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Title: Draft BS EN 63173-1 ed. 2.0 Maritime navigation and radiocommunication equipment and systems - Data interfaces -
Part 1: S-421 route plan based on S-100

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



80/1148/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 63173-1 ED2	
DATE OF CIRCULATION: 2025-02-14	CLOSING DATE FOR COMMENTS: 2025-04-11
SUPERSEDES DOCUMENTS: 80/1144/RR	

IEC TC 80 : MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS	
SECRETARIAT: United Kingdom	SECRETARY: Mr Kim Fisher
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 18	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED:	

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TITLE:

Maritime navigation and radiocommunication equipment and systems - Data interfaces - Part 1: S-421 route plan based on S-100

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Maritime navigation and radiocommunication equipment and systems -
Data interfaces - Part 1: S-421 route plan based on S-100 –**

FOREWORD

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IEC 63173-1 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.. It is an International Standard.

This second edition cancels and replaces the first edition published in 2021. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) change data product specification metadata and geometry type to be compatible with IHO S-100 Edition 5.2;
- b) application schema and test data;
- c) change the object attributes in Route, RouteActionPoint, and RouteWaypoint;
- d) add new enumeration for RouteActionPointRequiredAction and update the description for RouteInfoStatus;
- e) add descriptions for the external reference in routeWaypoint and routeActionPoint;
- f) update data encoding rule for the identifier with GML ID;
- g) binding rules for routeWaypoint and routeScheduleElement
- h) simplify the description of the metadata

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

The voyage plan is a key element of a vessel's voyage and can be used to optimize safety and processes, as well as for the interaction of participants and stakeholders.

The core element of the voyage plan is the route.

The exchange of routes (whether it be between ship-to-ship, ship-to-shore or shore-to-shore) may improve

- situational awareness,
- reduction in the number of accidents and incidents (by proactively de-conflicting routes),
- resource utilization by knowing the intentions of other actors,
- secured passages by knowing the intentions of other actors,
- predictability of arrivals and departures by early information sharing,
- planning for involved actors leading to reduced idle time for resources, and
- just-in-time operations by enabling stakeholders and service providers to be efficiently organized for handling vessel movements, port resources, and hinterland connections.

This document has been registered with the [IHO S-100](#) registry as product specification S-421. A S-100 product specification is a description of the features, attributes and relationships of an application and their mapping to a dataset. It is a complete description of all the elements required to define a particular geographic data product.

[IHO S-97](#) describes readiness levels of product specifications to show a progression from an idea to regular use. S-421 is currently at the initial level 1 pending demonstration in a real-world environment.

S-100 uses camelCase for naming. CamelCase names are made up of words joined together without spaces and capitalised within the compound using a limited set of English letters. Feature and information types begin with uppercase A-Z and attributes and values begin with lowercase a-z.

Note from IEC :

The following items were listed in the bibliography but not cited in the text. please find a suitable place to cite them in the text to justify their inclusion in the bibliography.

IEC 61174, *Maritime navigation and radiocommunication equipment and systems - Electronic chart display and information system (ECDIS) - Operational and performance requirements, methods of testing and required test results* [IEC 61174 \[1\]](#)

IEC 62288, *Maritime navigation and radiocommunication equipment and systems - Presentation of navigation-related information on shipborne navigational displays - General requirements, methods of testing and required test results* [IEC 62288 \[2\]](#)

ISO 19115:2003 (all parts), *Geographic information — Metadata* [ISO 19115:2003 \(all parts\) \[3\]](#)

ICRC, *Geneva Conventions and Additional Protocols 1949* [\[4\]](#)

IHO S-63, [IHO Data Protection Scheme \[5\]](#)

IHO S-97, *Guidelines for creating S-100 product specifications* [\[6\]](#)

IHO S-101, [ENC Product Specification \[7\]](#)

[IHO S-129, UKC Product Specification \[8\]](#)

IMO A.893(21), *Guidelines for voyage planning* [\[9\]](#)

[IMO A.999\(25\)](#), *Guidelines on voyage planning for passenger ships operating in remote areas* [\[10\]](#)

IMO MSC.232(83), *Adoption of the revised performance standards for electronic chart display and information systems (ECDIS)* [\[11\]](#)

IMO MSC.467(101), *Guidance on the definition and harmonization of the format and structure of maritime services in the context of e-navigation* [\[12\]](#)

RFC 2141, *URN Syntax* [\[13\]](#)

RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax* [\[14\]](#)

RFC 8141, *Uniform Resource Names* [\[15\]](#)

Maritime navigation and radiocommunication equipment and systems - Data interfaces - Part 1: S-421 route plan based on S-100 –

1 Scope

This part of IEC 63173 specifies an S-100 compliant product specification for route plan intended for exchange of information. It specifies the content, structure, and metadata needed for creating fully S-100 compliant route plan information and its portrayal within an S-100-based application. The IHO manages all numbers for S-100 compliant product specifications and has assigned S-421 for this route plan IEC standard.

This document specifies only a data format for the route plan exchange. This document does not specify a data format of vessel monitoring and logging information. This information can be provided by other mechanisms or be specified in other standards.

The format of the route plan exchange includes some limited vessel static information. When more static information is required, it can be obtained by other methods such as AIS.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

S-100, IHO Universal Hydrographic Data Model (edition 5.2.0)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

active route

route which is currently monitored for the voyage which may contain the schedule information

3.2

actor

human or machine that takes part in the route plan exchange process

3.3

feature

abstraction of real-world phenomena

Note 1 to entry: A feature may occur as a type or an instance. A feature type or a feature instance should be used when only one is meant as described in S-100.

3.4

feature catalogue

catalogue containing definitions and descriptions of the feature types, feature attributes, and feature associations occurring in one or more sets of geographic data as defined in S-100.

3.5

planned route

candidate route for the active route of the voyage

Note 1 to entry: The schedule information may be set by the ship.

3.6

portrayal

presentation of information to humans as defined in S-100

Note 1 to entry: This document is restricted to the portrayal of geographic information.

3.7

portrayal catalogue

collections of defined portrayals for a feature catalogue as defined in S-100

Note 1 to entry: Content of the portrayal catalogue includes portrayal functions, symbols, and portrayal context parameters.

3.8

recommended route

route recommended by external actors (e.g. national authorities or commercial organizations) to own ship for the planned route of the voyage

3.9

recommended time

time set by external actors to own ship for the planned route of the voyage

3.10

reference route

route without any vessel-specific information that can assist in the creation of a route plan for a particular vessel

3.11

route information

all related route objects specified in this document

3.12

Universal Resource Identifier

URI

unique sequence of characters that identifies an abstract or physical resource as specified in [\[14\]](#)

3.13

waypoint

reference point in physical space used for purposes of navigation

Note 1 to entry: It describes the geographical components of the route.

4 Abbreviated terms

ENC electronic navigational chart

GML Geography Markup Language

IEC International Electrotechnical Commission

IHO International Hydrographic Organization

IMO International Maritime Organization

ISO International Organization for Standardization

ETA estimated time of arrival

ETD estimated time of departure

EUT equipment under test

FOID Feature Object Identifier

5 General description

5.1 General data product description

The data product of a route plan is described as specified in [Table 1](#).

Table 1 – Informal description of the data product

Field	Description
Title	Route plan
Abstract	This data product describes real-world route plan and its related information.
Content	The product specification defines all requirements to which route plan data products shall conform. Specifically, it defines the data product content in terms of features and attributes within the feature catalogue. The display of features is defined by the symbols and rule sets contained in the portrayal catalogue
Spatial extent	Description: East bounding longitude: 180° West bounding longitude: -180° North bounding latitude: 90° South bounding latitude: -90°
Specific purpose	The purpose of a route plan dataset is to provide official route plan data to an S-100 based application for the safe and efficient passage and route of vessels to destinations.

5.2 Data product specification metadata

[Table 2](#) uniquely identifies this document and provides information about its creation and maintenance. For further information on dataset metadata, see [11.4](#).

Table 2 – Data product specification metadata

Field	Description
Title	Route plan
Version	1.1
Date	2024.10.23
Language	English
Classification	Unclassified
Contact	International Electrotechnical Commission 3, rue de Varembe P.O. Box 131 CH - 1211 Geneva 20 - Switzerland Telephone: +41 22 919 02 11 Fax: + 41 22 919 03 00
URL	www.iec.ch
Identifier	S-421
Maintenance	Changes to the product specification S-421 coordinated by IEC TC 80
ComplianceCategory	The level of compliance. Category 2

5.3 Product specification maintenance

This document for route plan complies with the maintenance schedule and policy in [IEC](#).

5.4 Specification scopes

The product specification scope of the route plan is specified in [Table 3](#).

Table 3 – Route plan product specification scope

Field	Description
Scope ID	Product
Level	006-series
Level name	Route plan

5.5 Dataset identification

The dataset identification information for this document is specified in [Table 4](#).

Table 4 – Dataset identification

Field	Description
Title	Route plan
Alternate Title	Route plan exchange
Abstract	The route plan for the radiocommunication and navigational equipment and system shall be produced in accordance with the rules defined in this document. This document contains all the information necessary to enable users to produce a consistent route plan and to use that data efficiently in an application
Topic category	Transportation (ISO 19115:2003 (all parts) [3] domain code 018)
Geographic description	Areas specific to marine navigation
Spatial resolution	Varies. The spatial resolution varies according to the application.
Purpose	Route plan exchange
Language	English (mandatory), other (optional)
Classification	Unclassified
Spatial representation type	Vector
Point of contact	Producing agency
Use limitation	Not to be used for navigation on land

6 Data content and structure

6.1 General

The route plan is a feature-based product. The content information is described in terms of a general feature model and a feature catalogue.

[IMO](#) has defined in MSC.530(106) minimum requirements for route planning in ECDIS. A route consists of both straight and curved segments. The route includes user selectable limits for checking navigational hazards. Further, a route includes user selectable cross track limits for automatic off-track alarms. In this document, curved segments are defined by radius-controlled turns in each waypoint. Also, the checking and cross track limit of starboard and port is defined in each waypoint.

[IMO](#) has defined voyage planning in [\[9\]](#) and [\[10\]](#). [IMO](#) voyage planning goes beyond this document and therefore this document does not use "voyage plan" for a route plan which contains some, but not all elements required for an [IMO](#) voyage plan.

This document uses the term "annotated route plan" for a plan which, in addition to route plan, contains some elements of the [IMO](#) voyage plan as georeferenced text or document (see [Annex C](#)).

The route plan contains elements intended for both mandatory and optional implementation. The optional elements to implement in this document do not describe all functionality which

Table 5 – Route plan coordinate reference systems

Field	Description
Horizontal coordinate reference system	EPSG:4326 (WGS84)
Projection	None
Temporal reference system	Gregorian calendar
Coordinate reference system registry	EPSG Geodetic Parameter Registry
Date type (according to ISO 19115:2003 (all parts) [3])	002- publication
Responsible party	International Organisation of Oil and Gas Producers (OGP)
URL	http://epsg.org/home.html

7 Feature catalogue

7.1 General

The route plan feature catalogue describes the feature types, information types, attributes, attribute values, associations and roles which may be used in a route plan dataset.

The route plan feature catalogue is available in a machine-readable printed version which conforms to the S-100 XML feature catalogue schema and can be downloaded from the CIRM¹ website (<http://cirm.org/s-421>). It is also available in [Annex D](#) as a human readable version.

When there are conflicts in the texts, tables, data model (see [Figure 1](#)) or schema, the machine-readable files shall take precedence.

The "Implementation" column in the object attribute tables has two alternatives: mandatory and optional.

- Mandatory means that the attribute, when provided, shall always be implemented and shall always be possible to support, i.e. process and/or interpret, for example view, edit and associated functionality.

NOTE This is not the same as that the attribute is mandatory to exchange.

- Optional means that it is voluntary for the receiver to implement support for that attribute.

The multiplicity column in the tables describes the number of elements that can be provided. Even though mandatory is in the implementation column, the value in the multiplicity column may be zero to one or zero to many, i.e. the attribute can be omitted even if the value of implementation column is mandatory. For example, routeInfoValidityStart has Implementation mandatory but has multiplicity of 0..1. This is a requirement to support it but no requirement to provide it. The routeInfoStatus has multiplicity 1 and the attribute shall thus be supported and shall have a value.

Tables in [Annex A](#) specify the objects and attributes used for a specific use case. Fields in tables marked "mandatory" specify fields that shall contain a value when exchanged in the specific use case. All actors that support the use case shall implement and process all fields (mandatory and optional) that are specified in that use case.

7.2 Feature types

7.2.1 Geographic

Geographic (geo) feature types form the principal content of the dataset and are fully defined by their associated attributes and information types.

¹ Comité International Radio-Maritime, the International Association for Marine Electronic Companies, www.cirm.org

7.2.2 Meta

Meta features contain information about other features within a data set. Information defined by meta features override the default metadata values defined by the data set descriptive records.

7.2.3 Route

The Route object attributes are given in [Table 7](#).

The version of route plan has a format X.Y. First value X of routeFormatVersion is updated when a [significant change](#)(s) is done in the route format structure. This includes

- a) when the status of some recognizable element (e.g. XTD) is changed from Optional to Mandatory,
- b) when new elements to the route format are added,
- c) when some elements in the route format are deleted, and
- d) where there are some changes to the XSD schema.

The second value Y of routeFormatVersion is updated when "typographical" changes are done, which do not affect the format itself. This includes

- e) when there are additional explanations in the description of the format, and
- f) when unrecognizable updates (i.e. add, delete and update) are made.

7.2.4 RouteActionPoints

The feature RouteActionPoints shall contain at least one RouteActionpoint object.

7.2.5 RouteActionPoint

The RouteActionPoint is intended to add elements of the associated voyage plan (see [abb-imo \[9\]](#)) into the basic route plan consisting of the waypoints and legs between the waypoints. The RouteActionPoint has the flexibility to use either point with radius, line with specified distance or area as a method to activate actions associated with waypoints or legs, or notes where a waypoint or leg cannot be used, for example to activate ship reporting when crossing a line or to act based on voyage planning when within a radius from a point (see [Table 8](#), [Table 9](#) and [Table 10](#)). Further examples of the use cases of RouteActionPoint are:

- instruction to report to a ship reporting system about entering the area using VHF (ship reporting);
- instruction to report to a ship reporting system via Website (ship reporting);
- instruction to report to entering into a VTS area (ship reporting);
- note about being too close to no-go area defined by the master (voyage plan);
- note about being aware of squat effect if the speed is more than 18 kn (voyage plan);
- note about being in area which require pilot (voyage plan);
- instruction to confirm pilot order (voyage plan);
- instruction to change used fuel to be compliant with a MARPOL area (voyage plan);
- instructions to reduce ballast water when sailing over a shallow area (voyage plan);
- instructions to perform check of position using line of position (LOP) method (voyage plan);
- instruction to select Radar and ECDIS setting suitable for area ahead (voyage plan).

The routeActionPointExternalReference attribute is used for the reference of an external link containing data related to the geometry of the route.

An external link may make use of the S-100 preferred identifier, the Maritime Resource Name (MRN).

A real example of the external reference is for outer approach to Sydney Harbour, Nova Scotia, Canada as following:

Table 6 – routeActionpoint examples

Attribute name	Example 1	Example 2
routeActionpointRequiredAction	4 (Note)	4 (Note)
routeActionpointRequiredActionDescription	Pilot boarding station	Petries Point is within the entrance
routeActionpointRequiredActionExternalReference	urn:mrn:iho:ca:ca00:ca000103422630000	urn:mrn:iho:ca:ca00:ca000063846730000

Exactly one of a routeActionPointRadius or routeActionPointTimeToAct shall be specified for an action point.

When a value of 5 (Critical point) in routeActionPointRequiredAction is used as a critical point, the routeActionPointTimeToAct shall have a negative value.

Table 7 – Route object attributes

Attribute Name	Description	Data type	Multiplicity	Implementation	Remarks
routeFormatVersion	The version of this route format	String	1	Mandatory	Describe when these numbers are changed, Format: X.Y X: Major version Y: Minor version
routeID	Unique route identifier	String	1	Mandatory	Unique identifier of the route
routeEditionNo	Route edition number	Integer	1	Mandatory	This number starts from one for each new route. This number is increased by one whenever the route information has changed. Exceptions for not increasing the number of routeEditionNo are changes when only routeInfoDescription, routeWaypointLegIssue or routeInfoStatus attributes have been changed.
routeExtensions	Additional proprietary information for the route specified by the manufacturer	RouteExtensions	0.. *	Optional	

Table 8 – RouteActionPoints object attributes

Attribute Name	Description	Data Type	Multiplicity	Implementation	Remarks
routeActionPointsExtensions	Additional proprietary information for the action points specified by	RouteExtensions	0.. *	Optional	

	the manufacturer				
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Table 9 – RouteActionPoint object attributes

Attribute Name	Description	Data Type	Multiplicity	Implementation	Remarks
routeActionPointID	Identifier of the action point. The identifier shall be unique in the route.	Integer	0..1	Optional	Positive integer
routeActionPointName	Name of action point	String	0..1	Optional	
routeActionPointExternalReference	Machine readable external reference information related to the action point Example 1 : MRN linking to an object in S-100 product.Example 2: FOID value linking to object in S-57 ENC .In this case, the encoding of the string is : <cell identifier>/ FOID "GB400000/1234567890" urn:iho:s57:foid:GB400000:1234567890	Universal Resource Identifier	0..1	Optional	
Geometry	Geographical position of the action point in degrees Examples : <geometry> <S100:pointProperty> <S100:Point gml:id="RTE.APT.1.PT" srsName=" http://www.opengis.net/def/crs/EPSG/0/4326 > <gml:pos>12.0 56.0</gml:pos> </S100:Point> </S100:pointProperty> </geometry>	GM_Point	1	Mandatory	For value range see IHO S-100 The minimum resolution is 0,000 1°
routeActionPointRadius	Distance from the action point within which action shall be taken.	Real	0..1	Mandatory for GM_Point	Unit: NM Positive real
routeActionPointTimetoAction	Time before or after the action point	Real	0..1	Mandatory	Unit: minutes Negative values : time before Positive values : time after
routeActionPointRequiredAction	The action required for this action	Enumeration	1	Mandatory	See Table 10

routeActionPointRequiredActionDescription	Human readable description of the action required for this action point	String	1	Mandatory	
routeActionPointExtensions	Additional proprietary information for the RouteActionPoint specified by the manufacturer	RouteExtensions	0.. *	Optional	

Table 10 – Definition of RouteActionPointRequiredAction

Enumeration value	Description	Remarks
1	User defined	Action is available in the field routeActionPointRequiredActionDescription
2	Report	Report from vessel to shore
3	UKCM	UKCM report
4	Note	Additional information related to the route
5	Critical point	Warning raised on ECDIS
6 to 9	Reserved	Reserved for future use

Table 11 – RouteWaypoints object attributes

Attribute name	Description	Data type	Multiplicity	Implementation	Remarks
routeWaypointExtensions	Additional proprietary information for the waypoints specified by the manufacturer	RouteExtensions	0.. *	Optional	

7.2.6 RouteWaypoints

The feature RouteWaypoints described in [Table 11](#) shall contain two or more RouteWaypoint objects, when the value of the RouteInfoStatus is other than "Acknowledged", "Terminated", "Errors", "Service started" or "Service ended" (see [7.3.6](#)).

NOTE The listed cases (Terminated, Errors, Service started and Service ended) are events, and the RouteInfo object alone is sufficient to communicate the event.

The sailing order shall be determined by the appearance order of RouteWaypoint objects and shall be the same as the order of the references in RouteWaypoints object.

7.2.7 RouteWaypoint

The routeWaypointID (see [Table 12](#)) shall be unique within a route, i.e., there shall be no waypoints with the same ID within one route. The routeWaypointID field for a waypoint is not related to the order of waypoints. The waypoint identifiers permit references to the geometry (rather than the succession order) from other objects, for example from the RouteScheduleElement.

The routeWaypointTurnRadius attribute shall contain a non-negative number smaller or equal to 5 NM, since a larger value of this parameter is not practical, and the upper limit provides a higher "junk" detection probability. This field shall be accurate to at least one decimal place. This field presentation precision may vary from 0,1 NM to 0,01 NM. If turn radius is not decided, the value is zero (0,0), for example first waypoint, last waypoint and recommended waypoints from shore.

NOTE It is essential that this route has a strictly defined geometry, and the turn radius, in its waypoint, has a considerable effect on this geometry, and therefore is not indefinite.

The RouteWaypoint objects contain data related to the geometry of the route. The geometry shall contain the latitude and longitude values expressed in degrees. Coordinates shall be presented with at least five decimal places. These values may vary from 0,000 1° (with a

precision in the order of 10 m) to 0,000 000 1° (with a precision in the order of 1 cm) depending on the application area.

Figure 2 and Figure 3 show examples of deleting and inserting waypoints and how routeWaypointID is used, alongside how the waypoints in a route are presented to the end user.

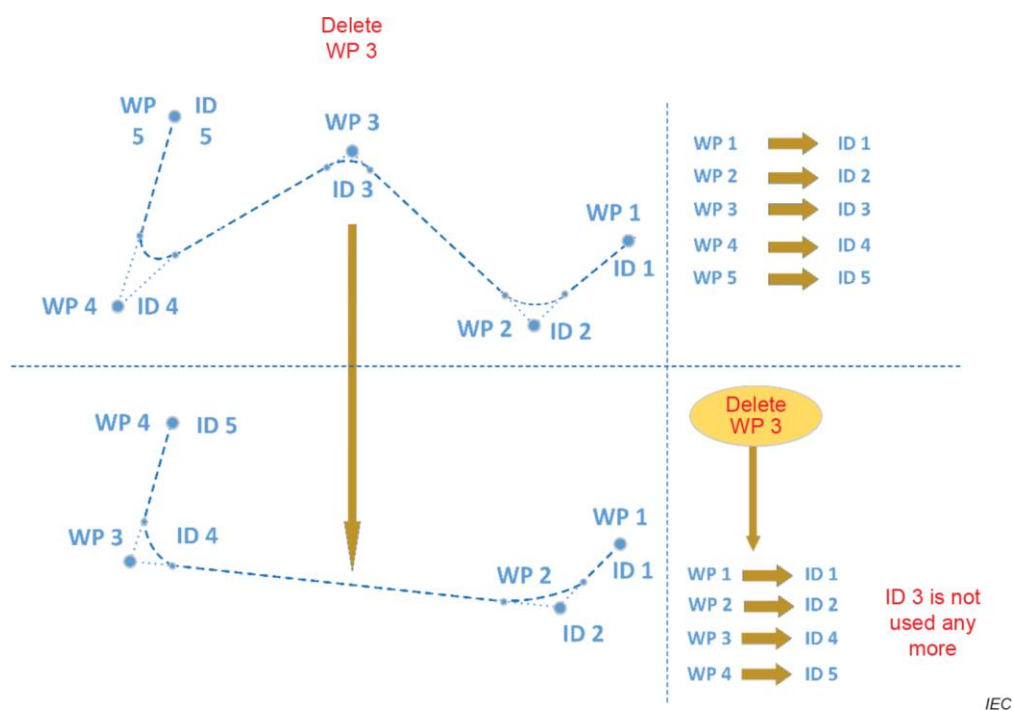


Figure 2 – RouteWaypoint identification usage examples: Delete

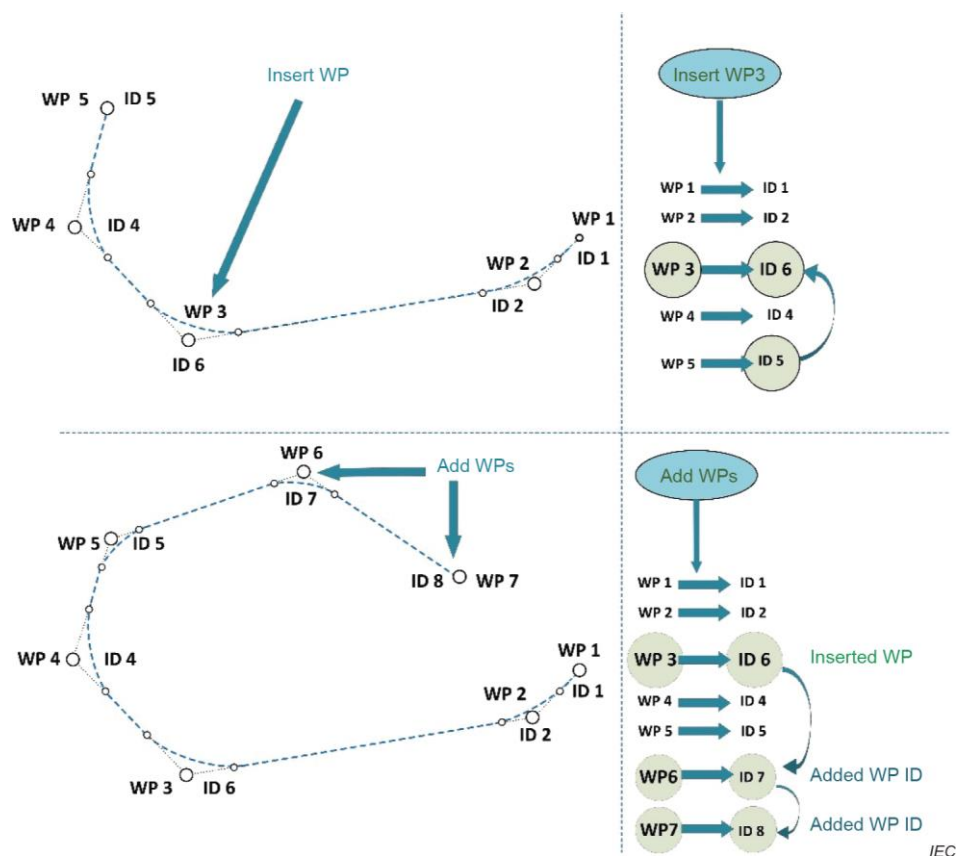


Figure 3 – RouteWaypoint identification usage examples: Insert

Table 12 – RouteWaypoint object attributes

Attribute Name	Description	Data Type	Multipli city	Implement ation	Remar ks
routeWaypointID	Identifier of the waypoint. The identifier shall be unique in the route.	Integer	0..1	Optional	Positiv e integer
routeWaypointName	Name of waypoint	String	0..1	Mandatory	
routeWaypointExternalR eferenceID	Machine readable external reference information related to the waypoint One intended use is to make links to the MRN values available in interoperabilityIdentifier as defined in S-100 based product. Other intended use is to make links to the FOID values available in S-57 ENC charts. For this case of encoding of the string is : <cell identifier>/ FOID For example, "GB400000/1234567890"	Universal Resource Identifier	0..1	Optional	

routeWaypointFixed	Indicator if the route waypoint is fixed or editable	Boolean	0..1	Mandatory	By default , all waypoints are editable unless set to fixed. FALSE : Editable. Deletion or update of the waypoints including waypoint position. TRUE: Fixed. No deletion or update of the waypoint position.
Geometry	Geographical position of the waypoint in degrees Examples: <geometry> <S100:pointProperty> <S100:Point gml:id="RTE.WP.1.PT" srsName= "http://www.opengis.net/def/crs/EPSG/0/4326" > <gml:pos> 59.483136 22.609812 </gml:pos> </S100:Point> </S100:pointProperty> </geometry>	GM_Point	1	Mandatory	For value range, see IHO S-100. The minimum resolution is 0,000 1°.
routeWaypointTurnRadii	Turn radius in nautical miles	Real	1	Mandatory	The value range is 0,0 NM to 5,0 NM The maximum resolution is 0,01 NM
routeWaypointExtensions	Additional proprietary information for the Route waypoints specified by the manufacturer	RouteExtensions	0..*	Optional	

7.2.8 RouteWaypointLeg

The RouteWaypointLeg object (see [Figure 4](#) and [Figure 5](#)) is optional for a waypoint which contains related information for a waypoint. The order of the RouteWaypointLeg elements follows the order of the RouteWaypoint elements as defined in RouteWaypoints.

Each route leg is formed within the framework of the set geometry (great circle or rhumb line) on the terrestrial ellipsoid. The routeWaypointLegGeometryType element is mandatory. Each route waypoint leg is formed as the shortest of all the possible segments within the framework of the set geometry in two waypoints. It shall be in the range $-180^\circ \leq \text{lon} \leq 180^\circ$ and $-90^\circ \leq \text{lat} \leq 90^\circ$. With this restriction, each point on the terrestrial surface (except for the poles, which can be corrected by setting zero longitudes only for them) can be uniquely correlated with a lat/lon pair. Moreover, introduction of this restriction permits, as in the case of the turn radius, easy detection of the "junk" longitude values.

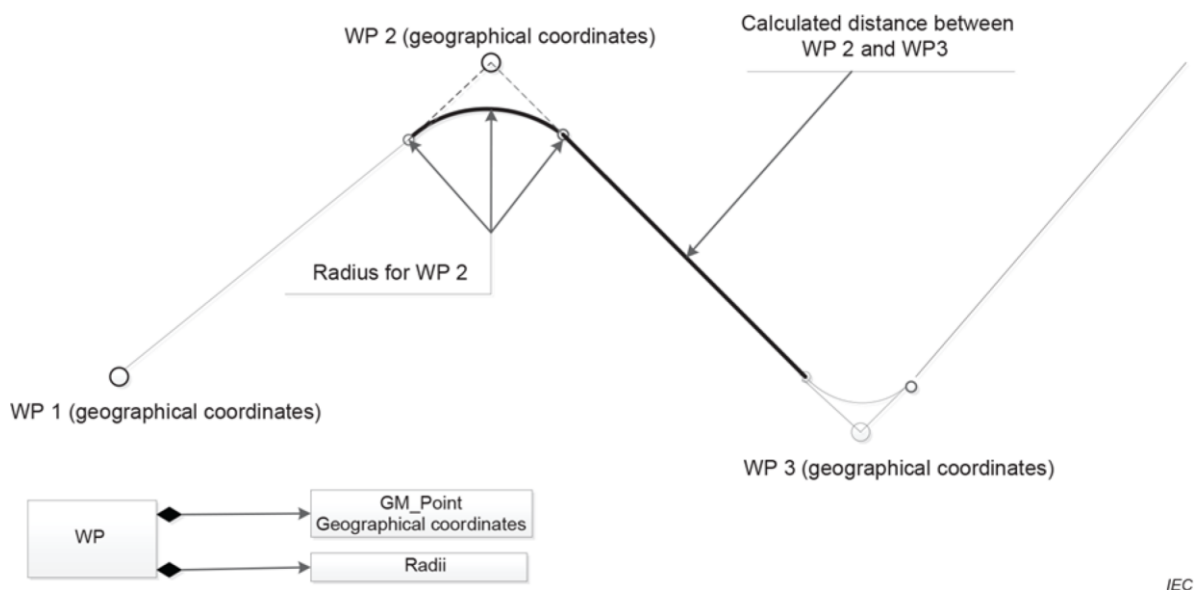


Figure 4 – RouteWaypointLeg distance between WP2 and WP3

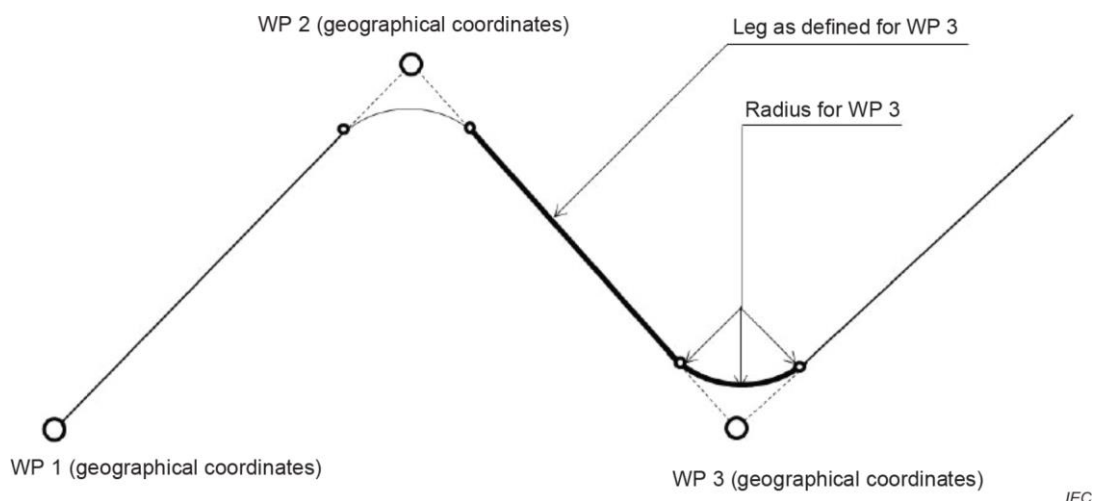
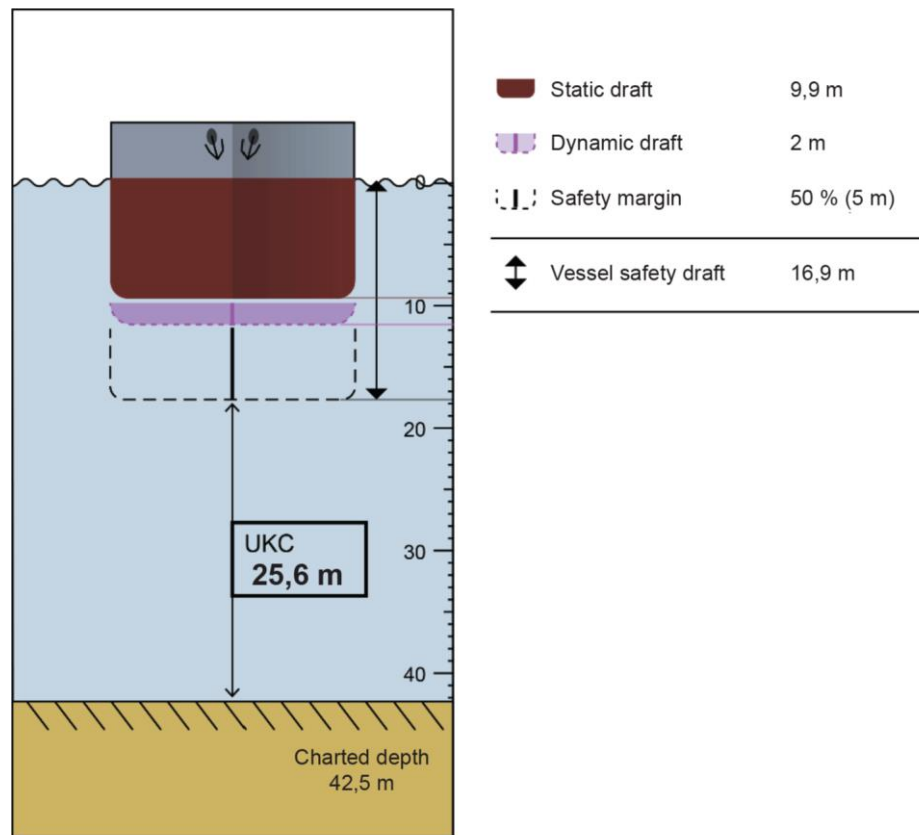


Figure 5 – RouteWaypointLeg parameters belonging to WP3

The routeWaypointLegStarboardXTDL and routeWaypointLegPortXTDL are optional attributes.

The under-keel clearance (see [Figure 6](#)) is a vertical distance between the deepest underwater point of the ship's hull accounting for the water level, dynamic draft, safety margin; and charted

depth. That clearance shall be sufficient to allow the ship's floatability in the most adverse hydrographical and meteorological conditions.



IEC

Figure 6 – Under-keel clearance example

The static draft is the draft of the vessel when not making way or subject to sea and swell influences, i.e. the maximum draft the vessel has loaded to.

The dynamic draft is the draft of the vessel when making way and subject to squat, sea and swell state and increase of draft due to heel when turning.

The safety margin is the draft component including uncertainties such as:

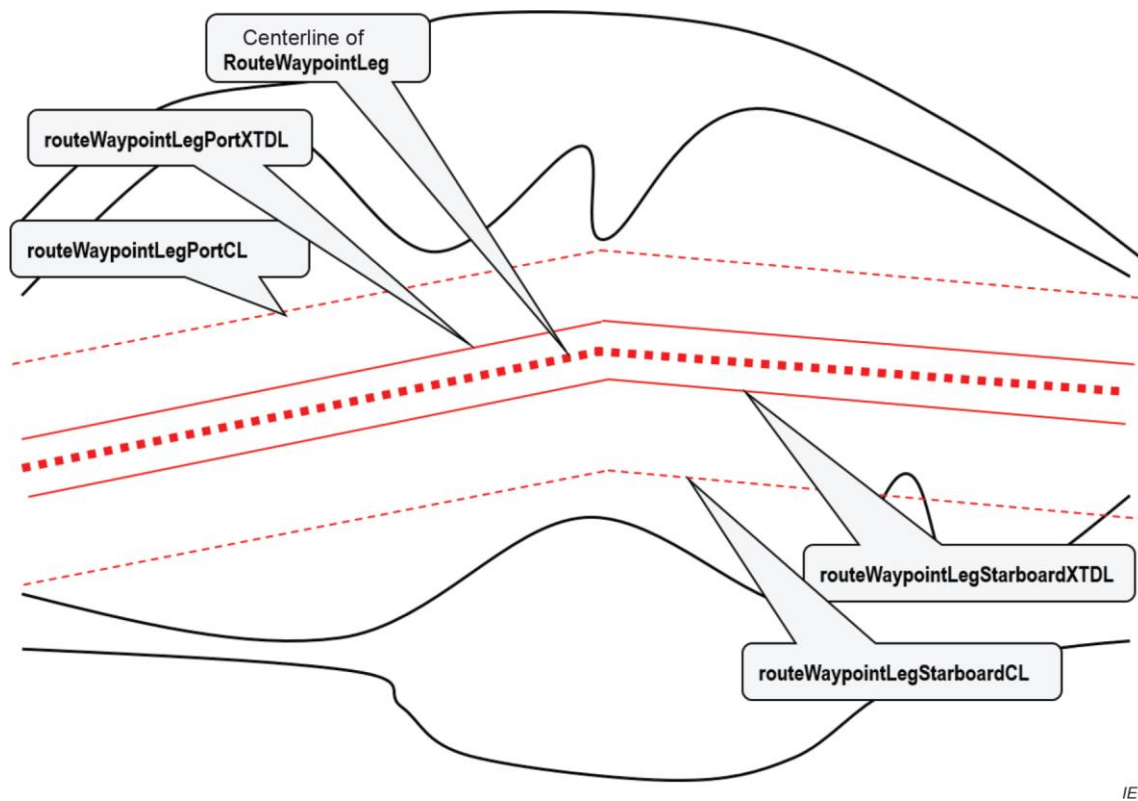
- the accuracy of the hydrographic data (references to reliability are often included on charts CATZOC);
- the vessel's size and handling characteristics;
- changes in the predicted tidal height, caused by wind speed and direction and high or low barometric pressure;
- the nature and stability of the seabed, i.e. sand waves, siltation, pipelines, obstructions etc.

Vessel safety draft is the sum of the static draft, dynamic draft and safety margin.

The waypoint leg area (see [Table 13](#)) is the area within a perpendicular distance from the center line of the leg as specified by `routeWaypointLegStarboardCL` and `routeWaypointLegPortCL`. In the case of crossing the 180° meridian, there might be multiple instances of the waypoint leg area. This can be derived from the route plan.

The waypoint leg area is related to the requirement of [IMO MSC 530\(106\)/A.11.3.5](#) for the user defined distance to check prohibited areas, areas with special conditions or navigational hazards. A smaller area within a perpendicular distance of the center line of the leg as specified by `routeWaypointLegStarboardXTDL` and `routeWaypointLegPortXTDL` is related to the

requirement of IMO MSC 530(106)/A.11.4.5 for an alarm when the user specified cross track limit for deviation from the planned route is exceeded. See Figure 7. The waypoint leg centerline is the center line of the leg.



IEC

Figure 7 – RouteWaypointLeg limits example

Table 13 – RouteWaypointLeg object attributes

Attribute name	Description	Data type	Multiplicity	Implementation	Remarks
routeWaypointLegStarboardXTDL	Starboard cross track distance limit. Used during the route monitoring onboard.	Integer	0..1	Optional	Unit: metre The value range is 1 m to 10 000 m. The resolution is 1 m.
routeWaypointLegPortXTDL	Port cross track distance limit. Used during the route monitoring onboard.	Integer	0..1	Optional	Unit: metre The value range is 1 m to 10 000 m. The resolution is 1 m.
routeWaypointLegStarboardCL	Starboard cross track distance check limit	Integer	0..1	Optional	Unit: metre The value range is 1 m to 10 000 m.

	Used to check route plan against the safety contour, areas with special condition and navigational hazards.				The resolution is 1 m.
routeWaypointLegPortCL	Port cross track distance check limit. Used to check route plan against the safety contour, areas with special condition and navigational hazards.	Integer	0..1	Optional	Unit: metre The value range is 1 m to 10 000 m. The resolution is 1 m.
routeWaypointLegSafetyContour	Planned safety contour	Real	0..1	Optional	Unit: metre The resolution is 0,1 m.
routeWaypointLegSafetyDepth	Planned safety depth	Real	0..1	Optional	Unit: metre The resolution is 0,1 m.
routeWaypointLegGeometryType	Geometry type of leg	Enum	1	Mandatory	Default value is 1 = loxodrome. 1: loxodrome (= rhumb line), 2: orthodrome (= great circle)
routeWaypointLegSOGMin	Regulatory lowest speed over ground	Real	0..1	Optional	Unit: knots, speed over ground
routeWaypointLegSOGMax	Regulatory highest speed over ground	Real	0..1	Optional	Unit: knots, speed over ground
routeWaypointLegSTWMax	Maximum safe speed through water	Real	0..1	Optional	Unit: knots, speed through water
routeWaypointLegSTWMin	Minimum safe speed through water	Real	0..1	Optional	Unit: knots, speed through water
routeWaypointLegDraft	Planned static draft, maximum	Real	0..1	Optional	Unit: metre

					The resolution is 0,1 m.
routeWaypointLegDraftForward	Planned static draft forward	Real	0..1	Optional	Unit: metre The resolution is 0,1 m.
routeWaypointLegDraftAft	Planned static draft Aft	Real	0..1	Optional	Unit: metre The resolution is 0,1 m.
routeWaypointLegDraftMax	Maximum draft of the route waypoint leg for all vessels	Real	0..1	Optional	Unit : metre The resolution is 0,01 m.
routeWaypointLegAirDraftMax	Maximum air draft of the route waypoint leg for all vessels	Real	0..1	Optional	Unit : metre The resolution is 0,01 m.
routeWaypointLegBeamMax	Maximum vessel beam of the route waypoint leg for all vessels	Real	0..1	Optional	Unit : metre The resolution is 0,01 m.
routeWaypointLegLengthMax	Maximum vessel length of the route waypoint leg for all vessels	Real	0..1	Optional	Unit : metre The resolution is 0,01 m.
routeWaypointLegStaticUKC	Minimum static UKC on the leg	Real	0..1	Optional	Unit: metre The resolution is 0,1 m.
routeWaypointLegDynamicUKC	Minimum dynamic UKC on the leg	Real	0..1	Optional	Unit: metre The resolution is 0,1 m.
routeWaypointLegSafetyMargin	Draft component including uncertainties	Real	0..1	Optional	Unit: metre The resolution is 0,1 m.
routeWaypointLegNote	Note for the route waypoint leg	String	0..1	Optional	
routeWaypointLegIssue	Safety issue for the route waypoint leg	String	0..1	Optional	
routeWaypointLegExtensions	Additional proprietary information for the RouteWaypointLegs specified by the manufacturer	RouteExtensions	0.. *	Optional	

7.3 Information types

7.3.1 General

Information types are identifiable pieces of information in a dataset that can be shared between other features. They have attributes but have no relationship to any geometry. Information types may reference other information types.

7.3.2 RouteSchedules

The feature RouteSchedules described in [Table 14](#) shall contain zero or one RouteSchedule object.

The three main elements of a schedule are: [ETA](#), [ETD](#), and speed. These schedule elements can be set manually by the operator or calculated by machine. See [Table 14](#) to [Table 17](#).

Each schedule element is associated with a routeWaypointID. When a RouteScheduleManual is used, the schedule element is set by the operator. When a RouteScheduleCalculated is used, all schedule element values except manual elements are set by machine. The schedule elements of passed waypoints may be omitted.

If the route geometry changes, all the calculated elements for schedules shall be reset, as the calculation results basically depend on the geometry.

7.3.3 RouteSchedule

The schedules contain three distinguishable parts: manual schedule (RouteScheduleManual), calculated schedule (RouteScheduleCalculated), and recommended schedule (RouteScheduleRecommended). The manual schedule is used to indicate manually entered values which are the basis for the schedule calculation/estimation. The main goal for the ship is to navigate safely to meet the manual schedule.

The RouteScheduleManual contains a RouteScheduleElement object that describe time preferences and calculation restrictions for each leg or waypoint of the route. A waypoint shall have only one associated RouteScheduleElement within a RouteScheduleManual.

NOTE The manually entered values are normally one or several of 1) manually entered planned time of departure from berth, 2) manually entered planned time of arrival to PBG (pilot boarding ground) and/or berth, 3) manually entered planned speed on certain legs, 4) speed constrained by SOGMin/Max on a leg (the regulatory constraints), and the preferred service speed window depending on cargo and weather.

If an external party has entered manual values, the calculated schedule shall be removed or cleared to indicate that it is invalid. Also, if waypoints have been changed, the calculated schedule may be invalid and shall be removed or cleared as a signal to the ship to re-calculate the schedule. Only one active manual schedule is allowed in a route plan.

RouteScheduleRecommended object is used by, from the ship perspective, external actors to recommend or request a new time, for example a port can use the [ETD](#) or [ETA](#) in the recommended schedule to request/recommend a new time for departure or arrival.

RouteScheduleCalculated object contains a sequence of RouteScheduleElement objects that store calculations results according to user's preferences available from the RouteScheduleManual or RouteScheduleRecommended object. A waypoint shall have only one associated RouteScheduleElement within a RouteScheduleCalculated object.

The calculated schedule contains manually entered values and calculated estimations on waypoints between the manually set times. Hence, the calculated schedule is more complete with times on each waypoint. It is calculated based on manually entered values and regulatory speeds on legs. The calculated schedule is set by the ship but can also be calculated onshore by for example a route optimization provider.

If the receiving application uses route information only for display or information purposes, it shall use the RouteScheduleElementCalculated object since this has all the schedule elements.

Table 14 – RouteSchedules object attributes

Attribute name	Description	Data type	Multiplicity	Implementation	Remarks
routeSchedulesExtensions	Additional proprietary information for the route schedules specified by the manufacturer	RouteExtensions	0.. *	Optional	

Table 15 – RouteScheduleManual object attributes

Attribute name	Description	Data type	Multiplicity	Implementation	Remarks
routeScheduleManualExtensions	Additional proprietary information for the route schedule manual specified by the manufacturer	RouteExtensions	0.. *	Optional	

Table 16 – RouteScheduleCalculated object attributes

Attribute name	Description	Data type	Multiplicity	Implementation	Remarks
routeScheduleCalculatedExtensions	Additional proprietary information for the route schedule calculated and specified by the manufacturer	RouteExtensions	0.. *	Optional	

Table 17 – RouteScheduleRecommended object attributes

Attribute Name	Description	Data Type	Multiplicity	Implementation	Remarks
routeScheduleRecommendedExtensions	Additional proprietary information for the route schedule recommended and specified by the manufacturer	RouteExtensions	0.. *	Optional	

Table 18 – RouteSchedule object attributes

Attribute Name	Description	Data Type	Multiplicity	Implementation	Remarks
routeScheduleID	Identifier of the schedule. This identifier is unique in the route	Integer	1	Mandatory	positive integer

routeScheduleName	Name of schedule	String	0..1	Optional	Human readable text
routeScheduleExtensions	Additional proprietary information for the route schedule specified by the manufacturer	RouteExtensions	0.. *	Optional	

7.3.4 RouteScheduleManual/RouteScheduleCalculated/RouteScheduleRecommended

The RouteScheduleCalculated shall contain both parameters consistent with the manually set values (presented in RouteScheduleManual or RouteScheduleRecommended), and the calculated values.

Consistency means equal value intervals for the routeScheduleElementETA, routeScheduleElementETD (with some reservations for this parameter which will be referred to below) and equality of the rest of parameters, as it is essentially dependent on the specific routeScheduleElementETA, routeScheduleElementETD values rather than on their intervals.

The schedule is considered complete if:

- its RouteScheduleCalculated element contains **ETD** parameter values for all the waypoints except the last one, and the **ETA** and speed parameter values for all the waypoints except the first one;
- the RouteScheduleManual element is not in contradiction with the RouteScheduleCalculated element, and the data for RouteScheduleManual is sufficient for recalculating the schedule.

7.3.5 RouteScheduleElement

The routeScheduleID (see [Table 18](#)) is intended for machine processing. The routeScheduleName is intended for the human operator. A unique routeScheduleID shall be set for each RouteSchedule object. The routeScheduleName attribute is optional, and there may be several schedules with the same name within the framework of one route.

NOTE 1 The routeScheduleName attribute is intended mainly for making it easier for an operator handling several schedules for one and the same route, to find the necessary schedule and distinguish the schedules from one another.

NOTE 2 It is helpful to use a globally unique identifier (GUID) for a routeScheduleID in the routeSchedule, to avoid problems associated with the merging of two versions of the same route from different sources, since the GUID guarantees that the schedules would not intersect, and that one could be certain about which schedules are common.

When all/any of the following attributes are changed,

- routeScheduleElementETA;
- routeScheduleElementETD (see [Table 19](#));
- routeScheduleElementPlanSOG;

there is a need to set intervals appropriately by filling in the following attributes:

- routeScheduleElementETDWindowBefore;
- routeScheduleElementETDWindowAfter;
- routeScheduleElementETAWindowBefore;
- routeScheduleElementETAWindowAfter.

All the fields describing a certain time interval (routeScheduleElementETAWindowAfter, routeScheduleElementETDWindowAfter, routeScheduleElementETAWindowBefore, routeScheduleElementETDWindowBefore) shall have the integer format with minutes. When the interval length is more than 24 h, and comes to for example 37 h 27 min, this shall be expressed as 2247.

7.3.6 RouteInfo

The routeInfoName (see [Table 20](#)) attribute is mandatory, intended for human reading purposes, and shall not be empty or consist of space symbols only.

When a route plan is exchanged in any given status, the validity period can be defined with a start and stop, or eventually only one of them. The attributes routeInfoValidityStart/routeInfoValidityEnd shall be understood by the receiving party that the route shall be used only within the given period. For a reference route (see [A.11](#)), this implies that the use of the route for passage planning shall not be possible outside the given time window. For a recommended route for example, giving a recommended [ETA](#), the validity period implies that the receiver shall not be able to base passage planning on the received route after this time window, and eventually shall request a new recommendation (see [A.10](#)). For a service replying with an under keel clearance management (see [A.6](#)) condition, the validity period shall be understood as the period during which the affected ship has to reply that the recommended route is to be used, and given the status of "used for monitoring". This understanding shall apply to any use of these two attributes.

The routeInfoAuthor attribute may specify not only the name with initials, but also the organizational position in human readable format. This attribute is not mandatory but important to support understanding by the receivers of a route.

The routeInfoEditionTime is mandatory and is the time when the given route was created or updated.

The routeInfoStatus field is mandatory. The routeInfoStatus shall be used to give the status of the route in order to support the various scenarios, for example route optimization and route cross check. The intention of the "Terminated" status is to inform receivers of a route plan that the route has been completed or stopped/cancelled; for example if a route is cancelled, possible previous receivers need to be made aware about this, whether or not they are given access rights to the route that "replaces" the cancelled one. [Figure 8](#) describes typical transitions of routeInfoStatus values for a ship. The route planning typically starts with an initial route or when a ship receives reference routes (routeInfoStatus=1 (Initial)). Some attributes in an initial route may be added or modified. When a route plan is ready to use, it changes state to "Planned" (routeInfoStatus=2).

The planned route may be sent to shore for processing; received routes are normally updated in the planned route. At any time, the ship may receive a recommended route (routeInfoStatus=3), an acknowledged route (routeInfoStatus=4) or a route issues (routeInfoStatus=9).

When route is loaded into ECDIS for monitoring, it changes status to "Used for monitoring" (routeInfoStatus=5).

If route is not finalised when unloaded, the route changes to status "Planned" (routeInfoStatus=2). When route is unloaded from ECDIS and the complete route plan is finalised or cancelled, the route changes status to "Terminated" (routeInfoStatus=6).

[Figure 9](#) describes typical transitions of routeInfoStatus values for a shore side service.

Shore is waiting for a route from a ship, or a route request from a ship. If a received route is planned or used for monitoring, processing is required. After the processing, the response is sent back to the ship with either a recommended route, an acknowledged route, a route issue, an incomplete route or a route error.

When the shore receives a terminated route, it ends all processing related with the route plan. When the shore receives the route request with an initial route or when it needs to send a reference route, it provides a reference route to the ship.

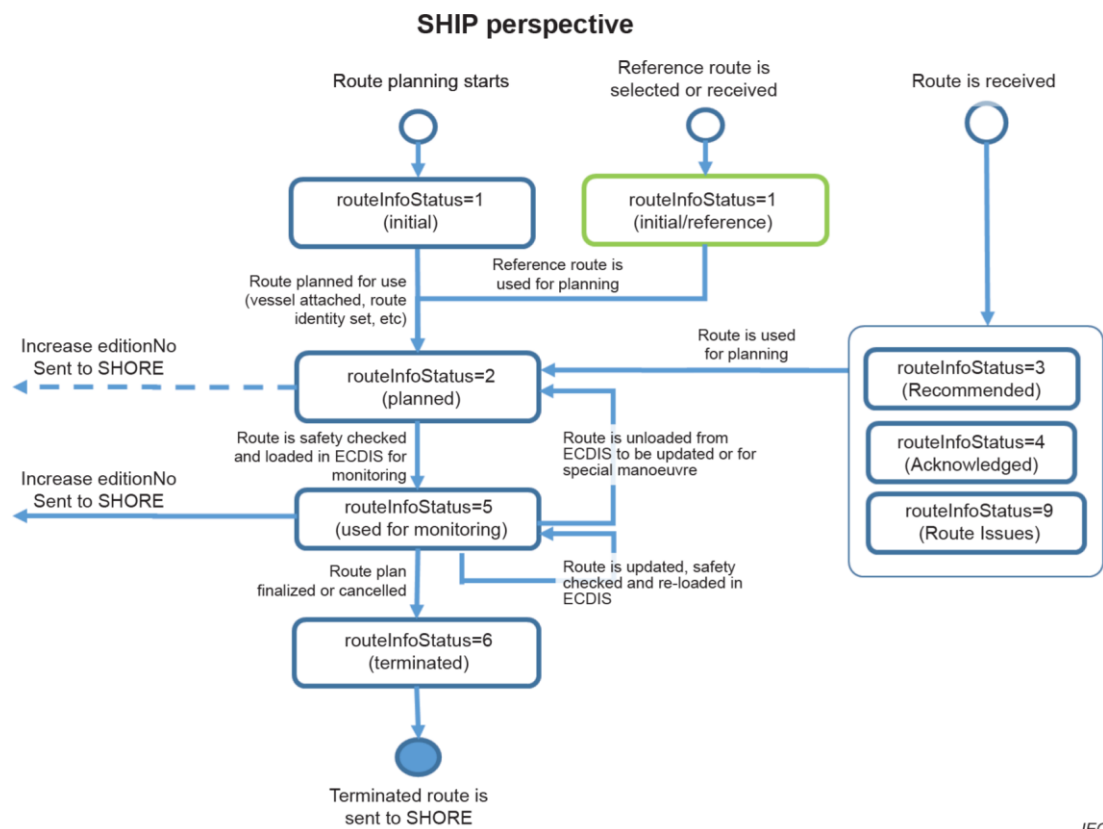


Figure 8 – State diagram for route status from ship perspective

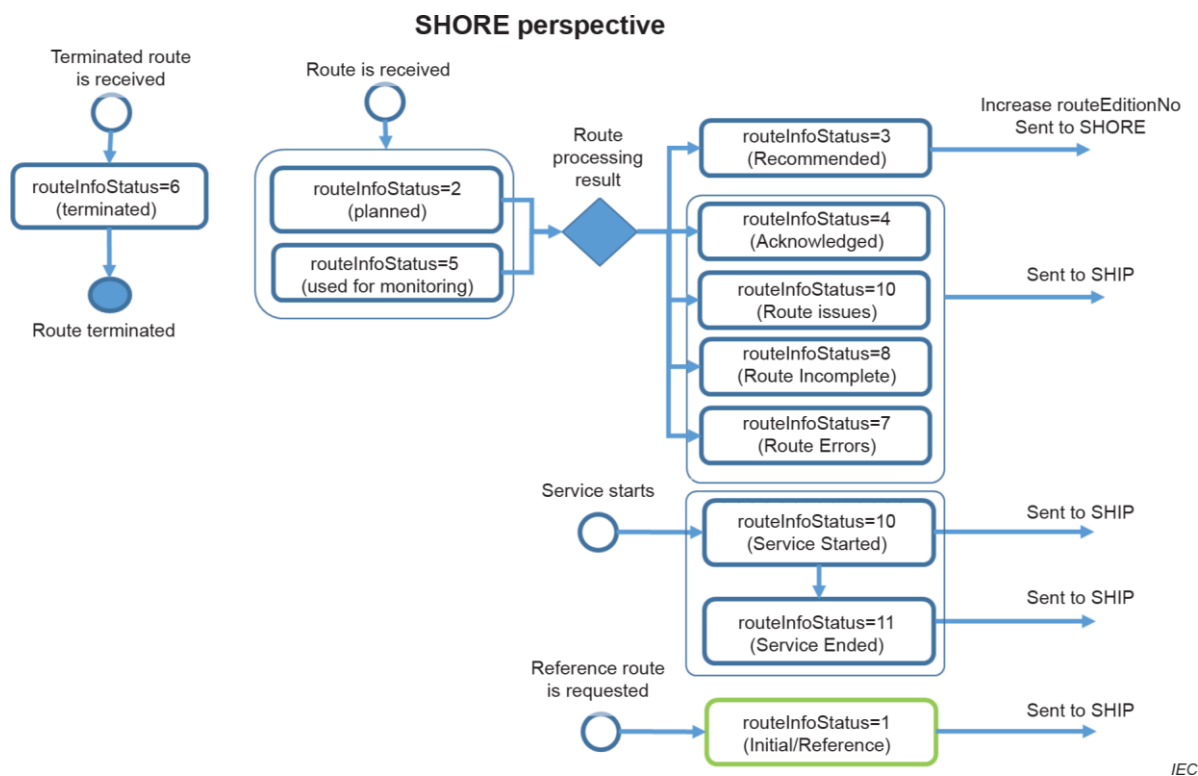


Figure 9 – State diagram of route status from shore perspective

Table 19 – RouteScheduleElement object attributes

Attribute name	Description	Data type	Multiplicity	Implementation	Remarks
routeWaypointID	Waypoint identifier of the schedule	Integer	1	Mandatory	
routeScheduleElementPlanSOG	Planned speed over ground	Real	0..1	Mandatory	Unit: knots, speed over ground
routeScheduleElementETD	Planned or recommended time of departure represented by estimated time of departure (ETD by schedule or by SOG)	DateTime	0..1	Mandatory	
routeScheduleElementETA	Planned or recommended time of arrival represented by estimated time of arrival (ETA by Schedule or by SOG)	DateTime	0..1	Mandatory	
routeScheduleElementETDWindowBefore	Describes the period of time before planned or recommended time of departure	integer	0..1	Optional	UNIT: minutes minutes to ETD
routeScheduleElementETDWindowAfter	Describes the period of time after planned or recommended time of departure	Integer	0..1	Optional	UNIT: minutes minutes after ETD
routeScheduleElementETAWindowBefore	Describes the period of time before planned or recommended time of arrival	integer	0..1	Optional	UNIT: minutes minutes to ETA
routeScheduleElementETAWindowAfter	Describes the period of time after planned or recommended time of arrival	Integer	0..1	Optional	UNIT: minutes minutes after ETA

routeScheduleElementNote	Notes for the route schedule element	String	0..1	Optional	
routeScheduleElementExtensions	Additional proprietary information for the route schedule element specified by the manufacturer	RouteExtensions	0..1	Optional	

Table 20 – RouteInfo object attributes

Attribute name	Description	Data type	Multiplicity	Implementation	Remarks
routeInfoName	Name of the route	String	1	Mandatory	Human readable text
routeInfoAuthor	Author of the route	String	0..1	Mandatory	Human readable text
routeInfoEditionTime	Time this edition of route plan is edited	DateTime	0..1	Mandatory	In UTC time, for example 2019-06-26T14:22:02 Z
routeInfoDescription	Additional information for the status of the route, i.e. specific error message and/or cause of the route change and/or any other detail to consider before further use of this route plan and/or the purpose of sending a route plan and/or why this route is recommended.	String	0..1	Mandatory	Human readable text
routeInfoStatus	Enumerated status value of the route	Enum	1	Mandatory	See Table 21
routeInfoValidityStart	Start of validity of route plan	DateTime	0..1	Mandatory	
routeInfoValidityEnd	End of validity of route plan	DateTime	0..1	Mandatory	
routeInfoDeparturePortID1	Primary identifier for departure port given by UN/LOCODE	String	0..1	Optional	UN/LOCODE as found from UNECE's code list

routeInfoDeparturePortID2	Secondary identifier for departure port given by free text string	String	0..1	Optional	Free text, e.g. location name, berth name, other identifier
routeInfoDeparturePortCall	Reference to port call identifier in departing port	String	0..1	Optional	
routeInfoArrivalPortID1	Primary identifier for arrival port given by UN/LOCODE	String	0..1	Optional	UN/LOCODE as found from UNECE's code list
routeInfoArrivalPortID2	Secondary identifier for arrival port given by free text string	String	0..1	Optional	Free text, e.g. location name, berth name, other identifier
routeInfoArrivalPortCall	Reference to port call identifier in arriving port	String	0..1	Optional	
routeInfoReferencePrevRoute	Reference previous route	String	0..1	Optional	
routeInfoReferenceNextRoute	Reference next route	String	0..1	Optional	
routeInfoVesselType	Type of ship	Integer	0..1	Optional	See Table 22
routeInfoVesselName	Ship's name	String	0..1	Optional	Any one of these attributes is used for the alternatives for the identification of the vessel
routeInfoVesselMMSI	Ship's MMSI	String	0..1	Mandatory	MMSI is used for vessel identification .
routeInfoVesselCallsign	Ship's call sign	String	0..1	Optional	These attributes complement the identification of the vessel.
routeInfoVesselIMO	Ship's IMO number	String	0..1	Optional	
routeInfoVesselVoyage	Unique voyage identifier	String	0..1	Optional	

	A voyage may have more than one destination and departure locations, but a route plan refers to only one destination and one departure location				
routeInfoVesselHeight	Vessel height measured from the keel to the masthead	Real	0..1	Optional	Unit : metres Resolution is 0,01 m
routeInfoVesselLength	Vessel length overall (LOA)	Real	0..1	Optional	Unit : metres Resolution is 0,01 m
routeInfoVesselBeam	Vessel beam	Real	0..1	Optional	Unit : metres Resolution is 0,01 m
routeInfoDraftMax	Maximum vessel draft	Real	0..1	Optional	Unit : metres Resolution is 0,01 m
routeInfoAirDraftMax	Maximum vessel air draft	Real	0..1	Optional	Unit : metres Resolution is 0,01 m
routeInfoBeamMax	Maximum vessel beam	Real	0..1	Optional	Unit : metres Resolution is 0,01 m
routeInfoLengthMax	Maximum vessel length	Real	0..1	Optional	Unit : metres Resolution is 0,01 m
routeInfoExtensions	Additional proprietary information for the route info specified by the manufacturer	RouteExtensions	0..1	Optional	

Table 21 – Definition of RouteInfoStatus

routeInfoStatus	Human readable text	Description of use case	Actors
1	Initial	Initial route or a reference route if meant for more than one specific route plan	Ship or shore – Ship: Initial route which is created in the route database on the ECDIS (route plan is not loaded into monitoring) or other system onboard. – Service provider (shore): reference routes given from a national authority or from a company. This includes a company making common reference routes for their own vessels, or from a service

			providing routes such as a VTS-service, pilot routes for given areas, routes for winter ice navigation and other appropriate services.
2	Planned	Route and schedule prepared by crew	Ship only Route with one or several schedules, calculated and stored in the route database on the ship (route plan is not loaded into monitoring)
3	Recommended	Route and schedule recommended by 3 rd party service provider	Shore only Recommended route with one or several schedules, calculated by any 3 rd party service provider (weather optimization, auto-routing, route checked, traffic management, etc.) and delivered to the ship or fleet operator.
4	Acknowledged	Checked and acknowledged route from any 3 rd party service provider or from a ship	Ship or shore – Service provider: Acknowledged route verified by 3rd party service provider. – Ship: Acknowledged route from ship to shore, for instance a ship acknowledge to perform a specific search and rescue.
5	Used for monitoring	Loaded for monitoring	Ship only Route with or without schedule is loaded for monitoring in the system on board. This is used only for the active route.
6	Terminated	Route completed or cancelled	Ship only Route plan has been completed or stopped/cancelled, or end of route monitoring
7	Errors	The received route information is invalid according to schema validation or application level context check	Ship, shore
8	Incomplete	Some fields of received route information are missing for this specific use case	Ship, shore
9	Route issues	Route checked by 3 rd party and the comments are available in routeWaypointLegIssue and/or routeInfoDescription attributes	– Shore: Service provider has added routeWaypointLegIssue and/or routeInfoDescription attributes. Route has been checked and disapproved for a given voyage for example by a VTS. The route will then often hold issues on one or more legs (RouteWaypointLegIssue) that should be addressed before resending to the given service, VTS or other. – Ship: After import of the route, inform the user about route check issues and provide textual contents of the routeWaypointLegIssue and/or

			routeInfoDescription attributes for reading.
10	Service started	This status is used for routes sent to a ship confirming a shore based service has started for the given route	Shore only
11	Service ended	This status is used for routes sent to a ship confirming a shore based service has been ended for the given route.	Shore only

Table 22 – Type of ship

Identifier no.	Special craft		
50	Pilot vessel		
51	Search and rescue vessel		
52	Tugs		
53	Port tenders		
54	Vessel with anti-pollution facilities and equipment		
55	Law enforcement vessels		
56	Spare - for assignments to local vessels		
57	Spare - for assignments to local vessels		
58	Medical transports (as defined in the 1949 Geneva Conventions and Additional Protocols)		
59	Ships and aircraft of States not parties to an armed conflict		
Other ships			
First digit	Second digit	First digit	Second digit
1 - Reserved for future use	0 - All ships of this type	-	0 - Fishing
2 - WIG	1 - Carrying DG, HS, or MP, IMO hazard or pollutant category X(2)		1 - Towing
3 - See right column	2-- Carrying DG, HS, or MP, IMO hazard or pollutant category Y(2)	3 - Vessel	2 - Towing and length of the tow exceeds 200 m or breadth exceeds 25 m
4 - HSC	3-- Carrying DG, HS, or MP, IMO hazard or pollutant category Z(2)		3 - Engaged in dredging or underwater operations
5 - See above	4 - Carrying DG, HS, or MP, IMO hazard or pollutant category OS(2)		4 - Engaged in diving operations
	5 - Reserved for future use		5 - Engaged in military operations
6 - Passenger ships	6 - Reserved for future use	-	6 - Sailing
7 - Cargo ships	7 - Reserved for future use	-	7 - Pleasure craft
8 - Tanker(s)	8 - Reserved for future use	-	8 - Reserved for future use
9 - Other types of ship	9 - No additional information	-	9 - Reserved for future use

7.4 Association roles of feature catalogue

An association role describes the nature of relationships. First is the relationship from one feature type to another feature type in a feature association. Second is the relationship from one object (feature or information type) to one information type in an information association. Each association has exactly two roles. Either or both may be a default. This document defines all roles which is used for feature associations and information associations.

Table 23 – Roles of the route plan

Role name	Definition	Code	Mult	Remarks
RouteInfoSet	A pointer to the aggregate in a whole-part relationship	routeInfoSet	1	
RouteInfo	A pointer to the class	routeInfo	1	
RouteWaypointsSet	A pointer to the aggregate in a whole-part relationship	routeWaypointsSet	1	
RouteWaypoints	A pointer to the class	routeWaypoints	0..1	
RouteWaypointSet	A pointer to the aggregate in a whole-part relationship	routeWaypointSet	1	
RouteWaypoint	A pointer to the class	routeWaypoint	2..*	
RouteWaypointLegSet	A pointer to the aggregate in a whole-part relationship	routeWaypointLegSet	1	
RouteWaypointLeg	A pointer to the class	routeWaypointLeg	0..1	
Route Schedules Set	A pointer to the aggregate in a whole-part relationship	routeSchedulesSet	1	
Route Schedules	A pointer to the class	routeSchedules	0..1	
Route Schedule Set	A pointer to the aggregate in a whole-part relationship	routeScheduleSet	1	
Route Schedule	A pointer to the class	routeSchedule	0..*	
RouteScheduleManualSet	A pointer to the member class in a whole-part relationship	routeScheduleManualSet	1	
RouteScheduleManual	A pointer to the class	routeScheduleManual	0..1	

RouteScheduleCalculatedSet	A pointer to the member class in a whole-part relationship	routeScheduleCalculatedSet	1	
RouteScheduleCalculated	A pointer to the class	routeScheduleCalculated	0..1	
RouteScheduleRecommendSet	A pointer to the member class in a whole-part relationship	routeScheduleRecommendSet	1	
RouteScheduleRecommend	A pointer to the class	routeScheduleRecommend	0..1	
RouteScheduleElementManualSet	A pointer to the member class in a whole-part relationship	routeScheduleElementManualSet	0..1	
RouteScheduleElementCalculatedSet	A pointer to the member class in a whole-part relationship	routeScheduleElementCalculatedSet	0..1	
RouteScheduleElementRecommendSet	A pointer to the member class in a whole-part relationship	routeScheduleElementRecommendSet	0..1	
RouteScheduleElement	A pointer to the class	routeScheduleElement	1..*	
RouteActionPointsSet	A pointer to the aggregate in a whole-part relationship	routeActionPointsSet	1	
RouteActionPoints	A pointer to the class	routeActionPoints	0..1	
RouteActionPointSet	A pointer to the aggregate in a whole-part relationship	routeActionPointSet	1	
RouteActionPoint	A pointer to the class	routeActionPoint	0..*	

7.5 Associations of feature catalogue

7.5.1 General

Associations are named relationships between objects (feature or information types). There are two types of associations: feature associations for relationships between two feature types, and information associations for relationships between objects (feature or information type) and an information type.

7.5.2 Feature association

A feature association is the description of the relationship between two instances of feature types. It can be characterized by thematic attributes and has normally two roles. The roles describe the ends of the relationship since such relationship is usually not symmetric (see [Table 24](#)).

Table 24 – Feature association for route plan

Role name	Definition	Code	Role	Role
RouteWaypoints-Composition Composition	Association of between feature types	routeWaypoints-Composition	routeWaypointsSet	routeWaypoints
RouteWaypoint-Composition	Association of between feature types	routeWaypoint-Composition	routeWaypointSet	routeWaypoint
RouteWaypointLeg-Composition	Association of between feature types	routeWaypointLeg-Composition	routeWaypointLegSet	routeWaypointLeg
RouteActionPoint-Composition	Association of between feature types	routeActionPoint-Composition	routeActionPointSet	routeActionPoint
RouteActionPoint-Composition	Association of between feature types	routeActionPoint-Composition	routeActionPointSet	routeActionPoint

7.5.3 Information association

An information association is the description between an arbitrary object (feature or information type) and an information type that supplies additional information for that object (feature or information type). The relationship can be characterized by thematic attributes and a role (see [Table 25](#)).

Table 25 – Information association for route plan

Role name	Definition	Code	Role	Role
RouteInfo Composition	Association of between feature and information type	routeInfoComposition	routeInfoSet	routeInfo
RouteSchedules-Composition	Association of between information types	routeSchedulesComposition	routeSchedulesSet	routeSchedules
RouteSchedule-Composition	Association of between information types	routeScheduleComposition	routeSchedulesSet	routeSchedule
RouteSchedule-Manual Composition	Association of between information types	routeScheduleManual-Composition	routeSchedule-ManualSet	routeSchedule-Manual
RouteSchedule-CalculatedComposition	Association of between information types	routeScheduleCalculated-Composition	routeSchedule-CalculatedSet	routeSchedule-Calculated
RouteSchedule-RecommendComposition	Association of between information types	routeScheduleRecommend-Composition	routeSchedule-RecommendSet	routeSchedule-Recommend

RouteScheduleElement- ManualComposition	Associatio n of between information types	routeScheduleElement- ManualComposition	routeScheduleElement -ManualSet	routeSchedule -Element
RouteSchedule- ElementCalculated Composition	Associatio n of between information types	routeScheduleElement- CalculatedComposition	routeScheduleElement -CalculatedSet	routeSchedule -Element
RouteScheduleElement- RecommendCompositio n	Associatio n of between information types	routeScheduleElement- RecommendComposition	routeScheduleElement -RecommendSet	routeSchedule -Element

7.6 Attributes

7.6.1 General

This document defines attributes as simple and complex. Types for thematic attribute types and spatial types (see 7.2) are used for attributes of feature types and are used for information types in this document (see 7.3).

7.6.2 Simple attribute types

This document uses eight types of simple attributes as defined in Table 26.

Table 26 – Simple attribute types

Type	Definition
Enumeration	A fixed list of valid identifiers of named literal values
Boolean	A value representing binary logic. The value can be either True or False. The default state for Boolean type attributes (i.e. where the attribute is not populated for the feature) is False.
Real	A signed Real (floating point) number consisting of a mantissa and an exponent
Integer	A signed integer number The representation of an integer is encapsulation and usage dependent.
CharacterString	An arbitrary-length sequence of characters including accents and special characters from a repertoire of one of the adopted character sets
Date	A date provides values for year, month and day according to the Gregorian calendar. Character encoding of a date is a string which follows the calendar date format. EXAMPLE 1 EXAMPLE EXAMPLE 1 19980918 (YYYYMMDD)
Time	A time is given by an hour, minute and second in the 24-hour clock system. Character encoding of a time shall be a complete representation of the basic format. Complete representation means that hours, minutes and seconds shall be used. Basic format means that separating characters are omitted. Time is preferably expressed as universal time coordinated (UTC). EXAMPLE 2 EXAMPLE EXAMPLE 2 183059Z Time may be expressed as a local time with a given offset to UTC. EXAMPLE 3 EXAMPLE EXAMPLE 3 183059+0100 Time may be expressed as a local time without a specified offset to UTC. EXAMPLE 4 EXAMPLE EXAMPLE 4 183059 The complete representation of the time of 27 min and 46 s past 15 h locally in Geneva (in winter one hour ahead of UTC), and in New York (in winter five hours behind UTC), together with the indication of the difference between the time scale of local time and UTC, are used as examples.

	Geneva: 152746+0100 New York: 152746-0500 The service hours for a service that is available all year in an area where daylight saving hour affects the offset to UTC could be expressed as local time without specified offset. Opening: 074500 Closing: 161500
DateTime	A DateTime is a combination of a date and a time type. EXAMPLE 5 EXAMPLE: EXAMPLE 5 19850412T101530

7.6.3 Complex attributes

Complex attributes are aggregations of other attributes that are either simple or complex. The aggregation is defined by means of attribute bindings.

RouteExtensions (see [Table 27](#)) is best associated with additional fields for the proprietary purpose in the route plan.

Table 27 – RouteExtensions attributes

Attribute name	Description	Data type	Multiplicity	Implementation	Remarks
routeExtensionsManufacturerId	Unique vendor identifier for the Route extensions	CharacterString	1	Mandatory	
routeExtensionsName	Route extension name	CharacterString	0..1	Optional	
routeExtensionsVersion	RouteExtension version	CharacterString	0..1	Optional	
routeExtensionsNote	Route Extension Note	Character String	1..*	Optional	

7.6.4 Spatial attribute types

Only feature type class RouteWaypoint and RouteActionPoint have a spatial attribute type. RouteWaypoint and RouteActionPoint define GM_Point as a spatial attribute type(see [Table 28](#)).

Table 28 – Spatial attributes

Attribute Name	Description	Data Type	Multiplicity	Implementation	Remarks
geometry	Geographical position of the point in degrees	GM_Point	1	Mandatory	For value range see IHO S-100 The minimum resolution is 0,000 1° Position values shall be set with the axis order of latitude and longitude.

7.7 Binding

7.7.1 General

Bindings consist of attribute bindings, feature bindings and information bindings. The following use cases for attribute bindings exist:

- defining the attributes for feature type;
- defining the attributes for information types;