

# TANGO-Grafana: an online diagnostic tool to assist in the analysis of interconnected problems difficult to debug in the context of the Square Kilometre Array (SKA) telescope project

M. Di Carlo<sup>\*a</sup>, P. Harding<sup>b</sup>, G. Le Roux<sup>c</sup>, M. Dolci<sup>a</sup>

<sup>a</sup>INAF Osservatorio Astronomico d'Abruzzo, Teramo, Italy; <sup>b</sup>SKA Organisation, Macclesfield, UK; <sup>c</sup>Instituto de Telecomunicações, <sup>d</sup>SKA South Africa, SA

The selected solution for monitoring the SKA Minimum Viable Product (MVP) Prototype Integration (SKAMPI) is Prometheus. Starting from a study on the modifiability aspects of it, the Grafana project emerged as an important tool for displaying data in order to make specific reasoning and debugging of particular aspect of SKAMPI. Its plugin architecture easily allow to add new data sources like prometheus but the TANGO related data sources has been added as well. The main concept of grafana is the dashboard, which enable to create real analysis. In this paper four example analysis are presented which take advantage of four different datasources and a variety of different panel (widget) for reasoning on archiving data, monitoring data, state of the system and general health of it.

## INTRODUCTION

### The SKA MVP Prototype Integration (SKAMPI)

Set of software artefacts, the corresponding repository and continuous integration facilities for the development, testing, and integration of the SKA prototype software systems

openstack, ceph, kubernetes, elasticsearch, GitLab

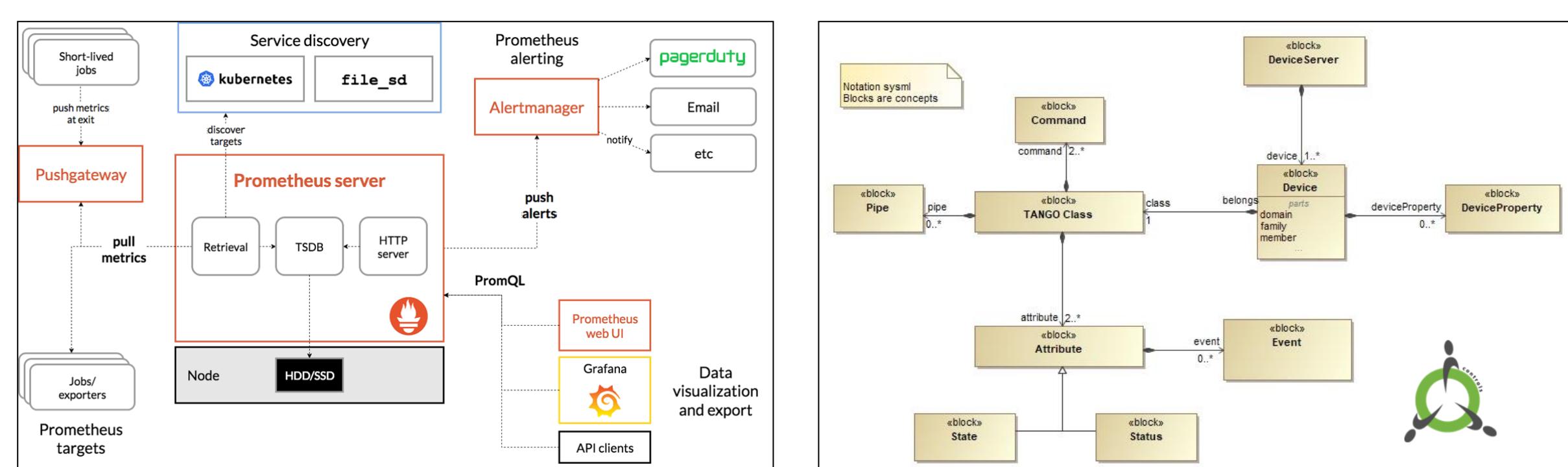


Fig.1 Prometheus monitoring

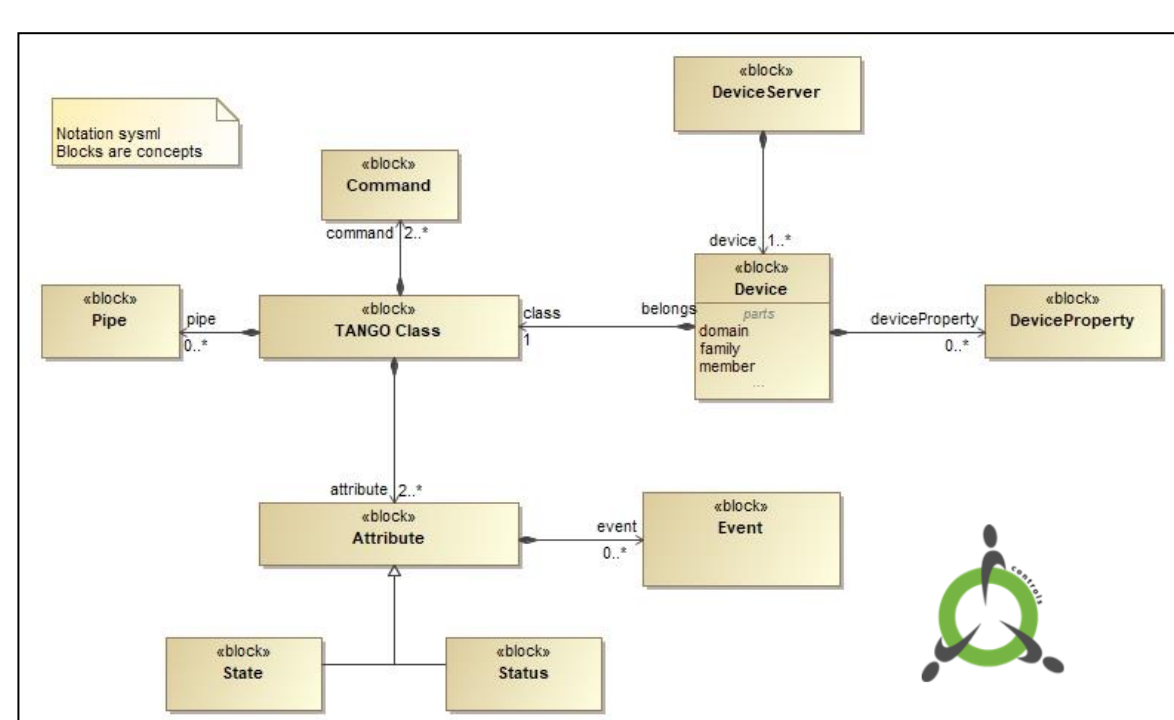


Fig.2 Tango-controls

## EXTENDING PROMETHEUS

### TANGO-Exporter

- Simple http server which provide a well defined metrics information for reading all the attributes from a TANGO control system like SKAMPI

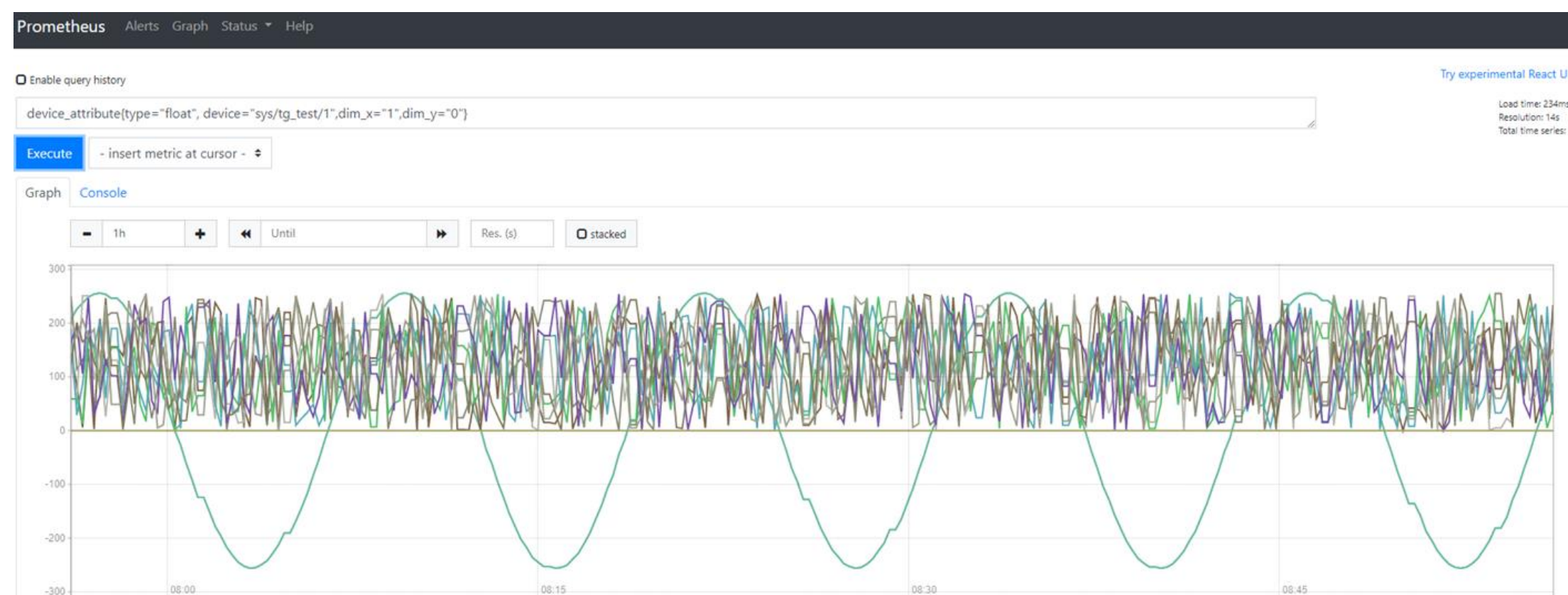


Fig.3 TANGO-Exporter graph view from Prometheus GUI

## DATA VISUALIZATION

### TANGO-Grafana

- Grafana is an engine for displaying data on web coming from many data sources
- Plugin architecture: panel, data sources and App

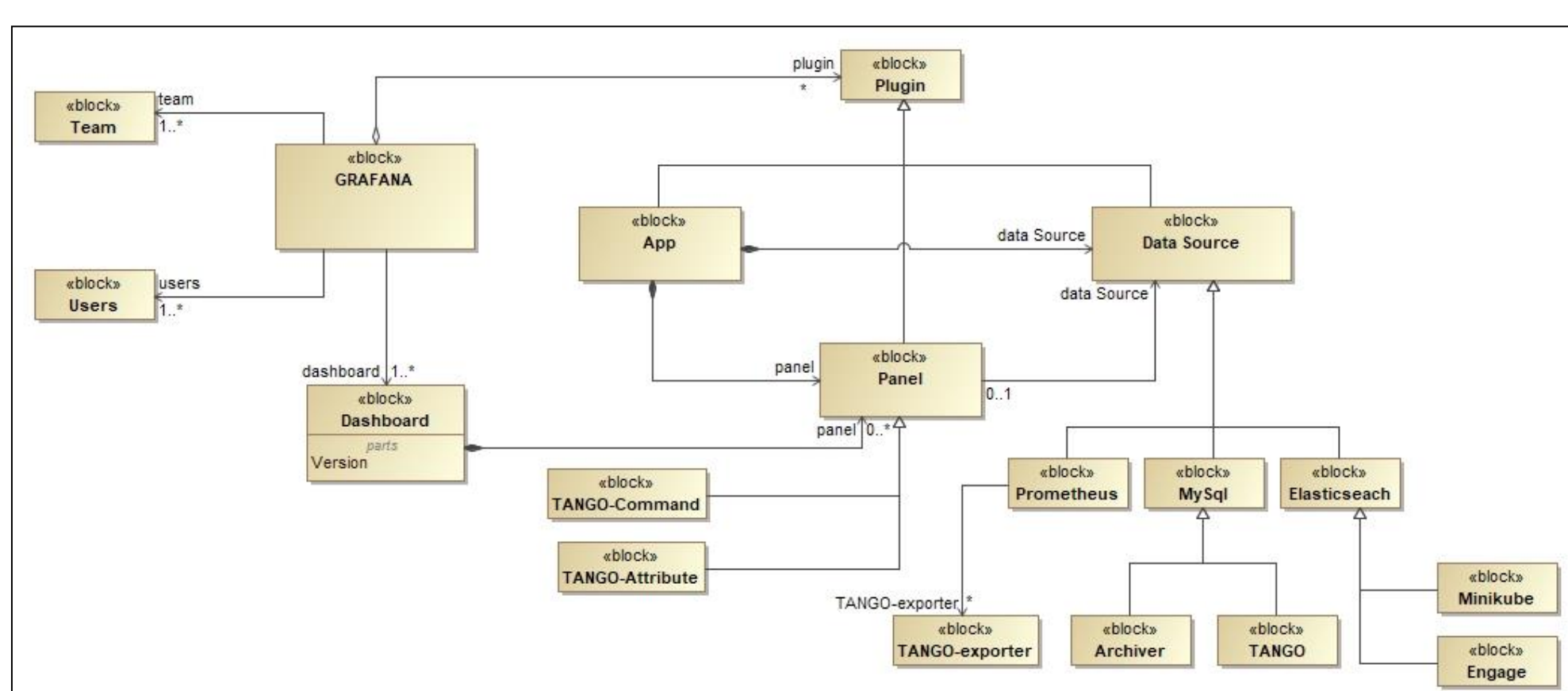


Fig.4 TANGO-Grafana data model

## GRAFANA CUSTOMIZATIONS

### Many data sources

- TANGO database (mysql)
- TANGO archiving database (mariadb)
- Elasticsearch
- Prometheus monitoring system (with TANGO-exporter)

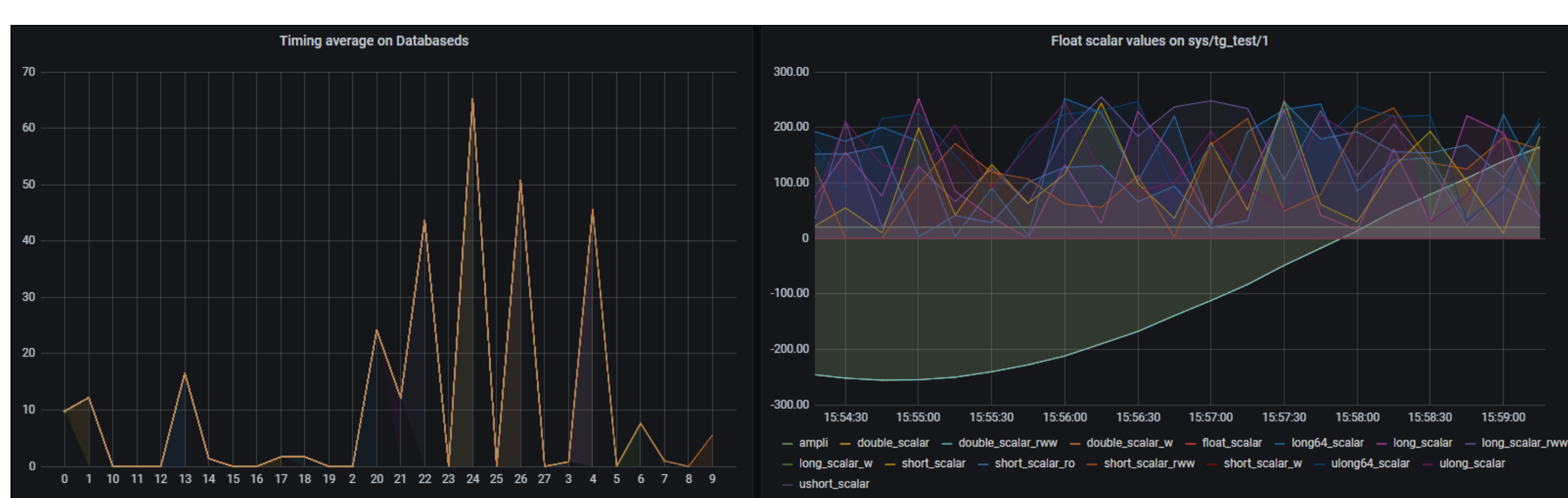


Fig.5 TANGO spectrum and scalar available from prometheus

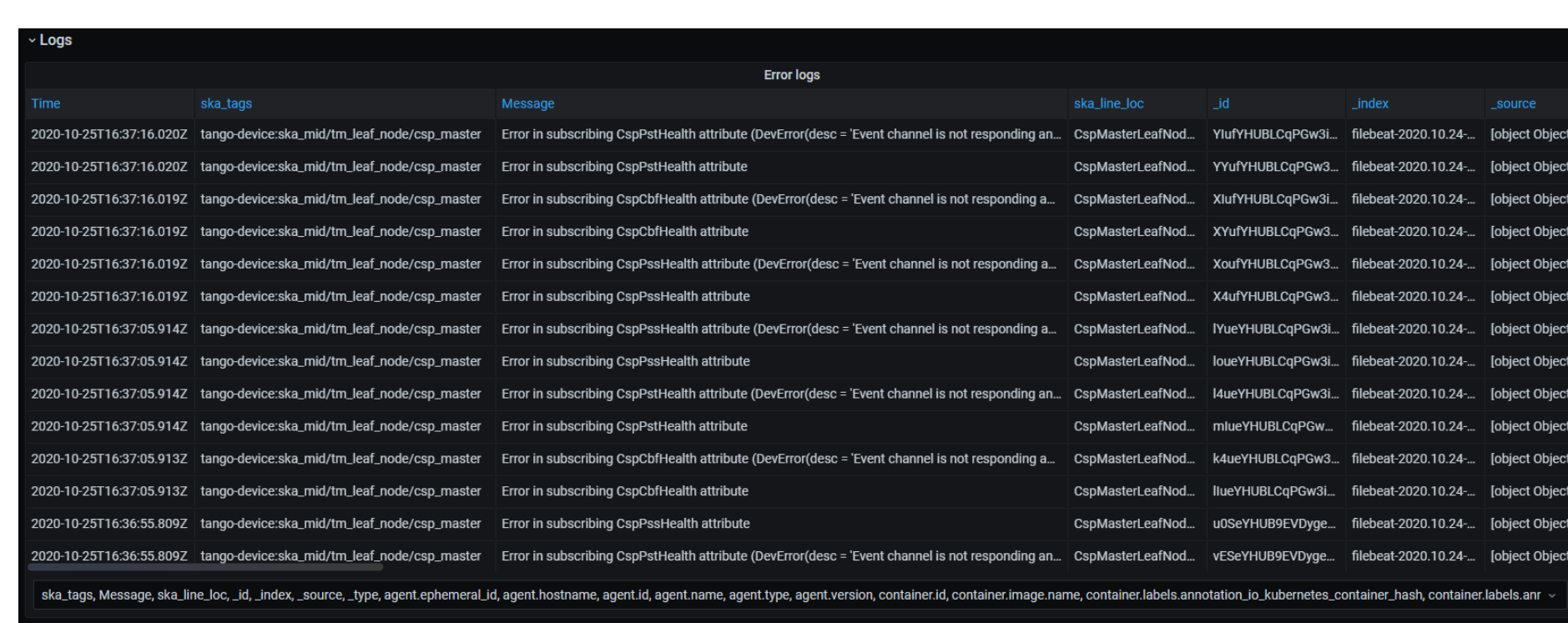


Fig.6 Logs from Elasticsearch

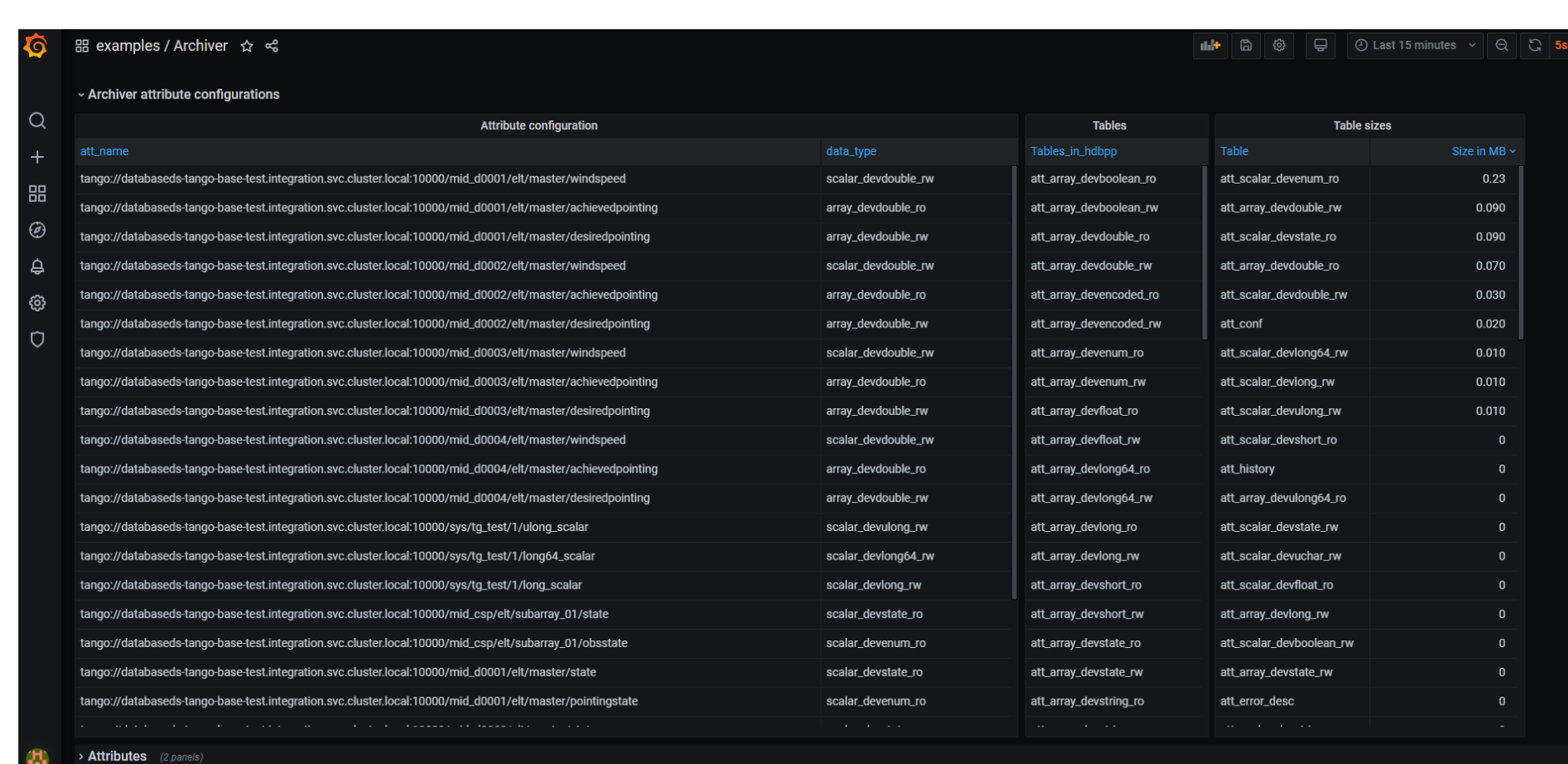


Fig.7 Tables of configured attributes from the archiving database

### Custom plugins of type Panel

- TANGO-attribute:** view attributes of any king in table format
- TANGO-command:** send control commands to the TANGO eco-system
- Ryantxu-ajax-panel:** community plugin for AJAX web requests



Fig.8 TANGO-attribute panel

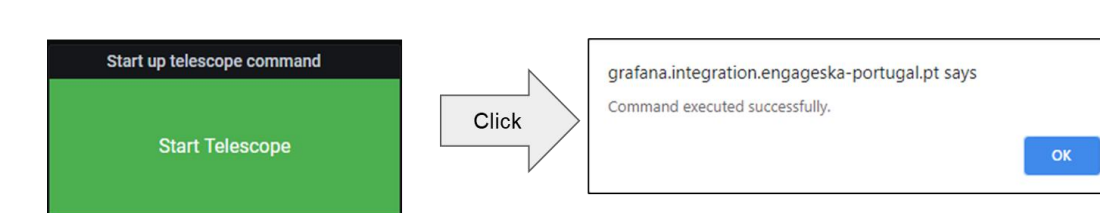


Fig.9 TANGO-command panel

## DIAGNOSTIC TOOL

Working with Grafana means to create dashboards in order to perform a particular analysis on a set of monitoring data.

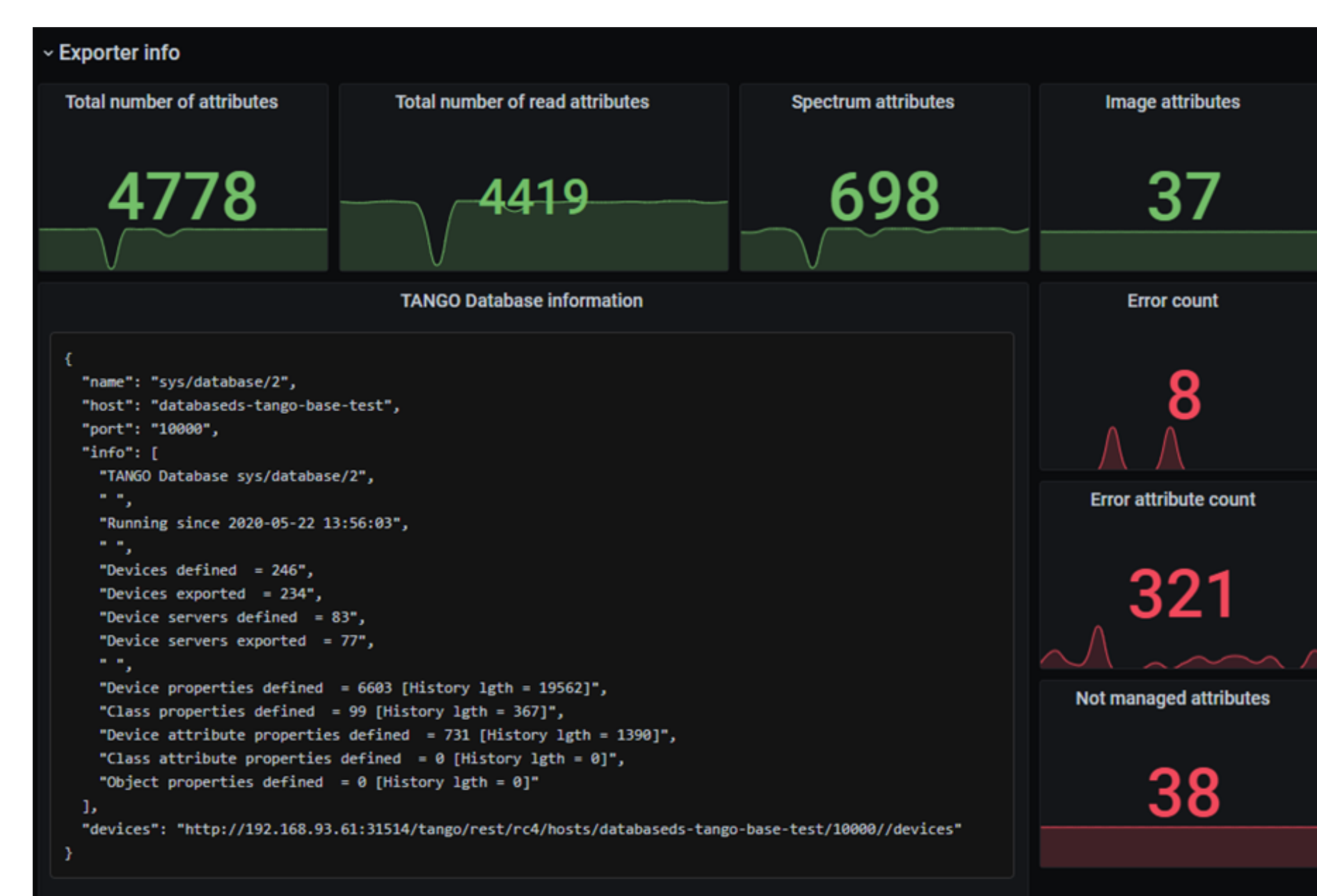


Fig.10 Generic system analysis

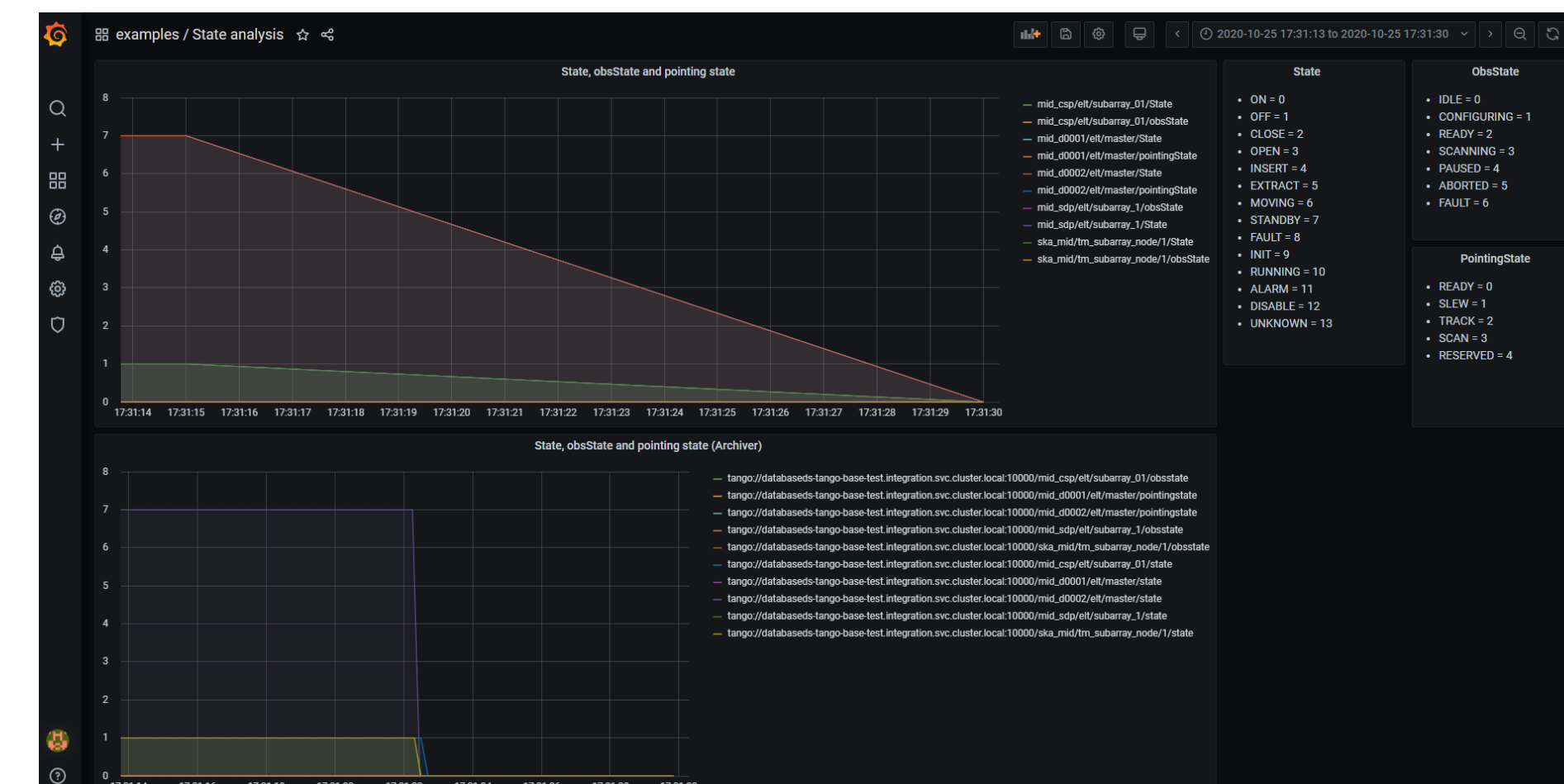


Fig.11 State analysis with data coming from Prometheus and Archiving system

## CONCLUSIONS

- Massive customizations thanks to the plugin architecture of Grafana and Prometheus**
- Next steps:**
  - Improve customizations
  - Achieving a rolled-up view of SKA TM health status and state

## REFERENCES

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- Dolci, M. et al., Achieving a rolled-up view of SKA TM health status and state[...], SPIE (2018).