Introduction to M3

The new era of time-series data at a massive scale

Cloud Chats
by aiven

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Agenda

- Intro to time series databases
- Aiven use case for a time series db
- Why we chose M3
- Managed “Aiven for M3” service
- Q & A

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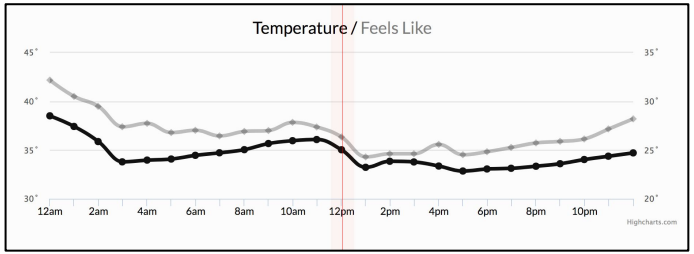
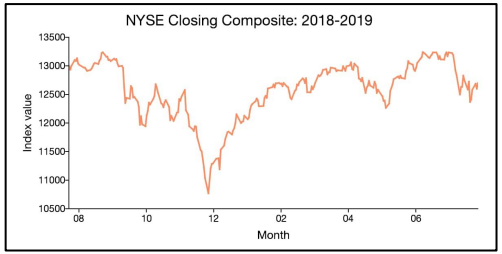
Time series data

/tīm ˈsirēz/

noun STATISTICS Data that collectively represents how something changes over time





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Common use cases for time series data

IoT

Analyze the past

Monitoring & Metrics

Monitor the present

Financial Industry

Predict and plan for the future

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Purpose-built time series databases

Time is key

Aimed to track changes over time
The data always includes a timestamp, “X-axis is time”

Optimized for writing at large scale

Majority of the traffic is INSERT’s, not UPDATEs
Also queries at scale

Efficiency

Data compression
Time granularity/ aggregation

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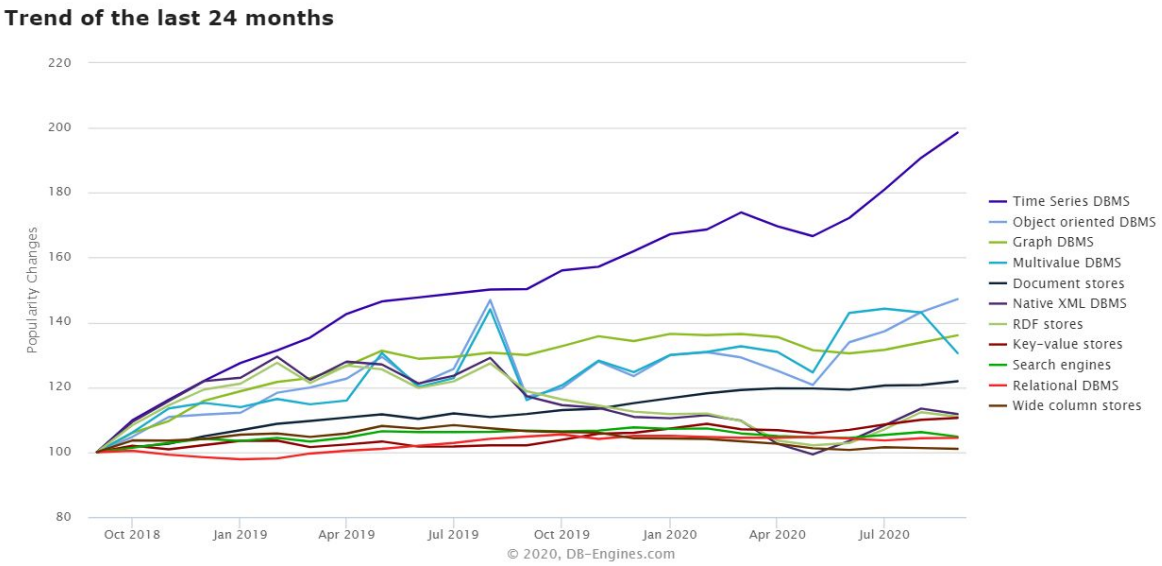
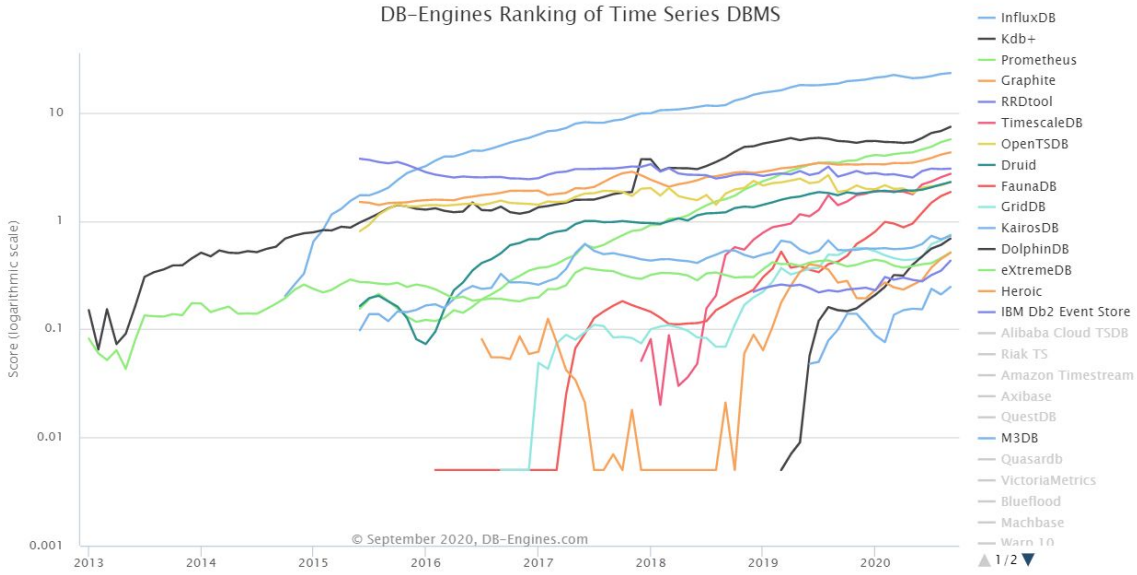
Time series databases growing in popularity



There are 30+ solutions out there



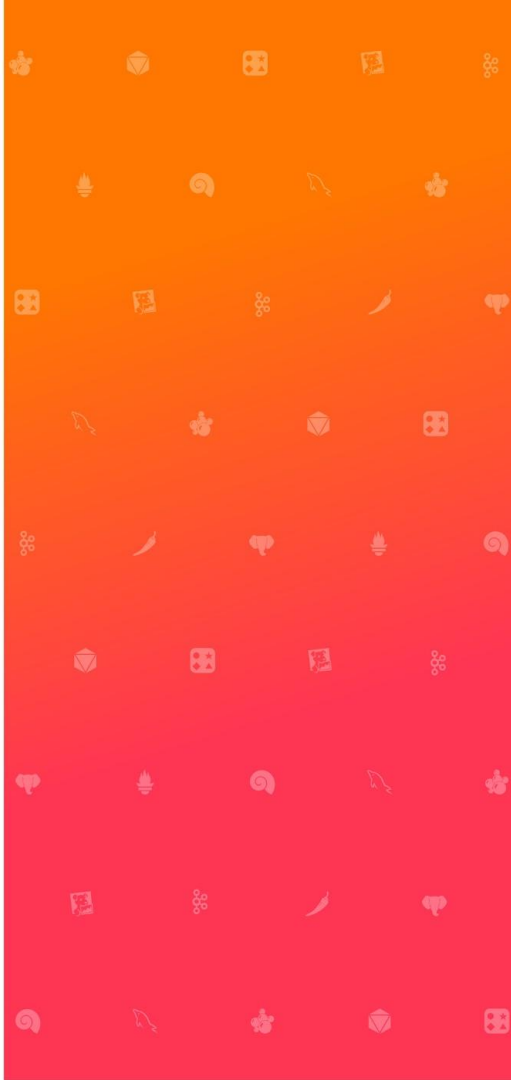
Use-case: Aiven

Problem statement (2019):

- We need visibility of tens of thousands of nodes (and growing fast)
    - Monitor behavior of single daemons in individual nodes of customer services
    - Monitor status of system resources in those nodes as well
- We currently use InfluxDB, but its HA is not open-source
- We need visualization and alerting with proper escalation path etc.

Constraints:

- The solution should be open-source and therefore something we can also offer to our customers
    - We run services we offer in our own management infrastructure
- The solution should be also efficient and therefore affordable at scale



Time series solutions

Possible alternatives to InfluxDB

Graphite

- 2006+, written in Python, scaling painful but possible

TimescaleDB

- 2017+, PostgreSQL based, has HA, lacks horizontal scalability

Prometheus

- 2012+, written in Go, no built-in HA but has federation

M3

- 2018+ (open sourced), HA storage solution for Prometheus

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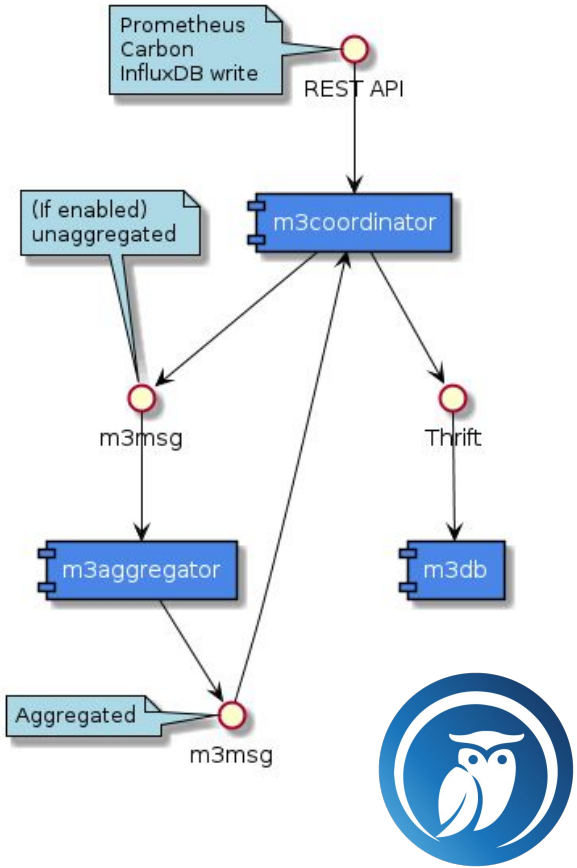
Architecture

- 3 different components
  - m3coordinator
  - m3aggregator
  - m3db
- etcd required by all components as well



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Why use it?

- No single critical point of failure
- All components horizontally scalable
- Hierarchical operation also possible with just configuration
  - Read => Can add other coordinators/dbnode clusters to query
  - Write => Can have same data-points in multiple clusters
- Proven at scale
  - Uber, Walmart, Linkedin, etc use it
- Compression of data both in rest, and in transit
  - In-transit compression of traffic is implemented by us; working on upstream adoption

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Backup

- m3db is the only component which has significant amount of state
  - m3aggregator/m3coordinator have some in etcd
- We have open-sourced our backup/restore tool Astacus at https://github.com/aiven/astacus
  - It supports cluster-wide backup and restore of
    - all m3db data on disk
    - subset of etcd state for the cluster
- Work in progress, but successfully used by us for months now

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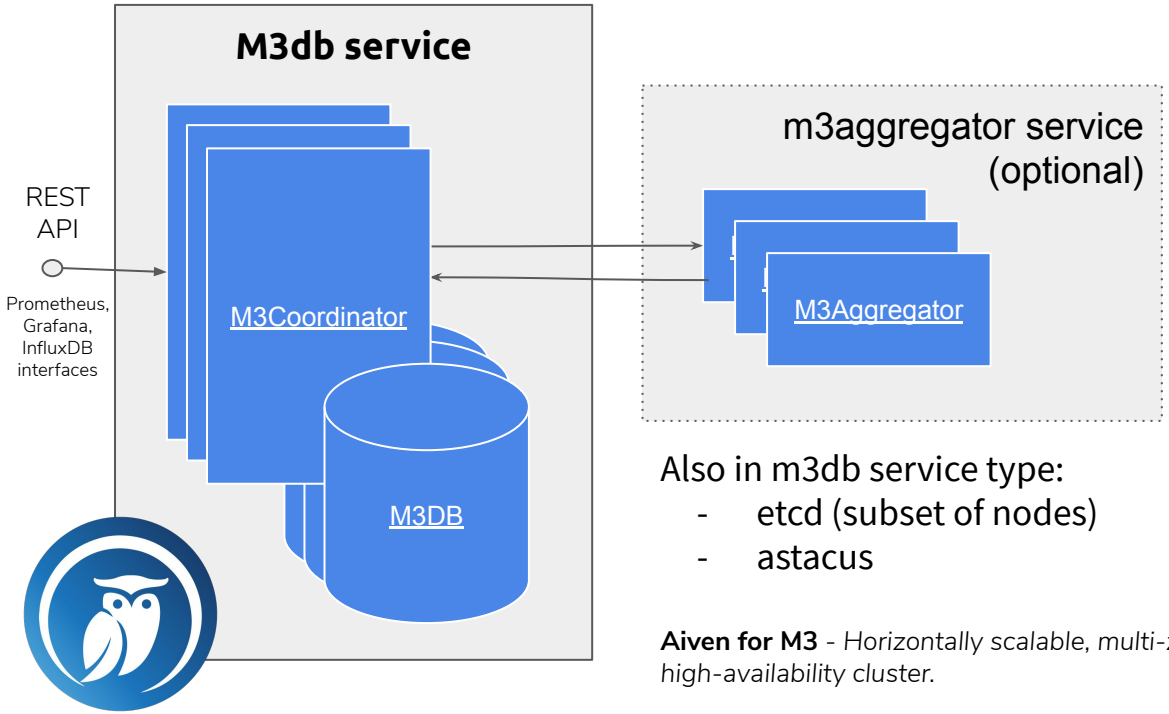
M3 use-case: Aiven

Solution (2020):

- We monitor metrics of every internal and customer node
  - We send the metrics to Kafka, and then onward from Kafka to metrics databases
- Data set size (9/2020)
  - 40 million unique time series, most being updated every 30 seconds
  - Ingestion rate about 800k points per second (~150MB/s influx line protocol)
  - Week's unaggregated data consists of over 2TB on SSD (6-node cluster, RF=3)
  - We also aggregate data (point per hour for month, point per day for year)
- M3 metrics database setup
  - 6 node m3coordinator service (with per-request load-balancing among nodes)
  - 6 node m3aggregator service
  - 6 node m3db service
- Data visualization and alerting with Grafana

Aiven for M3 - High level architecture



Also in m3db service type:

- etcd (subset of nodes)
- astacus

Aiven for M3 - *Horizontally scalable, multi-zone, high-availability cluster.*

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Not the solution for everything (yet)

- M3 limitations
  - Insertion of historic data is not possible
    - only real-time data
  - Only value type is float64
    - strings are NOT SUPPORTED
- If large scale
  - Hierarchical configuration (e.g. multi-cloud/multi-region) is not yet available
- If small scale, InfluxDB (or something else) might be better fit
  - open-source is non-HA

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Aiven for M3

but it is great for...

- medium-scale real-time numeric/boolean data storage and query needs with HA requirements
  - e.g. our own Aiven case
  - typical metrics / IoT applications

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Q & A

Appendix