M3 and Prometheus
Monitoring at Planet Scale for Everyone

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Who are we?

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Let’s talk

Monitoring an increasing number of things...

Metrics being used as a platform more than ever...

Operating in many regions or environments...

M3 and Prometheus/Graphite...
High dimensionality metrics?
Example system being monitored
Which code path to debug?
Need to detect failure and isolate to:
- route = /api/search
- region = eu-west
- client-version = v2.0
Let’s use high dimensionality metrics

- Let’s debug this using HTTP status code delivered by frontends:
  - http_status_code

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Revisiting this example...

Failure is isolated to:
- route = /api/search
- region = eu-west
- client-version = v2.0
Ideally we would see...
How many time series is that?

100 routes * 5 status codes * 12 regions * 40 client versions

= 240,000 unique time series

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You can roll up metrics to make viewing fast

- `region=eu-west client=v1.2 status=2xx`
- `region=eu-north client=v1.3 status=2xx`
- `region=us-west client=v2.0 status=2xx`
- `region=eu-west client=v3.2 status=5xx`
- `region=eu-north client=v3.1 status=5xx`
- `region=eu-west client=v1.1 status=5xx`
- `region=eu-north client=v1.4 status=5xx`
- `region=us-west client=v2.3 status=5xx`

- `status=2xx route=/api/search`
- `status=4xx route=/api/search`
- `status=5xx route=/api/search`
For drill down and high granular alerting

240k time series, expensive but not too bad..? However add any other dimensions and it gets out of control (any multiplier on 240k explodes to millions quickly)

e.g. Unique country code user = 249

```
status=5xx route=/api/search ...
user_country=de client=v1.0 status=5xx ...
user_country=us client=v1.3 status=5xx ...
user_country=lt client=v2.0 status=5xx ...
user_country=pl client=v2.0 status=5xx ...
...```
What is Prometheus? What is M3?

First built at SoundCloud (began 2012, open source in 2014)
- An open source monitoring system and time series database.
- All-in-one single node monitoring solution using metrics.

Built at Uber to scale monitoring horizontally and cost effective (began 2015, open source in 2018)
- Distributed monitoring system and time series database, compatible as remote storage for Prometheus.
A single Prometheus instance can hold a reasonable amount of data (and you should always get started using Prometheus)
Ok great, but what do I need?
Ok great, but what do I need?

Can I fit a service’s high cardinality metrics into an existing Prometheus instance? How do I scale up easily?
So what is M3 and how does it help?

Horizontally scalable platform that supports multiple metric formats
Why M3

1. Suitable for many scenarios
2. Scalable to billions of metrics
3. Focus on simple operation
1. Suitable for many scenarios

Cloud Native, Kubernetes or On Prem, Multi-Region, Prometheus and Graphite compatible
1. Suitable for many scenarios

M3 and Prometheus

- Store metrics for weeks, months or years
- Store metrics at different retention based on mapping rules (e.g. app:nginx endpoints:/api*)
- Scale up storage just by adding more nodes
Prometheus

Prometheus remote read and write to M3DB
1. Suitable for many scenarios

M3 and Graphite

- Ingest Carbon TCP protocol
- Support for Graphite query API
Graphite

My App

M3DB

Carbon TCP line protocol ingestion

Store Graphite and Prometheus metrics side-by-side

Grafana

Alerting
2. Scalable to billions of metrics
2. Scalable to billions of metrics

M3 at scale

- Collects metrics for 1000s of applications
- No onboarding to monitoring or provisioning of servers (just add storage nodes as required)
Reverse index uses FST segments, like ElasticSearch with Apache Lucene. It can regexp over billions of metric names and dimensions, unlike other solutions out there.

Each storage node

Find metrics matching query and return in parallel knowing exactly where to extract series data from local store.
Global view with region-local storage

PromQL or Graphite query (hit any region)

Multi-Region
2. Scalable to billions of metrics

Architected for Reliability and Scale

- Global metrics collection and query
- Low inter-region network bandwidth, data always kept in region
- Replication across Availability Zones within a region as soon as metric collected
3. Focus on simple operation
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- M3 can be deployed on premise without any dependencies - it’s easy to get started.
  - One binary and a YAML configuration file
  - Can be easily deployed using your favourite config management tool
- Clustered version is open source
  - HA setup is pretty straightforward
  - Scaling a cluster used to require a lot of manual work
3. Focus on simple operation

- M3 runs on Kubernetes and the M3DB k8s operator can manage the cluster for you!

See more at https://github.com/m3db/m3db-operator
Why M3

1. Suitable for many scenarios ✓
2. Scalable to billions of metrics ✓
3. Focus on simple operation ✓
Come say hi!
Thank you and Q&A

M3 GitHub Monorepo (Apache 2 licensed):
https://github.com/m3db/m3

M3 Slack:
https://bit.ly/m3slack

Chronosphere:
https://chronosphere.io

Twitter:
https://twitter.com/chronosphereio
License:
Apache 2

Website:
https://www.m3db.io

Docs:
https://docs.m3db.io

Mailing list:
https://groups.google.com/forum/#!forum/m3db
M3 and Prometheus with read/write isolation

Dedicated M3 Coordinator local to availability zone to coordinate replication

Single Region

Grafana
Alerting

M3 Query

Dedicated M3 Query to isolate queries impacting writes

Prometheus

My App

Dedicated M3 Coordinator

M3DB

M3DB

M3DB
What is Prometheus and M3 used for?

Real time alerting of application metrics
What is Prometheus and M3 used for?

Tracking business metrics (e.g., searches for “books” with category “biographies” in a region):

```java
m.Tagged(Tags{region="eu-west",category="books",subcategory="biographies"}).Counter("searches").Inc(1)
```
What is Prometheus and M3 used for?

Infrastructure metrics such as network routing and datacenter health