@PrometheusIO

Prometheus

Shaping Metric Monitoring in 2020

Deep Dive

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Bartłomiej Płotka
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Hello!

Goutham Veeramachaneni

Software Engineer @ Grafana Labs

Prometheus and **Cortex** maintainer

Co-author of **Loki**

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Hello!

Bartłomiej Płotka

Principal Software Engineer @ Red Hat

Prometheus maintainer

Co-founder of **Thanos**

CNCF SIG Observability Tech Lead

https://github.com/cncf/sig-observability

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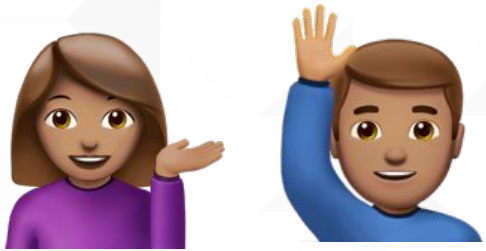
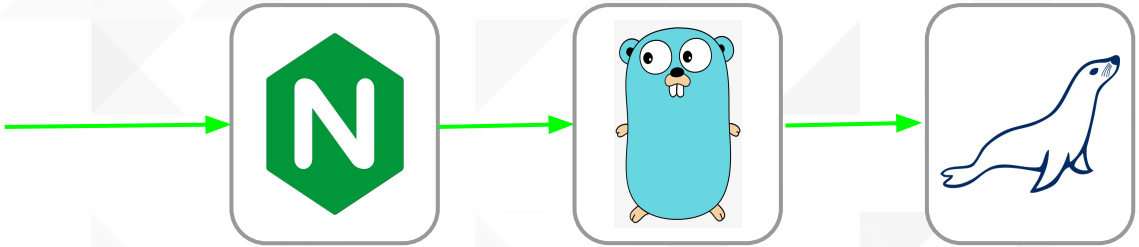
Let's start with a typical team





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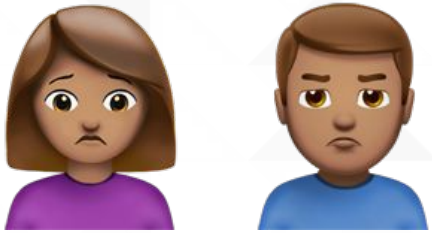
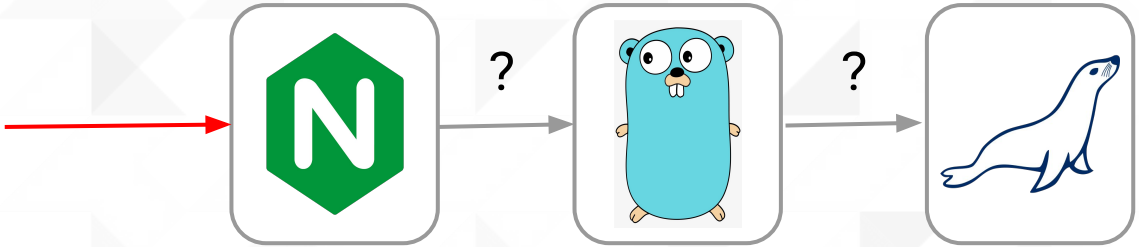
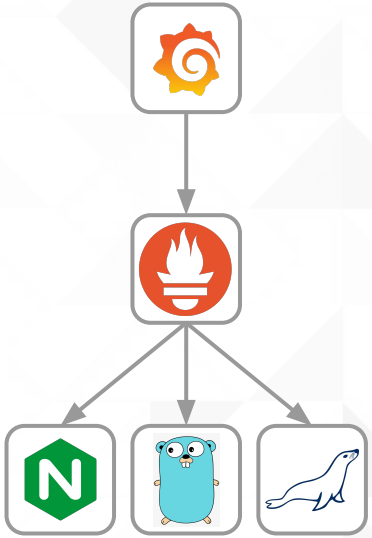
Things are great until they're not...





Add some Prometheus magic!



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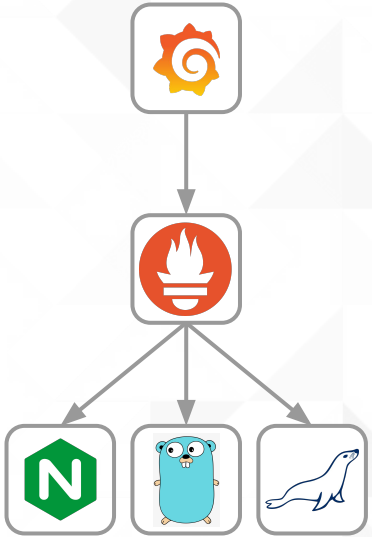
… with Dashboards!



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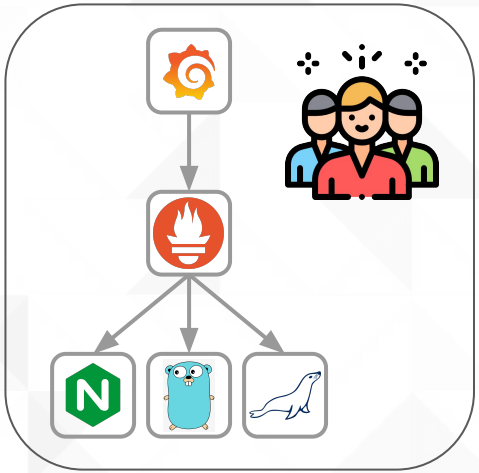
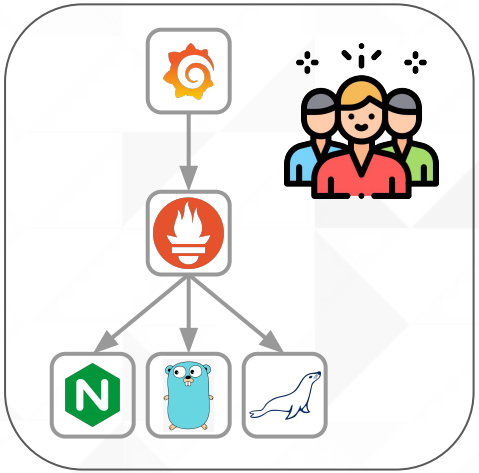
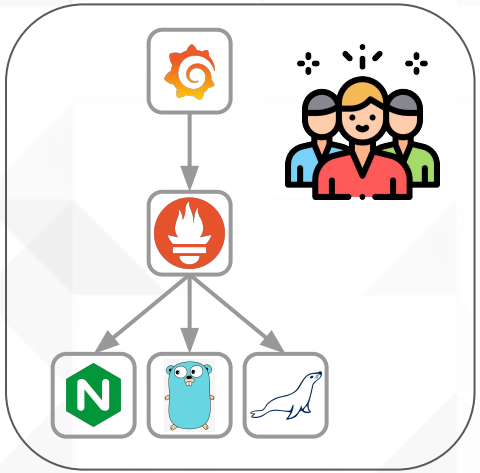
Slowly adoption grows!







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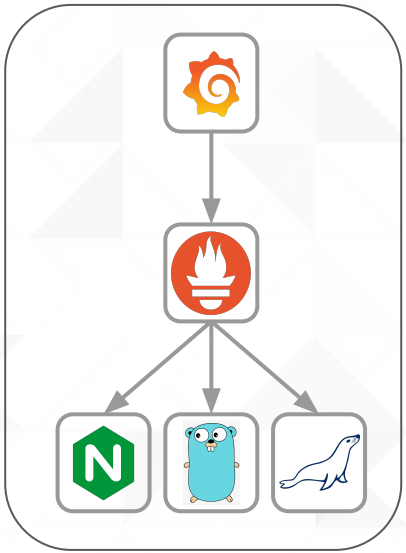
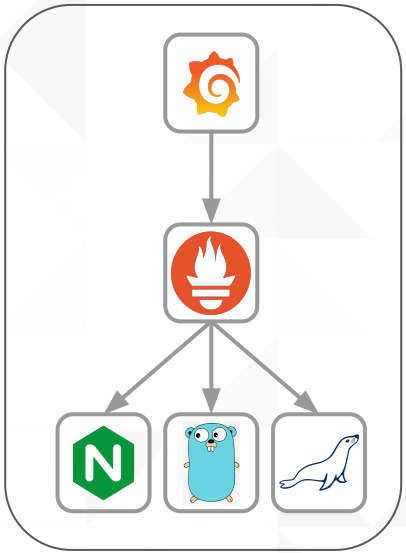
So does usage!



us-central-1



eu-west-2

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Global View

How do I combine data from **two Prometheus servers**?

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Global View

How do I combine data from **two Prometheus servers**?

sum by (handler) (rate(http_requests_total{code=~"5..", job=~"app1"}[5m]))

Execute - insert metric at cursor -

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Global View via Query API?

sum by (handler) (rate(http_requests_total{code=~"5..", job=~"app1"}[5m]))

Execute - insert metric at cursor -

???

/query_range?**query='sum by (handler) (rate(....'**

us-central-1

eu-west-2

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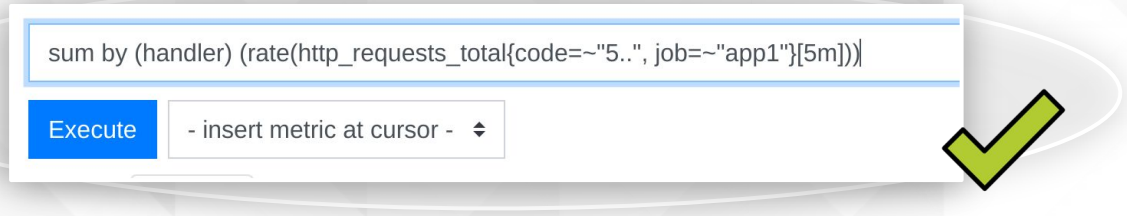
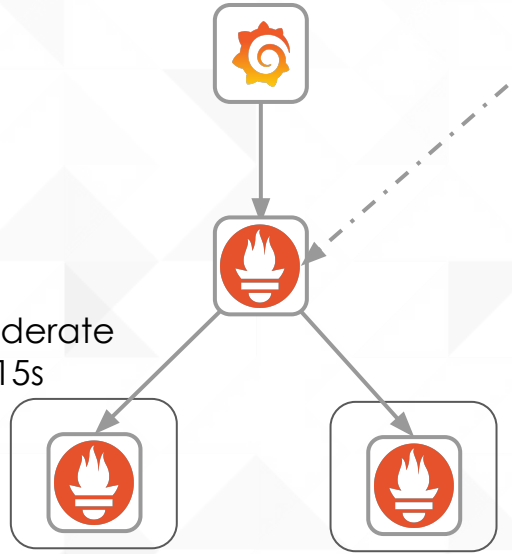
Global View via Federation






```
scrape_configs:
  - job_name: 'federate'
    scrape_interval: 15s
    metrics_path: '/federate'

    static_configs:
      - targets:
        - 'us-central-1.prometheus:9090'
        - 'eu-west-2.prometheus:9090'
```

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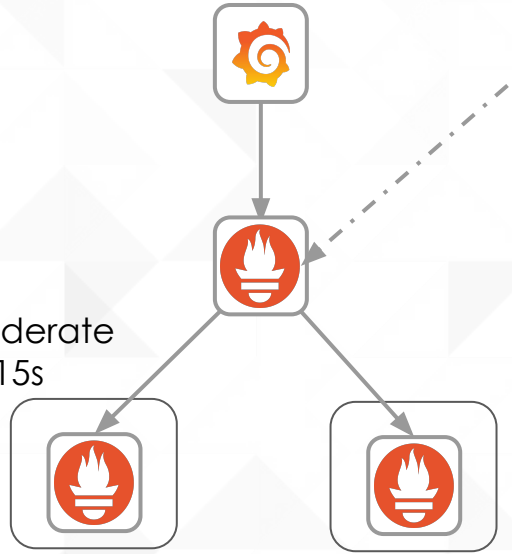
https://prometheus.io/docs/prometheus/latest/federation/

Global View via Federation

sum by (handler) (job:handler:http_requests_errors_total:rate5m:sum{job=~"app1"})

Execute - insert metric at cursor -




```
scrape_configs:
  - job_name: 'federate'
    scrape_interval: 15s
    metrics_path: '/federate'

    params:
      'match[]':
        - '{__name__=~".*:.*"}'

    static_configs:
      - targets:
        - 'us-central-1.prometheus:9090'
        - 'eu-west-2.prometheus:9090'
```

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https://prometheus.io/docs/prometheus/latest/federation/

Global View via Query API?

sum by (handler) (rate(http_requests_total{code=~"5..", job=~"app1"}[5m]))

Execute - insert metric at cursor -

???

/query_range?**query='sum by (handler) (rate(....'**

us-central-1

eu-west-2

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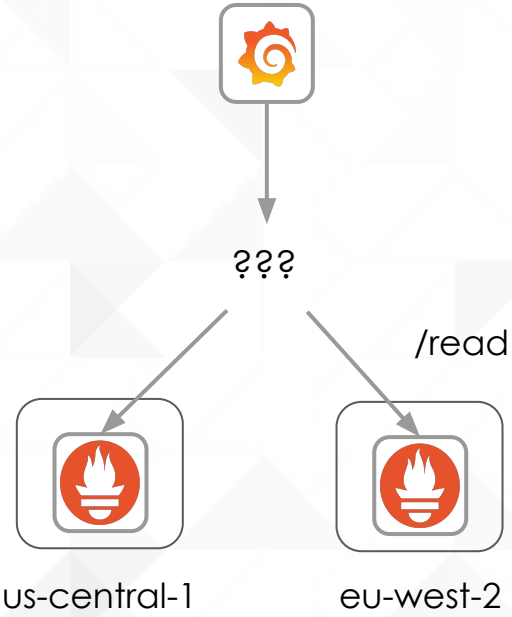
Global View via Remote Read

sum by (handler) (rate(http_requests_total{code=~"5..", job=~"app1"}[5m]))

Execute - insert metric at cursor -




```
message ReadRequest {
  repeated Query queries = 1;
}

message Query {
  int64 start_timestamp_ms = 1;
  int64 end_timestamp_ms = 2;
  repeated prometheus.LabelMatcher matchers = 3;
  ...
}
```

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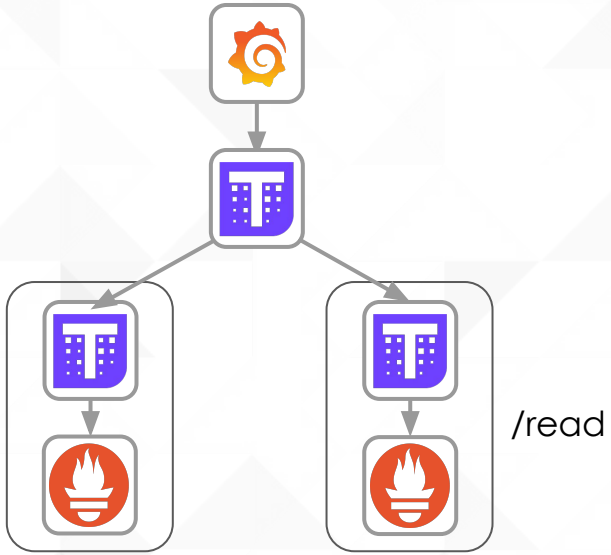
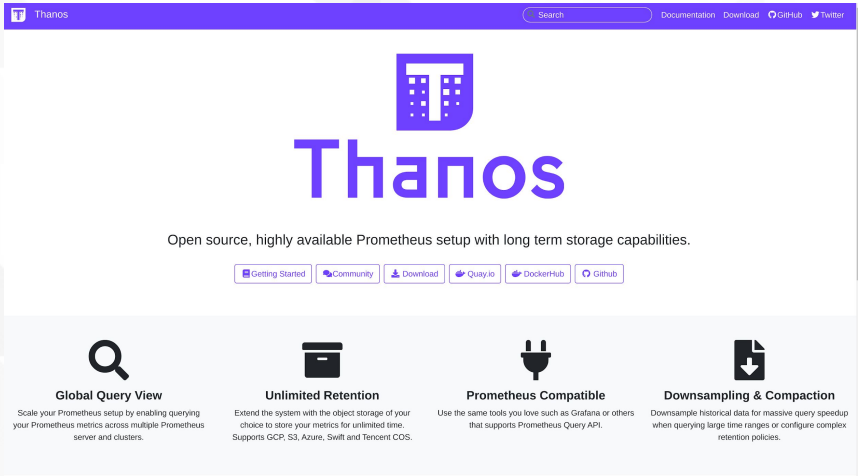
https://prometheus.io/blog/2019/10/10/remote-read-meets-streaming/

Global View via Remote Read (+ Thanos)

```
sum by (handler) (rate(http_requests_total{code=~"5..", job=~"app1"}[5m]))
```

Execute | - insert metric at cursor -





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https://thanos.io

Long Term Metrics Retention

Nice, but how do I store **years** of our metrics?

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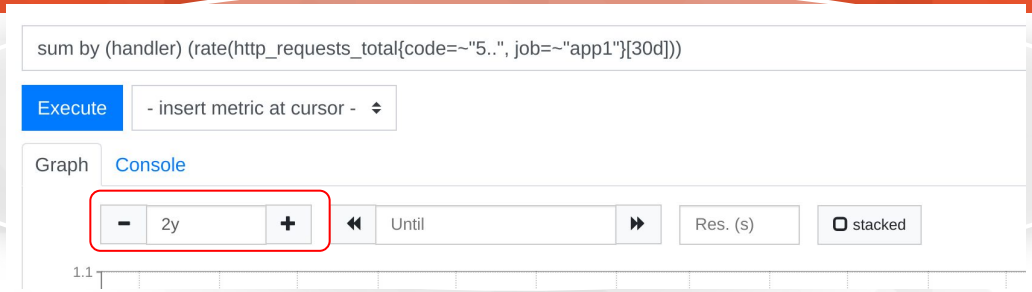
Long Term Retention with Prometheus?



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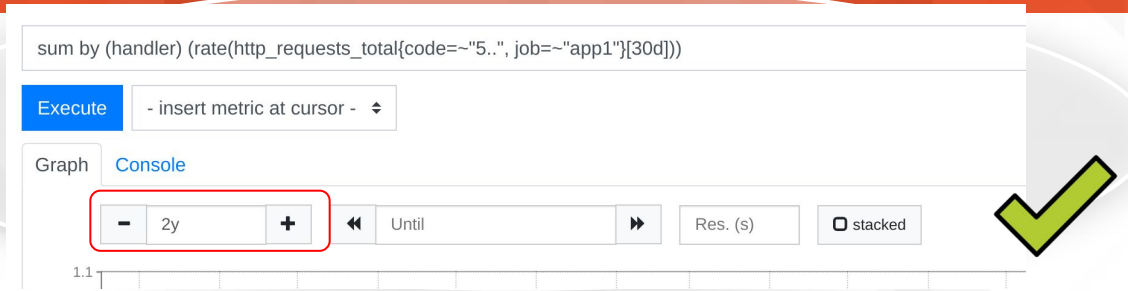
Long Term Retention with Prometheus: **Yes**!



Prometheus **can** hold long metric retention (years!)

Fact: **Older data use marginal resources when not queried.**

How? **Get large SSD and plan data size head of time.**

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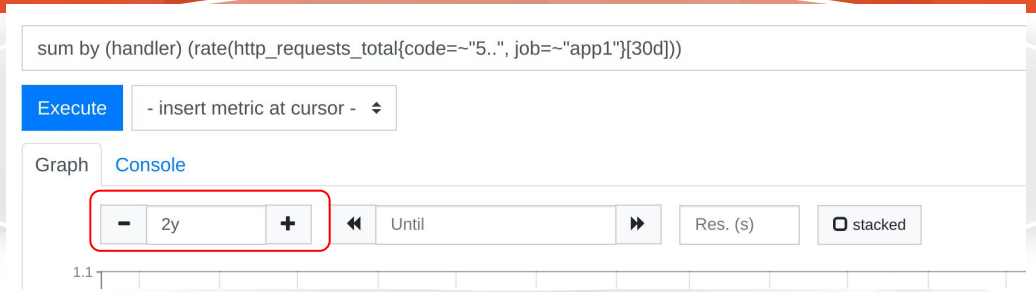
Long Term Retention with Prometheus: **Caveats**



Be careful:

- Hard to plan disk space for future: Uncontrollable cardinality.
- Persistent disk backup are not always easy
- No downsampling

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Remote Write

So what if I want to send to a different DB?

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Remote Write

```
remote_write:
- name: data-lake
  url: https://remote-tsdb.net
  basic_auth:
  username: "10428"
  password: <secret>
```

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Remote Write

```
remote_write:
- name: data-lake
  url: https://remote-tsdb.net
  basic_auth:
  username: "10428"
  password: <secret>

  write_relabel_configs:
  - source_labels: [__name__]
    regex: .*:.*
    action: keep
```

Remote Write

Integrations for every popular TSDB available.

Remote Endpoints and Storage

The remote write and remote read features of Prometheus allow transparently sending and receiving samples. This is primarily intended for long term storage. It is recommended that you perform careful evaluation of any solution in this space to confirm it can handle your data volumes.

- AppOptics: write
- Azure Data Explorer: read and write
- Azure Event Hubs: write
- Chronix: write
- Cortex: read and write
- CrateDB: read and write
- Elasticsearch: write
- Gnocchi: write
- Google Cloud Spanner: read and write
- Graphite: write
- InfluxDB: read and write
- IRONdb: read and write
- Kafka: write
- M3DB: read and write
- MetricFire: read and write
- OpenTSDB: write
- PostgreSQL/TimescaleDB: read and write
- QuasarDB: read and write
- SignalFx: write
- Splunk: read and write
- TiKV: read and write
- Thanos: read and write
- VictoriaMetrics: write
- Wavefront: write

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Remote Write

```
message WriteRequest {
  repeated prometheus.TimeSeries timeseries = 1;
}
```

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Remote Write

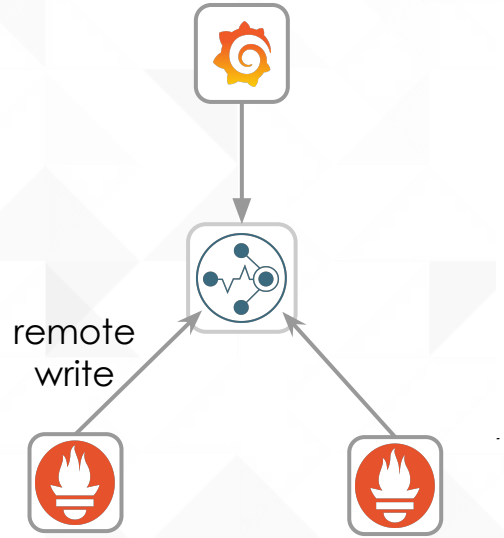
```
message WriteRequest {
  repeated prometheus.TimeSeries timeseries = 1;
}

message TimeSeries {
  repeated Label labels   = 1;
  repeated Sample samples = 2;
}
```

Global View via Remote Write (+ Cortex/M3/et.)

sum by (handler) (rate(http_requests_total{code=~"5..", job=~"app1"}[5m]))

Execute | - insert metric at cursor -



Documentation Twitter Github Search this site...

cortex

Horizontally scalable, highly available, multi-tenant, long term Prometheus.

Learn More | Releases

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https://cortexmetrics.io

Metadata

Wait, what is this metric in this query??

I'm new to the team, how can I understand the alerts better?

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Metadata

Follow naming best-practice

Sometimes, still not clear!

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METRIC AND LABEL NAMING

The metric and label conventions presented in this document are not required for using Prometheus, but can serve as both a style-guide and a collection of best practices. Individual organizations may want to approach some of these practices, e.g. naming conventions, differently.

Metric names

A metric name...

- ...must comply with the data model for valid characters.
- ...should have a (single-word) application prefix relevant to the domain the metric belongs to. The prefix is sometimes referred to as `namespace` by client libraries. For metrics specific to an application, the prefix is usually the application name itself. Sometimes, however, metrics are more generic, like standardized metrics exported by client libraries. Examples:
  - `prometheus_notifications_total` (specific to the Prometheus server)
  - `process_cpu_seconds_total` (exported by many client libraries)
  - `http_request_duration_seconds` (for all HTTP requests)
- ...must have a single unit (i.e. do not mix seconds with milliseconds, or seconds with bytes).
- ...should use base units (e.g. seconds, bytes, meters - not milliseconds, megabytes, kilometers). See below for a list of base units.
- ...should have a suffix describing the unit, in plural form. Note that an accumulating count has `total` as a suffix, in addition to the unit if applicable.
  - `http_request_duration_seconds`
  - `node_memory_usage_bytes`
  - `http_requests_total` (for a unit-less accumulating count)

Metadata

```
# HELP go_gc_duration_seconds A summary of the pause duration of garbage collection cycles.
# TYPE go_gc_duration_seconds summary
go_gc_duration_seconds{quantile="0"} 0.000670276
go_gc_duration_seconds{quantile="0.25"} 0.001622397
go_gc_duration_seconds{quantile="0.5"} 0.002350074
go_gc_duration_seconds{quantile="0.75"} 0.003350546
go_gc_duration_seconds{quantile="1"} 0.015834097
go_gc_duration_seconds_sum 142.036233996
go_gc_duration_seconds_count 46744
# HELP go_goroutines Number of goroutines that currently exist.
# TYPE go_goroutines gauge
go_goroutines 5218
# HELP go_info Information about the Go environment.
# TYPE go_info gauge
go_info{version="go1.14.4"} 1
# HELP go_memstats_alloc_bytes Number of bytes allocated and still in use.
# TYPE go_memstats_alloc_bytes gauge
go_memstats_alloc_bytes 2.7939151784e+10
```

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Metadata: API

Querying metric metadata

It returns metadata about metrics currently scrapped from targets. However, it does not provide any target information. This is considered **experimental** and might change in the future.

```
GET /api/v1/metadata
```

URL query parameters:

- `limit=<number>`: Maximum number of metrics to return.
- `metric=<string>`: A metric name to filter metadata for. All metric metadata is retrieved if left empty.

The `data` section of the query result consists of an object where each key is a metric name and each value is a list of unique metadata objects, as exposed for that metric name across all targets.

The following example returns two metrics. Note that the metric `http_requests_total` has more than one object in the list. At least one target has a value for `HELP` that do not match with the rest.

```
curl -G http://localhost:9090/api/v1/metadata?limit=2

{
  "status": "success",
  "data": {
    "cortex_ring_tokens": [
      {
        "type": "gauge",
        "help": "Number of tokens in the ring",
        "unit": ""
      }
    ],
    "http_requests_total": [
      {
```

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Metadata

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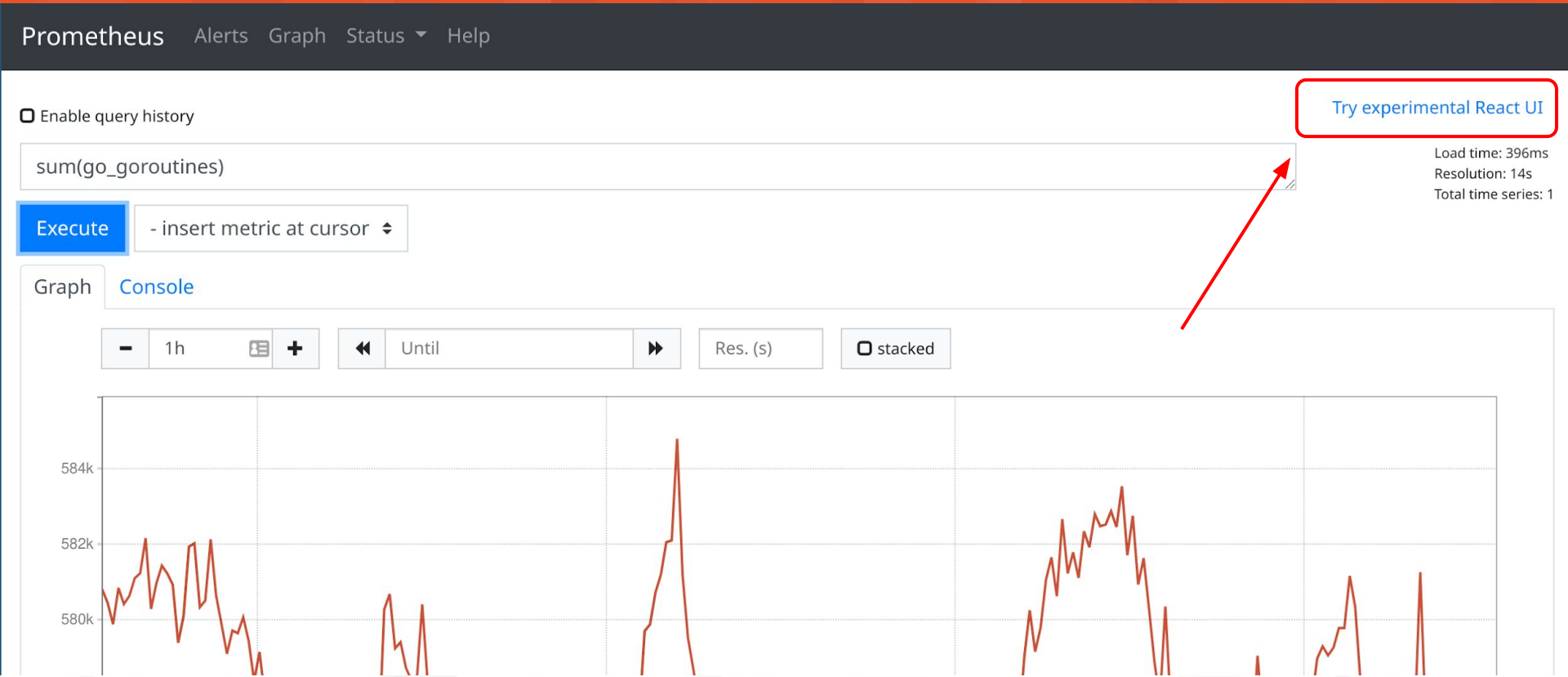
Sneak peek: React UI



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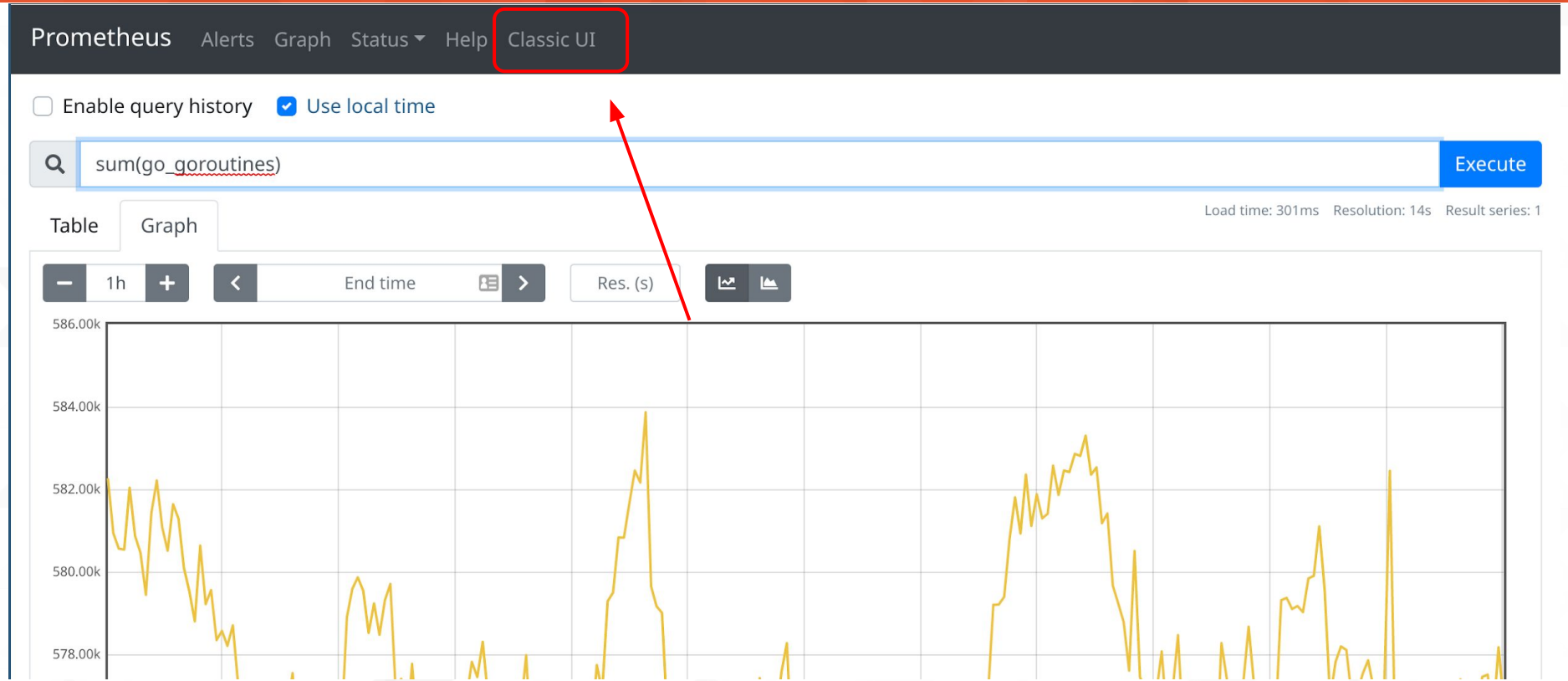
Sneak peek: React UI



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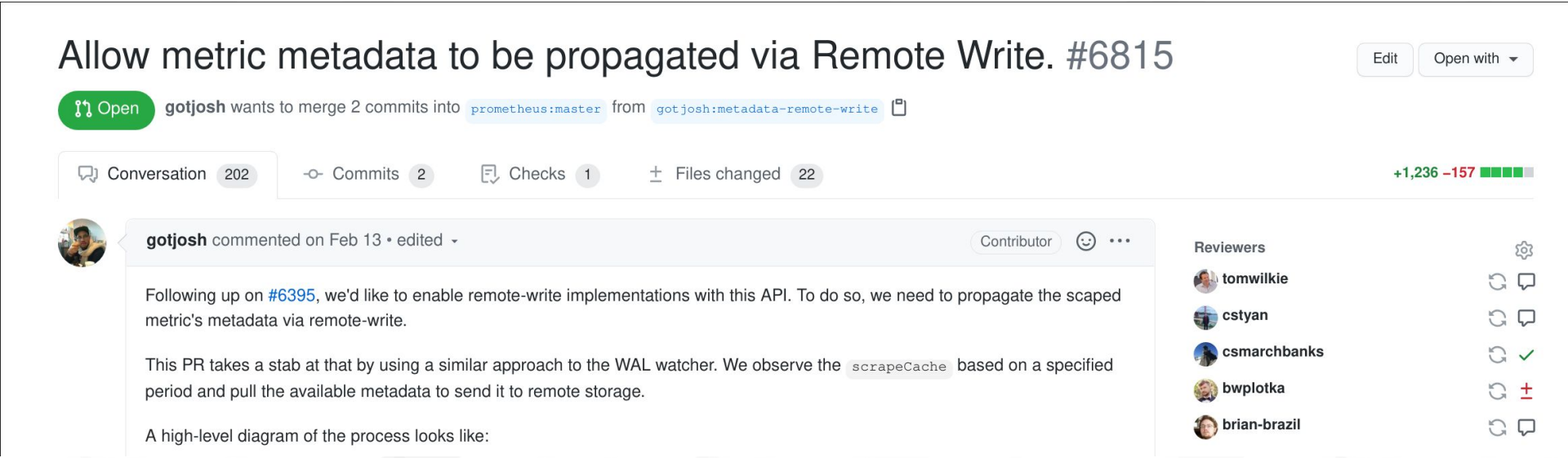
Metadata: **Future**

- **Persist** the metadata to disk.
  - See it historically
- **Remote write** metadata to other systems



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Backfilling

How do I **import my metrics** from different system to Prometheus?

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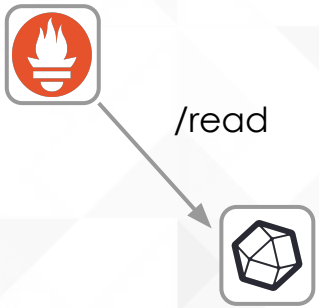
Prometheus reading from another DB

- via Remote read




```
remote_read:
- name: remote-db
  url: https://my-influxdb
  basic_auth:
  username: "10428"
  password: <secret>
```


https://prometheus.io/docs/prometheus/latest/configuration/configuration/#remote_read

File based import to Prometheus?

Nice, but can I import some data from CSV file?

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File based import to Prometheus: **Yes & DEMO**

Nice, but can I import some data from CSV file?

Added TSDB import with OpenMetrics and CSV file support. #7586

Edit | Open with

Open **bwplotka** wants to merge 2 commits into `master` from `tsdb-import`

Conversation 10 | Commits 2 | Checks 1 | Files changed 11 | +945 −44

bwplotka commented 4 hours ago • edited — Member

Based on #5887 Thanks for your work so far **@dipack95**, it helped a lot!

Changes on top of @dipack95 and above PR:

- Addressed all reviews components
- Used subcommands for different formats
- Simplified block creation, no need to be such complex for the first iteration.
- Simplified OpenMetrics parsing from io.Reader, the previous implementation was over-allocating a lot, I think this might be simple start. **@dipack95** please help to finish `openmetrics` package and tests 🤗
- Simplified and separate concerns. No need to have access to DB. Block
  - Block Writing is separated from parsing for ease of benchmarking and test. This will be also needed by **@JessicaGreben**
- Added import support for different formats.
- Removed all tests - those had to be pulled over and adjusted):

I wanted to create a demo of CSV file import for KubeCon import, so went ahead and tried to help you **@dipack95**. Hope we can together finish this and add two formats soon 🤗 What do you think of using this (if you think it's ok, please give your feedback!). Feel free to propose changes (PRs) to this branch `tsdb-import` so we can have this merged together. Help wanted around tests and benchmarks!

Reviewers: brian-brazil

Still in progress? Convert to draft

Assignees: No one—assign yourself

Labels: None yet

Projects: None yet

Milestone: No milestone

Linked issues

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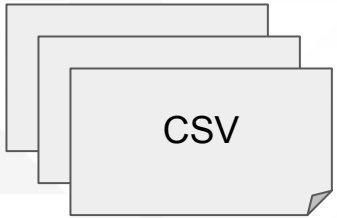
File based import to Prometheus?

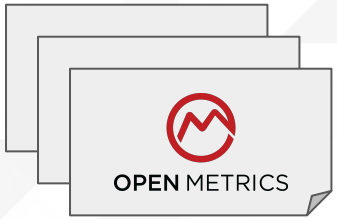
Nice, but can I import some data from CSV file?

cat my-file.csv | tsdb import



TSDB Block

cat my-file.om | tsdb import



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Summary

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Summary

- Global View
  - Query API
  - Federation
  - Remote Read

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Summary

- Global View
  - Query API
  - Federation
  - Remote Read
- Long Term Storage
  - Just Prometheus!
  - Replication via Remote Write

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Summary

- Global View
  - Query API
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  - Remote Read
- Long Term Storage
  - Just Prometheus!
  - Replication via Remote Write
- Metadata

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Summary

- Global View
  - Query API
  - Federation
  - Remote Read
- Long Term Storage
  - Just Prometheus!
  - Replication via Remote Write
- Metadata
- Future: Backfilling
  - CSV, OpenMetrics Import

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Thank You!

Prometheus

You can reach us via:

- https://prometheus.io/community/
- Goutham: https://github.com/gouthamve @gouthamve
- Bartek: https://bwplotka.dev @bwplotka