Thunderdome

Ian Davis, Protocol Labs

IPFS Camp

Thunderdome?

Thunderdome

A gladiatorial arena where ~~conflicts are resolved by a fight to the death~~ performance of different IPFS Gateway configurations and implementations can be compared

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What does Thunderdome do?

- Runs experiments on demand and records metrics for the things being tested
- Currently it supports testing IPFS gateway implementations with HTTP traffic
- Designed to run for long periods - days
- Given an experiment definition it starts all the necessary infrastructure, applies load and monitors

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Infrastructure

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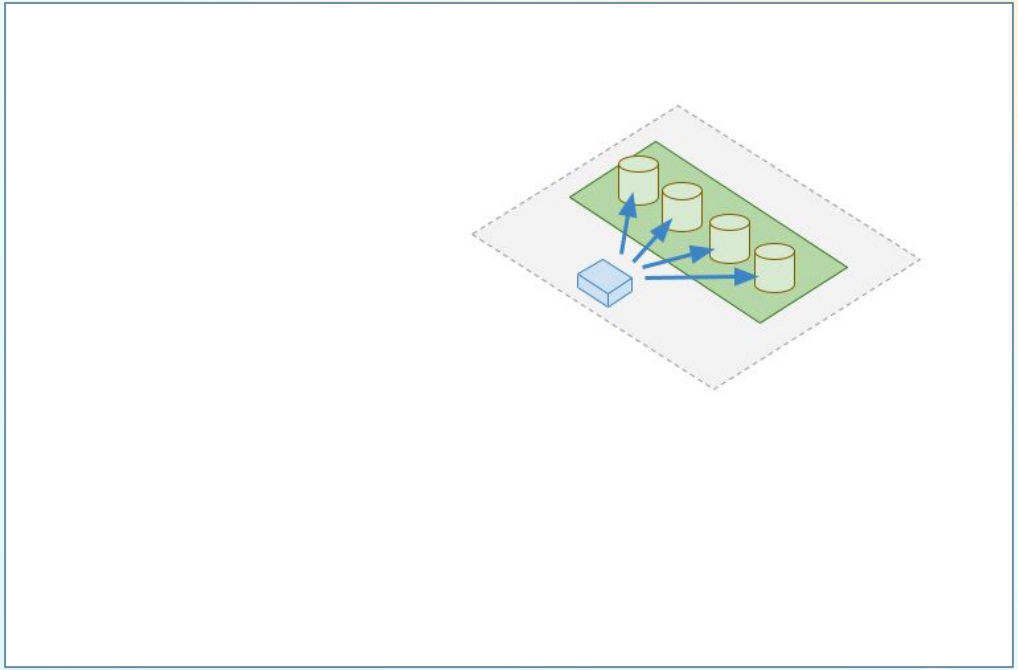
What is an experiment?

- At its simplest: fire requests at a bunch of ipfs nodes
- Today these are HTTP requests intended to test IPFS gateways



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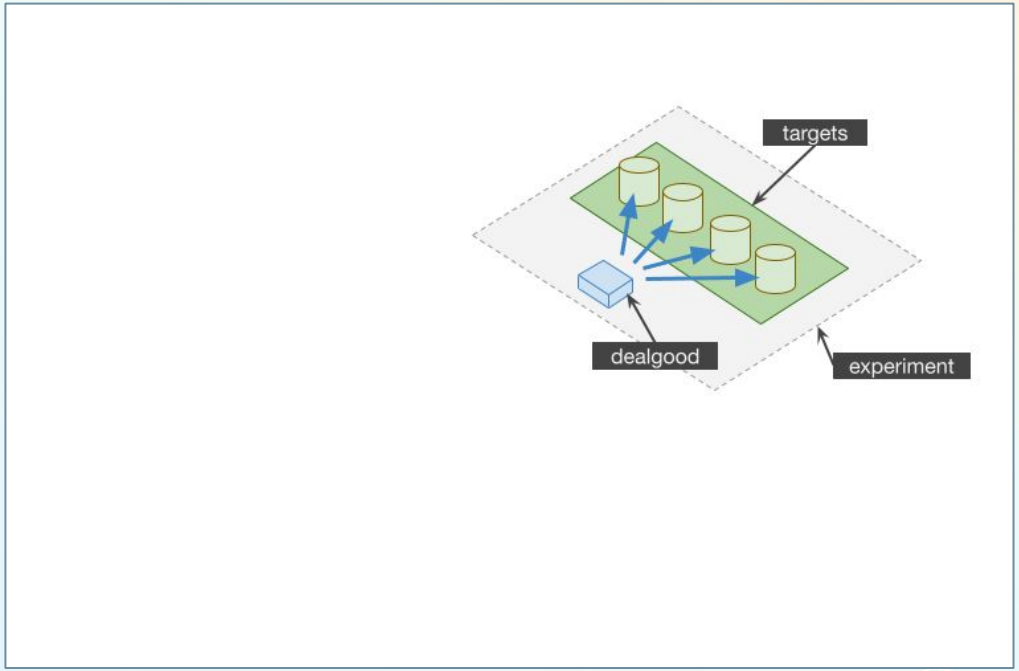
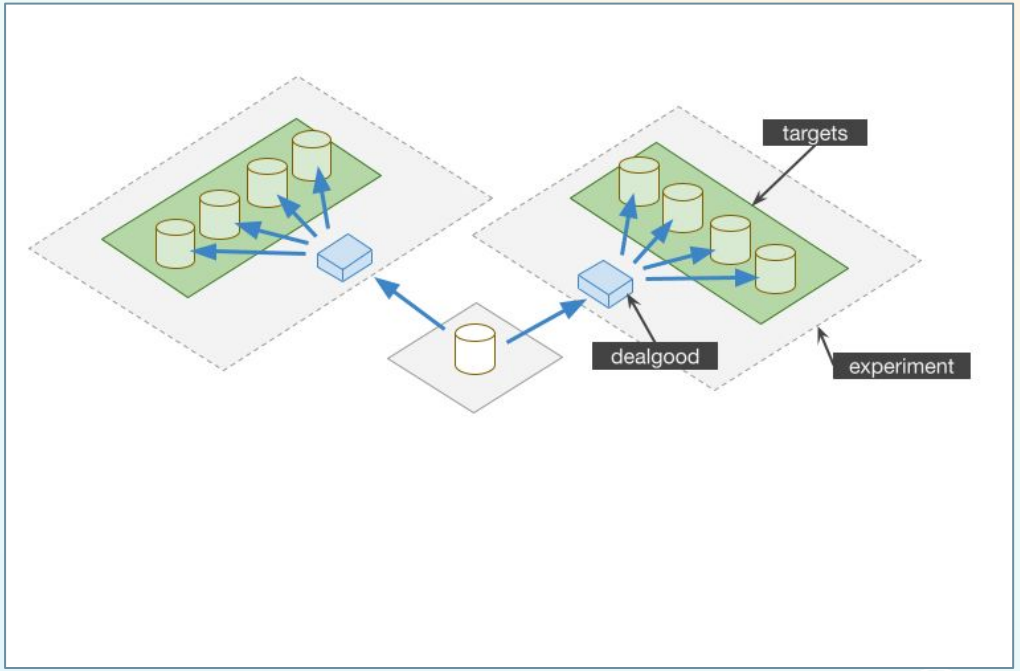
What goes into an experiment?

- experiment defines
  - request rate
  - concurrency
  - target config
- target - a docker container in ECS
- dealgood - applies load evenly to targets



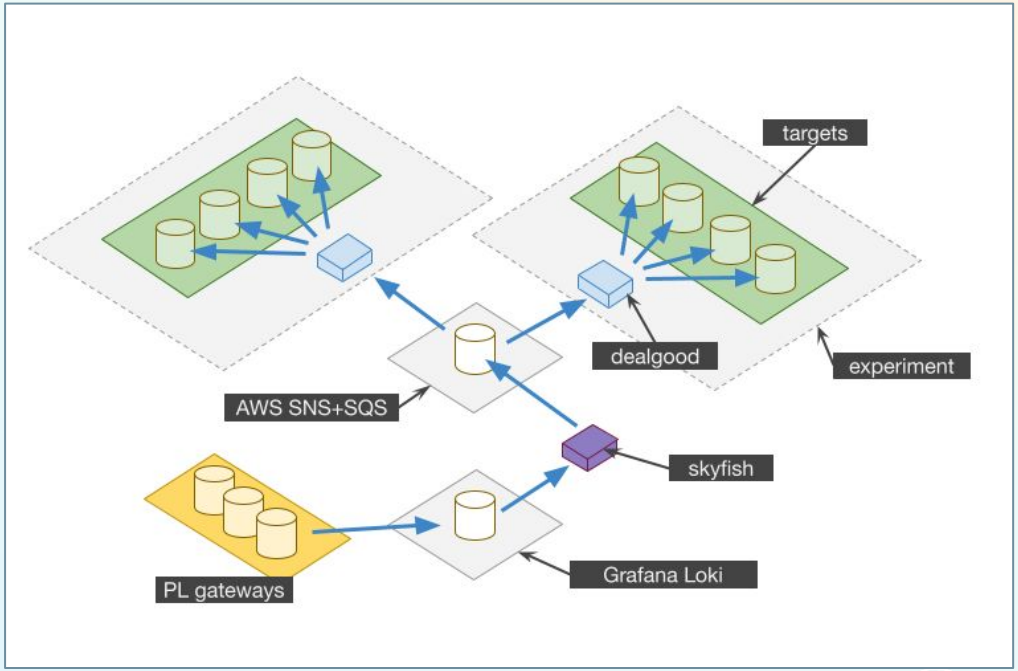
Multiple experiments

- Each experiment is independent
- Each instance of dealgood controls the load applied to that experiment's targets



Where do requests come from?

- HTTP requests are sampled from ipfs.io gateways into Loki
- skyfish - bridges Loki and AWS SNS
- dealgood - listens to its own SQS queue fed by SNS



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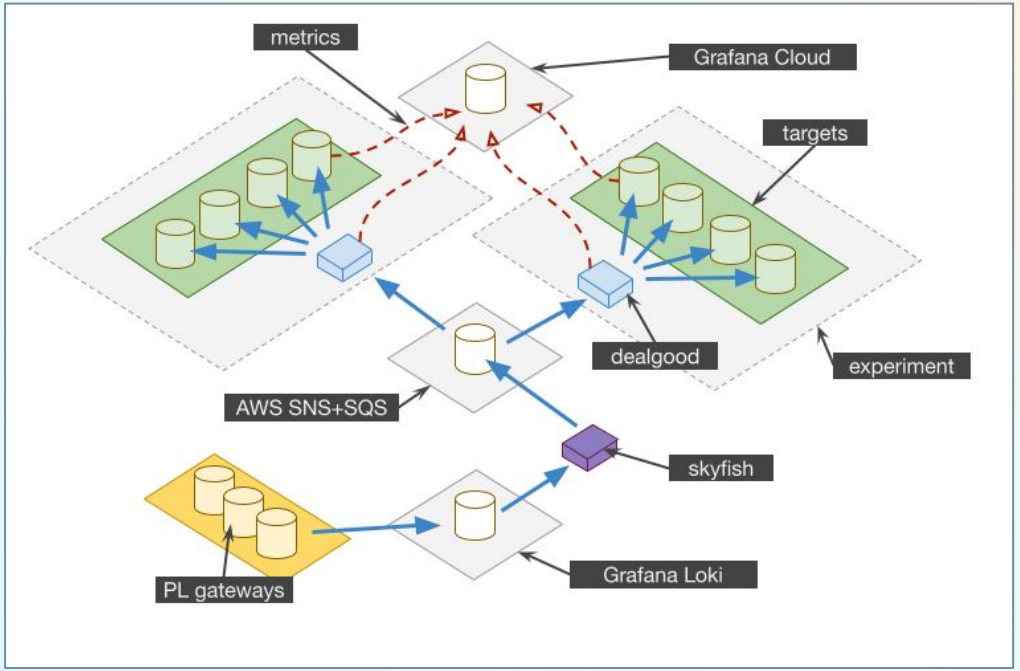
Metric collection

- Metrics are read from target containers and dealgood
- All available in Grafana cloud for dashboarding



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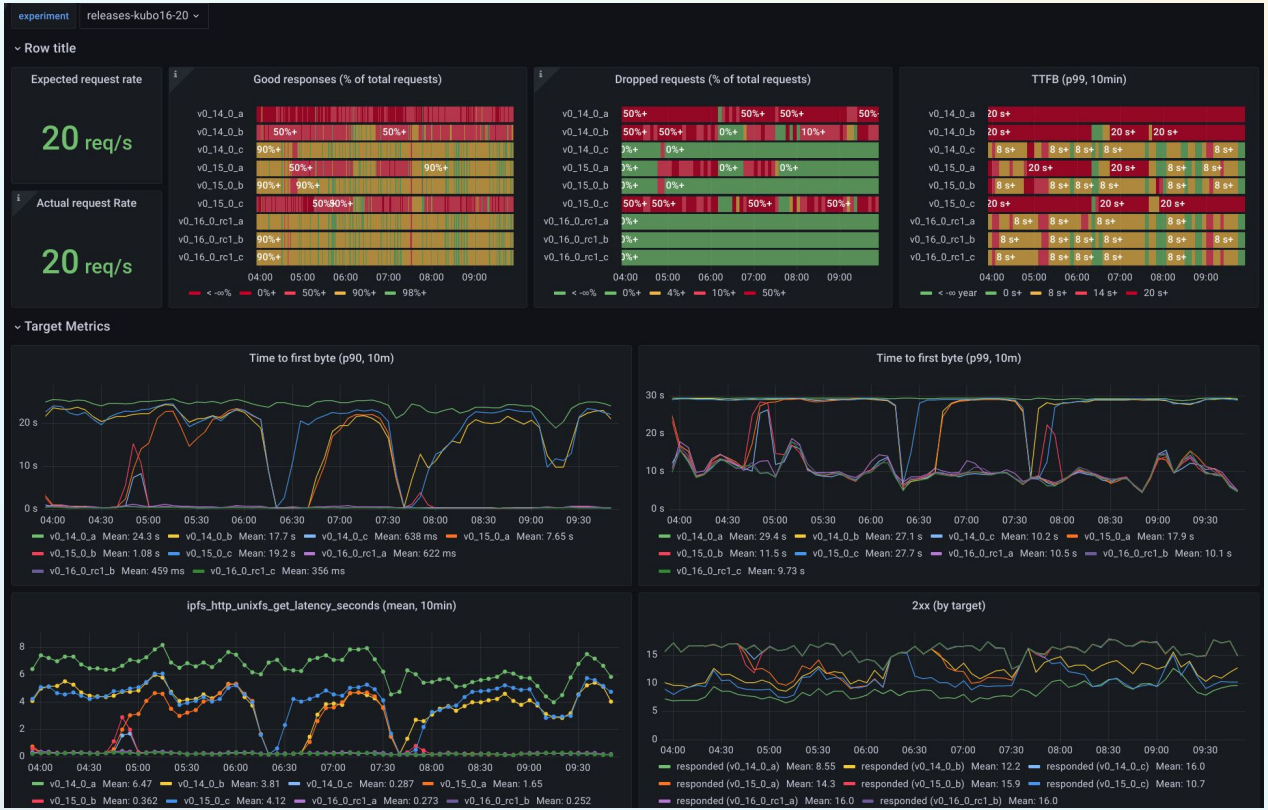
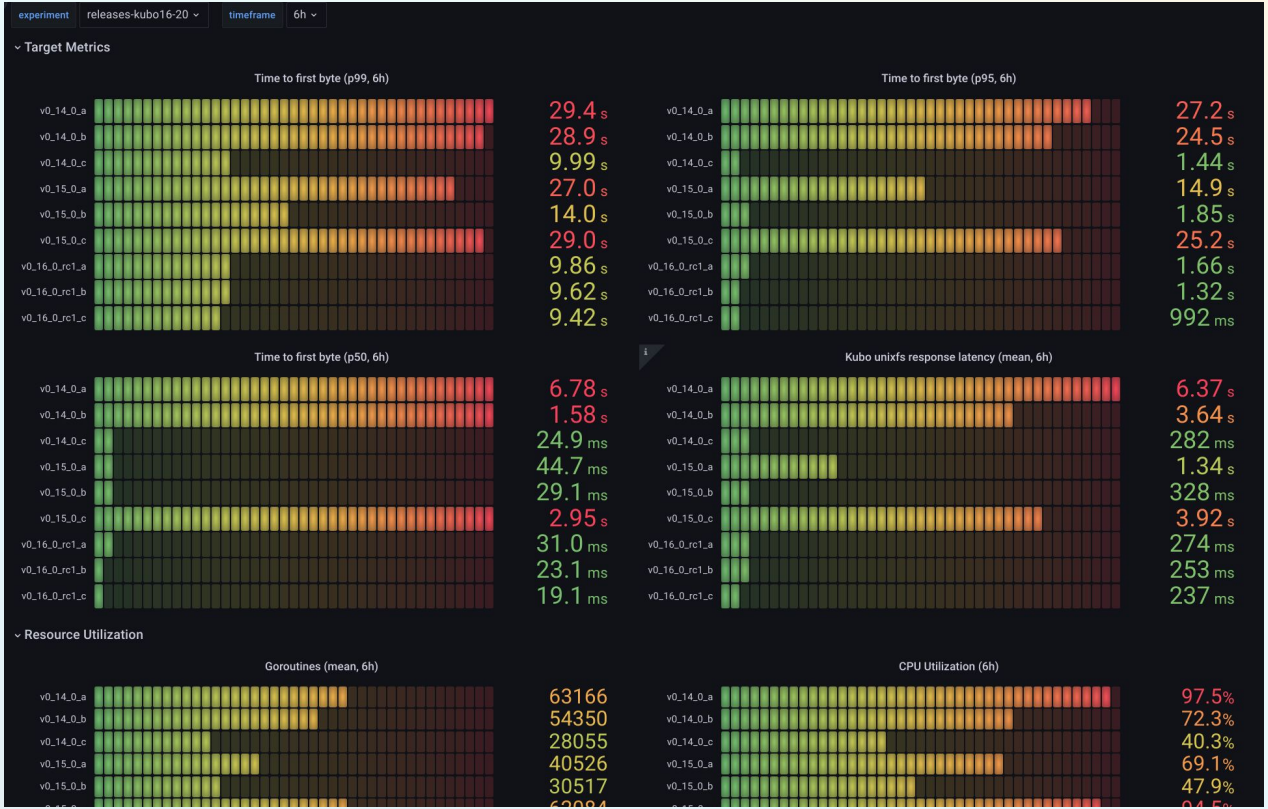
Experiment results

- Grafana holds all relevant metrics from an experiment
- Collected via prometheus from:
  - targets
  - dealgood
  - skyfish
- Tagged by experiment and source (job)

Experiment timelines



Experiment summaries



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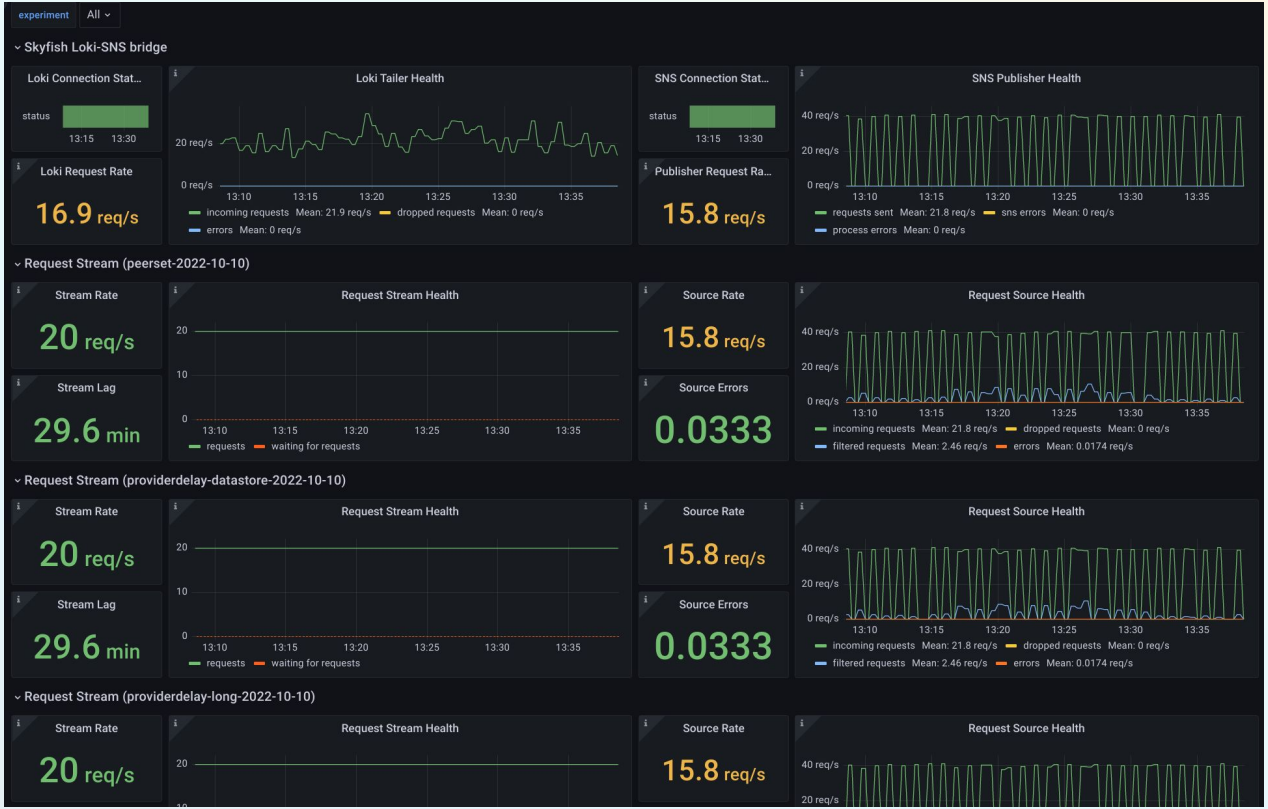
Experiment health



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Infrastructure challenges

- The nature of ipfs and p2p makes it hard to test instances in isolation
- Nodes like to chat to their neighbors
- At a minimum we want to avoid test targets from fetching from one another
- Network ACLs isolate each target
- Tracking IPFS work on peer connection rules

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Experiments

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Initial experiments

- Our focus has been on proving Thunderdome
  - Ensuring no bias in infrastructure
  - Scaling request streams
- Picked some easy experiments:
  - Baseline experiment
  - Comparing kubo releases
  - Bitswap provider delays

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Experiment: tweedles

- Baseline experiment
- Two identical Kubo instances
  - tweedle-dee and tweedle-dum
  - Same configuration
  - Same load
  - Should perform identically
- Detect bias in Thunderdome infrastructure

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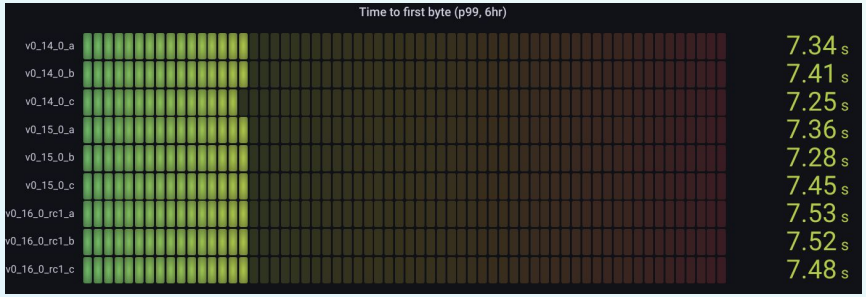
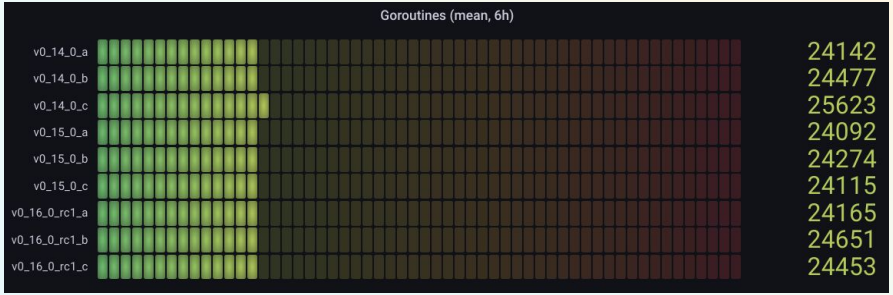
Experiment: kubo v0.16 release

- Version comparison
- Two pairs of each Kubo version:
  - v0.14, v0.15 and v0.16 rc1
  - Same configuration
  - 10 rps and 20 rps
- Detect potential performance regressions or improvements

Comparison at 10 rps

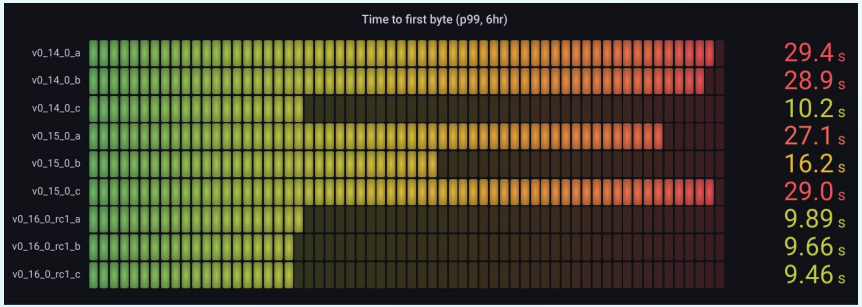
All quiet…

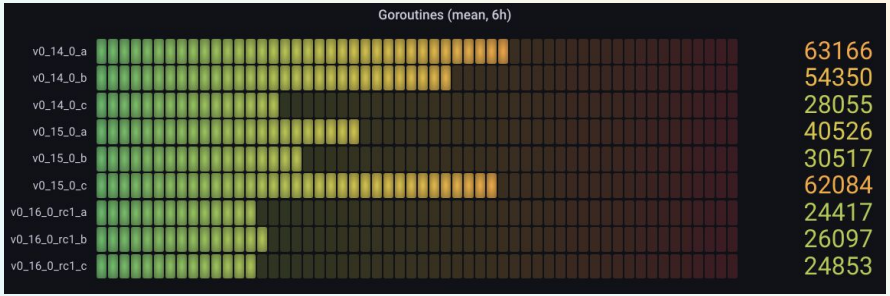


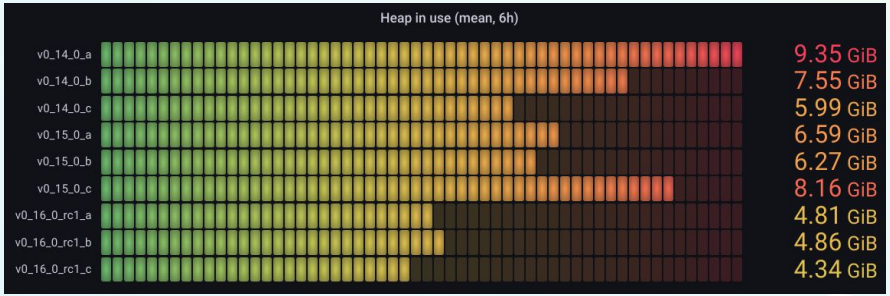


Comparison at 20 rps

Some things blew up…







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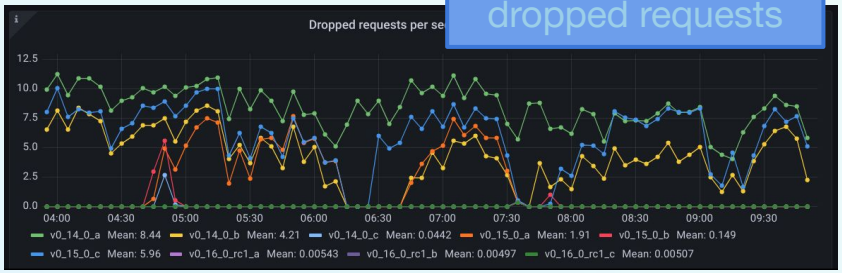
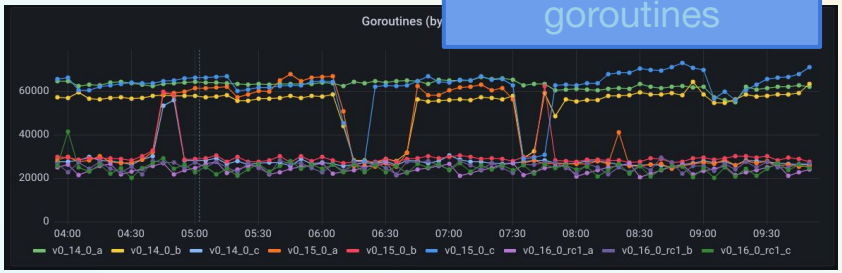
Comparison at 20 rps

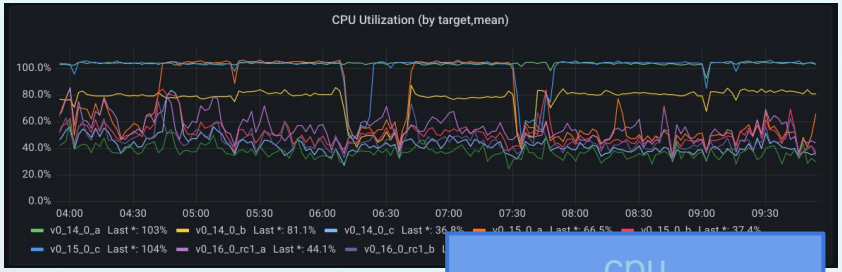
Over time…



dropped requests



goroutines



cpu

heap

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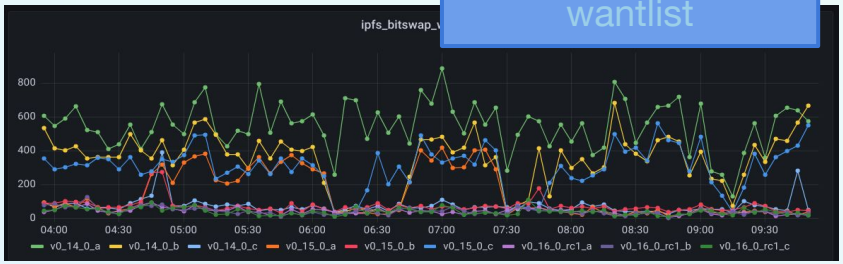
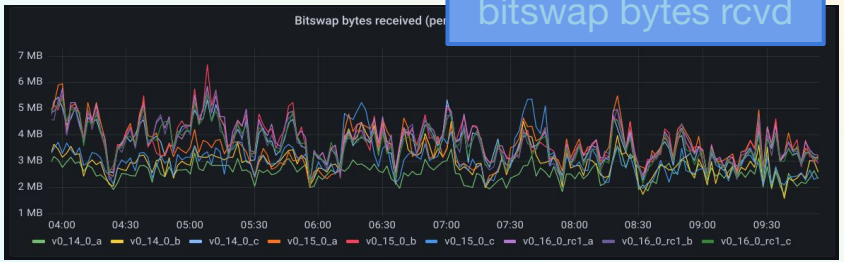
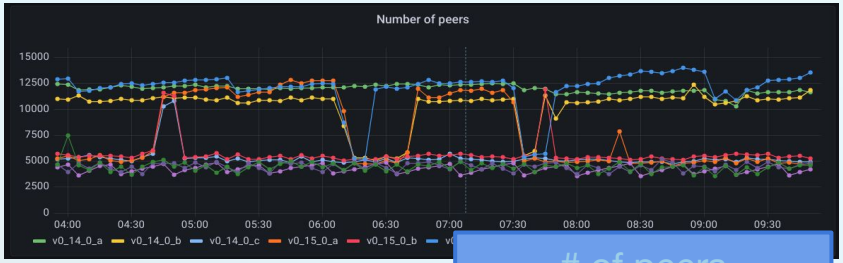
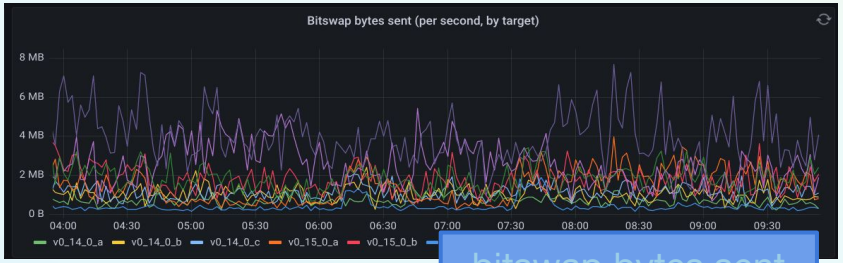
Comparison at 20 rps

Bitswap behavior - elevated peer lists









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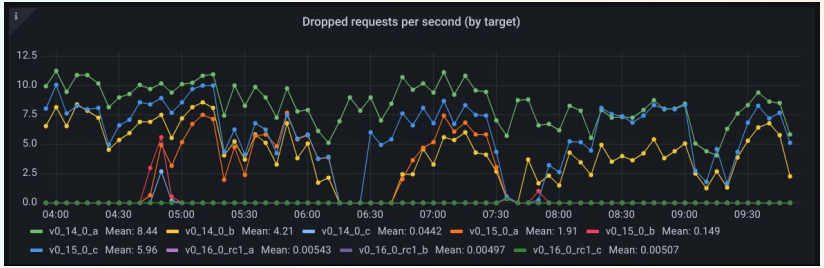
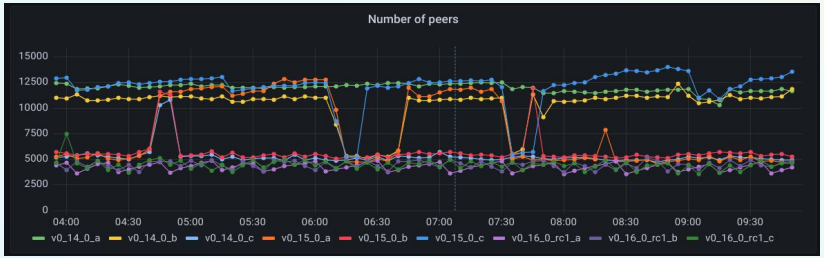
Observations

- Kubo can get trapped in a state with elevated numbers of peers which causes:
  - Large heap
  - High goroutines + CPU
  - Larger wantlists
  - High TTFB
  - Poor throughput





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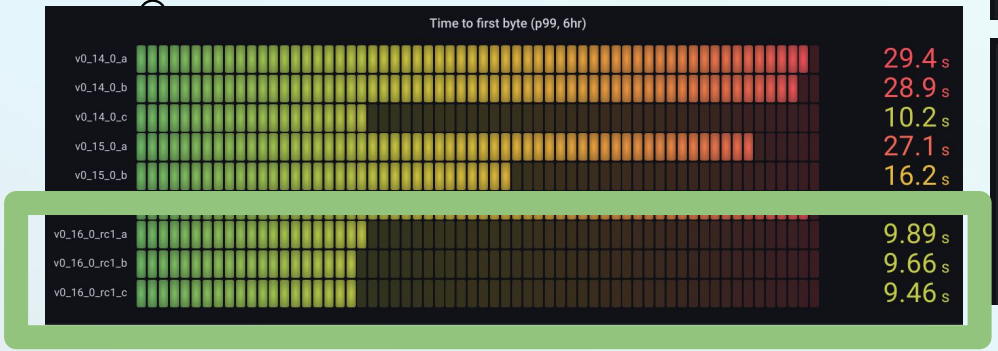
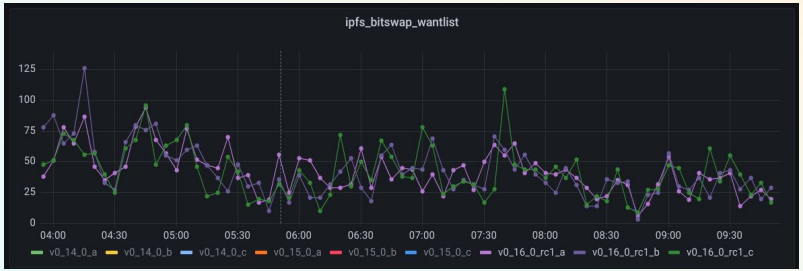
Conclusion

- But… Kubo 0.16.0 rc1 seemed to avoid falling into this state





Follow up

- Followed up with comparison of various commits between v0.15 and v0.16
- Narrowed down point at which Kubo appears to behave better - routing logic changes
- Read the experiment summaries
  - https://tinyurl.com/45mhhf89

Other Experiments

- **gwblock** — Compared performance of Kubo when instances are blocked from connecting to public gateway instances
- **providerdelay-base** — Compared various bitswap provider delay settings
- **providerdelay-peerset** — Compared various provider delays with high water of peer connections of 600
- **providerdelay-acceldht** — Same as base provider search delay experiment but accelerated dht is disabled
- **providerdelay-datastore** — Same as base provider search delay experiment but the datastore is limited to 1GB to force block retrieval
- **providerdelay-long** — Same as base provider search delay experiment but using much longer delays (10/20/30s)
- **peerset** — Latest kubo comparing settings for number of peer connections

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Future

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Roadmap

- Q4 2022 - Automatic Release Comparisons
  - Test every Kubo release candidate against previous release
- Q1 2023 - Single Click Experiments
  - Allow collaborators to create and run experiments
- Q2 2023 - Alternate Gateway Implementations
  - Experiments with iroh, pomegranate etc.

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Long term vision

- More target types - not just IPFS gateway implementations
- More load sources - support protocols other than HTTP such as bitswap
- Bring your own infra - enable deployment on non-AWS infrastructure
- More experiments… more data…

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Get Involved

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Got an experiment?

- Find me on Filecoin slack in #prodeng
- Or on IPFS discord in #probe-lab
- Raise an issue in the thunderdome Github repo:

  https://github.com/ipfs-shipyard/thunderdome/issues

(soon you can run your own)

Get the source code

- It's open source on Github

  https://github.com/ipfs-shipyard/thunderdome

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Thank you

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