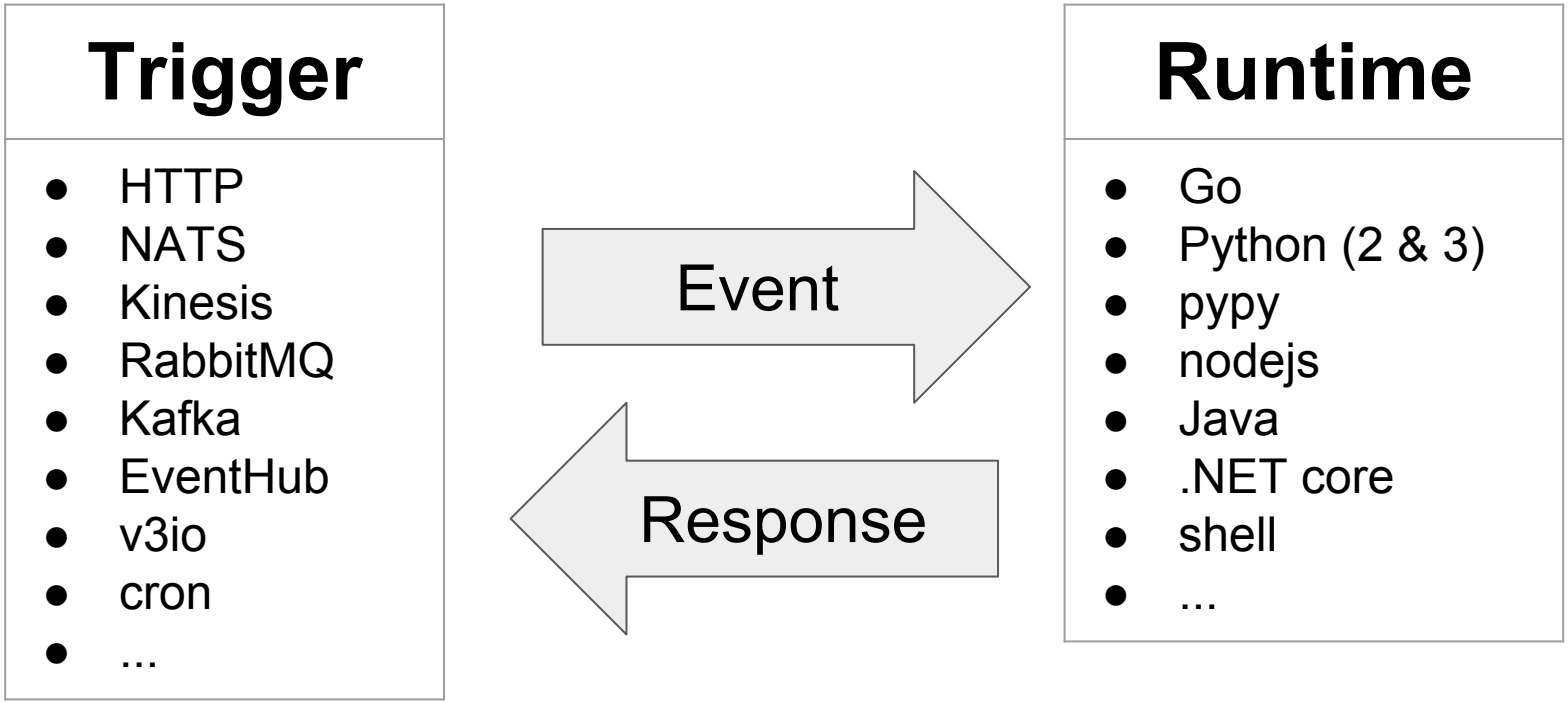
Embedding Other Languages in

Miki Tebeka

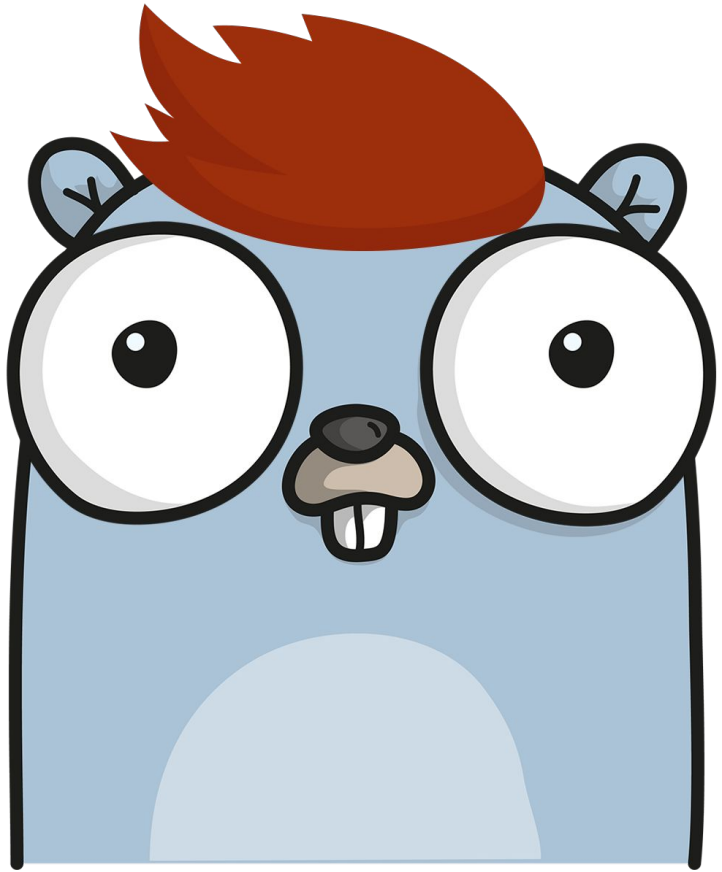
nuclio - Serverless for Real-Time and Data-Driven Applications



I have a 1bit Memory

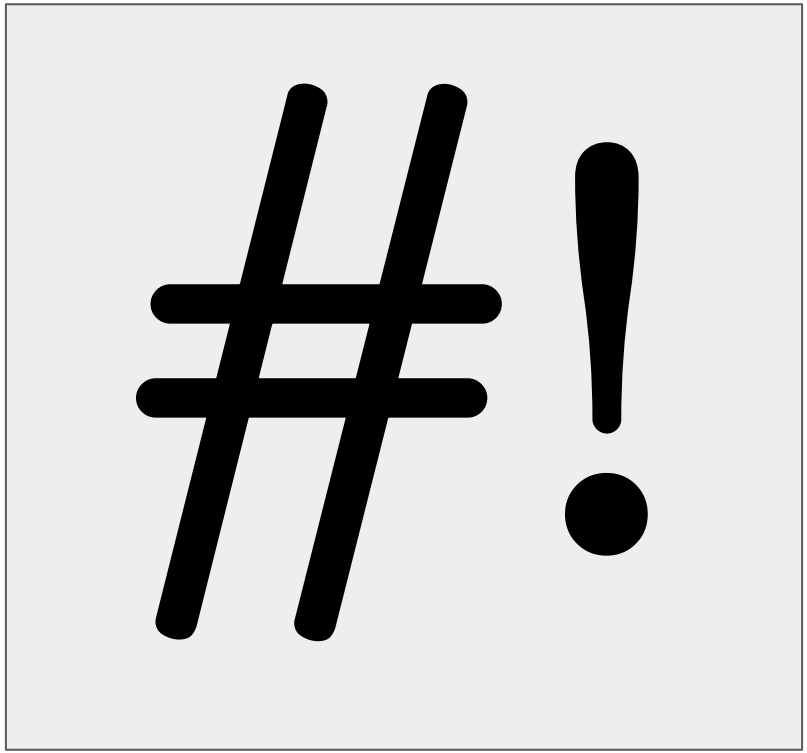
“Never let the truth get in the way of a good story.”

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
  - Bidirectional
- One process per worker
  - GIL

PyPy

pypy Runtime

- Go ⇄ C ⇄ 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

node
JS

nodejs Runtime

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

Java™

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

.NET core Runtime

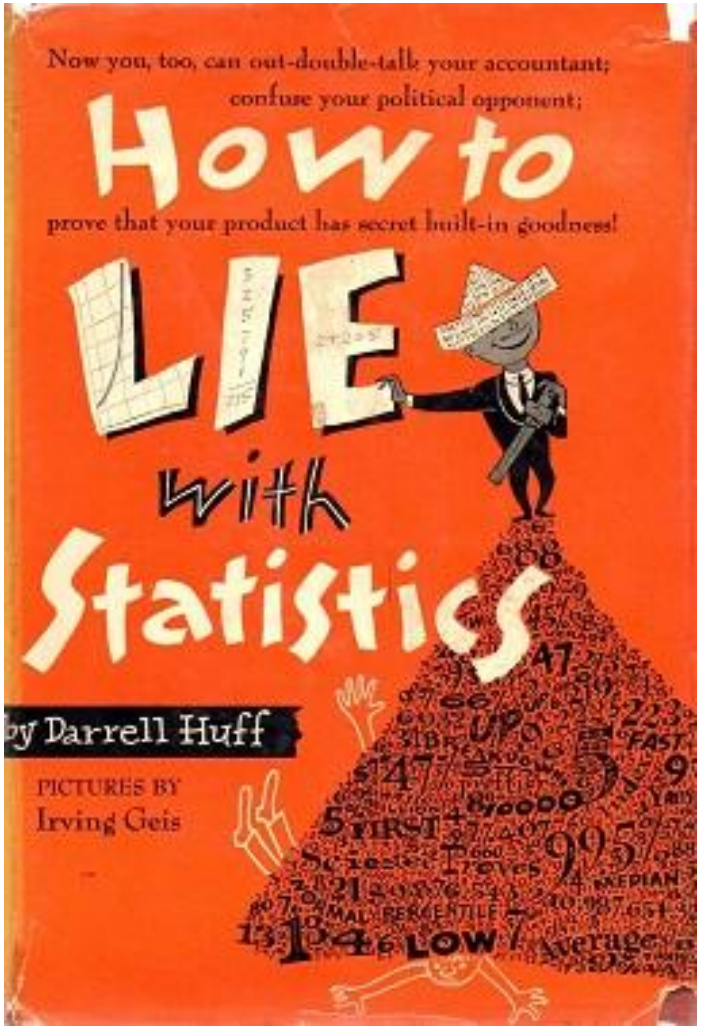
- Another RPC runtime
- Another SDK

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



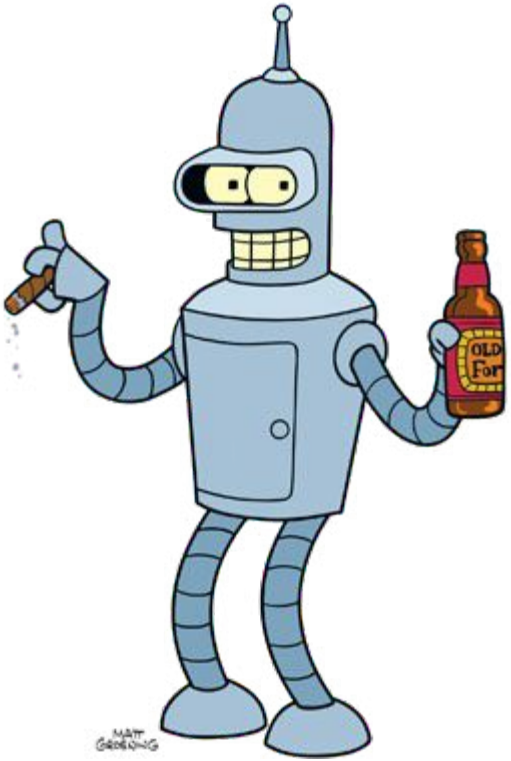
Lies, Damn Lies and Benchmarks

Benchmarks

Runtime	Requests/Second
golang	384,418.84
python	45,718.31
pypy	64,056.55
nodejs	48,746.13
java	51,999.28

Benchmarks

- `wrk -c 36 -t 36 -d 10 http://172.17.0.1:36724`
- c5.9xlarge
- On a better machine golang gets to ~500,000 RPS
- http://bit.ly/nuclio-bench



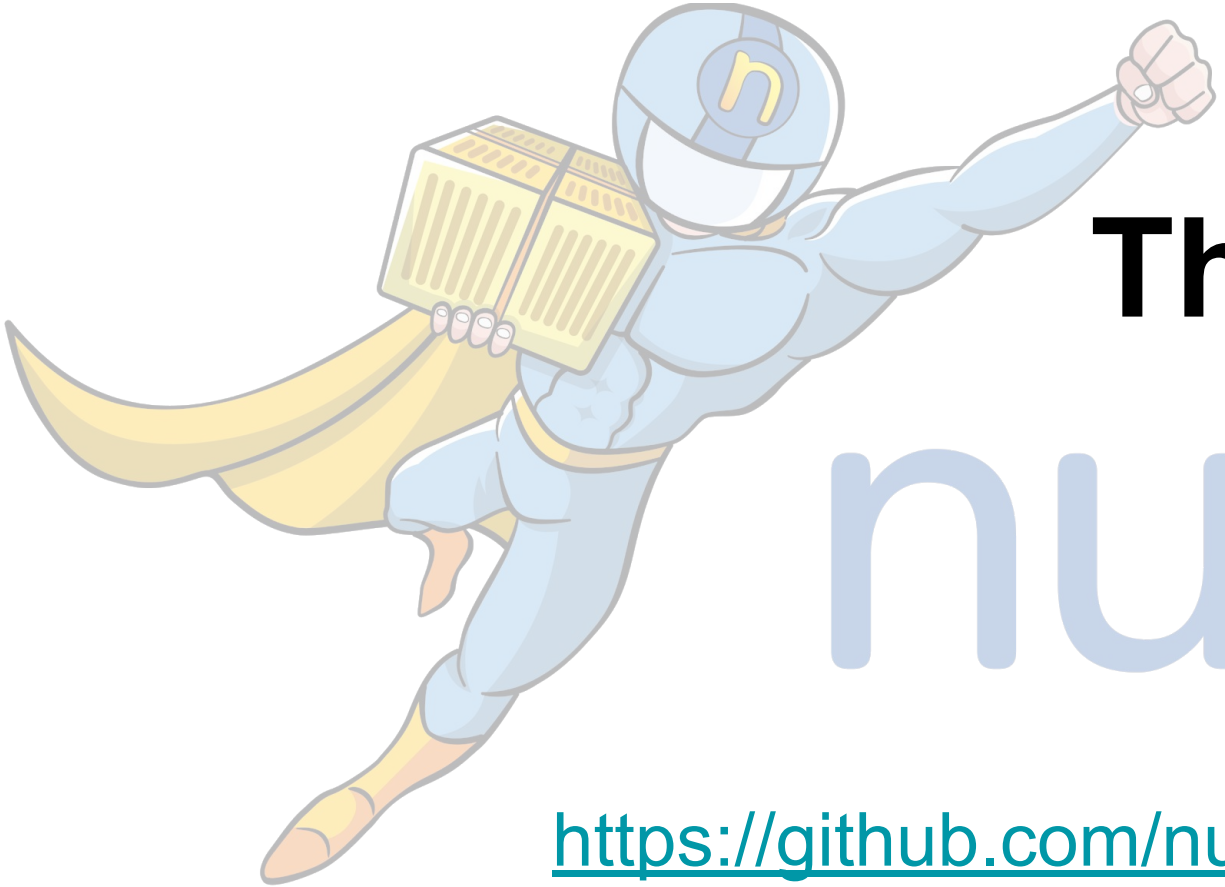
Future Development

“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