Infrastructure Monitoring for GridKa and beyond
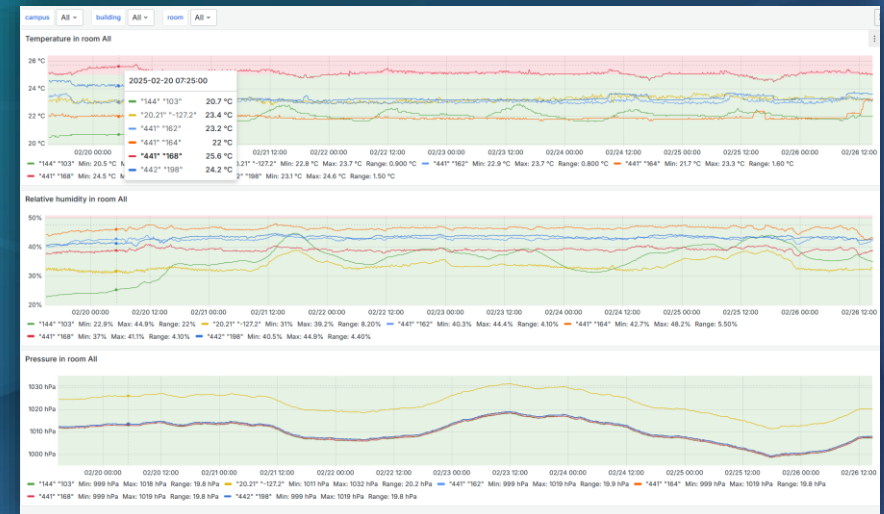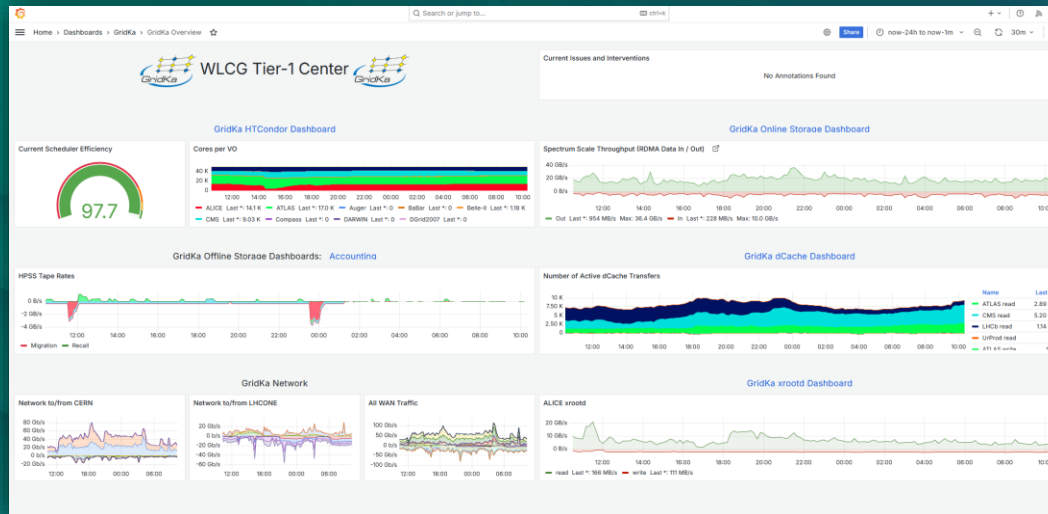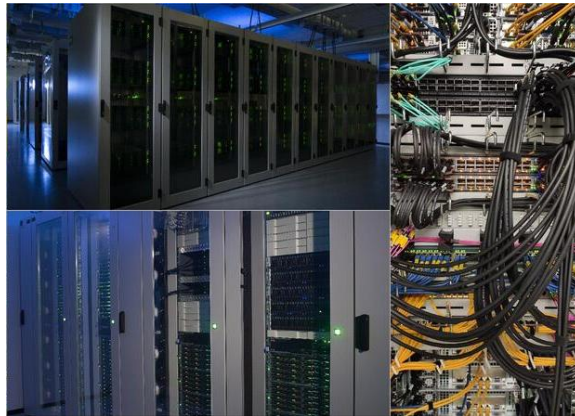
Evelina Buttitta
Hepix Spring 2025 Workshop, 31 March - 4 April 2025, Lugano

www.kit.edu
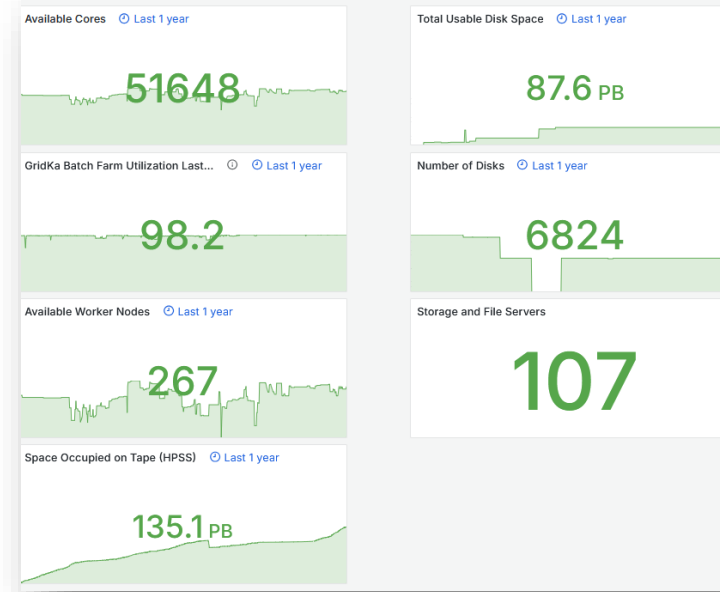
Infrastructure resources

WLCG Tier-1 Center

Available Cores — Last 1 year	**51648**
Total Usable Disk Space — Last 1 year	**87.6 PB**
GridKa Batch Farm Utilization Last... — Last 1 year	**98.2**
Number of Disks — Last 1 year	**6824**
Available Worker Nodes — Last 1 year	**267**
Storage and File Servers	**107**
Space Occupied on Tape (HPSS) — Last 1 year	**135.1 PB**

Online Storage

Offline Storage (Tape)

HTCondor — **GridKa Batch Farm**
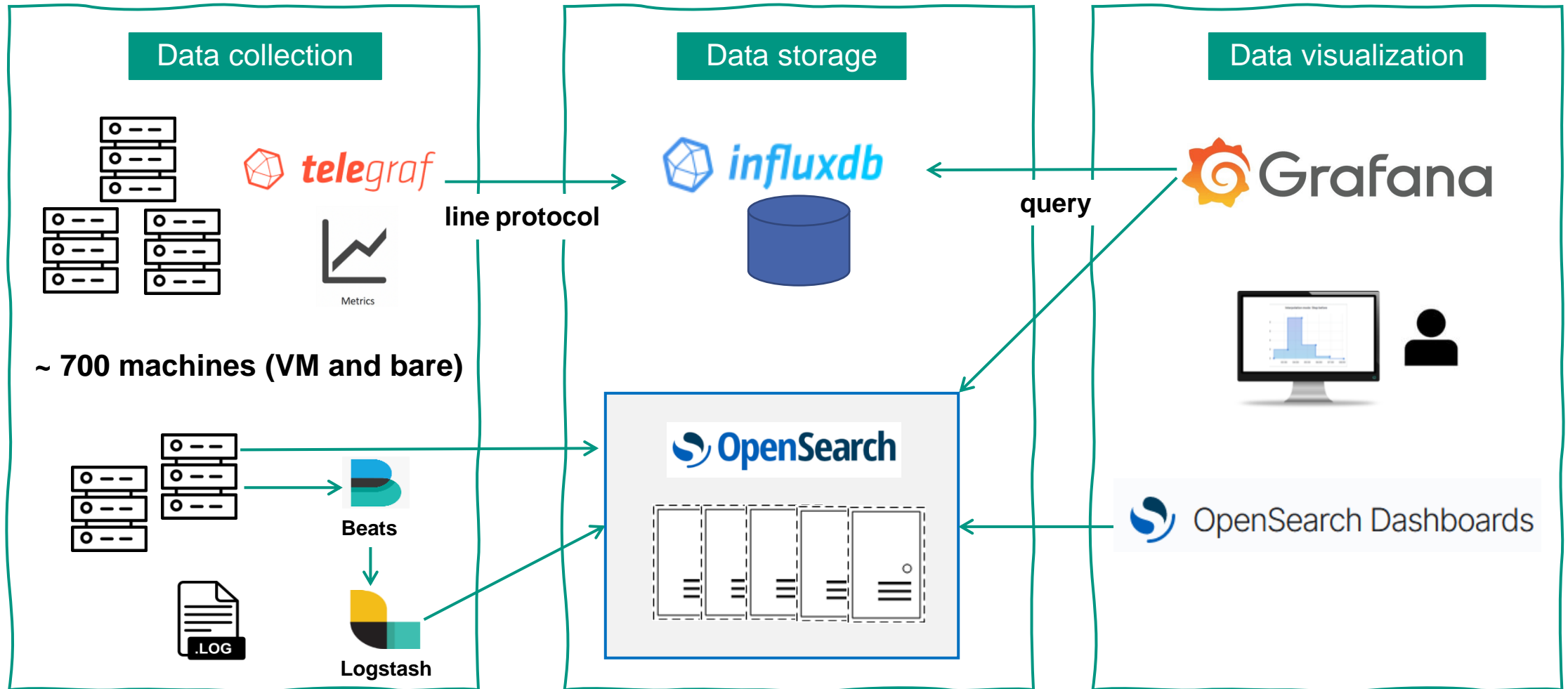
GridKa Network

LSDF Online Storage
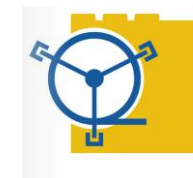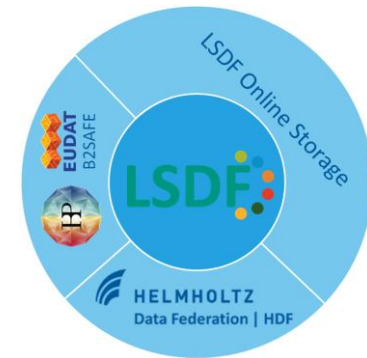
BWDATA ARCHIV

Motivations

- Constantly **monitor health and availability** of the services
- Give users a fast overview of services/applications status
- **Detect and report issues** fast and in detail
- Centralize, search, analyze a large volume of data (e.g. logs)

❯ The infrastructure monitoring provides insights and visibility into the health and status of all data center **by tracking specific metrics and logs in real time**
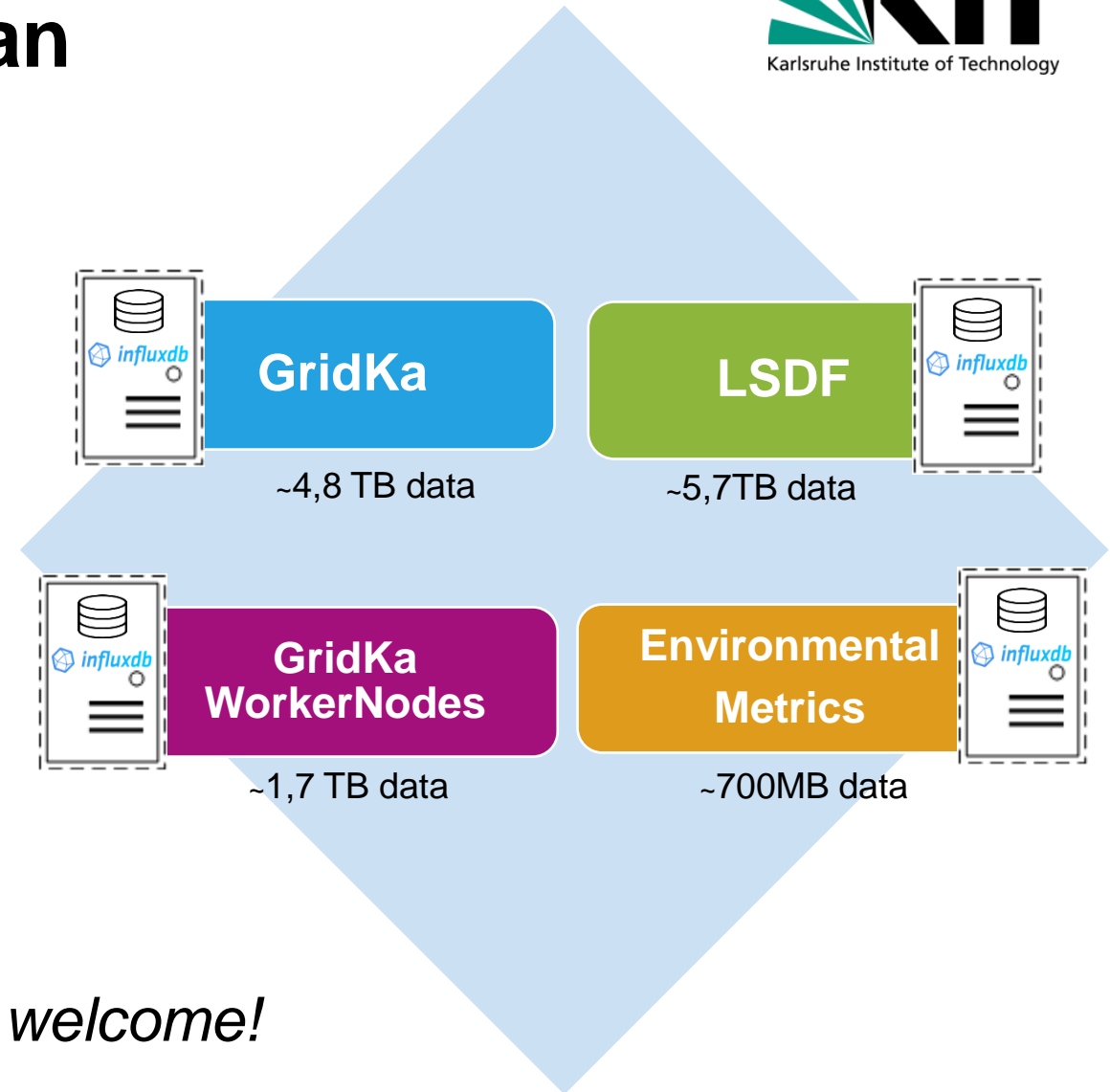
Monitoring architecture

Data collection

Data storage

Data visualization

telegraf

Metrics

~ 700 machines (VM and bare)

line protocol

influxdb

query

Grafana

OpenSearch

Beats

.LOG

Logstash

OpenSearch Dashboards

Collected metrics and logs

- Host Metrics (Disk, CPU, Memory, Network…)
- GridKa Experiments (Data Transfer, Disk usage per experiment)
- HTCondor (Running jobs info)
- Storage:
  - dCache, XRootD (IO Metrics and Accounting)
  - Storage Scale (GPFS) (IO Metrics)
  - Disk Systems (controller, disk, raid status and IO metrics)
  - Tape Monitoring
  - LSDF Online Storage
- Environmental Metrics (PDUs, humidity, temperature)
- Logs of GridKa and LSDF storage, HTCondor, Tape HPSS, GridKa networks, dCache, XRootD

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InfluxDB current and future plan
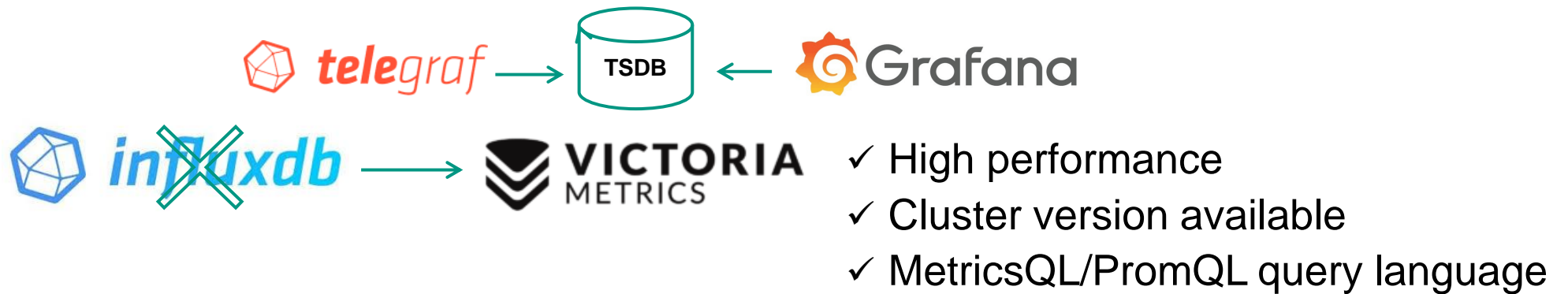
- Running 4 InfluxDB instances OSS v2.7

➢ Test the new version *InfluxDB 3 Core* with new capabilities and enhanced performances

➢ Migrate InfluxDB to other timeseries databases like Grafana solutions (e.g. Mimir) or VictoriaMetrics

Suggestions and sharing of experiences are welcome!

GridKa
~4,8 TB data

LSDF
~5,7TB data

GridKa WorkerNodes
~1,7 TB data

Environmental Metrics
~700MB data

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VictoriaMetrics as alternative TSDB

- Testing InfluxDB v2 migration to VictoriaMetrics

✓ High performance
✓ Cluster version available
✓ MetricsQL/PromQL query language

Challenges

- New data model for the metrics
- Import of large historical dataset from InfluxDB v2
- Translation of many InfluxQL/Flux queries in Grafana Dashboards to MetricsQL
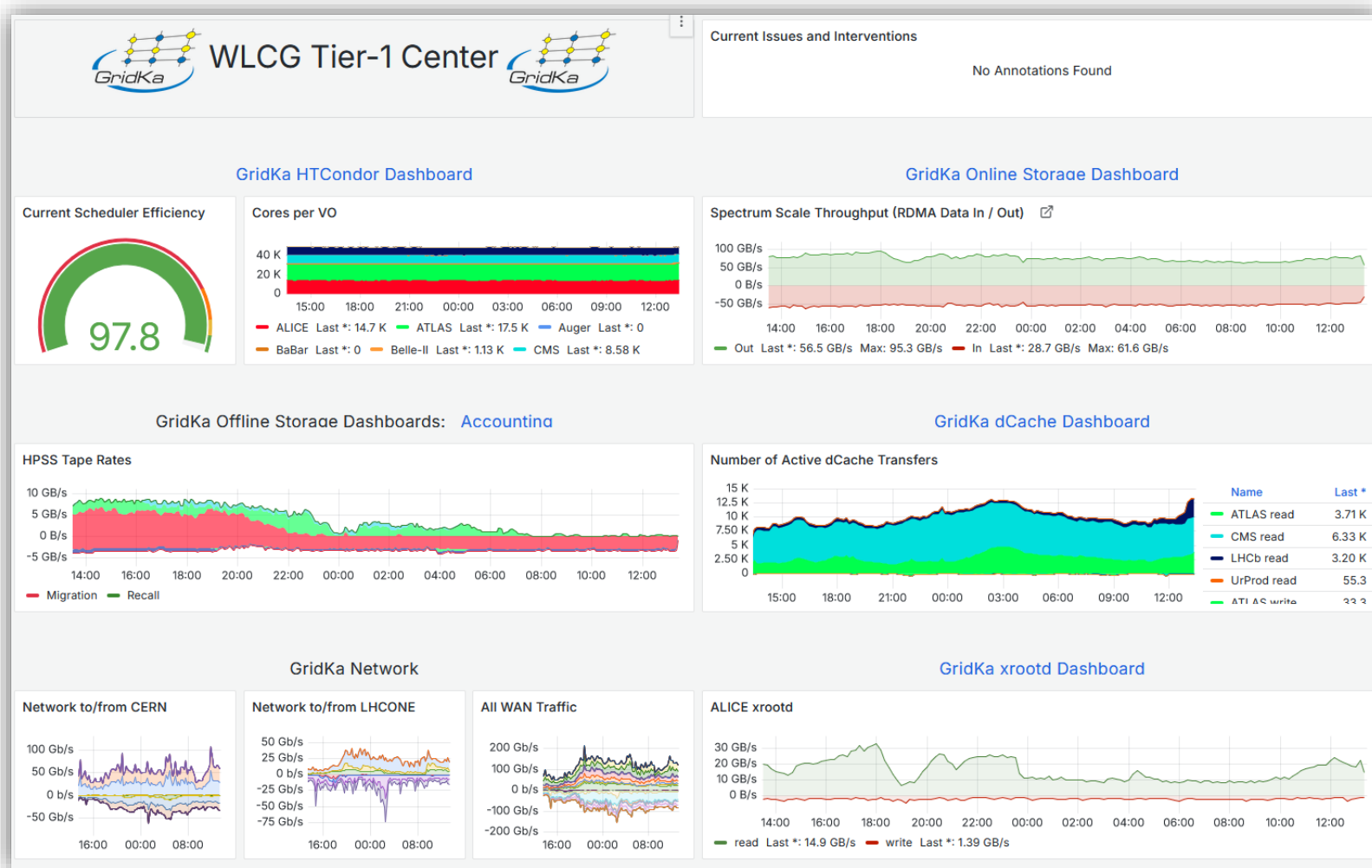
Grafana

https://grafana-sdm.scc.kit.edu

~ 60
dashboards

~ 40
active users

~ 20
provisioned
datasources

Auth/Authz via
KIT OpenID
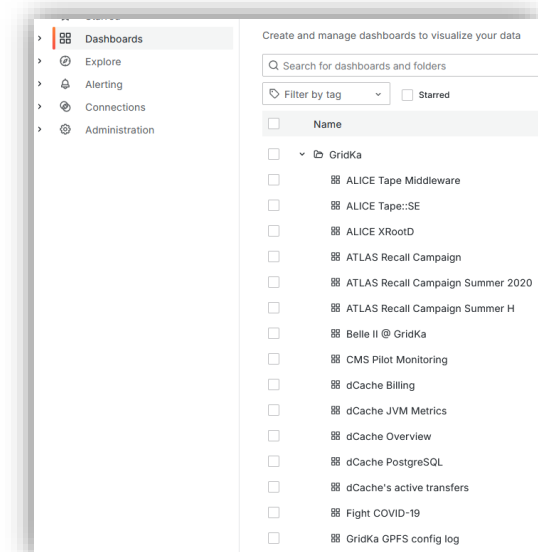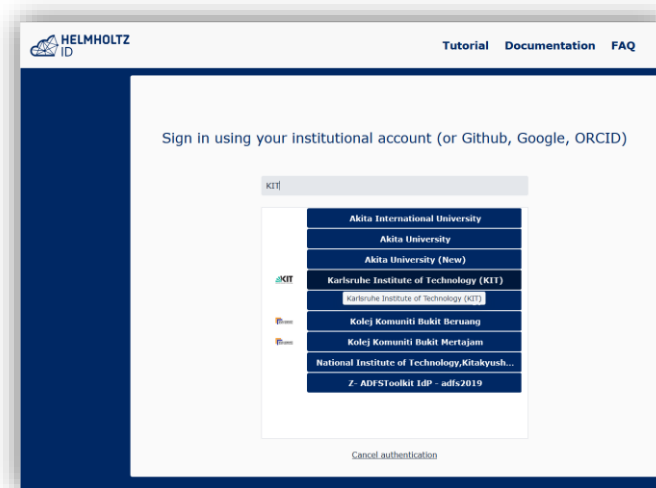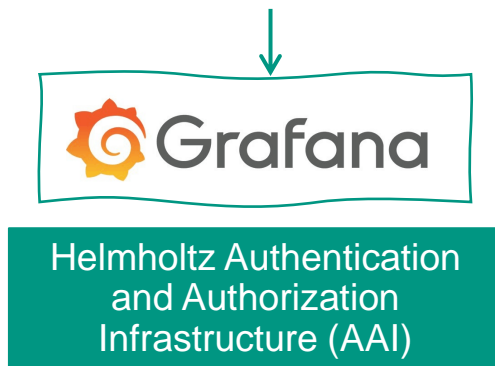
Grafana open instance

- The problem: share specific dashboards with external (no KIT) users
- What we have tried:
  - Enable anonymous access: there are security implications we have experienced
  - Use the *Public dashboard* feature: some inconvenient limitations
- Our solution: run a separate Grafana instance
  - Require auth, but allow auth from all of edugain (via Helmholz-ID AAI)

https://grafana-sdm-open.scc.kit.edu

Helmholtz Authentication and Authorization Infrastructure (AAI)

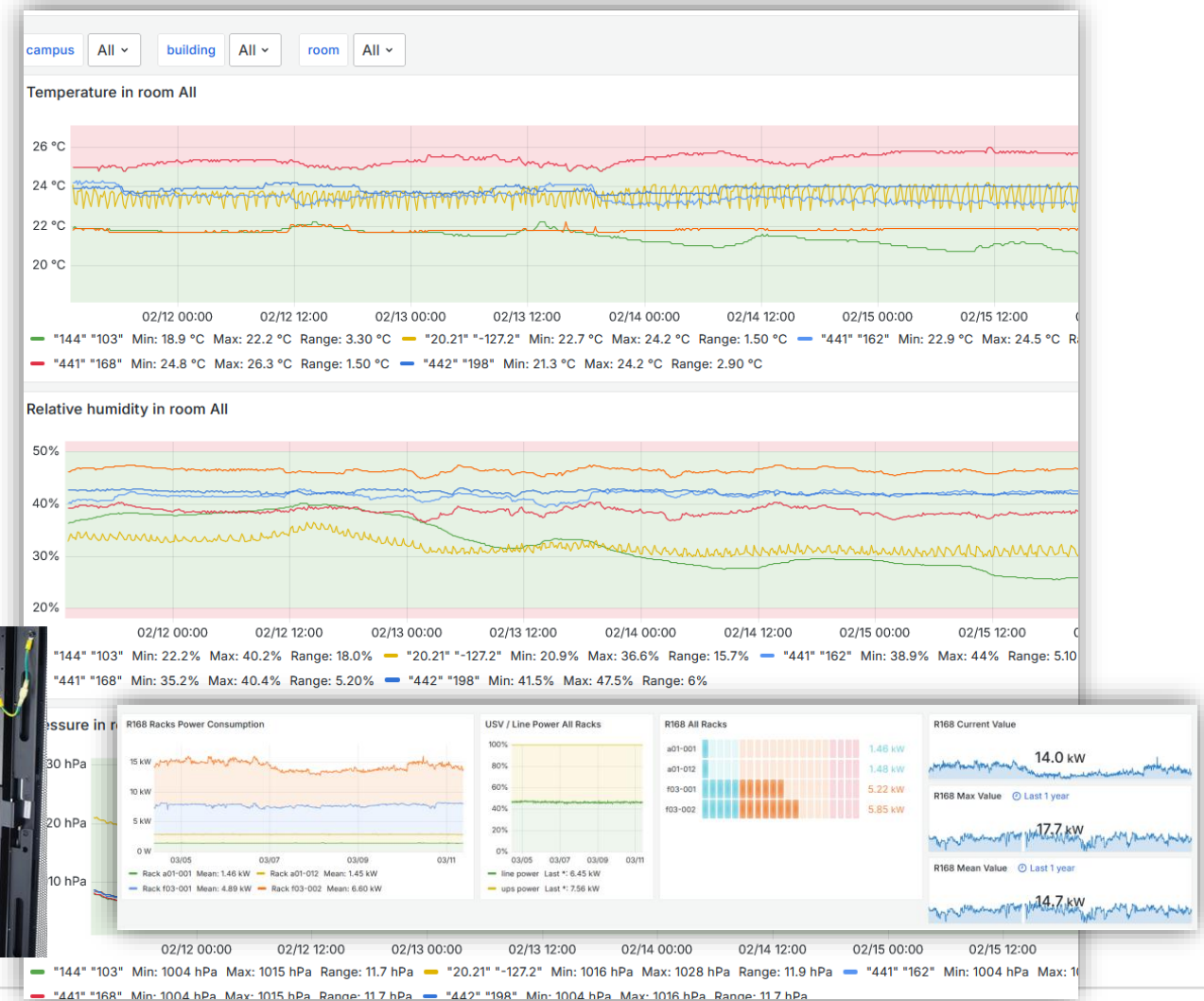# Grafana Datacenter Metrics

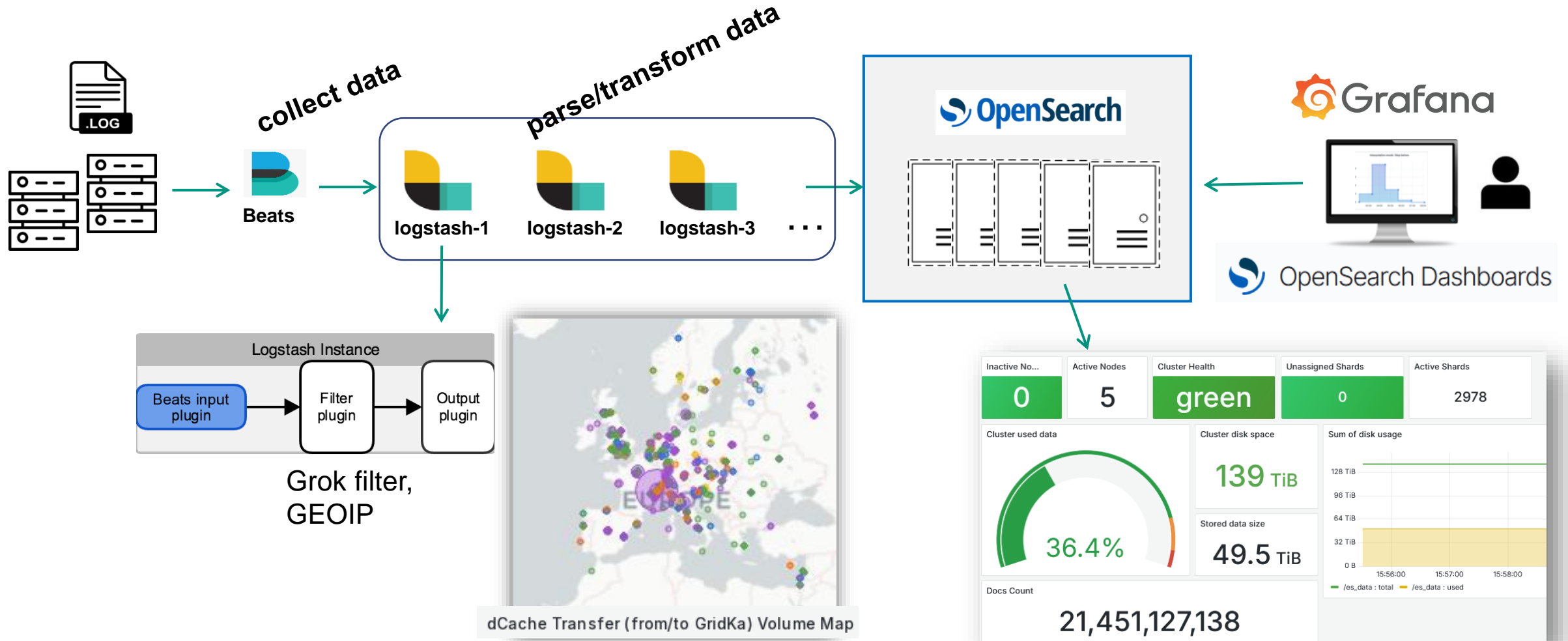https://datacenter-metrics.scc.kit.edu

Visualization of environmental metrics:

- Sensors metrics (temperature, humidity, pressure) from all server rooms

- Water cooling temperature

- Power consumption (UPS, Power distribution units (PDU))

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Monitoring with OpenSearch, Beats and Logstash

collect data

parse/transform data

Beats

logstash-1   logstash-2   logstash-3   . . .

Logstash Instance

Beats input plugin → Filter plugin → Output plugin

Grok filter, GEOIP

dCache Transfer (from/to GridKa) Volume Map

Inactive No...	Active Nodes	Cluster Health	Unassigned Shards	Active Shards
0	5	green	0	2978

Cluster used data: 36.4%

Cluster disk space: 139 TiB

Stored data size: 49.5 TiB

Sum of disk usage: 128 TiB, 96 TiB, 64 TiB, 32 TiB, 0 B — 15:56:00, 15:57:00, 15:58:00 — /es_data : total, /es_data : used

Docs Count: 21,451,127,138

Summary and outlook

- The infrastructure monitoring plays a fundamental role in the operations of the whole infrastructure

- It provides a real time (and historical) overview of all applications and ensures efficiency and reliability of services

- Future of InfluxDB v2.x:

  - Update to InfluxDB v3

  - Replace InfluxDB with other timeseries databases (e.g. VictoriaMetrics)?

- On-going research about a standard and consistent observability framework for collecting and storing telemetry data (logs, metrics, traces), e.g. OpenTelemetry

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