Advancing Decision-Making and Sustainment of Seismic and Infrasound IMS Network: From a Data-Driven Methodology to Network Summary in MuTIP

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INTRODUCTION AND MAIN RESULTS

Multi-Technology Integration Portal (MuTIP) has been created to allow for a heterogenous software ecosystem and to allow other tools and services to be plugged to a centralized place, which allows the users to focus on the business value.

The long-term sustainment of the IMS stations demands a comprehensive and multifaceted approach. Benefiting from the technology evolution, MuTIP can support IMS Sustainment Strategy and Planning by building a data-driven approach and presenting informative data to the end-users.

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SnT 2025 CTBT: SCIENCE AND TECHNOLOGY CONFERENCE
8 SEPTEMBER ONLINE DAY
9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE

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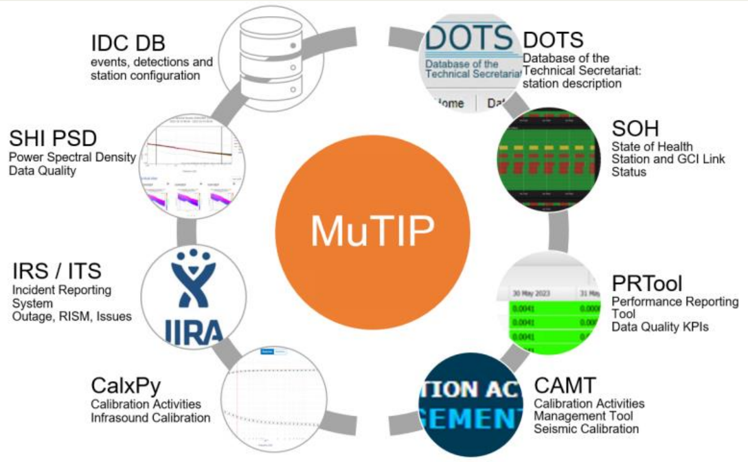
Introduction

The Multi-Technology Integration Portal (MuTIP) is an internal platform that aims at supporting several key functions and activities of technical staff of IMS and IDC.

MuTIP profits from the rapid evolution of Information Technology that has revolutionized traditional ways of working and helped to create tools to support the users. It is developed as a centralizing portal to guide users to the relevant expert tools and to facilitate access to the information through aggregation and representation of results coming from a variety of data sources.



By benefiting from the design concept of MuTIP, a data-driven Software tool "Network Summary" is being developed

Objectives

The process of station recapitalization planning is composed of 3 stages:

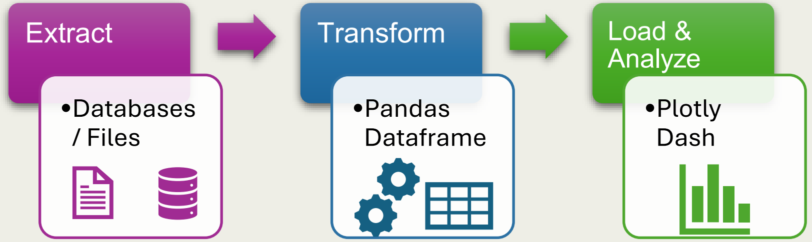
Building on the methodology that is presented in the e-poster "Modelling IMS Seismic and infrasound networks sustainment needs: data-driven approach for IMS sustainment planning" [P4.4-717], this e-poster focuses on the implementation of that data-driven approach through the development of software tools.

These tools can support technical teams and management in applying the sustainment strategy, by enabling data-focused visualization, identifying pain points and potential issues, and prioritizing work across IMS stations. In this way, the solution streamlines IMS sustainment decision-making and contributes to protecting and maintaining the unique global alarm system that plays a crucial role in international peace and security.

Methods

The tool retrieves data from various sources, transforms it and models it and then presents it to the end-users.

Methods / Data



For the technical risk assessment, Primary Seismic, T-Phase and Infrasound stations are split into functional components referred to as technical station subsystems (TSS).

Four subsystems are selected (Sensor, Digitizer, Computer and WNRS). For each one of them, data is collected and scores are computed and aggregated [P4.4-717]

DOTS Name	probability	impact	overall_risk	timeline
MB3a Differential	1	2	2	20
MB3a Differential	1	4	4	18
MB3a Differential	2	3	6	16
IFSN-5402-00100-A-PTS Differential, MB2005 Absolute Floating ground	4	4	16	4
IFSN-5402-00100-A-PTS Differential	1	2	2	20
MB2005 Absolute Floating ground, MB2005 Absolute Differential	3	5	15	6
MB2000 Absolute Single ended, MB2005 Absolute Differential	5	5	25	0
MB2000 Absolute Single ended	5	5	25	0
MB2000 Absolute Single ended	5	5	25	0
MB2000 Absolute Single ended	5	5	25	0
IFSN-5402-00100-A-PTS Differential	1	2	2	20
MB2000 Absolute Single ended	5	5	25	0
MB2000 Absolute Single ended, MB2005 Absolute Differential	5	5	25	0
MB2005 Absolute Floating ground	2	5	10	10
MB2000 Absolute Single ended	5	5	25	0
IFSN-5402-00100-A-PTS Differential	1	2	2	20
IFSN-5402-00100-A-PTS Differential	1	2	2	20
MB3a Differential	2	2	4	18
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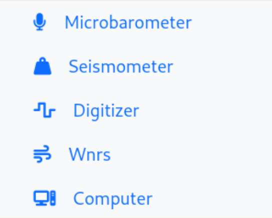
Results

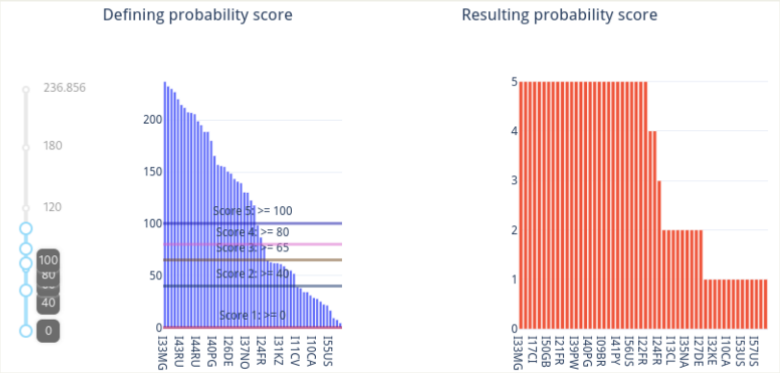
The Software tool offers two different ways of visualizing the retrieved data: Subsystem and Network views.

Subsystem View

For each one of the chosen subsystem:

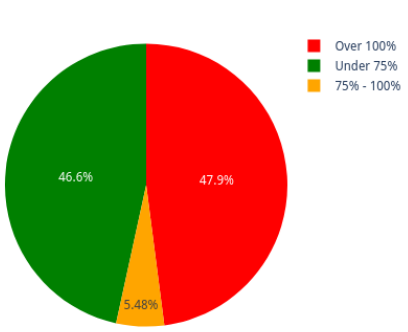


a probability and an impact scores are computed based on the two key concepts in the IMS sustainment strategy: equipment lifetime and obsolescence. Data is then aggregated and an overall score at the station level is calculated for a given subsystem, which is used to assign a timeframe to it. All those scores can be visualized as interactive figures.



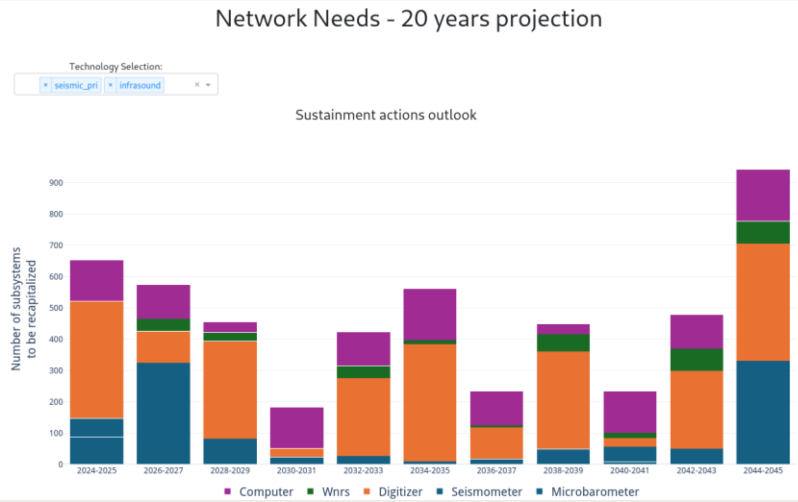
It is also possible to visualize the lifetime categories distribution for a given subsystem and a given network:

e.g. Lifetime Categories of The Digitizers of the Infrasound stations



Network View

The visualization of the data shows a projection of the IMS Network status for the upcoming 20 years (Infrasound, Primary Seismic, T-Phase).



Conclusion

This data-driven solution that is being implemented is developed in an agile way. The collected and aggregated data already serves as an input for the sustainment review sessions every six months. User feedback is collected to continuously improve the proposed solution.

The data visualization shows the needs of the IMS Network over the next 20 years, which helps to:

- Highlights vulnerabilities within the network
- Reduce time and effort in collecting and analysing the data
- Reduce complexity and take advantage from technological advances