USA Navigational Warning Application (SMAPS) Update

Submitted by USA

SUMMARY

Executive Summary: At WWNWS 14 the United States presented its Source Maritime Automated Processing System (SMAPS) program, specifically on how it utilizes aspects of Machine Learning and Natural Language Processing. This document provides an update on development efforts to have the SMAPS system handle S-124 navigational warnings.

Action to be taken: 4

Related documents: WWNWS14-7-3

1. Background

1.1 At the 14th meeting of the WWNWS-SC the deputy NAVAREA IV/XII Coordinator presented its new production system, the Source Maritime Automated Processing System (SMAPS). This system was a change to a cloud-based application which utilized machine learning and natural language processing to automate certain aspects of S-53 production.

2. Discussion

S-124 Development

2.1 The SMAPS program entered an operational status in 2022 with out a S-124 capability. It was intended to start development on our S-124 capability in 2023 and 2024. Due to this timeline, there are differences between the SMAPS data model and the S-124 product specification, though they are quite similar.

2.2 When scoping the work to allow the system to process S-124, it was determined that the system needed the ability to not only create an S-124 dataset but also ingest S-124 datasets. It is yet to be determined if source S-124 data would be ingested manually via an Amazon Web Services Simple Storage Solution bucket (AWS S3) or via the SMAPS Application Programming Interface, though both are technically feasible.

2.2.1 The use case for the ingestion of S-124 data could be a future state in which a National Coordinator is producing S-124 datasets in a national service (IntService = False) and there is a requirement for information to be provided as a NAVAREA S-124 dataset.

2.2.2 Additionally, a National Coordinator producing Coastal Warnings in S-124 format could have an IT issue which would not allow these datasets to be properly disseminated. In this case, SMAPS could automatically ingest these coastal warnings and ensure that they are properly disseminated.

2.3 The SMAPS system currently ingests warnings in S-53 format and unstructured text and runs them through a source pipeline, in which data is automatically extracted into the SMAPS data model. It is the intention for this process to continue to retain natural language processing, regular expression scripts, and potentially add large language models to the system to further automate the generation of S-53 warnings and S-124 datasets.

Expansion of the SMAPS data model to handle a dual fuel period.

2.4 Due to S-124's relationship to MSI and the GMDSS, NAVAREA IV/XII anticipates a significant dual fuel period in which it will be required to promulgate both S-53 and S-124 datasets. To support this, there has been significant expansion of the SMAPS Data model.

2.4.1 SMAPS uses an AWS Aurora relational database which is very similar to PostgreSQL database.

2.5 To accomplish this, developers added an XML column to each warning within the database. In this case one source can be related to a S-53 and a S-124 output. This ensures that during adual fuel period, S-53 and S-124 will always be in parallel.

2.6 It is expected that initial S-124 datasets will not maximize the use fields within the S-124 product specification, which is the current guidance of the S-124 Project Team. This is due to development that is still required to both the database and user interface to maximize all aspects of the product specification.

2.7 A high-level diagram of the intended process flows can be found in the ANNEX to this document.

3. Next Steps

3.1 It is the intention of NAVAREA IV/XII to meet the IHO timeline for Phase 1 of S-100 in 2026, which includes S-124.

3.2 To this end, NAVAREA IV/XII has started to create S-124 datasets, but has not yet created a full S-100 exchange set. We are currently reviewing our S-124 datasets for accuracy, and editing our data model and user interface to fully utilize the product specification

3.3 Allow for the validation of S-124 products, in a to-be-determined fashion.

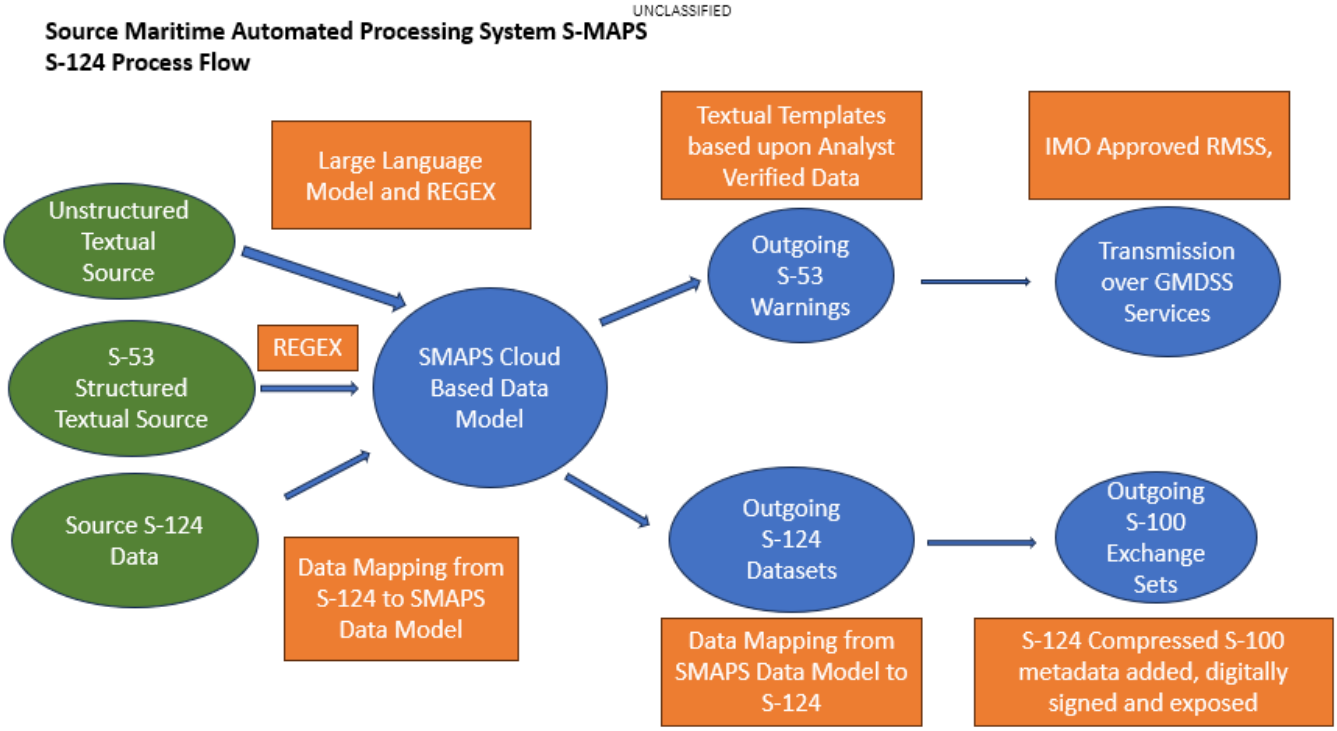
3.4 Further utilize automation and cloud-based services to allow for the automation of S-53 textual warnings and S-124 datasets.

4. Action to be taken

4.1 The WWNWS-SC is invited to note the information required.

4.2 Encourage NAVAREA coordinators and National Coordinators to share their datasets for testing purposes.

Annex


UNCLASSIFIED
Source Maritime Automated Processing System S-MAPS
S-124 Process Flow
Large Language Model and REGEX
Textual Templates based upon Analyst Verified Data
IMO Approved RMSS,
Unstructured Textual Source
S-53 Structured Textual Source
REGEX
SMAPS Cloud Based Data Model
Outgoing S-53 Warnings
Transmission over GMDSS Services
Source S-124 Data
Data Mapping from S-124 to SMAPS Data Model
Outgoing S-124 Datasets
Outgoing S-100 Exchange Sets
Data Mapping from SMAPS Data Model to S-124
S-124 Compressed S-100 metadata added, digitally signed and exposed