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THE RESULT OF IALA WORKSHOP ON INTERNATIONAL MOBILE TELECOMMUNICATION (IMT) FOR MARINE AIDS TO NAVIGATION

Harmonised Connectivity Architecture for S-100 ECDIS Implementation using SECOM and MCP

Submitted by IALA

SUMMARY

Executive summary: This document provides an overview and findings of the recent IALA workshop on International Mobile Telecommunication (IMT) for Marine Aids to Navigation.

*Strategic direction, if
applicable:*

Output:

Action to be taken: Note

Related documents: A.1158(32); MSC467(101) MSC.1/Circ.1610, as revised;
MSC108/12/5, paragraphs 9ff; NCSR 10/9; MSC109/19/3;

Background

1. IALA has an international role in the provision of Marine Aids-to-Navigation, including Vessel Traffic Services (VTS). IALA has long established guidance for the provision of Vessel Traffic Services (VTS) (Assembly Resolution A.1158(32) refers).
2. With the advent of global digital transformation, more and more services from the domain of Marine Aids-to-Navigation, including VTS, are being investigated to be provided electronically in appropriate digital format.
3. IALA has also taken an active role in creating Resolution MSC.467(101) on guidance on the definition and harmonization of the format and structure of Maritime Services in the Context of e-navigation, abbreviated MS henceforth, where fundamental concepts have been defined.
4. Resolution MSC.467(101), amongst other things, defines and explains the relationships between the MS, technical services supporting their implementation and the S-100 data products assembled in the 'S-100 World'. More specifically, it is explained how MS prompt Technical Services which in turn prompt S-100-World data products' functionalities; all of them eventually call for powerful connectivity. This

- hierarchy relationship is called the Services–Data–Connectivity (SDC) ‘stack,’ therefore.
5. The individual MS’ are defined in Circular MSC.1/Circ.1610, as revised. MS1 on the VTS Service provides an example of how this MS prompts certain S-100 data product, namely S-421 and S-212 specifically, and - in consequentially - appropriate connectivity eventually.
 6. Focusing on the mobile shore/ship and ship/shore radio connectivity needed to enable MS’ implementation, a contribution from New Zealand (MSC108/12/5, paragraphs 9ff) raised key questions regarding the actual radio systems capable of providing this connectivity as follows:
 - “9 New Zealand would like to understand how the Organization envisages the real-time shore-to-ship and ship-to-shore exchange of S-100 products will occur, including S-124 navigational warnings.”
 - “10 New Zealand is also of the view that the Organization should determine whether:
 - .1 a standard service interface, including information security protection, is required for all S-100 products;
 - .2 if existing shore-to-ship communication systems are intended to exchange S-100 products; and
 - .3 if these existing shore-to-ship communication systems have the capability to do so.”
 - “11 Paragraph 8 of document NCSR 10/9 (Austria et al.), noted that adding the functionality of a standardized and cyber-secure method for route exchange from ship-to-shore and from shore-to-ship to support ECDIS, would require the availability of a radio link, which has not been defined.
 - “12 Amendments to SOLAS, performance standards and guidance may need to be developed, and if so, this needs to be addressed in a timely manner.”
 7. These questions seem to have not been answered to date, and they are therefore still valid.
 8. It should be noted, that ongoing work at NCSR commissioned by MSC109 due to the request for ‘guidance to establish a framework for data distribution and global Internet Protocol (IP)-based connectivity to realize the full potential of S-100 capable Electronic Chart Display and Information System (ECDIS)’ (MSC109/19/3) does not seem to consider specific capable potential radio link technologies needed for any IP-based connectivity.
 9. Due to their elemental role, these radio link technologies are often simply called ‘carriers’ – they ‘carry’ the data exchange loads between ships and shore, and vice versa. The IP-based connectivity ideally is to be designed to be ‘carrier-agnostic’, meaning that different capable carriers can be used.
 10. IALA has studied the IMT family as it progressed from ‘IMT-Advanced’ (aka 4G/LTE) to ‘IMT-2020 and beyond’ (aka 5G), with a view of employing them in the maritime domain as such a capable carrier, or as the future default ‘working horse’ for any digital radio communication, even.
 11. With the advent of ‘IMT-2030 and beyond’ (aka 6G) IALA to be expected following 2030, IALA has also included this latest member of the IMT family in their scope. It should be emphasised that the advent of ‘IMT-2030 and beyond’ (aka 6G) does not mean to have to wait for 2030 to employ IMT family technologies: the other IMT family technologies mentioned above are ready to be used in the maritime domain immediately – if so desired by the maritime domain and consequentially stipulated by the Organization.

IALA Workshop

12. To facilitate and promote the above studies, IALA has conducted an 'IALA Workshop on International Mobile Telecommunication (IMT) for Marine Aids to Navigation'. This workshop was held from 1-5 September 2025 in Karlsruhe, Germany. The report of the Workshop is given in the Annex.
13. The conclusions of the workshop are as follows:
 - IALA should play a key role in representing marine Aids to Navigation (AtoN) within the 6G development process, ensuring the maritime domain's unique requirements are considered.
 - Engagement with 3GPP via ETSI is required to incorporate maritime perspectives, particularly for ship-to-X communications, AtoN communication, waterway information exchange, and safety-related information.
 - Use cases, operational coverage zones, preconditions, service flows, post-conditions, challenges, and potential requirements must be clearly defined to guide 6G feature development.
 - Detected operational coverage zones include inland/ports (OCZ1), close to coast (OCZ2), and far from coast (OCZ3), each with distinct challenges such as coverage, service continuity, and prioritisation.
 - Identified challenges for 6G implementation include ensuring continuous service across operators, service prioritization (QoS), coverage, and cost efficiency.
 - Potential maritime use cases for 6G include support for MASS, broadcast voice communication, communication with and between AtoNs, Position, Navigation and Timing (PNT), redundancy for existing systems, and intelligent AtoNs with advanced positioning and data exchange capabilities.
 - Expectations for 6G network providers include sufficient Internet connectivity, gateways with QoS, resilience to interference, cyberattacks, and authentication of providers.
 - Maritime-specific conditions such as sea state, weather influence, and channel characteristics must be addressed in system design and reliability requirements.
 - Technical services like Traffic Clearance, Route Exchange, and Navigational Warnings were analyzed, highlighting challenges such as coverage, service availability, high ship density, and prioritization.
 - IMT-2020 (5G) can support maritime services, including video-streaming, IoT applications, VTS, and AtoN monitoring, but requires careful consideration of public vs non-public networks and network slicing for QoS guarantees.
 - Procurement strategies should prioritize coverage, reliability, interoperability, and SLAs, with phased rollouts starting with pilot areas like ports and VTS before wider coastal adoption.
 - Private and hybrid networks are recommended for critical zones and coastal coverage, balancing control, cost, and efficiency.
 - Organisational measures are essential: governance accountability, workforce capacity building, integration into national digital strategies, structured knowledge sharing, and IALA guidance.
 - Cybersecurity, legacy system interoperability, lifecycle costs, and technology obsolescence must be managed through standards-based, backward-compatible solutions.
 - Preparing for IMT-2030 (6G) requires early adoption in ports and VTS for leadership and efficiency, with phased or later adoption for wider coastal coverage.

- IALA's strategic role includes strengthening influence in standardization, endorsing pilots, supporting global training via WWA, and building global capacity for 6G technologies and regulations.

Action requested of the Sub-Committee

14 The Sub Committee is invited to note the information provided.

Annex

Report of the 'IALA Workshop on International Mobile Telecommunication (IMT) for Marine Aids to Navigation'