**MS 17 Aids to Navigation services (AtoN)**

### Submitting organisation

IALA

### Coordination body

IMO and IALA

### Description of the Maritime Service

This Maritime Service describes the provision of Marine Aids to Navigation (AtoN) deployed to enhance the safety of navigation. The IALA Navguide defines an AtoN as a device, system or service, external to vessels, designed and operated to enhance safe and efficient navigation of individual vessels and/or vessel traffic.

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AtoN should not be confused with a navigational aid. A navigational aid is an instrument, device, chart, etc., carried on board a vessel for the purpose of assisting navigation.

Scope of AtoN in this description is limited to the application and use of various electronic AtoN.

### Purpose

In most cases, Electronic Navigational Charts and their updates should promulgate the latest information on AtoN, however the purpose of this Maritime Service is to provide information on AtoN on an appropriate shipborne navigation display, not displayed on a nautical chart.

### Operational Approach

This document deals primarily with electronic AtoN. Electronic AtoN can be Physical or virtual. Virtual AtoN can be AIS or some other future means of marking danger/data transfer… AIS AtoN, Virtual AtoN and Synthetic AtoN can be supported by the transmission of MSI using one of the AIS messages that support the administrations operational requirement.

The provision of electronic AtoN services should use distribution strategies, methods, and technologies which can adapt to serve vessels in locations or conditions that may be challenging for data transfer.

**17.5.1 Virtual AtoN**

Virtual AtoN services could be provided where AtoN does not physically exist. A virtual AtoN is(ref IALA guideline on Virtual AtoN for definition) a digital information object promulgated by an authorised service provider that may be presented on navigational systems. The purpose of the Virtual AtoN System is to provide a near-instantaneous warning to the mariner of a new danger, such as a wreck, obstruction or floating debris. This warning must be provided in a form that can be received, interpreted and displayed by any class of vessel in the required operational area and carrying appropriate equipment.

Virtual AtoN can provide early notification to the mariner of urgent, temporary or dynamic information. Virtual AtoN should not, in general, be considered as a replacement for other forms of MSI but can provide a valuable supplementary delivery mechanism, enabling an automated graphical display of MSI otherwise only available in textual form. In certain circumstances, referring to the IALA Recommendation O‐143 on the Provision of Virtual Aids to Navigation, Virtual AtoN) can be also used as permanent marking.

Virtual AtoN currently are AIS only, but in the future, it is likely these will be broadcast by other means.

Synthetic AIS Aids to Navigation: A Synthetic AIS AtoN is where the AtoN message is transmitted from a remote AIS station. This allow for a physical AtoN on which no or limited electronic equipment is able to be installed to be marked using an AIS base stations that covers the area around the physical AtoN. Synthetic AtoN allows extremely low power monitoring of an AtoN to be achieved using one technology and regular updates as to its position and status to be transmitted by the local AIS base station using message type 21 (ref: IEC 62320-2 and IALA Recommendation R0126(A-126)).

**17.5.2 Mobile AtoN**

A MAtoN is defined as a non-fixed or un-moored AtoN; it does not include a fixed or moored buoy that is adrift from its station, temporarily or otherwise.

A MAtoN can be fitted with an Automatic Identification System (AIS) device transmitting message 21. (Ref: IALA Guideline 1154).

**17.5.3 Physical AIS AtoN**

**17.5.3.1 Type of AtoN subject to a maritime service**

AtoN include xxx

Within the Maritime Buoyage System there are six types of marks, which may be used alone or in combination. The mariner can distinguish between these marks by identifiable characteristics. Lateral marks differ between Buoyage Regions A and B, as described below, whereas the other five types of marks are common to both regions.

**17.5.4 Positioning, Navigation and Timing (PNT) services**

**[description]**

Positioning, Navigation and Timing services is considered to be the services provided to allow the mariner, or an aid-to-navigation to calculate their position, or to receive precise time. References to PNT data is considered to be the use of such derived position and time data within the AtoN or the vessel’s receiver.

It is useful to recognise that some AtoN use PNT data, while others can provide PNT Services for use by others. Examples of such can be the use of GNSS within AtoN AIS or the provision of positioning information via Racons, or augmentation data. Based on this, the maritime service only considers PNT aspects within the remit of AtoN service provider.

**[purpose]**

The purpose of this AtoN Maritime Service in the context of e-Navigation is to provide the mariner, autonomous vessels, (electronic) infrastructure with uniformed centralised timing, resilient positioning and support for safe navigation (e.g. supporting authentication).

This Maritime Service can be delivered worldwide or regionally by satellite or terrestrial systems; to support resilient PNT for ships (crewed or autonomous), AtoN and to support other Maritime Services.

Within this document, PNT can be considered to include the provision of positioning at user level, integrity information and augmentation services.

**[operational approach]**

AtoN Maritime Services provided by national competent authorities are coordinated by IALA as part of the remit of support seamless maritime AtoN service worldwide.

**[user need]**

Many AtoN require information on their position in real time to support the context of service. Timing is a critical component in the provision of some AtoN services, and the need to synchronise and reference radio navigation signals to universal coordinated time (UTC) will increase as look to use more diverse systems and solutions.

Recognizing the vulnerability of radionavigation systems to interference (e.g. GNSS jamming), the use of multiple dissimilar positioning and timing systems is required to achieve resilience in support of safe navigation and the optimal working of AtoN.

**17.5.6 Other electronic AtoN**

### User Needs

Users will include mariners and shore side authorities. User needs may include the most up to date presentation of information on:

* new hazards (fixed or dynamic);
* temporary channels or routes;
* temporary areas to be avoided (e.g., restricted areas (i.e., military exercises), survey, dredging, fishing, special marine events);
* changed hydrography, such as shifting banks;
* temporary replacement of gone from position physical AtoN;
* dynamic areas (e.g., reduced visibility, presence of protected species);
* polar navigation, provided there is sufficient means of radio communication broadcast and charting;
* ice conditions and navigation;
* incident response (e.g., environmental, search and rescue);
* port specific applications (e.g., passage planning, amended pilot boarding location, etc.);
* measures for the protection of the marine environment; and
* security.

### Information to be Provided

**17.7.1 General**

IALA Maritime Buoyage System (MBS), Guideline 1081 on provision of virtual Aids to Navigation, Guideline 1147 on the use of Enhanced Radar Positioning Systems (ERPS) provide the set of information and guidance needed for the service.

**17.7.2 Electronic AtoN**

IMO SN/Circ. 243 Annex 2 provides guidance on the use of navigation related symbols on all shipborne navigational systems and equipment.



The symbol for an AIS AtoN

Shore based AIS networks provide competent authorities with means to operate an information service for shore‐based VTS, traffic management schemes, ship reporting systems and other shore‐based safety related services, including electronic AtoN services. This service consists of information delivery between ships and shore and vice versa.

Technical details of the AIS technology and of the layout and local configuration of shore‐based AIS are described in IALA Recommendation A‐124.

In the longer term, authorities may expect that other media for information services will become available. This would enable electronic AtoN services to be transmitted via means other than AIS, for example: sitcom / internet; WiMAX; LORAN; DGPS ‐ IALA maritime beacon system; GPRS cell phone data transmission protocol.

In the near term, not all vessels can be expected to be able to effectively display electronic AtoN information. As of July 2008 SOLAS Radars are required to interface to AIS and display AIS information, as in MSC Resolution 192(79). Although ECDIS is capable of displaying AIS information, it is not required to do so. Based on current rates of navigation system upgrades, it is expected to take at least some years before the substantial percentage of the international commercial fleet will have this capability. Changes in mandatory carriage requirements may accelerate this development for SOLAS vessels. Portable Pilot Navigation Systems may facilitate implementation.

Economic benefit to the shipping industry could also provide an impetus to early adoption of this technology. The nominal report rate of virtual AIS AtoN broadcasts is specified in ITU‐R‐M.1371. However, due to the limitations in data link capacity IALA Recommendation A‐126 recommends a more flexible approach to be considered, taking data link capacity and power consumption at transmitting stations into account. In the longer term, different report rates may be implemented on different communication media, as appropriate.

The IMO e‐Navigation concept includes the need to harmonise the presentation of both shipboard and shore side safety related information. Consideration should be given in implementing virtual AtoN to the harmonisation process within e‐Navigation for future applications.

**17.7.3 Product specifications S-201, S-124 and S-125**

The Aids to Navigation (AtoN) Information Product Specification provides a common structure for the exchange of information about AtoN. This includes buoys, beacons, racons, lights, sound signals and AIS. The product contains the positions, properties, operational status and general comments related to an AtoN.

The Product Specification can be used to exchange AtoN information in a consistent form between Lighthouse Authorities, Hydrographic Offices and other organizations, including commercial and professional agencies.

**17.7.4 Provision of Virtual AtoN**

IALA Recommendation O-143 and Guideline G1081 for provision of virtual aids to navigation provides guidance on the limitations and benefits of Virtual AtoN, criteria for use, notification process, display, application and delivery methods, applicable standards and guidelines, availability and integrity and legal and liability issues.

### Associated Technical Services

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| Name | ID (MRN) | Description | Architect(s) | Standardisation Body |
| Marine navigational services | urn:mrn:iho:S125: | S-125 |  | IHO |
| Navigation warning service | urn:mrn:iho:S124: | S-124 |  | IHO |
| AtoN information | urn:mrn:iala:aton: | S-201 |  | IALA |
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### Relation to other Maritime Services

MS 17 has a relationship with other Maritime Services where it affects the AtoN

Examples may be different depending on coastal states arrangement.

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| **Description** | **Examples of information related to MS 17** |
| MS 1 VTS Information Service (INS) | Navigational hazard |
| MS 2 VTS Navigation Service (NAS) | Exchange of routes, navigational advices and assistance |
| MS 3 VTS Traffic Organisation Service (TOS) | Waterway management |
| MS 4 Port Support Service (PSS) | ETA/ATA, Access to the port, availability of port services |
| MS 5 Maritime Safety Information (MSI) Service | MSI information |
| MS 6 Pilotage Service | Pilot and boarding arrangements |
| MS 7 Tug Service | Update on information |
| MS 8 Vessel Shore Reporting | Position information |
| MS 9 Telemedical Assistance Service (TMAS) | Vessels position, delays, weather information |
| MS 10 Maritime Assistance Service (MAS) | Notifications, routing, places of refuge |
| MS 11 Nautical Chart Service | Local area updates, chart updates |
| MS 12 Nautical Publication Service | Updates to publications |
| MS 13 Ice Navigation Service | Ice routes, ice conditions, ice breaking assistance |
| MS 14 Meteorological Information Service | Weather information |
| MS 15 Real Time Hydro and Environmental Information Service | Horizontal and vertical tidal information in VTS area, available water column |
| MS 16 Search and Rescue (SAR) Service | Search pattern and vessels of opportunity |