IHO

International Hydrographic Organization

5th S-100 Working Group (S-100WG) Meeting

KHOA S-100 testbed project

Republic of Korea (**KHOA**)

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1. General Information

- Name of testbed: KHOA S-100 Testbed Project
- Location of testbed: Busan, ROK
- Time and duration of testbed: Ongoing S-100 testbed project
- Contact person(s): Yong Baek, ybaek@korea.kr (Project Manager)
- Testbed website: N/A
- Organization(s) involved: KHOA (Korea Hydrographic and Oceanographic Agency)
- Funding program and budget: KHOA
- Last Edited/Updated: January 30, 2019

2. Executive summary

- In relation to the decision to use the **Lua-based Portrayal Catalogue**, the S-100 TestBed Project of the KHOA updated their tool applying the Lua-based Portrayal Process to the KHOA S-100 Viewer.
- NIWC provided the Lua Scripting Reference for support of SW based on C++ and described the results applied to KHOA S-100 Viewer.

3.1 Testbed Information

- The type of user group(s) involved in the test
  - The relevant user groups of the KHOA S-100 Testbed will be S-100WG members, TSM members, S-100 standard infrastructure development associates, and S-100 product standards development members.

- Details of the S-100 testbed solutions
  - Through a test, it tests S-100 standard infrastructure such as S-100 registry, FCB, PCB, and validates that S-100 TDS production tools, validation tools, and packaging tool scan be enabled.
  - In addition, data formats such as 8211, GML, BAG, and HDF-5 are used in the S-100 standard, so S-100 Testbed can test S-100 TDS using that data format.

3.2 Testbed Methodology

- Methodology used for data collection
  - The following data is prepared for the application of Portrayal Catalogue based on Lua to KHOA S-100 Viewer:
    - S-101 ENC Test data, S-101 FC/PC, Lua Scripting Reference
- Summary information on testbed respondents / participants
  - None
- Procedure used in the testbed
  - Technical solutions used
    - None
  - Standards
    - S-100 Universal Hydrographic Data Model, ver. 3.0.0
    - S-101 ENC Electronic Navigational Chart (ENC)

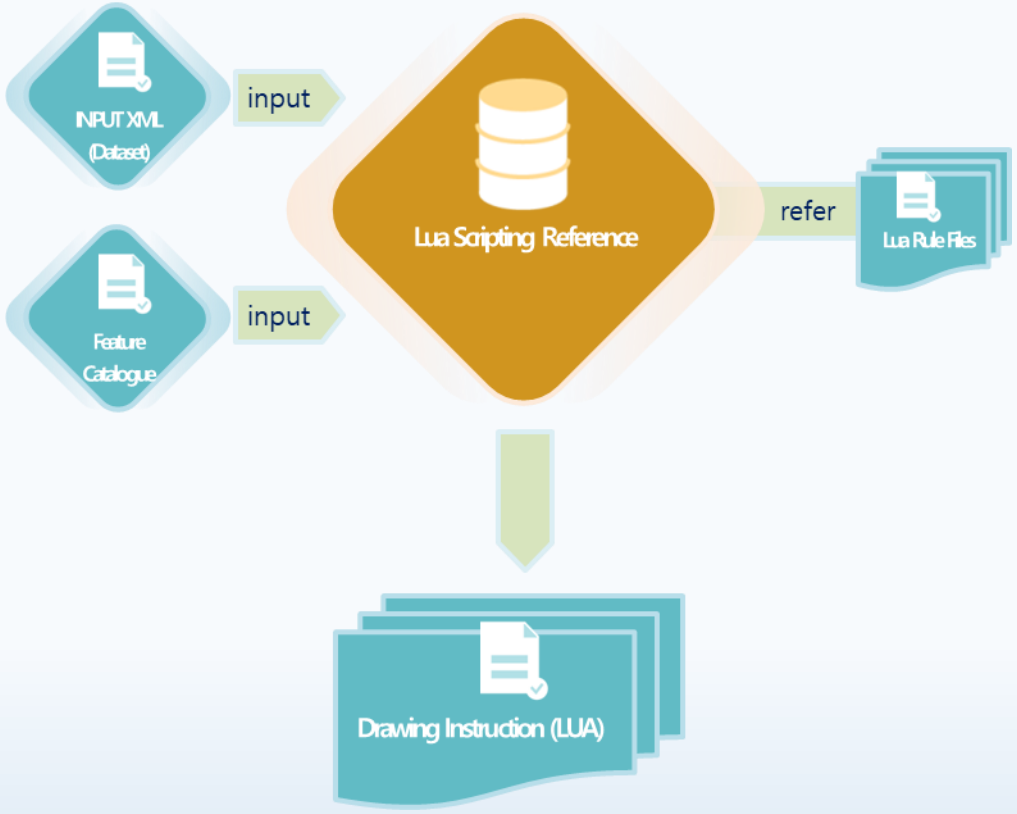
3.3 Testbed Results

- Procedure for applying Lua Scripting Reference
  - To apply the Lua Scripting Reference to the KHOA S-100 Viewer, the KHOA team carried out the following activities:
    - LuaScriptingReference C++ code analysis
    - LuaScriptingReference INPUT XML/Drawing Instrumentation (LUA) data analysis
    - Updated an input XML for an KHOA S-100 Viewer that matches the input XML of the LuascriptingReference
    - Handling the Drawing Instrument (LUA) in the KHOA S-100 Viewer
    - Validated the KHOA S-100 Viewer application results
    - To improve performance, replaced InputXML information in LuaScriptingReference with SENC
    - To improve performance, replaced FC on LuaScriptingReference with system FC
    - Validated the KHOA S-100 Viewer final results
  - Lua Scripting Reference has a structure to derive the Drawing Instrumentation by referring to Lua Rule files when input XML and Feature Catalogue are entered in the Reference Code.

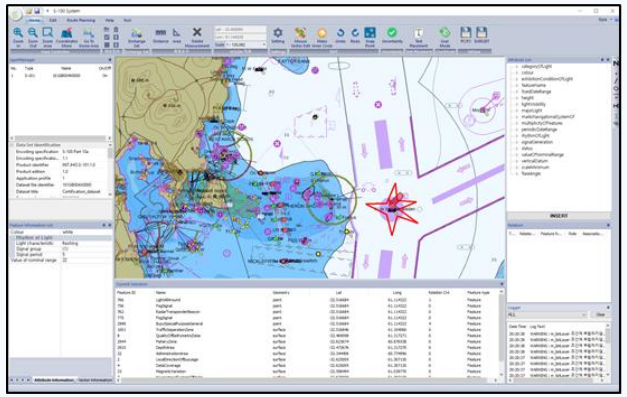
3.3 Testbed Results

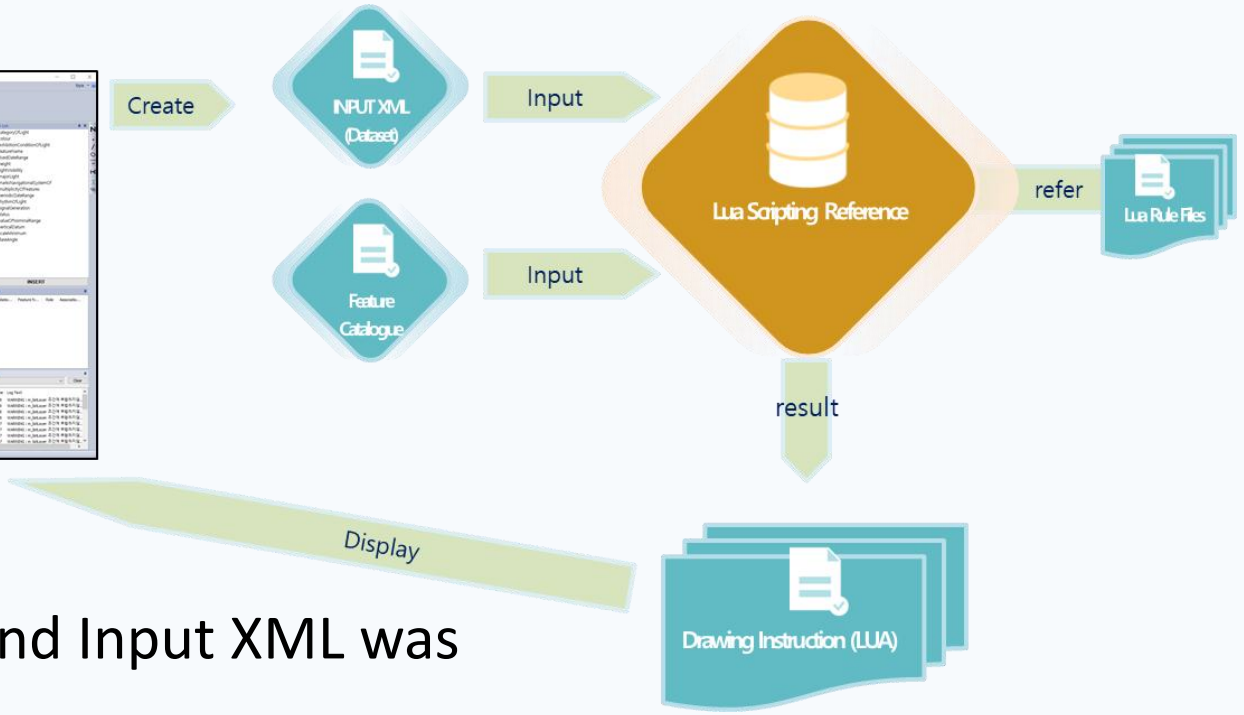
- In accordance with the Lua Scripting Reference structure of Fig. 1, the KHOA team designed a procedure that applies LSR in two stages:

- Phase 1
  - Create Input XML according to LSR's instructions for use
  - Enterthe created input XML and Feature Catalogue into the LSR.
- Phase 2
  - SENC information is transferred to LSR without generating input XMLDocument
  - System FC is transferred to LSR, not FC XML files
  - Updatethe contents of the Host function



3.3 Testbed Results

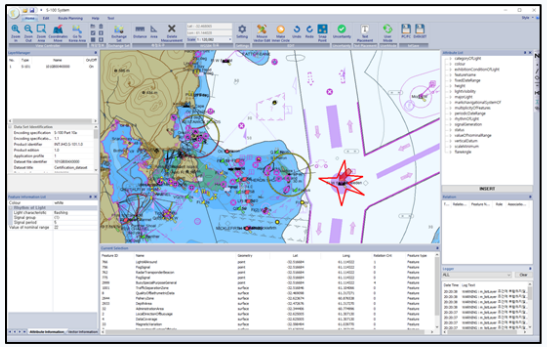


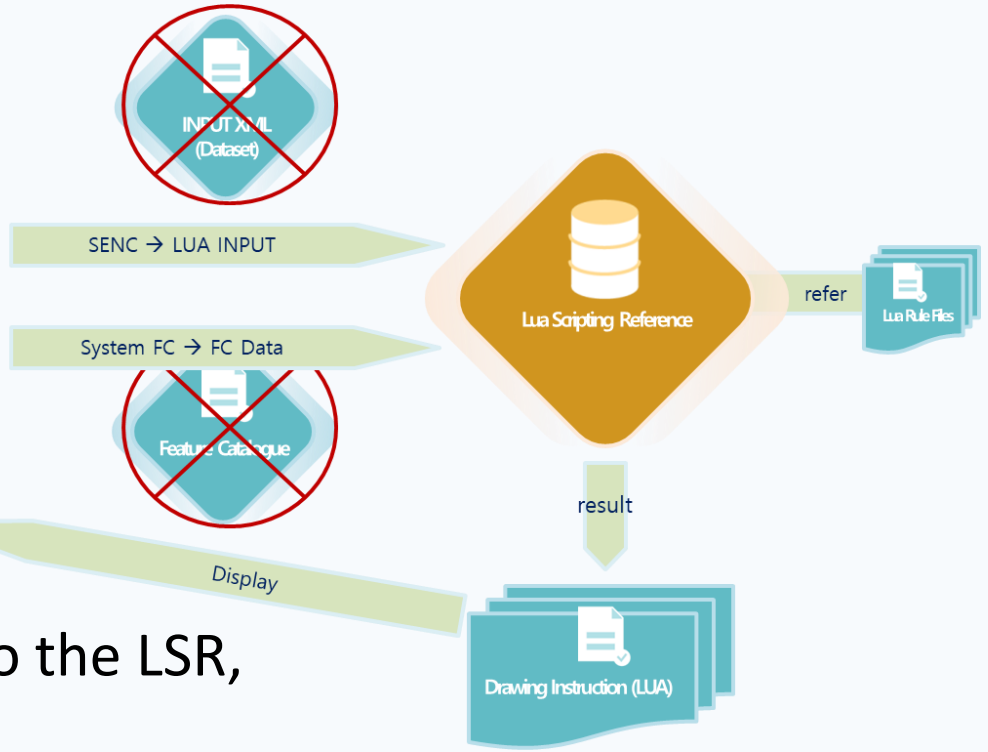


Phase 1

- S-101 ENC was converted to SENC and Input XML was generated using SENC data.
- The S-101 Feature Catalogue file was also entered into the LSR along with Input XML.LSR derived the Drawing Instruction by referring to Lua Rule files.
- Using this result, S-101 ENC marked successfully as shown

3.3 Testbed Results





Phase 2

- The SENC delivered the information directly to the LSR, without generating the Input XML Document.
- Feature Catalogue also delivered FC data from System FC not XML files to LSR, to derive the Drawing Instructions in accordance with LSR procedures.
- S-101 ENC display results were the same as Phase 1.

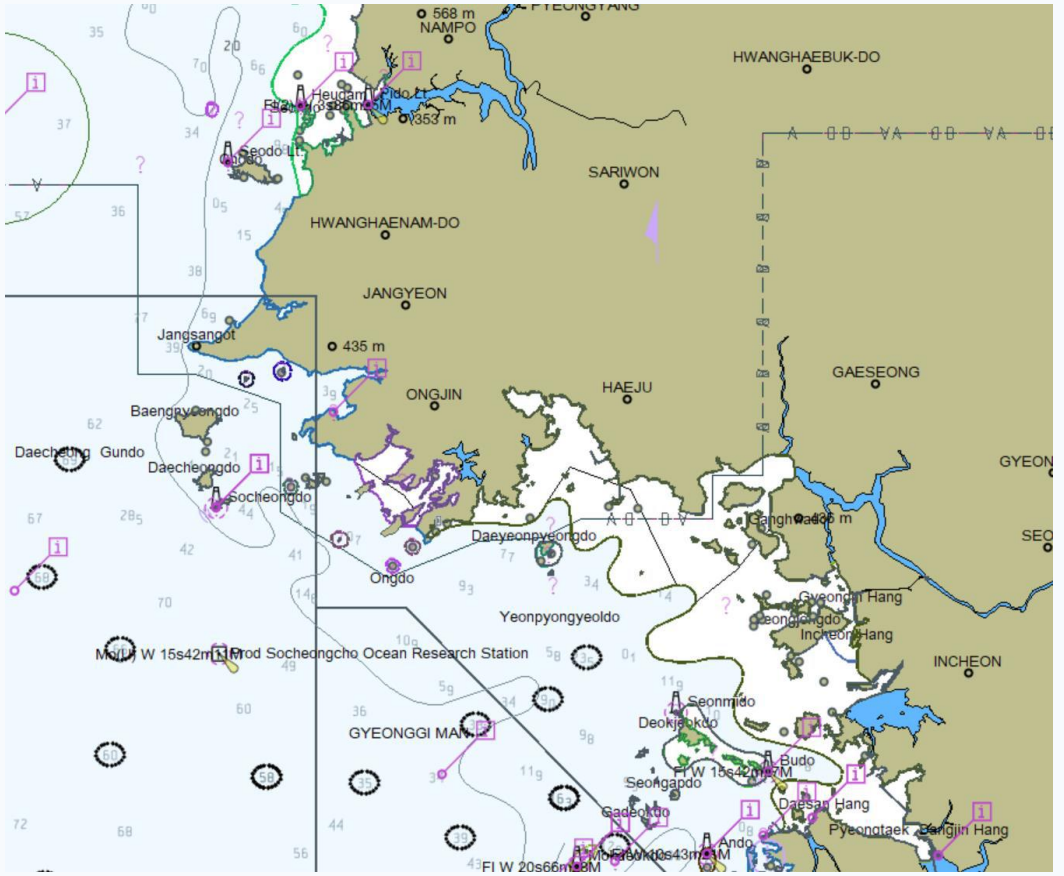
3.3 Testbed Results

- S-101 Viewer representation with Phase 1 and Phase 2 were the same, but there was a difference in processing time.
- Compared to Phase 1 method, Phase 2 method has about 41% improvement in processing speed.

Cell Name (File Size)	Round	Using Input XML Case (ms)			Using SENC Case (ms)			Comparative processing time (%)
		Input XML Creation Time	Drawing Instruction Processing Time	Total spend Time	Input XML Creation Time	Drawing Instruction Processing Time	Total spend Time	
I01US004NC55M (70KB)	1	17	104	121	-	81	81	67%
	2	15	101	116	-	80	80	69%
	3	16	106	122	-	78	78	64%
I01kkkkk (484KB)	1	103	311	414	-	267	267	64%
	2	105	320	425	-	262	262	62%
	3	103	301	404	-	272	272	67%
I01KR004G3E00 (1176KB)	1	282	739	1,021	-	553	553	54%
	2	278	730	1,008	-	554	554	55%
	3	279	735	1,014	-	571	571	56%
I01KR004G3B30 (1764KB)	1	361	1265	1,626	-	953	953	59%
	2	363	1272	1,635	-	991	991	61%
	3	360	1258	1,618	-	933	933	58%
I01KR004G3E20 (2945KB)	1	776	2254	3,030	-	1511	1,511	50%
	2	762	2351	3,113	-	1493	1,493	48%
	3	771	2226	2,997	-	1517	1,517	51%
Total Average								59%

3.3 Testbed Results

- Error in S-101 Lua Rules
  - The result of displaying of KR1F0000 according to the Lua based S-101 PC, confirming that Depth Area near the coastline is greyed out.
  - Depth Area is grayed out as the default background color of the KHOA S-100 Viewer. During the processing Lua rules, an error occurred in Depth area and that area was not displayed.



3.3 Testbed Results

- Among Lua files, SEABED01.lua uses a real type value, and the real type value is defined as a table type in the Lua Rules.

```
3   -- Main entry point for CSP.
4   function SEABED01(feature, featurePortrayal, contextParameters, depthRangeMinimumValue, depthRangeMaximumValue)
5       Debug.StartPerformance('Lua Code - SEABED01')
6
7       local Colour = 'DEPIT'
8       local Shallow = true
9
10      if (contextParameters.TwoShades) then
11          if (depthRangeMinimumValue >= scaledDecimalZero and (not depthRangeMaximumValue or depthRangeMaximumValue > scaledDecimalZero)) then
12              Colour = 'DEPVS'
13          end
14
```

3.3 Testbed Results

- Below is part of the DEPARE03.lua.
- If DepRangeMinimumValue of DepthArea is not found, -1.0 is assigned to DepthRangeMinimumValue to call SEABED01Function in Lua Rules.But -1.0 is the real type value not table type value, so an error occurred when comparing the table type and real type in SEABED01.lua.

```
10  -- Main entry point for CSP.
11  function DEPARE03(feature, featurePortrayal, contextParameters)
12      Debug.StartPerformance('Lua Code - DEPARE03')
13
14      local depthRangeMinimumValue = feature.depthRangeMinimumValue or -1.0
15      local depthRangeMaximumValue = feature.depthRangeMaximumValue
16
17      SEABED01(feature, featurePortrayal, contextParameters, depthRangeMinimumValue, depthRangeMaximumValue)
18
```

3.3 Testbed Results

- It is judged that the above errors are not caused by clarifying the handling of undefined / unknown.
- It is necessary to clarify the handling of undefined/unknown within Lua.
- It is necessary to take the following form:

```
local depthRangeMinimumValue = -1.0
if (feature.depthRangeMininumValue != nil) then
        if (feature.depthRangeMinimumValue == unknown) then
                // do unknown attribute work
        else then
                depthRangeMinimumValue = feature.depthRangeMinumumValue
        end
end
else then
        // do undefined attribute work
end
```

4. Conclusions and Recommendations

- In relation to the provision of LuaScriptingReference C++ Code provided by the NIWC for the C++ based SW development team, the KHOA team focused on applying LSR to the KHOA S-100 Viewer.
- In order to check LSR applicability, we divided it into Phase 1 and Phase 2. Input XML and Feature Catalogue are delivered based on KHOA S-100 Viewer's data structure. We checked 41% improvement over Phase 1 method in Phase 2.

- NIWC was grateful for providing LSR, allowing the KHOA team to apply Lua-based S-101 PC to the KHOA S-100 Viewer.
- LSR may need to be updated as the S-101 PC changes, and the IHO also needs to check whether LSR needs to be maintained continuously.