S100 Working Group Test Strategy Meeting 5
Arlington, Virginia – USA (September 19-21st)
Draft Minutes

Chairman: Julia Powell
Vice Chairman: Yong Baek
Secretariat: Tony Pharaoh

Participant Acronyms

LM	Louis	Maltais		EM	Eivind	Mong
HP	Hannu	Peiponen		RM	Raphael	Malyankar
DZ	Daniel	Zuehr		HB	Holger	Bothien
EK	Edward	Kuwalek		JP	Julia	Powell (**Chair**)
GG	Gerd	Glang		DB	Dave	Brazier
TdP	Tom	De Puyt		DG	David	Grant
YB	Yong	Baek (**Vice Chair**)		KH	Kurt	Hess
JL	Junshik	LEE		JP	Joseph	Phillips
SO	Sewoong	OH		MS	Mikan	Stamenkovich
KI	Konstantin	Ivanov		SJ	Stacy	Johnson
				AP	Anthony	Pharaoh

1. Opening and Administrative Arrangements

The Chair opened the meeting and thanked the Radio Technical Commission for Maritime Services (RTCM) for hosting the meeting.

2. Approval of Joint Agenda

Actions from the 4th meeting *(Document 2B)*

- TSM4/1 - Produce a simplified version of the design document which only includes interoperability levels 1 and 2 for discussion at the next S-100 meeting (EK). Completed.

- TSM4/2 - Provide new interoperability options to Chair. Chair to distribute to WG members with comment sheet soliciting comments – for further discussion at the next S-100WG meeting (EK/Chair). Completed.

- TSM4/3 - Propose to hold a Stakeholders event at the HSSC9 meeting (Chair). Proposed to but considered too premature.

- TSM4/4 - SPAWAR to further develop the Lua implementation examples and draft the necessary text for S-100 section 9 to make provision for Lua portrayal. This is for presentation and agreement at the next S- 100WG meeting and if approved, for inclusion in S-100 Edition 4.0.0. (SPAWAR) Completed.

- TSM4/5 - Send out a request to MS to provide data in different parts of the world for testing the viewer. Next step will be the inclusion of the interoperability catalogue. (Chair). Completed.

- TSM4/6 - Write an explanatory paper on concepts and their inclusion in the Registry - for the next S-100WG meeting. (Completed)

- TSM4/7 - Write a paper on S-100 Producer Codes - for consideration by next S- 100WG meeting. (TP/ YB). Completed.

- TSM4/8 - Invite IALA to present the proposal on Session Oriented Services to the next S-100WG meeting. (Chair). Completed

- TSM4/9 - Make provision for the inclusion of pixmap format in S-100 Ed 3.0.0. Part 9. Chair

3. Matters arising

None.

4. S-100 Portrayal and other S-100 Items (Data Protection)

4.1 S-100 Part 9 Lua Extension

S-100 Lua Extension (Part 50 Scripting 3.0.0) (Part 9a Portrayal (Lua) 3.0.0)

DG reported that SPAWAR had reported on a Lua option for S-100 portrayal and had an action to produce documentation for inclusion in S-100 Edition 3. He noted that "Part 50" defines a standard mechanism for including scripting support in S-100 based products and the "Part 9a" chapter describes how to implement portrayal using the Lua scripting mechanism defined in "Part 50."

Noted that the implementation is based on Lua 5.1. This will allow for backward compatibility. Proposed that all attribute values are passed as strings.

Discussion: What are the optimisation using Lua? Its not necearily faster; what makes a difference is pre- rendering. HP - IMO minimum rendering time should be met. DG – the current xslt implementation will not meet the IMO rendering speed requirements (this is just generating the drawing instructions – not rendering).

Furuno trials. HP noted that the drawing instruction is defined in S-100 – rendering should be left up to the manufacturer. Generating the drawing instruction for the spatial coordinates slows down the process.

DG reviewed the extension to Part 9a that makes provision for Lua. HP - we need simple lookup tables for alerts and indications and for depth area polygons for own vessel depth polygons.

HB – in his opinion; it is not necessary for all spatial objects to be used for alerts and indications.

Discussion about whether to implement Lua – ChartWorld, Furuno and IIC reported that they were in favour of the Lua for S-101. EK expressed concerns that we don't want to maintain two different solutions. Lua will only be used for S-101 mainly because of the complex conditional procedures. HP reminder the meeting that we will probably be making the decision for the Inland ENC and for AML, and we will need to inform them of the decision. Hannu – must be only one PS with one portrayal mechanism. There could be two portrayal mechanisms in a system.

Decision of the meeting was to include Lua. SPAWAR to produce revised version part 9 for comment and final acceptance at the Singapore meeting. New part to S-100 for the scripting proposal (i.i. SPAWAR Part 50 proposal).

EK proposed that there should be a test plan – need to define some use cases that can be used to compare Lua to XSLT implementation.

Decision: The meeting agreed that Part 9b (submitted by SPAWAR) will be added to the current Part 9 for S-100 Edition 4. Chapter 50 will be implemented with a logical concurrent number.

4.2 S-100 Portrayal Catalogue Builder Issues

JP reported that little progress had been made with the portrayal catalogue builder application mainly due to the work that is being carried out on the Registry application.

YB reported that with the FCB 0.9.2 is not yet released. Version 0.9.1 is (missing association and supertypes). There is also a need to validate against the catalogue against a schema. The current catalogues content is mostly is in compliance with the DCEG 0.9.2.

4.3 S-100 Registry Improvement

YB purported on the status of extension to the IHO Registry application that had been initiated as a result of the discussion at the 2nd S-100WG meeting (Genoa, Italy). These include; improvement of approval process, the inclusion of a Concept Register; restructuring of the Data Dictionary Register; progress with the development of the Portrayal, Product Specification and Producer Code Registers. A "test bed" webpage and new interfaces to the GI Registry are also being developed. NEW registry of this improvement will be made available after the test operation in January 2018.

The meeting noted that paper and the chair thanked KHOA and YB for undertaking this extensive work

4.4 S-100 – bSplines

JP reported that a revised edition of S-100 Chapter 7 (spatial schemas) had been drafter to include bSpline geometry. Additional classes for certain kinds of curvilinear geometry have been included. These additional classes are based on specifications that are expected to be in the next edition of ISO 19107. It was agreed to use the 2003 edition of 19107 as this edition is the edition cited in S-100.

4.5 Marine Resource Names

Eivind Mong reported that the MRN concept was proposed initially planned as a unique identifier for Aids to Navigation however it has been determined that it provides a mechanism for creating unique identifiers for any maritime resource.

The meeting agreed that the Maritime Resource Name concept should be adopted for use in S-100 products and services (as the proposal in Annex B of the paper) and the IHO should apply for the urn:mrn:iho name space. Furthermore, it was agreed that the IHO should develop a management process for the urn:mrn:iho name space.

It was proposed that NIPWG should be invited to develop a guidance document on how to use unique identifiers should be implemented for S-100 products.

4.6 S-100 Metadata Updates

EM reported that the metadata updates are required by the S-104, S-111, S-122 and S-123 product specification work. There were also updates included in new editions of the ISO 19115 and 19139 (xml encoding) standards that need to be included. The meeting agreed the proposed changes for circulation to the WG. The final agreed text to be included in Edition 4.0.0.

4.7 Use of ISO standards in S-100

Proposed to include clarification in S-100 to highlight the significance of ISO standards and to improve references to the relevant standards. EM proposed that there is a need to review and enhance the language that describe the connection between S-100 and ISO standards.

The meeting noted the report.

4.8 GML Encoding – Part 10a.

RM reported that the proposed changes to Part 10b includes modifications arising from splines, miscellaneous clarifications and a correction and conventions for GML datasets. The meeting agreed the additional interpolation types corresponding to the splines proposal and the proposed clarifications. The meeting also agreed the incorporation of proposed new GML rules, conventions included in the revised Part 10b document (TSM4.8B).

DG proposed that there is a difference between the implementation of curves between 19107 and 19136 (GML). This may need soma additional investigation. Following further discussion, several issues were identified in the proposal which will require further clarification. The “informative guidance” sections need to be changed to “normative rules”

4.9 Portrayal Experience from prototype S-101 Viewer.

HP reported on the Furuno experience gained with their S-101 ECDIS prototype. The tests used the 2015 S-101 test datasets. He reported on some portrayal issues related to using XSLT as opposed to Lua. He concluded that the Lua implementation provided much faster rendering. Three dimension objects such as spot soundings were particularly slow in rendering. He proposed that consideration should be given to solving the spot soundings issue and proposed that having the spatial attribute is the main problem. He proposed soundings should be individual features rather than group sounding object should objects. It was agreed that this should be a proposal to the next S-100 WG meeting.

TP questioned what the impact of the Lua implementation will be for the portrayal catalogue builder. DG - the portrayal model will be the same but each manufacturer’s implementation will differ.

4.10 S-100 open issues based on experience from prototype S-10x Viewer [Peiponen]

HP reported on the Furuno prototype S-10x viewer which has been produced to gain experience on implementation of S-100, S-101 and S-124. He noted that their test had been based on the S-57, S-52 and S-63 standards. A few things had been extended to handle S-100/S-101 data. The XSLT based method specified in Ed 2.0.0 of S-100 had been used for the implementation of portrayal. He noted that they had experienced similar issues as reported by SPAWAR and KHOA from the test beds in 2016 and 2017. These included items such as wrong colour token, missing specification of a colour token, wrong symbol shape reference, etc. in the portrayal catalogue. These will be have to be fixed. Furthermore, he commented that they also observed similar drawing speed performance issues with XSLT as reported by SPAWAR.

The meeting noted the report.

4.11 Updating GML Datasets

RM reported he had been requested by NIPWG4 to write a paper on GML updating – especially for up the S-122, S-123 and also for the S-100 WG. He noted that the proposal is for a delta that is applied to a dataset to produce a new version of the dataset. He highlighted five possible approaches that range from attribute, object and whole dataset level updates and included plain text and XML patches.

The meeting agreed to continue with the “whole object” approach, and with the proposed next steps to develop rules / guidelines about update dataset format and management processes for eventual incorporation into S-100.

4.12 S-100 Data Protection

See Agenda item 5.5.

5. S-100 Interoperability Specification

5.1 S-100 Interoperability Specification

The Chair presented the interoperability specification (included as document TSM5-5.1_InteroperabilitySpecification_V0_1) and noted that this work had been funded by NOAA. The document had been allocated the S-98 number by HSSC9.

5.2 Report on S-100 Interoperability Workshop

EM reported that the draft specification is ready for use in test beds and for consideration by the S-100 other Working Groups. He proposed to keep the S100_IC_DrawingInstruction and S100_IC_Feature elements in the model until feedback from test-bed development had been received. A decision about what to do with them can be made after test-bed feedback.

The meeting agreed that the interoperability specification document should be circulated to the S-100 and other relevant Working Group for consideration.

YB provided a report on the Interoperability Workshop (29 31 August 2017) during which they were able to validate the S-100 interoperability concept. In order to test the interoperability catalogue, S-101, S-102, S-111, S-112, S-122, S-124 S-411 and 412 datasets were used. The testbed also provided the opportunity to test the registry, Feature Catalogue Builder, Portrayal Catalogue Builder, SVG symbol editor and other S-1xxx tools. Seven different scenarios were used for the test. He provided an overview of the results showing the various scenarios for interoperability levels 0 and level 1 (no suppression) and level 2. YB noted that it is proposed to hold another workshop in 2018.

5.3 Procedures for S-100 Interoperability Catalogue

SO reported on the procedures for creating S-100 Interoperability Catalogue and the Interoperability Workshop conducted by KRISO. He highlighted the levels of interoperability and proposed that S-100WG should initially focus on levels 1 and 2. He reported on the S-100 Interoperability Catalogue Builder application which was still in an experimental phase. The meeting noted the paper and the proposal that the S-100 IC should be managed by the IHO as part of the process of updating IHO standard. He reported that KHOA will continue to support the creation and management of S-100 IC in cooperation with S100WG.

HB commented that Usage Band 1 “General” category is not suitable for a world map series, because they are so inconsistent. Both seven-Cs and Furuno produce their own General Usage band 1 datasets as background charts.

5.4 IHO Producer / Agency Code Register

TP reported that at the 2nd S-100 Working Group meeting (May 2017), it was agreed that the structure and format of the S-62 producer codes, needed to be revised in order to cater for S-10X products. It was also agreed that the data model for the Producer Codes Register needed to be revised and the Sec was requested to develop a draft data structure for the S-100 Producer Code Register. He presented a proposed data model for inclusion in the next version of the Registry application. The meeting noted the report.

5.5 Progress Report on S-63 for S-100

Chair noted that this was being by the DPSWG which had recently been split into two groups. Progress had been made at the S-100WG2 in Genoa but needed to be completed further work for inclusion in S-100 Edition 4. A short paper had been provided in which Jonathan Pritchard reported that a summary discussion had been held concerning various aspects of the existing S-63 standard and operation of the IHO data protection scheme. The chair reported that the WG are struggling to find members and/or contributors to the new S-100 part and encouraged members who wish to be involved to do so.

6. S-100 Test Bed Reports

6.1 S-100 Test Bed Framework.

The Chair introduced the item of developing an S-100 Testbed Framework and highlighted that there need for an implementation specification for HDF5 to insure that there is compatibility between those Prod Specs use this encoding (e.g. S-111 and S-102) in order that they load in the KHOA S-100 viewer. She noted that there is also a need to consider compatibility between GML implementations.

6.2 S-100 Test Bed Platform

YB proposed that, although an S-100 infrastructure comprises many components (e.g. Feature Catalogue Builder, Portrayal Catalogue Builder and Interoperability Catalogue Builder) and there is no mechanism for testing these components for PS development. He proposed that there is a need to test these is conjunction with some version of the draft PS under development. He noted that it will be easier to develop Interoperability Catalogues if a standard procedure is developed and testing PSs and the associated system. The meeting noted the need to consider a systematic mechanism for testing and sharing all information relating to S-100 PS development.

The meeting agreed testbed guidelines should be developed and included on the S-100 website to share all relevant information and test datasets. It was considered premature to include these in IM3 and TR 2/2007.

6.3 Report on S-124 Test activity

SO reported on the S-124 Navigational warnings test activity. The model is based on S-53 and has been revised many times. The model covers two types of navigational warnings. Three test bed project Korean SMART, DMA NIORD and SMT Swedish Project have been conducted using the draft PS. Purposes of test cases are to test the model.

The test cases consist of, creating a database according to the S-124 NW data model, converting the content to NW messages, converting these to S-124 GML datasets, viewing them in an S-100 viewer.

He proposed that MSI information will be shown as a symbol. Those without a spatial component will be shown as part of the NAVAREA message. S-124 only covers about half of the current mandatory MSI. HP noted that their test had they found that the NIORD implementation of GML is not conforming to S-124.
The meeting noted the report.

6.4 Update on S-100 Test Data Sets

(See Item 6.3)

6.5 KHOA S-100 Test Datasets and Test Bed Plano

YL reported that the team has been creating the S-100 test datasets for the purpose of testing in the S-100 test system. New test datasets will be created at an appropriate compilation scale for the Busan Port test area. They propose to receive S-112 real time tide data received via AIS feed. KHOA will also developed additional functions for test information to be viewed in a second ECDIS monitor. They have developed several test scenarios that include rout planning, Go/No areas and interoperability tests between products. KHOA will conduct sea trial in May 2018.

6.6 SPAWAR S-100 TestBed Project

MS reported that the main aims of SPAWAR test bed is to identify gaps in utilization of the S-100 family of product specifications with initial focus on S-100 and S-101. Additional product support based on GML and HDF-5 encodings will also be tested at a later stage. The main items of considered for this stage were to build catalogues, produce data, and load and display the data on ECDIS.

He provided a summary of findings that resulted from the test bed effort. The included issues relating Feature Catalogue (Ed 0.9.0) not validating against the S-100 schema, some issues with the GML, the S100_FC_ListedValue feature attribute and a few other items.

The meeting noted the RADAR_OVERLAY issues agreed that the items in section 5 of the report should be addresses in S-100 Ed 4. It noted the recommendation for additional product experimentation with different GML based products, and for future GML data prototypes to include a portrayal catalogue.

7. S-100 Product Specifications Reports (that tie into interoperability)

7.1 S-102 Update

DB reported on the progress made by the S-102 project team with a view to finalize S-102 v2.0 for submission to HSSC9. He noted that the PT are also looking a putting together a proposal on variable-resolution gridding (fall 2017).
The meeting discussed the various options proposed at S-100 WG2 and also how the grid would fit into the interoperability levels. The PT recommended that there should be recommended grid resolutions that match the ENC compilation scale bands. He noted that there was discussion as to whether S-102 should utilize geographic or projected CRS.

DB reported that it is proposed to release a BAG to S-102 conversion application (due for completion by December 2017). He noted that the PT are also considering implementing a grid tile referencing system (e.g. Discrete Global Grid?.

7.2 S-101 Taxonomic Hierarchy

7.3 S-111 Update (Presentation)

LM provided an update on the current state of the S-111 Surface Current Prod Spec. The PT have used the HDF viewer to check test datasets – will use the KHOA S-100 viewer. They have developed a validator tool called SLGO which will be used for future tests. The PT needs to reviewed attributes and check that all the camelCase naming conventions are correct. S-111 test datasets have been posted on the web site.

He reported that next steps for the PT include work on discovery metadata, development of requirements for exchange sets and the development of a service delivery model. S-111 Edition 1.0.0 will be proposed for MS approval.

HB proposed that issues related to data distribution should be left to data distributors.

7.4 S-101 Validation Demo

HB provided an online demonstration of the draft S-101 validation application. He noted that their tool will be made freely available for those that want to use and test it. Members interested in getting a copy should to contact Holger to get a free licence and would be requested to report any bugs to SevenCs.

8. Any Other Business

8.1 Hydrographic Dictionary – Update.

TP reported that a HD data base prototype had been developed and demonstrated to the HD WG. As a result of the WG were carrying out a “clean up” of the HD content. One this has been completed a revised version of the database will be produced and an attempt will be made to match the unique ids of the HD and Registries concept register.

9. Review of Meeting Actions

The meeting reviewed the meeting actions.

10. Date and Venue of Next Meeting

Following an invitation from KHOA, it was agreed that this next meeting would take place in Busan, ROK.

11. Close of Meeting

The Chair thanked members for their participation and for RTCM for hosting the meeting.

Annex A

Agenda

Document Number Prefix	Agenda Item	Agenda Item / Document Title	
1. Opening and Administrative Arrangements			[Powell]
S100WGTSM5	01A	List of Documents	
S100WGTSM5	01B	List of Participants	
2. Approval of Joint Agenda			[Powell]
S100WGTSM5	02A	Agenda	
3. Matters Arising			[Powell]
4. S-100 Portrayal and other S-100 Items (Data Protection)			[Powell]
S100WGTSM5	4.1	S-100 Part 9 Lua Extension	[SPAWAR]
S100WGTSM5	4.2	S-100 Portrayal Catalogue Builder Issues	[Powell]
S100WGTSM5	4.3	S-100 Registry Improvement	[KHOA]
S100WGTSM5	4.4	S-100 - bSplines	[Malyankar/Mong]
S100WGTSM5	4.5	Marine Resource Names	[Malyankar/Mong]
S100WGTSM5	4.6	S-100 Metadata Updates	[Malyankar/Mong]
S100WGTSM5	4.7	Use of ISO standards in S-100	[Malyankar/Mong]
S100WGTSM5	4.8	GML Encoding - Part 10a	[Malyankar/Mong]
S100WGTSM5	4.9	Portrayal Experience from prototype S-101 Viewer	[Peiponen]
S100WGTSM5	4.10	S-100 open issues based on experience from prototype S-10x Viewer	[Peiponen]
S100WGTSM5	4.10A	Annex B	[Peiponen]
S100WGTSM5	4.11	Updating GML Datasets	[Malyankar/Mong]
S100WGTSM5	4.12	S-100 Data Protection	[Powell for Pritchard]
5. S-100 Interoperability Specification			[Powell]
S100WGTSM5	5.1	S-100 Interoperability Specification	[Mong/Malyankar]
S100WGTSM5	5.2	Report on S-100 Interoperability Workshop	[Baek]
S100WGTSM5	5.3	Procedures for S-100 Interoperability Catalogue	[Oh]
S100WGTSM5	5.4	IHO Producer / Agency Code Register	[Pharaoh]
6. S-100 Test Bed Reports			[Powell]
S100WGTSM5	6.1	S-100 Test Bed Framework	[Powell]
S100WGTSM5	6.2	S-100 Test Bed Platform	[Baek]
S100WGTSM5	6.3	Report on S-124 Test activity	[Oh]
~~S100WGTSM5~~	~~6.4~~	~~Update on S-100 Test Data Sets~~	~~[Baek]~~
S100WGTSM5	6.5	KHOA S-100 Test Datasets and Test Bed Plan	[Lee]
S100WGTSM5	6.6	SPAWAR S-100 TestBed Project	[SPAWAR]
7. S-100 Product Specifications Reports (that tie into interoperability)			[Powell]
S100WGTSM5	7.1	S-102	[Brazier]
S100WGTSM5	7.2	S-101 Taxonomic Hierarchy	[MalyankarMong]
S100WGTSM5	7.3	S-111 Update (Presentation)	[Malthais]
S100WGTSM5	7.4	S-101 Validation Demo	[Bothien]
8. Any Other Business			[Powell]
S100WGTSM5	8.1	Hydrographic Dictionary - Update	[Pharaoh]

9. Review of Meeting Actions	[Powell]
10. Date and Venue of Next Meeting	[Powell]
11. Close of Meeting	[Powell]

Annex B

List of Actions

Para	Action	By	Status
4.1	Inform the Inland ENC and for AML communities of the decision to use Lua for S-101 ENC portrayal (Chair).	Chair	
4.5	Include Marine Resource Name concept in the S-100 report to HSSC9 proposing that it is adopted for use in S-100.	Chair	
4.5	Request NIPWG to draft documentation on the management process for this name space.	Chair	
4.5	IHO to register for the urn:mrn:iho name space and establish provide documentation for the use and management of MRN.	Sec	
4.6	Circulate the proposed metadata extension (paper TSM5-4.5) to the S-100 WG for comment / approval. (JP)	Chair	
4.8	Revise the proposed new GML rules included in the revised Part 10b document to take account of differences between the implementation of curves described on 19107 and 19136 (GML). The "informative guidance" sections need to be changed to "normative rules".	(EM/RM)	
4.9	Conduct test to establish whether the concept of splitting soundings into discrete objects will improve rendering of 3D objects, and carry out tests to see what the differences are. It is proposed to use cell US4VA12.000 to compare the differences in loading and portrayal. Test how to eliminate the spatial break up the SOUNDG feature into discrete soundings and test loading and portrayal.	OEMs	
	(OEMs)		
6.1	KHOA to provide the FC and PC for weather (S-412) to SPAWAR for testing. (Not to be made publically available). Joe to provide weather data.	KHOA	

Annex C

List of Participants

List of Participants

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Annex D

Follow up Test Results - Furuno

Email from HP dated 29 Sept 2017.

"In the last week TSM-5 meeting I had an input paper about our observation when comparing performance of XSLT method and current S-52 presentation library method. During the TSM-5 debate I was requested to provide more details than originally available in my input paper. Below is a table indicating itemised time consumption for 3 different ENC charts available as officially published S-57 ENC charts and as S-101 ENC charts by DMA (Danish government) as part of the EfficienSea2 testbed project. The ENC charts are from 3 different countries: Germany, Sweden and Denmark. They represent different navigation purposes and the Danish chart is sounding rich while the other two have less soundings".

	DK4SUNDT	**SE2BHS1S**	**DE110000**
Navigational purpose	Approach	General	Overview
Number of non-sounding objects/features	4865	2822	8291
Number of soundings	2457	619	396
S-57 ENC + S-52 PresLib			
Total process time of S-52 drawing rules (look-up-table process + CSPs) Note: Our SENC format include pre-processed values for items required by the CSPs (i.e. same idea as with portrayal support attributes implemented in S-101 object model)	**33 ms**	**18 ms**	**48 ms**
S-101 ENC + S-101 XSLT portrayal			
Creation of DOM: from SENC to XSLT input format (XML based ASCII text)	36 ms	20 ms	26 ms
XSLT process	1984 ms	172 ms	160 ms
From XSLT output (XML based ASCII text) to drawing (binary format)	47 ms	19 ms	26 ms
Total process time of drawing	**2067 ms**	**211 ms**	**212 ms**
How much slower than S-57/S-52 version	x63	x12	x4,4
S-101 ENC + S-101 XSLT portrayal, but ignoring XSLT processing of soundings			
Creation of DOM: from SENC to XSLT input format (XML based ASCII text)	36 ms	16 ms	28 ms
XSLT process	138 ms	39 ms	83 ms
From XSLT output (XML based ASCII text) to drawing (binary format)	21 ms	12 ms	20 ms
Total process time of drawing	**195 ms**	**67 ms**	**111 ms**
How much faster than XSLT with soundings	x11	x3,1	x1,9
How much slower than S-57/S-52 version	x5,9	x3,7	x2,3
S-101 ENC + S-101 XSLT portrayal, but modified object model (= spatial attributes of the soundings moved as feature attributes of the soundings)			
This was requested by SPAWAR in a discussion after the meeting	Not available	Not available	Not available

Conclusions from the table:

Our S-57/S-52 process has been optimized to be very efficient and fast during the last 20 or so years. In the debate at TMS-5 I described the traditional drawing performance as just a 'puff'. Based on above table the 'puff' is significantly less than 100 ms (and therefore not recognized by a human observed)

The 'binary to XML/ASCII' or 'XML/ASCII to binary' conversions take additional time in the XSLT version, but this time consumption could maybe be tolerated. Anyhow we prefer introduction of "Lua" to remove such unnecessary time consumption.

The XSLT processing time is not acceptable for practical onboard ECDIS, especially this is true when there are soundings.

All results are for a single chart. Typically the ECDIS screen includes at least one crossing of coverages of ENC charts (=> result is drawing of 4 ENC charts) and very often there are multiple crossing of coverages (depend on publishing country and local conditions combined with single cell size limit of 5 MB, we have seen max 12 ENC charts used for creation of a single screen). Therefore the practical onboard ECDIS must have performance to handle much more than a single cell to keep the full screen update rate acceptable for the end user.

Discussion about the table

During the TMS-5 debate SPAWAR had concerns that the performance improvement observed by Furuno Finland when ignoring sounding in XSLT processing would be lost if the soundings would be made available as depth values encoded as feature attributes. Reason for the concern of SPAWAR was that processing of soundings based on feature attribute would also consume time which was not available in the Furuno Finland input paper to TMS-5 meeting. In a discussion after the TMS-5 meeting hours SPAWAR requested us to provide measurement for this case. Such measurement values are not available from us as the creation of such measurement values is not trivial – we should first create something to convert "S-101 with depth values of soundings as spatial attributes" into "S-101 with depth values of soundings as feature attributes".

Obviously above measurements being available or not available could be used for the judgement of introduction a change for the object model of the S-101 (= change from spatial attributes to feature attributes).

However above measurements being available or not available do not change the fact that unless something is done the XSLT method is too slow for the S-101 ENC charts including significant amount of soundings for coastal, approach or harbour purposes. This is the strongest argument to support the "Lua" method instead of XSLT method for complex S-10X Products such as S-101, Inland ENC, etc.