|  |
| --- |
| IALA Guideline |

1???

Technical Aspects of VTS Data Exchange with External Stakeholders

Edition 1.0

Document date

Revisions to this IALA Document are to be noted in the table prior to the issue of a revised document.

|  |  |  |
| --- | --- | --- |
| Date | Page / Section Revised | Requirement for Revision |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

1 INTRODUCTION 4

1.1 Preamble 4

1.2 Objective 4

2 DATA EXCHANGE BETWEEN VTS AND EXTERNAL STAKEHOLDERS 5

3 LEGAL ASPECTS AND CONSTRAINTS 5

3.1 Security 5

4 TECHNICAL ASPECTS OF INTERACTION WITH STAKEHOLDERS 5

4.1 Uses 6

4.1.1 Sea-based Uses 6

4.1.2 Shore-based Uses of Maritime Data 7

4.2 Technical? Considerations 9

4.2.1 Data Integrity 9

4.2.2 Time stamping 9

4.2.3 Data Security and Confidentiality 9

4.2.4 Accessibility 10

4.2.5 Storage 10

4.2.6 Data Models 10

4.2.7 Architecture of Sharing 10

4.2.8 Communication Links 10

5 DEFINITIONS 11

6 ACRONYMS 11

7 REFERENCES 12

ANNEX A TECHNICAL ASPECTS OF DATA EXCHANGE 13

List of Tables

Table 1 Title required 7

Table 2 Types of Data Exchange 14

Table 3 Characteristics of the data exchange 15

List of Figures

Figure 1 Example figure caption **Error! Bookmark not defined.**

Figure 2 Another example figure caption **Error! Bookmark not defined.**

# INTRODUCTION

## Preamble

A Vessel Traffic Service (VTS) is recognised as a valuable asset to reduce incidents resulting from conflicts in vessel traffic. This contributes to the safety and efficiency of maritime traffic, and protecting the marine environment. Consequently, VTS plays an important role in risk management, not only on behalf of maritime traffic safety and fluency, but also on behalf of the continuity of the maritime transport chain.

The role of VTS is well established and its services are well positioned in the maritime domain. However, this Guideline has a broad perspective, to help VTS authorities in their interaction with other services, outside the VTS area.

Also in the maritime domain, VTS data may be needed to support other services such as maritime security or environmental agencies, with which the VTS Authority may not have had previous interaction. The possible stakeholders who may wish or need to co-operate with the VTS Authority need to be identified. Examples are given in ANNEX A.

Present legislation, guidelines and manuals could be studied in order to identify the limitations on possible interaction with allied and other services, identify inconsistencies with legislation, guidelines and manuals and determine any modifications necessary.

In particular, the references in chapter 7 may provide guidance in this respect.

## Objective

This Guideline describes the issues to be considered and the principles to be respected for successful interaction between VTS and allied or other services.

VTS Authorities collect business information and compile a real time picture of maritime traffic within the VTS area. This includes information that can assist other allied services with their own tasks and it is probable that other allied services may have information that can assist a VTS Authority. This guideline aims to set out a framework for the exchange of information between these stakeholders for the purpose of achieving increased efficiency and reduced costs for the community of stakeholders.

There are sometimes situations where multiple allied services collect the same data through independent means. By establishing a framework that simplifies the process of exchanging information, the various stakeholders will be able to save costs and the collected data will have a greater number of users which will therefore increase efficiency.

1. Who are potential stakeholders.

Refer to guideline 1102, Annex A

1. Type of data exchanged:
   1. VTS Voyage Data.
   2. Traffic Image.
   3. Surveillance Sensor Data.
   4. Meteo/Hydro.
2. Characteristic of the data that is exchanged:
   1. Real-time, i.e. data that changes on a timeframe in the order of seconds.
   2. Non real-time, data that changes on a timeframe in the order of minutes or more.
   3. Static/semi-static, pertinent data or data that changes infrequently.
   4. Historical, i.e. recorded data.
3. Timing of the data exchange.
   1. Continuous.
   2. On Demand.
   3. By Notification.
4. Governance of data exchange.

Refer to IALA Guideline 1102

# DATA EXCHANGE BETWEEN VTS AND EXTERNAL STAKEHOLDERS

Data exchange between VTS and external stakeholders – inside or outside the maritime domain – could be necessary to sustain the services of the external stakeholder. In such a case, an arrangement between the VTS Authority and the provider(s) of those services should be put in place.

Examples of possible external stakeholders are given in IALA Guideline 1102, Annex A. This list is taken as a basis to further develop the technical aspects of data exchange between VTS and external stakeholders.

# LEGAL ASPECTS AND CONSTRAINTS

Legal aspects and constraints are considered in IALA Guideline 1102.

## Security

The data exchanged between VTS and Allied Services or Stakeholders may have considerable business value and/or contain data that is privacy-sensitive. Therefore, proper care should be taken to protect this data during transmission and on subsequent storage. Also, access to the data should be properly governed.

It is recommended to use an appropriately secured transmission channel, e.g. a Virtual Private Network (VPN) and/or encryption of the transmission, to avoid unauthorised access during data transmission. When data is stored in e.g. a database, proper procedures should be set-up to limit access to authorised personal.

# TECHNICAL ASPECTS OF INTERACTION WITH STAKEHOLDERS

As stated in IALA Guideline 1102, VTS interaction with stakeholders should be based on a clear need for such interaction.

Our text comes here

1. Title required

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Domain | Type of Data Exchange | Purpose | Update rate | Duration |
| Other VTS | Voyage Data / Traffic Image |  |  |  |
| Security | Voyage Data / Traffic Image / CCTV / Voice |  | Real time | constant |
| SAR | Voyage Data / Traffic Image / Metoc | To support SAR action | Real time | During incident |
| Defence | Voyage Data / Traffic Image / CCTV |  | Real time |  |
| Environmental | Voyage Data / Traffic Image / Metoc | To support pollution incident management | Real time | On demand |
| Research | Voyage Data / Traffic Image |  |  | Historical |
| Commercial |  |  |  |  |
| Others |  |  |  |  |
|  |  |  |  |  |

## Uses

### Sea-based Uses

1. Voyage planning & execution:
   1. Risk identification & avoidance (shipboard).
   2. Weather routeing.
   3. Cargo management (planning loading & discharge).
   4. Logistics (shipboard).
   5. Monitoring of cargo, vessel status and resources;.
   6. Track keeping & collision avoidance;.
   7. Planning for sufficient under keel clearance.
2. Regulatory compliance
   1. Reporting.
   2. Environmental;.
   3. Port State.
   4. Coastal State.
3. Seakeeping (Stability & Seaworthiness).
4. Security.
5. SAR response.

### Shore-based Uses of Maritime Data

IALA Guideline 1086 on the Global Sharing of Maritime Data, lists various shore-based uses of maritime data for external stakeholders including adjacent VTS. These include:

1. Traffic management:
   1. VTS operations (adjacent VTSs).
   2. Anchorage and berth management (when not the responsibility of VTS).
2. Hazard management:
   1. Risk analysis.
   2. Business continuity.
   3. Incident reporting and response.
   4. Emergency towage and salvage.
   5. Accident investigation.
3. SAR.
4. Pilotage and allied services.
5. Support to the logistics chain.
   1. Port operations.
   2. Voyage monitoring;.
   3. Asset and resource management (Increased efficiency).
   4. Forward planning of movements.
6. Asset tracking and management.
7. Regulatory compliance:
   1. Shipping inspection.
   2. Port State Control.
8. Law enforcement:
   1. Fisheries enforcement.
   2. Customs.
   3. Border control / Immigration.
   4. Police.
9. Ship clearance:
   1. Health and quarantine.
10. Environmental protection:
    1. Pollution monitoring and control.
11. Security and intelligence.
12. Waterways infrastructure management (including inland waterways):
    1. AtoN operations and system optimisation.
    2. Infrastructure.
13. Science and research support.
14. Maritime Safety Information (MSI).
15. Marine Spatial Planning:
    1. Licencing.
    2. Offshore structure permits.
16. Offshore operations.

A VTS centre collects, in the scope of their operation, a lot of data that may be of interest to external stakeholders. Therefore, in order to reduce cost and increase efficiency, arrangements can be made between the VTS Authority and external stakeholders to share (part of) this data. Examples of data that may be exchanged are given in paragraphs 17 to 20.

1. VTS Traffic Image:
   1. Vessel Data:
      1. Position.
      2. Speed/Course over Ground.
      3. Identification, e.g. ship name, call sign, MMSI.
   2. Aids to Navigation:
      1. Position.
      2. Status.
2. VTS Voyage Data:
   1. Vessel Data:
      1. Static, e.g. length, width, ship type, MMSI, call sign, tonnage, flag.
      2. Dynamic, e.g. draught, air draught.
      3. Defects (including local intelligence on defects).
      4. Incident reports.
      5. Anomalous activity.
   2. Voyage-related data:
      1. Cargo.
      2. Crew and passengers.
      3. Route, ETA, ATA.
3. Environmental Data:
   1. Hydrographic.
   2. Meteorological.
   3. Electronic Navigational Charts.
   4. Ecological.
   5. Oceanographic (Tsunami).
   6. Oil spill/pollution detection & reporting.
   7. Possible signal deterioration/ jamming (GPS).
4. Surveillance Sensor Data
   1. Radar data.
   2. AIS data.
   3. CCTV.
   4. Radio Direction Finder.

## Technical? Considerations

### Data Integrity

Data integrity is a key concern of both users and providers.

Source data holders are often reluctant to allow access to their data. If the intent is free and open exchange of data, there must be a trusted process by all parties (providers and recipients) to enable access.

Users expect that data provided is accurate and consistent and that the data is authentic, in that it is derived from credible sources which can be validated.

It is also of concern that because the route from provider to user may be a chain of different links, with various opportunities for interference, that there must be some means of confirming received data integrity along the data supply chain. Loss of integrity may be accidental or through deliberate interference.

Data should be transmitted using recognised formats such that the receiver will understand the format used by the sender.

Timeliness can be regarded as a part of data integrity. Quality of data is also very important. Data should, therefore, include some form of quality marker information.

### Time stamping

Data should be received when needed. This may be in advance of an event, real time, near real time or historic as appropriate. Data should be time stamped as appropriate to the nature and use of the information. The time stamp should preferably be at time of origin but if not should be as soon thereafter as possible. Where the time stamp is not time of origin it is desirable that the difference involved be flagged.

#### Data Limitations

Users need to be made aware of the limitations of the maritime data or information to avoid taking action based on inappropriate, incomplete or inaccurate data or information.

#### Availability?

Systems designed for the global sharing of maritime data and information should be supportable and avoid single points of failure, where possible.

#### Version control

Version control procedures will be required to ensure there is proper tracking and control of changes to software and equipment. This will ensure on-going efficient exchange for the global sharing of maritime data and information.

### Data Security and Confidentiality

Users are concerned with issues of data security and confidentiality and in particular any commercial sensitivity of data as it relates to release of information that may compromise investors or introduce a competitive advantage / disadvantage.

Other data that requires protection includes location sensitive data, such as location of fishing grounds, or personal identification data. Personal data includes identity data relating to vessels as well as individuals.

In many cases confidentiality is already protected by legislation but this is not universal throughout the maritime domain. The requirement to protect access to data may go beyond the limits of primary legislation. Confidentiality needs, at least, to be protected by appropriate levels of access rights to data exercised through physical security, encryption and password protection.

### Accessibility

There is a concern that authorities that may wish to exchange maritime data may be restricted in their ability to do so due to cost or complexity. This may be resolved through the use of open source software and sharing agreements between contracting government and service providers.

### Storage

The volume of maritime data and information involved in many of the aforementioned uses will be considerable. Given that many of these uses also require access to archive or historic data and information, consideration must be given to providing adequate capacity for retaining and archiving these records.

When using historical data, the more commonly searched maritime data is mainly related to geographical areas and time periods. In light of this observation, to facilitate the end-users to access the relevant data and then the growth of value added services, such as risk analysis and environmental studies, suitable file format and storage space architecture can be chosen. The storage space architecture could rely on a hierarchical geographical area / time period model, while the file format should provide direct, efficient and fast access to the stored data.

Data storage must comply with national regulations.

### Data Models

Exchange of data requires an understanding of how the data values are represented and their meaning. The former is specified by data format; the latter is reflected in the data model.

The data model unambiguously defines the:

* semantics of the data fields;
* structure of the data;
* permissible ranges of a data field.

The IHO S-100 standard [9] is a framework standard intended to allow development of data models and associated product specification for a variety of common and maritime specific information. Data models, used in the domains of maritime safety, security or, more generally, describing data for exchange by VTS, are maintained in the IHO GI Registry.

### Architecture of Sharing

Transfer of data may be initiated by the sender or the receiver. This may be an automated process or require manual intervention.

### Communication Links

The transfer of data between sender and receiver requires connectivity via a network. A network comprises appropriate hardware and software interconnected by communication channels. In the maritime world, both aboard ship and shore side, data links may consist of a combination of wired and wireless network segments.

Different technical solutions and architectures can be used when establishing a data sharing network. Consideration should be given to:

* the physical distance between the sending and receiving parties;
* the services provided by the network;
* the quality of services requested by the users;
* the constraints on infrastructure.

Global sharing of maritime data and information can take place either through the internet or through dedicated private networks. The internet is public, while dedicated networks are generally closed.

Consideration should be given to the security related characteristics of these network types.

Systems used for global sharing of maritime data and information are in reality a network of networks.

When designing a network for global sharing of maritime data, consideration should be given to transmission protocols, bandwidth limitations, communication / data distribution strategy, security aspects such as authentication and confidentiality as well as data integrity.

A selection between the options available should be based on a number of criteria, including the type of data being transferred, volume of data, types and number of clients connected to the network.

Although bandwidth cost is in decline, the value of conveyed information has to be balanced against the cost of transmitting it. Additionally, the required data transmission speed needs to be assessed and agreed in context with associated costs. Another trade-off is the speed at which the data needs to be transmitted. Higher bandwidth links infer higher costs.

# DEFINITIONS

*Suggested text:* The definitions of terms used in this IALA Guideline can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) at <http://www.iala-aism.org/wiki/dictionary> and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

External Stakeholders: the Allied and Other Services as defined in IALA Guideline 1102 (in the scope of this guideline, the organisations, outside of the VTS, that may use VTS data to support their operations)

VTS Data: as defined in IALA Guideline 1102, the data produced by VTS and/or owned by the VTS Authority.

Traffic Image: A (VTS) traffic image is the surface picture of vessels and their movements in a VTS area.

Surveillance Sensor Data: Data captured by a sensor, such as radar, AIS and electro-optical devices that is used to build the traffic image.

VTS Voyage Data: Data about a vessel, its historical and intended route and its cargo, that is used in the context of VTS.

Meteo/Hydro: Meteorological and hydrographical information

# ACRONYMS

AIS Automatic Identification System

ATA Actual Time of Arrival

AtoN Aid(s) to Navigation

CCTV Closed-Circuit Television

ETA Estimated Time of Arrival

GI Geospatial Information *Registry* (IHO)

GPS Global Positioning System; operated by the Government of the United States

IALA International Association of Marine Aids to Navigation and Lighthouse Authorities - AISM

IHO International Hydrographic Organization

IMO International Maritime Organization

ISPS International Ship and Port Facilities Security [Code]

MAS Maritime Assistance Service

MSI Maritime Safety Information

RSO Recognized Security Organization

SAR Search and Rescue

SOLAS International Convention for the Safety of Life at Sea (IMO 1974 as amended)

S-100 Geospatial Information Registry (IHO)

VPN Virtual Private Network

VTS Vessel Traffic Services

# REFERENCES

1. SOLAS Chapter V, Regulation12 Vessel Traffic Services
2. IMO Resolution A.857(20) Guidelines for Vessel Traffic Services
3. IALA Recommendation V-127 on Operational Procedures for Vessel Traffic Services
4. IALA Recommendation V-128 on Operational and Technical Performance Requirements for VTS Equipment
5. IALA Guideline 1086 on the Global Sharing of Maritime Data & Information
6. IALA VTS Manual
7. IALA NAVGUIDE
8. IALA Guideline 1018 on Risk Management
9. IHO S-100
10. TECHNICAL ASPECTS OF DATA EXCHANGE
11. Types of Data Exchange

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Stakeholder | Voyage Data | Traffic Image | Surveillance  Sensor Data | Metro/Hydro |
| Port Administration / Harbour Master | x |  |  |  |
| Maritime Rescue Coordination Centre (MRCC) | x | x | x | x |
| Port State Control (PSC) | x |  |  |  |
| Environmental Agency | x | x | x | x |
| Coastguard | x | x | x | x |
| Adjacent VTS | x | x | x | x |
| Immigration / Border Control | x | x | x |  |
| Police | x | x | x |  |
| Recognized Security Organization (RSO / ISPS) | x | x | x |  |
| Navy | x | x | x | x |
| Maritime Pilot Organisation / Maritime Pilots | x | x |  | x |
| Health Authorities / Medical Assistance | x |  |  |  |
| Ship Owners / Agents | x |  |  |  |
| Terminal Operators | x |  |  |  |
| Tugboat Companies | x | x |  | x |
| Boatmen / Linesmen | x |  |  |  |
| Inspection | x |  |  |  |
| Customs | x | x | x |  |
| Stevedores | x |  |  |  |
| Port Service Providers (e.g. bunker/water providers, surveyors, etc.) | x | x |  |  |
| Ship Reporting Agencies | x |  |  |  |
| Cargo Treatment / Processing | x |  |  |  |
| Research Institutes | x | x | x | x |
| Maritime Assistance Service (MAS) | x | x |  | x |

1. Characteristics of the data exchange

| Type of Operation | What Data | Data Timing | Type of Data Exchange |
| --- | --- | --- | --- |
| **Traffic management** |  |  |  |
| VTS operations | Traffic Image | Real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Surveillance Sensor Data | Real-time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |
| Anchorage & berth management. | Traffic Image | Non real-time | Continuous |
|  | Voyage Data | Non real-time | Notification |
| **Hazard management** |  |  |  |
| Risk Analysis | Traffic Image | Historical | On demand |
|  | Voyage Data | Historical | On demand |
| Business Continuity | Voyage Data | Non real-time | Notification |
| Incident reporting & response | Voyage Data | Non real-time | Notification |
| Emergency towage & salvage | Traffic Image | Non real-time | Notification |
|  | Voyage Data | Non real-time | Notification |
| Accident investigation | Traffic Image | Historical | On demand |
|  | Voyage Data | Historical | On demand |
|  | Surveillance Sensor Data | Historical | On demand |
|  | Meteo/Hydro | Historical | On demand |
| **SAR** | Traffic Image | Real Time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Surveillance Sensor Data | Real time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |
| **Support to the logistics chain** |  |  |  |
| Port operations | Voyage Data | Non real-time | Notification |
| Voyage monitoring; | Voyage Data | Non real-time | Notification |
| Asset & Resource Management | Voyage Data | Non real-time | Notification |
| forward planning of movements | Voyage Data | Non real-time | Notification |
| **Asset tracking & management** | Voyage Data | Non real-time | Notification |
| **Regulatory compliance** |  |  |  |
| Shipping inspection | Voyage Data | Non real-time | Notification |
| Port State Control | Voyage Data | Non real-time | Notification |
| **Law enforcement** |  |  |  |
| Fisheries inspection | Traffic Image | Real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Surveillance Sensor Data | Real-time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |
| Customs | Traffic Image | Real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Surveillance Sensor Data | Real-time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |
| Border control / Immigration | Traffic Image | Real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Surveillance Sensor Data | Real-time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |
| Police | Traffic Image | Real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Surveillance Sensor Data | Real-time | Continuous |
| **Ship clearance** |  |  |  |
| Health & quarantine | Voyage Data | Non real-time | Notification |
| **Environmental protection** |  |  |  |
| Pollution monitoring & control | Traffic Image | Real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Surveillance Sensor Data | Real-time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |
| **Security & intelligence** | Traffic Image | Real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Surveillance Sensor Data | Real-time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |
| **Waterways infrastructure management** |  |  |  |
| AtoN operations & system optimisation | Traffic Image | Non real-time | Continuous |
| Infrastructure | Traffic Image | Historical | On demand |
|  | Voyage Data | Historical | On demand |
| **Science & research support** | Traffic Image | Historical | On demand |
|  | Voyage Data | Historical | On demand |
|  | Surveillance Sensor Data | Historical | On demand |
|  | Meteo/Hydro | Historical | On demand |
| **Maritime Safety Information** | Traffic Image | Non real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |
| **Marine Spatial Planning** |  |  |  |
| Licencing | Traffic Image | Historical | On demand |
|  | Voyage Data | Historical | On demand |
| Offshore structure permits | Traffic Image | Historical | On demand |
|  | Voyage Data | Historical | On demand |
| **Offshore operations** | Traffic Image | Non real-time | Continuous |
|  | Voyage Data | Non real-time | Continuous |
|  | Meteo/Hydro | Non real-time | Continuous |