Computer and Informatics Engineering Projects

SOFTWARE DEFINED NETWORKS MONITORING SYSTEM

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Why Monitoring SDNs ?

Lack of **physical restrictions** of common networks.

Reliability and **system balance**.

Scaling speed and dynamism.

Increase flexibility when reacting to traffic.

Development process

- **State of the Art**
  - P4 language
  - SDN architecture
  - OpenFlow
- **Requirements and Design**
  - Monitoring requirements
  - User interaction
- **Development**
  - P4 Devices API
  - Dashboard
  - Data fetching
- **Integration**
  - Over the dashboard control

Workflow

Simple **Kanban** board organization.

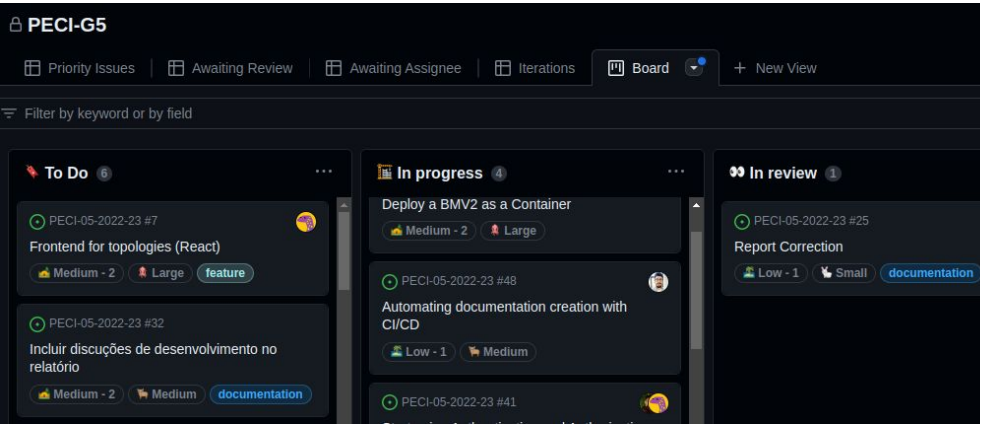
Speed of resolution over **number** of features.

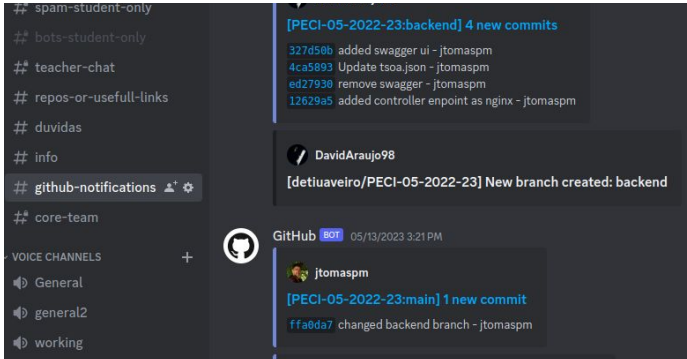
Review process for all **major features**.

Isolated feature development.

Fast and shared **documentation** creation.

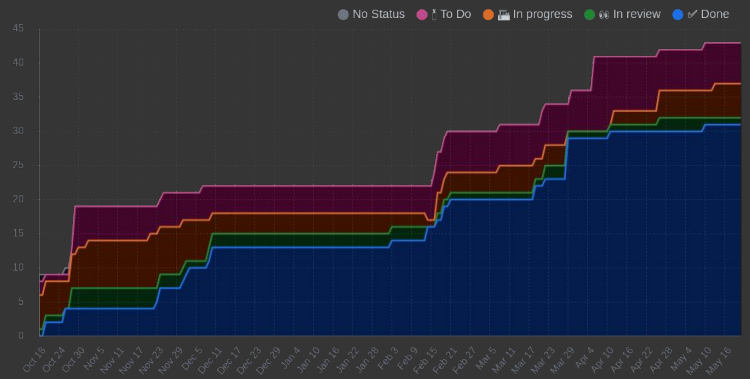
Real-time notification and **team awareness**.





Divide to conquer!

Three **atomic** components: **Infrastructure**, **Data** and **Interaction**.



P4 devices

Network layer communication

- API for P4 device communication
- Mininet network control
- Containerized P4 device

Data gathering

Metric treatment and visualization

- Metric data collection.
- *Feeders* for Prometheus

UX/UI

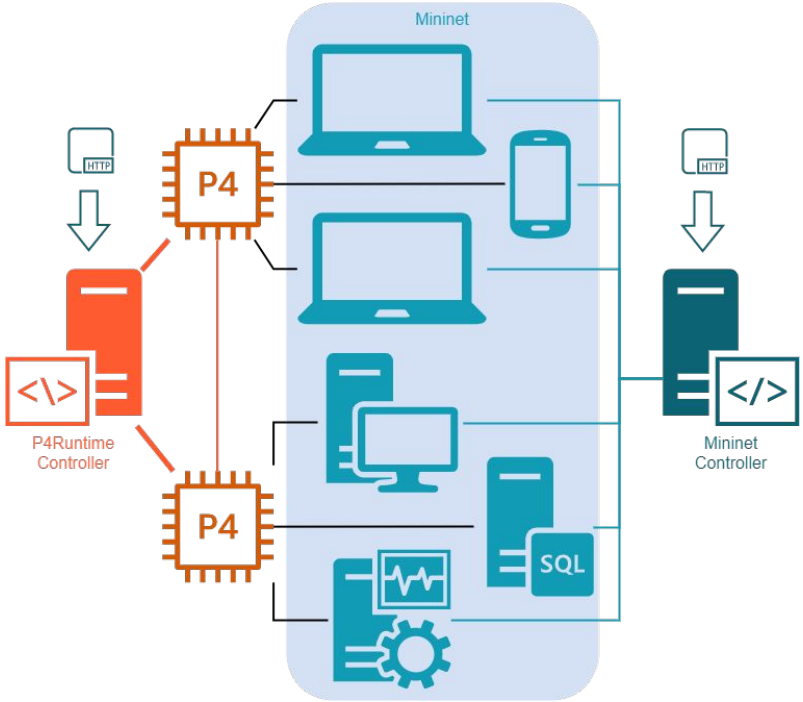
Dashboard control

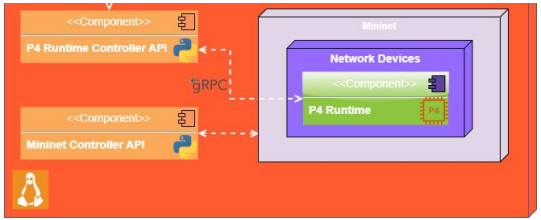
- React built dashboard

Controlling APIs

Two main APIs control the environment:

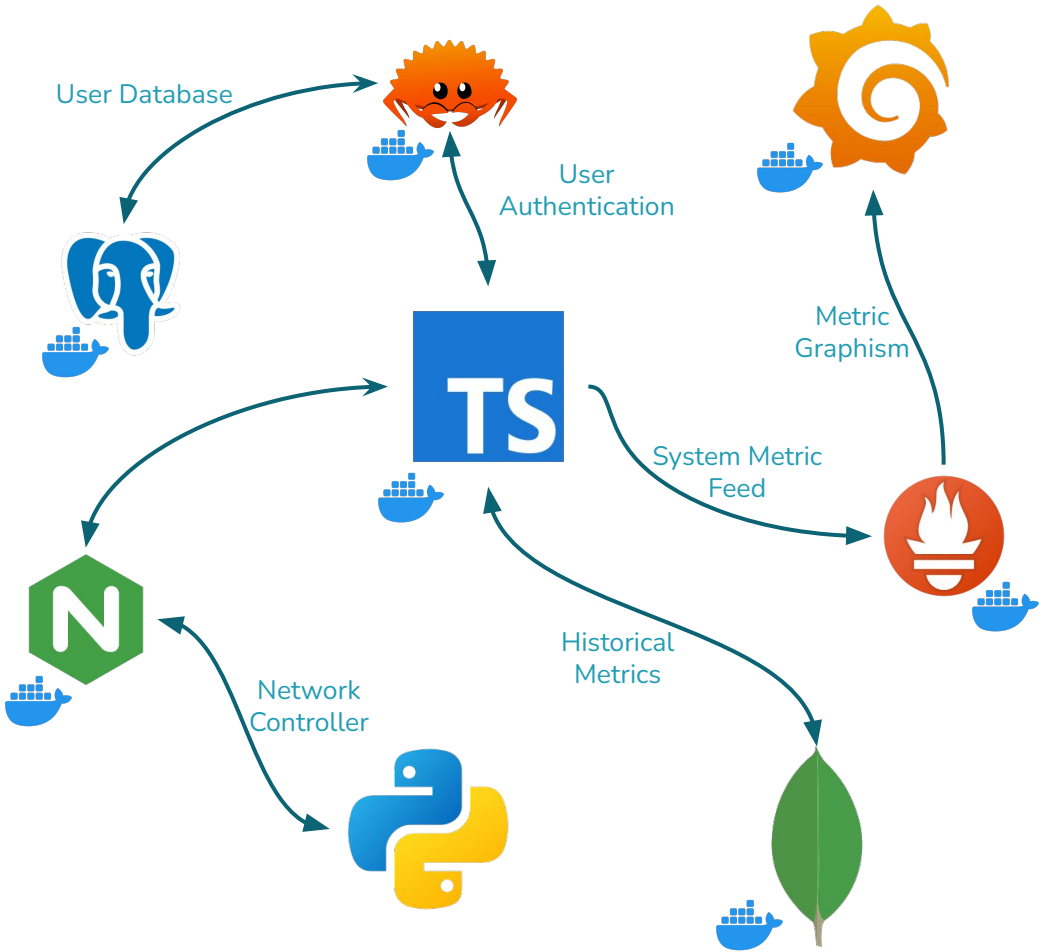
- **Translates HTTP** requests to effective communication with P4 Devices via the **P4Runtime** which uses **gRPC**.
- Programmatic control **over Mininet network** using HTTP request.





Backend

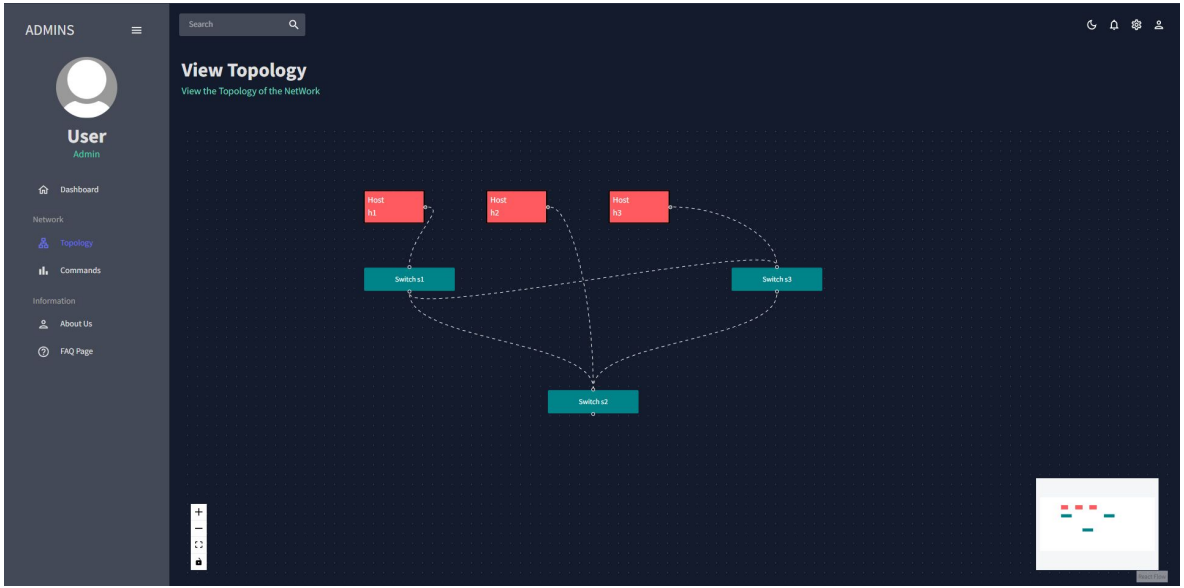
- **Flexible** data model (MongoDB)
- Authentication / Authorization / User metadata
- Integration with Prometheus and **Grafana** for metric visualization
- Service Broker
- **Microservice** Architecture



Dashboard

Interface to display the information about the network topology:

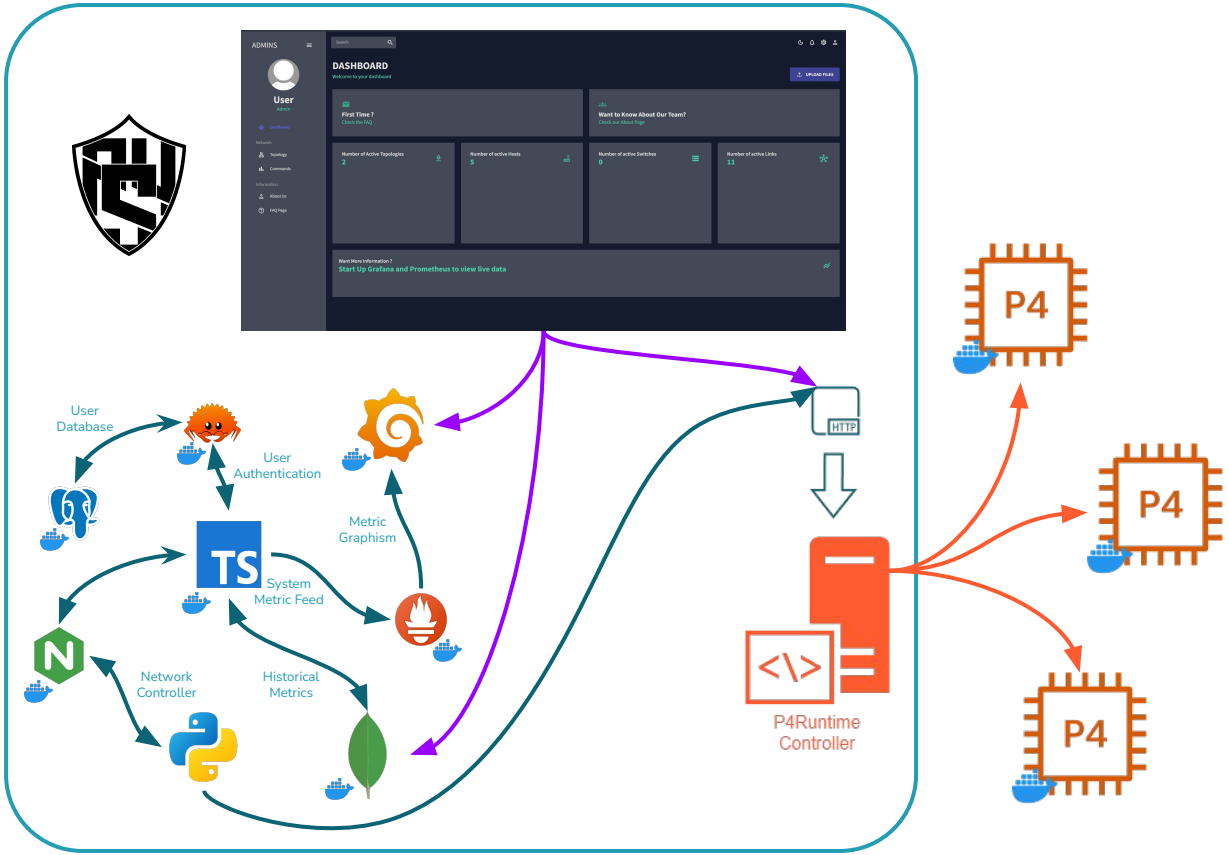
- **Generates** table displaying the available **network topologies**
- **Displays** the **hosts**, **switches** and the **links** of the network, and their details
- Includes **information** about our team and to help non-experienced users

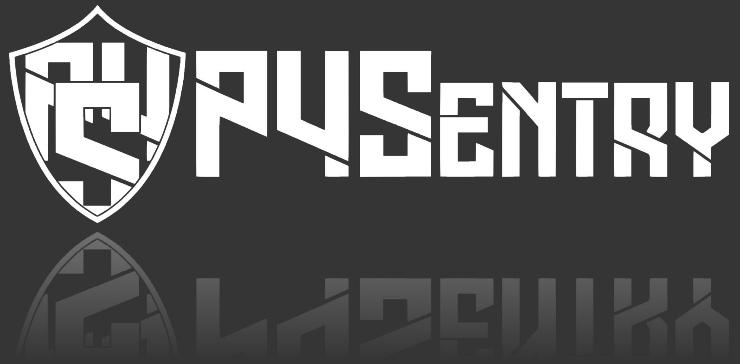


Integration

Served as **single package solution** or with **standalone components**.

Used to create **new networks** or deployed **in production**.





Future as an **Open Source Software (OSS)**.

Publicly available **P4 Runtime API** and **BMV2Watchdog** container **images**.

Traffic awareness and **reactivity**.

Exploration with **machine learning** at the level of **network analysis**.