**Input paper: [[1]](#footnote-1)**XXXX-9.6.2

**Input paper for the following Committee(s):** **Purpose of paper:**

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**☐**ARM **☐**ENG **☐**PAP **☐**Input

**☐** ENAV **☒**VTS **☒**Information

**Agenda item**[[2]](#footnote-2) 9.6

**Technical domain/ Task number**2 …………………………………

**Author(s)/Submitter(s)** Korea Coast Guard

Proposal for abnormal situation detection system using big data[[3]](#footnote-3)

# Summary

Considering recently updated Guideline 1110 (‘Use of Decision Support Toolsfor VTS Personnel’) in January 2022, S1040 (‘Vessel Traffic Services’) and the task of preparing a living document on Future VTS, including emerging technologies and human element (VTS Task Plan 2018-2022) will be launched at the VTS 52 meeting, this paper aims to share information about an abnormal detection technology using VTS big data.

## Purpose of the document

The present proposal has the objective of introducing the work carried out by the Korea Coast Guard in the use of big data technology to upgrade VTS decision support tools and sharing information about abnormal situation detection technology using VTS big data.

## Related documents

IMO. Resolution A. 1158(32) – Guidelines for Vessel Traffic Services

IALA Guideline 1110 – Use of Decision Support Tools for VTS Personnel

VTS49-7.1.1 (VTS48-7.1.2) VTS Committee Task Plan 2018-2022 (20191010)[[4]](#footnote-4)

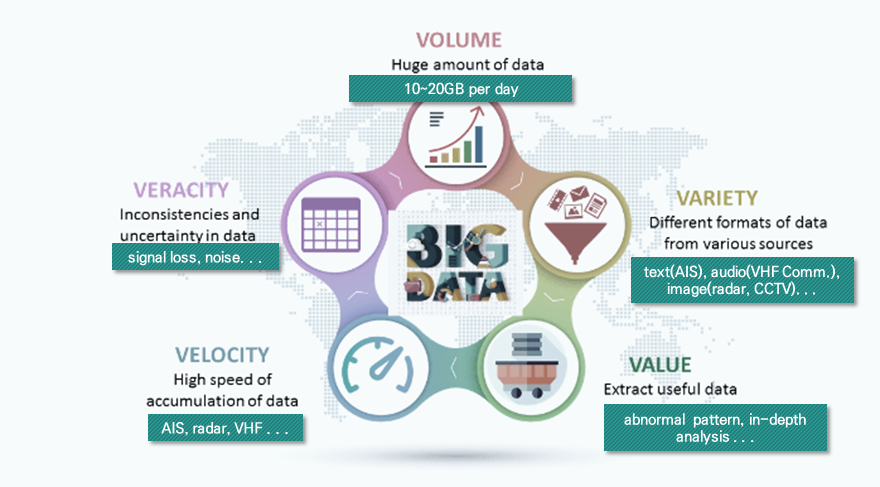
# Background

All references to “Types of Service (INS, NAS, TOS)” have been removed in IMO A.1158(32) and have been emphasized the purpose of a VTS in mitigating the development of unsafe situations through providing timely and relevant information, monitoring and managing ship traffic and responding to developing unsafe navigational situations.Preventing vessel trafficaccidents in advance is getting important. In order to ensure more effective management of unexpected vessel traffic situation, early detection system is required. The Korea Coast Guard has developed an early awareness system to detect vessel abnormal behaviour as soon as possible in VTS service areas.

# Discussion

## Concept of VTS Big data

Generally big data refers to the unimaginable amounts of information generated every second from social media, cell phones, cars, credit cards, M2M sensors, images, video, and so on, and this kind of data can only be treated by Big Data Technologies (Figure 1). Likewise, VTS collects lots of data from various sensors such as Radar, AIS, VHF, Met. sensor, etc. Much of data produced by VTS, however, are limitedly used, being stored on storages and then become digital fossils, unless they are re-used by many other purposes.



1. Characteristicsof big data on VTS

3.2. abnormal Situation Detection System based on AI technics

VTS Operators (VTSO) have paid a great deal of efforts and attention to monitoring vessel traffic situation, nevertheless there are still vessel traffic accidents occurred. Many authorities and institutes across the world have introduced lots of supporting tools for VTSs, but it is still necessary to have systems in place that can help detect better or alarm system of abnormal or unsafe situation in advance.

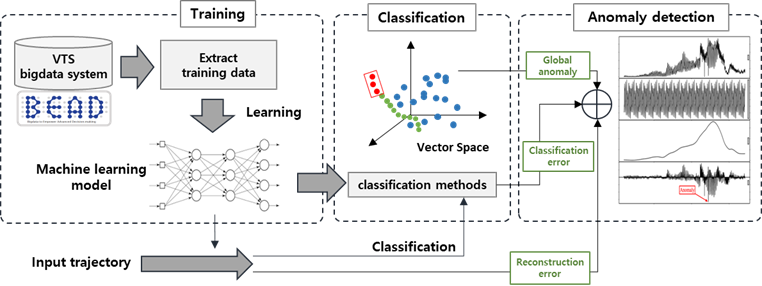


Figure 2 Big data driven abnormal situation detection processes using machine learning model

The Korea Coast Guard has been developingawareness technologies using the big data obtained from VTS centre in order to ensure managing and mitigating unsafe situation in the VTS areas (Figure 2). This method diagnoses whether vessel operation or traffic situation is normal by learning from past data set including traffic data, movement of vessels and others. Then, it dassifies the degree of anomaly of traffic situation. Finally, it identifies whether vessels or traffic situations are either safe or in abnormal situation. The final results which cover every spot within the VTS areas are delivered to VTSOs as alarm messages (Figure 3).

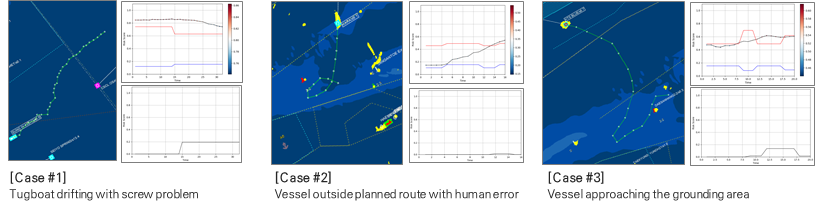


Figure 3 Cases by abnormal detection system using VTS Big Data

This method can bring lots of benefit to VTSO by helping identifying abnormal traffic situation early and mitigating the risk of accident by intervening in the situation at the right time.Therefore, this big data driven abnormal situation detection system has to be considered as part of VTS decision support tools.

# Action requested of the Committee

VTS committee is invited to note the application of this technology, and take this technology into consideration during the process of developing "a living document on Future VTS ".

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
2. Leave open if uncertain [↑](#footnote-ref-2)
3. Footer will automatically populate [↑](#footnote-ref-3)
4. Informal document as agreed between members of VTS committee [↑](#footnote-ref-4)