

S-100 Test Framework

*Delivering the future navigational environment
And reflecting the lessons of S-57 ENC/ECDIS*

Draft Version 0.3
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1 Introduction

The development of S-100 and S-101 by the IHO has reached the stage where testing and further development are required to complete the standards and associated elements to deliver a specification that can produce data and be used operationally. This document presents a framework for the incremental testing of the systems which make up the future marine navigational environment. It adopts a systems engineering approach (using ISO 15288:2008) reflecting that standards can only be tested based on implementation and that a complex system of systems make up the marine navigational environment.

This framework is intended to support the testing of a wide range of S-100 based product specifications. The level of testing required for each product specification will vary depending upon the end use of the data. For example, if the data is intended to be used in an ECDIS to support navigation, then the product specification should utilize component of the framework. If the end result is for shore-based information systems, then it may not be necessary to test the product specification all the way to full ECDIS capabilities.

2 Background

Since the 1980's a digital revolution has occurred. No domains have been unaffected by this global phenomenon. In the marine navigation domain this led to the development of digital navigation. Initially with raster charts but leading to the Electronic Navigational Chart standardised in the IHO S-57 Specification and built on the S-57 standard. This has progressed to become a mandatory carriage requirement for some vessels in concert with ECDIS.

The digital revolution has continued and technology has evolved, in the early 2000's IHO recognised the need to develop a contemporary standard and also to broaden the scope of exchange standards to support a wider variety of digital information.

S-100 provides the framework standard for the future marine navigational environment. It is realised through the creation of product specifications which enable data exchange and product delivery by defining the content, display and structure of marine spatial data.

Experience with S-57 ECDIS has shown that disconnected standards cannot deliver the user expectation for marine navigation. Instead there must be a clear connection from the user needs to system functions and to the underlying data which supports these functions. The standards simply define the data structures and the systems within this environment.

In addition the regulatory and testing environment must be coherent. This test framework should feed into the development of appropriate test plans, cases and datasets. Draft versions for further development should be deliverables of this work.

It should be noted that while one of the main components of S-100 is the IHO Geospatial Information Registry, for the purposes of this framework it is considered to be out of scope. The S-100 GI Registry has already undergone testing and is in use by the IHO and several

other organizations, and while it is not part of the testing regime, it is considered a major input item to this testing framework. In addition, through this test framework, some gaps within the registry may be identified and will be directed to the appropriate working group for consideration.

3 The Approach

Reflecting contemporary development paradigms for complex software systems involving the integration of systems and data; a system engineering approach is adopted for the testing of S-100 and associated product specifications. This approach utilises the ISO 15288 standard which;

“provides a common process framework covering the life cycle of man-made systems. This life cycle spans the conception of ideas through to the retirement of a system. It provides the processes for acquiring and supplying systems. In addition, this framework provides for the assessment and improvement of the life cycle processes.”

This framework will specifically use the Technical Process defined in part 5.5 of ISO 15288 which consists of the following processes;

- a) Stakeholder Requirements Definition Process;
- b) Requirements Analysis Process;
- c) Architectural Design Process;
- d) Implementation Process;
- e) Integration Process;
- f) Verification Process;
- g) Transition Process;
- h) Validation Process;
- i) Operation Process;
- j) Maintenance Process;
- k) ~~Disposal Process.~~ – This process is not applicable for this framework.

For each component system identified, these processes will be applied as appropriate and documented within this Test Framework and associated supporting documents. Each system of interest will also be documented as a system defining its inputs, outputs and processes.

This approach will be applied in an incremental fashion where each stage builds upon the previous and requirements must ensure the successful integration of the systems. Such requirements must reflect the integration and interfaces of systems. They must cater for another system operating in states where it has not met its requirements.

4 Goals

The goal for the S-100 Test Program for which this framework forms the basis is as follows;

To provide a set of complete and validated standards and specifications and associated documents to support the development of S-100 marine navigation systems which meet the user need.

5 Objectives

This goal can be subdivided into the following objectives working backwards from the use of S-100 products in ECDIS;

- *S-100 products display and function as required by users in S-100 ECDIS. Standards and testing must ensure the required level of consistency and reliability.*
- *S-100 products can be distributed and ingested in a proper and reliable manner by S-100 ECDIS.*
- *S-100 products can be collated and packaged into distribution packages with required data integrity etc*
- *S-100 products can be validated to conform to defining standards and acceptable quality levels.*
- *S-100 products can be created and updated.*
- *S-100 feature and portrayal catalogues can be created and updated. Processes must ensure catalogues are valid and consistent.*

More specifically, this framework will test four major types of products that could be used within an S-100 ECDIS. They are:

- *S-101 ENC Product Specification*
- *S-10X Overlay – where the data would overlay the base ENC to provide additional information*
- *S-10X Partial Replacement – where the data would replace part of the base ENC to provide more detailed information*
- *S-10X wholesale replacement – where the data would replace the entire ENC. For example a port ENC may replace the existing harbour ENC.*

The following functional flowchart depicts the high level S-100 System Overview. Each box represents a component or a set of components that will be tested utilizing this framework.

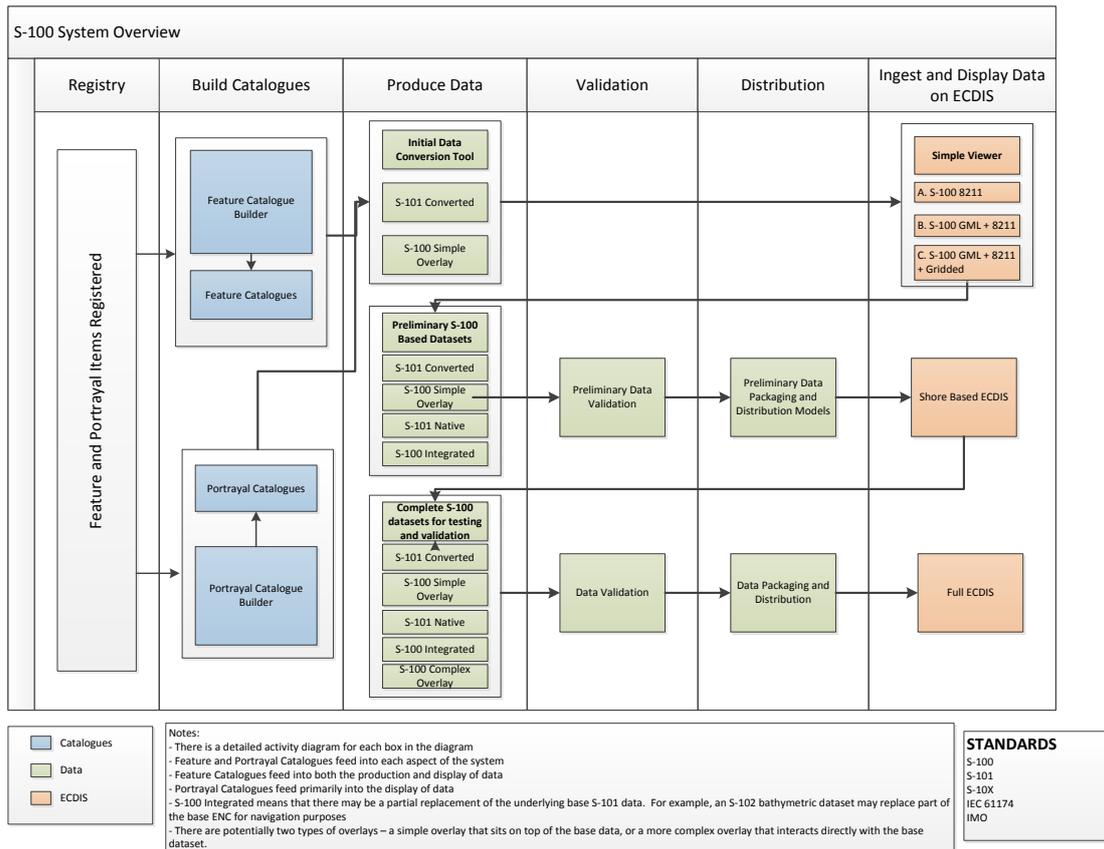


Figure 1 - S-100 High Level System Overview

6 Phases

In order to manage the number of sub systems and complexity involved this framework will break the overall S-100 system testing into 9 phases. These are shown in figure 2 and follow a logical progression from catalogue creation through to use within ECDIS.

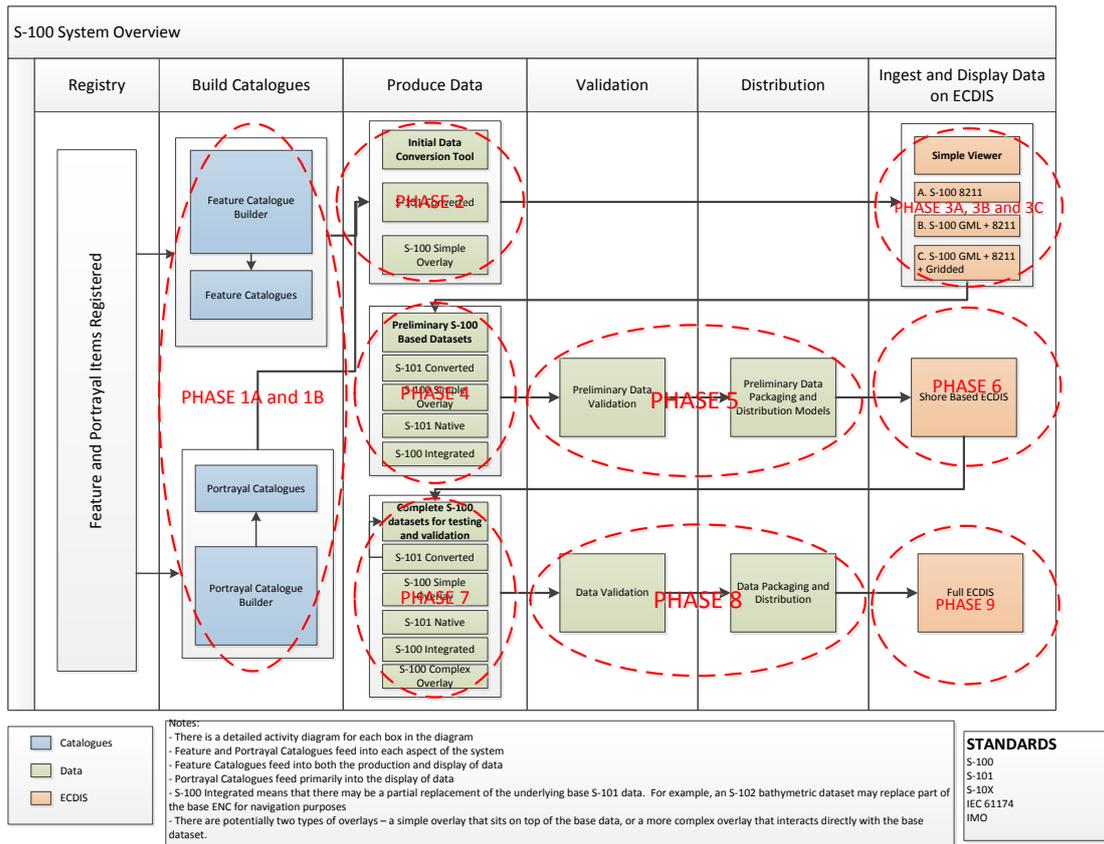


Figure 2 - S-100 High Level System Overview with Phases

Breaking out the testing through phases allows for the iterative development of future ECDIS as a system by gradually expanding requirements and test bed. At a high level the phases are as follows:

Phase 1: Feature and Portrayal Catalogue Generation. This phase is split into two parts that concentrates on the feature and portrayal catalogue builders and the generation of catalogues to support the S-101 product specification and S-100 based product specifications.

Phase 2: Initial Data Conversion Tool. This phase deals with creating S-101 ENCs by using the S-57 convertor. In addition, it will also look to create an S-100 simple overlay file for use in testing.

Phase 3: Simple Viewer. This phase is split into three parts to create a simple viewer that will ingest feature and portrayal catalogues, along with an S-100 based dataset to validate if the dataset displays according to what is defined in the portrayal catalogue. It is split into three phases in order to build capability to view datasets that are utilizing different S-100 encoding formats.

Phase 4: Preliminary S-100 Based Datasets. This phase deals with multiple datasets and scenarios to provide test data for S-100 testing. At this time, it is expected that test data will not be converted data from S-57, but rather data that can realize the full functionality of S-100.

Phase 5: Preliminary Data Validation and Distribution. This phase will put in place draft data validation rules and test data packaging and distribution models.

Phase 6: Shore-Based ECDIS. This phase deals with the creation and testing of several shore based ECDIS. This version of the S-100 ECDIS is not expected to have the full capabilities of an ECDIS that will undergo type approval, but should be able to handle different types of S-100 based data, perform basic navigation functions – such as set the safety contour and have the pick report functionality implemented.

Phase 7 – 9: Complete S-100 datasets for testing and validation, Data Validation, Distribution, and Full ECDIS. These final three phases deal with the full system testing and implementation of S-100 and S-101.

The following section in this document is structured to reflect each phase and document requirements, processes and the systems model. Individual test cases and test datasets are stored separately from this document.

7 Phase 1 Production and Maintenance of Catalogues

S-100 realises its flexibility by encapsulating data content and display content within exchangeable catalogue files. These catalogues are defined within S-100 and form a constituent part of product specifications. The systems for the production and maintenance of S-100 catalogues are considered enabling systems within the future navigational environment.

This phase is divided into two parts A and B to cover feature and portrayal catalogues respectively. Due to the relationship between feature and portrayal catalogues part B is dependent on part A.

7.1 Phase 1A Feature Catalogue Builder

System of interest – S-100 Feature Catalogue Builder

Inputs – Register items, User input items

Processes – Creation of feature catalogue, editing of feature catalogues, deletion of feature catalogues, output of catalogues

Outputs – Valid S-100 Feature Catalogue

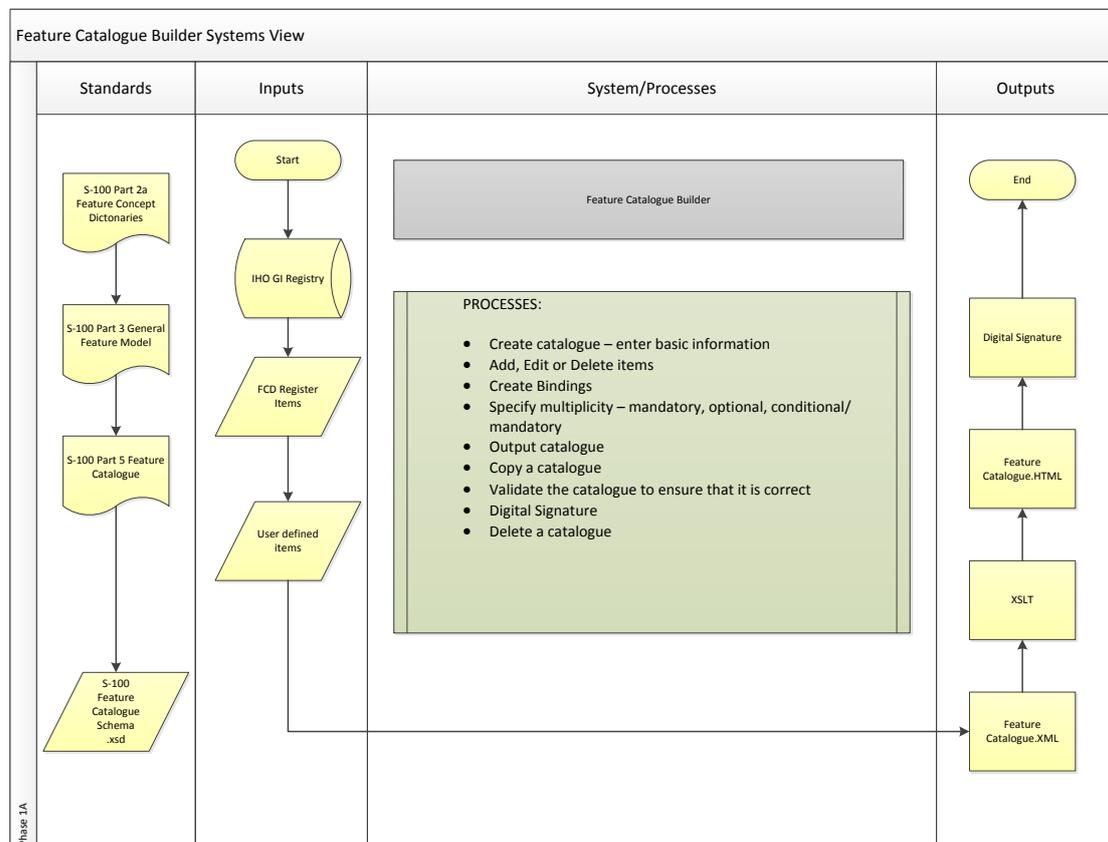


Figure 2- Feature Catalogue Builder Systems View

a) Stakeholder requirements Process

Stakeholders

Product specification developers/editors – primary users who require the ability to create a catalogue from scratch, edit catalogues and output finalised catalogues

Catalogue builder manager – a support role, the point of contact for issues with or changes to the catalogue builder

System constraints

- The output catalogues must conform to the S-100 Feature Catalogue Schema.
- The system must be accessible to the broad range of S-100 users irrespective of platform and location.

Stakeholder Activities

Stakeholders require access to the catalogue builder to create new catalogues, edit existing catalogues or delete a catalogue. They must also be able to validate a catalogue to ensure that it conforms to S-100 and create a digital signature against the catalogue.

Security

The system requires user login and catalogues must be assigned to a specified user.

The system shall be able to create a digital signature

b) Requirements Analysis Process;

General Requirements:

The catalogue builder must be able to build catalogues on different versions of S-100.

Requirements

Based on the stakeholder activities the following detailed requirements are developed. Each one of these requirements will have an associated test case/test scenario.

Ref	Requirement	Comment
LINK: Phase 1A Feature Catalogue Test Cases		
1.0	Access system	
1.1	System Log on	User access through a password protected login.
1.2	Assign User Roles	This could be inherited through the registry.
1.2.1	Read Only Role	This could be inherited through the registry.
1.2.2	Read/Write Role	This could be inherited through the registry.
1.2.3	Administrator role	This could be inherited through the registry.
1.2.4	Approving Official Role	Assigns the final Digital Signature
1.3	Read Access to the IHO GI Register	
1.4	Only users from the same submitting organization can edit their catalogues	This is to prevent members from one organization accidentally editing or deleting an FC from another organization
2.0	Catalogue Management	These are functions to the database (not opening the XML)
2.1	Create catalogue	
2.1.1	Input catalogue metadata	This would include that the catalogue is valid for several versions of the product specification.
2.2	Open existing catalogue	
2.3	Copy existing catalogue to a new catalogue	
2.4	Delete Catalogue	This is for test catalogues – will not be able to delete a validated catalogue
2.5	View Catalogue	
3.0	Edit catalogue	Items can be added from either the Feature Concept Dictionary or by user input if they are non-registered items
3.1	Add items	Items added from the S-100 GI Registry
3.1.1	Add attributes	
3.1.2	Add features	
3.1.3	Add information types	
3.1.4	Add enumerations	
3.1.5	Add complex attributes	
3.1.6	Add associations	
3.1.7	Add association roles	
3.2	Add items	Items added manually
3.2.1	Add attributes	
3.2.2	Add features	
3.2.3	Add information types	
3.2.4	Add enumerations	
3.2.5	Add complex attributes	
3.2.6	Add associations	
3.2.7	Add association roles	
3.3	Edit catalogue items	
3.3.1	Edit feature primitives	Adding the geometry

Ref	Requirement	Comment
3.3.2	Edit feature attributes	Binding attributes to the feature and adding multiplicity
3.3.3	Edit complex attributes	Constructing the complex and there are cases where there will be a complex within a complex
3.3.4	Edit information type attributes	Information types can also be bound to features
3.3.5	Edit enumerations	
3.3.6	Edit catalogue details	
3.3.7	Edit associations	
3.3.8	Edit dataset attributes	Requirement removed as they will be handled as information types within the catalogue
3.3.8	Edit supertypes	They are defined in the feature catalogue of S-100
3.3.9	Edit subtypes	They are defined in the in the feature catalogue of S-100
3.4	Delete catalogue items	Items can only be deleted before the catalogue has been validated
3.4.1	Delete feature primitives	
3.4.2	Delete feature attributes	
3.4.3	Delete complex attributes	
3.4.4	Delete information type attributes	
3.4.5	Delete enumerations	
3.4.6	Delete catalogue details	
3.4.7	Delete associations	
3.4.8	Delete dataset attributes	Requirement removed as they will be handled as information types within the catalogue
3.4.9	Delete supertypes	
3.4.10	Delete subtypes	
4.0	Output catalogue	
4.1	Export .XML catalogue file	Export .xml catalogue file conforming to S100 FC schemas
4.2	Be able to display an HTML version of the catalogue using a common style sheet and create a PDF version of the catalogue	Export HTML style sheet for a human readable catalogue
4.3	Export Feature Catalogue tables to the S-100 Registry	
5.0	Validation	
5.1	Is the catalogue valid to the schema	
5.2	Is the catalogue valid for content	
6.0	Digital Signature	Final authority on if the catalogue is correct.

c) Architectural Design Process;

N/A - the feature catalogue builder must make catalogues that conform to S-100

d) Implementation Process;

The feature catalogue builder must be maintainable and have proper documentation.

e) Integration Process;

The FC builder is integrated into the registry process and is connected as the inputs.

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date
Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

The user documentation must outline how the feature catalogue builder will work.

j) Maintenance Process;

The following maintenance process is defined for the feature catalogue builder;

Point of contact

The role of Feature Catalogue Builder manager is defined to support the maintenance and use of the builder. The contact details are listed on the opening page of the builder. The process is defined as follows;

General Processes

Change request – minor/major

Requestor emails manager with change, manager decides if it's a simple cosmetic change or enhancement or whether it constitutes a substantive major change. Changes which are not consistent with S-100 part 5 etc cannot be considered and must be put through as changes to S-100 first. Substantive major changes must be scoped and estimated by the manager and a submission made to TSMAD.

S-100 change

Any significant changes to the S-100 GFM and S-100 Part 5 may impact the feature catalogue builder. When any such changes are being prepared the feature catalogue builder manager must prepare a change proposal with estimates of resources required and submit to TSMAD.

It is necessary to allow output of catalogues conforming to previous S-100 versions therefore the output catalogue component of the application may need to support more than one S-100 version.

7.2 Phase 1B Portrayal Catalogue Builder

System of interest – S-100 Portrayal Catalogue Builder

Inputs – Register items, User input items

Processes – Creation of portrayal catalogue, editing of portrayal catalogues, deletion of portrayal catalogues, output of catalogues

Outputs – Valid S-100 Portrayal Catalogue

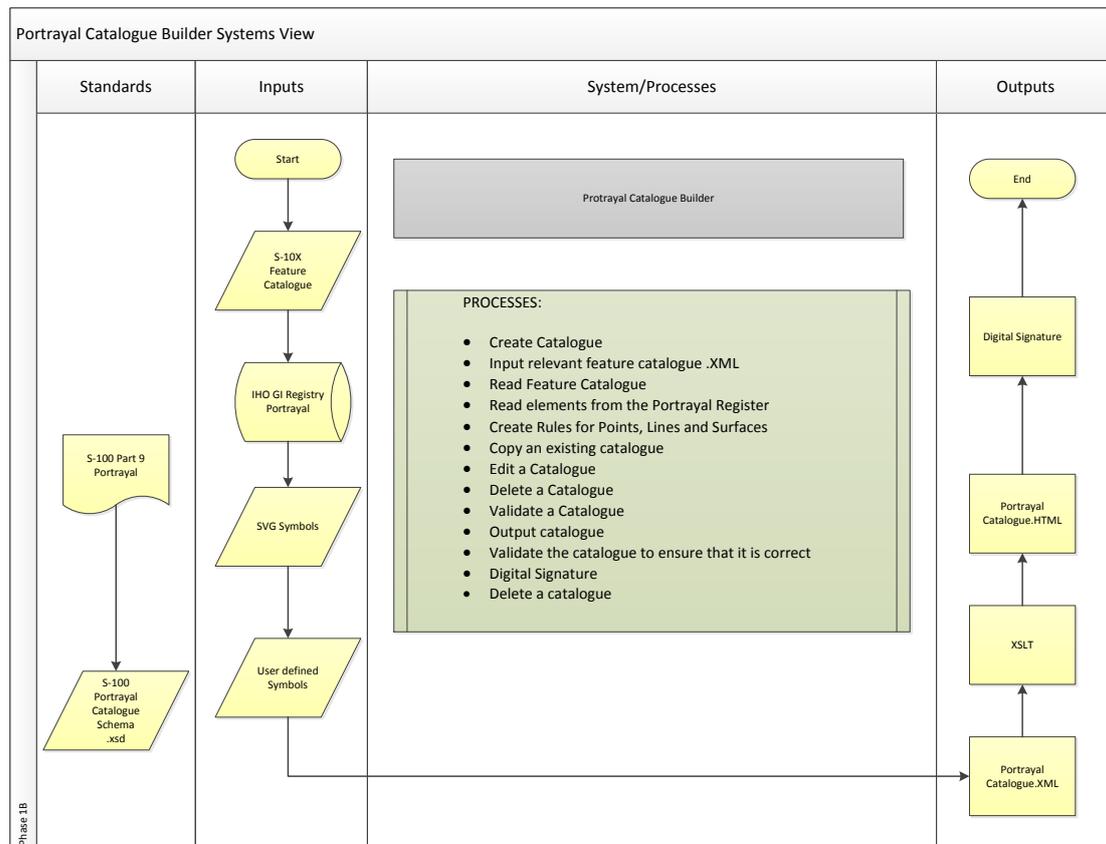


Figure 3 - Portrayal Catalogue

a) Stakeholder requirements Process

Stakeholders

Product specification developers/editors – primary users who require the ability to create a catalogue from scratch, edit catalogues and output finalised catalogues

Catalogue builder manager – a support role, the point of contact for issues with or changes to the catalogue builder

System constraints

- The output catalogues must conform to the S-100 Portrayal Catalogue Schemata.
- The system must be accessible to the broad range of S-100 users irrespective of platform and location.
- Conditional Symbology is outside the system

Stakeholder Activities

Stakeholders require access to the catalogue builder to create new catalogues, edit existing catalogues or delete a catalogue. They must also be able to validate a catalogue to ensure that it conforms to S-100 and create a digital signature against the catalogue.

Security

The system requires user login and catalogues must be assigned to a specified user.

The system shall be able to create a digital signature

b) Requirements Analysis Process;

General Requirements:

The catalogue builder must be able to build catalogues on different versions of S-100.

The catalogue builder and portrayal catalogues must conform to S-100 part 9.

Requirements

Based on the stakeholder activities the following detailed requirements are developed. Each one of these requirements will have an associated test case/test scenario.

Ref	Requirement	Comment
LINK: Phase 1B Portrayal Catalogue Test Cases		
1.0	Access system	
1.1	System Log on	
1.2	Assign User Roles	
1.2.1	Read Only Role	
1.2.2	Read/Write Role	
1.2.3	Administrator role	
1.2.4	Approving Official Role	Assigns the final Digital Signature

Ref	Requirement	Comment
2.0	Catalogue Management	These are functions to the database (not opening the XML)
2.1	Create catalogue	
2.1.1	Input catalogue metadata	This would include that the catalogue is valid for several versions of the product specification.
2.1.2	Input the relevant feature catalogue XML Pick the relevant Feature Catalogue from the registry	
2.1.3	Read in elements from the Portrayal Register	
2.1.3.1	Symbols	
2.1.3.2	Colour Tokens	
2.1.3.3	Line Styles	
2.1.3.4	PENs	Defines how symbols are drawn
2.1.3.5	Area Files	
2.1.3.6	Pix Maps	
2.1.3.7	Viewing Groups	
2.1.3.8	Display Panes	
2.1.3.9	Rule-sets	To include portrayal rules
2.2	Open existing catalogue	
2.3	Copy existing catalogue to a new catalogue	
2.4	Delete Catalogue	This is for test catalogues – will not be able to delete a validated catalogue
2.5	View Catalogue	
3.0	Edit Catalogue	
3.1	Add Items	
3.1.1	Point Features	
3.1.1.1	Add symbol	(SVG file – should include pivot point and offset)
3.1.1.2	Add viewing group	
3.1.1.3	Add Display Mode	
3.1.1.4	Add Display Pane	
3.1.1.5	Add Ruleset	
3.1.1.6	Add User defined variables	
3.1.1.7	Add alerts and indications	Needs to be part of the portrayal catalogue specification. So this is not activated yet.
3.1.1.8	Part 9 Clause 10.1	Add in tests to conform to Part 9 Clause 10.1
3.1.2	Line Features	
3.1.2.1	Add Simple Line Style	
3.1.2.1.1	Add Colour Token	
3.1.2.2	Add Complex Line Style	
3.1.2.3	Add viewing group	
3.1.2.4	Add Display Mode	
3.1.2.5	Add Display Pane	
3.1.2.6	Add Ruleset	

Ref	Requirement	Comment
3.1.2.7	Add User defined variables	
3.1.2.8	Add alerts and indications	
3.1.2.9	Part 9 Clause 10.4	Add in tests to conform to Part 9 clause 10.4
3.1.3	Surface Features	
3.1.3.1	Add Area Fill	
3.1.3.1.1	Add Colour token	
3.1.3.2	Add Area Pattern	
3.1.2.3	Add viewing group	
3.1.2.4	Add Display Mode	
3.1.2.5	Add Display Pane	
3.1.2.6	Add Ruleset	
3.1.2.7	Add User defined variables	
3.1.2.8	Add alerts and indications	
3.1.2.9	Part 9 Clause 10.5	Add in tests to conform to Part 9 clause 10.5
3.2	Edit items	
3.2.2	Point Features	
3.2.2.1	Edit symbol reference	(SVG file – should include pivot point and offset)
3.2.2.2	Edit viewing group	
3.2.2.3	Edit Display Mode	
3.2.2.4	Edit Display Pane	
3.2.2.5	Edit Ruleset	
3.2.2.6	Edit User defined variables	
3.2.2.7	Edit alerts and indications	
3.2.2.8	Part 9 Clause 10.1	Add in tests to conform to Part 9 Clause 10.1
3.2.3	Line Features	
3.2.3.1	Edit Simple Line Style	
3.2.3.1.1	Edit Colour Token	
3.2.3.2	Edit Complex Line Style	
3.2.3.3	Edit viewing group	
3.2.3.4	Edit Display Mode	
3.2.3.5	Edit Display Pane	
3.2.3.6	Edit Ruleset	
3.2.3.7	Edit User defined variables	
3.2.3.8	Edit alerts and indications	
3.2.3.9	Part 9 Clause 10.4	Add in tests to conform to Part 9 clause 10.4
3.2.4	Surface Features	
3.2.4.1	Edit Area Fill	
3.2.4.1.1	Edit Colour token	
3.2.4.2	Edit Area Pattern	
3.2.4.3	Edit viewing group	
3.2.4.4	Edit Display Mode	
3.2.4.5	Edit Display Pane	
3.2.4.6	Edit Ruleset	
3.2.4.7	Edit User defined variables	
3.2.4.8	Edit alerts and indications	
3.2.4.9	Part 9 Clause 10.5	Add in tests to conform to Part 9 clause 10.5
3.3	Delete items	

Ref	Requirement	Comment
3.3.2	Point Features	
3.3.2.1	Delete symbol	(SVG file – should include pivot point and offset)
3.3.2.2	Delete viewing group	
3.3.2.3	Delete Display Mode	
3.3.2.4	Delete Display Pane	
3.3.2.5	Delete Ruleset	
3.3.2.6	Delete User defined variables	
3.3.2.7	Delete alerts and indications	
3.3.2.8	Part 9 Clause 10.1	Add in tests to conform to Part 9 Clause 10.1
3.3.3	Line Features	
3.3.3.1	Delete Simple Line Style	
3.3.3.1.1	Delete Colour Token	
3.3.3.2	Delete Complex Line Style	
3.3.3.3	Delete viewing group	
3.3.3.4	Delete Display Mode	
3.3.3.5	Delete Display Pane	
3.3.3.6	Delete Ruleset	
3.3.3.7	Delete User defined variables	
3.3.3.8	Delete alerts and indications	
3.3.3.9	Part 9 Clause 10.4	Add in tests to conform to Part 9 clause 10.4
3.3.4	Surface Features	
3.3.4.1	Delete Area Fill	
3.3.4.1.1	Delete Colour token	
3.3.4.2	Delete Area Pattern	
3.3.4.3	Delete viewing group	
3.3.4.4	Delete Display Mode	
3.3.4.5	Delete Display Pane	
3.3.4.6	Delete Ruleset	
3.3.4.7	Delete User defined variables	
3.3.4.8	Delete alerts and indications	
3.3.4.9	Part 9 Clause 10.5	Add in tests to conform to Part 9 clause 10.5
4.0	Output catalogue	
4.1	Export .XML catalogue file	Export .xml catalogue file conforming to S100 FC schemas
4.2	Export HTML style sheet	Export HTML style sheet for a human readable catalogue
4.3	Portrayal Catalogue is stored in the registry	
5.0	Validation	
5.1	Is the catalogue valid to the schema	

Ref	Requirement	Comment
5.2	Is the catalogue valid for content	
6.0	Digital Signature	Final authority on if the catalogue is correct.

c) Architectural Design Process;

N/A – Portrayal Catalogue builder must comply to S-100 Part 9 and the architectural design process is being handled via an IHO contract and managed by DIPWG

d) Implementation Process;

The portrayal catalogue builder must be maintainable and have proper documentation.

e) Integration Process;

The PC builder is integrated via both the registry process and the feature catalogue. The PC utilizes the Feature Catalogue as in input along with the portrayal register and provides an output for the associated product specification.

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date
Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

Reference the user documentation process.

j) Maintenance Process;

The following maintenance process is defined for the portrayal catalogue builder;

Point of contact

The role of Portrayal Catalogue Builder manager is defined to support the maintenance and use of the builder. The contact details are listed on the opening page of the builder. The process is defined as follows;

General Process

Change request – minor/major

Requestor emails manager with change, manager decides if it's a simple cosmetic change or enhancement or whether it constitutes a substantive major change. Changes which are not consistent with S-100 part 9 etc cannot be considered and must be put through as changes to S-100 first. Substantive major changes must be scoped and estimated by the manager and a submission made to TSMAD/DIPWG.

S-100 change

Any significant changes to the S-100 Part 9 - portrayal may impact the portrayal catalogue builder. When any such changes are being prepared the feature catalogue builder manager must prepare a change proposal with estimates of resources required and submit to DIPWG.

It is necessary to allow output of catalogues conforming to previous S-100 versions therefore the output catalogue component of the application may need to support more than one S-100 version.

8 Phase 2 Initial Data Conversion Tool

System of interest – S-10X Convertor

Inputs – S-57 ENCs, S-101 Feature Catalogue, S-100 Based Feature Catalogues, S-57 based overlays

Processes – Conversion of S-57 ENCs to S-101 ENCs, conversion of other S-57 data (IENC) to S-100 Based Datasets

Outputs – S-10X Data (8211 encoding)

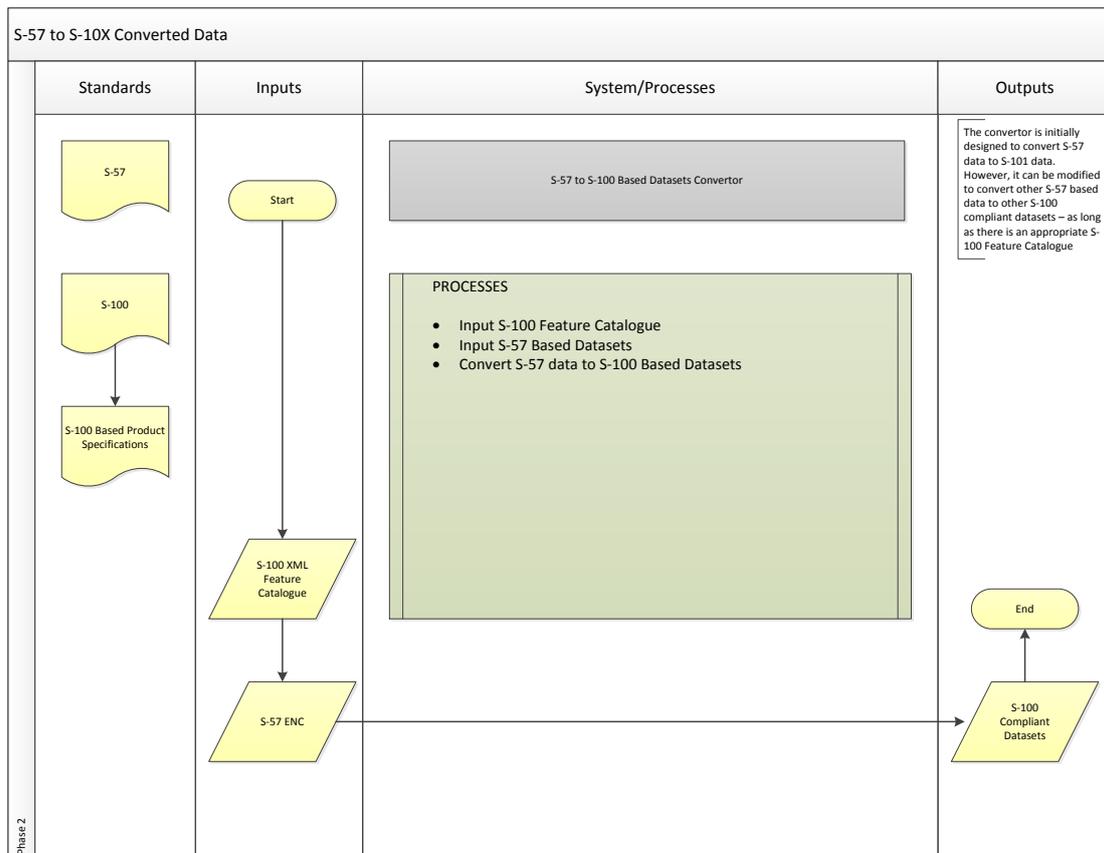


Figure 4 - S-57 to S-101 converted data

a) Stakeholder requirements Process

Stakeholders

Product specification developers – those who need the ability to create S-100 Based Vector data for test bed purposes

Software Manufactures – they may choose to implement parts of the convertor

ECDIS Manufacturers – allows for rapid creation of S-100 Based Test Datasets

Hydrographic Offices – a support role, they will be eventually responsible for converting their ENC suite or authorizing a RENC/VAR to handle the conversion.

RENCs/VARs – support role, they have access to large amounts of ENC data to test the conversion process. They may also eventually be handling data conversion for some Hydrographic Offices.

System constraints

- Initially, the convertor will handle updates as a re-issue process
- The convertor must be able to convert simple overlays (From S-57 8211 to S-100 8211)
- The convertor must be open source

Stakeholder Activities

Stakeholders require access to the convertor in order to convert S-57 ENC datasets.

Security

The integrity of the data must remain the same during the conversion process

b) Requirements Analysis Process;

General Requirements:

The convertor must be open source and must convert S-57 ENCs to S-101 ENCs based on the S-101 Feature Catalogue.

The convertor must conform to applicable sections of S-101.

The convertor may be modified to handle S-10x overlay data conversion.

Requirements

Based on the stakeholder activities the following detailed requirements are developed. Each one of these requirements will have an associated test case/test scenario.

Ref	Requirement	Comment
1.0	Input S-101 Feature Catalogue	
2.0	Input S-57 ENCs	
2.1	Set appropriate Minimum and Maximum Display Scale mapping	

Ref	Requirement	Comment
2.2	Convert simple attributes to Complex Attributes	There will be a mapping table to identify which will be converted
2.3	Convert S-57 lights model to S-101 lights model	
2.4	Calculate the new attributes required to eliminate CSPs	
2.4.1	Default Clearance Depth	
2.4.2	Minimum Surrounding Depth	
2.4.3	Flare Angle	
2.4.4	Sector Extension	
2.5 New	Convert S-57 Bridges to S-101 Bridges	
3.0	Output S-101 ENC Basefile	
3.1	Output S-101 base cells and updates as reissues	
3.2	Output S-101 updates	Not a mandatory requirement yet
4.0	Converting S-57 8211 Products to S-100 8211	This is to convert S-57 datasets such as IENC and IENC overlays to S-100 Based Products
4.1	Input S-100 Based Feature Catalogue	
4.2	Input S-57 Based Dataset	
4.3	Convert Data	
4.3.1	Convert simple attributes to Complex Attributes	If applicable
4.3.2	Convert Features to New Features	
4.3.3	Convert Attributes	
4.3.4	Convert Enumerants	
4.4	Output S-100 Based Product Basefile	

c) Architectural Design Process;

N/A – The convertor is being developed as an open source application. For this effort TSMAD is only concerned about the inputs and the expected outputs and does not want to constrain the design of the convertor

d) Implementation Process;

The convertor must be maintainable and have proper documentation.

e) Integration Process;

The S-10x convertor is a standalone application.

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date
Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

Reference the user documentation process.

j) Maintenance Process;

The following maintenance process is defined for the portrayal catalogue builder;

Point of contact

The point of contact for the convertor is currently Tom Depuyt of ESRI. Once the convertor is finalized it will be turned over to the IHO for management and distribution;

General Process

Change request – minor/major

Change requests for the convertor must be made through TSMAD.

9 Phase 3A Simple Chart Viewer (S-100 8211)

The Simple Chart Viewer is split into three phases in order to handle the different dataset encodings that are allowed in S-100. The rationale behind splitting Phase 3 into three parts is so that as different product specifications mature and produce test data the simple viewer can be expanded to handle the different encodings without having to wait for the viewer to handle all the formats first.

System of interest – S-100 Simple Chart Viewer for S-100 8211 Encoding

Inputs – S-100 Based Data Using the S-100 8211 Encoding

Processes – Supports the display of individual datasets according to the feature catalogue and portrayal catalogue.

Outputs – Proper display of S-100 Based data and simple overlays according to the portrayal catalogues.

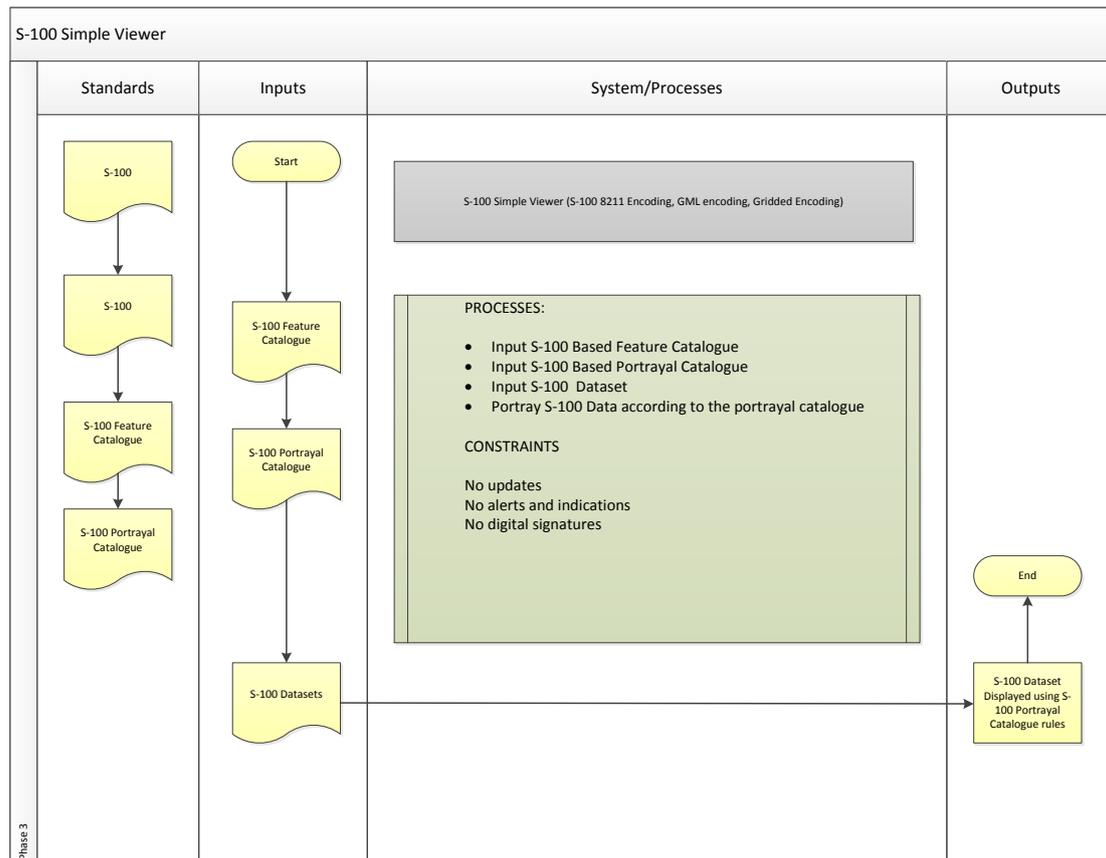


Figure 5 - S-100 Simple Viewer

a) Stakeholder requirements Process

Stakeholders

Product specification developers – those who need to be able to test simple portrayal aspects of their datasets

Software Manufactures – To ensure that the data is ingested properly

ECDIS Manufacturers – to ensure that the data is ingested and displayed properly

Hydrographic Offices – a support role, to ensure that the product specification is working as designed.

System constraints

- It does not have to be able to apply updates
- Does not have to handle alerts and indications
- Does not have to handle digital signatures
- Text placement only in north up mode can be tested
- Overlay does not have to have the interaction rules in place
- The viewer must work with a minimum of one overlay at a time
- Overlay is anything that is not S-101 or S-401 (ENC and IENC specifications)

Stakeholder Activities

Stakeholders will need to have a simple viewer to test initial functionality of S-100 based datasets.

Security

N/A

b) Requirements Analysis Process;

General Requirements:

At a high level the simple viewer must be capable of loading multiple datasets in multiple display scales and be able to pan and zoom (horizontal and vertical).

It must also be capable of loading in specific feature and portrayal catalogues and properly displaying the data.

At a minimum the simple viewer must comply too the S-101 product specification, feature catalogue, portrayal catalogues and exchange set metadata, except where it has been specifically constrained.

Requirements

Based on the stakeholder activities the following detailed requirements are developed. Each one of these requirements will have an associated test case/test scenario.

Ref	Requirement	Comment
LINK: Phase 3A Simple Viewer 8211 Test Cases		
1.0	Catalogue Loading	
1.1	Load in S-101 Feature Catalogue	
1.1.1	Load in an updated S-101 Feature Catalogue	Must handle both the multiple and cumulative catalogue approach
1.2	Load in S-101 Portrayal Catalogue	
1.2.1	Load in an updated S-101 Portrayal Catalogue	Must handle both the multiple and cumulative catalogue approach
1.3	Load in S-10x Feature Catalogue	At a minimum those that use the S-100 8211 specification
1.4	Load in S-10x Portrayal Catalogue	At a minimum those that use the S-100 8211 specification
2.0	Dataset Loading	
2.1	Load in multiple S-101 datasets	
2.1.1	Load in data at multiple display scales	
2.1.2	Load in data that is associated with two different editions of the S-101 Feature Catalogue	
2.1.3	Load in data that is associated with two different editions of the S-101 Portrayal Catalogue	
2.2	Load in S-101 Exchange Sets	
2.2.1	Read in S-101 Exchange Set Catalogue metadata	
2.3	Load in S-10x Simple Overlay	
2.3.1	Load in S-10x Exchange Sets	
2.3.2	Read in S-10x Exchange set catalogue metadata	
3.0	Display	
3.1	Ability to pan	
3.2	Ability to zoom	
3.3	Ability to query attributes	
3.3.1	Ability to use the S-100 Pick Report Method	
3.4	Ability to use the S-100 palettes	
3.5	Ability to use the S-100 viewing groups	

Ref	Requirement	Comment
3.6	Ability to change display modes	
3.7	Ability to test conditional portrayal based on a depth from user input	e.g. isolated dangers that change based on a depth value
4.0	S-100 Based Products Catalogue Loading	S-100 8211 Encoding for Phase 3A
4.1	Load in S-100 Based Feature Catalogue	
4.1.1	Load in an updated S-100 Feature Catalogue	
4.2	Load in S-100 Portrayal Catalogue	
4.2.1	Load in an updated S-100 Portrayal Catalogue	
4.3	Load in a second S-100 Feature Catalogue	To test multiple S-100 Based Overlay Products
4.4	Load in a second S-100 Portrayal Catalogue	
5.0	S-100 Overlay Dataset Loading	
5.1	Load in multiple S-100 overlay datasets	
5.1.1	Load in data at multiple display scales	
5.1.2	Load in data that is associated with two different editions of the S-100 Based Feature Catalogue	
5.1.3	Load in data that is associated with two different editions of the S-100 Based Portrayal Catalogue	
6.0	Display Overlay data in conjunction with an S-101 ENC	
6.1	Ability to pan	
6.2	Ability to zoom	
6.3	Ability to query attributes	
6.3.1	Ability to use the S-100 Pick Report Method	
6.4	Ability to use the S-100 palettes	
6.5	Ability to use the S-100 viewing groups	
6.6	Ability to change display modes	
6.7	Ability to Toggle overlays	

Ref	Requirement	Comment
	on and off	

c) Architectural Design Process;

N/A – The simple viewer must meet the requirements outlined above. For this effort TSMAD is only concerned about the inputs and the expected outputs and does not want to constrain the design of the simple viewer.

d) Implementation Process;

The simple viewer must be able to be used on a PC.

e) Integration Process;

The S-100 Simple Viewer is a standalone application.

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date
Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

Reference the user documentation process.

j) Maintenance Process;

The following maintenance process is defined for the portrayal catalogue builder;

Point of contact

The point of contact for the S-100 Simple Viewer (s) will be the company or organization responsible for its development;

General Process

Change request – minor/major

Change requests for the simple viewer must be made through TSMAD.

10 Phase 3B Simple Chart Viewer (S-100 8211 + S-100 GML)

The Simple Chart Viewer is split into three phases in order to handle the different dataset encodings that are allowed in S-100. The rationale behind splitting Phase 3 into three parts is so that as different product specifications mature and produce test data the simple viewer can be expanded to handle the different encodings without having to wait for the viewer to handle all the formats first.

System of interest – S-100 Simple Chart Viewer for S-100 8211 Encoding and S-100 GML

Inputs – S-100 Based Data Using the following encoding methods:

- S-100 8211 Encoding
- S-100 Geographic Markup Language (GML)

Processes – Supports the display of individual datasets according to the feature catalogue and portrayal catalogue.

Outputs – Proper display of S-100 Based data and simple overlays according to the portrayal catalogues.

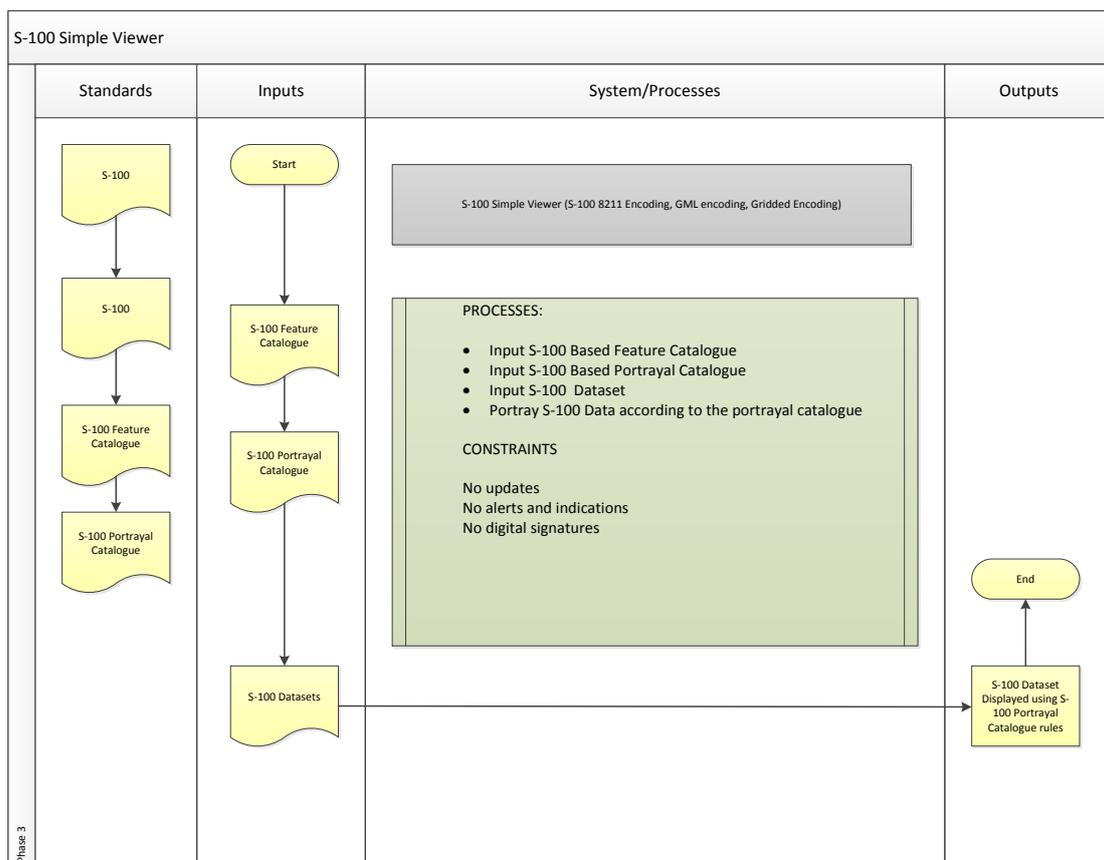


Figure 6 - S-100 Simple Viewer

a) Stakeholder requirements Process

Stakeholders

Product specification developers – those who need to be able to test simple portrayal aspects of their datasets

Software Manufactures – To ensure that the data is ingested properly

ECDIS Manufacturers – to ensure that the data is ingested and displayed properly

Hydrographic Offices – a support role, to ensure that the product specification is working as designed.

System constraints

- It does not have to be able to apply updates
- Does not have to handle alerts and indications
- Does not have to handle digital signatures
- Text placement only in north up mode can be tested
- Overlay does not have to have the interaction rules in place
- The viewer must work with a minimum of one overlay at a time
- Overlay is anything that is not S-101 or S-401 (ENC and IENC specifications)

Stakeholder Activities

Stakeholders will need to have a simple viewer to test initial functionality of S-100 based datasets.

Security

N/A

b) Requirements Analysis Process;

General Requirements:

At a high level the simple viewer must be capable of loading multiple datasets in multiple display scales and be able to pan and zoom (horizontal and vertical).

It must also be capable of loading in specific feature and portrayal catalogues and properly displaying the data.

At a minimum the simple viewer must comply too the S-101 product specification, feature catalogue, portrayal catalogues and exchange set metadata, except where it has been specifically constrained.

Requirements

Based on the stakeholder activities the following detailed requirements are developed. Each one of these requirements will have an associated test case/test scenario.

Ref	Requirement	Comment
1.0	Catalogue Loading	
1.1	Load in S-101 Feature Catalogue	
1.1.1	Load in an updated S-101 Feature Catalogue	Must handle both the multiple and cumulative catalogue approach
1.2	Load in S-101 Portrayal Catalogue	
1.2.1	Load in an updated S-101 Portrayal Catalogue	Must handle both the multiple and cumulative catalogue approach
1.3	Load in S-10x Feature Catalogue	
1.4	Load in S-10x Portrayal Catalogue	
2.0	Dataset Loading	
2.1	Load in multiple S-101 datasets	
2.1.1	Load in data at multiple display scales	
2.1.2	Load in data that is associated with two different editions of the S-101 Feature Catalogue	
2.1.3	Load in data that is associated with two different editions of the S-101 Portrayal Catalogue	
2.2	Load in S-101 Exchange Sets	
2.2.1	Read in S-101 Exchange Set-Catalogue metadata	
2.3	Load in S-10x Simple Overlay	
2.3.1	Load in S-10x Exchange Sets	
2.3.2	Read in S-10x Exchange set catalogue metadata	
3.0	Display	
3.1	Ability to pan	
3.2	Ability to zoom	
3.3	Ability to query attributes	
3.3.1	Ability to use the S-100 Pick Report Method	
3.4	Ability to use the S-100 palettes	

Ref	Requirement	Comment
3.5	Ability to use the S-100 viewing groups	
3.6	Ability to change display modes	
3.7	Ability to test conditional portrayal based on a depth from user input	e.g. isolated dangers that change based on a depth value
4.0	S-100 Based Products Catalogue Loading	
4.1	Load in S-100 Based Feature Catalogue	
4.1.1	Load in an updated S-100 Feature Catalogue	
4.2	Load in S-100 Portrayal Catalogue	
4.2.1	Load in an updated S-100 Portrayal Catalogue	
4.3	Load in a second S-100 Feature Catalogue	To test multiple S-100 Based Overlay Products
4.4	Load in a second S-100 Portrayal Catalogue	
5.0	S-100 Overlay Dataset Loading (8211)	
5.1	Load in multiple S-100 overlay datasets (8211)	
5.1.1	Load in data at multiple display scales (8211)	
5.1.2	Load in data that is associated with two different editions of the S-100 Based Feature Catalogue (8211)	
5.1.3	Load in data that is associated with two different editions of the S-100 Based Portrayal Catalogue (8211)	
6.0	S-100 Overlay Dataset Loading (GML)	Extended to handle S-100 GML datasets
6.1	Load in multiple S-100 overlay datasets (GML)	
6.1.1	Load in data at multiple display scales (GML)	
6.1.2	Load in data that is associated with two different editions of the S-100 Based Feature Catalogue (GML)	
6.1.3	Load in data that is associated with two	

Ref	Requirement	Comment
	different editions of the S-100 Based Portrayal Catalogue (GML)	
7.0	Display Overlay data in conjunction with an S-101 ENC	Must handle both GML and 8211
7.1	Ability to pan	
7.2	Ability to zoom	
7.3	Ability to query attributes	
7.3.1	Ability to use the S-100 Pick Report Method	
7.4	Ability to use the S-100 palettes	
7.5	Ability to use the S-100 viewing groups	
7.6	Ability to change display modes	
7.7	Ability to Toggle overlays on and off	

c) Architectural Design Process;

N/A – The simple viewer must meet the requirements outlined above. For this effort TSMAD is only concerned about the inputs and the expected outputs and does not want to constrain the design of the simple viewer.

d) Implementation Process;

The simple viewer must be able to be used on a PC.

e) Integration Process;

The S-100 Simple Viewer is a standalone application.

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date
Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

Reference the user documentation process.

j) Maintenance Process;

The following maintenance process is defined for the portrayal catalogue builder;

Point of contact

The point of contact for the S-100 Simple Viewer (s) will be the company or organization responsible for its development;

General Process

Change request – minor/major

Change requests for the simple viewer must be made through TSMAD

11 Phase 3C Simple Chart Viewer (S-100 8211 + GML + Gridded Data)

The Simple Chart Viewer is split into three phases in order to handle the different dataset encodings that are allowed in S-100. The rationale behind splitting Phase 3 into three parts is so that as different product specifications mature and produce test data the simple viewer can be expanded to handle the different encodings without having to wait for the viewer to handle all the formats first.

System of interest – S-100 Simple Chart Viewer for S-100 8211 Encoding and S-100 GML

Inputs – S-100 Based Data using the following encoding methods:

- S-100 8211 Encoding
- S-100 Geographic Markup Language (GML)
- S-100 Gridded Datasets

Processes – Supports the display of individual datasets according to the feature catalogue and portrayal catalogue.

Outputs – Proper display of S-100 Based data and simple overlays according to the portrayal catalogues.

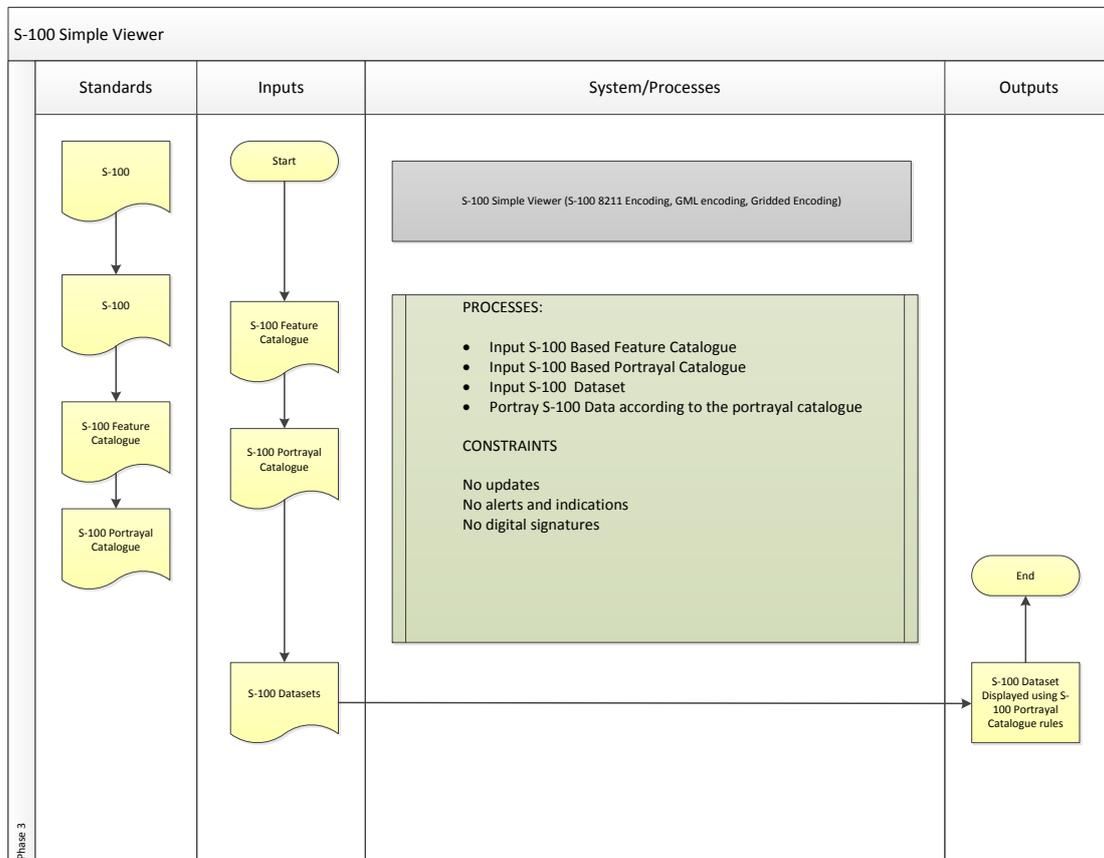


Figure 7 - S-100 Simple Viewer

a) Stakeholder requirements Process

Stakeholders

Product specification developers – those who need to be able to test simple portrayal aspects of their datasets

Software Manufactures – To ensure that the data is ingested properly

ECDIS Manufacturers – to ensure that the data is ingested and displayed properly

Hydrographic Offices – a support role, to ensure that the product specification is working as designed.

System constraints

- It does not have to be able to apply updates
- Does not have to handle alerts and indications
- Does not have to handle digital signatures
- Text placement only in north up mode can be tested
- Overlay does not have to have the interaction rules in place
- The viewer must work with a minimum of one overlay at a time
- Overlay is anything that is not S-101 or S-401 (ENC and IENC specifications)

Stakeholder Activities

Stakeholders will need to have a simple viewer to test initial functionality of S-100 based datasets.

Security

N/A

b) Requirements Analysis Process;

General Requirements:

At a high level the simple viewer must be capable of loading multiple datasets in multiple display scales and be able to pan and zoom (horizontal and vertical).

It must also be capable of loading in specific feature and portrayal catalogues and properly displaying the data.

At a minimum the simple viewer must comply too the S-101 product specification, feature catalogue, portrayal catalogues and exchange set metadata, except where it has been specifically constrained.

Requirements

Based on the stakeholder activities the following detailed requirements are developed. Each one of these requirements will have an associated test case/test scenario.

Ref	Requirement	Comment
1.0	Catalogue Loading	
1.1	Load in S-101 Feature Catalogue	
1.1.1	Load in an updated S-101 Feature Catalogue	Must handle both the multiple and cumulative catalogue approach
1.2	Load in S-101 Portrayal Catalogue	
1.2.1	Load in an updated S-101 Portrayal Catalogue	Must handle both the multiple and cumulative catalogue approach
1.3	Load in S-10x Feature Catalogue	
1.4	Load in S-10x Portrayal Catalogue	
2.0	Dataset Loading	
2.1	Load in multiple S-101 datasets	
2.1.1	Load in data at multiple display scales	
2.1.2	Load in data that is associated with two different editions of the S-101 Feature Catalogue	
2.1.3	Load in data that is associated with two different editions of the S-101 Portrayal Catalogue	
2.2	Load in S-101 Exchange Sets	
2.2.1	Read in S-101 Exchange Set Catalogue metadata	
2.3	Load in S-10x Simple Overlay	
2.3.1	Load in S-10x Exchange Sets	
2.3.2	Read in S-10x Exchange set catalogue metadata	
3.0	Display	
3.1	Ability to pan	
3.2	Ability to zoom	
3.3	Ability to query attributes	
3.3.1	Ability to use the S-100 Pick Report Method	
3.4	Ability to use the S-100	

Ref	Requirement	Comment
	palettes	
3.5	Ability to use the S-100 viewing groups	
3.6	Ability to change display modes	
3.7	Ability to test conditional portrayal based on a depth from user input	e.g. isolated dangers that change based on a depth value
4.0	S-100 Based Products Catalogue Loading	
4.1	Load in S-100 Based Feature Catalogue	
4.1.1	Load in an updated S-100 Feature Catalogue	
4.2	Load in S-100 Portrayal Catalogue	
4.2.1	Load in an updated S-100 Portrayal Catalogue	
4.3	Load in a second S-100 Feature Catalogue	To test multiple S-100 Based Overlay Products
4.4	Load in a second S-100 Portrayal Catalogue	
5.0	S-100 Overlay Dataset Loading (8211)	
5.1	Load in multiple S-100 overlay datasets (8211)	
5.1.1	Load in data at multiple display scales (8211)	
5.1.2	Load in data that is associated with two different editions of the S-100 Based Feature Catalogue (8211)	
5.1.3	Load in data that is associated with two different editions of the S-100 Based Portrayal Catalogue (8211)	
6.0	S-100 Overlay Dataset Loading (GML)	Extended to handle S-100 GML datasets
6.1	Load in multiple S-100 overlay datasets (GML)	
6.1.1	Load in data at multiple display scales (GML)	
6.1.2	Load in data that is associated with two different editions of the S-100 Based Feature Catalogue (GML)	
6.1.3	Load in data that is	

Ref	Requirement	Comment
	associated with two different editions of the S-100 Based Portrayal Catalogue (GML)	
6.0	Display Overlay data in conjunction with an S-101 ENC	Must handle both GML and 8211
6.1	Ability to pan	
7.0	S-100 Overlay Dataset Loading (Gridded)	Extended to handle S-100 Based Datasets using gridded formats (S-102)
7.1	Load in multiple S-100 overlay datasets (Gridded)	
7.1.1	Load in data at multiple display scales (Gridded)	
7.1.2	Load in data that is associated with two different editions of the S-100 Based Feature Catalogue (Gridded)	
7.1.3	Load in data that is associated with two different editions of the S-100 Based Portrayal Catalogue (Gridded)	
8.0	Display Overlay data in conjunction with an S-101 ENC	Must handle both GML and 8211 and Gridded data
8.1	Ability to Pan	
8.2	Ability to zoom	
8.3	Ability to query attributes	
8.3.1	Ability to use the S-100 Pick Report Method	
8.4	Ability to use the S-100 palettes	
8.5	Ability to use the S-100 viewing groups	
8.6	Ability to change display modes	
8.7	Ability to Toggle overlays on and off	

c) Architectural Design Process;

N/A – The simple viewer must meet the requirements outlined above. For this effort TSMAD is only concerned about the inputs and the expected outputs and does not want to constrain the design of the simple viewer.

d) Implementation Process;

The simple viewer must be able to be used on a PC.

e) Integration Process;

The S-100 Simple Viewer is a standalone application.

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date
Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

Reference the user documentation process.

j) Maintenance Process;

The following maintenance process is defined for the portrayal catalogue builder;

Point of contact

The point of contact for the S-100 Simple Viewer (s) will be the company or organization responsible for its development;

General Process

Change request – minor/major

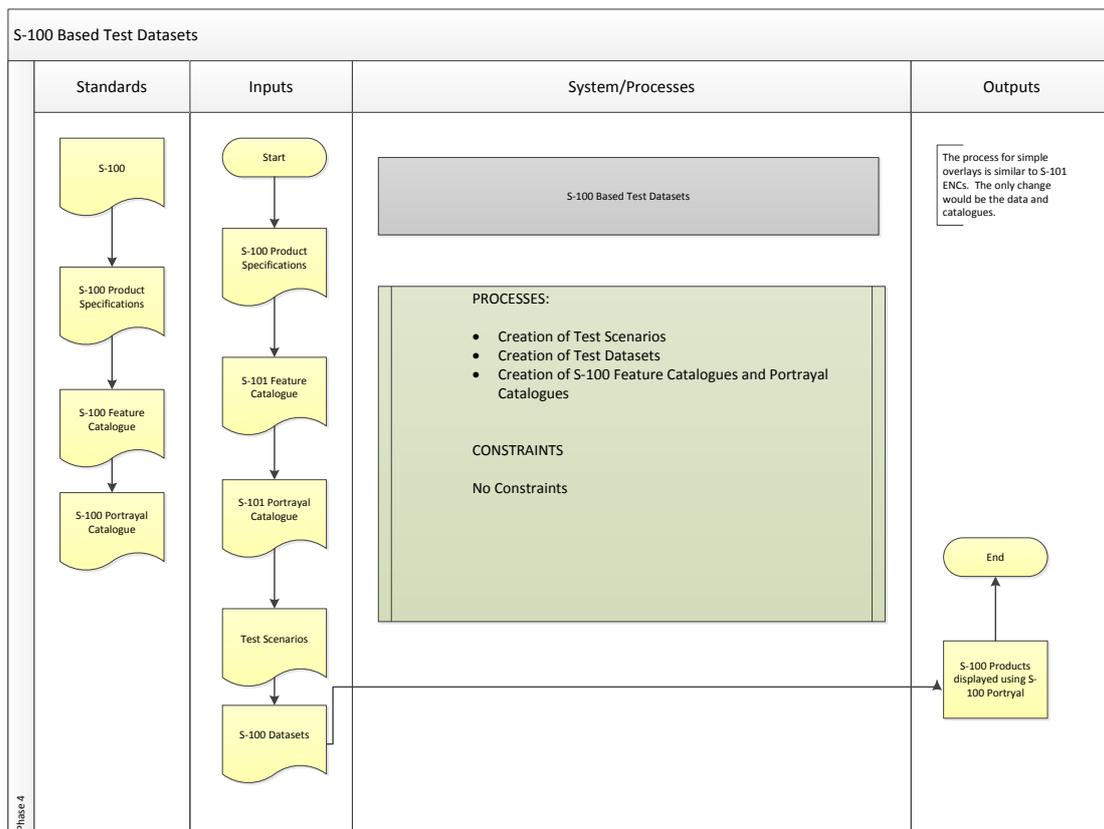
Change requests for the simple viewer must be made through TSMAD

12 Phase 4 Preliminary S-100 Based Test Datasets

System of interest – S-100 Based Datasets

Dependencies – S-100 Feature and Portrayal Catalogues will be used in conjunction with the Test Datasets

Deliverables – Valid S-100 Based Datasets (8211 and GML) and updates



a) Stakeholder requirements Process

Stakeholders

Product specification developers/editors – users of the test datasets

System Manufacturers – users of the test datasets

Dataset constraints

No Constraints

Stakeholder Activities

Stakeholders require access to the full suite of test datasets for use in system development activities.

Security

Not Applicable

b) Requirements Analysis Process;

General Requirements:

Need to be able to create a variety of test datasets to test the full functionality of S-100 and S-100 based product specifications. The test datasets may be created using several options:

1. S-57 to S-100 convertor – this is to support test scenarios that do not need to utilize new feature types, attributes and enumerants. For example, in order to test data loading and unloading algorithms the convertor can be leveraged to quickly create test data in an S-100 8211 Encoding
2. Other methodologies – This framework is not intended to constrain the development of production systems to create native S-100 test data and updates. Thus the tool utilized to create native test data is left up to the developers of the test data.

Requirements

In order to test the various functions of the S-100 based product specification, the developers will need to create a listing of the types of scenarios that will need to be tested and the accompanying test dataset. It is recommended that this be maintained as a separate document. The only requirement for the test dataset is as follows:

- Datasets need to state what version of the Feature Catalogue that they are valid for.
- Datasets need to state what version of S-100 they are valid for.

c) Architectural Design Process;

N/A - It is not intended for the framework to guide the design process

d) Implementation Process;

N/A

e) Integration Process;

N/A

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date
Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

N/a

j) Maintenance Process;

The test dataset listing must be kept up to date.

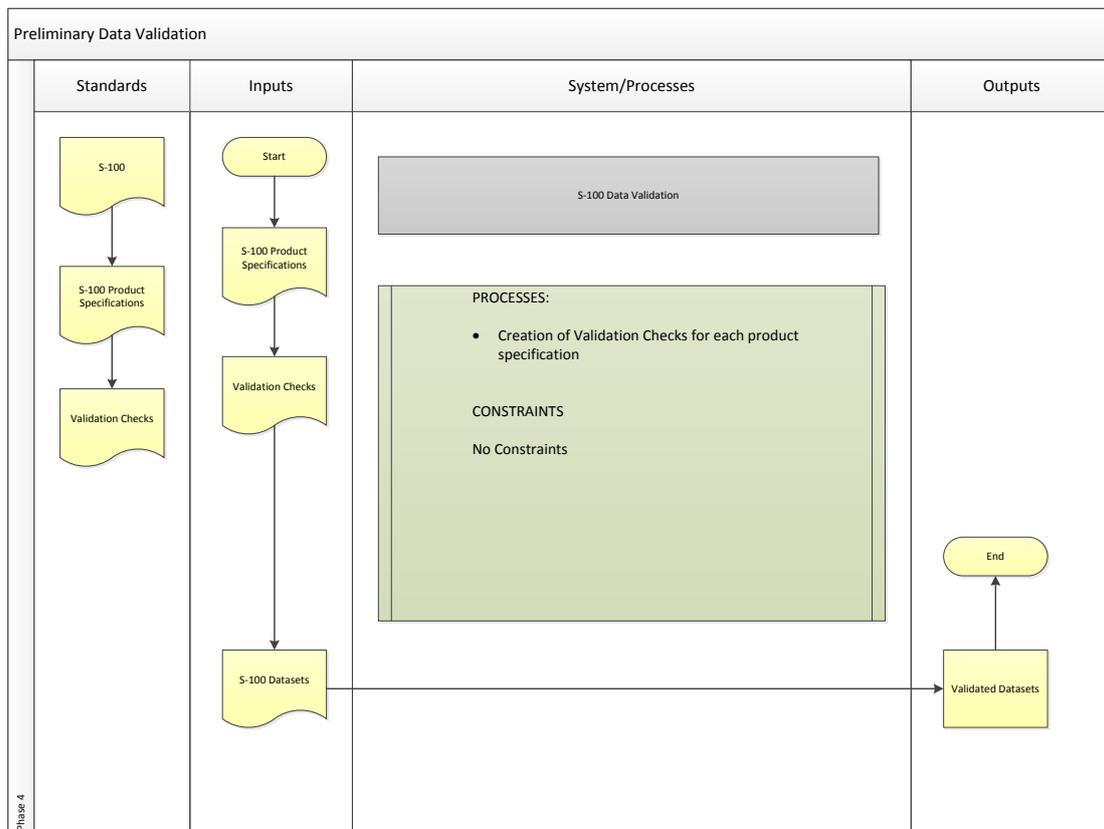
13 Phase 5 Preliminary Data Validation and Distribution

13.1 Phase 5A Preliminary Data Validation

System of interest – S-100 Based Datasets

Dependencies – Validation checks to show that the dataset conforms to the product specification it was produced against. For example, S-101 Datasets must conform to a series of S-101 Validation checks for the dataset to be considered an S-101 dataset.

Deliverables – Validated S-100 Datasets



a) Stakeholder requirements Process

Stakeholders

Product specification developers/editors – creators of the test data exchange sets

Software Manufacturers – creators of the test data exchange sets

System Manufacturers – users of the exchange sets

Dataset constraints

No Constraints

Stakeholder Activities

Stakeholders require access to both the product specification and test data

Security

The data within the exchange set may or may not be encrypted and may or may not have a digital signature.

b) Requirements Analysis Process;

General Requirements:

At a high level, data must conform to the S-100 based product specification rather than S-101. So in the case of S-101 there will be extensive data validation rules (similar to S-58) that allows for the checking of the dataset and exchange sets in conformance to the product specification. While there may be some commonality for the most part this means that the validation rules are unique to the product specification.

Requirements

Each product specification should contain a set of validation checks. It has been determined because validation will be unique to each product specification that a detailed set of requirements is not needed.

c) Architectural Design Process;

N/A - It is not intended for the framework to guide the design process

d) Implementation Process;

N/A

e) Integration Process;

N/A

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date

Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

N/A

j) Maintenance Process;

The validation checks must be maintained as the product specification changes.

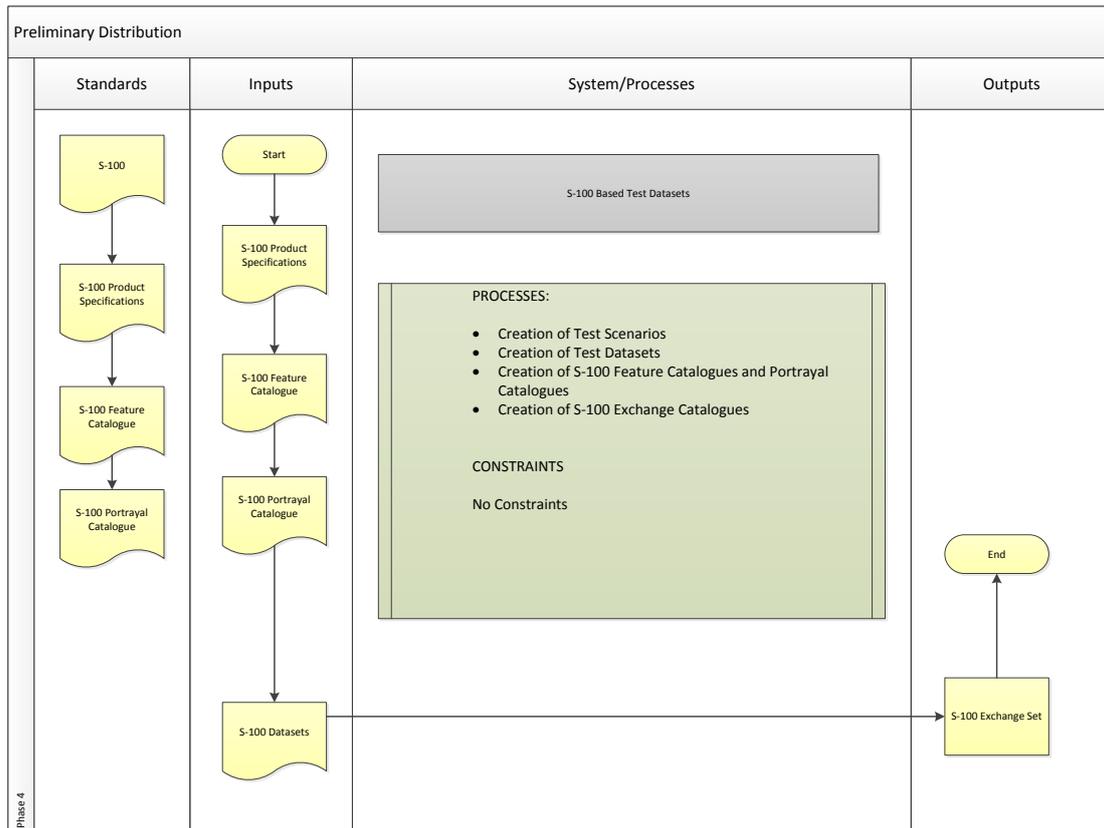
13.2 Phase 5B preliminary Data Packaging and Distribution Models

System of interest – S-100 Based Datasets, Feature Catalogues and Portrayal Catalogues

Dependencies – Depending on what is part of the packaging and distribution model the following are needed:

- S-100 Based Datasets
- S-100 Feature Catalogues
- S-100 Portrayal Catalogues

Deliverables – S-100 Exchange Sets



a) Stakeholder requirements Process

Stakeholders

Product specification developers/editors –

Software Manufacturers – users of the validation checks

System Manufacturers – users of the validated datasets

Dataset constraints

No Constraints

Stakeholder Activities

Stakeholders require access to both the product specification and the validation checks and test data.

Security

Not Applicable

b) Requirements Analysis Process;

General Requirements:

At a high level the data packaging and distribution model will contain S-100 datasets. Optionally, it may also contain updated feature and portrayal catalogues along with datasets.

Requirements

Based on stakeholder feedback the preliminary requirements are documented in the table below:

Ref	Requirement	Comment
1.0	Create XML metadata catalogue for a single S-100 dataset	
2.0	Create XML metadata catalogue for multiple S-100 conformant datasets using the same product specification	
3.0	Create XML metadata catalogue for multiple S-100 conformant datasets from different product specifications	Eg. S-101 and S-102
4.0	Create XML metadata catalogue for the distribution of S-100 Portrayal and Feature Catalogues (without datasets).	

The following represents notes from TSM3

NOTE: Discussion on including multiple products into a single exchange set. The initial thought was that it was one product for one exchange set.

If we want to bundle multiple product specs into a single product spec. S-100 can have a hieracrical structure to deliver multiple products. But that would require a change to S-100.

Low priority to do this work it is a good idea.

Questions on how to package the S-100. Requirements for delivering portrayal catalogues and feature catalogues within the exchange set. You will end up with multiple PC's and FC's within in the same catalogue.

FC shouldn't be bundled into the exchange set. Different parameters for when you do a replacement catalogue but if you are making semantic changes it should be new catalogue.

1. add in metadata elements PC and FC into the exchange set (S-100 to do).
2. Develop requirements that will test the addition of FC and PC as part of the exchange set. For example one catalogue goes out, both catalogues go out.
3. Testing the updating of FC and PC.
4. Exchange set that only contains FC and PC. (We need to add in the metadata for this in S-100)
5. Need to add some text clarification regarding that the metadata exchange set can just deliver catalogues without datasets in S-100. Also need to add to S-100 Catalogue.

c) Architectural Design Process;

N/A - It is not intended for the framework to guide the design process

d) Implementation Process;

N/A

e) Integration Process;

N/A

f) Verification Process;

Based on these requirements verification and validation tests are provided in a separate document. These must be conducted by the tester and reviewed by the test reviewer and signed off as follows when complete;

Tester Name	Tester Signature	Date
Reviewer Name	Reviewer Signature	Date

g) Transition Process;

N/A

h) Validation Process;

N/A – The validation process is over the entire system and not just at the subcomponent level

i) Operation Process;

N/A

j) Maintenance Process;

N/A

<The Following Sections still need scoping>

14 Phase 6 Shore based ECDIS

Supports exchange sets (unencrypted)

Supports multiple products possibly used together

Supports loading strategy

System of interest –

Inputs –

Processes –

Outputs –

- a) Stakeholder Requirements Definition Process;
- b) Requirements Analysis Process;
- c) Architectural Design Process;
- d) Implementation Process;
- e) Integration Process;
- f) Verification Process;
- g) Transition Process;
- h) Validation Process;
- i) Operation Process;
- j) Maintenance Process;
- k) Disposal Process

15 Phase 7 Test Datasets for Full Production and ECDIS Validation

System of interest –

Inputs –

Processes –

Outputs –

- a) Stakeholder Requirements Definition Process;
- b) Requirements Analysis Process;
- c) Architectural Design Process;
- d) Implementation Process;
- e) Integration Process;
- f) Verification Process;
- g) Transition Process;
- h) Validation Process;
- i) Operation Process;
- j) Maintenance Process;
- k) Disposal Process

16 Phase 8 Data Validation and Distribution

System of interest –

Inputs –

Processes –

Outputs –

- a) Stakeholder Requirements Definition Process;
- b) Requirements Analysis Process;
- c) Architectural Design Process;
- d) Implementation Process;
- e) Integration Process;
- f) Verification Process;
- g) Transition Process;
- h) Validation Process;
- i) Operation Process;
- j) Maintenance Process;
- k) Disposal Process

17 Phase 9 Full ECDIS

Connections to all relevant systems Radar AIS etc

Incorporation of GNSS etc

Testing of encrypted exchange sets and other products used together.

System of interest –

Inputs –

Processes –

Outputs –

- a) Stakeholder Requirements Definition Process;
- b) Requirements Analysis Process;
- c) Architectural Design Process;
- d) Implementation Process;
- e) Integration Process;
- f) Verification Process;
- g) Transition Process;
- h) Validation Process;
- i) Operation Process;
- j) Maintenance Process;
- k) Disposal Process.

