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Progress on the IDC Seismic, Hydroacoustic and Infrasound Reengineering Project and Station State of Health (SOH)

CTBTO PREPARATORY COMMISSION

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INTRODUCTION

With more than 300 stations in operations, the CTBTO needs an efficient tool to monitor the status and performance of the stations.
As the current system is reaching end-of-life, its successor is being developed.

METHODS/DATA

Between current and future system, the incoming data and expected output are comparable.
The challenge lies in the implementation of modern software architecture and improvement of processing, reliability and traceability.

START

RESULTS

Based on the open-source release of the Geophysical Monitoring System, we managed to adapt the system to implement some of the CTBTO specific monitoring requirements.

CONCLUSION

Modern software architecture and recent technology are being implemented proving useful in the new SOH project.
Development is ongoing with an expected delivery to production in 2024.

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P4.1-314

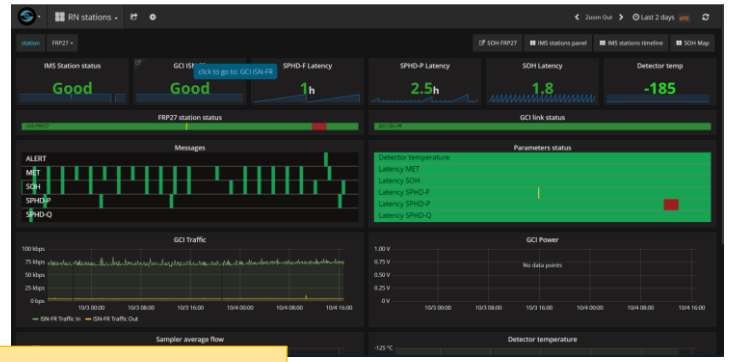
Introduction
State of Health (SOH), a critical tool reaching end-of-life

SOH is a critical system for the daily work of Operations officers, also available to external users

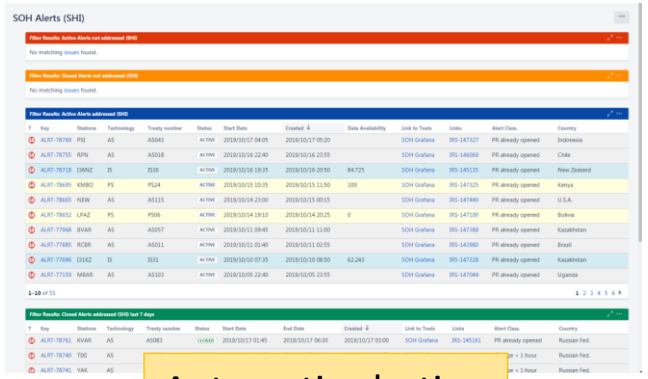
Current system was mostly developed between 2008 and 2011

A modernization effort in 2017-2018 brought improvements but with high additional complexity

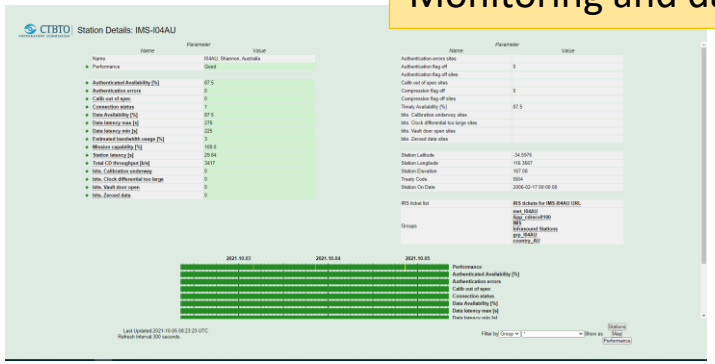
The difficulty and cost of maintenance are a challenge for the organization

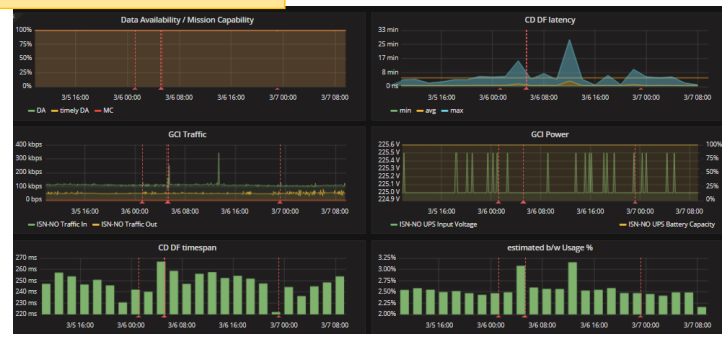


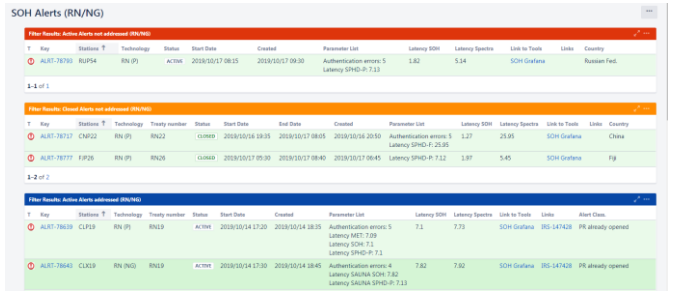
Monitoring and data visualization



Automatic alerting







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Objectives
A technical upgrade with a reevaluation of monitoring processes

SOH system should perform real-time monitoring of seismic, hydroacoustic, infrasound and radionuclide stations, along with the communication infrastructure.

Modernized components: Use only open-source libraries and components, backed by a large community of users.

Robust deployment: The system should operate on the new CTBTO on-premises cloud environment. It must use tools as Kubernetes and Helm for deployment and follow the GitOps approach.

Increased reliability: Different components of the system should be monitored. We should develop buffer and fallback mechanism as resilience mechanism.

Improved transparency and traceability: Clear metric and status rules definitions. Versioning of the configuration and improved user documentation.

Flexibility and Extensibility: System must be designed to easily configure new metrics with their monitoring conditions and alerting.

P4.1-314

Methods/Data
How do we design and build this system?

GMS Geophysical Monitoring System

The future system is based on the open-source release of the Geophysical Monitoring System (GMS) developed for the US NDC.

kafka

Apache Kafka is at the core of the SOH system which is designed as a data streaming pipeline.

Several other tools and technologies enable us to achieve our goals and requirements.

elasticsearch fluentd kibana aws GitLab HELM Istio

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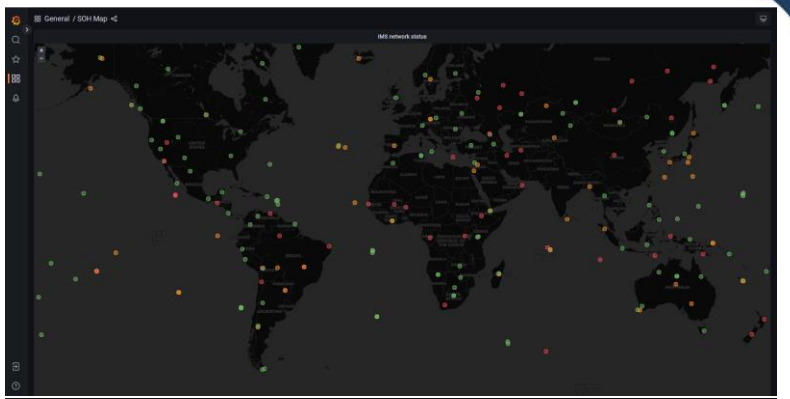
Project Status and Recent Advances

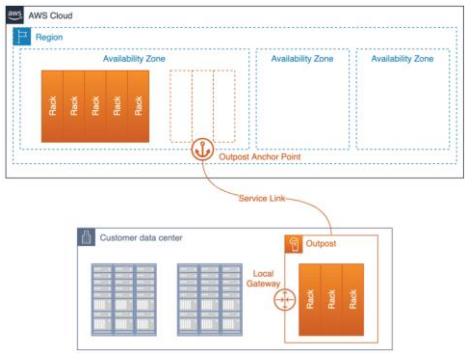
The development of the system is ongoing based on the GMS version received in March 2023

The system is running on the on-premises cloud computing solution AWS Outpost

Recent achievements:

- Support of CD-1.0 data streams
- Synchronization of IMS network definition from DOTS
- Added Global Communication Infrastructure (GCI) monitoring
- Initial effort porting Grafana dashboard for data visualization
- Use of managed PostgreSQL and Kafka services
- Implementation of Kafka authentication and generalization of the use of Sealed Secrets





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Upcoming activities and Milestones

Extending SOH system capabilities

- Adding new metrics (Mission Capability, data authentication…) - *Q3-Q4 2023*
- Improved monitoring of Auxiliary stations - *Q3 2023*
- Radionuclide station monitoring - *Q4 2023*
- Additional Grafana SOH displays - *Q3-Q4 2023*
- Automatic alerting features - *Q1 2024*
- Support for external user access - *Q1 2024*

Migration to Amazon EKS Anywhere solution on CTBTO bare-metal infrastructure - *Q3 2023*

Testing and validation of the system

- Alpha Tester Group activity - *September 2023*
- Internal validation and release - *Q1-Q2 2024*

P4.1-314