SNPWG Product Specification Exercise:
Pilotage Product Specification
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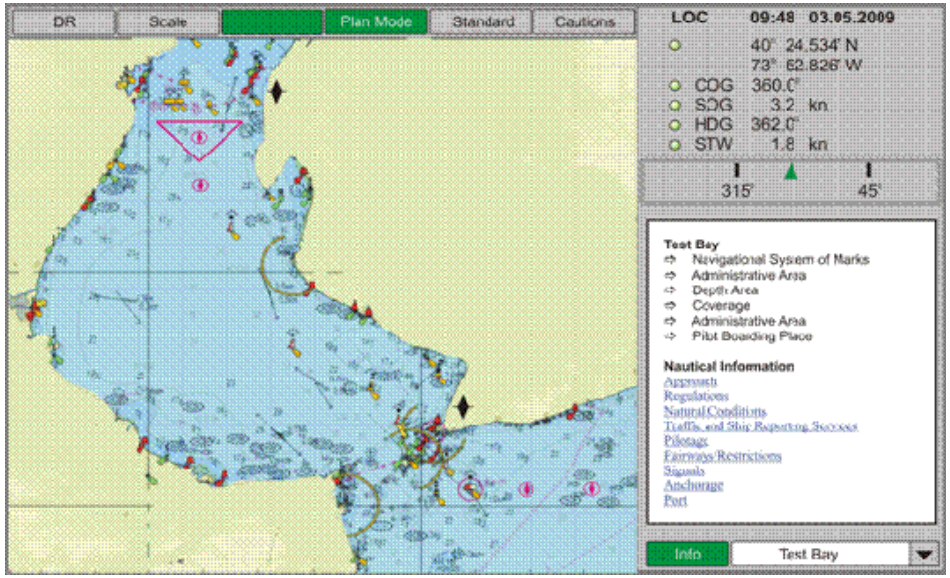
Overview

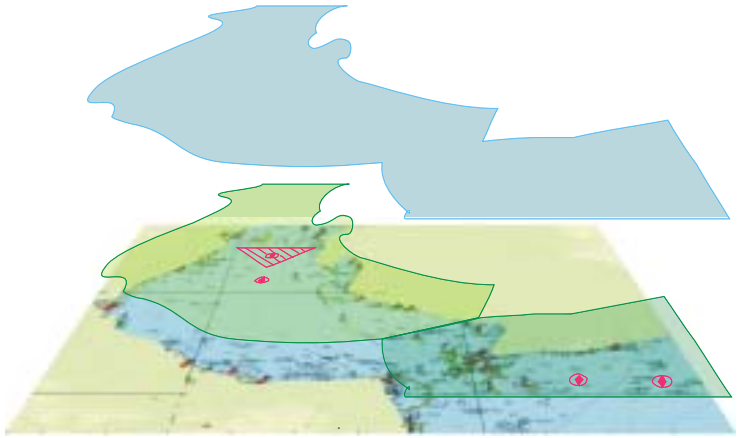
- Method
- Sample Pilotage Test Mapping (round 1)
- Generic Pilotage Test Mapping (round 2)
- Review of Available S-100 Documentation
- Pilotage Product Specification Draft
- Recommendations

Method

1. Review SNPWG Wiki, S-57, other references
2. Map pilotage content to SNPWG10 model
   - Round 1
     - Rostock, New York, Nagoya
   - Round 2
     - Generic port - combines elements from above ports
3. Test pilotage data in ECDIS use cases
4. Circulate test cases for HO feedback
5. Review S-100 guidance on Product Specs
   - S-100
   - S-101 and other available draft specs
6. Draft Pilotage Product Specification
   - Review with MPA and Waterway subgroups
   - Review with SNPWG

Hypothesized S-100 ECDIS Use Cases





- 2nd Mate clicks in chart view to start textual UI window
- ECDIS performs simple spatial analysis on chart objects at clicked point, then compares pilotage info with ship's characteristics
- 2nd Mate queries text UI to understand all requirements, make arrangements with pilot service and execute pilotage

Sample Pilotage Test Mapping, round 1

- Characteristics of pilotage in sampled ports
  - 75% have multiple pilot services per port
  - 50% involve pilot-to-pilot handover
  - 75% define pilot boarding places as areas
  - Pilotage SD content always describes 3 things

    Who must use pilot, How to schedule, How to execute
- Results of mapping pilotage to SNPWG model
  - Used Wiki definitions: 80% of content stayed prose
- Results of hypothetical S-100 ECDIS use cases
  - Round 1 sample data failed ECDIS use cases
- HO feedback: more granular reduction needed

Why did sample data fail in round 1?

- Specific causes of failure differed by port
  - Regional variations in how pilotage works
  - Variations in how pilotage is realized in ENC
- General causes of failure using SNPWG10 model
  - Model doesn't distinguish pilotage regs from other regs
  - CharacteristicsOfVesselsCausingLimitations doesn't specify inclusion vs. exclusion of vessels that meet the criteria
  - Model didn't provide adequate means of encoding a sequence of reporting times or complex service hours
  - Spatial geometry in charts is not designed to support nautical publications queries

Generic Pilotage Example (round 2)

- Generic case combined some tougher pilotage info challenges
  - Multiple pilot services in one port
  - Pilot-to-pilot handover
  - Pilot boarding place areas and points
  - Limitations: we did not deeply test 4 “brothers” issues
- A few new attributes were created to distill crucial detail into software readable coded values.
- Postulated that ECDIS performs more basic spatial analysis
- In this round, the sample data WORKED in ECDIS test cases
- HO feedback
  - Feasibility of reducing SD content to this level is questionable
  - Split: some liked idea of ECDIS becoming a Decision Support System, others advised that much Sailing Directions info is too complex to be coded values; better for mariner to read text.

Why did the Generic Test Succeed?

- Postulated that S-100 ECDIS performs basic spatial analysis on the fly
  - ADMARE for Test Bay contains the 2 PLTSRVs, PLTSRVs contain PILBOPs
  - Enabled ECDIS to determine that 2 pilot services are involved in Test Bay transit
  - Clicking any place in Test Bay yields complete enough information to be effective
- Relationships of NPUBS and HYDRO classes were specified
  - Regulations associated with ADMARE
  - Geo object PLTSRV requires a polygon object
  - MANY fewer relates to build and maintain
- CATRXN added to distinguish Pilotage regulations from other regulations
  - ECDIS user doesn't have to scroll through lengthy list of ALL regulations for Test Bay
- RXNCOD attribute added to provide summary text strings for ECDIS display
- LIMTYP attribute added to CHALIM to distinguish inclusion/exclusion and required/recommend.
- NTCTIM/NTCTXT complex attrib added to improve ability to encode notice time
- WKDYWK made into a complex attrib to streamline Service Hours

Use cases worked, but issues remain.

Review of Available S-100 Documentation

- Following S-100 and using S-101 as an example, it was possible to draft a Product Specification for Pilotage, however
  - Some S-100 constraints, such as limits on hierarchical structure, are not well suited to publications information
  - S-100 generally hasn't yet considered the nature of textual information in nautical publications
  - S-100 guidance on how feature catalog, feature concept dictionary, bindings, associations, and roles should be documented in Product Specifications needs refinement

Examples of significant issues follow

Context Tables and Feature Catalog

Context Table

Role Name	Name	Description	Multiplicity	Data Type	Remarks
Class	PilotService	The area where pilotage services are available. Pilotage is a service provided by a person who directs the movements of a vessel through pilot waters, usually a person who has demonstrated extensive knowledge of channels, aids to navigation, dangers to navigation, etc., in a particular area and is licensed for that area.	-	-	
Attribute	categoryOfPilot	?	1..*	CategoryOfPilot	
Attribute	dateEnd	The attribute "date end" indicates the latest date on which an object (e.g. a buoy) will be present.	0..1	date	
Attribute	dateStart	The attribute "date, start" indicates the earliest date on which an object (e.g. a buoy) will be present.	0..1	date	
Attribute	noticeTime	Span of time, prior to the time the service is needed, for preparations to be made to fulfil the requirement.	0..*	complex	
Attribute	objectName	The individual name of an object	0..*	text	
Attribute	periodicDateEnd	The end of the active period for a seasonal object (e.g. a buoy). See also "date end".	0..1	date	
Attribute	periodicDateStart	The start of the active period for a seasonal object (e.g. a buoy). See also "date start".	0..1	date	
Attribute	pilotDistrict	The name assigned to the area within which a particular pilotage service operates.	0..*	text	
Attribute	pilotQualification	?	0..1	pilotQualification	
Attribute	pilotRequest	Description of the pilot request procedure	0..1	text	
Attribute	remotePilot	Whether remote pilotage is available.	0..1	boolean	
Attribute	informationMultilingual	Textual information about the object.	0..*	complex	
Attribute	scaleMaximum	The maximum scale at which the object may be used e.g. for ECDIS presentation. The modulus of the scale is indicated, that is 1:25 000 is encoded as 25000	0..1	integer	
Attribute	scaleMinimum	The minimum scale at which the object may be used e.g. for ECDIS presentation. The modulus of the scale is indicated, that is 1:25 000 is encoded as 25000.	0..1	integer	
Attribute	textualDescription	The file name of an external text file that contains the text	0..*	text	
Attribute	sourceDate	The production date of the source, e.g. the date of measurement.	0..1	date	
Attribute	sourceIndication	Information about the source of the object.	0..1	?	
Association	additionalInformation	Additional information is available	0..*	ServiceHours	
Association	additionalInformation	Additional information is available	0..*	ContactDetails	

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Feature Catalog

Geo Object Class: Pilot service — Alpha code: **PLTSRV**

Camel case: **PilotService** — Abstract type: False

Definition: The area where pilotage services are available. Pilotage is a service provided by a person who directs the movements of a vessel through pilot waters, usually a person who has demonstrated extensive knowledge of channels, aids to navigation, dangers to navigation, etc., in a particular area and is licensed for that area. (adapted from IHO Dictionary, S-32, 5th Edition, 3843)

References: INT 1: not specified; M-3: Chapter C Section C 2.8; M-4: not specified;

Remarks: The name of this object may be the same as the Pilot District of the associated PILBOPs.

Spatial Objects: Area (GM_Polygon)

Distinction: No distinctions.

Attribute	Camel case	Alpha code	Cardinality	Sequential
Category of pilot	categoryOfPilot	CATPLT	1..*	False
Date end	dateEnd	DATEND	0..1	
Date start	dateStart	DATSTA	0..1	
Notice Time	noticeTime	NTCTIM	0..*	False
Object Name	objectName	OBJNAM	0..*	False
Periodic date end	periodicDateEnd	PEREND	0..1	
Periodic date start	periodicDateStart	PERSTA	0..1	
Pilot district	pilotDistrict	PILDST	0..*	False
Pilot qualification	pilotQualification	PLTQFC	0..1	
Pilot request	pilotRequest	PLTRQS	0..1	
Remote pilot	remotePilot	RMTPLT	0..1	
Information, multilingual	informationMultilingual	INFOML	0..*	False
Scale max	scaleMaximum	SCAMAX	0..1	
Scale minimum	scaleMinimum	SCAMIN	0..1	
Textual description	textualDescription	TXTDSC	0..*	False
Source date	sourceDate	SORDAT	0..1	
Source indication	sourceIndication	SORIND	0..1	

Information feature	Camel case	Alpha code	Cardinality
Contact details	ContactDetails	CONDET	0..*
Service hours	ServiceHours	SRVHRS	0..*

Process and role of Registry in Context Table and Feature Catalog maintenance and generation of documentation needs to be refined.

Sequential Instructions

- Sailing Directions often request a vessel to first make arrangements with a pilot service well before arrival in the port, then provide an update closer to the arrival.

- Typically, the SDs also instruct the ship to contact the pilot vessel at the pilot boarding place, and often an initial contact followed by updates is required.

- Major ports sometimes have multiple pilot services working with multiple pilot boarding places.

- To allow the ECDIS to handle these sequential instructions properly, the data must be encoded in a strict sequential order that is harmonized between port states.

```
PilotService
        noticeTime
                sequence=1 (how to link this with PilotBoardingPlace)
                noticeTimeHours=48
                noticeTimeText=give notice to the pilot district
        noticeTime
                sequence=2
                noticeTimeHours=24
                noticeTimeText=give notice to the pilot district
PilotBoardingPlace
        noticeTime
                sequence=1 (how to link this with PilotService)
                noticeTimeHours=12
                noticeTimeText=give notice to the pilot office
        noticeTime
                sequence=2
                noticeTimeHours=6
                noticeTimeText=give notice to the pilot office
        noticeTime
                sequence=3
                noticeTimeHours=1
                noticeTimeText=give notice to the pilot vessel
```

Repeated information

- Some information consists of lists of values. Sometimes the values are linked to values of other attributes. E.g., day of week is linked to working hours for the day.
- What is the proper balance between theoretically clean data representations and representations that may be more compact and which are probably less error-prone during maintenance and possibly easier for applications to handle?

```
ServiceHours
    workingDaysOfWeek=1
    workingHoursOfDay
        timeReference=1
        timeOfStartOfWork=0600
        timeOfEndOfWork=1800
    workingDaysOfWeek=2
    workingHoursOfDay
        timeReference=1
        timeOfStartOfWork=0600
        timeOfEndOfWork=1800
    …
    workingDaysOfWeek=5
    workingHoursOfDay
        timeReference=1
        timeOfStartOfWork=0600
        timeOfEndOfWork=1800
```

or

```
ServiceHours
    workingDaysOfWeek=1,2,3,4,5    (or 1/5)
    workingHoursOfDay
        timeReference=1
        timeOfStartOfWork=0600
        timeOfEndOfWork=1800
```

Sequencing of Object-Related Events

- Sequence of usage of pilot services and pilot boarding places depends on the direction of the route and destination.
- At present this can be modeled only verbally or functionally in software

PilotService
    objectName=”Test Bay Pilot Service”
    pilotDistrict=”Test Bay Pilot District”
PilotBoardingPlace (draft > 14m)
    objectName=”Test Bay Pilot Boarding Place 1”
    dstntn=”Test Bay, inbound to and outbound from sea”
PilotBoardingPlace (draft < 14m)
    objectName=”Test Bay Pilot Boarding Place 2”
    dstntn=”Test Bay, inbound to and outbound from sea”
PilotBoardingPlace
    objectName=”Test Bay Alternate Pilot Boarding”
    dstntn=”Test Bay outbound to sea”
PilotBoardingPlace
    objectName=”Test Bay Alternate Pilot Boarding”
    dstntn=”Test Bay inbound from sea”

PilotService
    objectName=”Port Alpha Pilots Association”
    pilotDistrict=”Port Alpha Pilot District”
PilotBoardingPlace (except tankers, hazardous cargo, draft < 14m)
    objectName=”Pilot Boarding Area A”
    pilotDistrict=”Alpha Pilotage district”
    dstntn=”Port Alpha or Beta, inb. from or outb. to Test Bay Pilot Boarding Place”
PilotBoardingPlace (tankers, draft > 14m)
    objectName=”Pilot Boarding Area A”
    pilotDistrict=”Alpha Pilotage district”
    dstntn=”Port Alpha or Beta, inb. from or outb.to Test Bay Pilot Boarding Place”

Conditional Information

Passage Interdiction

In Test Bay Narrows, between lighted whistle buoys 1 and 2

If the visibility exceeds 1000m and in winds up to force 6, and if the aggregate beams of the vessels in a potential head-on situation do not exceed 40.00m, and draught of one of the vessels does not exceed 6.50m, or if visibility is less than 1000m or wind exceeds force 6, and the aggregate beams of the vessels does not exceed 30.00m, and the draught of one of the vessels does not exceed 7m, the outbound vessel shall have the right of way

- Conditional information abounds in Sailing Directions.
- In the above example, passing is conditional upon
  - Complex dependencies between limitations based on ship characteristics and environmental conditions
  - A verbally described area that is conditional upon multiple ATONs

S-100 would need a means of handling complex, conditional information

Pilotage Product Specification Draft

- We strived to follow S-100 rigorously, but made some practical adaptations
  - Scopes diagram expanded
  - App Schema diagram reduced to show classes/relates only
  - Summary of Types Table added
  - Bindings documented as tables with FCD items
- Conclusion: it is not yet possible to write valid Product Specification for Pilotage
  - Need for a clear, shared vision of how S-100 ECDIS works with NP content
    - HOs apparently plan to keep Nautical Publications even if NP in ECDIS works
    - Doubt whether a chart UI is the best UI for complex text information
    - Portrayal of Nautical Publications would certainly require major departure from S-52
  - Need to resolve fundamental questions with S-100 data model
    - Would behoove HSSC to assess time and effort remaining to achieve S-100 data
    - Goal: Optimize coded-value reduction of NP, or optimize text, BOTH?
  - S-100 guidelines for composing Product Specification documentation need refinement and expansion to address textual content as well as chart content.

Recommendations

- IHO, IMO, and the industry should reach mindshare and publish the core S-100 ECDIS design objectives, explaining whether:
  - ECDIS remains a purpose-built chart navigation solution (with better text)
  - ECDIS changes to become a multi-purpose Decision Support System that provides both a charting user interface and a text user interface.
  - ECDIS remains a purpose-built chart navigation solution, but it interfaces to separate systems that are optimized for text publications.
- SNPWG should assess the full spectrum of NPUBS and related HYDRO information, organize work packages, and continue with Product Specs.
  - SCOPE: Decide whether SNPWG is modeling *all* carriage-required, HO authored NP content, or only the part that works well in a chart-driven user interface
  - Assess time and cost to reach S-100 implementation
  - Divide the full scope into work packages, prioritize, and continue the work started in SNPWG 10 using subgroups. Publish and follow a timeline.
- SNPWG should submit edits to S-100 and define an improved template for Product Specifications.