

## Radiocommunication Study Groups



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### **International Organization for Marine Aids to Navigation**

#### **LIAISON NOTE TO ITU-R WORKING PARTY 5D**

#### **1. Introduction**

International Organization for Marine Aids to Navigation (IALA) have been developing the use cases and service requirements of Marine Aids to Navigation (Marine AtoN) including regulatory aspects for maritime safety, which may serve as input to support the development of IMT-2030 standardization.

IALA would like to provide some of use cases that IMT-2020 has been applied as IMT applications in maritime sector and kindly request that those use cases are additionally included in the section 5.10 of the working document for the preliminary draft revision of Report ITU-R M.2527-0, titled "Applications of the Terrestrial Component of International Mobile Telecommunications for Specific Societal, Industrial, and Other Usages," as attached.

#### **2. Action requested**

ITU-R WP5D is kindly requested to include additional use cases provided by IALA in the working document towards preliminary draft revision of Report ITU-R M.2527 as attached.

**Attachment:** 1

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## ATTACHMENT 1

*Source: Annex 3.2 to Document 5D/242*

[FIRST CHANGE]

## 5.10 IMT applications in maritime sector

IMT-2020 and beyond technologies are expected to provide rich features to satisfy diverse service requirements of the maritime sector in the fields of vessel traffic management, port operation and management, maritime safety and rescue, video surveillance, maritime drones, autonomous vessels, remote pilotage, telemedicine, fisheries and aquaculture, and ocean oil drilling.

IMT-2020 and beyond system can be used to address such specific needs, for example<sup>1</sup>:

- secure mechanism to associate an identity of a IMT-based device with a vessel identity;
- direct communication among vessels;
- communication between shore-based operations centres<sup>2</sup> and vessels/UAVs/unmanned underwater vehicles (UUVs);
- determining accurate position, heading and speed of IMT-based devices associated with a vessel identity, e.g. for maritime emergency requests or assisting IMT-based devices associated with other vessels with safety information;
- mechanisms of distributing a maritime emergency request received from a UE to other UEs on a vessel.
- digitalised workflows and processes, e.g. digital bunkering.

Some use cases are described below<sup>3</sup>.

### 5.10.1 Pilotage service and tug service

The use case on pilotage service is to provide shipboard users such as a pilot or a shipmaster and shore-based users such as pilot authorities, pilot organization or bridge personnel the exact information necessary to manoeuvre vessels over IMT systems through pilotage areas such as dangerous or congested waters and harbours or to anchor vessels in a harbour to safeguard traffic at sea and protect the environment.

A tug is a boat or ship that manoeuvres vessels by pushing or towing them. Tugs move vessels that either should not move by themselves (e.g. vessels passing in a narrow canal, berthing and unberthing operations) or those that cannot move by themselves (e.g. barges, disabled ships, oil platforms). The use case of tug service is described for ship assistance (e.g. mooring), towage (in harbour/ocean), or escort operations to safeguard traffic at sea and protect the environment by IMT systems.

### 5.10.2 Autonomous surface ships

The autonomous surface ship is one of the main streams for the digital transformation of the maritime sector. The demand for the high performance of maritime communication technologies is expected to be skyrocketing once autonomous surface ships become pervasive at sea or in-land

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<sup>1</sup> 3GPP TS 22.119: *Maritime Communication Services over 3GPP system; Stage 1*.

<sup>2</sup> It is not uncommon for maritime entities such as port authorities and VTS centres to face constraints in the maritime digitalisation journey due to a lack of good comprehensive terrestrial communications coverage within port waters.

<sup>3</sup> 3GPP TR 22.819: *Feasibility Study on Maritime Communication Services over 3GPP system*.

river. In general, most ships are designed for a life of 25 to 30 years, which means that multiple radio access technologies are highly likely to coexist in the maritime sector across two or three generational evolutions of IMT systems that have been evolved every ten years so far. IMT-2020 technologies provide the feature on the support of the multiple radio access technologies (RATs).

FIGURE 32

**Autonomous surface ship with multiple RATs over IMT-2020 and beyond system<sup>4</sup>**



The size of autonomous ships is varied, and the length of such ships can be from a few meters to a few hundreds of metres. In case of an autonomous ship with the length of a few hundred meters, the communications environment on its deck or inside the ship may be similar with the one of smart factory, smart farm, or smart campus where local networks over IMT-2020 and beyond systems provide mobile services only within their territories. The IMT-2020 technologies related to non-public networks are applicable to provide the mobile communication services for cabin crews, passengers, or Internet of Things (IoT) devices integrated into navigation systems of the ship on board on its deck or inside the ship.

In addition, the direct communication between two ships is applicable over IMT-2020 technologies and it will help autonomous surface ships efficiently exchange the information related to their navigation and maritime safety and avoid any delay of the information delivery which may cause a risk on the conflict between autonomous surface ships. IMT-2020 and beyond systems are expected to continue to enhance the support of the direct communication among ships to provide much longer communication coverage which is sufficient to satisfy the requirement of the maritime sector.

### 5.10.3 UAVs

As decarbonisation efforts intensify in the maritime sector, novel ways are needed to reduce the carbon footprint of maritime operations in the port waters. UAVs is one such example that could achieve this. Take for example the management of the oil spill<sup>5</sup> within port waters where multiple drone flights were conducted to capture high quality video footages for transmission back to the

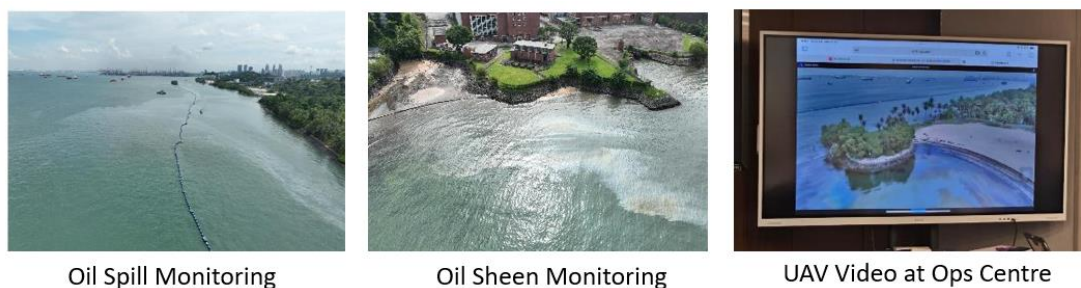
<sup>4</sup> Source: [www.kassproject.org](http://www.kassproject.org).

<sup>5</sup> Source: Presentation by Maritime and Port Authority of Singapore (MPA) at IALA DTEC3 committee on 30<sup>th</sup> Sept. 2024.

shore-based operations centre via IMT-2020 system. Live high quality video footage was crucial to monitor and predict the movement of oil spills affected by waves, tides and wind, validate oil spill models, and allow better deployment of response assets.

FIGURE XX

**Example of usage of UAVs using IMT-2020 system<sup>6</sup>**



#### **5.10.4 Real-time video steaming service**

Maritime incidents in the port waters are unavoidable, and speed is of the essence to resume normalcy for port and maritime operations. To ensure that emergency response teams are equipped to do so, standard operating procedures need to be periodically rehearsed and practised to deal with such contingencies. During a ferry rescue exercise in Aug 2024<sup>7</sup>, a simulation of collision between two domestic ferries, one electric and one diesel-powered, was carried out within port waters. The collision resulted in severe damage to the hull of the diesel-powered ferry, causing the vessel to take in water. An UUV was deployed from a vessel to conduct hull inspection of the diesel-powered ferry, and live high quality video footage was sent by IMT-2020 system to the shore-based operations centre for hull “damage” assessment to aid “rescue” operations.

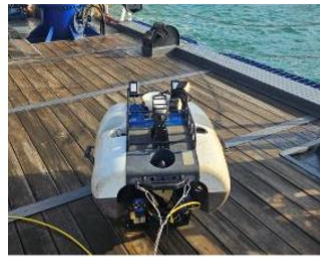
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<sup>6</sup> Source: Presentation by Maritime and Port Authority of Singapore (MPA) at IALA DTEC3 committee on 30<sup>th</sup> Sept. 2024.

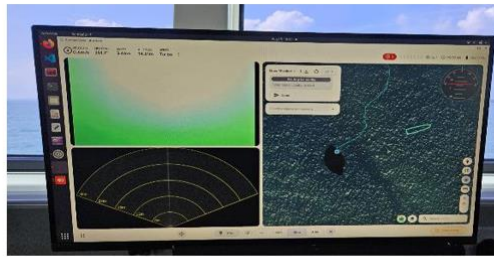
<sup>7</sup> Source: Presentation by Maritime and Port Authority of Singapore (MPA) at IALA DTEC3 committee on 30<sup>th</sup> Sept. 2024.

FIGURE YY

Example of usage of real-time video steaming service using IMT-2020 system<sup>8</sup>



Deployment of UUV



UUV Video at Ops Centre

#### 5.10.5 Virtual marine Aids to Navigation (AtoN)

The term ‘marine Aids to Navigation (AtoN)’ means a device, system, or service which are external to a vessel, designed and operated to enhance safe and efficient navigation of all vessels or vessel traffic. Example of conventional types of such AtoN includes lighthouses, buoys, and day beacons. The maritime sector recently employed virtual marine AtoNs whose position information is broadcast to make ships identify them though they do not physically exist at sea. IMT-2020 technologies are applicable for the virtual marine AtoNs to enable their location information to be broadcast to ships on voyage around virtual marine AtoNs. In addition, more enhanced direct communication supporting the communication range sufficient for the maritime sector are expected to make IMT-2020 and beyond system attractive to the maritime sector because it may be useful to overcome the constraints of the maritime communication environment caused by the limited network infrastructure compared to the terrestrial communication environment.

#### 5.10.6 Maritime services

The IMT-2020 technologies provide features that are useful for the communication among authorities, the emergency request, or the public warning. Mission critical services (e.g. mission critical push to talk, mission critical data service) over IMT-2020 system are applicable to the marine usage by enabling coast guard ships to efficiently exchange the information even in an isolated network at sea where coast guard ships are away from a shore and are unable to be connected to a core network on land.

IMT-2020 system also provides features for the public warning that are related to regulatory requirements. Additional enhancement of IMT-2020 technologies is expected to enhance the information related to marine regulatory requirements is integrated into features for the public warning.

Digitalisation of bunkering processes and documentations such as electronic bunker delivery notes (eBDN), in alignment with IMO regulation 18 of MARPOL Annex VI, can be achieved IMT-2020<sup>9</sup> system within port waters. This will help to improve efficiency and productivity, increase transparency, enhance crew safety and facilitate interoperability between different systems.

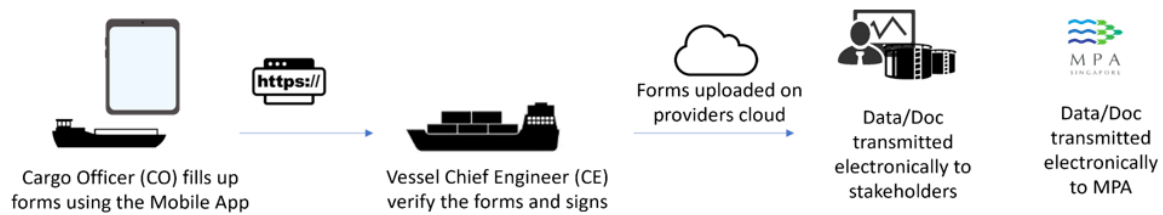
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<sup>8</sup> Source: Presentation by Maritime and Port Authority of Singapore (MPA) at IALA DTEC3 committee on 30<sup>th</sup> Sept. 2024.

<sup>9</sup> Source: Presentation by Maritime and Port Authority of Singapore (MPA) at IALA DTEC3 committee on 30<sup>th</sup> Sept. 2024.

FIGURE ZZ

**Example of Digital Bunkering using IMT-2020 system<sup>10</sup>**



### 5.10.7 Other use cases in ports

Automation and worker safety and retention are the key motivation for IMT applications at shipping ports. The world's largest shipping ports operate 24 (hours) × 7 (days). In this dynamic environment, worker safety is a major concern. Another pain point for port operators is worker retention due to poor working conditions. For example, crane operators work in tight spaces, high above the ground, for an extended period. Remote control of crane operations, container trucks, and other heavy machinery in ports can alleviate these pain points. For instance, with real-time video streaming and analytics, a crane operator may be able to operate multiple lifts and cranes situated at an operations centre. As a result, remote operations can increase productivity, save labour costs, and improve worker safety.

Real-time video is critical for port security and remote control operations. Video surveillance is essential to maintaining port security. Real-time video surveillance with computer vision can be used to maintain security control and access. In addition to infrastructure security, real-time video is vital for handling heavy machineries, such as cranes and unmanned container trucks, in remote command and control operations. Private IMT-2020 networks promise superior coverage, low latency, and massive machine-type communications with fewer radios than existing RLAN-based meshing networks. While existing RLAN and meshing solutions are fine for fixed wireless applications, they are not reliable in dynamically changing mobile environments such as ports.

Drone inspection of port operations is another interesting IMT application found in shipping ports. In addition to drones, video-mounted cranes and containers tagged with sensors are used to track containers to help locate goods (within containers) in ports. Port operators are increasingly called upon to provide visibility of the supply chain to logistics and trucking companies and end customers in an increasingly connected world. As a result, port operators increasingly seek new technology solutions, such as private IMT-2020 and video analytics, to gain additional operational efficiency and compete against other port operators worldwide.

<sup>10</sup> Source: Presentation by Maritime and Port Authority of Singapore (MPA) at IALA DTEC3 committee on 30<sup>th</sup> Sept. 2024.