

ORWELL: Monitorization Platform for a 5G Testbed

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Projeto em Informática, 3º ano, LEI.

Abstract

5G networks are fiercely developing and so are the vertical applications of this technology. To develop new 5G applications, researchers need to test them. This necessity led to the creation of 5G testbeds with state-of-the-art technology. These tests require a controlled environment, thus all the infrastructure has to be monitored. This work discusses an approach that complies with 5GASP standards and centralizes all the information on a unique database. Moreover, the proposed methodologies were implemented in a proof of concept product which demonstrates the potential of the proposed approach.

Introduction

This project presents new mechanisms and a toolset to monitor a 5G testbed. The toolkit relies on open-source tools capable of monitoring VNFs, network's performance and security, system's security liabilities and 5G infrastructure. When compared to other state of the art projects, Orwell presents an alternative architecture, along with an uniform access interface and data storage format. This system considers VNFs as blackboxes, so all the metrics are collected through a non-intrusive process.

Methodology

Since this project will be included in the CI/CD pipeline of ITAv's testbed and it is expected to be integrated with 5GASP European Project Monitoring Service, some standards had to be respected: the main database is a Prometheus time series database and Grafana is the main data visualization tool.

To monitor VNFs the system relies on OS Images with pre-installed metrics collection mechanisms, implemented using Prometheus Node Exporter or Telegraf. If a VNF does not have any of these, it is monitored from the hypervisor which runs a Gnocchi service. Network performance monitorization is assured by PerfSonar while network security relies on Suricata. Security alerts and reports are assured by Infection Monkey. To collect 5G infrastructure metrics this solution uses Huawei's eSight API, because all the infrastructure was provided Huawei.

It was necessary to develop translators to all these tools so as to store all metrics in Prometheus format.

Architecture

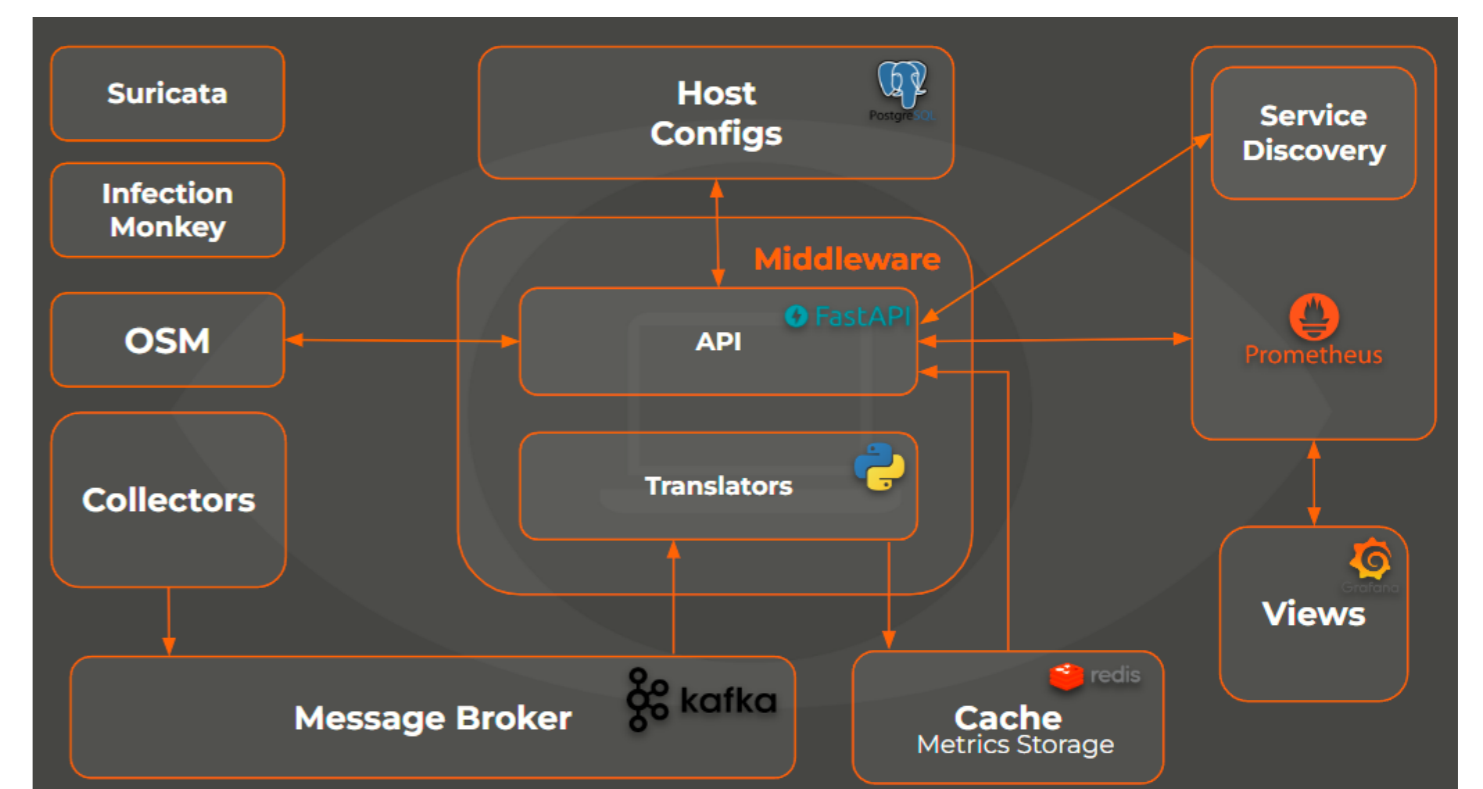


Fig 1 - ORWELL's architecture

Functionalities

An API was developed to provide an uniform access interface which we consider to be the core and the orchestrator of our system. Orwell's robust core together with the developed modules provides multiple advantages, those are:

- Consult Metrics - three Grafana dashboards were configured to display all the collected metrics
- Alerts and Reports - network security alerts are sent to Slack and internal security issues are reported through a web interface
- Modularity - due to the micro-service oriented architecture, Orwell is extremely modular allowing the suppression of some modules that are not required for one's use case.
- Customization - the toolkit provided is not mandatory, Orwell was built to be transparent over the toolkit chosen. The addition of new tools requires little effort, since, basically, only the translator has to be developed.

Conclusion

The result of this project is a complete monitoring system that can easily be adapted to realities divergent from the original scope of the project. Orwell is capable of monitoring a testbed and does not require direct access to the VNFs, since all the metrics collection mechanisms are non-intrusive.

The solution developed will soon be deployed on ITAv's testbed contributing to speed up the process of developing new 5G applications.

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