WEB DASHBOARDS FOR CERN RADIATION AND ENVIRONMENTAL PROTECTION MONITORING
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RADIATION AND ENVIRONMENT MONITORING AT CERN

OPERATIONAL RADIATION PROTECTION

CONTAMINATION

VENTILATION

GATE

AIR

WEATHER

WATER

REMUS WEB DASHBOARDS

Progressive Web Application

Dashboards are built in a Progressive Web Application (PWA), therefore usable from any platform using a standard compliant browser, including desktop, tablets and mobile devices.

Front-end (1)

The REMUS Web front-end is built on top of React.

Dashboards pages make use of an additional library, react-grid-layout. This library enables the creation of flexible and responsive grid layouts in React applications.

REMUS Web states are managed using Redux. Additionally, the react-query library enables individual dashboard components to fetch their own data in parallel.

HighCharts library is used to display all the dashboards' widgets containing measurement data. HighCharts' Boost module enables GPU acceleration using WebGL.

Back-end (2)

The REMUS Web back-end is built on Java 17 and Spring Boot.

The Environment and Radiation Unified Data Integration Service (ERUDIS) library, developed by our team, serves as an API for data access.

The API's architecture is rooted in Akka, an actor concurrency model framework, and utilizes the Akkaq library, purpose-built for data stream handling, including features such as:

- Buffering
- Advanced error handling
- Built-in redundancy

REMUS Web dashboards leverage the WebSocket protocol, a powerful technology that enables the creation of full-duplex, near-real-time communication channels between clients and servers.

Data Sources (3)

The information displayed on the dashboards are of two types:

- Configuration database exploration, such as entities meta-data, and parameters applied to the different instruments over time.
- Measurement and Alarm data.

Measurement and Alarm data leverage four data sources:

- Oracle: Stores long term, down-sampled measurement data. Ensures low latency access to data, thanks to the partitioning and down-sampling.
- NXCAL5 (CERN Hadoop-based solution): Stores long term, raw measurement data. Ensures high resolution access to the data.
- Apache Kafka: Provides subscribable near-real-time data coming directly from the SCADA layer.
- InfluxDB: Fed by Kafka via Kafka Connect, it provides one week buffer of the most recent data.

Web Dashboards Features

REMUS Web dashboards provide the following widgets:

- Trends: Multiple measurement data series line charts.
- Alarms: Near-real-time and read-only replication of the SCADA alarm screen.
- Measurements Statistics: Box plots or table of metrics of the measurement data series.
- Parameters: List of current parameters of an instrument.
- Information: Meta-data of an instrument.
- Text: Markdown-enabled text area.
- Parameters Statistics: Box plots or list of current parameters of multiple instruments.
- Snapshots: List or aggregations of snapshot data (spectrum or logically linked measurements).

Access rights can be managed per dashboard by group of users.

Dashboards can be shared by link or via QR codes.

In addition, there are three display modes: standard, full-screen and edition providing that the permission is granted.

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