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PROPOSAL FOR DEVELOPMENT OF S-210

USING IVEF SERVICE BASED ON KCG STUDY CASE

1. SUMMARY

This document serves as an introduction to the operational case of the Cloud VTS development project, led by the Korea Coast Guard. Additionally, it proposes enhancements for the IVEF Service. The importance of inter VTS data exchange is underscored through an analysis of the current state of VTS operations in Korea. The document outlines the operational status of the Cloud VTS testbed in Korea, elucidates data exchange configurations, and recommends revisions to the IVEF Service based on testbed outcomes.

1.1. PURPOSE OF DOCUMENT

The purpose of this document is to introduce the VTS operational environment in Korea and to present the testbed operation case of the Cloud VTS development project being conducted by the Korea Coast Guard. Through the testbed operation case, we aim to propose an improvement direction for the IVEF service.

1.2. RELATED DOCUMENTS

IALA RECOMMENDATION R0145(V-145) THE INTER-VTS EXCHANGE FORMAT (IVEF) SERVICE

2. BACKGROUND

Following the successful completion of the IALA Recommendation R0145–Inter-VTS Exchange Format (IVEF) Service, the next important step is to apply it in the actual service. Discussions related to the IALA Recommendation R0145, which had not been held since 2011, were resumed by the 51st VTS committee. The Korean Coast Guard introduced the Cloud VTS concept to VTS 53 at first exemplifying the IVEF service. The Korea Maritime Institute conducted a survey of VTS operators regarding the IVEF service and proposed an IVEF recommendation update that includes the need for information exchanging between Radar and VHF.

1 Input document number, to be assigned by the Committee Secretary

2 Leave open if uncertain

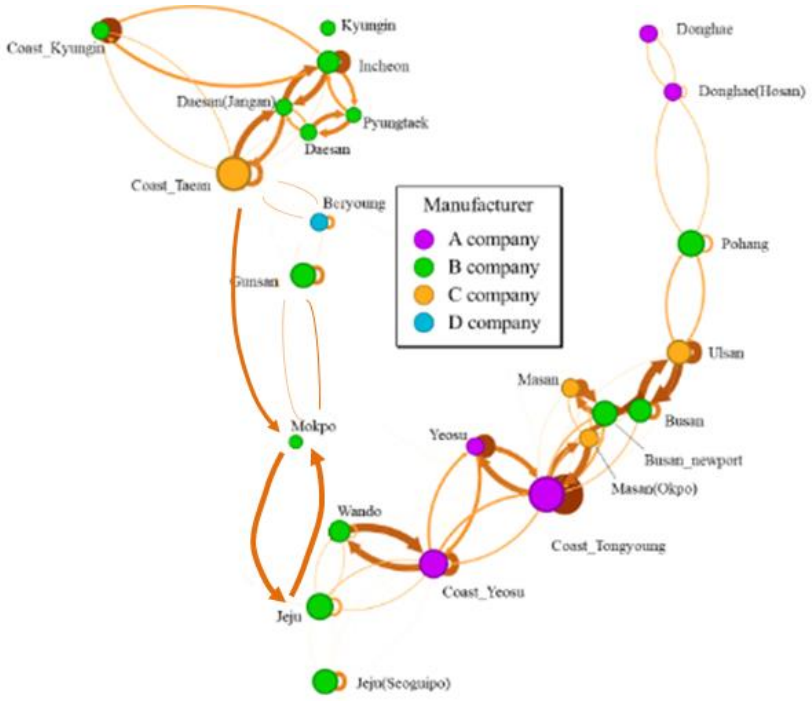
This document aims to share the testbed operation results of the Cloud VTS project introduced at the 53rd IALA VTS Committee and to propose directions for improving the IVEF service.

3. DISCUSSION

3.1. SOUTH KOREA VTS OPERATIONAL STATUS

Presently, South Korea operates three Regional VTS centers, twleves port VTS centers, and four coastal VTS centers. Notably, the three Regional VTS centers, in trial operation since June 2023, facilitate continuous maritime traffic management from ports to the coastline. Given the interconnections between major ports and coastal regions in Korea, the exchange of data between VTS centers has become even more crucial.

Four VTS systems from distinct manufacturers has been operated in South Korea. However, limitations exist in exchanging VTS data beyond Radar-track, Vessel, Voyage data, and Tagged item data as defined in IVEF. This is due to differing protocols employed by each manufacturer. The following figure depicts vessel tracks passing through VTS areas along the South Korean coast, categorized by manufacturer.



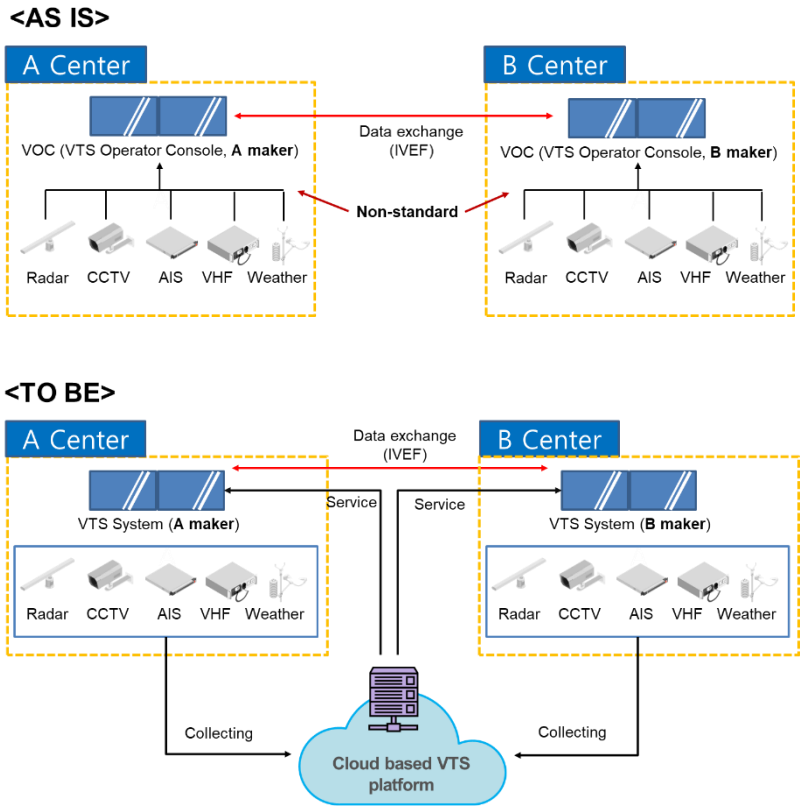
All VTS areas in South Korea are adjacent and interconnected. For instance, a vessel navigating the western direction of the Gyeongin coastal VTS area can proceed to Boryeong Port via the Taean coastal VTS area, or alternatively, enter Mokpo Port. Nevertheless, due to differenent protocol of VTS System in each manufacturers between the Gyeongin Port VTS center and the Taean and Boryeong Port VTS centers, seamless VTS information linkage might be hindered, except for data conforming to the IVEF format.

3.2. INTRODUCTION OF CLOUD VTS

To overcome the difficulty of information linkage between different VTS manufacturers, South Korea started the Cloud VTS development project from 2021 to 2023. So far, VTS operators have been able to exchange limited data with nearby VTS centers through IVEF. However, while there is a data exchange standard (IVEF), the standard for collecting data into the VTS system differs between manufacturers. Therefore, the collection device and VTS system can only be influenced by the manufacturer. In addition, to respond to emergency situations such as VTS center closures due to COVID-19, the VTS system used when performing control in

other areas can also be influenced by the manufacturer of the Radar site. As VTS areas gradually expand for safe and efficient vessel operation and more data is expected to be generated in the maritime industry with the emergence of MASS(Maritime Autonomous Surface Ship), various data exchanges are necessary for prompt and accurate decision-making by VTS operators, and it is necessary to examine the entire national VTS status.

The following figure compares the current VTS system with the Cloud VTS system.

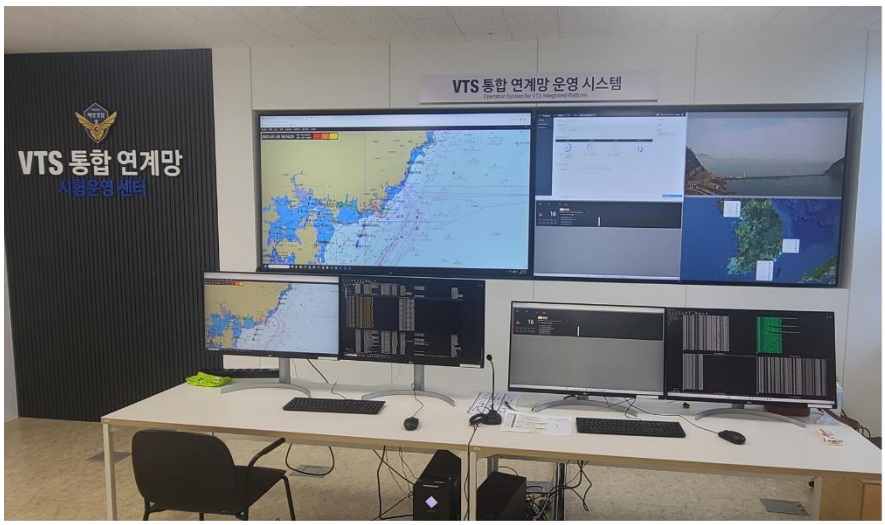


VTS operators can access information from local radar sites or the Cloud platform. In addition to data exchange through IVEF, data from Radar screens, VHF, CCTV, and other sources can also be exchanged, making it possible to utilize them for control support in emergency situations. The Cloud platform enables monitoring of VTS data nationwide in South Korea, and South Korea plans to expand it to a National VTS using the Cloud platform.

3.3. TESTBED VERIFICATION

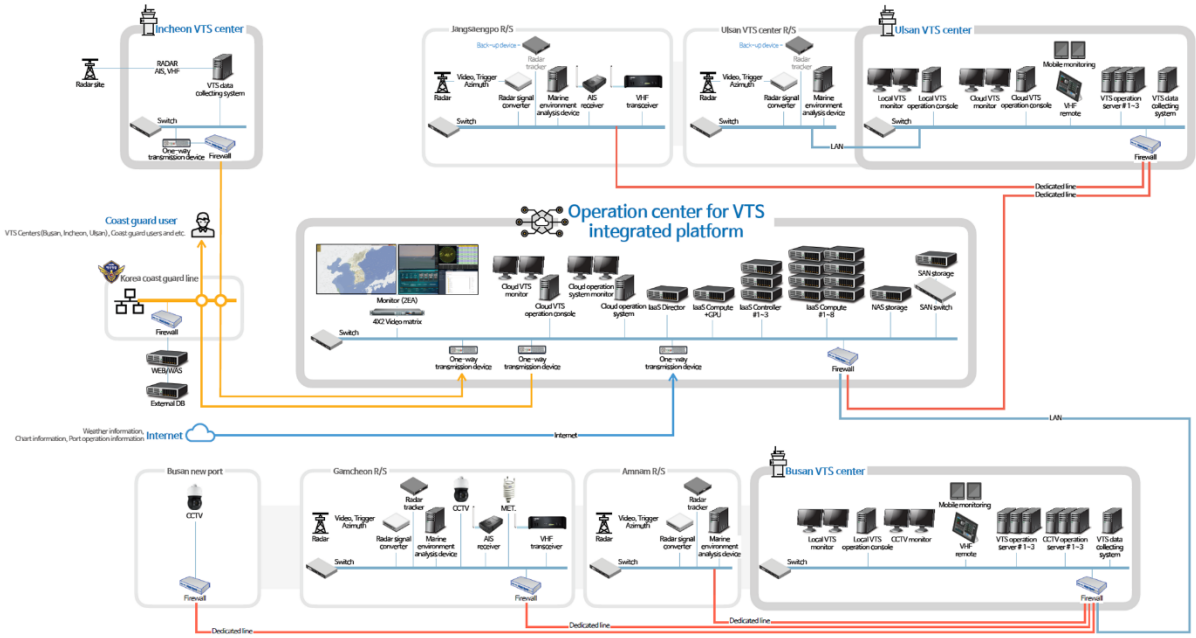
The concept of Cloud VTS is to collect VTS information acquired by other centers or external agencies through a cloud server and provide services by accessing it from VTS centers or other agencies. To achieve this goal, a testbed has been set up.

The testbed is composed of the following: Information from Busan Port, Ulsan Port, and Incheon Port is collected on the integrated platform, and the information is displayed on the cloud monitor. The integrated platform can collect and display Radar screen, chart, VHF information, CCTV, and weather information from three VTS centers.



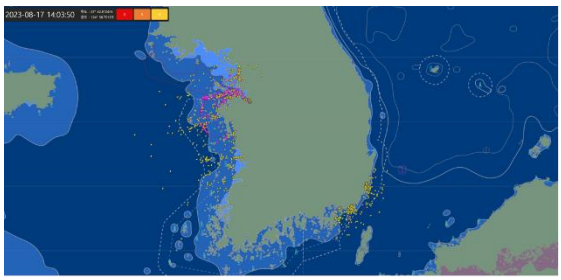
(a) VTS operation system in test-bed

(b) Cloud server

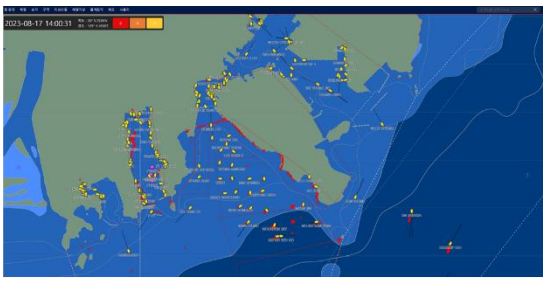


Through the integrated platform, it is possible to track Radar screens, radar, and AIS charts of Busan Port, Ulsan Port, and Incheon Port that are connected via the platform. In addition, VHF data transmission and reception are possible for control purposes. The integrated platform also enables sharing of information such as Radar screens, CCTV, and VHF in addition to chart information.

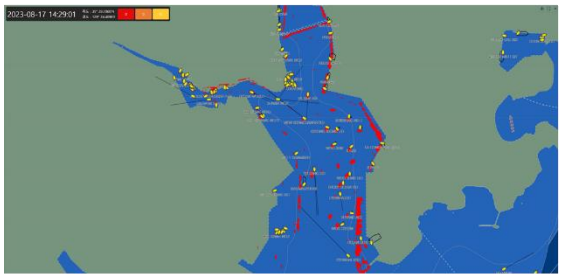
In the testbed, VTS data exchanged includes Radar video, Radar track, CCTV (video), CCTV (object), AIS, VHF, and weather information. According to the IVEF standard, Track, Vessel, Voyage data, and Tagged item information can be exchanged.



(a) Total screen



(b) Busan VTS area radar screen & target data



(c) Ulsan VTS area radar screen & target data

(d) Incheon VTS area radar screen & target data

3.4. UPDATING OF IVEF SERVICE

In this paper, we propose an update to the IVEF Service to enable the exchange of Radar video, CCTV, VHF, and weather information for control purposes. Radar video can increase the accuracy of target tracking, and CCTV data integration enables the consolidation of traffic data from diverse areas into the the integrated platform. VHF communication enables communication even in areas where the frequency does not reach in an emergency, and weather information can be easily checked remotely for local weather. Detailed specification on each data format is attached in the Appendix 1.

[1] IALA RECOMMENDATION R0145(V-145) INTER-VTS EXCHANGE FORMAT (IVEF) SERVICE

[2] IALA VTS MANUAL 2021 - EDITION 8

4. ACTION REQUESTED OF THE COMMITTEE

VTS committee is invited to note the application of this technology and review the data format in appendix for the development of S-210 using IVEF and approve to update "IALA Recommendation R0145(V-145) The inter-VTS exchange format (IVEF) service."

APPENDIX 1 DETAILS OF DATA FORMAT

1. RADAR TARGET DATA

Data format: !RADAR,TargetID,Status,Lat,N/SIndicator,Lon,E/WIndicator,Course,Speed,Timestamp*H,CR/LF

No.	Field name	Type	Contents
1	SentenceID	String	Starting letter
2	Target ID	String	Delimter (0~4,294,000,000)
3	Status	String	0=Removed, 1=Lost, 2=Firm, 3=Initial, 4=Coasted, 5=Parked
4	Latitute	String	Ddd.dddddd
5	N/S indicator	String	N= North, S= South
6	Longitude	String	Ddd.dddddd
7	E/W indicator	String	E= East, W= West
8	Course	String	Degre (000~359.9)
9	Speed	String	Knot
10	Timestamp	String	0~59s
11	Checksum	String	H: checksum, Checksum is the XOR value of characters other than "!" and "*"
12	Terminatior	String	CR/LF: 0x0D/0x0A

2. CCTV VESSEL TARGET DATA

Data format: !CCEXT,CameraID,Count,X1,Y1,X2,Y2,SHIPTYPE*H,CR/LF

No.	Field name	Type	Contents
1	SentenceID	String	Starting letter
2	CameraID	String	CCTV camera Delimter (1~65,000)
3	Count	String	Number of vessel (maximum *n*)
	Start interval (*n* times)		
4	X1	String	Pixel point (Left, Up)
5	Y1	String	
6	X2	String	Pixel point (Right, Down)
7	Y2	String	
8	ShipType	String	AIS standard (ITU-R M.1371)
	End interval (*n* times)		
4+(5*n)	Timestamp	String	0~59s
5+(5*n)	Checksum	String	H: checksum, Checksum is the XOR value of characters other than "!" and "*"
6+(5*n)	Terminator	String	CR/LF: 0x0D/0x0A

3. MANUAL RADAR TRACKING DATA

Data format: !ACQRE,Lat,N/SIndicator,Lon,E/WIndicator,Timestamp*H,CR/LF

No.	Field name	Type	Contents
1	SentenceID	String	Starting letter
2	Latitude	String	dd.dddddd
3	N/S Indicator	String	N = North, S = South
4	Longitude	String	ddd.dddddd

5	E/W Indicator	String	E = East, W = West
6	Timestamp	String	0~59s
7	Checksum	String	H: checksum, Checksum is the XOR value of characters other than "!" and "*"
8	Terminator	String	CR/LF : 0x0D/0x0A

4. VHF STATUS DATA

Data format: !VHFST,VHFID,Channel,VHFStatus,Timestamp*H,CR/LF

No.	Field name	Type	Contents
1	SentenceID	String	Starting letter
2	VHFID	String	VHF Delimter (1~65,000)
3	Channel	String	Channel (1~88)
4	VHF Status	String	0= Off, 1= PTT, 2= Busy
5	Timestamp	String	0~59s
6	Checksum	String	H: checksum, Checksum is the XOR value of characters other than "!" and "*"
7	Terminator	String	CR/LF: 0x0D/0x0A

5. WEATHER STATUS DATA

Data format: !WEATH,DeviceID,Temp,Humidity,WindDirection,WindSpeed,Visibility,Timestamp*H,CR/LF

No.	Field name	Type	Contents
1	SentenceID	String	Starting letter
2	Device ID	String	Device Delimter (1~65,000)
3	Temp	String	Temperature (℃)
4	Humidity	String	Humidity (%)
5	WindDirection	String	Wind direction (0~359.9°)
6	WindSpeed	String	Wind speed (m/s)
7	Visibility	String	Visibility (km)
8	Timestamp	String	0~59s
9	Checksum	String	H: checksum, Checksum is the XOR value of characters other than "!" and "*"
10	Terminatior	String	CR/LF: 0x0D/0x0A