REMUS Web
Radiation and Environment Monitoring Unified Supervision
Web Application

24.06.2021 – Web Development Technical Exchange

HSE-TS-CS Section
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REMUS: Overview

From Instrumentation to Operation

OPERATIONAL RADIATION PROTECTION

CONTAMINATION

GATE

VENTILATION

WEATHER

AIR

WATER

Commands
On, Off, Sample, etc.

Parameters
Thresholds, Units, etc.

820 Monitoring Stations
5 400 Measuring Channels

300 active users

24/7

Measurements
Alarm signals
Faults
Process Statuses

Radiation Protection & Environmental Experts

CERN Control Centre

Experiments Control Rooms

Safety Control Room

50K parameters

800 synoptic

120K defined alarms

10M meas./hour

REMUS
Supervision
Control
DAQ

REDUNDANT
WCC OA project
850K Tags

ERGO
Data Visualization

300 active users

Desktop Java 8 app
jdataviewer

REMUS - Problem Statement - REMUS Data pipeline - REMUS Web

24.06.2021

EDMS no: 2596059
**Problem Statement**

**What is missing?**

- **On-site Interventions:**
  - Upon Environmental incident: Fire Brigade depends on CCC/Safety Room to know about the evolution of measured conditions

- **Domain-specific Reports**
  - Experts depends on Excel spreadsheets and know-how to generate:
    - Net Ambient Doses reports
    - Released activities of radionuclides reports
    - Alarms reports
    - Hyetograms
    - …

- **Statistics**
  - Detect misconfigured instruments among thousands is a time-consuming task

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**Possible yet not optimal to implement in WinCC OA**
Data to Information

SCADA (WinCC OA) to Data Stores
REMUS Data pipeline: Drivers and SCADA

Safety-Critical - Availability >99.99%

REMUS - Problem Statement - REMUS Data pipeline - REMUS Web
REMUS data pipeline: Data Batch Processing and Streaming

Historical: High latency, non-reduced
Historical: Low latency, reduced
Near Real-Time Buffer
Near Real-Time

Historical
Near Real-Time

Batch processing
meas. & alarms
Buffered measurements & statuses
RT measurements & statuses

Long term storage
Long term storage
1 week retention
3 days retention

RT meas. & alarms
RT meas. & statuses

[1992, -5mn]
[-7days, now] now + subscription

WinCC OA-agnostic Near Real-Time & Historical Data Stores

REMUS - Problem Statement - REMUS Data pipeline - REMUS Web
REMUS data pipeline : Web Applications

REMUS - Problem Statement - REMUS Data pipeline - REMUS Web

* Not deployed yet
Demo
REMUS data pipeline: REMUS Web Architecture

- Problem Statement: REMUS Data pipeline

REMUS Web

CERN SSO

Web Browser

Graphana

OPENSHIFT

ORACLE

Clients

Web Service

Data Service x2

API Gateway

Spring

Spring

Oracle

Oracle

NXCALS

NXCALS

Influxdb

NXCALS

influxdb

Frontend Technologies

Redis

Socket.io

Highcharts

Redux

Kafka

SCADA

Instrumentation

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Conclusion

• In production since December 2019

• Target domain-specific requirements

• Use Industry standards & CERN existing software Infrastructure

• Decoupled from REMUS (WinCC OA)

• Do **NOT** aim at replacing WinCC OA UIs in Control Rooms
  • =>We are interested in WRAP!

• What can be re-used:
  • Source code of REMUS Web (on demand)
    https://gitlab.cern.ch/hse-see-co/REMUS/remus-web/

  • Open-source WinCC OA /Kafka **Full-duplex** Driver
    https://github.com/cern-hse-computing/WCCOAkafkaDr

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Demo Screenshots
REMUS Web Demo

Hyetogram generator
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<th>Instrument</th>
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REMUS data pipeline: Kafka usages

Receive REMUS measurements, delete if entry is more than 72h old
=> Circular buffer of 72 hours of measurements

Receive REMUS alarm states, delete if not last value of a given key
=> Current alarms dashboard

Receive timestamp of measurement sent to NXCALS, delete if not last value of a given key
=> Shared State (pointers) store

Shared data store between heterogeneous applications
Fast R/W
Highly scalable
Guaranteed message order
Consumers can have their own read pointer
Secured access (TLS + Kerberos)
Access from TN and GPN
Overview

REMUS to NXCALS

Insert in NXCALS

Send last timestamp sent / channel & keepalive

Check if active pair is alive

Query every 10mn

REMUS to NXCALS

Passive pair(s)
Scenario

LHC P1

Water discharge

High reflection

Water Monitoring Station

Hydrocarbons detected

REMUS Driver

HC Alarm at LHC P1!

Notifications

External systems

REMUS - ERGO - REMUS Web

CERN Control Centre
Fire Brigade
Environmental Experts

Intervention

REMUS Web

Hydrocarbon detector