REPORT ON

S-131 Marine Harbour Infrastructure Database Project

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Contents

Introduction 3

Background of the S-131 database project 3

Project objectives 4

Project deliverables 5

Project Implementation 6

Target schedule 6

Development and testing (2022-2024) 6

Team roles and collaborations 6

Data sources from participant ports/HOs 6

S-131 product spec. and sample dataset 7

Design of the S-131 online tool 7

Feedback to S-131 Product Specification 9

Deployed S-131 platform (in operation since 2024) 14

Introductory Guide 14

User accounts created 14

Port data statistics 15

Feedback from users, support and continued implementation 17
Appendix 1: Project Proposal Summary 21
Phase 1 proposal and recommendations (2021) 21
Phase 2 project proposal (2022) 23
Revised phase 2 project proposal appendices (2023) 27
Revised App.1 – project team leader and members 27
Revised App. 2 – project schedule 27
Appendix 2: Meetings and Progress 28

Introduction

The Marine Harbor Infrastructure Database Project (S-131 project) was approved by the IHO-Singapore Lab Governing Board in April 2022, as the first project of the IHO-Singapore Innovation and Technology Lab.

Background of the S-131 database project

NIPWG8 (March 2021) discussed the way forward for S-131, taking into account that the product spec. development was outsourced with tentative delivery date set in spring 2022. The decision was to incorporate the intention to operate an IHO based database for collecting, storing and provision of marine harbour infrastructure information in the HSSC13 report.

HSSC 13 (May 2021) agreed on the way forward proposed by NIPWG to consider the possibility of setting up a digital infrastructure to collect S-131 compliant Harbour Information and agreed upon to propose an S-131 database project to the IHO-SG Lab [1] for experimentation.

Project proposal part 1[2] was submitted to the IHO-SG Lab in August 2021 by the NIPWG Chair, with the vision as follows:

"The Marine Harbour Infrastructure Database Project is intended to improve berth-to-berth planning by developing an IHO-operated database for harbour information exchange. Data needed for berth-to-berth planning will be submitted by harbours, and can be harvested by the interested hydrographic offices. This function will improve the efficiency of creating S-131 datasets that help facilitate berth-to-berth route creation and harbour calls, and enable smooth transitions between berthing positions. Hydrographic offices implementing the S-100 framework will benefit. The database could be an interim solution and should stay in operational mode until Coastal States or HOs are able to host and operate their own systems to collect marine harbour

[1] HSSC report to C-5
[2] GBM02_2021_2.b_EN_Marine Harbour Infrastructure_v2_20210831

infrastructure information on a national basis. If it is beneficial for stakeholders, the database may remain operational on a longer period of time."

Project proposal part 2 was submitted in 4 February 2022, with "secured resources from CHS (project funding) and NTOU (in-kind support)".

See Appendix 1 for the summary of the phased project proposal.

Figure 1 shows the IHO-Singapore Lab Proposer Session held in 12 April 2022 and the then proposed platform for the S-131 database project.

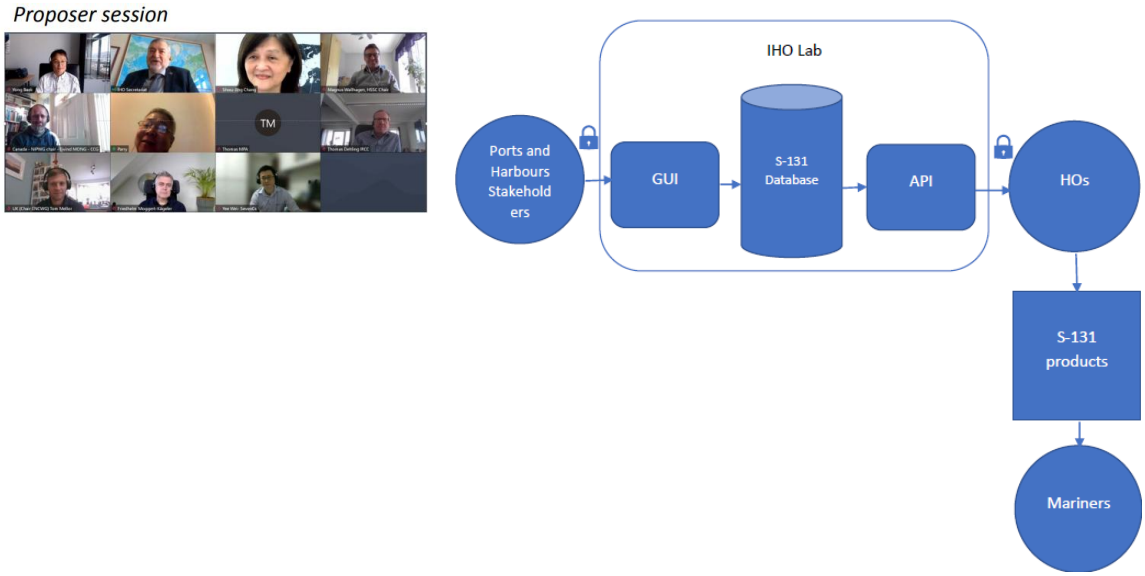


Figure 1 Proposer session and the proposed platform

Project objectives

1. **Create a S-131 database infrastructure and a database** that will improve the information exchange between harbours and hydrographic offices by acting as a neutral repository of harbour information.

2. **Support the creation of S-131 (and S-101 ENC) products** that help ports and shipping to be compliant with IMO A.893(21): safe berth to berth navigation and IMO A.862(20): recommended contents of port information books.

   Demonstrating that Hydrographic Offices and Port Authorities have worked together to discharge their collective SOLAS responsibilities

as per Chapter V Regulation 9: Hydrographic Services.

To that end, support exchange of:

Port infrastructure for Nautical Charts and Sailing Directions

Port depths for Nautical Charts

Port information for Sailing Directions

3. **Facilitate the exchange of information between harbours, HOs and port users** (e.g., mariners, shipping lines, trading floors) compliant with the S-101 and S-131 standards.

Project deliverables

1. Operational S-131 database and infrastructure that is compatible with S-101.

2. A physical implementation of the database suitable for access by contributors and participants.

3. A Graphical User Interface (GUI) that permit the source originators, such as harbour masters, to easily input and validate information, in a secure mode, while also allowing authorised hydrographic offices to review and extract needed information suitable for their products which are to be made available to end-users, the mariners.

4. Create an Application Programming Interface (API) to simplify and expedite the information flow between harbours that have a GIS system in place and authorised hydrographic offices by connecting their GIS systems and extract information.

5. Documentation which includes details about the management and configuration of the database, GUI and API sufficient for database operator.

6. Documentation for all system users and administrators.

Project Implementation

Target schedule

The S-131 project kick-off meeting was held on 22 April 2022. The target was set to “develop an operational S-131 database and infrastructure that is compatible with S-101, then operate in a beta mode with programming support,” as a 3-year project.

Development and testing (2022-2024)

See Appendix 2 for the chronological list of S-131 project meetings, communications, progress and events until the completion of deployment in April 2024.

Team roles and collaborations

The roles and responsibilities of the project team turned out to be rather different from the proposed or planned due to various factors.

Almost all the sequentially schedualled work items had to be executed in parallel and iteratively. Nevertheless, the project team has collaborated to complete the project.

Data sources from participant ports/HOs

Very useful data sources have been provided by participant ports/HOs for use in the development/testing phases. (See the list below)

	data (or documentation)/ports
CHS	ENCs, port data (GIS, CAD)/port of Halifax, port of Montreal
NHS	ENCs, port database/port of Stavanger, port of Kristiansand Sailing Directions approach Stavanger and Kristiansand
MPA	(S-101) ENCs

	Port Guide (2022/2023 Singapore Port Information)

S-131 product spec. and sample dataset

The project propress was depending on the S-131 Product Specification development. The first draft of feature catalogue for S-131 1.0.0 was dated 15 June 2022. The full draft of the S-131 Product Specification was finalized for NIPWG review in January 2023. And the sample dataset (13100AA_SAMPLE_CAHAL_20230115.zip) created by the product specification development was provided also in January 2023.

Design of the S-131 online tool

For the S-131 project, National Taiwan Ocean University (NTOU) team developed a web-based application[3]. It is called "Visible and Interoperable Port (VIP) web" in its online user guide, indicating the goal to make world-wide port data visible and interoperable via the conversion, creation and exchange of port data using S-131 data model.

When NTOU started to develop a Graphical User Interface (GUI) for the S-131 project, S-131 data model was still under discussion. As a first step, global data available from the web, including UN Location Code, SMDG Terminal Code and the Port Facility Number in the Maritime Security Module of IMO GISIS, were collated and processed into GIS layers as default resources for all users. Significant location errors and inconsistency among such global data sources were easily identified via the GUI. (See Figure 2)

The first version presented[4] in NIPWG9 (2022) demonstrated the concept and framework, focusing on the identifications and locations of port facilities. This simple version allows users to search and navigate between ports, query mapped data, add port data and geometry.

[3] NIPWG11-11.6.4A.1 NTOU online tool_experience_feadback_for_S-131 (September 2024)
[4] NIPWG9-12.2.1A S-131 DB project update on system development (September 2022)

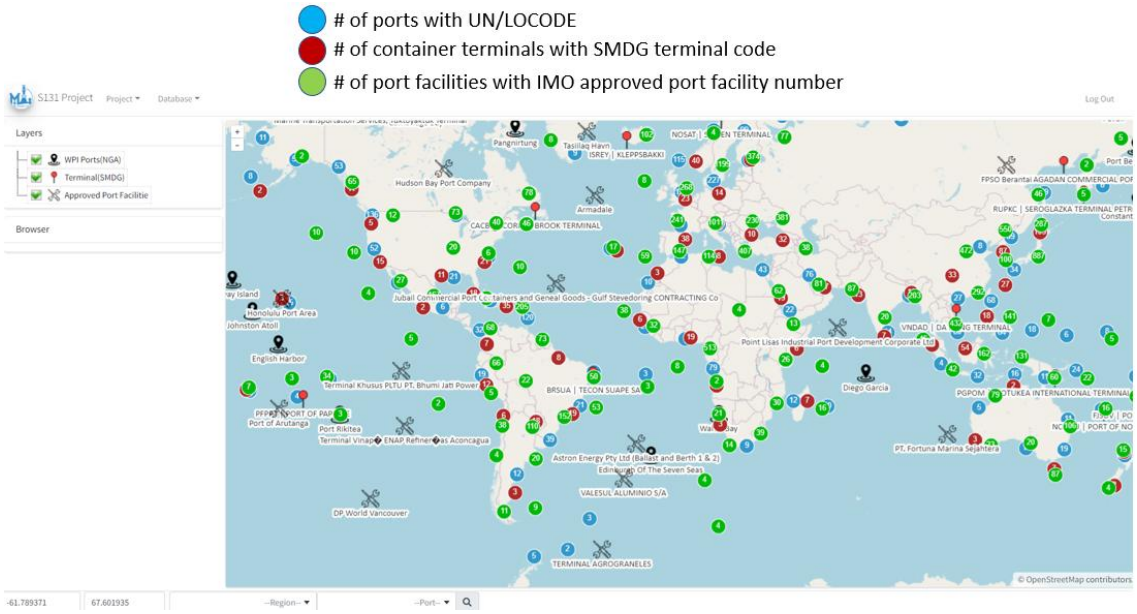


Figure 2 The 1st version demonstrated in NIPWG9 (2022)

With S-131 feature catalogue versions, source data from ports and the sample dataset made available, as well as continuous testing and innovation, the web tool evolved through several major revisions in its design.

The web tool uses UN location code (without a space after the country code) to identify ports and manage S-131 datasets. This is in line with IMO's guidance[5] for the destination field in AIS messages. S-131 could facilitate such usage and significantly improve the consistency.

User Interface (UI) of VIP web tool is driven by the machine-readable Feature Catalogue.

Some data types require special UI design to facilitate user's understanding and entry of data. For example, Association class with attribute such as InclusionType and PermissionType, and the timeIntervalsByDayofWeek complex attribute. Some cases such as S100_TruncatedDate value type involve different formats required for GUI (data entry, viewing), data exchange, and GML encoding. The tool takes care of various cases and differences in the background.

[5] IMO Circular SN.1/Circ.244/Rev.1, Guidance on the use of the UN/LOCODE in the destination field in AIS messages, 4th November 2016

Feedback to S-131 Product Specification

Feedback to S-131 has been reported in a paper[6] submitted to NIPWG. Feedback based on the S-131 sample dataset is as follows:

(1) S-131 sample dataset of the Port of Halifax provides a large variety of examples, making it a very useful asset for the development and testing of the web tool.

(2) Errors encountered could be in the sample dataset, which seems inevitable because the sample dataset has been created without a usable S-131 editing tool. Errors found in the sample dataset include mismatch between fileReference and the file name of the support file, fileLocator not found in the referenced HTML file, AnchorBerth objects all wrongly tagged as AnchorageArea. Such error types could be included into S-131 validation checks.

(3) One error found in S-131 Ed.1.0.0 Feature Catalogue is that the Applicability information type has an informationBinding to vslLocation (FeatureType objects) tagged as informationType. It was also found that timeIntervalsByDayofWeek example given in DCEG 2.4.10.4 should have dayOfWeekIsRange = 0 (False) instead of 1 (True), for the case "on Thursdays and Saturdays".

(4) Multiple levels of inheritance in the data model and feature catalogue should be reconsidered and used only if necessary. In S-131 Ed.1.0.0, all feature types have 4 levels of super types, e.g., Berth→ Layout→ Supervised Area→ Organization Contact Area→ Feature Type, and Dry Dock→ Harbour Physical Infrastructure→ Supervised Area→ Organization Contact Area→ Feature Type. Supervised Area and Organization Contact Area are simply for adding information binding with Authority and Contact Details respectively. Why not merge such information bindings into the Feature Type?

[6] NIPWG11-11.6.4A.1 NTOU online tool_experience_feadback_for_S-131 (September 2024)

(5) The hierarchy of complex attributes should be minimized as appropriate, for the sake of not only the software development, but also the data producer and end user of the data product. Currently the extreme case reaches 4 levels, e.g., text/ information/ textContent/ generalPortDescription/ generalHarbourInformation.

Based on Singapore Port Information (in PDF) and some S-101 data, NTOU team tested the creation of S-131 dataset for SGSIN via the web tool. This work resulted in the following feedback:

1. Berth Pocket

   Berth Pocket is modelled in S-131 Ed.1.0.0 as a Waterway Area. In S-131's Waterway Area, the depth information can only be encoded as textual description. Apparently, remodelling is needed.

   Relevant comparison is provided below, for reference.

S-131 Ed.1.0.0	ENC data (SGSIN)	Guide for Nautical Data
Waterway Area: categoryOfPortSection=3 (Berth Pocket) depthsDescription: categoryOfDepthDescription textContent locationByText markedBy --- [inherited from Feature Type] globalLocationNumber featureName reportedDate textContent …	Dredged Area (DRGARE): OBJNAM= Brani Terminal Berth B7 DRVAL1=15 (m) TECSOU=3 (multi-beam) SOUDAT=20221018	Berth Pocket: Global Location Number Name Chart Datum Maintained Depth Nature of Seabed Latitude/Longitude

2. Berth, Berth Position and Fender

   From the S-131 data model as extracted below, Berth Position would seem redundant, when Berth objects are encoded as point type. The IHO definition of Berth Position is "a specific position within a berth where a vessel may be moored or anchored." For the Berth Position feature type, the multiplicity of bollardNumber (and metreMarkNumber, manifordNumber) should be corrected from [0..2] into [0..1].

S-131 Ed.1.0.0		Guide for Nautical Data
Berth (P, C, S)	Berth Position (P)	Berth – types Anchor Berth Fender or Breasting Dolphin Mole Multi Buoy Mooring (MBM) Berth Open Face Wharf Pier (Jetty) Quay Ramp Slipway Solid Face Wharf Tie-Up Wall Wharf ---------- Berth Position – types bollard no. meter mark no. loading arm/manifold no. ramp no.
attributes: minimumBerthDepth elevation cathodicProtectionSystem methodOfSecuring uNLocationCode terminalIdentifier gLNExtension availableBerthingLength bollardDescription bollardPull categoryOfBerthLocation bollardNumber: [0..2] metreMarkNumber [0..2] manifordNumber[0..2] rampNumber [0..1]..	attributes: gLNExtension availableBerthingLength bollardDescription bollardPull bollardNumber: [0..2] metreMarkNumber [0..2] manifordNumber[0..2] rampNumber [0..1]..	

‘Fender’ is not mentioned in S-131 data product specification. In S-101, ‘Fender’ is in the ‘Category of Shoreline Construction’ enumeration, while ‘Fender or Breasting Dolphin’ is in the ‘Category of Dolphin’ enumeration.

3. Category of Cargo

   In S-131 Ed.1.0.0, only the Terminal feature type and the Applicability information type have the Category of Cargo attribute binding. This attribute should be added to Berth, Anchor Berth, and Anchorage Area feature types, as in the S-101 Ed.2.0.0.

4. Category of Harbour Facility

   Category of Harbour Facility attribute type in S-131 is bound to several feature types, each with a subset of permitted values, as shown in the Table below.

   DCEG says that “in S-131 the Harbour Facility feature is used only for encoding the locations of ship lifts and straddle carriers”. According to GI Registry, NIPWG’s proposals for Ship Lift and Straddle Carrier to be new feature types are already accepted. Will these two then become feature types in S-131 Ed.2.0.0?

   The Harbour Facility feature type might need to be kept for the encoding of whatever not yet explicitly modelled, such as electricity

connection point, emergency response equipment, etc. On the other hand, it seems not a good idea to use the Category of Harbour Facility attribute for all, i.e., keep expanding the enumerations then use a subset of it via permitted values.

		S-131 Ed.1.0.0				S-101
		Terminal	Harbour Area Section	Harbour Area Administrative	Harbour Facility	Harbour Facility
	Category of Harbour Facility					
1	RoRo Terminal	1		1		1
3	Ferry Terminal	3		3		3
4	Fishing Harbour	5	4	4		4
5	Yacht Harbour/Marina		5	5		5
6	Naval Base		6	6		6
7	Tanker Terminal	7		7		7
8	Passenger Terminal	8		8		8
9	Shipyard		9	9		9
10	Container Terminal	10		10		10
11	Bulk Terminal	11		11		11
12	Ship Lift			12 (why ?)	12	12
13	Straddle Carrier			13 (why ?)	13	13
14	Service Harbour		14	14		14
15	Pilotage Service		15	15		15
16	Service and Repair		16			
17	Quarantine Station		17			

For the specific S-131 feature type ‘Terminal’, a Category of Terminal attribute would be better than the Category of Harbour Facility, in terms of data modelling, encoding and use of the data.

5. Shipyard, Docks, Repair Berths, Slipway and Cranes

In the Singapore Port Information (guide), shipyards are listed under the section “Docks and Repair Berths”. One shipyard has a coordinate, followed by information tables of wharf/berth, dry docks, floating docks, slipway, repair berths, mooring quay, cranes, etc. This provides good use cases for data modelling and DCEG for S-131 Ed.2.0.0.

It is noted that Crane, a feature type in S-101, is not found in S-131. The information table of cranes will then have to be encoded in S-131 by using a fileReference to HTML file via textContent attribute of other features.

Slipway is considered a type of Berth in the Guide of Nautical Data. Both Slipway and Crane shoud be included in the data model of S-131.

6. Pilot Disembarkation Grounds

   There are 10 pilot disembarkation grounds listed in the Singapore Port Information document. ‘Disembarkation’ is a listed value in the Pilot Movement enumeration, used in S-101 and S-127. Pilot Movement attribute should be added to S-131’s Pilot Boarding Place.

7. Bollard, Dolphin, Mooring Buoy

   Bollard is a category of mooring/warping facility in S-57 and S-131. S-101 has already split the Mooring Warping Facility, remodelling Bollard, Dolphin, and Mooring Buoy as separate feature types. Relevant remodelling in S-101 should be considered in the revision of S-131.

8. Data modelling: Attribute vs Association

   Provided source data of ports, such as NOKRS, NOSVG, CAMTR, TWTXG, contain hundreds to over one thousand bollards. Large amount of data can be easily imported and batch converted into S-131 data model via the tool, by applying mapping rules to the uploaded resource. However, any additional feature binding or information binding would require extra editing work and make the data less easy to maintain.

   For the data model, unless sharing among multiple objects is required, specific attribute binding is a better way than associations. Data modelling could also consider to make use of the interoperability identifier, to facilitate S-131 data maintenance and exchange.

Deployed S-131 platform (in operation since 2024)

The S-131 platform is hosted in the AWS (Amazon Web Service) cloud infrastructure provided by the IHO-Singapore Lab, with the server located in the Asia-Pacific (Singapore) Region. The link is http://www.port-data.net/ or https://www.port-data.net/s131/

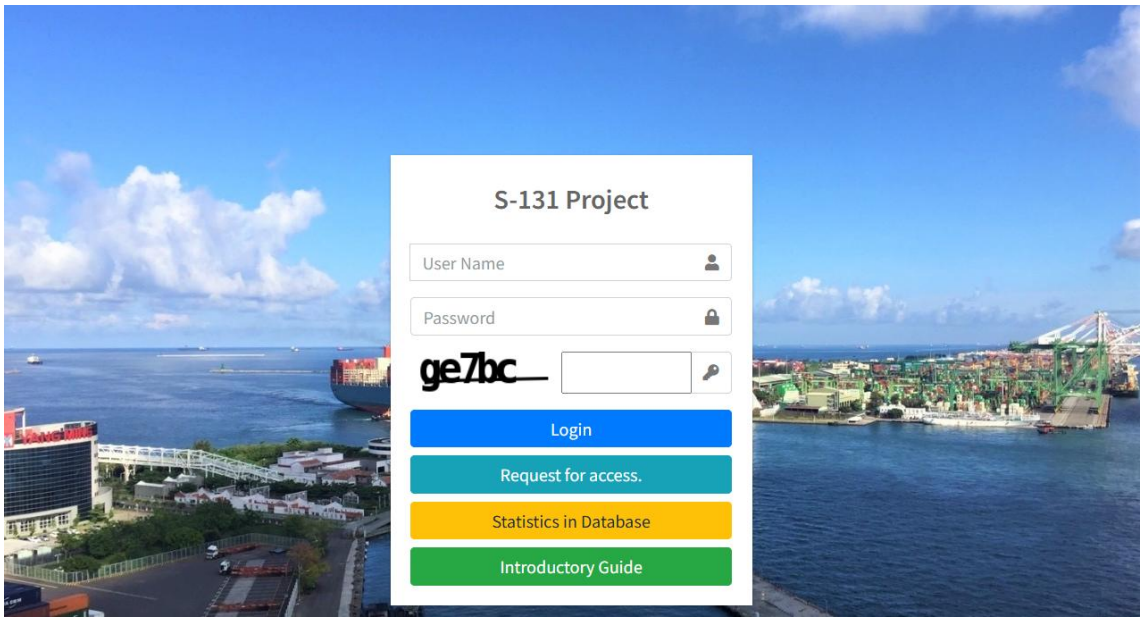


Figure 3 The S-131 platform hosted on AWS by IHO-SG Lab

NTOU team of the S-131 project continues to support the operation of the platform, innovation and implementation toward the objective (at least for another 3 years, beginning from 2024).

Introductory Guide

An Introductory Guide has been created, readily accessible from the S-131 portal, as shown in Figure 3. Account creation and onboarding process via 'Request for access' is described in it.

More detailed user guide is provided online within the web application.

User accounts created

User accounts created continue to increase in 2025, from 43 in February, 50 in May, to 57 in June. Figure 4 illustrates the statistics, where

the regional statistics count only the HO and Port categories. Users categoried as industry are from Teledyne (CARIS, SevenCs, ChartWorld), ESRI, DiNav Marine Oy, Smartship Australia, Pelagis Data Solutions, HARTIS Integrated Nautical Services, IMIS Global, etc.

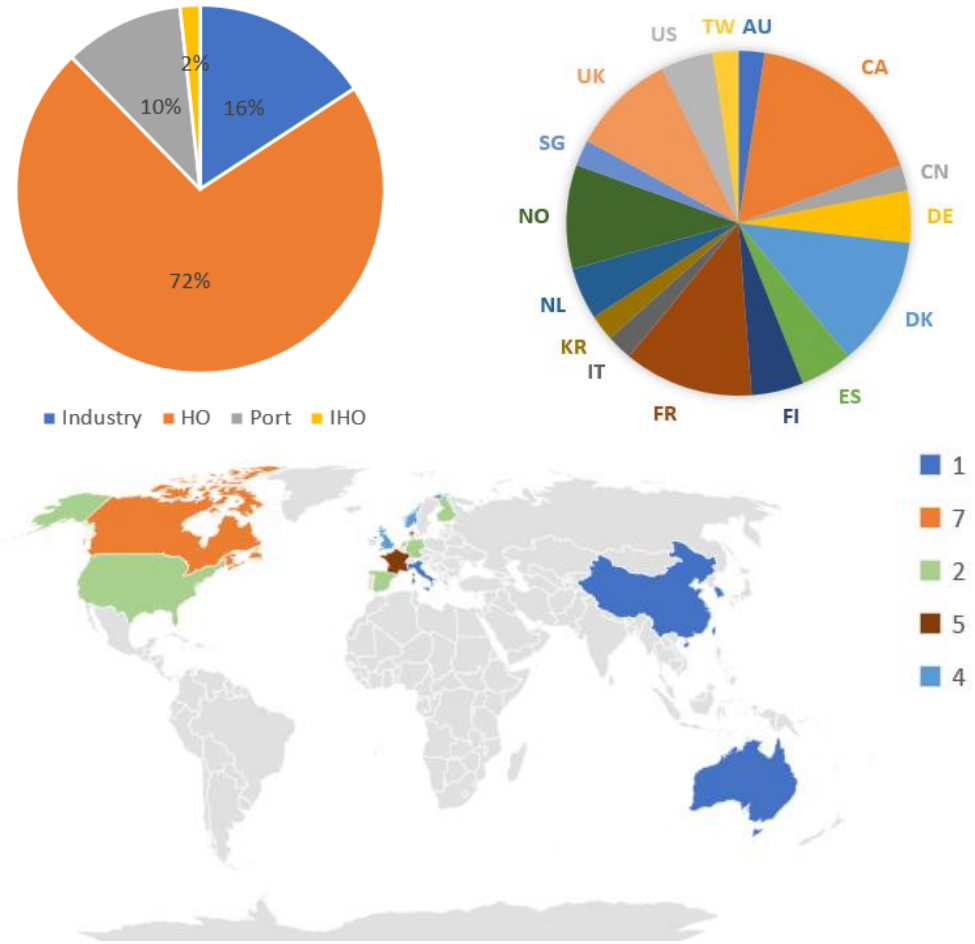
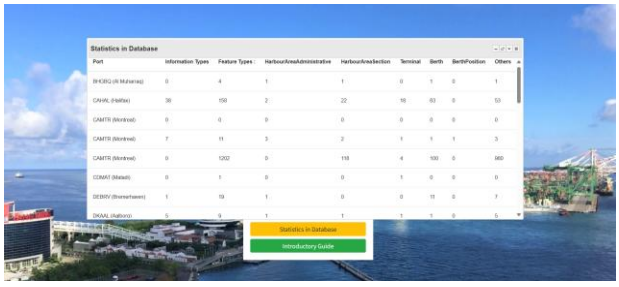


Figure 4 Statistics: created user accounts (June 2025)

Port data statistics



'Statistics in database' is updated whenever a user saves his/her data and logs out. User's own port data are private, unless set as 'shared' with

others for collaboration (viewing or editing). Therefore, multiple datasets of the same port may co-exist in the S-131 database. Statistics on S-131 dataset contents created by some users (HO/Port) are listed below.

Port	Information Types	Feature Types	Harbour Area Administrative	Harbour Area Section	Terminal	Berth	Berth Position	Others
CAMTR (Montreal)	7	11	3	2	1	1	1	3
DEBRV (Bremerhaven)	1	19	1	0	0	11	0	7
DKAAL (Aalborg)	5	9	1	1	1	1	0	5
DKAAL (Aalborg)	1	12	0	1	0	1	0	10
NLRTM (Rotterdam)	0	1378	0	0	0	1373	0	5
NLRTM (Rotterdam)	0	6394	0	0	457	1359	4578	0
NOBGO (Bergen)	4	1382	1	1	1	84	0	1295
SGSIN (Singapore)	53	256	1	28	73	70	0	84
SGSIN (Singapore)	53	622	1	28	73	400	0	120
TWKHH (Kaohsiung)	3	172	1	0	10	135	0	26
TWTXG (Taichung)	0	1377	1	5	1	66	0	1304

Latest statistics show that S-131 data have been created for the following ports[7].

BHGBQ (Al Muharraq)	ESALG (Algeciras)	NLRTM (Rotterdam)	TWHUN (Hualien)
CAHAL (Halifax)	DKAAL (Aalborg)	NOBGO (Bergen)	TWKEL (Keelung)
CAMTR (Montreal)	DKEBJ (Esbjerg)	NOKRS (Kristiansand)	TWKHH (Kaohsiung)
CDMAT (Matadi)	FRBES (Brest)	NOSVG (Stavanger)	TWMLI (Mai-liao)
DEBRV (Bremerhaven)	ITGOA (Genova)	SGSIN (Singapore)	TWTPE (Taipei)
	MYSGG (Sungai Udang)		TWTXG (Taichung)

[7] accesed on 29 June 2025

Feedback from users, support and continued implementation

Feedback from users as well as NTOU team's support and continued implementation are summaried as below:

Date	Summary
20220822	User: I was using the S-131 web tool today for a while. From the beginning it was working ok, with a reasonable speed, but now for about an hour I have not been able to connect to it any more. We are now trying to populate some ports to get the test datasets for S-131. Also experimenting with the local source upload. GML data files are unresponsive and hence does not load in, but with the geojson we had some success. Question, once the mapping rules are established, could those be saved in a rule file and re-used when connected to a different port using the same schema geojson file?
	Support: The S-131 web tool has been restarted right away. 1. Look like saving also to API are causing some memory leak. I will suggest not to save to API, there is no way to actually use that part anyway. We might remove that "save also to API" option for now. 2. In the crash log, I saw some coorinates that are 3D with a z dimension of value -9999…That might be the reason why the objects are not saved. Note: the function for re-using mapping rules has been implemented later.
20240823	User: When choosing to add the locationMRN attribute, there is no way to add a text string of the MRN - there is no input field provided. In our project it is quite crucial to be able to add it, as it is about the interoperability between the products. Do you think it would be possible to enable this attribute in the S-131 web tool? And another thing, the Export to S-131 function does not work for me.
20240826	Support: 1. locationMRN attribute is of URN type which was previously neglected by the software. Editing/mapping of the locationMRN attribute is now enabled. 2. File path convention was the reason why the export to S-131 fuction did not provide the result. This issue has also been fixed.

20240826	User: As regards to the geometry and too dense vertices....does the tool during the export "removes" any geometry if it is duplicated, or does it exports separate geometry to each of the objects, even if it fully or partly duplicates? Support: With larger resource data, it takes longer time to load the port data when you login or switch to that port. For better user experience, we intend to change the design to load the resource only when you try to open it. This S-131 web tool only support inline geometries, no sharing between features. The tool will check whether the uploaded geometry is valid, but will not change any part of it.
20240829	User: Importing the geojson data to S-131 with the chosen Harbour Facility object it is not possible to choose the attributes and their mapping. Otherwise it is going quite good. Support: The issue related to Harbour Facility feature type, which has many layers of inheritance, has been fixed. For Harbour Facility objects, the permittedValues of categoryOfHarbourFacility are only two, namly shipLift and straddleCarrier. Such restriction in allowed enumeration values is also implemented. By the way, it seems the proposal by NIPWG to add new feature types for shipLift and straddleCarrier respectively have been approved. Therefore, Harbour Facility feature type might not be needed any more in the next version of S-131. User: I think it is crucial to have it there - like the NEWOBJ in the ENCs. I link to it all electrical, water, recycling facilities that also is part of a port services, and require a location indication as a point. Maybe then it needs to be communicated to S-131. Support: I wonder whether it is sufficient in your case to encode electrical, water, recycling facilities all as HarbourFacility objects. I mean, how do you differentiate among them ?
20240909	User: I tried to make an update files export.. Does the update export functionality works? Support: Generation/export of update dataset is not within the scope of the project and NTOU has not yet trying to further extend our design to support export of updates.
20241113	User: To be able to work with the editor we need shared users so we have a change to look at the

	data we are creating. Some feedback for the project team: Login, Alerts, Editing geometries, Attributes, Starting location of the port, DataCoverage, SoundingDatum and VerticalDatum.. Support: 1. The requested test user accounts and ports have been activated. 2. Managing the assess: we have thought of various possbile needs in managing the assess, and have done some coresponding work in the past. However, due to too many uncertainties, unknown of possible users/use scenarios and drastically different views on the deliverables of this project, we had to first provide such a protective approach of access. Now, I guess we can move forward to support the sharing and collaboration. The design will be, via the port list, for the user to set a specific port to be shared with a specific user for R/W access. Each port entry in the port list would indicate whether it is shared. 3. "Ports to access" function will also be added under the menu "Database/add port", so that after login, active users can still request access to additional ports. 4. UI Alerts: the “save success” will be removed, other alerts will be reviewed to see whether they are still needed, considering possible network connection situations, etc. 5. UI Edit geometry: UI for geometry editing seems to have cause some confusion to you, which might be due to too much flexibility and unclear workflow in the current UI. Recently, we have been adding support for adding circle and holes, the entire UI for geometry editing will be rearranged altogether to make the function/workflow more intuitive. In addition, when editing, the UI will be locked to the feature/geometry under edit. 6. UI Attribute: similar to the geometry issue, when editing attributes, the UI will be locked to the feature under edit. 7. UI wrong coordinate for the specific port: it is found that that port is not found in NGA's WPI database, while in the UNECE's UNLOCODE database the coordinate of it is empty. Its coordinate in S-131 project's database might has been incorrectly parsed from some other data source. It is now corrected. 8. DataCoverage layer: after you edit the geometry of that feature, the DataCoverage layer will be listed in the layer panel. This feature/geometry is for the creation of CATALOG.XML. 9. SoundingDatum and VerticalDatum: This S-131 tool will automatically create the geometry and instance of other meta features based on the geometry of DataCoverge. Attached please see the example. The intention is to ease/facilitate the process when exporting to S-131 exchange set, because it might be rather difficult for non-expert users to understand and create those meta features. We expect that HOs will fine tune/edit the finally S-131 data product. 10. Technical GML: pointProperty will be corrected to camelCase to match the latest S-100 schema. 11. As for the last feedback: " GML, When creating references like a PortService a reference with an ID is created on the feature but that ID doesn’t exist anywhere else and the relation isn’t created in the GML file." We need more detailed information to make sure what this is referring to. If this is referring to edit relationship.....perhaps you didn't click the "+"

	button at the end of the row, before click "submit". The planned redesign or change mentioned above will be completed as soon as possible
20241212	User: we are currently trying to add a WMS layer to the S-131 website without any luck. Support: issue solved by improving the flexibility of "add WMS" function.
20241216	User: When adding a WMS service with multiple layer I need to pick one layer for each connection. This is working pretty well when I use orthophoto but if I need to add our S-57 service it is a nightmare since that service have like 12 layers. Support: I'm afraid the layers of your S-57 service will have to be added one by one, for those layers required to be used in the S-131 tool. The WMS connections set in S-131 will be saved to the user's account, so that the user does not have to do the settings again.
20250516	User: When I export the S-131 dataset from this port, the result seems to be missing a lot of data. Support: The export issue was found to be due to a special character, '&', in a feature name, which needs to be replaced by a form acceptable in XML. That has been fixed.
20250528	User: GML export formatting: the gml file (in the export exchange set) do not have the indentation. It might be beneficial to recheck the code formatting. This would enhance the understanding and readability. Support: GML export formatting (indentation) fixed.
20250610	NIPWG_VTC02-2025 paper 2025_09.2.2_EN_Input-France-NIPWG-10th-June-2025 “A tool like the one developed under the S-131 project by the ENC Center of the National Taiwan Ocean University is highly valuable. Expanding such a tool to cover other GML-based vector standards would provide practical support and a more concrete understanding of the data and how to produce it effectively.”

Appendix 1: Project Proposal Summary

Phase 1 proposal and recommendations (2021)

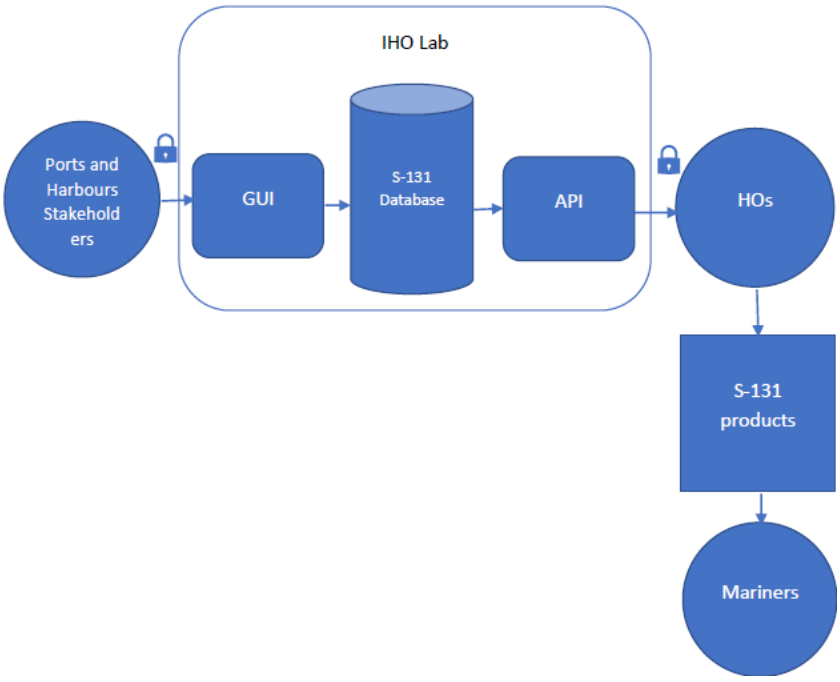
Ref: GBM02_2021_2.b_EN_S-131 Project Summary		
Project Team S-131 – Part 1 Assessment of Project Proposal submitted by Project Team Leader for Consideration by IHO-Singapore Innovation and Technology Laboratory Governing Board[8]		
S/No	Description	Summary of Proposal
1	Project objective	The Marine Harbour Infrastructure Database Project aims to create a database that will improve the information exchange between harbours and hydrographic offices by acting as a neutral repository of harbour information
2	Indicative budget duration	Not indicated.
3	Duration	Not indicated.
4	Team composition and Project Team Leader	S-131 WG headed by Eivind Mong, Canada, including assistance from NIPWG.
5	Project scope, challenges identified, innovation opportunities and potential benefits.	Mariners must currently collect harbour information from many sources. Some information in navigational charts, which may not be updated with the latest harbour information. Other harbour information may be found in sailing directions or coast pilots, but these may suffer from the same challenges the navigational chart has. It is common that a ship's agent acts as an intermediary between the harbour and the ship as to provide the ship with the necessary information to plan a berth-to-berth voyage. Several benefits are created and issues in current processes are addressed: 1. There is one access point for both the contributors and users, 2. Harbours can define what information they would like to share with hydrographic offices, 3. Hydrographic offices can harvest and further process the data,

[8] GBM02_2021_2.b_EN_S-131 Project Summary

		4. Formally defined API based interchange enables automated data exchange for all stakeholders, 5. The International Maritime Organization (IMO) can be encouraged Contracting Governments to reach out to ports and terminals that are not contributing, keeping in mind the harbour's contribution to the fulfilment of the relevant IMO resolution on berth-to berth route planning, and 6. An IHO-operated database will help to build up a neutral and trusted environment.
6	R&D or test-bedding work descriptions	API and web interfaces to be developed and to be compatible with relevant industry standards. The web interface should match the guidance set forth in IMO Circ. 1512 in terms of software quality and its human-centered design, making the tool easy to use.
7	Key milestones and deliverables for each milestone	Completed by mid 2022.
8	Profile and respective of industry partner(s) participating in the industry consortium (if the company is forming a consortium) including their role and contributions (financial or in-kind).	Needed but not identified yet.
9	Project risk assessment and mitigation plan	Need to first determine a common agreed upon set of information that harbour authorities are willing to share. It was also agreed that the project has to adopt a global perspective. Therefore, it would be essential to identify like-minded harbours representing different regions for the testing phase of the development.
10	Brief description of the Intellectual Property (IP) arrangements to facilitate eventual commercialisation of the project IP developed	None.
	Recommendations	The identification of key partners important for the proposed project to be successful. Need to clarify the support required to undertake the project ie. funding and/or resources.

Phase 2 project proposal (2022)

Ref: GBM03_2022_2.b_EN_Part 2 S-131 Evaluation Recommendations.	
Project Details	Submission
Project title : Project description:	S-131 Marine Harbour Infrastructure Database Project To create a S-131 database and infrastructure that will improve the information exchange between harbours and hydrographic offices (HOs) by acting as a neutral repository of harbour information. A Graphical User Interface (GUI) for easy data entry and an Application Programming Interface (API) will also be created to help HOs retrieve the data by connecting their GIS systems directly to the database. The exchange of information between harbours, HOs and mariners will be compliant with the S-101 and S-131 standards and IMO BLU CODE.
Summary of project objectives:	Besides creating database and infrastructure, will support creation of S-131 (and S-101) products that help ports and shipping to be compliant with IMO A.893(21): safe berth to berth navigation and IMO A.862(20): recommended contents of port information books (BLU Code)
Summary of project deliverables:	An Operational S-131 database and infrastructure that is compatible with S-101. A physical implementation of the database suitable for access by contributors and participants A GUI that permit the source originators, such as harbour masters, to easily input and validate information, in a secure mode, while also allowing authorised hydrographic offices to review and extract needed information suitable for their products which are to be made available to end-users, the mariners. Create an API to simplify and expedite the information flow between harbours that have a GIS system in place and authorised hydrographic offices by connecting their GIS systems and extract information. The API based on open API standards, for example, OGC API Features. Documentation which include details about the management and configuration of the database, GUI and API sufficient for database operator Documentation for all system users and administrators.
Practical relevance to Hydrographic Community/Industry:	The Marine Harbour Infrastructure database will be an IHO-operated database to collect harbour information in a form compatible with S-101 and S-131 as developed by NIPWG. Given that the IHO is an intergovernmental organisation, hosting such a database by the IHO Secretariat could help to build up a trusted environment where harbour authorities know where their data is being stored,

	and that it is held securely. The data entered would be S-101 and S-131 compliant and so harbours will not be requested to become familiar with the technical details S-100 or S-131 encoding. HOs can use the extracted S-131 compliant data to then implement them more easily into their own S-100 based production platforms. Marine Harbour Infrastructure database will facilitate the information exchange between harbours and HOs. The database content will be S-101 and S-131 compliant and will contribute to allow ports and shipping to be compliant with the relevant IMO resolutions: • IMO A.893(21): safe berth to berth navigation • IMO A.862(20): recommended contents of port information books (BLU Code) Demonstrating that Hydrographic Offices and Port Authorities have worked together to discharge their collective SOLAS responsibilities as per Chapter V Regulation 9. The technology developed should be free from proprietary restrictions, pen and adaptable and made available free for HO's to implement in their own country. 
Project team:	IHO Lab - 3 years hosting of server and technical support, before transferred to IHO secretariate Project governance: Louis Maltais, Canadian Hydrographic Service

	Team leader: Prof Shwu-Jing Chang, National Taiwan Ocean University (NTOU) Technical development leader: Jonathan Pritchard, IIC Technologies Programmers: junior programmers, NTOU Team members: Raphael Malyankar, LLC Matilde Skjæveland Skår, Norwegian Hydrographic Office. Charline Giffard, Canadian Hydrographic Service. Applicant(s) information: Eivind Mong, Canadian Coast Guard. Stefan Engström, Traficom, Laura Hall-King, UKHO.
Summary of project cost:	1 project lead and 2 programmers (±€40K funded by NTOU) – In-Kind 1 architect/Lead developer & 1 programmer/developer - €70K Documentation of operating and training manuals for port and HOs - €10K Implementation and testing coordination and support for ports and HOs - €40K S-131 updates - €10K Project documentation - €10K Hosting server, backup and maintenance (probably cloud based) - €14K IT support - €10K
Collaborators information:	Volunteer ports (to be identified) and HOs for testing phase.
Other source of funding:	Canadian Hydrographic Service is willing to contribute €70K per year for the first 2 years in this 3 year project NTOU is contributing in human resources and expertise with Shwu-Jing Chang as project lead and 2 programmers (equivalent to ±€40K per year for 2 years)

Do you require a Workspace at IHO Lab? If so please provide:	Space for the hosting server (physical or virtual) 2 to 3 desk office spaces Other requirements: IT support on call during development phase and testing and deployment phases. Possibility to working remote.

Project Schedule

	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2	Year 2	Year 3	Year 3	Parties Involved
Design database infrastructure									• Development team plus advisors
Design API									• Development team plus advisors
Design GUI									• Development team plus advisors
Testing phase									• Development team, Ports and relevant HOs
Operate in a beta mode with programming support									• IHO Lab, ports, HOs and development team

Revised phase 2 project proposal appendices (2023)

Revised App.1 – project team leader and members

PROJECT TEAM LEADER Canadian Hydrographic Service

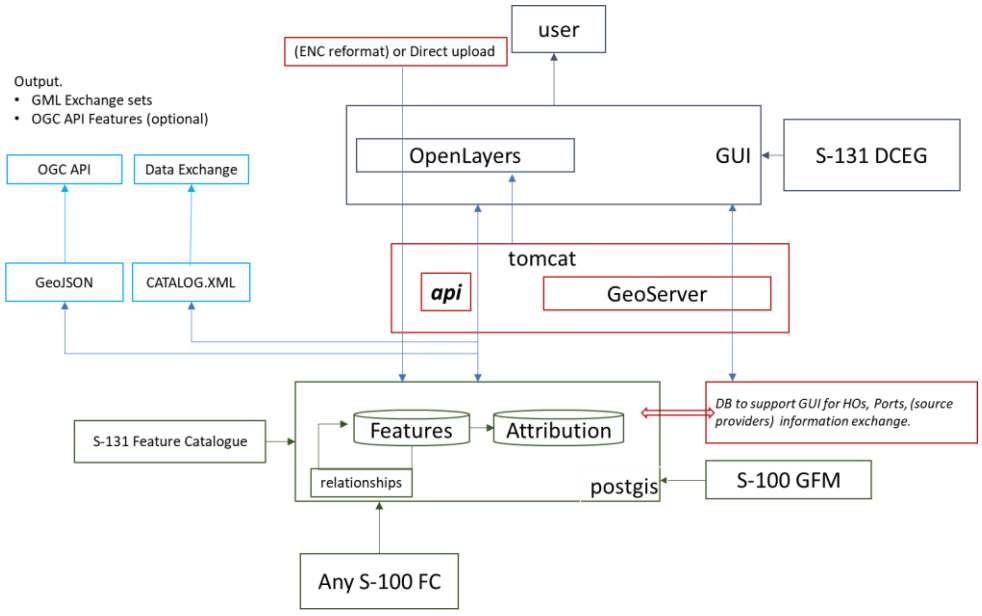
A)	Name	Sarah Rahr
B)	Designation	Project Supervisor, Sailing Directions Chair of National Canadian SDWG
C)	Education / Professional Qualifications	Cartography
D)	Department	Sailing Directions
E)	Organisation	Canadian Hydrographic Service
F)	Postal Address	1 Challenger Dr, Dartmouth, NS B2Y 4A2 Canada

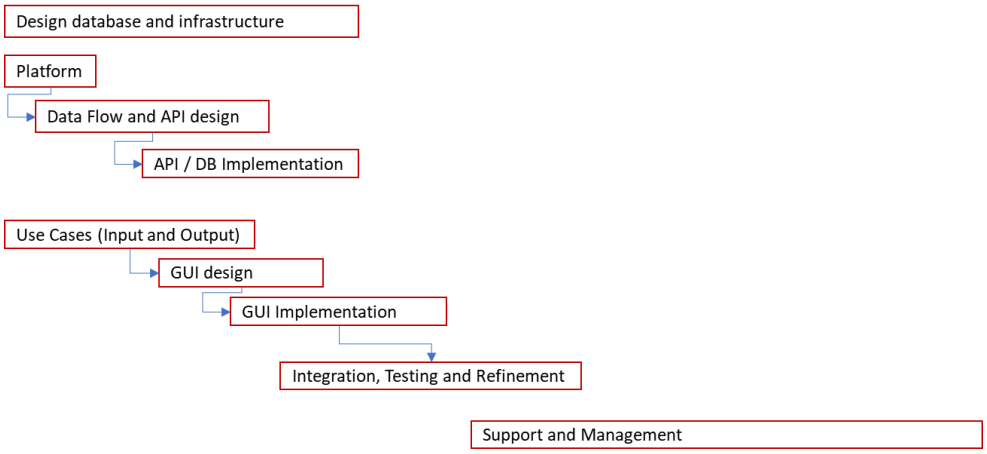
Revised App. 2 – project schedule

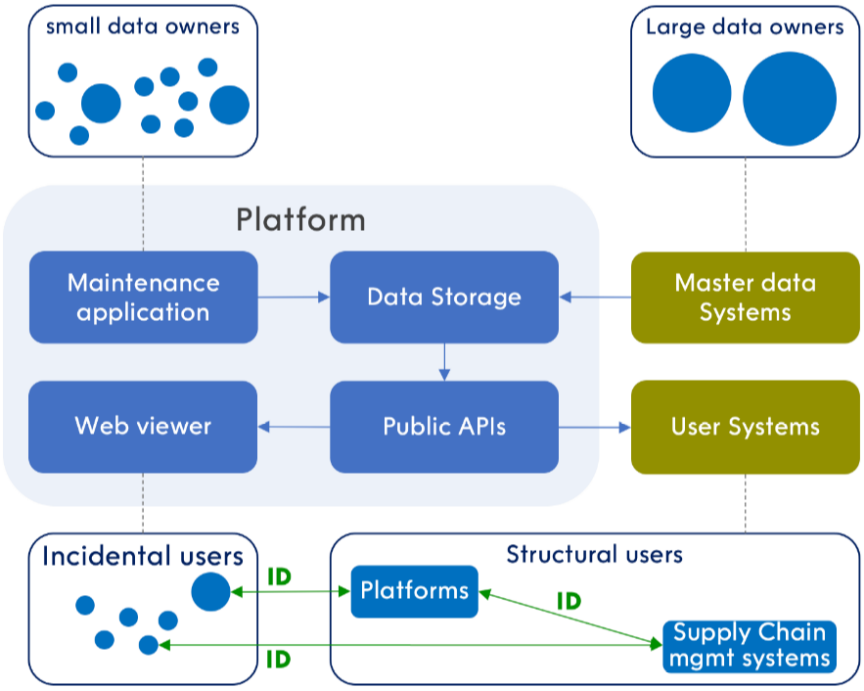
	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2	Year 2	Year 3	Year 3	Parties Involved
Design database infrastructure									• Development team plus advisors
Design API									• Development team plus advisors
Design GUI									• Development team plus advisors
Testing phase REVISED =									• Development team, Ports and relevant HOs
Operate in a beta mode with programming support									• IHO Lab, ports, HOs and development team

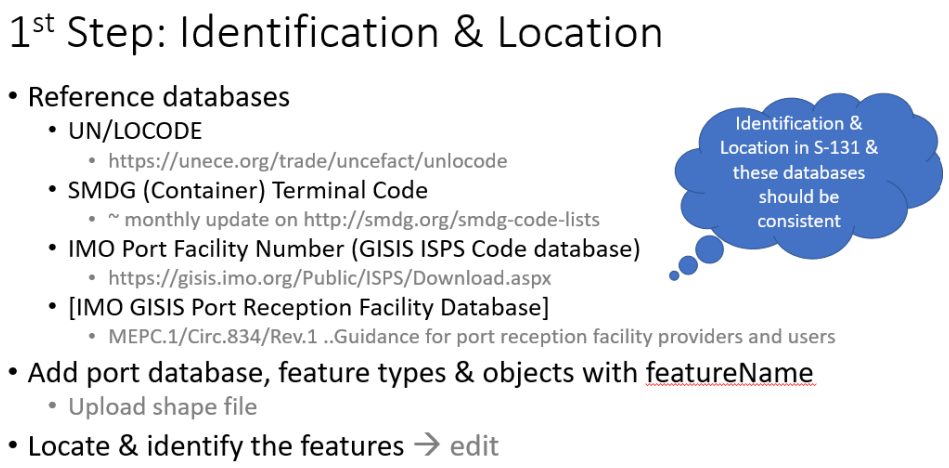
Appendix 2: Meetings and Progress

The S-131 project kick off meeting was held on 22 April 2022. At the meeting, the target was set to "develop an operational S-131 database and infrastructure that is compatible with S-101, then operate in a beta mode with programming support," as a 3-year project.

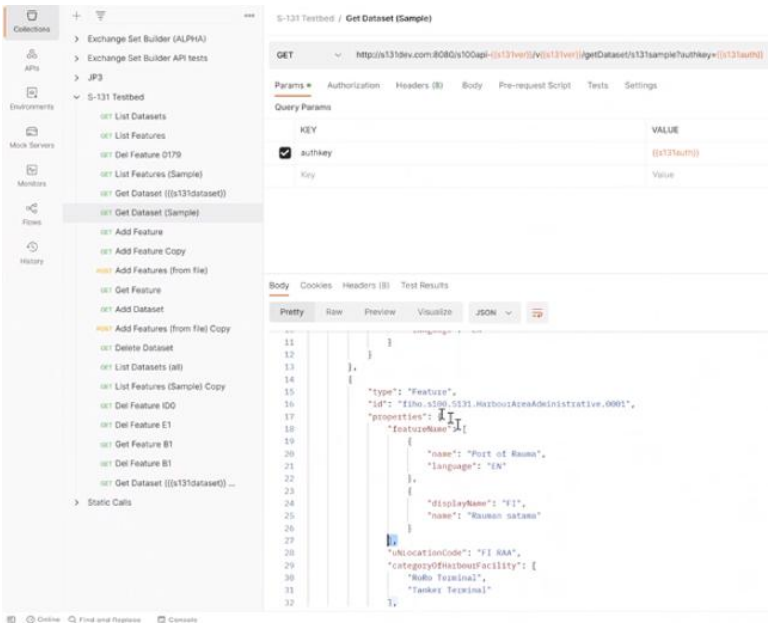
Date	Summary
20220422	Agreed to use Github for communications, repository, codes, discussions Team roles precision: Charline Giffard agreed to be the Project Leader
20220504	Project plan? IIC and NTOU: discussions on architecture for the project and how responsibilities could be usefully divided.  Front end GUI (NTOU) – grey; Backend supporting database (NTOU) – red Backend (IIC) – green; Data Export (IIC) – blue Middleware (Platform NTOU, API IIC, need collaboration on API definition) – red (tomcat) API (IIC): Data export via API (specifically OGC API Features) is easy to achieve. Data input may need to be through flat file (bulk) transfer as well as API (and should ENC be supported to (at least partly) input base S-131 features. Difficulty is mapping input formats to S-100 GFM attribution. Any user input will need to be mediated by the GUI as well. We believe this detail can be worked out as we explore use cases for data input.

	Timeline/milestones (TBD): 
20220512	NTOU explored GitHub, setup Github platform for S-131 NTOU sent hardware specifications to IHO Lab. IIC and NTOU presented Project plan and shared responsibilities; timeline and API (tomcat) formats to be discussed Actions: Gathering contact info form port partners (Port of Rotterdam, Port of Montreal, Port of Halifax, Port of Stavanger, Port of Singapore, Port of Kristiansand and others.) HO provides data from identified ports to NTOU (S-57 or .SHP, Autocad format source from ports. Some more “textual” data such as the information found in Sailing Directions Draft S-131 catalogue by around mid-June (Raphael) In order to establish a data flow diagram and use cases, try to see how we want to use the platform, ie, put ourselves in the shoes of the user, make scenarios and establish the flow of data according to the scenarios (Who?)
20220526	Received port data from CHS (20220520) and NHS (20220523). No ruch for the hardware specifications and acquirement for now, IIC and NTOU can work on their side for the moment.
20220614	Meeting with the ports : (Extract from IIC’s presentation) We are interested in: Understanding the scope of any existing data and any gaps which exist between S 131 and existing data; Whether data transformation can be used to form S-131 data or the extent of manual input required;

	Use cases for data exchange
20220622	S-131 Project - Technical Setup Discussion: IHO Lab and NTOU
20220709	Received draft feature catalogue for S-131 1.0.0 (dated 20220615) from Raphael.
20220803	S-131 project Architectural Update: NIPWG Chair, IIC, NTOU Regarding a (GLDP concept) system that Port of Rotterdam has developed as a proof of concept that might be available to us to draw inspiration from… The application of the proof of concept with demo data can be found on: https://portmasterdata.com/home . This utilizes a Postgres database with a Kotlin backend, Rest APIs and a React frontend.  One key point that NTOU team sees in this GLDP demo application is the concept/approach of hierarchy or hierarchic relations.
20220822	Email discussions: IHO-Lab and NTOU MPA Cybersecurity team advised to consider setting up the project in the cloud environment. The use of Azure, AWS and Google cloud environments explored.
20220901	It is announced that Sarah Rahr will take over the NIPWG work and S-131 Project team lead from Charline Giffard, which unfortunately had to take a medical leave.
NIPWG9	13 –16 September 2022

	Update from IIC: o Working on backend server for the API, which is progressing, initial concept work completed, reusing quite a lot of the OGC leftover methodology. Ensuring and validating data storage and that it's in a 131 format and has a feature catalogue. o Hoping work to be finished on API for S-100 – to show that the data is flowing to and from servers. o Challenge is to ensure participant ports do not have to transform all existing data in to a S-131 form that they're not comfortable with. Update from NTOU: Presentation 12.2.1A (NTOU/SJC) and demo of the system: It was noted that data errors were found in the source material in GISIS (IMO), for the overlay information. Project team was requested to investigate whether they can export the data and pass this on to the IMO through the official channels. The Global Location Data Platform (GLDP) from Rotterdam was discussed and influence the design of the S-131 database GUI. 
20220926	IHO Lab evaluating Microsoft Azure Cloud service for S-131 Project setup. Details discussed with NTOU.
20220929	Project Team meeting: Update from development teams on component status
20221004	NIPWG9 follow up (GISIS Data Quality): NTOU provided "IMO GISIS Maritime Security Port Facilities Location Analysis" to be used in NIPWG's S-131 presentation to the EGDH meeting
20221005	IHO Lab cloud environment: NTOU suggested to change the "Source Region:" from "East Asia (sever location: Hongkong)" to "Southeast Asia (server location: Singapore)."
20221013	IIC provided S-131 API description v1 to NTOU, with short youtube clip https://youtu.be/MBudobw7hZs on how it works, and the current datasets which is on

	there (the finland S-131 sample data)
20221017	NTOU provided feedback on S-131 API to IIC
20221031	Project Team meeting: Update from development teams on component status
20221128	IHO Lab and NTOU: S-131 Technical Meeting on Microsoft Azure Set-up details
20230124	Full draft of the S-131 Product Specification finalized for NIPWG review
20230204	IIC and NTOU: catch up on the database/GUI integration, talk about the complexity issues and how to use the database for import/export
20230207	Project Team meeting: 1) S-131 Edition 1.0.0 Product Specification package: Raphael Malyankar 2) Development updates: a) API and DB progress: Jonathan Pritchard/Ed Kuwalek b) GUI progress: Shwu-Jing Chang IIC update: (Latest release v1.3) Better upload and creation (bug fixes); Postman scripts to test multiple feature creation; Features can be added to dataset either all at once or incrementally. Also can be deleted by ID. IIC's plan for next period: Establish error and success codes across the whole API; Fix associations in JSON encoding; JSON encoding documentation; Validation against FC (simple) More simple datasets, Singapore? Add expressive datasets implementing all the S-131 features; Implement Access Control via signatures; Integration with Front End; Templates for simple features? Suggest finding examples in Singapore and encoding one of each feature with simple (mandatory) attribution, one more complex, and common associations. NTOU update: Another major revision of the GUI ongoing The tools, technology and platform used remain the same. One main reason of such major revision is to better support different types or roles of users, e.g. HOs, ports of the same nation and possibly global end users. P.S. NTOU are developing not only the S-131 dataset editor, but also a web-based S-1xx GML dataset viewer. NTOU's S-131 Prod. Spec. (Draft) Observations/Questions: Multiple (up to 4) levels of complex attributes (GUI has to support all I/O).
20230215	IIC provided JSON encoding examples (that API uses) of Berth, BerthPosition, Terminal and HarbourAreaSection, with a "simplified" list of attributes for the features which could use to build a template for these features.

20230302	S-131 Project Sub-group meeting 16-17 Mar 2023, Singapore → cancelled IIC suggested to start with simple templates for Berth/BerthPosition and Terminal together with any of the simple textual attributes. IIC suggested to meet on the 13th/14th and do data scenarios - then on the 20th to review progress at putting GUI elements in place to insert these features into the database, then maybe also meet on the 27th to follow up.
20230313	S-131 Examples…: IIC suggested to "go over the mappings sent, talk about data capture again, try to come up with some more candidates to see if we can get data going through the system." NTOU: GUI and API now use the same JSON encoding structure based on the provided examples. As for the GUI design, since this is an S-131 project, NTOU's focus remains on supporting all elements of S-131 in a simplified way (+ providing feedback to S-131 PS). That includes HarbourAreaAdministrative, which has the most complicated complex attributes, generalHarbourInformation. To highlight key layout features, an extra layer of menu has been added which provides 'short cuts' to the editing of those features, to make it appear simpler. Elements which are known or may be implied from the FC or database will be automatically populated by GUI. The intention is for GUI to also facilitate the creation of relationships.
20230324	IIC, NTOU and IHO Lab (Eric FOO, Lawrence CHEW, Victor SIM): Catchup DB/GUI S-131 IIC showed the API with JSON sample (FI data); NTOU indicated errors in the sample. 

```
{
    "type": "Feature",
    "id": "fiho.s100.S131.HarbourAreaAdministrative.0001",
    "properties": {
        "featureName": [
            {
                "name": "Port of Rauma",
                "language": "EN""eng"
            },
            {
                "displayName": "FI",  "language":"fin"
                "name": "Rauman satama"
            }
        ],                          "FIRAA"
        "uNLocationCode": "FI RAA",
        "categoryOfHarbourFacility": [
            "RoRo Terminal",
            "Tanker Terminal"
        ],
```

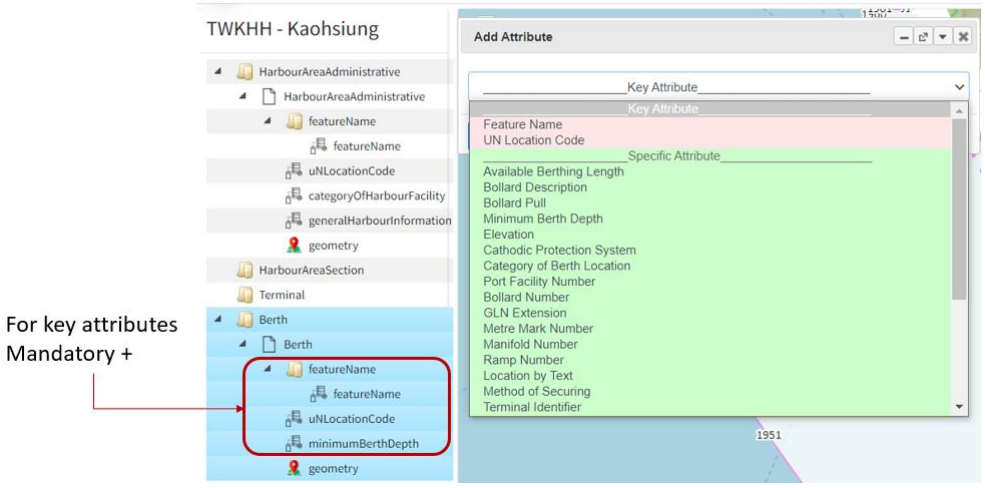

NTOU presented the latest version of the S-131 tool/GUI:

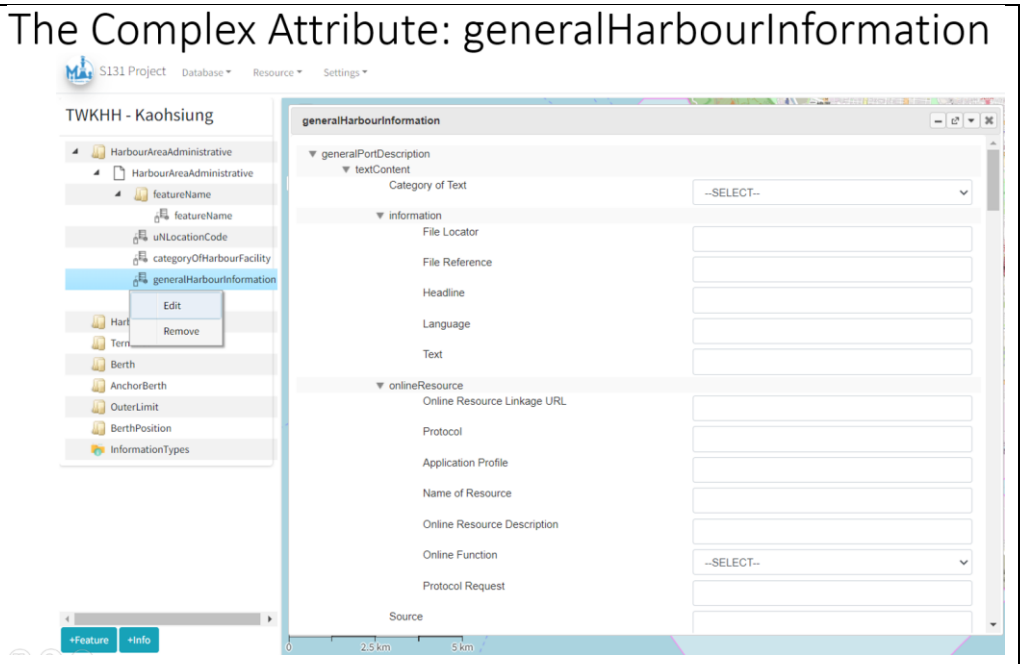
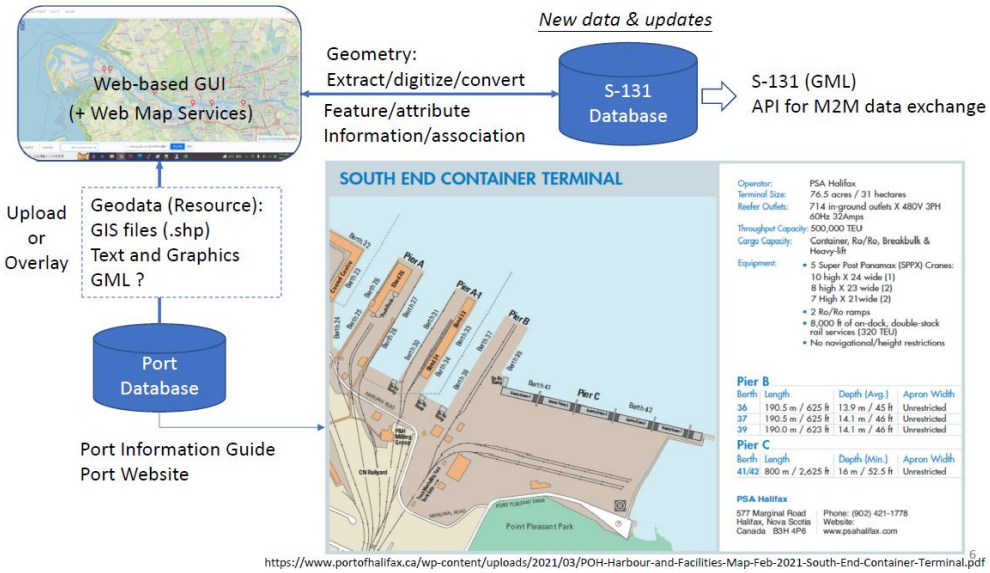
UI with(default) key Feature Types, user may choose to add other features and info types ;

Batch Upload, and creation of features/attributes from uploaded resources;

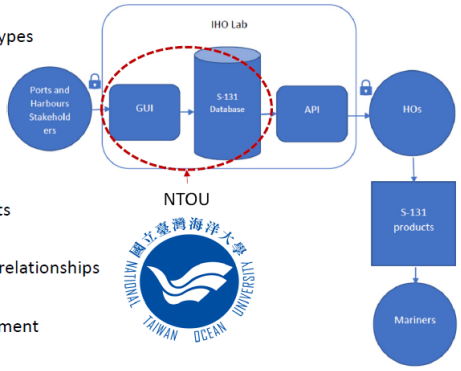
Add feature, add/edit geometry, add/edit attribute, including the most comeplex one;

Add a “Berth”



	
20230609	HSSC15 (06-09 June 2023, Finland): S-131 Edition 1.0.0 product specification approved by HSSC (ref. HSSC15_2023_05.3B)
	NTOU presented a paper entitled “Feedbacks from the System Design and Implementation for S-131 Database Project” (ref. HSSC15_2023_PS9)  https://www.portofhalifax.ca/wp-content/uploads/2021/03/POH-Harbour-and-Facilities-Map-Feb-2021-South-End-Container-Terminal.pdf

	Observations
	• S-131 data model
	  • Split information (edited books, designed web pages) into data elements
	  • Feature Types, Information Types, Attributes (+ Spatial Geometry + Support Files)
	  • Group or link by using "multiple levels" of complex attributes and associations
	  • generalHarbourInformation/generalPortDescription/textContent/information/fileReference
	  • Feature → Regulations → Applicability (→ Authority → ContactDetails)
	• Challenge - Encoding
	  • source material → mapping to data model (assisted by GUI/software) → dataset
	  • Narrative texts providing explanations and advice; annotated photo; illustrating graphics ?
	• Challenge - Viewing
	  • dataset → data model → portrayal → user interface for human cognition (mental map)
	  → machine, for automation ?
	  • How to improve the end result /usability ? "Who" is responsible to "which" ? Collaboration
	• Challenge - Information Exchange
	  • S-131 data model is fundamentally different from that of known GIS system
	  • Need additional 'middle-ware' for M2M connection with existing GIS system to be useful

20230620	NIPWG_VTC02(2023):
	S-131 DB project: progress update from NTOU
	• GUI design
	  • Contents generated from S-131 FC, including hover text (tips)
	  • Shortcut to Key Feature Types
	  • Support editing of all Feature and Information types
	• Upload Resource (zipped GIS files)
	  • May select & rename contents to be submitted
	• Batch create features from uploaded resources
	  • with attribute mapping support
	• Edit geometry on map and/or coordinates
	  • Point/Curve/Surface; flexible coordinate formats
	  • Layer transparency/Hide/Show/Set to top
	• Add Attributes (simple, complex, and Inherited) and relationships
	• Next steps:
	  • more testing & sample data for further development
	  • GML import/export
	 

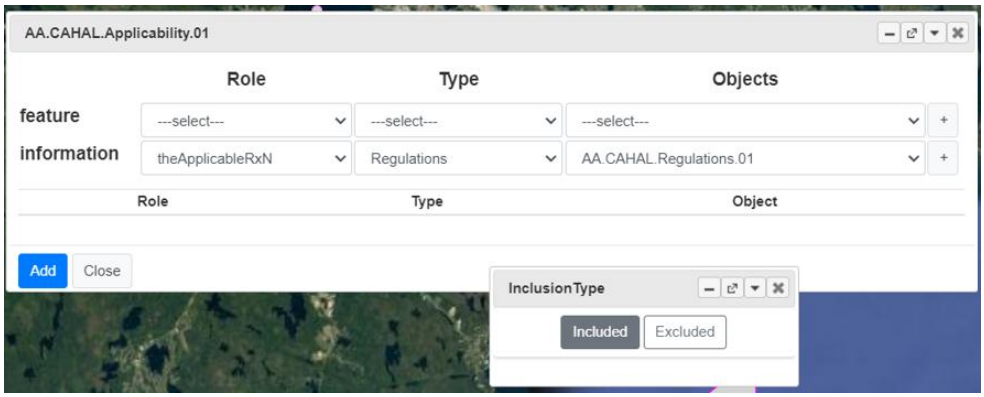
20230628	S-131 Project Team Meeting, Regrets: Shwu-Jing Chang (unable to login) and JP IIC's API and DB progress: early version of the system is up and running on s131dev.com. (Main Swagger interface http://s131dev.com:8080/s100api-1.0.0/dist/#/) API linked to DB, loaded with some sample S-131 data, can key in individual API end points and send requests into the API and receive responses via Postman. Can extract GML-conformant data from DB. Challenges: attributes of relationships, multi-treading needs more stress/performance testing Modelling in S-100 world and implementing those models using existing technologies requires a bit of flexibility re format. IIC started engaging with a limited number of different ports for now to ensure functionality

	can support bigger/broader datasets. Update from NIPWG VTC02, June 20th-21st: SR Gap Analysis from what SHOM has done and what their SD contains, an accurate depiction of most HOs data. How to close these gaps? Speed restriction zones – where does that go? S-127, S-131. 421 discussion – SD are usually presented in narrative and that is a description of a journey. We don't have a good way of capturing that type of info in S-100. Test Data From ports: 3 or 4 ports to start; 6 more by December 2023. Want a variety of data & participants, need to test all aspects of features and model. EM: cross-selection of big ports to smaller ports to test access. The more representative sample we can get of real-world ports, the better prepared the system will be to support as many users (and GIS skill levels) as possible. Eg Port Dover – is it run by the municipality? Federal government department? Who is the authority to engage to get info on the port? Will start developing an online "info session" to circulate among mariners/ports/etc via e-navigation.
20230710	S-131 Project Team Meeting: NTOU: how to simplify GUI while maintaining the integrity of the data – does the effort involved in the complex model bring enough value to the user. JP suggested a 'middleware' solution – he will look into it and suggest solutions at the August meeting. Could also enhance the GUI at a later date, and will likely need to do that for more complex ports anyway. Shwu-Jing will look into an info icon HTML file linking to DCEG guidance. IIC: JP offered to guide users through login and wants as much testing of API by users as possible. He has digitized some parts of the Singapore port info guide and created a more representative data set. Split into 5 logical groups: Layout, Physical Infrastructure, Services (berths, mooring, etc), Regulations and Contact Info. Will create test data for all 5 groups and look at relationships between them. Port Information Sessions: SR meeting with CCG e-Nav/Cheryl Marshall July 2023 to discuss how to connect with ports and prep their data for ingestion into S-131 database using GUI. SR to develop draft presentation, detailing what we need users to know, what we are asking of them, and steer towards potential solutions to the challenges they may face. SR to present draft of workshop at August meeting. Matilde has agreed to help develop the presentation upon her return in August and JP offered to weigh in as well. In addition to CMAC, will also be brainstorming how to reach users, Victor suggested OCIMF (https://www.ocimf.org/programmes/mtis perhaps aim to harmonize port info of tanker community. There are commercial shipping organizations – very vested in port info), and JP suggested Ben van Scherpenzeel as potential contacts/resources as well. **ACTION:** SR to prep and deliver draft mariner info presentation and deliver at August 2023 meeting. - how to prep ports for data ingestion via GUI?
20230712	Access to Singapore ENCs for S-131 Project IIC requested the access to get geometries (e.g., for anchorages and berths) from the ENCs.

	Project team (IICx2, NTOUx1) granted access to 3 UB4 SG ENCs (to delete on April 2024).
20230815	S-131 Project Team Meeting (cut off by the meeting software in 30 min.) Agenda: Development updates; Port Information Sessions- how to prep ports for data ingestion via GUI? ; Future Funding of S-131 project; Upcoming S-131 Project Team meetings: September 11, 2023 in Monaco (NIPWG10) & November 20-22, 2023 in Singapore (S100WG). NOTU prepared presentation on completed GUI developments: Import/Export of S-131 GML Files, Pick report (data view), Add/Edit/Show Relationship (feature-feature or feature-information)
20230911	NIPWG10 (20230912-15, Monaco) NTOU failed to attend the Project Team meeting on 11 Sep. (couldn't reschedule the flight) Meeting on 12 Sep. before NIPWG10: NTOU presented/demonstrated latest developments using S-131 sample dataset (Halifx): import/export S-131 datasets (GML or GML with all referenced support files) Add/Edit/Show Relationship (feature-feature or feature-information) Pick report (data view, including referenced support files and associated feature/info types), Layer control and WMS settings.
20230913	S-131 meeting follow up: json file converted from S-131 Sample GML NTOU provided to IIC : the Json file "ConvertedJsonFileFromS-131SampleGML.json" converted from S-131 Sample GML by using a GML to Json Converter developed by NTOU.
20230926	Weekly S-131 project progress meeting (before the F2F meeting in Singapore) Agenda: the following action items 1. API version to be updated from 1.0 to 1.3 (or 1.4 if possible) 2. Swagger documentation to be updated from last year's copy 3. JP to update Shwu-Jing regularly with any changes to the API version NTOU provided results on "S-131 testbed API upload testing and integration":

	Summary
	• Test upload of NTOU JSON output into backend database server complete.
	• Updates to API deployed as v1.4
	• Features and information types can be imported and stored in S-100 form in database. Needs further testing to ensure 1-1 mapping (inputs and storage). Retrieval by feature (in GeoJSON) also works. Verified List and Get of features individually.
	• Issues
	  • GeoJSON geometry is formatted incorrectly. Needs to be modified before data can be imported (next slide)
	  • Attributes on relationships not yet implemented. These have been worked around (for now) and will be implemented in database in v1.5
	  • MultiPolygon is used in the geometry. This isn't supported by database but has been implemented in the database so can be parsed. This needs agreement by the product specification (are multipolygons acceptable encoded geometry?) API can support but will need implementation in GML as it will cause issues on extraction
	• Other aspects
	  • No extraction to GML has been done (yet). In progress.
	  • No validation against FC yet (in progress).
	
	IIC:
	
	API is now on v. 1.4 on the server -> URL is http://s131dev.com:8080/s100api-1.4/dist/#/
	
	I'm going through and marking all the endpoints as either "Dev" or "Live" - the Live ones are all fine and work. If any of the parameters aren't implemented, I'll mark them individually as "Dev". Some of the API calls probably aren't needed for our project (e.g. the exchange set calls) and some parameters aren't required at the moment.
	
	I will also get the exception/error codes better defined - many of the calls only ever return code 200 - OK and need better error trapping. The swagger description will also be updated so you'll see them become better defined.
	
	If you want a verison of the API as a WAR file I can get you one - then you can deploy locally and I can help you set the DB up that it needs.

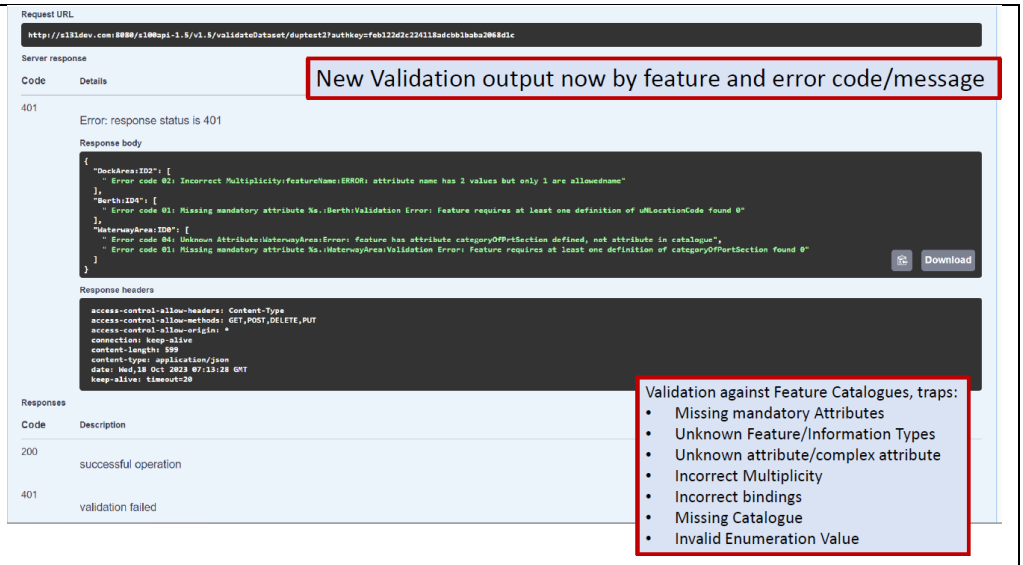
20230927	Testing of NTOU database and GUI: Sarah: " I would like to supply three ports with your existing database and GUI solution, for testing by users (a smaller community, a mid-sized harbour and a large commercial operation). Could you please supply me with a login and access so that I may share it with these ports?" NTOU:" In order to set up accounts for testing, would you please provide the UNLOCODE of those ports or their port names?" Sarah: "I have asked the three ports for their UNLOCODE, will send them as soon as possible." (20231003)
20231001	IIC sent S100 API & database details: s100api-1.4.zip, configyaml.zip, s100ed5.sql (ubuntu) Note: yaml config files use /tmp folder (have to re-copy them when you reboot the server) NTOU deployed the API to NTOU's server (Windows, PostgreSQL 14.2)

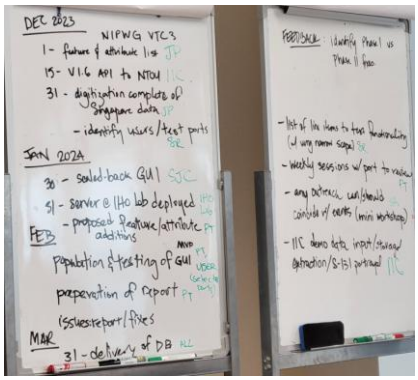
	Issue: platform dependent paths IIC sent the updated s100api-1.4.war and postgresql.jar (20231005) NTOU: The API deployment with DB connection working now. (20231005) Issue: 'addDataset' does not work (no response) IIC: may use 'addFeature' instead. Parameter datasetID : "name of dataset to add feature to. If dataset does not exist, it will be created"
20231005	Weekly S-131 project progress meeting Meeting minutes: ➢ NTOU tried testing on Windows server (original design on Ubuntu so JP had to adjust) ➢ Shwu-Jing got version 1.4 of the API last night and has begun working on it – will test data this week ➢ JP reviewed how to create new datasets ➢ IIC working on v 1.5, validating calls against the feature catalog and documentation in Swagger ➢ Integration ongoing with tweaks - both parties collaborating ➢ Sarah to supply the UNLOCODE of the 3 Canadian ports for testing NTOU's update on GUI: added support to association types with an attribute (e.g., InclusionType/membership) added layer view panel and display text view control button 
20231013	Weekly S-131 project progress meeting (Cancelled, replaced by providing update via email) IIC: This week we've focused on getting the validation embedded in the API, as it's probably the most important part of the S-100 service available in the API after feature/dataset creation

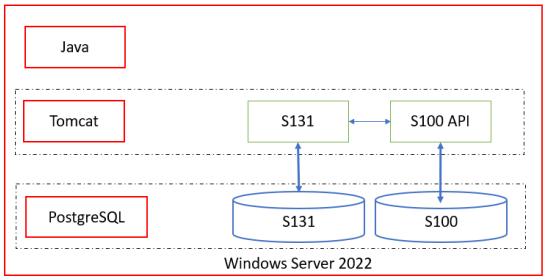
	from the JSON encodings. There's a validation mechanism in place now, which does basic feature catalogue validation of whole datasets. This is accessbile through the validateDataset API Call which is under development in v1.5 of the API. This is currently deployed in test on http://s131dev.com There's not much to see on the validation front as the API only currently delivers a success/fail code and message for any given dataset. I'm now working on making a structured message which will be returned with any validation call. This will transmit the details of the validation carried out - we're focusing on missing features/attributes, lack of mandatory attribution and unrecognised attribute names. The next phase will introduce validatiokn on relationships (which S-131 has quite a few of). The basic idea is for the validation call to return a single true/false status together with an array of validation results which state the source feature, a structured numeric code detailing the reason for validation failure and an explanatory message. This should give the front end enough information to work with, and feed back to the user if necessary. I will try and get this up and running before the meeting next wednesday so we can demo it and see if it is sufficient for use by the front end. Separately, I've also done a bit of work with the documentation on the swagger calls, tidying up some of the messages and started putting better error handling in place. We'll nehance this significantly for v1.5 which will help a lot with the implementation by the front end too. Haven't got the attributes working with relaitonships yet but we have a design and database modifications drafted so we are going to make a start on that late next week. NTOU: We have completed the testing on the v1.4 API deployed in NTOU. Key findings are as follows: 1. API treats "Information Type" as "Feature Type" without geometry : In order to add "Information Type" data into API's database, its json encoding needs to be modified from "type:information" to "type:feature". 2. Dataset may be created by using addFeature to upload the json file. However, if the json file uploaded has some error or encodings which is not supported by API, e.g. the file "NTOU_Sample_full2.json" which contains "multipolygon", when using "getDataset" to retrieve that dataset, API responds first with error message "can't parse JSON" , then the raw data, and sometimes shutdown the tomcat. 3. Comparing the successfully uploaded json file (having removed the feature not supported by API) with the json file retrieved via "getDataset", it is found that (1) "type:information" becomes "type:feature" (2) For all features, either "Feature Type" or "Information Type", "featureType" originally contained in the properties when uploaded is lost in the retrieved json file. As shown in the following example. (Note: omitted here) 4. extractDataset (to GML) does not work for the created dataset or the existing s131sample.

	(Response: "HTTP Status 500 – Internal Server Error") 5. Using "addFeature" to add a single feature will simply add another feature to the API database (with another index), even if there is already a feature with the same GML id. Questions: how to check whether there is another version of the feature input /modified by different users or in different ways ? Will API support user/editing control, and perhaps add timestamps, etc.? In the meantime, we have done some improvements in GUI.

20231018	From IIC, in response to NTOU's observations on the API
	
	API observations
	
	• API treats "Information Type" as "Feature Type" without geometry. In order to add "Information Type" data into API's database, its json encoding needs to be modified from "type:information" to "type:feature". **This is required: GeoJSON uses type:Feature consistently – it could be changed but we would suggest leaving it as is for compatibility. The FC defines which features are information types so the distinction isn't required in the input data.**
	
	• Dataset may be created by using addFeature to upload the json file. However, if the json file uploaded has some error or encodings which is not supported by API, e.g. the file "NTOU_Sample_full2.json" which contains "multipolygon", when using "getDataset" to retrieve that dataset, API responds first with error message "can't parse JSON" then the raw data, and sometimes shutdown the tomcat. **This is fixed. There are now error codes on the addFeature page and exceptions are given their own codes if there are problems.**
	
	• Comparing the successfully uploaded json file (having removed the feature not supported by API) with the json file retrieved via "getDataset", it is found that
	  • "type:information" becomes "type:feature"
	  • For all features, either "Feature Type" or "Information Type", "featureType" originally contained in the properties when uploaded is lost in the retrieved json file.
	  This is the same as above? Suggest leaving this as it is (we could change but it complicates import and means the format is not GeoJSON conformant)
	
	Continued…
	
	• extractDataset (to GML) does not work for the created dataset or the existing s131sample. (Response: "HTTP Status 500 – Internal Server Error") **changed this and added better error codes. The GML output is working now, would be good to see it tried. Think there may be some compatibility problems with the catalogue (and the inheritance). We'll test as well but there should be some GML delivered for all datasets now.**
	
	• Using "addFeature" to add a single feature will simply add another feature to the API database (with another index), even if there is already a feature with the same GML id.
	  • One of the questions is : how to check whether there is another version of the feature input /modified by different users or in different ways ?
	  • Will API support user/editing control, and perhaps add timestamps, etc. ?
	  We can trap features with pre-existing IDs and raise an error code. Default should probably be to "merge" features in datasets.

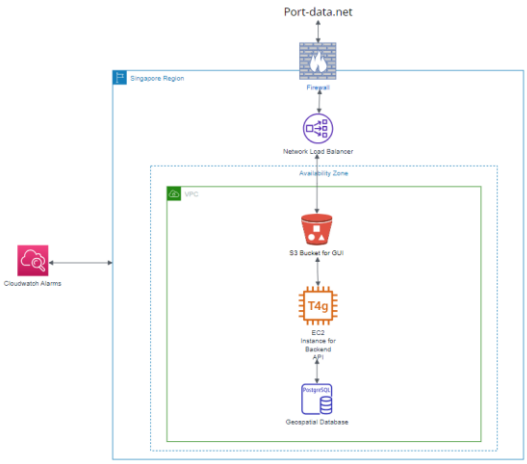
	 The missing featureType: lines will be fixed in v1.5 and I'll circulate the API tomorrow... For now this version accepts import (GeoJSON), validation and export to GML. the addFeature will delete the dataset first and then replace it with wehatever is in the payload. I will be working on the documentation and error codes this week and also will put something in place to upload/download supplementary files.
20231020	NTOU received s100api-1.5.war from IIC and deployed it to local server for testing IIC: We've changed the way the feature catalogue and other temporary files are accessed so it should be good for both Unix and Windows systems (we've tested both here and they both work for dataset extraction to GML). We've also put some trace debugging messages in too.
20231024	NTOU presented S-131 and the project to the Taiwan International Ports Coporation (TIPC) in an invited visit to the Port of Kaohsiung VTS.
20231027	NTOU received s100api-1.5.1.war from IIC and deployed it to local server (20231029)
20231102	NTOU's feedback on S100api-1.5.1.war to IIC: We have noticed that the GML file extracted via S100api-1.5.1 has the following two issues: 1. extra # in almost all xlink:href , for example <theContactDetails xlink:href="##AA.CAHAL.ContactDetails.00" 2. empty geometry element in all information types, for example <Applicability gml:id="AA.CAHAL.Applicability.7.14.1">....<geometry></geometry></Applicability>
20231122	S-131 F2F Meeting, Singapore (20-22 November 2023, after S100WG8 meeting)

	Agenda: Update on S-131 Developments; Integration of front & back ends; World Port Index editor presentation (NGA); Singapore test dataset digitizing; MPA Tour; Discussions; Review  Team members & observers Raphael: Can we try to find some time on Tuesday to discuss whether there are any "must-have" extensions to the S-131 model for the purposes of this project and see if we can either work out an accelerated schedule for approval by NIPWG or work on a "draft" basis? I have been thinking about this and I think adding things (new enumeration values, features) would be less disruptive than changing things in the current model. Feature Catalogue 1.1: prioritize list (modelling of fender line, berth pocket, bollards, dolphins, terminal area, alongside depths, etc) 
20231204	NTOU provided GUI & API Architecture on the request from IHO Lab. (We will be proceeding with the purchase of the system on cloud and will require the architecture details to finalise.)

	S131 Project
	 
	
	• Operating System
	  • Window Server 2022
	• Java
	  • Version 8
	• Tomcat
	  • Version 10
	  • Operates in Java environment
	  • There are two web projects, "S131" and "S100 API".
	  • The web project "S131" use the s131 database, while web project "s100 api" use the s100 database.
	• PostgreSQL
	  • Version 14
	  • There are two databases, "S131" and "S100 api".

20231212	NTOU organized a half-day S-100 workshop. S-131 was introduced to participants from international ports (commercial & industrial).
20231214	NTOU received s100api-1.6.0.war from IIC and deployed it to local server
20240130	PRIMAR/ECC asked about Singapore Lab S-131 testing: "a Norwegian project where it could be possible to test out the creation of S-131 data for a couple Norwegian ports" Will provide the needed information (UN location codes or port names) later.
20240201	S-131 Project Team Meeting Agenda: API Update – IIC; GUI Update – NTOU; Server deployment update & domain name - IHO Lab; Review & revise Timeline from F2F; Feature Catalogue 1.1: prioritize list S-131 Timeline from November 2024 PT F2F↵ ↵ **December 2023**↵ Early: feature and attribute list from JP ↵ Mid: version 1.6 API to NTOU ↵ End: digitization complete a Singapore data Identify users and test ports↵ ↵ **January 2024**↵ End: NTOU to deliver a scaled-back GUI ↵ End: PT to discuss proposed feature and attribute additions↵ ↵ **February 2024**↵ Early: IHO Lab server deployment↵ Early: Population and testing of GUI↵ Mid: Weekly sessions with ports to review feedback↵ Mid: Begin report↵ ↵ **March 2024**↵ Early: Identify issues, report, supply fixes↵ Mid: Preparation of report↵ End: Test database launch, submit report↵ ↵ **Feedback**:↵ Identify phase 1 versus phase 2 fixes ↵ List of items to test functionality (narrow scope)↵ Any outreach can, and should coincide with events (offer mini S-131 workshops?)↵ ICC demo data input storage extraction S131 portrayal IIC↵

	NTOU Update:
	
	Integration
	• Save via API to S-131 database
	  • Only GML, not including the Support Files
	• GML extracted via API may be imported into GUI platform for further editing
	  • GML only, for API can not deal with Support Files
	GUI
	• Export S-131 (dataset + Support Files + CATALOG.XML → Zip)
	• Import S-131 (zipped, including referenced support files)
	• "Search" within the port dataset
	• Measurement tool (distance & angle) to assist in editing berth, bollards etc.
	• Show relative distance & angle while editing geometry (curve/surface)

20240227	S-131 Cloud Infra Call (IHO Lab, NTOU, IIC, project lead) IHO Lab: Proposed Conceptual S-131 Architecture (domain name: port-data.net)  Amazon EC2 – hosts the backend server API Amazon RDS for PostgreSQL – Database for the storage of Port/Harbour Information Amazon Simple Storage Service (S3) – web hosting of the S-131 Graphic User Interface (GUI)
20240304	S-131 Project Team Meeting NHS provided a gap analysis that Electronic Chart Centre (ECC) did for NHS, between the Norwegian Port data standard ("Havnedata 3.0") and S-131 Ed.1.0.0. NTOU report: 1. S-131_ProductSpec_SampleDataset_Issues (1) FC: Applicability InformationType has informationBinding to FeatureType (2) DCEG 2.4.10.4: Error in the example of Schedules (3) Sample dataset: incorrect fileReference/fileLocator, all the AnchorBerth objects:

tagged as AnchorageArea.

2. User Guide provided for S-131 (Visible and Interoperable Port Database) tool

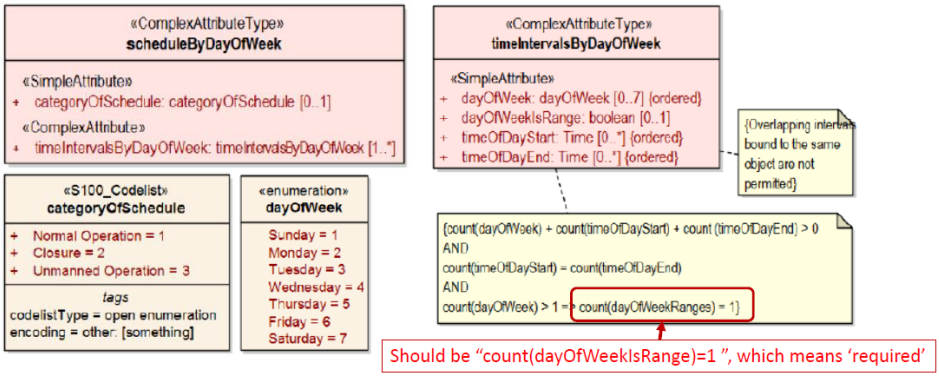
3. GUI hides the complexity of Date, TruncatedDate, and Date (Time) Range: the differences between values entered by user to GML encoding, storage, viewing, data exchange are handled by the GUI/tool.

4. Propose to remodel 'Schedule By Day Of Week'

Pick Report(Portrayal) vs Editor UI

- Pick Report is one-way from final/validated data to the end user
  - to view the existing data (GML)
- Editor UI has to take care of :
  - UI for initial data input (all the possible combinations, multiplicities, order)
  - Viewing the intermediate data on the client side
  - Saving the intermediate input data (possibly containing errors)
  - Retrieving the data from database and populating them back into the UI for further editing

S-131 Ed.1.0.0 **Figure 4.14 - Working times and schedules**



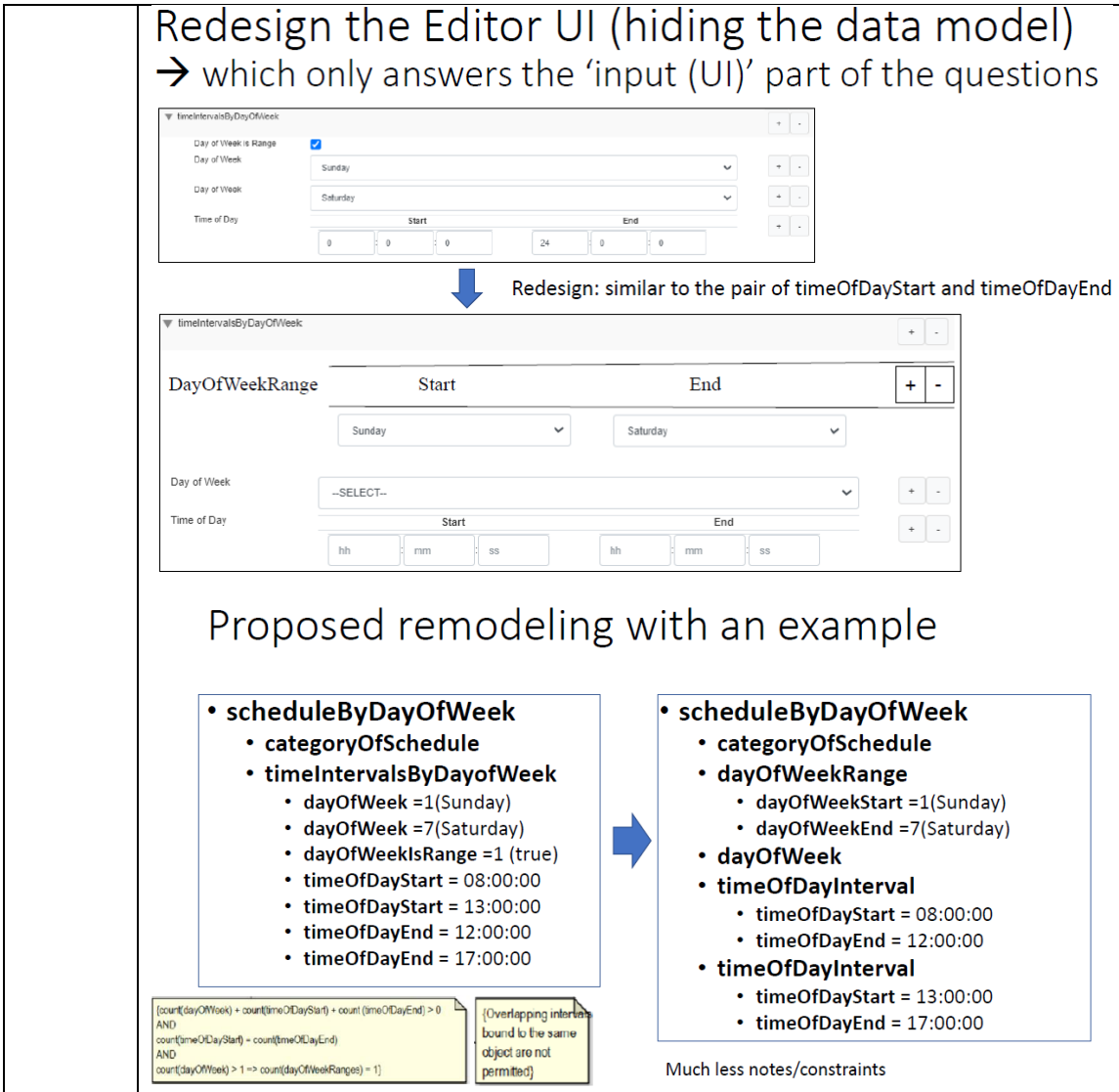
Questions

(1) What if count(dayOfWeek) > 2 and dayOfWeekIsRange=1(true) ?

- Limit it to 2 ?
- So many notes/conditions to check (ref. comments/discussions in S-123TG). Why not remodel ?

(2) Are the dayOfWeek attributes in the correct order ?

- How does the user know two dayOfWeek attributes are in start-end order ?
- The order to be input(UI)/saved (Json)/validated/export (GML)/used ?
  - In S-131 FC, the sequence is 1 to 7
  - dayOfWeekIsRange=1 & [Friday(6), Sunday(1)] or (Sunday(1), Friday(6)] ?

	
20240304	(20240304) IIC to IHO Lab: The EC2 host, is it possible to configure this as a Windows server, not a linux one. The GUI is an application, so it can't be hosted purely on S3. I beleive the RDS config will be ok for the database but we'll need the EC2 as a windows host before we can start installing the GUI components. (20240307) IHO Lab: There should not be an issue configuring the EC2 as a windows server instead, as long as the specifications of the EC2 is equal or lower than what we have stated in the slides previously shared.
20240312	Sarah forwarded, to the group, two sample GML files received from IIC on 20240308 (131IIC0SINGAPORE.GML & 131IIC0SINGAPORE2.gml created from digitizing the Singapore Port Guide)

	IIC: We still have some berths to capture - there are quite a few in the coverage so we've done a representative sample, if they're good we'll keep going and finish off the coverage. At this stage I'm interested in feedback on what we've done so far to give us enough time to improve it before the end of March. NTOU's feedback: The first two major issues noticed are regarding the geometries as follows: 1. The coordinates are in longitude/latitude order and without srsName, hence no features can be displayed in S-131 GUI; 2. When using QGIS to open the GML files, some features of surface type still can't be correctly displayed, which is found to be due to the numerous duplicated coordinates in the posList of the linear ring. See below for one example (shown with only part of the posList).
20240318	NTOU to IHO Lab, IIC, team lead: NTOU team has started to deploy the application to AWS: 1. An instance of host (OS: ubuntu linux server) has been created in EC2 to install Tomcat... and the S-131 application. 2. The IP of the S-131 instance associated to a fixed one for use with the domain name. 3. An error occurred when trying to create a DB Instance in RDS. Both accounts have the same situation. See below for the error messages "Error loading resource". IHO Lab: We have updated the relevant user policies to allow for the action below. NTOU: The error message is as below: Error Loading Resource: ... because no identity-based policy allows the rds:DescribeDBSecurityGroups action. In the mean time, we have already installed PostGreSql and PostGIS in EC2 for S-131 testing. IHO Lab: Included the security groups as well to update the policy. Do let us know if the PostGIS an Postgresql works better on EC2 or the RDS still continues to face issue. NTOU: 1. The issue of RDS remains. 2. We have changed the EC2 location to Singapore. The IP to be used for the domain name is now changed. 3. PostGIS an Postgresql work better on EC2. We will have them setup in the same new location.
20240319	NTOU: Previous errors describeDBsecuritygroups , describeDBinstances cleared. The latest situation: 1. Create DB (Error loading KMS keys) 2. KMS Error IHO Lab: We have included new policies for KMS and IAM to circumvent the error. NTOU: Summary of options for the setup process: 1. PostgreSQL 14.11-R1 2. db.m5d.large 3. general Purpose SSD(gp3),100Gib 4.Connect to an EC2 compute resource. KMS setup has been proceeded further, but still stuck at CreateKey AccessDeniedException

	NTOU to IIC: We have installed the API to EC2. One issue that does require change is as below: Current configuration of API requires that the configuration files (authkeys.yaml and dbconfig.yaml) be placed in the tmp folder. In EC2, files in the tmp folder will be deleted after restarting the host. Would you please change that to a folder other than tmp ? IHO Lab to NTOU: As per yesterday evening's discussion, could we check what is the recommended specs of the EC2 you would like to increase to? We can then relook at the costings accordingly. NTOU: Additional 100GB, to replace RDS, for the storage should be enough. IHO Lab: We are unable to increase the EC2 to host 100 GB as it will be vastly out of our budget. We have attached new policies to facilitate the RDS setup. NTOU: It works now for us to create a database instance in RDS. We are progressing to the setup and testing of the database content and connections. We will use RDS as much as possible for the storage and reduce the use of space in EC2. However, as mentioned yesterday, to store the support files (tiff, txt, html, etc.) also in the database/RDS requires rewriting some server side software (and then testing). It will at least take time. Therefore, it would be helpful to also evaluate whether the the storage of EC2 could be increased to about 20-30 GB. We understand that, in EC2, the space could only be increased not reduced. IHO Lab: The current budget is unable to facilitate the increase the size of the EC2 to cater for 20-30gb in such a short notice period. We will be required to re-budget to submit for approval accordingly which will take about 1-2 weeks to process. As an interim is it possible to make use of the amount of space currently catered for or have a more light-weight MVP version to be deployed on the EC2 first? NTOU: It should be fine, since users/ports would probably not be adding too many graphic support files in the beginning.
20240322	S-131 Project Team Meeting (Sub-group: on S-131 server deployment) Agenda: EC2 - storage capacity; Install of API; Association with domain name IIC: www.port-data.net seems to work. Also, I think squarespace (who we use for domain names) has a default SSL certificate so I think the https will work as well so Lawrence may not be needed. If Shwu-Jing can confirm it's working as expected we can let Lawrence know as well. NTOU: It's linking to http://www.port-data.net/s131/, but not https yet. We still need a SSL certificate file for us to put to the web server.

20240402	S-131 Project VTC Discussion on SSL, security group functionality 1. Discussion on SSL Lawrence mentioned that AWS advised to utilise network load balance to implement SSL. This does not add on to cost. Shwu-Jing shared that her team has already installed the free SSL from letsencrypt. 2. Discussion on the need for network firewall All agreed that there would not be a need for additional firewall other than what is currently provided by AWS. Hence, no additional cost. Lawrence will check and provide access to the security group functionality for Shwu-Jing and Jonathan to review and to make changes if required. 3. Any Other Business Shwu-Jing shared that the software has been modified to to store support files also in databse/RDS, and limited upload of graphic files to maximum 1mb. Victor mentioned he had sent the undertaking form to Raphael, pending Raphael's return of the signed document, before sharing the softcopy SPI with him.
20240403	IHO Lab: Could we request for your team to change the RDS instance from m1.small to t4g.small as it is cheaper and has slightly more memory. NTOU: If it could help reduce the cost, sure we will do that, i.e. create/setup a new database with db.t4g.small RDS instance and delete the current RDS instance db.m1.small. NTOU: It is confirmed that NTOU team has changed the RDS instance to t4g.small and deleted the RDS instance db.m1.small. (20240408)
20240411	NTOU received a mail from ECC/PRIMAR to follow up on the S-131 online tool. "Did we hear correctly that this tool is now available to the wider public for further testing? If that is correct we would be interested to test its functionality. How could we test it? Who do we ask for access?"