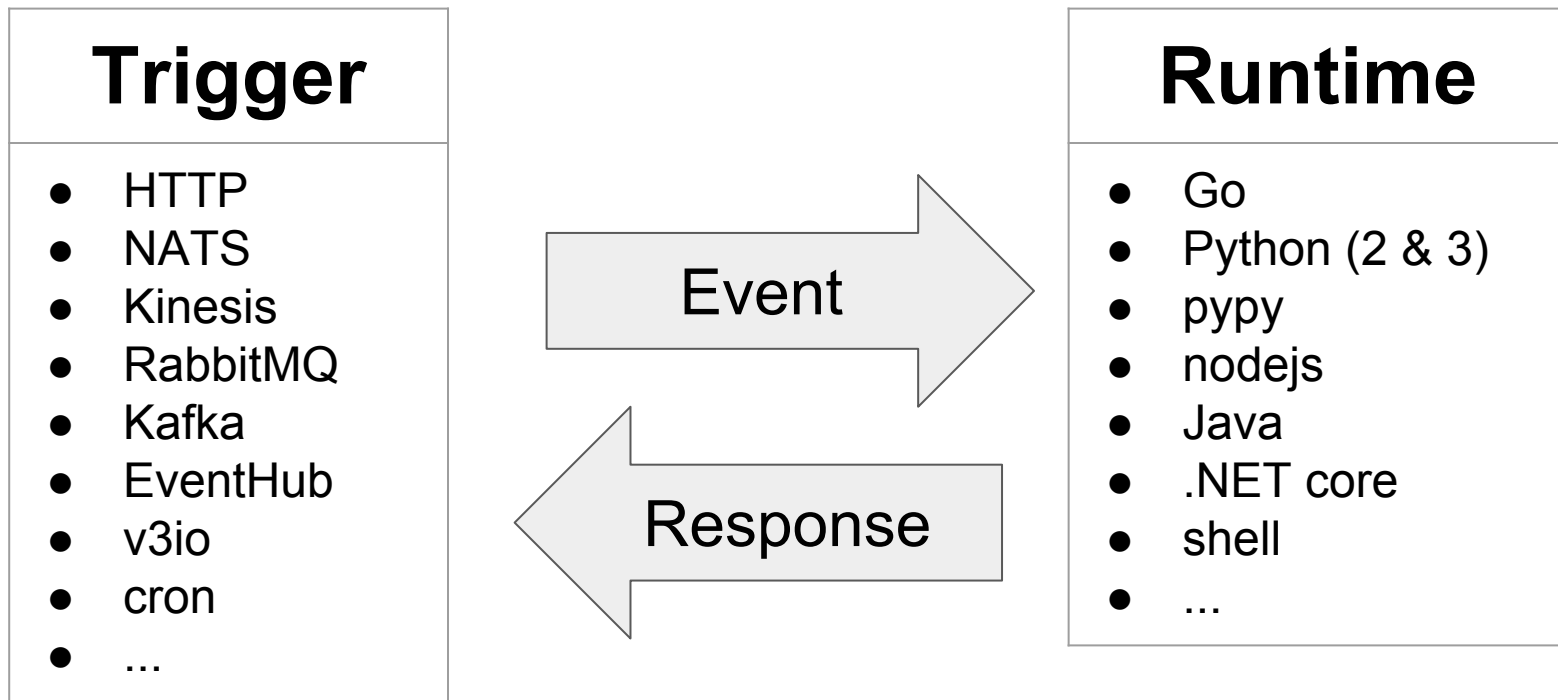


Embedding Other
Languages in 

Miki Tebeka



nuclo - Serverless for Real-Time and Data-Driven Applications

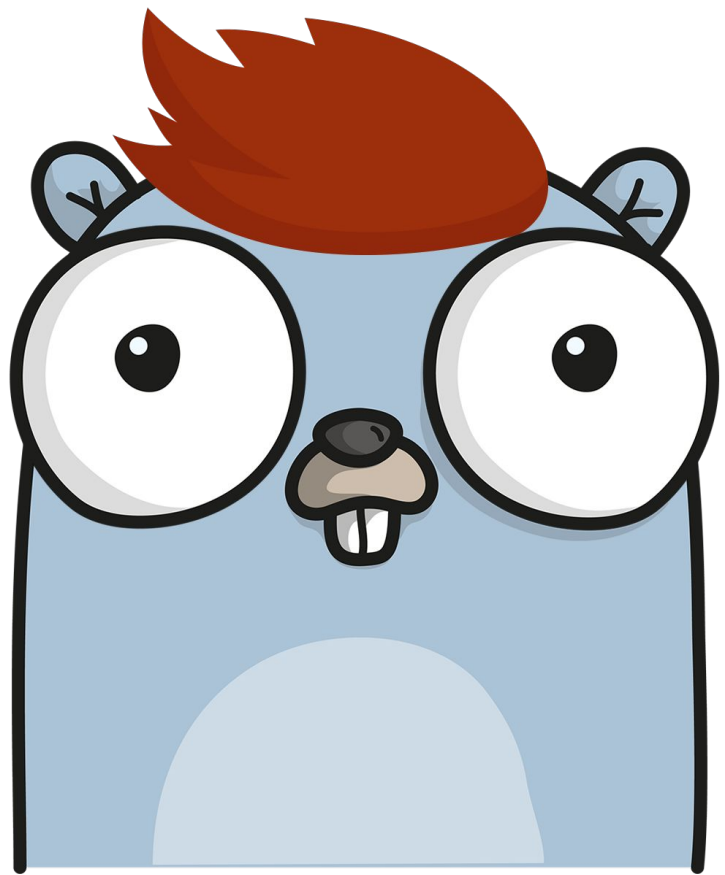




I have a 1bit Memory

“Never let the truth get
in the way of a good
story.”

Mark Twain



Go Runtime

- Add user code to nuclio and build
 - Dependency hell
- Go SDK
- Plugins
 - Benchmark plugin function call
 - `nuclio.Event != nuclio.Event`

#!

Shell Runtime

- Invoke via [os/exec](#)
 - Using [CommandContext](#)
 - Allow extra arguments via HTTP headers
- Extra information in environment
 - NUCLIO_EVENT_ID ...



Python Runtime

- JSON over unix socket
 - Line oriented
- One process per worker
 - GIL



РyРy

pypy Runtime

- Go \rightleftharpoons C \rightleftharpoons pypy
 - [cffi](#)
 - `import "C"`
- panic: runtime error: cgo argument has Go pointer to Go pointer
 - `GODEBUG="cgocheck=0"`

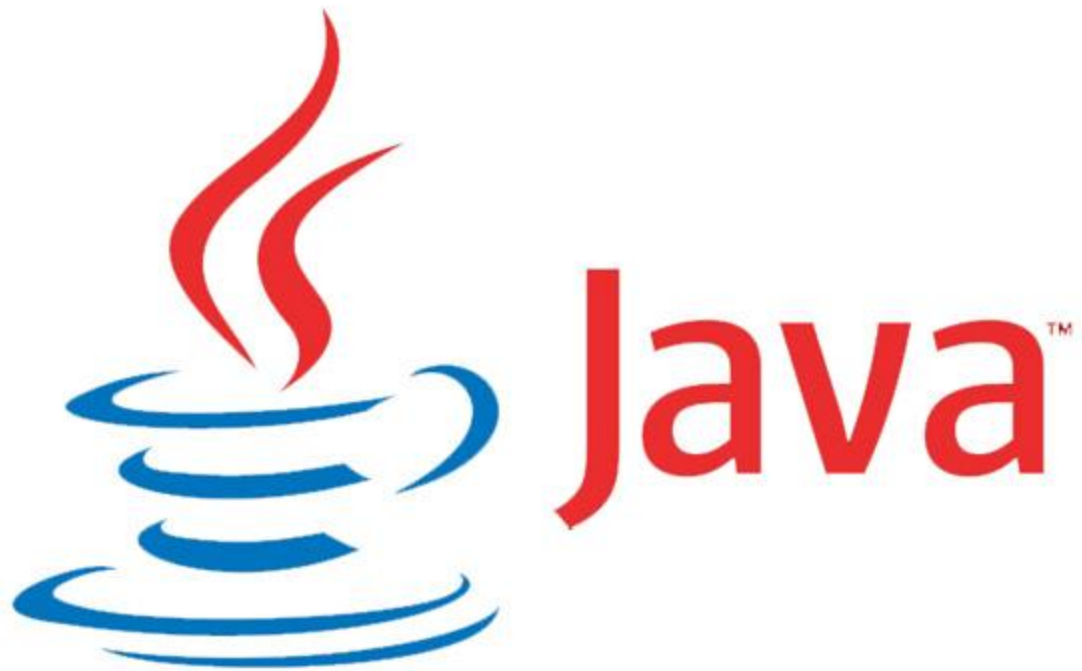
pypy Runtime

- Super long stack traces 😊
- Memory allocations between runtimes
- [runtime.KeepAlive](#)
- Build tags



nodejs Runtime

- Failed attempt with embedding
 - Worked with v8
 - Remembered how I hate C++ 😊
- JSON + unix socket
- General RPC runtime

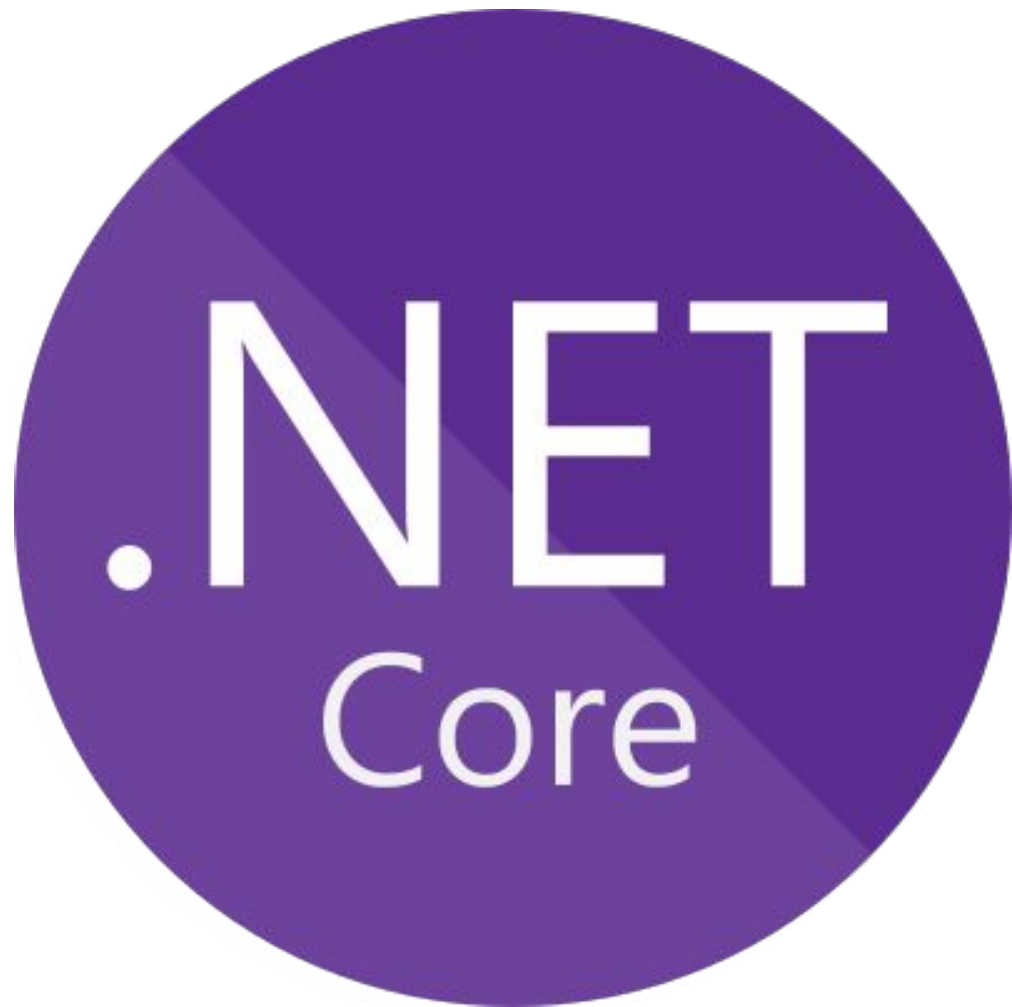


java Runtime

- No unix sockets in Java
 - Added TCP sockets to RPC runtime
- Embed user code inside handler
(shadow/uber) JAR
- Java SDK
- **gradle**, mvn, sbt, ivy ...

java Runtime

- jackson was super slow
 - Switched to GSON
- I still hate Java 😊

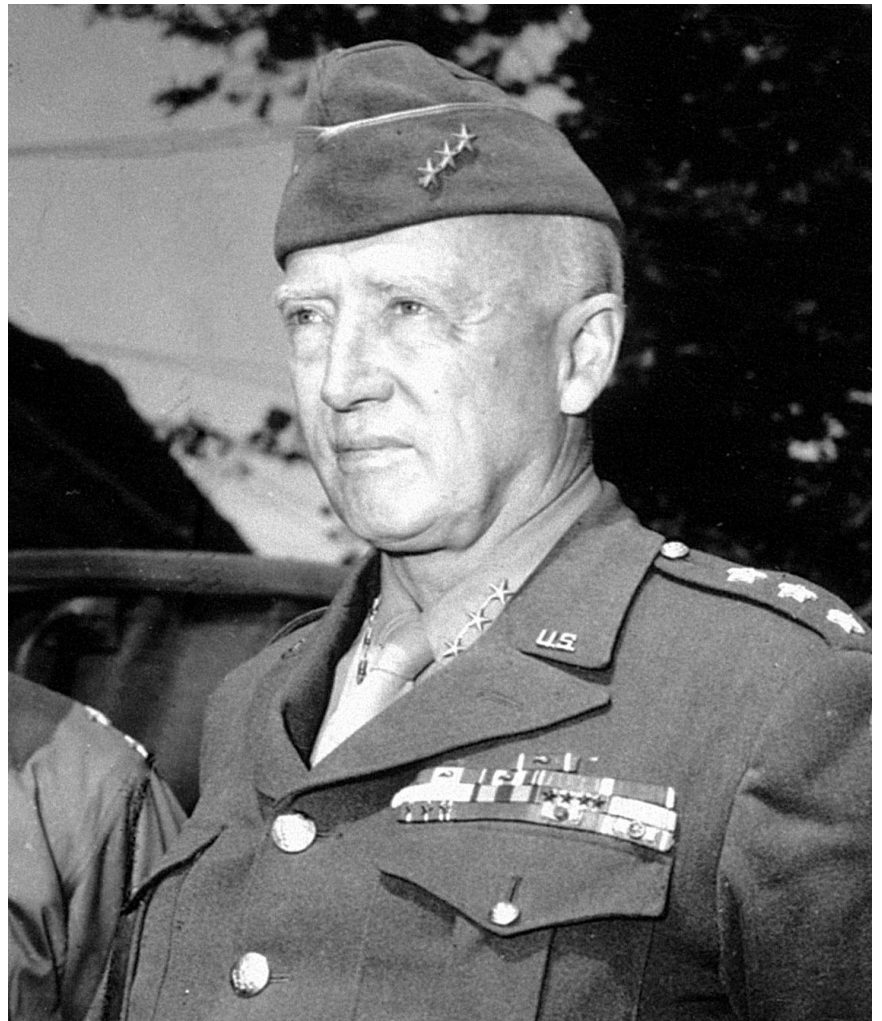


.NET core Runtime

- Another RPC runtime
- Another SDK

General Comments

Actually ...
this is general Patton



General Comments

- Docker
 - Don't have to install anything
- Logging is important
 - Hard to get noise/signal ratio right
- Error message in tests
- Common runtime tests

How to



With Statistics

by Darrell Huff

PICTURES BY
Irving Geis

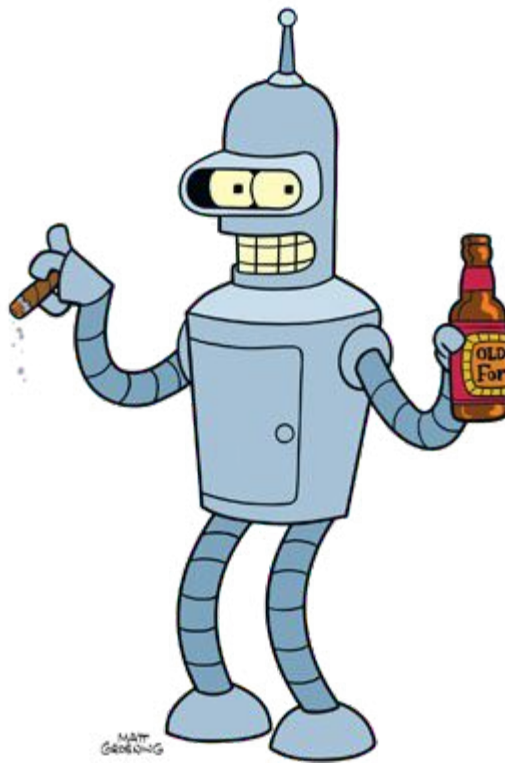
Lies, Damn Lies and Benchmarks

Benchmarks (wrk -c4 http://localhost:8080)

Runtime	Requests/Second
golang	50,111.42
python	8,564.62 (flask: 1,870.76)
pypy	27,216.73 (flask: 1,891.91)
nodejs	12,807.32
java	92.22 (???)

Benchmarks

- Benchmarks done on my laptop
- On a better machine golang gets to ~500,000 RPS
- Java can get to ~90,000 RPS



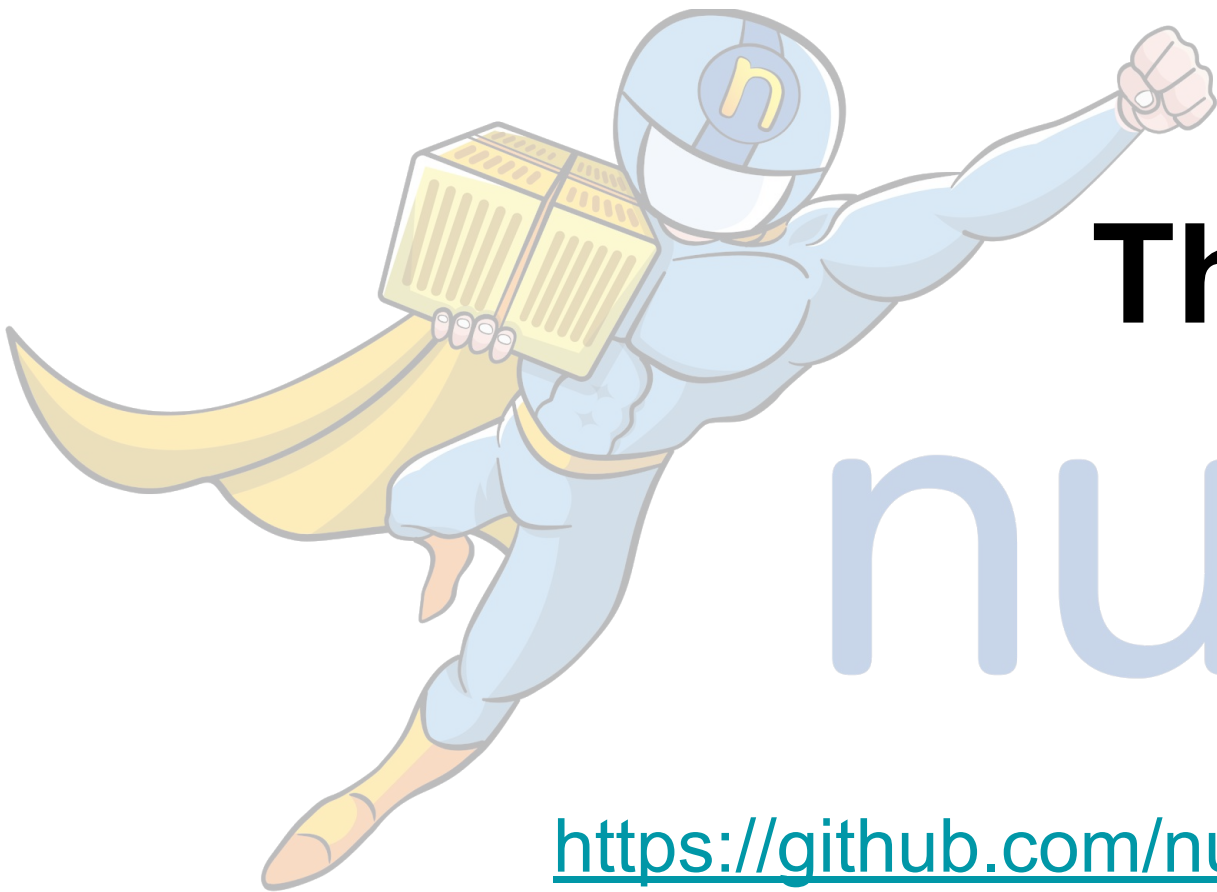
Future Development

“It's tough to make
predictions, especially
about the future.”

Yogi Berra

Future Directions

- Faster RPC
 - [flatbuffers](#), [msgpack](#) ...
 - Shared memory
- FFI runtime (100K RPS for Python)
- Speed center
- Data bindings ([arrow](#)?)



Thank You

nuclio

<https://github.com/nuclio/nuclio>