**Notes (Last revised 03 May 2019 – last updated 14 April 2020)**

**Terms**

S-nnn An S-100-based product specification

**Folder Organization:**

Wherever local files are referenced in the XSD files and XML sample files, the references are based on this organization of folders.

In the future (after an IHO Internet server for schemas is set up) the local references will be updated to the appropriate Internet locations (URLs). Developers and distributors may use “XML catalogs” as described in the OASIS standard for XML catalogs (see #4 in “Additional notes” below) or other means of specifying the actual locations, especially if access to Internet files is needed on board ship or in other conditions when real-time Internet access is not available or precluded by security considerations.

Table 1. File and folder organization

|  |  |  |
| --- | --- | --- |
| ***S-100 schemas and other files*** | | |
| **schemas/** | This folder. Contains the S-100 and S-nnn schemas. Optionally, may contain the ISO schemas as well. | |
| **ephemera/** | Miscellaneous transient files. For examples, updates to ISO Schematron files for newer versions of the ISO schemas. | |
| **S100/** | S-100 schemas | |
| **4.0.0/** | Edition 4.0.0 schemas container | |
| **S100Catalog/** | Exchange catalogue schema container | |
| **20181015/** | Build 20181015 of the exchange catalogue schemas. This build includes revisions to the exchange catalogue arising from TSM6. (Deprecated – use 20190422 or later build.) | |
| **20190422/** | Build 20180422 of the exchange catalogue schemas. Adds the missing ID attribute in S100\_DataCoverage, removes unused ISO namespaces, and updates the Schematron rules file that implements consistency checks for instance documents which cannot be expressed in XML Schema. | |
| **Files in S100Catalog build folders:**  **20181015**  **20190422** | **S100\_ExchangeCatalogue.xsd** | XML schema for S-100 exchange catalogue |
| **s100mds.xsd** | container file for S-100 extensions to service identification metadata |
| **serviceIdentification.xsd** | S-100 extensions to service identification metadata |
| **ISOTS19139A1Constraints\_v1.4.sch** | Schematron ISO 19139 constraints (necessity for S-100 Edition 4.x TBD) |
| **S100\_DSMD.sch** | Schematron file with S-100-specific validation checks for ISO 19115-1 metadata files for vector datasets |
| **S100\_XC.sch** | Schematron file with S-100-specific validation checks for exchange catalogues |
| **S100\_DQ.sch** | Schematron file with S-100 generic checks for data quality results. Tentative pending formalization of data quality reporting in S-100/S-97.  New in build 20190422. |
| **S100DE/** | Data encryption schema container | |
| **20180619/** | OBSOLETE DRAFT. | |
| **20181015/** | Build 20181015 of the permit file XML schema. For the October 1028 draft of S-100 4.0.0 Edition. | |
| **S100FC/** | Feature catalogue schema container | |
| **20180502/** | OBSOLETE DRAFT. This build DOES NOT include the revisions due to introduction of ISO 19115-1 and 19115-3. | |
| **20180611/** | Build 20180611 of the feature catalogue schemas. This build DOES include the revisions due to introduction of ISO 19115-1 and 19115-3. | |
| **S100GML/** | GML profile container | |
| **20180502/** | Build 20180502 of the GML profile. Future distributions may have additional or other build folders. | |
| **S100XSLTPR/** | Container for S-100 XSLT portrayal schemas. | |
| **20180619/** | OBSOLETE DRAFT. Lacks LUA in file formats. Use a later draft instead. | |
| **20181015/** | Container for 20181015 build of XSLT portrayal schemas. The same as the obsolete 20180619 build, but updated to include “LUA” in the FileFormat enumeration. | |
| **resources/** | Container for resource files | |
| **Codelists/** | Container for S-100 codelists (see the next table) | |
| **XMLCatalogs/** | Container for XML catalogs. Currently empty, reserved for developer-provided XML catalogs. | |
| **w3c/** | (folder hierarchy with W3C XLink schema) | |
| ***ISO schemas and other files*** | | |
| **standards.iso.org/** | Folder with ISO TC211 schemas. These are a snapshot of the “working versions” from the ISO TC211 GitHub site but should be the same as the stable versions which have since been uploaded to the ISO schema distribution site https://standards.iso.org/iso/. (Distribution held pending clarification of permissions.) | |
| **19110/**  **19115/**  **19135/**  **19139/**  **19157/** | ISO schemas. The names and organizations are the same as in the ISO distribution. Note that the ISO web site places them under an “iso” sub-directory, e.g., https://standards.iso.org/iso/19115/... for the ISO 19115 schemas. Several S-100 schemas currently reference locally installed ISO schemas instead of the ISO web site, e.g., using schemaLocation="../../../../standards.iso.org/19115/-3/cit/2.0/cit.xsd". This means you must either install the standards.iso.org folder as part of the S-100 distribution, or change the schemalocation attributes to load from the ISO site (in’ schemaLocation’ and ‘import’, replace everything up to and including “standards.iso.org” with “https://standards.iso.org/iso”).  Notes: (1) Some ISO schema files may import other schema files from the ISO site, so without an implementation based on XML catalogs, those imports will access the offsite files. At this point of time (April 2019) there is no known problem related to this, but as time passes and schemas evolve this might change. (2) The ISO distribution also includes 19111, 19155, and 19165 folders, which have been removed since they are not required for S-100 4.0.0 (determined by visual inspection - please inform the S-100 WG chair if they are in fact needed). | |
| ***Schemas for product specifications*** | | |
| **S98/**  **S101/**  **S102/**  **S111/**  **S127/** | Folders for schemas for individual product specifications, including metadata/exchange catalogue schemas extending the S-100 generic schemas and Schematron files implementing product-specific restrictions on metadata.  The **XC/** folder in each product folder contains the exchange catalogue schema and a Schematron file implementing product-specific restrictions on exchange catalogues.  The **FMT/** folder in some product folders contains the product’s data format XSDs (that is, the GML application schemas based on S-100 Part 10b – GML format) and Schematron files. The FMT folder is not present for products which use the ISO 8211 or HDF5 data formats.  The **resources/** folder in some product folders contains product-specific codelists, for example, a codelist for type of current data in S-111. | |
| ***Samples*** | | |
| **samples/** | Samples folder | |
| **generic/** | Folder with S-100 4.0 generic samples | |
| **FC/** | Feature catalogue sample(s). | |
| **20180611/** | Sample conforming to the 20180611 build of the feature catalogue schema | |
| **permits/** | Permits file sample(s). | |
| **20181015/** | Sample permit file described in Part 15 of S-100 4.0.0. | |
| **S98/**  **S101/**  **S102/**  **S111/**  **S127/** | Samples of S-100 exchange catalogue and ISO 19115-3 metadata for the respective products.  The S-127 folder also contains a sample Marine Traffic Management exchange set.  The S122, S123, and S412 folders are empty because S122 1.0.0 and S123 1.0.0 reference S-100 Edition 3.0.0 and the scope of S412 may change.  The data quality reporting examples are tentative since conventions for reporting data quality have not been formalized.  The S-101 exchange catalogue file example intentionally omits an element in one support file discovery block to demonstrate the operation of Schematron rules.  There will be some informative messages for S-nnn exchange catalogue files reporting the number of discovery blocks for different types of files. | |

Table 2. Codelists

|  |  |
| --- | --- |
| ***S-100 Codelist locations*** | |
| **S100/4.0.0/resources/Codelists/** | Container for S-100 codelist folders |
| **cat/codelists.xml** | Comprehensive ISO codelists file. IHO S-100 codelists in ISO catalog format. Supplements the ISO codelists file by defining two codelists not defined in that file (language and character set codes).  Also includes a codelist for the data encoding format described in S-100 Part 10c, for use by specifications which encode that in metadata files. |
| **gml/\*.xml** | IHO S-100 codelists in GML dictionary format (currently none) |
| ***ISO Codelist locations*** | |
| **standards.iso.org/19115/resources/Codelists/** | Container for ISO codelist folders (see Note 2 below) |
| **cat/codelists.xml** | Comprehensive ISO codelists file. ISO TC211 codelists in a single file in ISO catalog format. |
| **gml/\*.xml** | Codelists in separate files in GML dictionary format. Currently has more codelists than the ISO "cat" codelists.xml |
| **standards.iso.org/191xx/.../codelists.xml** | Additional locations for the codelists for individual specifications as separate files. The ISO TC211 distribution includes these files for convenience. However, to minimize the chances of conflicts, S-100 implementations must treat these files as fallbacks, i.e., use these files only if the codelist is not specified in the ISO 19115 comprehensive codelists file or the S-100 comprehensive codelists file.  Note (2020-04-14): Some ISO TC211 codelists for 19139 and 19157 have been temporarily removed pending a fix for missing and/or duplicate ISO resources. |
| ***Product-specific codelist locations*** | |
| **<Snnn>/<version>/resources/Codelists/...** | Codelists specific to S-nnn products.  The “codelists.html” files present them in reader-friendly HTML format. |

**Namespaces**

As of April 2019, the product-specific schemas (for examples, the data format and exchange catalogue schemas for S-101, S-122, etc.) include the edition+revision number of the product specification as part of the namespace. The generic S-100 schemas do not include the S-100 version number or any part of it in their namespaces. Future releases of the S-100 schemas (new builds for S-100 Ed. 4.0.0 or for future revisions of S-100) may also add version numbers to their namespaces. Any comments about this should be sent to Raphael Malyankar ASAP.

**Version numbering:**

Both S-100 and S-nnn schemas have the version number in the <schema> root element’s “version” attribute. The format is N1.N2.N3-YYYYMMDD where:

* N1, N2, and N3 are the major version, revision, and clarification number respectively of the S-100 edition
* YYYYMMDD the build date of the schema.

Example: <schema . . . version="4.0.0-20180502"> indicates build 20180502 of the schemas for S-100 Edition 4.0.0.

Clarifications to the S-100 standard may or may not result in an update of the XSD files. If an update does result, it will be a "non-substantive change" and will not change the structure of the schema, but may correct grammatical and spelling errors (including element definitions); or amend or update cross references. If the schemas are updated, the build date will also be updated.

Corrections to XSD files which are due to errors or amendments to the XSD files themselves and not caused by changes in S-100 will result in a new version of the schema files which has the same S-100 edition component but a different build date from the previous version of the schemas.

Dependency on particular versions of the schemas should be checked by comparing at least the N1.N2 and YYYYMMDD portions of the schema version. This means that the schema build date may have to be included where there is a dependency on XML schema structure (including the presence of enumerates, upper and lower bounds on multiplicity, etc.)

**Additional notes:**

1. The namespaces and referenced XSDs use the March 2018 ISO "Working Version" schemas by default. This is because "During September 2017 some problems were identified with the (ISO) codelists and a significant upgrade was made." Update (7 Nov. 2018): A note on the ISO working version now says “The schemas developed in this repository that include recent changes have been migrated to the Official ISO Schema Repository at http://standards.iso.org on September 18, 2018.”
2. The official location of the ISO final schemas for ISO 19115-1/2/3 (for schema validation purposes) is given in a comment in the ExchangeCatalogue.xsd file. To use the "final schemas" change the schemaLocation and namespaces in both the schemas and XML files. Schema-validity with subsequent ISO versions which implement the same 19115-X version is probable but not guaranteed. The same applies to Schematron rules. The codelist keys or values, however, may have changed and compatibility between ISO's "final" and working versions is not guaranteed.
3. ISO-provided Schematron files for validation are now included in the folders for the revised schemas and are also on the ISO’s web site. As of April 2019, the ISO’s Schematron files have not yet been updated for new versions of the ISO schemas. For example, cit.sch is provided in the folder standards.iso.org/19115/-3/cit/1.0/ but not in standards.iso.org/19115/-3/cit/2.0/. The older versions generally DO NOT work for the newer versions (due to namespace mismatches). ISO may update them; meanwhile, the “ephemera” folder contains updated versions for use with S-100 (only for two files – contact us if more are needed). Keep in mind the statements in Note 2 about Schematron rules and codelists.
4. XML catalogs describe mappings between external references and locally cached equivalents. They allow software tools and applications to resolve references to external entities (e.g., in schemaLocation attributes) in terms of locally cached files.

(See "XML Catalogs - OASIS Standard V1.1, 7 October 2005" URI: <https://www.oasis-open.org/committees/download.php/14810/xml-catalogs.pdf>.) The development of XML catalogs for S-100 is not planned at present. This folder is reserved for depositing XML catalogs that may be prepared by developers.

1. There are discrepancies between ISO 19115-1 and the schemas distributed by ISO (both the final and working versions) in the folder and filenames of the codelist files. The sample in this distribution attempts to match the actual location of the codelists to the values encoded in the samples, but the values encoded in the sample (i) need to be checked, and (ii) may have to be updated after ISO correct their discrepancies. Also, some codelists are missing from the ISO distribution. Note: (7 Nov. 2018): The discrepancies should have been resolved before the Sep. 2018 migration to the official repository. Please inform us if they still exist.)
2. ISO 19115-3 defines the allowed space for character set codes (ISO CodeList MD\_CharacterSetCode) as “use IANA Character Set register: http://www.iana.org/assignments/character-sets”. This is different from the ISO 19139 specification. MD\_CharacterSetCode is used as the datatype for character PT\_Locale and therefore the metadata attributes which are of type PT\_Locale. The effects on S-100 artifacts, including various catalogues and the registry, remain to be determined. Meanwhile, the 19115-3 definition is defined in an S-100 codelists.xml resource file.

**Updates and changes**

Please do not change locations, namespaces, or file names in the schemas and samples in this package without consulting me (Raphael), or unless you are an XML expert and have checked the side-effects.

Any changes to the schemas on the official IHO distribution should get a new build date and an update in the file history at the beginning of the file describing the change and identifying the author. This README document should also be updated accordingly.

2020-04-14: Updated with replacements for broken ISO links to ISO TC211 resources which have since been removed from the ISO standards.iso.org server. The changes to the ISO schemas are all in the standards.iso.org section of the distribution. The version & build dates of the S-100 XSD files and product specifications have not changed, there being no changes to the S-100 schemas themselves - the only changes in the S-100 section of the distribution package are to the codelist files for some product specifications.

Bug reports and questions should be sent to Julia Powell (S-100 WG Chair) with a copy to Raphael Malyankar (author).

Requests for changes should be submitted to the IHO S-100 WG Chair or submitted through the regular S-100 maintenance proposal process.