

HPS

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Monitoring in High Performance Computing

Installing Telegraf, Influx and Grafana (TIG)

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Learning Objectives

- Basic understanding of monitoring
- Basic installation of a monitoring stack

Definition

- Continuous collection of data/metrics from a system
- Analysis of the collected data/metrics within a period of time
- Up-to realtime
- Storing of (selected) data for later analysis

Difference to reporting:

- Monitoring takes place nearly in realtime
- Reporting is about analysing data/metrics over a long period: statistics

Motivation

- W/o monitoring the status of the system/software is unclear
- Admins want monitoring data to check:
 - ▶ Availability
 - ▶ Performance of the system
- Problems, e.g., regressions can be identified using the data/metrics
- Analyze system performance to plan future updates/systems (procurement)
- HPC users - profile/optimize jobs utilizing metrics

What can be monitored?

Availability of network infrastructure/components/services:

- PDUs, PSU, CDUs, ...
- Switches, router, servers, compute nodes, ...
- SSH, FTP, Apache web server, ...

Performance/Load/Misc.:

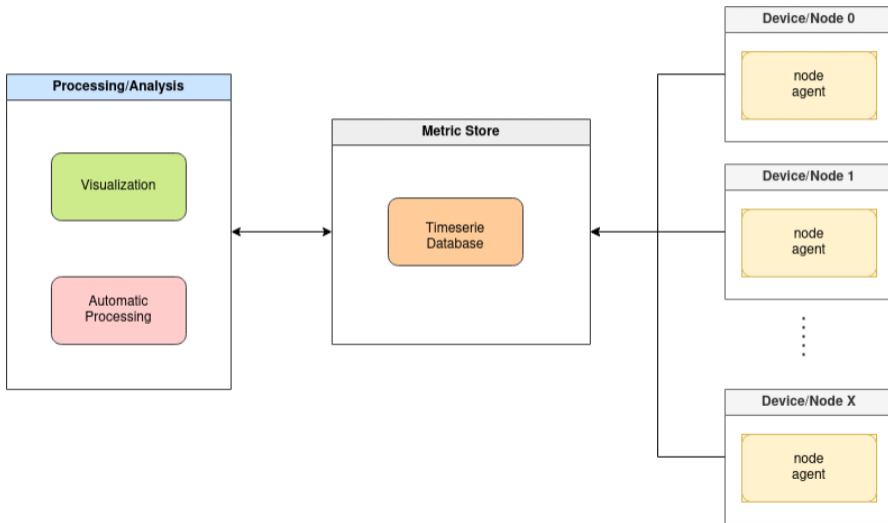
- Infrastructure: bandwidth used, node load, I/O load, storage used, ...
- Job specific: CPU load, bandwidth used, I/O Load, storage/memory used ...
- Energy consumption metrics to be associated later with jobs etc.

Monitoring infrastructure in HPC

Monitoring stacks usually consists of three components/stages:

- Metrics collector: collect metrics and forward them to a database
 - ▶ E.g., PCP, Telegraf, node-exporter, cc-exporter
- Database: collects, stores and provides data (relational, time-series)
 - ▶ E.g. Prometheus, InfluxDB, OpenTSDB
- Processing: automatic analysis of data, graphical display
 - ▶ E.g. Grafana, Kibana, Graphite, Cyclotron

Monitoring infrastructure in HPC 2



TIG Stack

Abbreviation for

- **Telegraph** - the node agent collecting metrics on the systems
- **InfluxDB** - a time-series database used to store the data
- **Grafana** - a tool to visualize metrics and create dashboards

TIG Dashboard example



InfluxDB overview

- Developed by [InfluxData](#)
- First released 2013
- Written in Go for performance
- Time-series based instead of relational
- Design specifically for time-series from all kind of devices
- Query language Flux (similar to SQL)
- push approach
- open-core

Comparison to relational DB

Relational DB

- Defined table format/schema
- Develop for large amount of uniform data
- Fast to process SQL queries on huge sets of uniform data
- Fast to operate on entries (e.g. modify/delete)
- Difficult to store large amounts of non-uniform data at the same time

Time-series DB

- Flexible format, no fixed schema
- Developed for storing large amounts of non-uniform data at the same time
- Fast to store the data
- Slow to operate on data in the DB (e.g., modify/delete entries)

InfluxDB installation

■ Tutorial 1

Overview

- Developed by [InfluxData](#)
- Node agent for InfluxDB
- Tasks: collecting, processing, aggregating, writing metrics
- Extendable architecture based on plugins
- As InfluxDB written in Go for max. performance
- Is run as service on the monitored systems

Plugins

- Telegraf uses plugins to collect and send data
- the plugins utilize different tools to collect metrics e.g.
 - ▶ Likwid to collect hardware counters from CPUs
 - ▶ Files in /procfs for process statistics
- 2 plugin types: input and output
- At least one input and one output plugin has to be configured e.g.
 - ▶ Input: CPU, diskio, procstat
 - ▶ Output: influxdbv2
- Huge variety of plugins can be found the [Plugin documentation](#)

Telegraf installation

■ Tutorial 2

Overview

- Developed by [GrafanaLabs](#)
- Web based dashboard application to visualize data
- Written in Typescript, Go
- Supports relational, time-series databases
- open-core
- Can display real-time data using specific plugins/config (MQTT+Telegraf)
- Goals: easy visual analysis of data from different sources, easy dashboard creation

Grafana installation

■ Tutorial 3

References

- <https://www.influxdata.com/>
- <https://grafana.com/>
- <https://docs.influxdata.com/telegraf/v1.20/plugins/>