



IIC Technologies:

A Stakeholder's
perspective:

Our (continuing)
S-100 Implementation
and S-100 Tools

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Technical Strategy and Portfolio

- Our toolset focuses wholly on an implementation and supporting tools for S-100 edition 5. All our technology implements the framework
- Supporting the standard development process through S-100, S-98, S-164, product specifications
- Generation and publishing of:
 - Models, Feature Catalogues and GML Schemas
 - Actual Data for any product specification
 - Metadata/Signatures and S-128 to support services
 - New data, legacy data conversion and transformation



...the answer is S-100, the question is how to get there.

We create technology to answer the “nuts and bolts” questions...

DESIGNING THE INTERNAL “DATABASE”

Validation between products



GML?

S-128, do I need to...?

Data Production

S-101 migration, how? Updates???

Feature Catalogue import

Language Packs

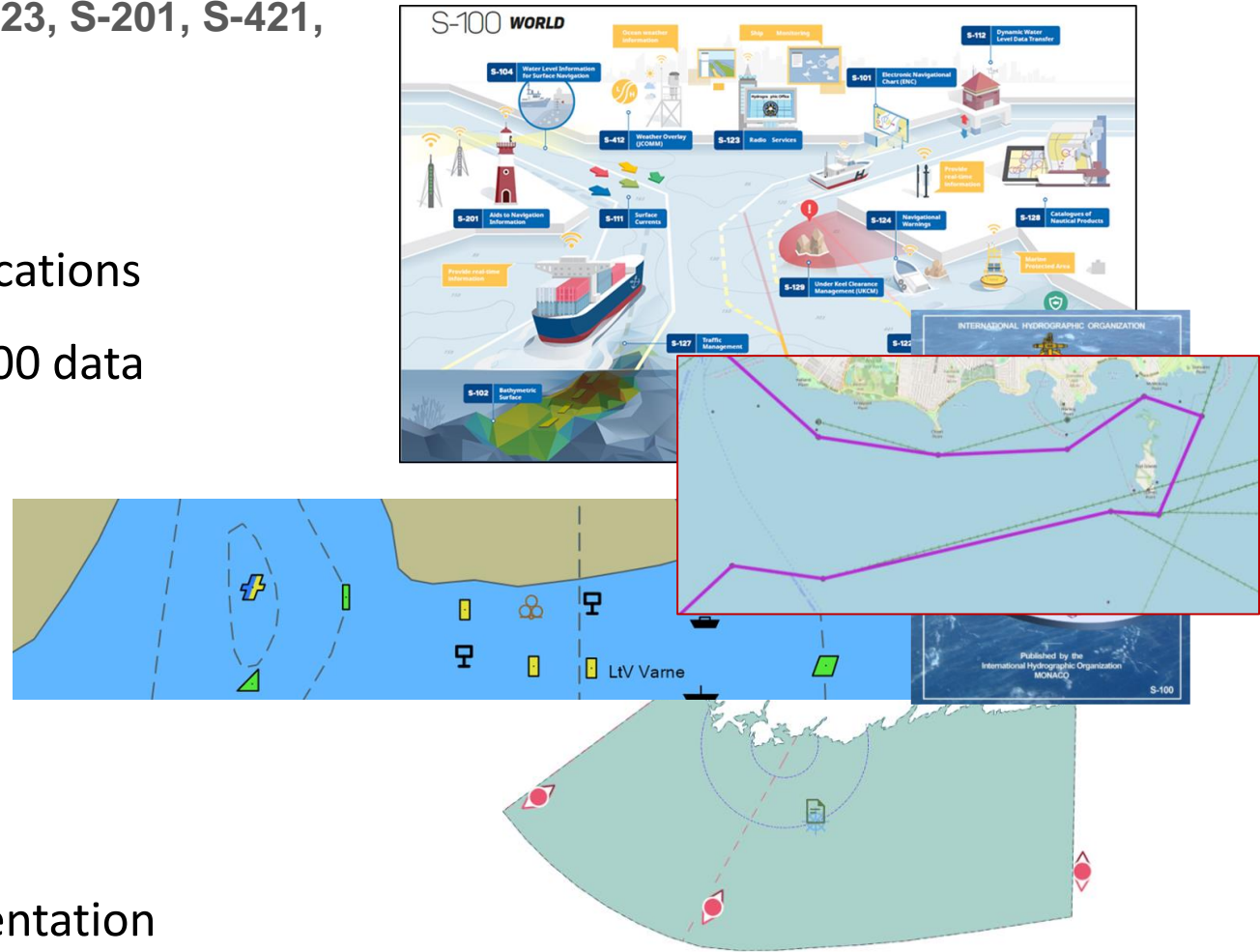
Should I create S-102, S-104, S-12X...?

Digital Signatures, do I need one?

Metadata, CATALOG.XML

Our view as an implementer IS our implementation:

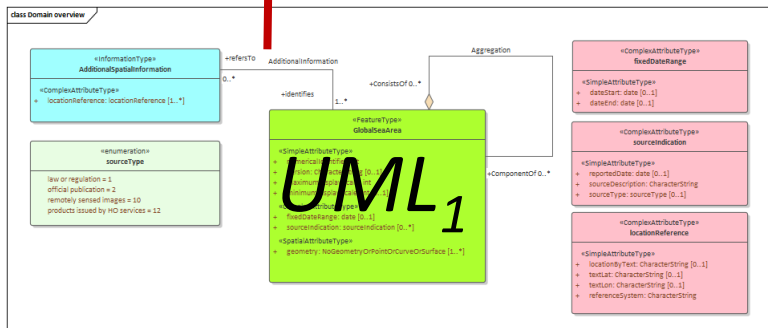
- Multiple S-100 products
 - S-101, S-102/S-104, S-128, S-131, S-130, S-127, S-123, S-201, S-421, S-121, S-122, S-124
- Digitisation of S-101 and S-12X products
- Modelling, creation and support for product specifications
- Migration, Transformation and Manipulation of S-100 data
- Legacy data management
- Relational Database migration
- Creation of Metadata
- Part 15/Part 17 implementation
- Interoperability testing and demonstration
- Software library and API development and implementation
- OGC API interoperability, Search engine optimisation for IHO data
- **Training**



Dataset



Feature catalogue



featureBuilder v6.2.1

Data Settings Export Help

Add ConcentrationOfShippingHazardArea

Add Authority

Features	Value	Type	Gid	Comment
<ul style="list-style-type: none"> DataCoverage <ul style="list-style-type: none"> maximumDisplayScale 10000000 minimumDisplayScale 1000 VesselTrafficServiceArea 3413NC <ul style="list-style-type: none"> categoryOfVesselTraffic: Traffic Organisation Service featureName <ul style="list-style-type: none"> language eng name Northern Canada Vessel Tr... featureName <ul style="list-style-type: none"> language fra name La zone de services de trafi... requirementsForMaint: none RestrictedAreaNavigation 363MRIVER <ul style="list-style-type: none"> categoryOfRestrictedA offshore safety zone restriction entry restricted featureName <ul style="list-style-type: none"> language eng name Mackenzie River Marine Sa... featureName <ul style="list-style-type: none"> language fra name Procédures relatives aux av... textContent <ul style="list-style-type: none"> information <ul style="list-style-type: none"> language eng text For the purpose of enhanci... 	ARCTIC	F [S]	7196/113...	CANPI127ARCTIC
		INTEGER [1-1]		
		INTEGER [1-1]		
	3413NC	F [S]	3413C	3.4.1.3 Northern Canada_clipp...
		ENUMERATION ...		
		Complex [0..*]		
		TEXT [0-1]		
		TEXT [1-1]		
		Complex [0..*]		
		TEXT [0-1]		
		TEXT [1-1]		
		TEXT [1-1]		
	363MRIVER	F [S]	363RESA...	3.6.3 Western Arctic – Mack...
		ENUMERATION ...		
		ENUMERATION ...		
		Complex [0..*]		
		TEXT [0-1]		
		TEXT [1-1]		
		Complex [0..*]		
		TEXT [0-1]		
		TEXT [1-1]		
		Complex [0..*]		
		TEXT [0-1]		
		TEXT [0-1]		
		TEXT [0-1]		

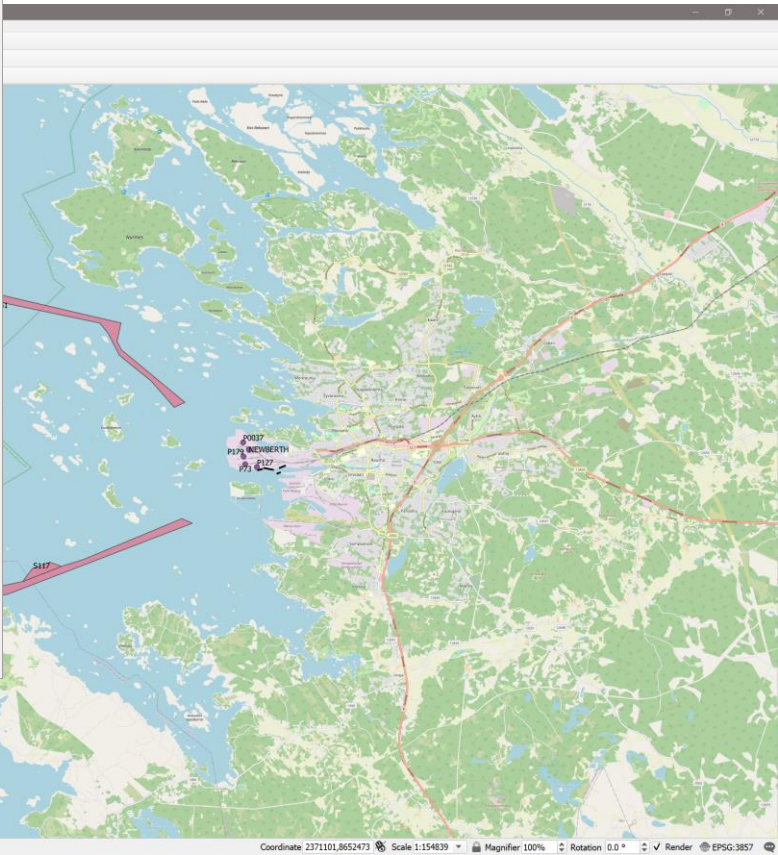
Relations

Product=S-127 Schema=s127ed5 Dataset=1272C7196113811ARv5

Validation

Validation against feature catalogue successful

OK



USCG_Districts

Statistic	Value
Selected features only	

Type to locate (Ctrl+K)

Auto-Generation

featureBuilder v6.2.1

Data Settings Export Help

Add: RouteWaypoints

Features	Value	Type	Gid	Comment
Route	RT1	F [N]	RT1	
routeID	VancouverOutbound	TEXT [1-1]		
routeEditionNo	1	INTEGER [1-1]		
routeFormatVersion	S-421/S-100 Edition 5.0.0	TEXT [1-1]		
RouteWaypoints	RPTS1	F [N]	RPTS1	
RouteInfo	RINFO1	I [N]	RINFO1	
routeInfoStatus	planned	ENUMERATION ...		
routeInfoName	VancouverOutbound	TEXT [1-1]		
RouteWaypointLeg	R1WP1	F [C]	R1WP1	
routeWaypointLegNotr	ROCHE POINR WEST WP1	TEXT [0-1]		
routeWaypointLegGeo	Lexodrome	ENUMERATION ...		
routeWaypointLegSOG	6	REAL [0-1]		
RouteWaypoint	WP50776	F [P]	WP50776	
routeWaypointName	ADMIRALTY POINT WEST	TEXT [0-1]		
routeWaypointID	WP50776	INTEGER [1-1]		
routeWaypointTurnRac	0.0	REAL [1-1]		
RouteWaypointLeg	R1WP2	F [C]	R1WP2	
routeWaypointLegNotr	WAYPOINT WP2	TEXT [0-1]		
routeWaypointLegGeo	Lexodrome	ENUMERATION ...		
routeWaypointLegSOG	6	REAL [0-1]		
RouteWaypoint	WP52657	F [P]	WP52657	
routeWaypointName	ROCHE POINR WEST	TEXT [0-1]		
routeWaypointID	WP52657	INTEGER [1-1]		
routeWaypointTurnRac	0.0	REAL [1-1]		
RouteWaypointLeg	R1WP3	F [C]	R1WP3	

Relations

Product=S-421 Schema=s100ed5 Dataset=VancouverOutbound

S-128 Metadata

featureBuilder v6.2.1

Data Settings Export Help

Add: ElectronicChart

Add: DistributionDetails

Features	Value	Type	Gid	Comment
ElectronicChart	ID2	F [S]	S1	
typeOfProductFormat	ISO/IEC 8211	ENUMERATION ...		
chartNumber	101AA00DBASE.000	TEXT [1-1]		
compilationScale	45000	TEXT [1-1]		
producerCode	AA00	TEXT [1-1]		
copyright	None	TEXT [1-1]		
editionDate	2022-12-25	DATE [1-1]		
editionNumber	12	INTEGER [1-1]		
issueDate	2022-12-25	DATE [1-1]		
productType	ENC	ENUMERATION ...		
CatalogueOfNauticalProd	ID1	F [N]		
editionNumber	1	INTEGER [1-1]		
issueDate	2023-03-04	DATE [1-1]		
featureName		Complex [1-1]		
name	catalogue number one.	TEXT [1-1]		

Relations

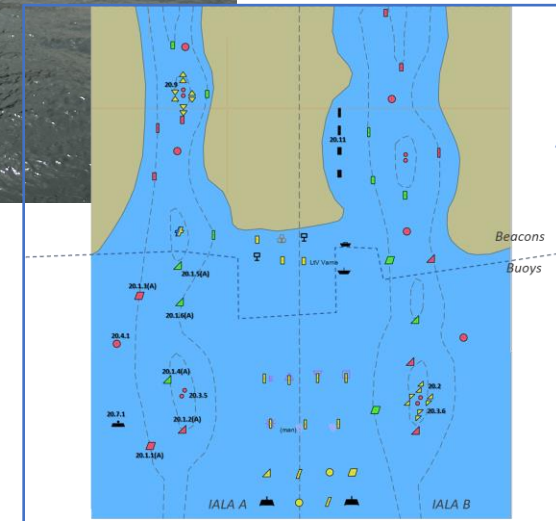
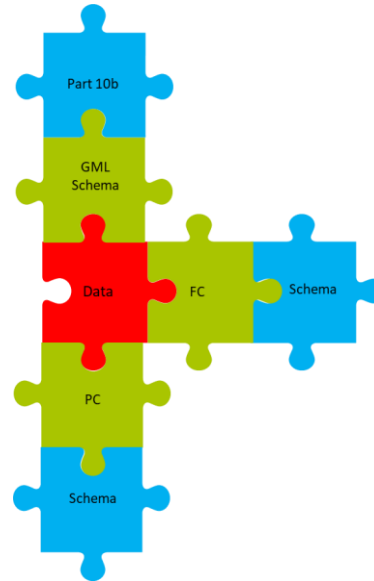
Product=S-128 Schema=s100ed5 Dataset=s128sample

```

<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<Dataset xmlns:S100="http://www.ihoint/s100gml/5.0" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:s100-profile="http://profiles/s100_gmlProfile" xmlns:xlink="http://www.w3.org/1999/xlink" gml:id="DS1">
  <S100:DatasetIdentificationInformation>
    <S100:encodingSpecification>S-100 Part 10b</S100:encodingSpecification>
    <S100:productEdition>1.0</S100:productEdition>
    <S100:applicationProfile>1</S100:applicationProfile>
    <S100:datasetFileIdentifier>XXXIC00000.GML</S100:datasetFileIdentifier>
    <S100:datasetTitle>Sample GML Encoding</S100:datasetTitle>
    <S100:datasetReferenceDate>2001-04-22</S100:datasetReferenceDate>
    <S100:datasetLanguage>eng</S100:datasetLanguage>
    <S100:datasetTopicCategory>oceans</S100:datasetTopicCategory>
    <S100:datasetPurpose>base</S100:datasetPurpose>
    <S100:updateNumber>0</S100:updateNumber>
  </S100:DatasetIdentificationInformation>
  <members>
    <ElectronicChart gml:id="ID2">
      <copyright>some stuff here...</copyright>
      <editionDate>2022-12-25</editionDate>
      <editionNumber>12</editionNumber>
      <issueDate>2022-12-25</issueDate>
      <productType code="2">ENC</productType>
      <chartNumber>101AA00DBASE.000</chartNumber>
      <compilationScale>45000</compilationScale>
      <producerCode>AA00</producerCode>
      <typeOfProductFormat code="2">ISO/IEC 8211</typeOfProductFormat>
    </ElectronicChart>
    <S100:surfaceProperty>
      <S100:surface gml:id="SID2">
        <gml:patches>
          <gml:PolygonPatch>
            <gml:exterior>
              <gml:LinearRing>
                <gml:posList>0.0 0.0 0.0 1.0 1.0 1.0 0.0 0.0</gml:posList>
              </gml:LinearRing>
            </gml:exterior>
            <gml:PolygonPatch>
              <gml:patches>
                </S100:surface>
              </S100:surfaceProperty>
            </geometry>
          </ElectronicChart>
          <CatalogueOfNauticalProduct gml:id="ID1">
            <editionNumber>1</editionNumber>
            <issueDate>2023-03-04</issueDate>
            <featureName>
              <name>catalogue number one.</name>
            </featureName>
            <theCatalogueElements xlink:arcrole="http://www.ihoint/s-128/gml/1.0.0/roles/componentOf/theCatalogueElk"
              </CatalogueOfNauticalProduct>
          </members>
        </Dataset>
  
```


What's on the horizon?

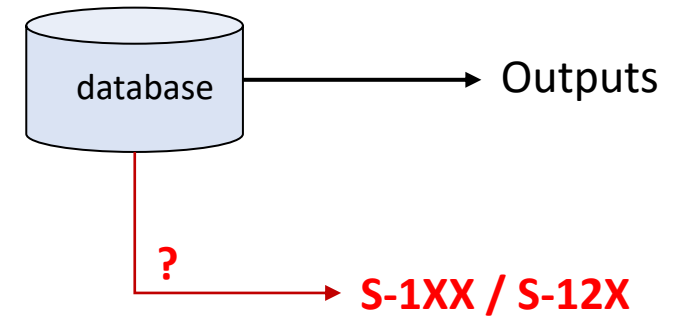
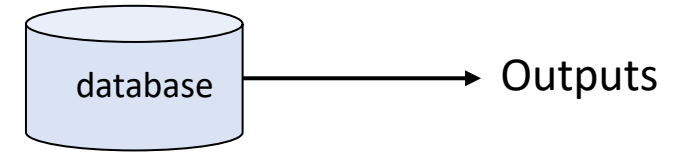
- We are focusing on making S-100 simpler to understand and implement
- Simpler to integrate with existing data sources, either to replace or sit alongside legacy databases
- Streamlining creation and validation of usable, interoperable data from feature catalogues
- Supporting the OEM community with
 - Creation of S-164 test datasets
 - Exchange Sets for S-164 (including S-128)
 - Refining the S-164 documentation
 - Clarifications/Corrections to S-98
 - Test datasets for S-101 (and others)



We need help!

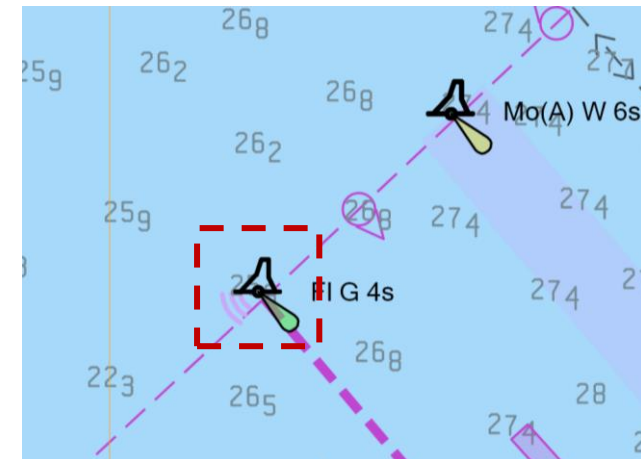
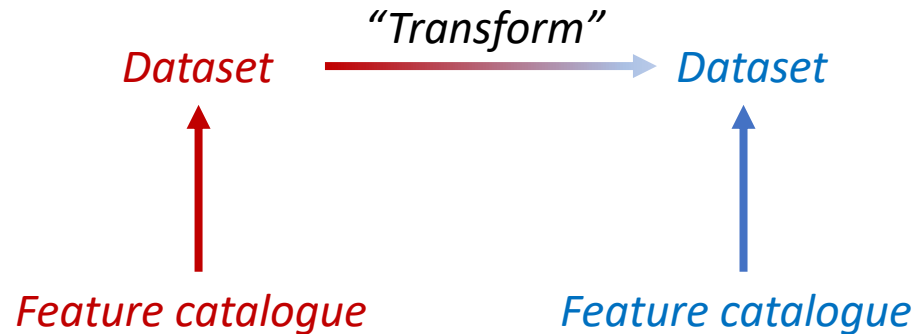
Conversion and Transformation?

- “How do I migrate my existing legacy database to produce future S-12X and S-1XX products”?
- Can I produce S-12X, S-12Y and S-1ZZ from a single database ?
What does that database look like?
- What do I do when the product feature catalogue changes?
- How do I know my migration is “complete” and “conformant”?
- Are my outputs consistent with each other?



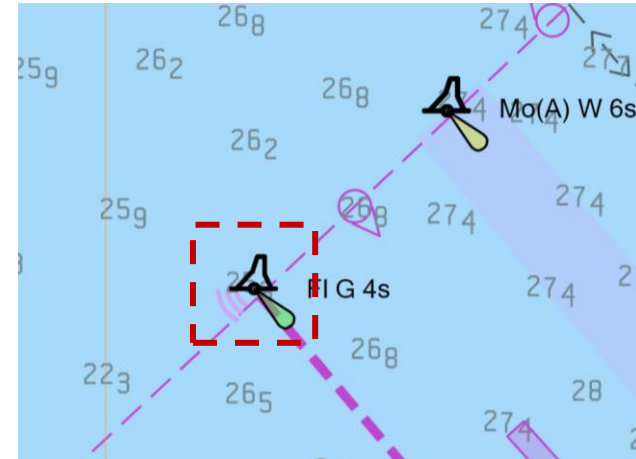
Data Transformation Framework

- Transform from FC to FC and dataset to dataset
- From/To relational databases
- From UML to FC



Consider an Aid To Navigation

- Charted by Hydrographic Office (category, colour, topmark etc..)
- Maintained through another agency
 - Maintenance regime
 - Contact details
 - History
 - NMs
- S-100 implementation could be S-201 or S-125 production
 - Continue legacy database?
 - Create new database?
 - What about bespoke database
- **All relational (and spatial) databases can be turned into S-100 data structures either completely or partially**
- **Without some form of flexible transformation tools these problems are “significantly difficult”**



ENC “conversion” is actually a transformation from one data form to another

But we need to find a way to state how “good” the transformation is?



“where it is”

~~“99.86% of features are converted”~~

“what it is”

For 100% of locations, all features are defined by an unambiguous, independently defined mapping.

BOYLAT
COLOUR
TOPSHP

converts to

Buoy Lateral
categoryOfLateralMark
Colour
TopMark

derived from

...including updates

“everything is somewhere...”

S-100 ECDIS Development

S-100 ECDIS is not just the implementation of more layers.

S-100 ECDIS will be an engine for:

- Handling arbitrary data layers which conform to the standard
- Conforming to the necessary standards for safe navigation
- Adding whatever value is possible for the end user.

S-52 was such an engine (".dai" files) but S-100 is a step change in complexity. This requires a new approach.



".dai" files

How?



Catalogues.

"Sgt Pepper broke the mould in so many ways—from concept (a "theme" album) to musical arrangements (using a full orchestra and four pianos in "A Day in the Life") to production effects to cover art—it blew the roof off of what was possible in rock music."
– Steve Jobs

ECDIS is the killer App?

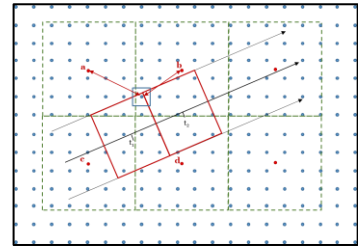
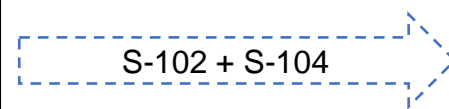
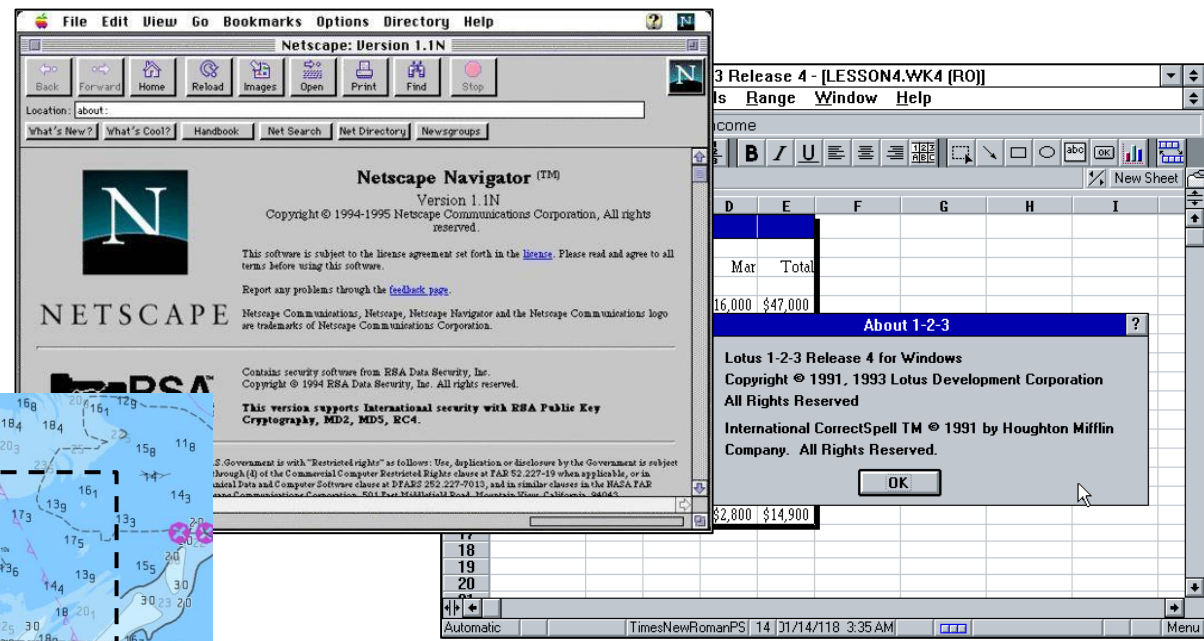
The killer app makes it all worthwhile...

It was (and still is...)

- Positional/Situational Awareness
- Automated Update
- Automated Checking
- Where is (Un)Safe for me?

S-100 ECDIS brings:

- Water Level Adjustment
- User Selectable Safety contour
- Interoperable portrayal and interrogation
- Access to all relevant data layers



S-100 fundamentally changes what is on the ECDIS.

Single Layer official S-57 ENC's are replaced by multiple, interoperable layers of navigational data.

The deeper question is how to integrate the other data.

Accessibility to other kinds of information via structured data, accessed "spatially" using links within the features.

3.5 Local Vessel Traffic Services (VTS) Zones

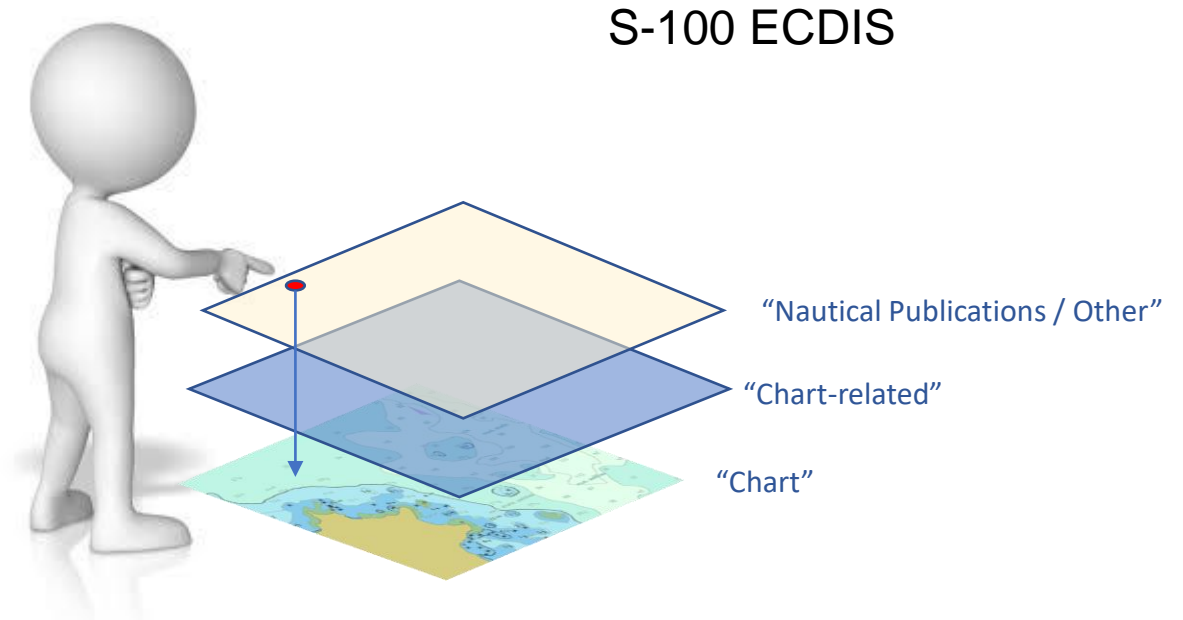
With respect to the VTS zones specified in the Vessel Traffic Services Zones Regulations, these regulations apply in respect of:

- a) every ship 20 metres or more in length;
- b) every ship engaged in towing or pushing any vessel or object, other than fishing gear, where;
 - i. the combined length of the ship and any vessel or object towed or pushed by the ship is 45 metres or more in length, or
 - ii. the length of the vessel or object being towed or pushed by the ship is 20 metres or more in length.

With respect to the VTS zones specified in the Vessel Traffic Services Zones Regulations, these regulations do not apply in respect of:

- a) a ship engaged in towing or pushing any vessel or object within a log booming ground;
- b) a pleasure yacht that is less than 30 metres in length; and
- c) a fishing vessel that is less than 24 metres in length and not more than 150 tons gross tonnage.

Participation is mandatory.



What's here?

What's important to me?

✓	✓	Priority	Message	Time	Ack Time
✓	☐	Indication	Safety contour defaulted to next deeper contour	Sat 12:23:44	Sun 10:22:50
✓	☐	Report	Ship Report Notice Time (Hours) 0.25	Sat 12:23:44	Sun 10:22:50



Pick Report

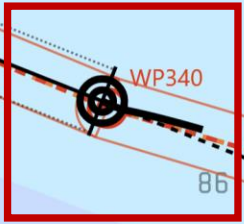
Radio Calling-In Point
Recommended Track
Information Area
Navigation Line
Navigational System of Marks
Depth Area

Attributes

Orientation Value: 320°
Traffic Flow: Inbound
Feature Name: 5A
Name: 5A
Vessel Traffic Services Area: [Applicable]
Ship Reporting Service Area: [Applicable]
-> Ship Report: textContent, headline, language, text

Arrival at a Calling-In-Point (CIP)
a) the name of the ship;
c) the position of the ship;
j) estimated time at which the ship will next arrive at a reporting point.

Send >





Thank You.

Questions?

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