**Input paper: [[1]](#footnote-2)** VTS54-8.7.1

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

(Select as appropriate)

ARM  ENG  PAP  Input

ENAV VTS  Information

**Agenda item** [[2]](#footnote-3) 8.7

**Technical domain/ Task number** 2 1.9.4

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

proposal FOR update on Future VTS DISCUSSION PAPER: Korea coast guard case study

# Summary

This purpose of this paper is introducing the case study of Korea coast guard, preparing IALA Future VTS.

This document share information about the prototype system using the data science technology.

## Purpose of document

The present proposal has the objective of introducing the work carried out by the Korea Coast Guard in the use of the data science technology to prepare the future VTS. This document will contribute the update and deep discussion of the Future VTS discussion paper.

## Related documents

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

IALA Future VTS Discussion Paper

# 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 traffic accidents in advance is getting important. In order to ensure more effective management of unexpected vessel traffic situation, early prediction system is required. The Korea Coast Guard has developed a big data-based system to prepare the Future VTS and support VTSO.

# 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.

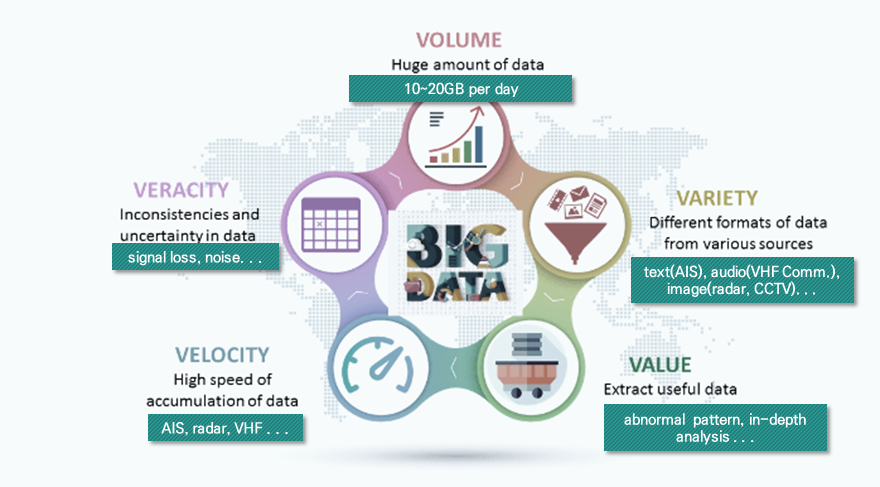


Figure 1 Characteristics of big data on VTS

## VTSO support Functions based on Data SCience Technology

The Korea Coast Guard has been developing VTSO support 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 classifies 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).

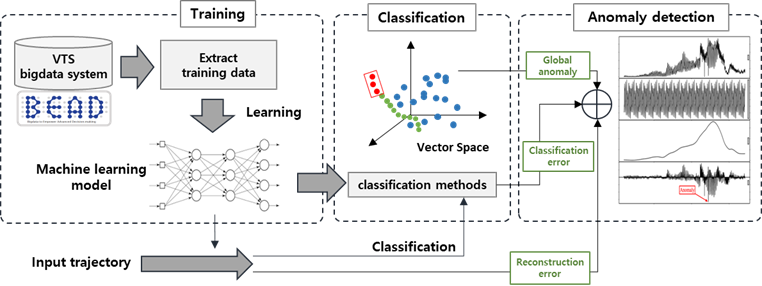


Figure 2 Big data driven abnormal situation detection processes using machine learning model

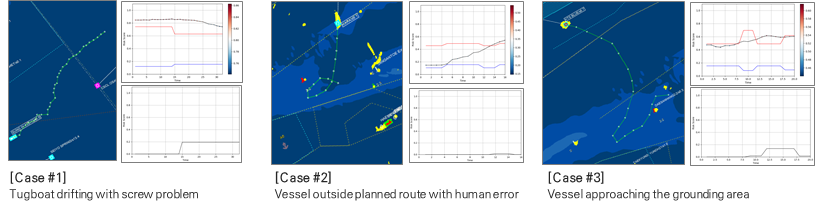


Figure 3 Cases by abnormal detection system using VTS Big Data

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.

Second, the Korea Coast Guard has been developing VTSO support technologies using the big data obtained from VTS centre in order to manage traffic density in the VTS areas. This method predicts whether vessel traffic density is congested by analysing the past data set including traffic data and present data set including the port arrival and departure report data.

Then, it classifies the degree of traffic density. Finally, it identifies whether traffic congestion is either high or low level. The final results which cover every node and edge within the VTS areas are delivered to VTSOs as density map (Figure 4).

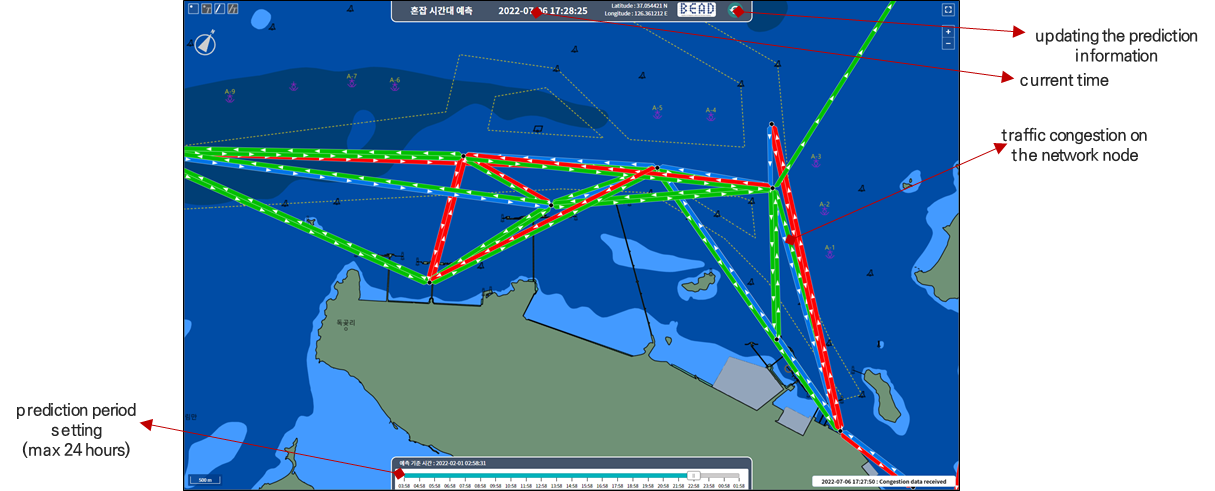


Figure 4 Cases by traffic congestion prediction system

Third, the Korea Coast Guard has been developing VTSO support technologies in order to manage vessels in anchorage area. This method predicts time of the vessel’s weighing anchor by learning the past data set and analysing the port arrival and departure report data.

The final results which cover every vessel within the anchorage area are delivered to VTSOs as the predicted order list (Figure 5).

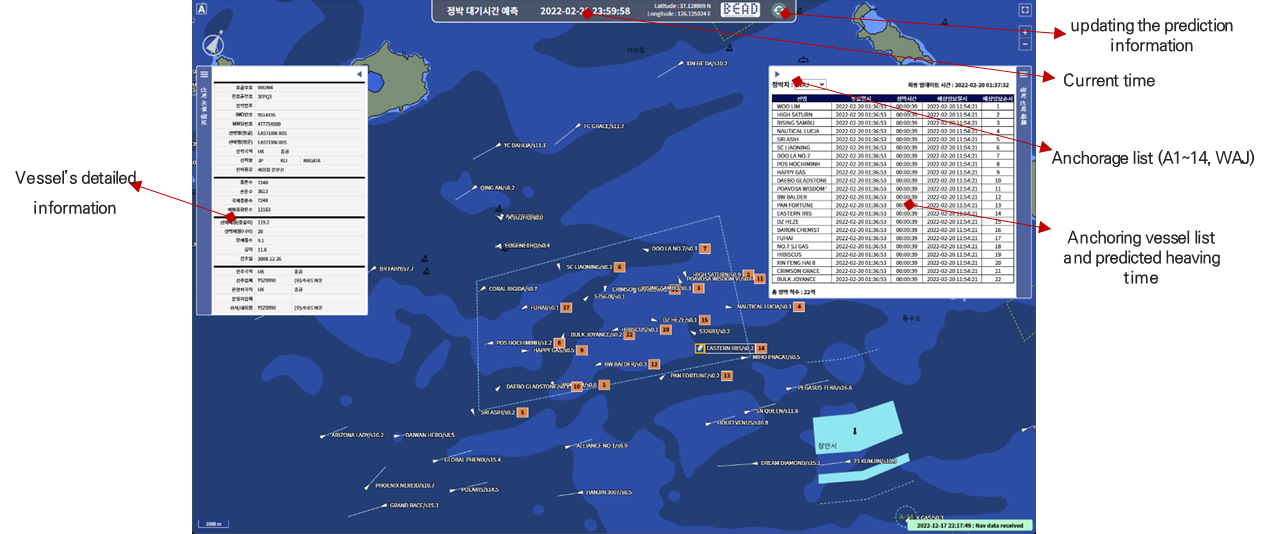


Figure 5 Cases by anchor-up order prediction system

## Prototype system at DAESAN VTS centre

The Korea Coast Guard has installed and operated the prototype system at Daesan VTS centre. This system is collecting the real time data such as Radar, AIS, VHF, Met., port reporting data (PORT-MIS) and managing the Big data platform. This prototype system has fully integrated and the performance and usability has been testing.

Figure 6 Prototype system at Daesan VTS centre

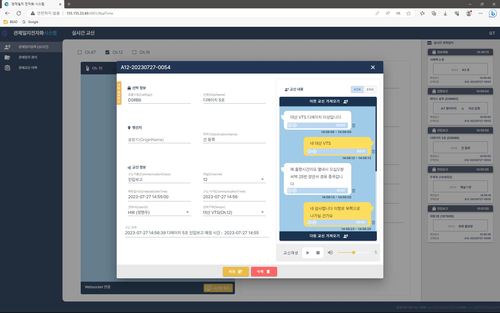
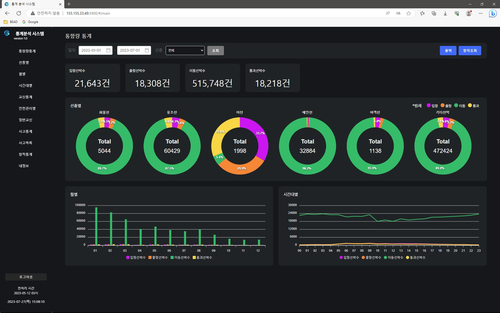
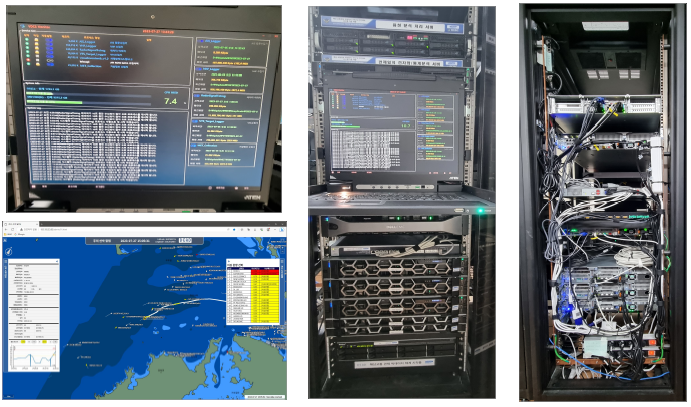


Figure 6 Prototype System at the DAESAN VTS Centre

# action requested of the committee

VTS committee is requested to :

1. Invite to note the application of this technology, and take this technology into consideration during the process of updating "Future VTS Discussion Paper ".
2. Assign the presentation slot on the Open Plenary Session.

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-2)
2. Leave open if uncertain [↑](#footnote-ref-3)