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Agenda item [[2]](#footnote-2) 10

Technical Domain / Task Number 2 Working Group 3 (Emerging Digital Technology)

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Example of the development of 3GPP use cases on IMO MSPs initiated by Smart-Navigation project

# Summary

This document introduces the example of 3GPP use cases related to IMO MSPs and potential requirements derived from those 3GPP use cases. They were developed from the perspective of 3GPP Stage 1 standardisation based on the concept of IMO MSPs [1] and describe some parts of the whole end-to-end service aspects related to IMO MSPs correspondingly. Three 3GPP use cases provided in APPENDIX 1, APPENDIX 2 and APPENDIX 3 are the outcome of Smart-Navigation project by Korean MOF (Ministry of Oceans and Fisheries).

## Purpose of the document

This document is to introduce how to develop service requirements derived from maritime use cases in terms of the development of 3GPP standardisation to enable 3GPP enabling technologies to support maritime communication services over 3GPP systems such as LTE or 5G.

## Related documents

None

# Background

The maritime domain, one of the 5G vertical domains in 3GPP is moving forward with the digitalisation and mobilisation of commercial as well as safety fields. Legacy 3GPP-based technologies and solutions can be beneficial to the digitalisation and mobilisation of the maritime domain though some of the legacy 3GPP enabling technologies and solutions may not be able to fully support the performances required by the maritime domain. The maritime radio environment was not originally considered by 3GPP when the technical specifications and solutions were standardised for LTE and 5G.

However, most of the legacy mobile services and IoT services based on capabilities of EPS (Evolved Packet System) and 5GS (5G System) specified in 3GPP specifications are applicable to maritime usage for the support of mobile broadband services, and for the support of IoT services or machine-type communication services in a vessel at sea.

In addition, there are service scenarios and requirements specified in 3GPP specifications based on requirements of other related vertical domains (e.g. public safety domain, automotive domain, factory automation domain, and satellite industrial domain). Some requirements derived by service scenarios from these related vertical domains are applicable to the maritime domain. Thus, it is beneficial to use 3GPP enabling technologies developed to satisfy those requirements for the maritime domain in terms of the economy of scale.

For example, satellite access is one of the 3GPP radio access networks supported over the 5G system, so it is possible to provide seamless maritime mobile services by integrating multiple access technologies including satellite access depending on the service scenarios. In addition, 5G LAN-type access that can replace Ethernet-based access are applicable to indoor maritime mobile services inside a vessel.

However, the maritime domain also has specific situations that do not happen in other vertical domains or in the legacy ICT industrial domain. New 3GPP enabling technologies dedicated to the maritime domain can be used to address such specific situations based on requirements derived from maritime use cases. Other vertical domains may benefit from such new 3GPP enabling technologies that consider maritime domain scenarios and may need more robust technologies or solutions than those that currently exist for those vertical domains.

# Discussion

The document IMO NCSR 1-28 [1] describe the concept of IMO MSPs that is sufficient for 3GPP delegates to understand the goal of IMO MSPs that IMO intend to achieve for maritime safety and vessel traffic management at port. However, detailed service scenarios need to be developed in order to enable 3GPP enabling technologies to be applicable to maritime usage for the support of IMO MSPs over 3GPP system.

Korean Register collaborated with SyncTechno Inc. to develop detailed service scenarios and potential requirements from the 3GPP perspective for IMO MSP 5 (Maritime Safety Information Service), IMO MSP 6 (Pilotage Service) and IMO MSP 7 (Tugs Service). Those service scenarios deal with some parts of the end-to-end service aspects from the perspective of the development of 3GPP standardisation. 3GPP contributions for three IMO MSPs were approved at 3GPP SA1 meeting in August 2017 and 3GPP TSG SA plenary meeting in September 2017 as follows.

* Coastal and local warning for MSI (Maritime Safety Information) service [3] that is described in the clause 7.3 of 3GPP Technical Report 22.819 [2]
* Pilotage service [4] that is described in the clause 7.4 of 3GPP Technical Report 22.819 [2]
* Tugs service [5] that is described in the clause 7.5 of 3GPP Technical Report 22.819 [2]

# References

1. IMO NCSR 1-28: "Report to the Maritime Safety Committee" 16 July 2014
2. 3GPP Technical Report 22.819 “Feasibility Study on Maritime Communication Services over 3GPP system” that is downloadable from <http://www.3gpp.org/DynaReport/22819.htm>
3. S1-173495, Coastal and local warning service for maritime safety information
4. S1-173409, Pilotage service
5. S1-173536, Tugs service
6. 3GPP Use Case on Coastal and Local Warning Service [3]

**3GPP TSG-SA WG1 Meeting #79 S1-173495**

**Guilin, China, 21 - 25 August 2017 *(revision of S1-173408)***

Title: Coastal and local warning service for maritime safety information

Agenda Item: 8.3

Source: SyncTechno Inc.[[3]](#footnote-3)

Contact: Hyounhee Koo (koo (at) synctechno (dot) com

*Abstract: This document describes a use case where an authority disseminates coastal and local warnings to vessels over 3GPP system.*

## 7.x Coastal and local warning service

### 7.x.1 Description

Maritime safety information service provides navigational warning, meteorological information and other urgent safety-related information.

Navigational warnings are messages containing urgent information relevant to safe navigation that are broadcast to ships in accordance with the provisions of the International Convention for the Safety of Life at Sea, 1974, as amended. There are four types of navigational warnings, i.e. NAVAREA warnings, Sub-Area warnings, coastal warnings and local warnings. The first two warnings are broadcast by NAVTEX or SafetyNET and the second two warnings could be broadcast by other means (e.g. 3GPP system) than NAVTEX or SafeyNET according to IMO NCSR 1/15/1 [x].

Costal warnings disseminate the information which is necessary for safe navigation within areas seaward of the fairway buoy or pilot station, and should not be restricted to main shipping lanes.

Local warnings disseminate the information which covers inshore waters, often within the limits of jurisdiction of a harbour or port authority. They are disseminated by other means than NAVTEX or SafetyNET, and supplement to coastal warnings by giving detailed information within inshore waters.

This use case describes a scenario where coastal and local warnings disseminate the information relevant to safe navigation over 3GPP system and vessels automatically monitor disseminated information and display information which is relevant to their navigation.

### 7.x.2 Pre-conditions

Coastal and local warning service is available to all vessels that are subscribed to 3GPP system.

Electronic Navigation Chart (ENC) service is available to an authority in charge of coastal and local warnings and to a vessel and shipboard users (e.g. mariner or shipmaster) of that vessel

Vessels are in the coverage of 3GPP system.

### 7.x.3 Service Flows

1. When a vessel is approaching the port, a shipboard user (e.g. a mariner or a shipmaster) requests a maritime safety information from an authority (e.g. national administrator of the national coordinator) in charge of coastal and local warnings.

2. The authority in charge of coastal and local warnings provides the coastal and local warnings.

NOTE 1: An authority can provide either coastal warning or local warning or both depending on marine traffic information and marine environmental situation near a vessel requesting a maritime safety information.

NOTE 2: According to IMO NCSR 1/15/1 [x], a message that is sent to notify coastal and local warnings consists of three parts, i.e. preamble, warning and postscript. The identifier of that message (i.e. message series identifier followed by the consecutive number) is always included in the preamble of that message. As a minimum information of coastal and local warnings, the information about a key subject and a geographical position is included in that message and the example of key subjects are as follows.

- Casualties to lights, fog signals, buoys and other aids to navigation affecting main shipping lanes;

- The presence of dangerous wrecks in or near main shipping lanes and, if relevant, their marking;

- Establishment of major new aids to navigation or significant changes to existing ones, when such establishment or change might be misleading to shipping;

- The presence of large unwieldy tows in congested waters;

- Drifting hazards (including derelict ships, ice, mines, containers, other large items over 6 metres in length, etc.);

- Areas where search and rescue (SAR) and anti-pollution operations are being carried out (for avoidance of such areas);

- The presence of newly discovered rocks, shoals, reefs and wrecks likely to constitute a danger to shipping, and, if relevant, their marking;

- Unexpected alteration or suspension of established routes;

- Cable or pipe-laying activities, seismic surveys, the towing of large submerged objects for research or exploration purposes, the employment of manned or unmanned submersibles, or other underwater operations constituting potential dangers in or near shipping lanes;

- The establishment of research or scientific instruments in or near shipping lanes;

- The establishment of offshore structures in or near shipping lanes;

- Significant malfunctioning of radio-navigation services and shore-based maritime safety information radio or satellite services;

- Information concerning events which might affect the safety of shipping, sometimes over wide areas, e.g. naval exercises, missile firings, space missions, nuclear tests, ordnance dumping zones, etc;

- Operating anomalies identified within ECDIS including ENC issues;

- Acts of piracy and armed robbery against ships;

- Tsunamis and other natural phenomena, such as abnormal changes to sea level;

- World Health Organization (WHO) health advisory information; and

- Security-related requirements in accordance with the requirements of the ISPS (International Ship and Port Facility Security) only.

3. The authority provides another message to the vessel requesting maritime safety information in order to provide enough extra data for shipboard users of that vessel to be able to recognize the hazard and assess its effect upon their navigation.

4. The authority periodically broadcasts coastal and local warnings at a scheduled notification time as well to all vessels in the coverage of 3GPP system.

NOTE 1: Same coastal and local warnings can be disseminated at a scheduled notification time if they are valid.

NOTE 2: Cancellation details are included in a message notified in order to inform that coastal and local warnings related to that message is cancelled and not valid any more.

NOTE 3: A message indicating no warnings can be periodically disseminated at a scheduled notification time though there are no coastal and local warnings to be notified.

5. Source data relating to coastal and local warnings that are notified are recorded with coastal and local warning messages including message series identifier according to the requirement of the national administration.

6. The shipboard user receives messages notified by the authority in charge of coastal and local warnings and identifies some important information included in that message on the ENC in the vessel.

### 7.x.4 Post-conditions

The vessel safely entered to the port by avoiding potential risks that were notified by coastal and local warning service.

### 7.x.5 Potential Impacts or Interactions with Existing Services/Features

None

### 7.x.6 Potential Requirements

[PR-7.x.6-1] 3GPP system shall provide a mechanism of correlating a UE identity with a vessel identity (e.g. a national vessel identification number managed by a national authority or an IMO number that is a unique international vessel identification number consisting of 7-digit number).

[PR-7.x.6-2] The information related to a vessel-dedicated UE’s actual position where the vessel is located and is expected to be located along with a navigational route shall be included in a message sent from a UE in order to request a maritime safety information.

NOTE: The example of the information related to a vessel-dedicated UE’s actual position is current position, heading and speed of a vessel and scheduled navigational routes, heading and speed of a vessel.

[PR-7.x.6-3] 3GPP system shall provide a mechanism of notifying a message on coastal and local warnings to a sea area that includes the position, heading and speed of other UEs in the area.

[PR-7.x.6-4] 3GPP system shall provide a mechanism of enabling only the UE that requested a maritime safety information to identify a message notified from an authority in charge of coastal and local warnings.

[PR-7.x.6-5] 3GPP system shall provide a mechanism of enabling all UEs of vessels that are in the coverage of 3GPP system to identify a message broadcast from an authority in charge of coastal and local warnings.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[x] IMO NCSR 1/15/1: "Consideration of operational and technical coordination provisions of maritime safety information (MSI) services, including the development and review of related documents", 28 March 2014.

1. 3GPP Use Case on Pilotage Service [4]

**3GPP TSG-SA WG1 Meeting #79 S1-173409**

**Guilin, China, 21 - 25 August 2017 *(revision of S1-173168)***

Title: Pilotage service

Agenda Item: 8.3

Source: SyncTechno Inc.[[4]](#footnote-4)

Contact: Hyounhee Koo (koo (at) synctechno (dot) com)

*Abstract: This contribution describes the pilotage service that help a shipboard user such as a pilot manoeuvre a vessel requesting the pilotage service and safely anchor it to a destination.*

## 7.x Pilotage service

### 7.x.1 Description

This use case describes the pilotage service that provides 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 through pilotage areas such as dangerous or congested waters and harbours or to anchor vessels in a harbour in order to safeguard traffic at sea and protect the environment.

### 7.x.2 Pre-conditions

Shipboard users such as a pilot who has a pilotage certificate or licensing or a shipmaster who has a pilotage exemption certificate are subscribed to pilotage service.

Vessels are subscribed to pilotage service and to 3GPP system so that the information about their neighbouring situations including other vessels that are operating in a pilotage area is able to be timely provided over 3GPP system to make vessels successfully pass through a pilotage area.

Vessels are subscribed to electronic navigation chart (ENC) service so the ENC is updated as the latest version when a vessel is in a pilotage area.

NOTE: A shipboard user can identify the latest information about a port or sea area such as the depth of water, buoys, navigational route, berth information from the ENC.

Pilotage service is accessible to ENC service.

Vessels are subscribed to coastal and local warning service so the maritime safety information including the meteorological information is updated as the latest version when a vessel is in a pilotage area.

A drone with a 3D-LiDAR sensor that is operated by a pilot authority or pilot organisation is subscribed to pilotage service and to 3GPP system.

A pilotage area is in the coverage of 3GPP system.

### 7.x.3 Service Flows

1. A shipboard user (e.g. mariner or shipmaster) on a vessel A sends an online request on pilotage service to a pilot authority or pilot organisation such as a (local) pilot office when the vessel A is approaching a pilotage area.

NOTE: A ship company or an agent in charge of the vessel A can request a pilot assignment to a pilot authority or pilot organisation instead of a shipboard user on the vessel A in advance before the vessel A’s entry or departure.

2. A shipmaster on a vessel B who has the pilotage exemption certificate also sends a request on pilotage service to a pilot authority or pilot organization when the vessel B is approaching the same pilotage area. He informs a pilot authority or pilot organization of his pilotage exemption certificate in order to manoeuvre his vessel by himself and pass a pilotage area.

3. The pilot authority or pilot organization accept requests on pilotage service for the vessel A and the vessel B. In addition, they inform the vessel A of the assignment of a pilot after assigning a pilot to provide pilotage service for the vessel A and permit the shipmaster on the vessel B to access the pilotage service that is available to a pilot.

4. The pilot embarks on the vessel A and logs in the pilotage service. Then, the pilotage service authenticates the pilot on the vessel A and authorises the pilot to the pilotage service that is available to a pilot.

NOTE: A pilot can log in the pilotage service using a device that is one of communication equipments inside the vessel A or using a device that is brought by a pilot and is connected to an equipment of the vessel A.

5. The pilotage service provides the shipboard user (i.e. a pilot or a shipmaster with the pilotage exemption certificate) with the latest information such as a port guideline of a pilotage area that helps the shipboard user understand the characteristics of sea area corresponding to a pilotage area and the standard piloting method in advance.

6. The shipboard user (i.e. a pilot or a shipmaster with the pilotage exemption certificate) identifies the marine traffic information about all vessels in a pilotage area from the pilotage service. The example of the marine traffic information is as follows.

- static information about vessels such as IMO number as a vessel identification number consisting of 7-digit number and vessel particulars)

NOTE: Vessel particulars include vessel name, call sign, IMO number, MMSI number, type, flag/port of registry, gross tonnage/net tonnage, dead weight, LOA (Length Over All), width, depth etc..

- dynamic information about the movement of vessels such as direction, speed, rate of turn (ROT) expressed in degrees per second of heading change that vessels make, and position of vessels

- navigational information (e.g. cargo, estimated time of arrival (ETA), and destination of a vessel)

7. A drone with a 3D-LiDAR sensor that is operated by a pilot authority or a pilot organisation is flying above the vessel A and the information captured from the 3D-LiDAR sensor is transmitted in real time to the vessel A, a pilot authority or a pilot organisation and a bridge personnel until the shipboard user (i.e. a pilot or a shipmaster with the pilotage exemption certificate) completes his mission on the pilotage.

NOTE: Information that is captured by a 3D-LiDAR and is transmitted to the vessel A, a pilot authority or a pilot organisation and a bridge personnel can be displayed in the ENC if the ENC supports 3D data.

8. The pilotage service provides the prediction of vessels’ movement in a pilotage area based on the information of the current vessels’ movement that is obtained from AIS, radar sensor of vessels or 3D-LiDAR sensor of a drone. In addition, the pilotage service provides a piloting route automatically proposed by the pilotage service or manually planned by the shipboard user (i.e. a pilot or a shipmaster with the pilotage exemption certificate).

9. In order to avoid any collision between vessel A and vessel B in a pilotage area, the information relevant to safe navigation is exchanged between vessel A and vessel B directly. Such information is also transmitted to a pilot authority, a pilot organization or a bridge personnel who are involved in supporting the pilotage service for the vessel A and vessel B

10. A bridge personnel transmits a local warning that in advance informs vessel A and vessel B of any potential risk (e.g. a collision between two vessels or a collision between a vessel and any obstacle) if it is anticipated by the pilotage service.

10. The shipboard user (i.e. a pilot or a shipmaster with the pilotage exemption certificate) manoeuvres his vessel and passes a pilotage area with the help of several useful information provided by pilotage service.

11. The pilotage service records vessel routes passed in real time.

### 7.x.4 Post-conditions

Vessel A and vessel B are safely anchored to the port without any collision or accident.

### 7.x.5 Potential Impacts or Interactions with Existing Services/Features

None

### 7.x.6 Potential Requirements

[PR-7.x.6-1] 3GPP system shall provide a mechanism of authenticating a UE transmitting an online request on pilotage service and authorising such a UE to access the pilotage service.

[PR-7.x.6-2] 3GPP system shall provide a mechanism of correlating a UE identity with a vessel identity (e.g. IMO number that is a unique international vessel identification number consisting of 7-digit number).

[PR-7.x.6-3] 3GPP system shall support to transmit the information about the movement of vessels obtained from diverse sensors (e.g. 3D-LiDAR, radar, GPS) in real time.

[PR-7.x.6-4] 3GPP system shall provide a mechanism of synchronising the information used by shipboard users (i.e. a pilot or a shipmaster with pilotage exemption certificate) and shore-based users (e.g. a pilot authority or a pilot organisation and a bridge personnel).

[PR-7.x.6-5] 3GPP system shall support the data rate and the latency that enable a shipboard user not to recognise any gap between the real vessel movement and the vessel movement shown through the pilotage service.

* NOTE: Depending on the size and weight of a vessel, it may cause a large movement of a vessel within a very short time that is difficult to restore to the original status. Very short latency is also as important as the high data rate when transmitting information obtained from sensors such as 3D-LiDAR.

[PR-7.x.6-6] 3GPP system shall support real-time data streaming service.

1. 3GPP Use Case on Tugs Service [5]

**3GPP TSG-SA WG1 Meeting #79 S1-173536**

**Guilin, China, 21 - 25 August 2017 *(revision of S1-173410 of S1-173169)***

Title: Tugs service

Agenda Item: 8.3

Source: SyncTechno Inc. [[5]](#footnote-5)

Contact: Hyounhee Koo (koo (at) synctechno (dot) com)

*Abstract: This document describes the tugs service that help shipboard users such as shipmasters of tug boats manoeuvre a vessel requesting the tugs service and safely anchor it to a destination.*

7.x Tugs service

7.x.1 Description

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).

This use case describes the tugs service that are for ship assistance (e.g. mooring), towage (in harbour/ocean), or escort operations to safeguard traffic at sea and protect the environment.

7.x.2 Pre-conditions

Shipmasters of tug boats are subscribed to tugs service and pilotage service.

Tug boats as well as a vessel that is moved by tug boats are subscribed to tugs service, to pilotage service and to 3GPP system.

Tug boats are subscribed to an Electronic Navigation Chart (ENC) service. The ENC is updated as the latest version before tug boats start their mission of moving a vessel.

NOTE: A shipboard user can identify the latest information about a port or sea area such as the depth of water, buoys, navigational route, berth information from the ENC.

Tugs service is accessible to ENC service.

Tug boats are subscribed to coastal and local warning service so the maritime safety information including the meteorological information is updated as the latest version when tug boats are in a tug area.

A drone with a 3D-LiDAR sensor that is operated by a port tug organisation is subscribed to tugs service and to 3GPP system.

A tug area is in the coverage of 3GPP system.

Pilotage service is available in a tug area.

7.x.3 Service Flows

1. A shipboard user (e.g. mariner or shipmaster) on a vessel sends an online request on tugs service to a port tug organisation when a vessel is approaching a waiting point of a tug area.

NOTE: A ship company or an agent in charge of a vessel can request the assignment of tug boats to a port tug organisation instead of a shipboard user on a vessel in advance before a vessel’s entry or departure.

2. The port tug organisation accepts the request on tugs service for the vessel, assign four tug boats to move that vessel and inform the vessel requesting tugs service of the assignment of tug boats.

NOTE: The number of tug boats assigned by a port tug organisation may be decided depending on the size of a vessel that tug boats move.

3. Tug boats approach the vessel and are attached to that vessel with tugboat ropes. In addition, tug boats and the vessel are connected together through indirect network connection between tug boats and the vessel via a drone with a 3D-LiDAR sensor or through direct network connection between them over 3GPP system in order to directly exchange the information necessary for tugs service depending on the capability of the vessel.

4. Shipmasters of four tug boats receive the marine traffic information about all vessels in a tug area from the pilotage service. In addition, they share information about tug boats and the vessel that tug boats move with bridge personnel or pilots manoeuvring other vessels in a tug area through pilotage service in real-time.

NOTE: The shipmasters of the four tug boats receive all information from the pilotage service that is available to a pilot in a tug area. They may receive the information about the vessel that tug boats move either via the indirect network connection through the drone or via the direct network connection between tug boats and the vessel that tug boats move.

5. A drone with a 3D-LiDAR sensor that is operated by a port tug organisation is flying above tug boats and the vessel and the information captured from the 3D-LiDAR sensor is transmitted in real time to tug boats, the vessel, a port tug organisation and a bridge personnel until shipmasters of tug boats complete their mission on the tugs service.

NOTE: Information that is captured by a 3D-LiDAR and is transmitted to tug boats, the vessel, a port tug organisation and a bridge personnel can be displayed in the ENC if the ENC service supports 3D data.

6. A bridge personnel transmits a local warning that informs shipmasters of tug boats of any potential risk (e.g. a collision between tug boats and other vessels).

7. Tugs service provides the prediction of the movement of tug boats.

8. Tugs service records information applied to control four tug boats (e.g. strength of pulling tugboat ropes in each tug boat as well as its environmental circumstance around them) and routes passed by tug boats and the vessel in real time.

9. Shipmasters of tug boats manoeuvre tug boats by exquisitely coordinating tug boats based on all available information about marine traffic situations and make the vessel pass in a tug area.

7.x.4 Post-conditions

Tug boats safely completed their mission of moving the vessel to the destination.

7.x.5 Potential Impacts or Interactions with Existing Services/Features

None.

7.x.6 Potential Requirements

[PR-7.x.6-1] 3GPP system shall provide a mechanism for tugs service to authenticate and authorise a UE to access the tugs service.

[PR-7.x.6-2] 3GPP system shall support handling of an online request for tugs service from an authorised UE.

[PR-7.x.6-3] 3GPP system shall provide a mechanism of correlating a UE identity with a vessel identity (e.g. IMO number that is a unique international vessel identification number consisting of 7-digit number).

[PR-7.x.6-4] 3GPP system shall provide a mechanism of registering the UEs that are dedicated to tug boats and a vessel moved by tug boats as a group of UEs.

[PR-7.x.6-5] Group communication among a group of UEs that are dedicated to tug boats and a vessel moved by tug boats shall be supported via the direct network connection or via indirect network connection.

NOTE: The example of a relay UE providing the indirect network connection mode is a drone that is regarded as one of UEs or a UE deployed in the highest place of a vessel or one of tug boats where the group communication among a group of UEs is available.

Editor’s Note: It is FFS whether the existing concept on direct network connection or indirect network connection is applicable to vessel to vessel communication.

Editor’s Note: It is FFS which the group communication is used, i.e. the group communication specified by off-network MC services, the group communication specified for any commercial services or both selectively.

[PR-7.x.6-6] 3GPP system shall support the data rate and the latency that enable shipboard users (e.g. shipmasters of tug boats) to exquisitely coordinate tug boats based on all information available to them (e.g. the information captured from the 3D-LiDAR sensor in real-time during tugs service) while manoeuvring tug boats to move a vessel to the destination.

NOTE: Depending on the size and weight of a vessel, it may cause a large movement of a vessel within a very short time that is difficult to restore to the original status. Very short latency is also as important as the high data rate when transmitting information obtained from sensors such as 3D-LiDAR.

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
2. Leave open if uncertain [↑](#footnote-ref-2)
3. On the behalf of Korea Register ([www.krs.co.kr](http://www.krs.co.kr)) that is in charge of the international standardisation of the Smart-Navigation project that Korean MOF (Ministry of Oceans and Fisheries, [www.mof.go.kr](http://www.mof.go.kr)) is driving, SyncTechno Inc. carries out 3GPP global standardization project for maritime communication services over 3GPP systems. [↑](#footnote-ref-3)
4. On the behalf of Korea Register ([www.krs.co.kr](http://www.krs.co.kr)) that is in charge of the international standardisation of the Smart-Navigation project that Korean MOF (Ministry of Oceans and Fisheries, [www.mof.go.kr](http://www.mof.go.kr)) is driving, SyncTechno Inc. carries out 3GPP global standardization project for maritime communication services over 3GPP systems. [↑](#footnote-ref-4)
5. On the behalf of Korea Register ([www.krs.co.kr](http://www.krs.co.kr)) that is in charge of the international standardisation of the Smart-Navigation project that Korean MOF (Ministry of Oceans and Fisheries, [www.mof.go.kr](http://www.mof.go.kr)) is driving, SyncTechno Inc. carries out 3GPP global standardization project for maritime communication services over 3GPP systems. [↑](#footnote-ref-5)