npm's first Rust service

the problem: add a feature to npm's simplest microservice

why was this **non-trivial**?

→ the microservice was old: vintage 2014

→ not git-deployable

→ used old configuration (like, really old)

→ no modcons

Chris's **challenge** to me: don't just add the feature but rewrite it in **Go**

requirements

- → a **public** proxy in front of license-api
- → proxy GET requests from npm-e installations to fetch license data
- → proxy POST callbacks from Stripe

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- → *new!* send the Stripe callbacks to a 2nd destination!

I spent an afternoon **rewriting** the existing javascript service fallback plan in case my rewrite **failed**

let's look at code (condensed quite a bit)

```javascript
var server = require('restify').createServer({ name: 'public-license-api' });
var proxy = require('http-proxy').createProxyServer();

Monitor(server); // <--- adds our monitoring hooks
server.get('/license/:productId/:billingId/:licenseKey', fetchLicense);
server.post('/stripe/callback', stripeCallback);

server.listen(process.env.port, process.env.host || '0.0.0.0', function() {
    logger.info(`starting public-license-api on port ${process.env.PORT}`);
    process.emit('metric', {name: 'start'});
});
```

and the request handlers look like this

```
function stripeCallback(req, res, next)
{
  proxy.web(req, res, { target: process.env.PRIVATE_LICENSE_API });
  next();
};
```

So. Little. Code.

task: learn Go, then reimplement

I bounced off Go hard

no modern dependency management
ran into WTF is GO_PATH immediately
verbose language with no payoffs
no new ideas since the 70s

give up? nah.

I decided to give Rust a try.

systems language

aka designed for writing systems

canonical examples: C & C++

more direct access to hardware/memory

more control / more responsibility

PITA vs performance tradeoff

systems languages are what **everything else** is implemented in

Mozilla invented Rust to write their next browser in "safe, concurrent, practical language"

modern FP language features

no garbage collection

a compiler that does its best to help

no exceptions, only return values

`match` on the Some<T>, None option

can you say monad? sure you can

```rust
fn get_env_var<'a>(name: &'a str) -> std::string::String
{
    match env::var_os(name)
    {
        Some(v) => v.to_string_lossy().into_owned(),
        None => String::from(""),
    }
}
```

best feature: cargo/crates.io

modern dep management

a package manager based on semver

writing an http proxy in Rust
is crushing a walnut with a piledriver

perfect for learning

because the problem itself is trivial

we have perf-critical work coming up
best to get experience **now**

So I dove in.

How hard can it be?

here's the spine of the app
rust-flavored this time

```rust
fn main()
{
    let mut server = Pencil::new("stripe-receiver");
    let metrics = get_env_var("METRICS");
    let port = get_env_var("PORT");
    let host = get_env_var("HOST");

    monitoring::monitor(&mut server, metrics); // Logging is now enabled.

    server.get("/license/<product_id:string>/<billing_id:string>/<licence_key:string>", "license", fetch_license);
    server.post("/stripe/callback", "stripe", handle_stripe);

    let listen_path = format!("{}:{}", host, port);
    info!(slog_scope::logger(), "listening on {}", listen_path);
    server.run(&*listen_path);
}
```

pencil: http framework

inspired by flask

familiar to users of restify

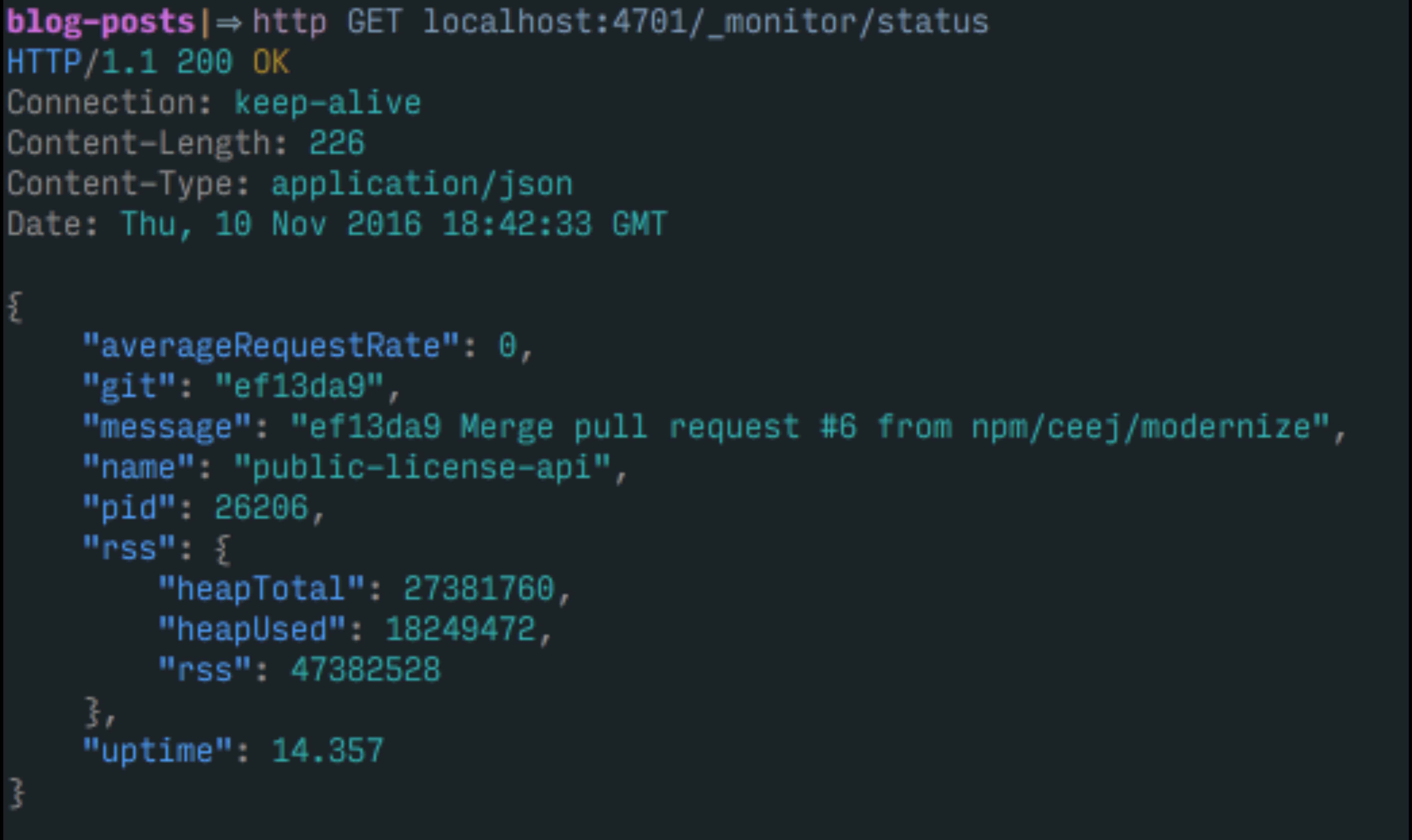
first step: implement /ping

```
pub fn ping(_: &mut Request) -> PencilResult
{
    Ok(Response::from("pong"))
}
```

Not so bad!

next: /status

which does a deeper look...



```
blog-posts|⇒ http GET localhost:4701/_monitor/status
HTTP/1.1 200 OK
Connection: keep-alive
Content-Length: 226
Content-Type: application/json
Date: Thu, 10 Nov 2016 18:42:33 GMT

{
    "averageRequestRate": 0,
    "git": "ef13da9",
    "message": "ef13da9 Merge pull request #6 from npm/ceej/modernize",
    "name": "public-license-api",
    "pid": 26206,
    "rss": {
        "heapTotal": 27381760,
        "heapUsed": 18249472,
        "rss": 47382528
    },
    "uptime": 14.357
}
```

→ uptime

→ memory use

→ PID

→ git commit hash

→ git commit message

→ request rate!

yak shave time

ceejbot/git-latest-commit

my first Cargo crate

a build dep that writes a file

logging & env vars

```
let port = get_env_var("PORT");
let host = get_env_var("HOST");
let listen_path = format!("{}:{}", host, port);
info!(slog_scope::logger(), "listening on {}", listen_path);
```

chose `slog` for logging
global scope, can do json

```rust
pub fn status(_: &mut Request) -> PencilResult
{
  let pid = format!("{}", psutil::getpid());
    let thisproc = Process::new(psutil::getpid());
    let rssbytes = match thisproc
    {
        Ok(v) => v.rss,
        Err(e) => { println!("{:?}", e); 0 }
    };

  let mut seconds = get_now_millis();
  unsafe { seconds = seconds - starttime; }

  let uptime = format!("{:.0}", seconds);
  let rss = format!("{}", rssbytes);

  let mut status = BTreeMap::new();
  status.insert("name", "stripe-receiver");
  status.insert("pid", &*pid);
  status.insert("version", env!("CARGO_PKG_VERSION"));
  status.insert("uptime", &*uptime);
  status.insert("rss", &*rss);
  status.insert("git", GIT_HASH);
  status.insert("message", GIT_SUMMARY);
  return jsonify(&status);
}
```

omg metrics

numbat-metrics/rust-emitter

numbat-emitter is **deeply** idiomatic node

re-writing it in rust has been work

- → JSON is, well, native to JS but not to Rust
- → current API doesn't hide the serde_json choice
- → learned about lazy_static and mutexes

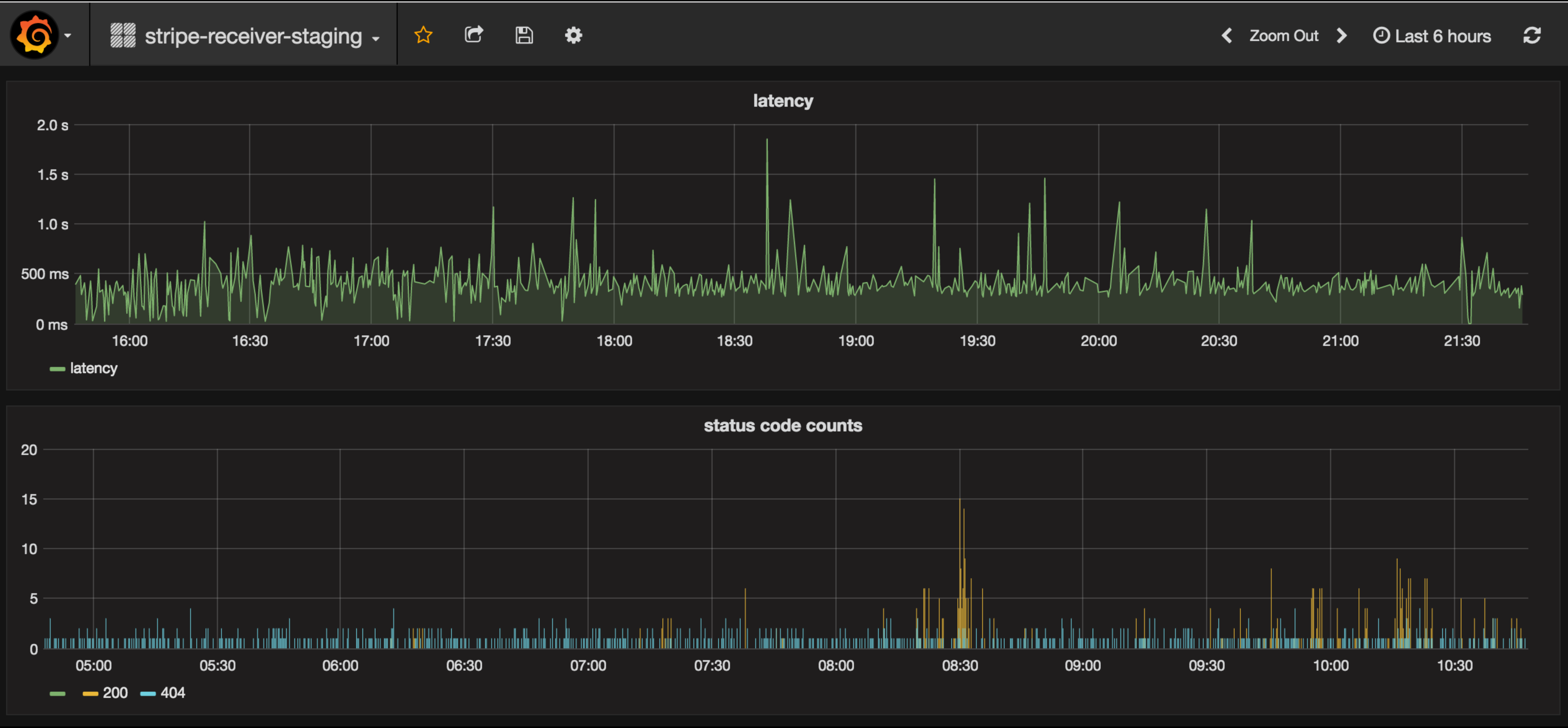
```rust
let mut point_defs: BTreeMap<&str, Value> = BTreeMap::new();
point_defs.insert("x", serde_json::to_value("global"));

emitter().init(point_defs, "numbat-emitter");
emitter().connect("tcp://localhost:4677");
emitter().emit_name("initialization");
emitter().emit_name_val_tag("response", 23, "status", "200");
```

error handling ha ha ha

doesn't retry, doesn't reconnect

but the **happy path** works!


stripe-receiver-staging
Zoom Out
Last 6 hours
latency
2.0 s
1.5 s
1.0 s
500 ms
0 ms
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30
latency
status code counts
20
15
10
5
0
05:00
05:30
06:00
06:30
07:00
07:30
08:00
08:30
09:00
09:30
10:00
10:30
200
404

the server is operationalized
now actually **proxy** something!

```rust
fn proxy_request(request: &Request, request_body: Vec<u8>,
  target: &str, target_host: &str)
  -> Result<hyper::client::Response, hyper::Error>
{
    use hyper::header::Host;
    let client = hyper::Client::new();

    let mut headers = request.headers.clone();
    headers.set(Host {
        hostname: target_host.to_string(),
        port: None
    });

    let proxy_response = try!(
        client.request(request.method.clone(), target)
        .headers(headers).body(&request_body[..]).send());

    Ok(proxy_response)
}
```

current status:

in staging, handling traffic successfully

to-do list

1. finish up the metrics emitter & publish it
2. contribute Pencil changes back upstream
3. continue to learn Rust idioms & rewrite
4. fix my proxy code omg
5. build server & build artifact deployer

conclusion: we can write perf critical services in Rust