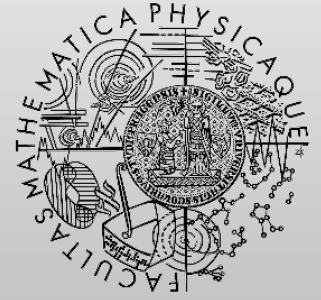
Topics for year projects and bachelor theses

http://d3s.mff.cuni.cz



FACULTY
OF MATHEMATICS
AND PHYSICS
Charles University

Department of Distributed and Reliable Systems

Tomas Bures

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Where do you know us from / Where do you know us from

Pavel Ježek

Computer principles, C# language and .NET platform, Advanced programming for .NET,

Petr Hnětynka

Java, Python

Jan Kofroň

Models and verification of system behaviour, Application development for mobile devices

Pavel Parizek

Software Development Tools, Program Analysis and Code

Tomáš Petříček

Design of programming languages

Jan Vitek

Where do you know us from / Where do you know us from

Petr Tuma

Operating Systems, Middleware,
Software Performance Evaluation

Vojtěch Horký

Operating Systems, Introduction to Linux

Lubomir Bulej

Computer architecture, Programming best practices, Software performance measurement

Tomas Bures

Python, Concepts of modern programming languages,
Embedded and Real-Time Systems, Software Engineering for Reliable Systems, Model Driven Development

Martin Kruliš

Parallel Programming, Computer

Systems

The context of our themes: Smart systems

What topics you can do with us

Things related to:

- smart/adaptive systems and machine learning
- virtualization, cloud, edge-cloud systems
- parallel systems and performance computing (not only on GPU)
- containers - Docker, Kubernetes
- Internet of Things (IoT), embedded systems with a small overlap into robotics
- analysis and processing of IoT data
- web technologies
- software performance measurement and evaluation
- distributed systems, middleware, operating systems
- software verification and testing
- technologies around Python, Java, Scala, C#, .NET, JavaScript, TypeScript ...

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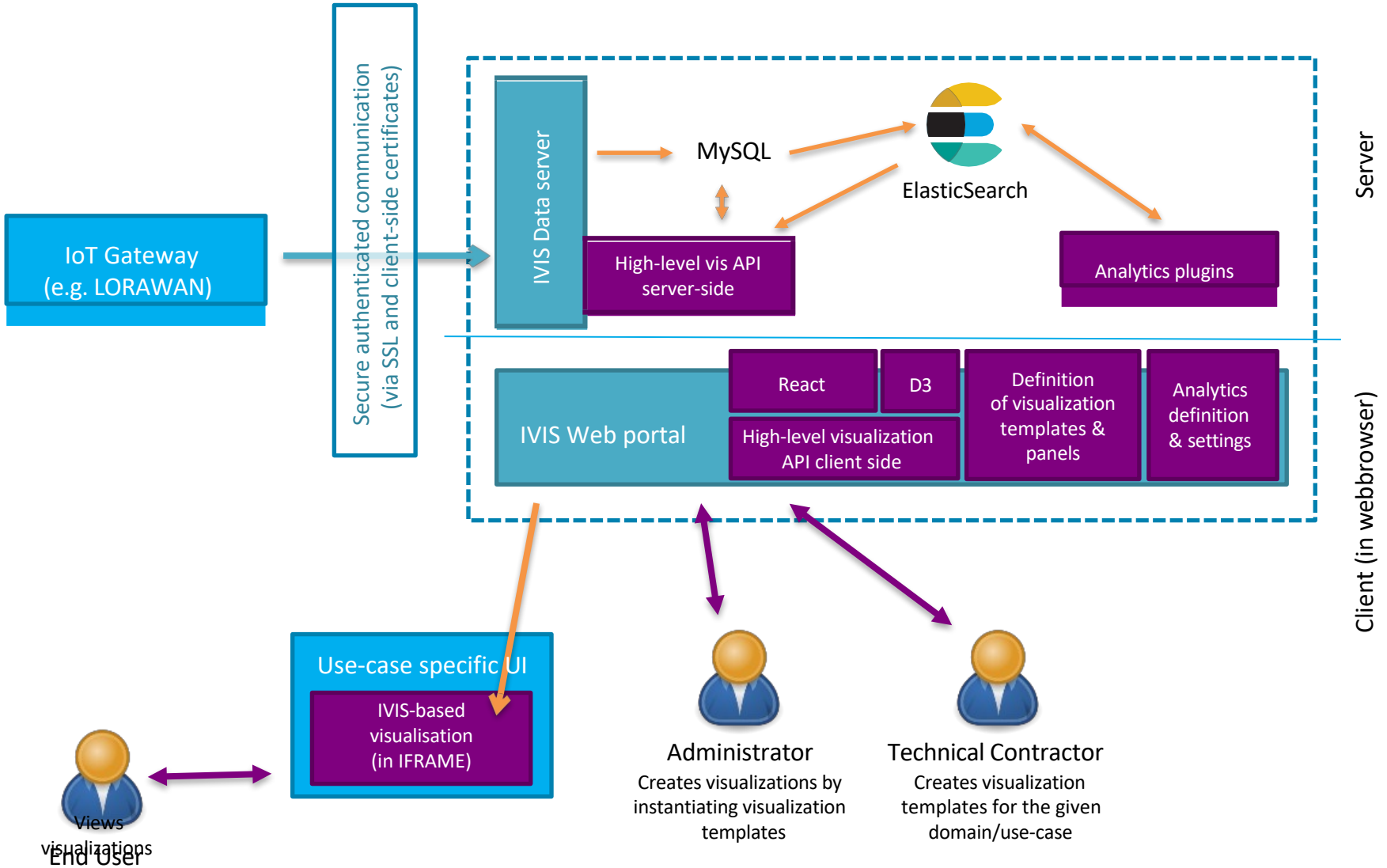
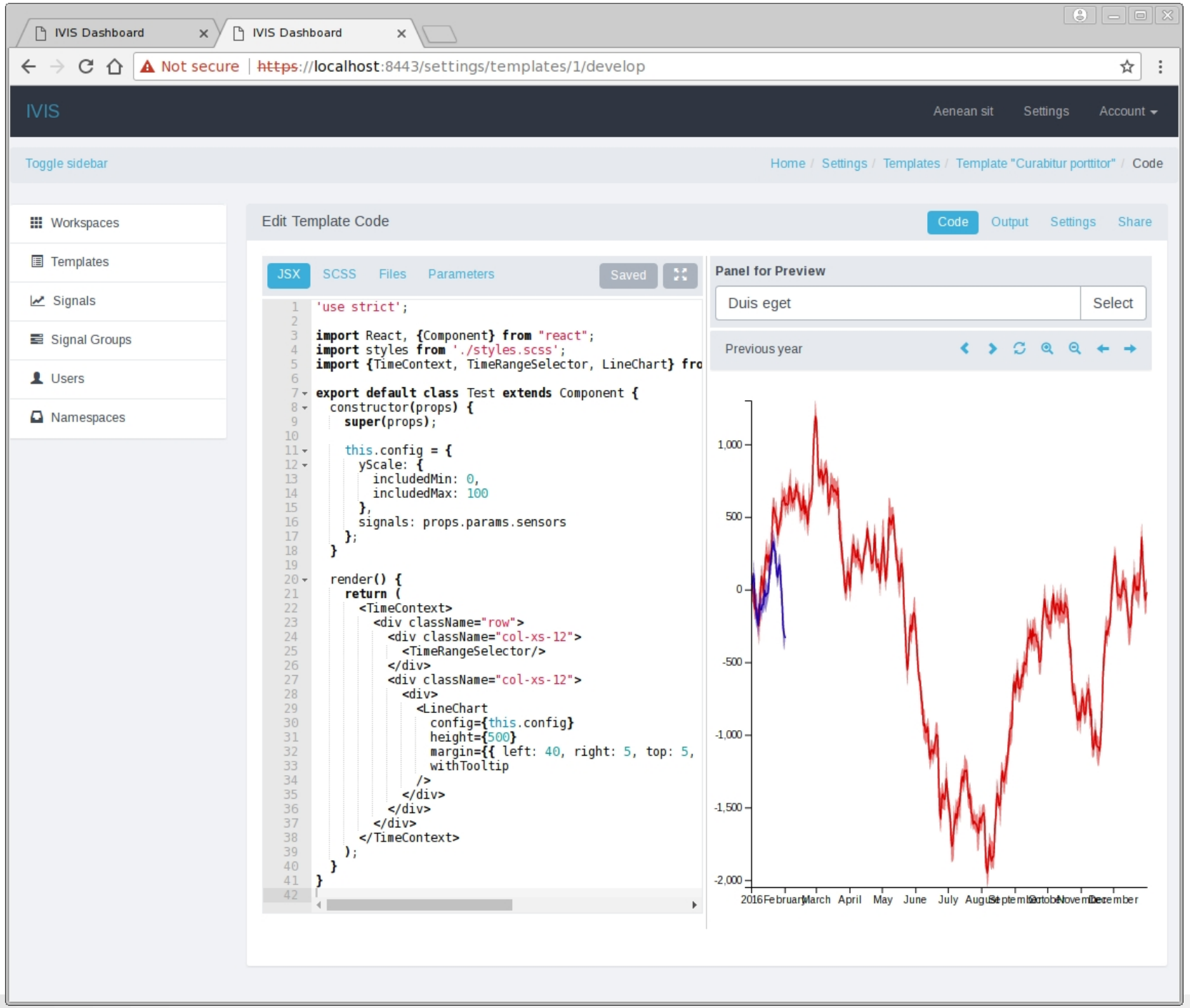
Applied research projects

- Current projects
  - **ExtremeXP:** EXPerimentation driven and user eXperience oriented analytics for eXtremely Precise outcomes and decisions
    - Modeling and implementation of machine-learning workflows and data visualization in the cloud
  - **SA4CPS**: Secure situational awareness for critical cyber-physical systems
    - Modelling smart systems
    - Modelling and detection of "situations"
    - Integration of AI/ML methods
  - **OP JAK Georizika:** Modelling, forecasting and projection of atmospheric and climatic hazards their impacts
    - Efficient implementation and parallelization of these models (e.g. on GPUs)
  - **GraalVM** (cooperation with Oracle)
    - Benchmarking and analysis of performance changes in compiler and VM (Java)

IVIS Framework - IoT data visualization and analysis




IVIS Dashboard
IVIS Dashboard
Not secure | https://localhost:8443/settings/templates/1/develop
IVIS
Aenean sit
Settings
Account
Toggle sidebar
Home / Settings / Templates / Template "Curabitur porttitor" / Code
Workspaces
Templates
Signals
Signal Groups
Users
Namespaces
Edit Template Code
Code
Output
Settings
Share
JSX
SCSS
Files
Parameters
Saved
'use strict';
import React, {Component} from "react";
import styles from './styles.scss';
import {TimeContext, TimeRangeSelector, LineChart} fro
export default class Test extends Component {
constructor(props) {
super(props);
this.config = {
yScale: {
includedMin: 0,
includedMax: 100
},
signals: props.params.sensors
};
}
render() {
return (
<TimeContext>

<TimeRangeSelector/>

<LineChart
config={this.config}
height={500}
margin={{ left: 40, right: 5, top: 5,
withTooltip
/>

</TimeContext>
);
}
}
Panel for Preview
Duis eget
Select
Previous year
1,000
500
0
-500
-1,000
-1,500
-2,000
2016
February
March
April
May
June
July
August
September
October
November
December

Examples of topics for RP and B.Sc. theses

- IoT applications (combining embedded devices and management, potentially using a web interface)
  - Management and remote configuration of ESP32 boards
  - Modern "pinchers" using ESP32 and NFC stickers
  - Air quality monitoring with ESP32, alarm signalling
- Using machine learning to detect anomalies in IoT system data
- Various web-based visualizations of IoT sensor data
- Data analysis (anomaly detection using statistics or machine)
- Unit power testing (SPL over JMH)
- Dynamic profiling of a paired application, profiling in a constrained context
- Implementation of debugging support for the static analysis library
- Optimizing the state space explosion problem in test generation using model checker
  Parallelization and code optimization using ML (including LLM)
-

Contact

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