Input paper: [[1]](#footnote-1) DTEC1-5.1.3.7

Input paper for the following Committee(s): check as appropriate Purpose of paper:

**□** ARM **□** ENG **□** PAP **X** Input

X DTEC **□** VTS **□** Information

Agenda item [[2]](#footnote-2) n.n

Technical Domain / Task Number 2 …………………………………

Author(s) / Submitter(s) NSONESOFT Co., Ltd.(Republic of Korea)

The proposal on integrated management and coordination of TDMA slot resource sharing between VDE-TER shore stations

# Summary

IALA started new work in 2021 per Japan’s proposal, ENAV28-5.1.3.3 Proposal of initiating discussion on the VDES resource sharing. The purpose of this work is to establish international cooperation and resource sharing and management for VDES terrestrial and satellite. In this regard, the China MSA proposed the resource sharing and coordination issues among VDE-TER stations, VDE-TER and VDE-SAT stations, and VDE-SAT stations on EM1-5.1.3.4 Proposals on VDES communication resource coordination.

VDES resource sharing and coordination require proper system configuration and operation plans to ensure VDES communication efficiency and reduce the impact of interference and collision. Korea is conducting research on system configuration and operation plans for sharing and coordinating VDES resources in a government-sponsored R&D project since April 2023. In this proposal, we first propose key considerations for resource sharing and coordination between VDE-TER shore stations.

## Purpose of the document

When considering detailed plans for resource sharing and coordination between VDE-TER shore stations in the guidelines for VDES resource sharing and coordination/cooperation, it is requested to review the contents proposed in this proposal.

## Related documents

1. ITU-R M.2092-1, *Technical characteristics for a VHF data exchange system in the VHF maritime mobile band, February 2022*
2. IALA G1117, *VHF Data Exchange System(VDES) Overview, December 2022*

# Background

According to ITU-R M.2092-1, radio interface resources must be coordinated and shared among VDE-TER stations, VDE-TER and VDE-SAT stations, and VDE-SAT stations. In addition, in order to improve the efficiency of VDES applications and provide the full capacity of VDES services globally, the VDES community agreed that application resources should be shared and coordinated between VDE-TER and VDE-SAT. Therefore, the VDES community began discussions on drafting guidelines for resource sharing and coordination/cooperation by October 2024.

# Discussion

## Issues to be coordinated

The terrestrial control station is responsible for resource control and management for information service (e.g. maritime safety information service) using VDE for one or more groups of VDE-TER shore stations with overlapping coverage, and shares resources with the VDE-SAT system. To do so, It should be considered the proper distribution of roles and operation plans about elements composing the system for resource sharing and coordination between VDE-TER shore stations.

### System composition and role for resource sharing and coordination of terrestrial control stations

The system configuration for resource sharing and coordination of VDE-TER can be composed of three representative elements: a ship station, a Coastal station, and a terrestrial control station.

1 Ship station: It transmits AIS dynamic/static/voyage-related information messages and ASM messages within the service area of Coastal stations, and uses resources to transmit digital information messages and resource requests required for VDE digital information transmission.

2 Shore station: It takes on the role of supplying and using resources to receive various messages from ship stations within the service area or to transmit service messages from Coastal stations according to a planned schedule.

3 Terrestrial control station: It plays a role in allocating appropriate resources to ship stations and Coastal stations through a resource sharing and coordination system that has a resource information map synchronized with each Coastal station according to messages received from multiple Coastal stations and Coastal station service schedules. Terrestrial control stations do not use TDMA slot resources.

In the case of a Coastal station operating alone without overlapping coverage with other Coastal stations, it must be able to allocate resources on its own without the intervention of a terrestrial control station.

### Resource information map synchronization method of a terrestrial control station

The terrestrial control station must be synchronized with the resource information map of the system for resource sharing and coordination with Coastal stations’. It should be considered the use of NMEA formatted sentence output through the presentation interface of the Coastal station.

Methods for constructing a synchronized resource information map may include:

1 Analysis of Communication State containing slot occupancy schedule information using ITDMA, SOTDMA, FATDMA, and MITDMA schemes.

2 Analysis of the VDL Signal Information sentence containing information such as the coast station's MMSI, message sequence identifier, reception time, and first slot number used for transmission.

3.1.3 Procedures and methods for responding to requests for VDE resources

When a ship within the service area of the terrestrial control station transmits information to other ships or shores within communication coverage using VDE, the following procedures and procedures are should be considered between each system configuration to request resources necessary for transmission and to be allocated available resources.

1 Resource request (Ship to Shore): The ship station transmits the resource request message including the unique identifier (Dest. ID) of the Coastal station that is the target of the resource request through the RAC designated in the Coastal station bulletin board message.

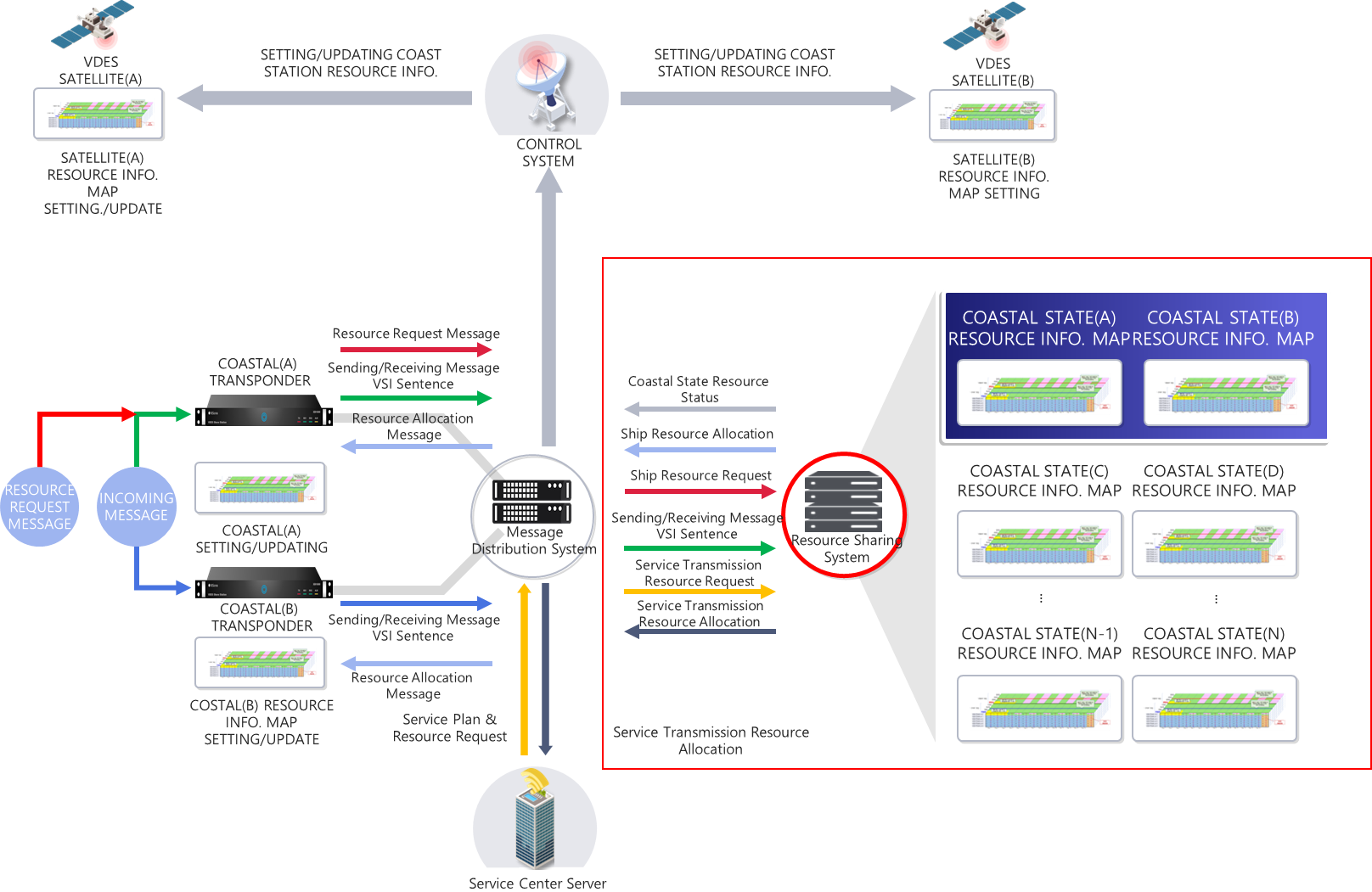
2 Request Forwarding (Shore to T.C.S.): When the destination matches its unique identifier, the Coastal station delivers the resource request message received from the ship to the terrestrial control station through the message gateway.

3 Analysis and determination of available resources (T.C.S.): The system for resource sharing and coordination of terrestrial control stations compares and analyses the resource information maps of neighboring Coastal stations that have overlapping communication coverage areas within the communication coverage area. Then, It determines available resources to minimize the impact on AIS/ASM transmission and neighboring Coastal stations' VDE transmission.

4 Distributing determined resource (T.C.S. to Shore): The terrestrial control station distributes allocation information about the resource request of the ship station through a message gateway to all adjacent Coastal stations used to determine available resources.

5 Response for request (Shore to Ship): The Coastal station adds and updates the newly allocated resource information distributed by the terrestrial control station to its resource information map, and transmits an allocation response to the resource request through the ASC.

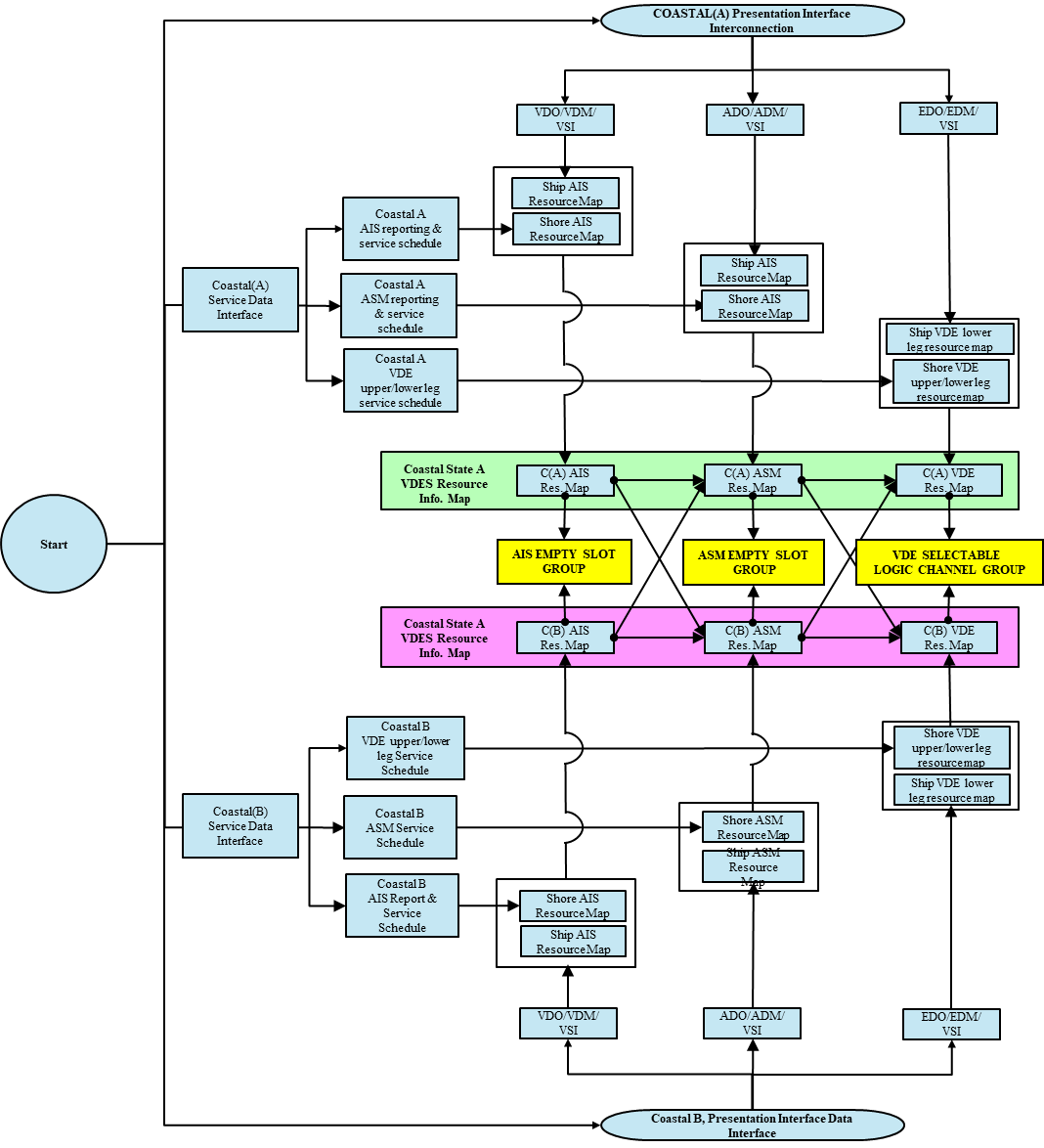
Requesting and allocating resources for information services (e.g. MSI Service) using VDE follows this same process. However, short data messages using a single timeslot in RAC can transmit information without the procedures required for requesting and allocating resources.



1. Multi-Channel TDMA Slot Resource Management for VDES

3.1.4 Available resource analysis through VDES resource information map initialization and real-time resource status update

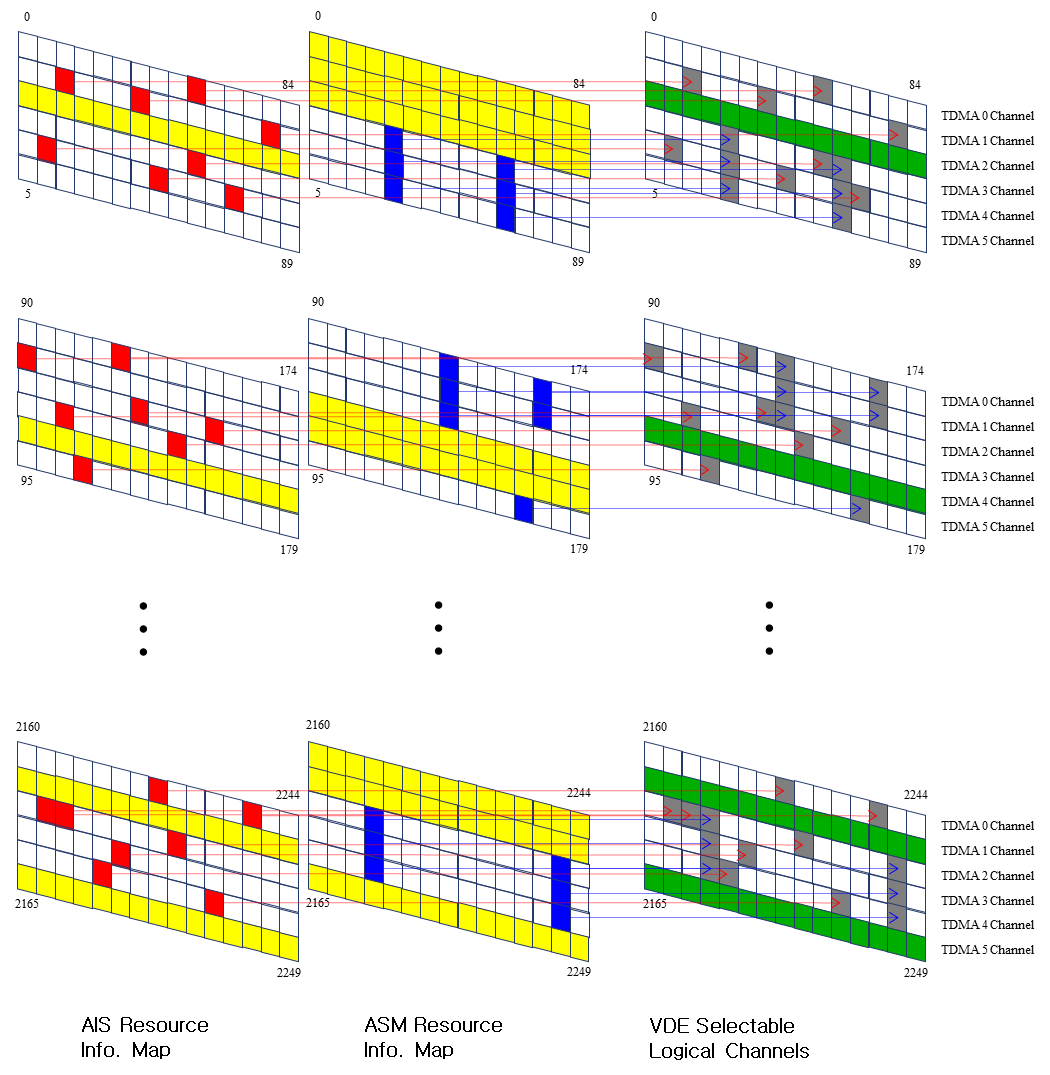
A system for resource sharing and coordination of terrestrial control stations must be able to analyze available resources for resource allocation. It is necessary to construct a resource information map that is synchronized with the resource information map that the competent Coastal station has on its own. In addition, available resource candidates, that is, selectable logical channels, must be considered as search conditions for free slots according to the priority of the communication system.



1. Analysis method of available resources between VDES communication systems of adjacent Coastal stations with overlapping communication areas

A slot state can be one of the following: free slot, internally allocated, externally allocated, available, or unavailable. In order to speed up the search for available resource candidates, a method of deriving available resource candidates from empty slots may be efficient.

Resources required for allocation can be selected from the TDMA frame with selectable logical channels following the current TDMA frame in which the resource request is received, and the earliest selectable logical channel is allocated to the resource request received first.



1. Example of analysis of available resources focused on empty slots according to the priority of the communication system

# References

1. E-NAV 31ST Extraordinary Meeting Input Document – EM1-5.1.3.1 Development of Guideline on VDES resource sharing and coordination cooperation
2. E-NAV 31ST Extraordinary meeting Input Document - EM1-5.1.3.4 Proposals on VDES Communication Resource Coordination

# Action requested of the Committee

The committee is requested to:

1 Engage in the discussion regarding VDES resource sharing and coordination between VDE-TER shore stations.

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