OGC Maritime Limits and Boundaries Pilot Project

Table of Contents

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Chapter 1. Introduction and Background

Introduction to project, goals aims and objectives.

- what this report is for
- objectives of project - overview
- groups involved at a high level
- the part OGC plays in development of the standard
- this is the first project to have been run in this way

Chapter 2. Background

2.1. Maritime Limits and Boundaries

- development of UNCLOS
- background and links for more information
- relevance to spatial data etc…

2.2. IHO S-121

- Background to development of IHO S-121
- its authorship, development
- Current status

Chapter 3. Executive Summary

The Executive Summary clause shall contain the key findings and results in a concise form. A more detailed description of the findings should be in the body of the report.

The Executive Summary shall contain a business value statement that should describe the value of this Engineering Report to improve interoperability, advance location-based technologies or realize innovations.

This section shall include precise descriptions of the requirements that have been addressed by the work documented in this Engineering Report; together with the research motivation that answers the fundamental question: What motivated us to address this topic in this report?

This section provides an overview of recommendations on how to further proceed with the achievements documented in this ER.

This section shall be between 1-3 pages.

3.1. Document contributor contact points

All questions regarding this document should be directed to the editor or the contributors:

Contacts

Name	Organization	Role
Jonathan Pritchard	IIC Technologies	Editor

3.2. Foreword

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

Chapter 4. Intro and Summary

Chapter 5. This Document

Chapter 6. Background

6.1. UNCLOS

- Short history of the relevant parts of UNCLOS, the parts relevant to this project
- Wider applicability, e.g. MSP and other marine uses. How OGC can fit into that, MSDI as the broad term for these uses of data

6.2. IHO / S-121 history

- Description of the S-100
- S-100 for the unitiated, how PS development works, registry, feature catalogue etc.
- S-121 for the unitiated, brief description of model
- Where is S-121 now?
- User Perspective?

Chapter 7. OGC Pilot Project

7.1. Pilot Project objectives and Goals

- Description of goals and objectives for the project.
- How it is achieved

7.2. Structure of project

Chapter 8. Deliverables

8.1. GML Application schema

8.1.1. Background to GML AS for S-121

- Description of IHO S-100 GML schema development
- Use, how S-100 is structured and the constraints
- Unique challenges with S-121
- Approach taken in project
- Current client implementations, also where S-100 adoption is
- What the S-100 profile provides
- S-100 for the uninitiated
- S-121 for the unitiated (model description)

8.1.2. Structure of schema

- modular structure
- features, information types, geometry
- how features are aggregated into collections
- how topology and geometry is dealt with
- Use cases

8.1.3. Example uses

8.2. Client SDI

8.2.1. Current state

8.2.2. User perspective

COTS

Free/open Source

Chapter 9. Interoperability Testing

9.1. Introduction. Interoperability goals

9.2. Test Definitions

9.3. Execution and Results

9.4. Observations

Chapter 10. Future possibilities.

10.1. Extension of schema

10.2. Data creation and editing

10.3. IHO outputs

10.3.1. Automation of AS construction

10.3.2. Support for multiple languages

10.3.3. Use of GML

10.3.4. On Topology

10.4. OGC outputs

10.4.1. GML

- Feedback on use of GML for meeting the objectives of the project.
- How IHO S-100 GML profile ties in with boader use and any issues that generates

10.4.2. Topology

10.4.3. Definitions

10.5. Document contributor contact points

All questions regarding this document should be directed to the editor or the contributors:

Contacts

Name	Organization	Role
Jonathan Pritchard	IIC Technologies	Editor

Chapter 11. References

The following normative documents are referenced in this document.

NOTE: Only normative standards are referenced here, e.g. OGC, ISO or other SDO standards. All other references are listed in the bibliography. Example:

- OGC 06-121r9, OGC® Web Services Common Standard [https://portal.opengeospatial.org/files/?artifact_id=38867&version=2]

Chapter 12. Terms and definitions

For the purposes of this report, the definitions specified in Clause 4 of the OWS Common Implementation Standard OGC 06-121r9 [https://portal.opengeospatial.org/files/?artifact_id=38867&version=2] shall apply. In addition, the following terms and definitions apply.

NOTE: Delete the first three terms because they are examples.

- *coordinate reference system*

  coordinate system that is related to the real world by a datum term name (source: ISO 19111)

- *portrayal*

  presentation of information to humans (source: ISO 19117)

- *LiDAR*

  Light Detection and Ranging — a common method for acquiring point clouds through aerial, terrestrial, and mobile acquisition methods.

- *term name*

  text of the definition

- *term name*|*synonym*

  text of the definition

12.1. Abbreviated terms

NOTE: The abbreviated terms clause gives a list of the abbreviated terms and the symbols necessary for understanding this document. All symbols should be listed in alphabetical order. Some more frequently used abbreviated terms are provided below as examples.

- COM Component Object Model
- CORBA Common Object Request Broker Architecture
- COTS Commercial Off The Shelf
- DCE Distributed Computing Environment
- DCOM Distributed Component Object Model
- IDL Interface Definition Language

Chapter 13. Overview

Instructions

NOTE

This 4-overview.adoc file helps the reader to better understand the various sections of the ER. It should be written like an extended table of contents.

Example:

Section 5 introduces the problem of vector tiling. It describes the situation prior to the testbed and discusses the requirements set by the sponsors.

Section 6 discusses the mathematical model behind the various tiling strategies. It provides recommendations on preferred strategies.

Section 7 presents the solution developed in this testbed. A clear mapping of requirements to solutions is provided. The section shows additional work is required to implement 3D tiles, which could not be addressed in this activity.

Section 8 provides a summary of the main findings and discusses links to other tasks such as WFS 3.0 and WMTS 2.3.

Annex A provides code snippets that illustrate the functionality of the Vector Tiling Engine and shall help to implement similar technology. It briefly discusses the key issues we experienced during implementation.

Chapter 14. Example Clause

Instructions

NOTE

This section explains some concepts frequently required by Asciidoc novices. Please use this file as a template for your own clauses.

14.1. Headlines

All headlines are marked by "=" signs. The top level in each each file starts with level 2 ("=="). Important: For whatever strange reason, headings in annexes are marked differently.

14.2. Figures

If you want to reference a figure by using a figure number, it is important to use the following syntax. The figure identifier for Figure 1 is the first statement of the header. Please adapt the width as appropriate, but generally a width of 800 is good for landscape-shaped figures and 400 is good for portrait-shaped ones.

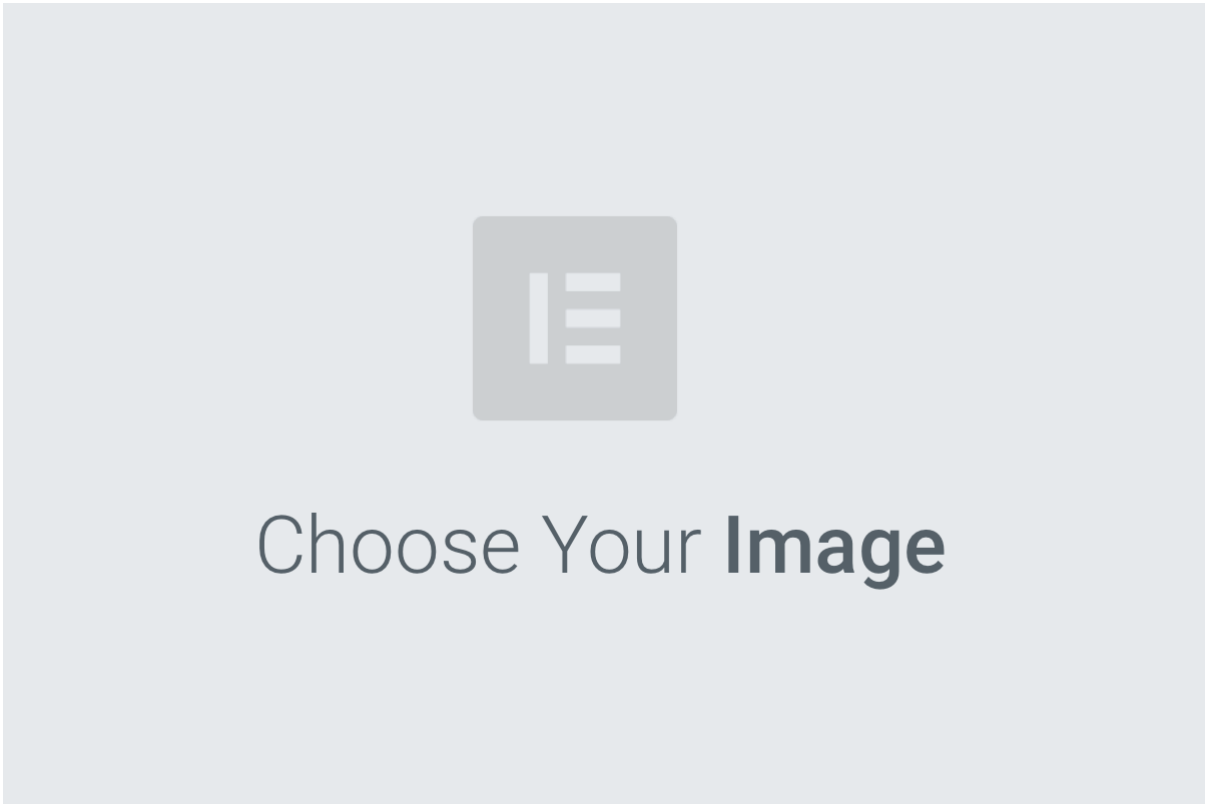

Figure 1. This is an example figure

It is important that you use the same syntax for all images, otherwise the automatic numbering is corrupted!

14.3. Tables

Tables are easy to deal with as long as you keep them simple! To add a table, please use the following syntax.

Country	Population	Size
Monaco	36371	**1.98**
Gibraltar	29431	**6.8**

Table 1. Countries in Europe

The first line is used for referencing. You can reference Table 1 in your text. The only thing you should change in that line is the table id, which is "table_countries" in this case. Please do not remove the "#", please do not change anything else in that line.

You can define the style and width of each column. In our example, the first column takes 50% of the entire width, the second and third column take 25% each. The total width of the table is 75% of the text width.

The letters after the width percentage indicate if the column is e=emphasis, m=monospaced, a=asciidoc, s=strong. The d=default does not need to be set.

Cell alignment: If you need to align a column, you may indicate this by setting ^,<, or >. Examples:

- ^25m = centered, 25% width, monospaced.
- >25e = aligned right, 25% width, emphasised
- <25 = aligned left, 25% width, asciidoc

In any case, please make sure that your table fit on a piece of A4 or letter-size paper!!

14.4. Recommended Asciidoc Environment

We recommend to use asciidoctor [http://asciidoctor.org] and asciidoctor-pdf [http://asciidoctor.org/docs/convert-asciidoc-to-pdf/] in combination with the Atom [https://atom.io] editor.

14.4.1. Installation on MacOS and Linux

1. Please follow the steps on https://asciidoctor.org/#installation.
2. Install the bibtex extension: *gem install asciidoctor-bibtex*

14.4.2. Installation on Windows

We have made best experiences with the following steps:

1. Install ruby for windows: https://rubyinstaller.org/downloads/. If you experience any issues, the following link may help: stackoverflow [https://stackoverflow.com/questions/18908708/installing-ruby-gem-in-windows]
2. Open command prompt and install two gems:
    a. Execute: "gem install asciidoctor"
    b. Execute: "gem install asciidoctor-bibtex"
3. Text your installation
    a. Open a folder that contains your Engineering Report asciidoc source files, including the *er.adoc* file.
    b. Execute the following command: *asciidoctor -r asciidoctor-bibtex er.adoc*

14.4.3. Using Asciidoctor with Atom

In Atom, you should install the following packages:

- asciidoc-preview
- autocomplete-asciidoc
- language-asciidoc
- markdown-writer: requires changing of key-map to allow for keyboard shortcuts such as e.g. **bold**
- platformio-IDE-terminal

This environment allows you to use keyboard shortcuts, autocomplete, syntax highlighting and a rendered preview for asciidoc; and provides you an terminal window within the editor to convert your asciidoc to html and pdf.

14.5. Asciidoc Conversion

In order to achieve a uniform look-and-feel of all ERs in both HTML and PDF, we have provided a css and theme file. The following commands can be used to convert the ER:

Command for PDF output: asciidoctor-pdf -r asciidoctor-bibtex -a pdf-stylesdir=resources -a pdf-style=ogc -a pdf-fontsdir=resources/fonts er.adoc

Command for HTML output: asciidoctor -r asciidoctor-bibtex -a linkcss -a stylesheet=rocket-panda.css -a stylesdir=./stylesheets er.adoc

14.6. Source Code

You can add code snippets using the following syntax:

Code Example XML

```
<section>
  <title>Section Title</title> ①
</section>
```

① This notation allows to reference particular sections within the code.

You can alternatively use line numbers to reference a specific section in your code.

Code Example JSON

```
{"menu": {
  "id": "file",
  "value": "File",
  "popup": {
    "menuitem": [
      {"value": "New", "onclick": "CreateNewDoc()"},
      {"value": "Open", "onclick": "OpenDoc()"},
      {"value": "Close", "onclick": "CloseDoc()"}
    ]
  }
}}
```

As shown in line 2, the value of "id" is "File".

14.7. Asciidoc(tor) Syntax Help

Is available e.g. here: http://asciidoctor.org/docs/

14.8. Citations

Please use the following syntax to insert citations anywhere in the text:

```
cite:[VanZyl2009]
```

or, if it is more than one citation that should be added at the same location, use

```
cite:[Pross2018,OGCTechTrends2018]
```

which will create links in the compiled HTML/PDF that look as follows: [1], of for the second example given above, it results in [2, 3]

Then you need to provide all citation information in the file resources/bibtex-file.bib. This file uses the bibtex file format, which is defined in full detail here [http://www.bibtex.org/Format/]. The bibtex-style file shall remain untouched.

The conversion of *cite:[]* takes place at the time of asciidoc-to-pdf/html conversion and requires two things:

1. The definition of the *bibtex-file* and the *bibtex-style* attributes. This is done in this template in file er.adoc. Please make sure that both files are available at their defined locations.

```
Examples of bibtex attributes as set in file er.adoc

:bibtex-file: resources/bibtex-file.bib
:bibtex-style: resources/lncs.csl
```

2. Adding a flag to the asciidoctor conversion command

```
asciidoctor -r asciidoctor-bibtex er.adoc
```

A full conversion command could look as in the following example:

```
asciidoctor -r asciidoctor-bibtex -a linkcss -a s tylesheet=rocket-panda.css -a stylesdir=./resources/stylesheets er.adoc
```

For further information, please consult https://github.com/asciidoctor/asciidoctor-bibtex.

Chapter 15. Example using equations in asciidoc

You need to define the equation either as an asciimath inline macro:

$\frac{32\ 881\ \ 581.700504}{2^{n + 8}}$meters/pixels

as a delimited block:

or use the compact '\' notation

alternative

\[e^{2\pi \sqrt{-1}} = 1, \]

For the macross, you can use either asciimath or latexmath macro identifiers:

\frac{Tsble4at60}{Table4at90} = \frac{4214.27}{4516.57} = 0.933069.

Unfortunately, the preview in most tools will not display the equation correctly, see the screenshot from Atom as an example:

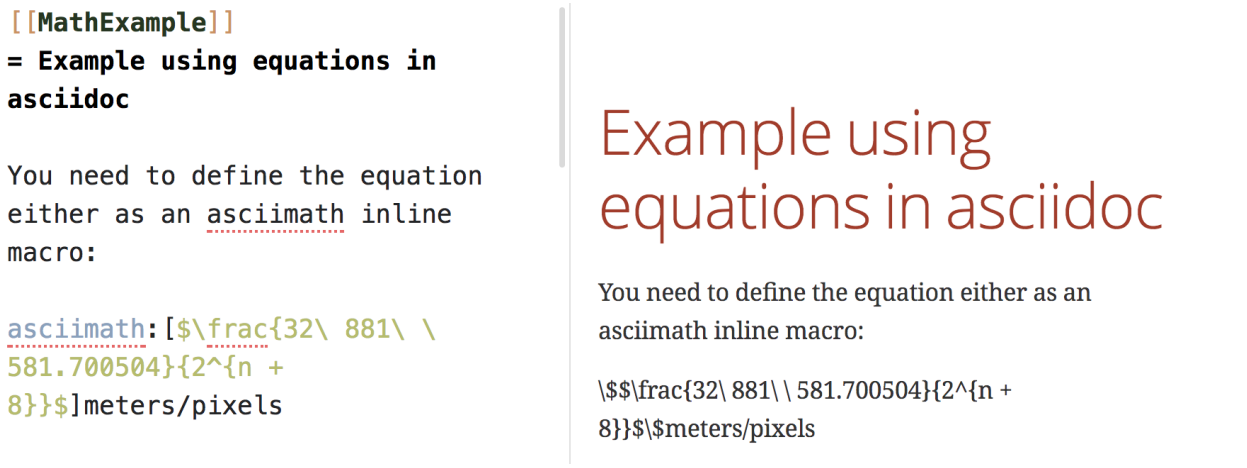

Figure 2. Screenshot from Atom editor: the preview shows the raw formular

…but once compiled with the stem "latexmath" being set, it works well in the html (reason is that the code is actually interpreted by the Javascript engine of the browser).

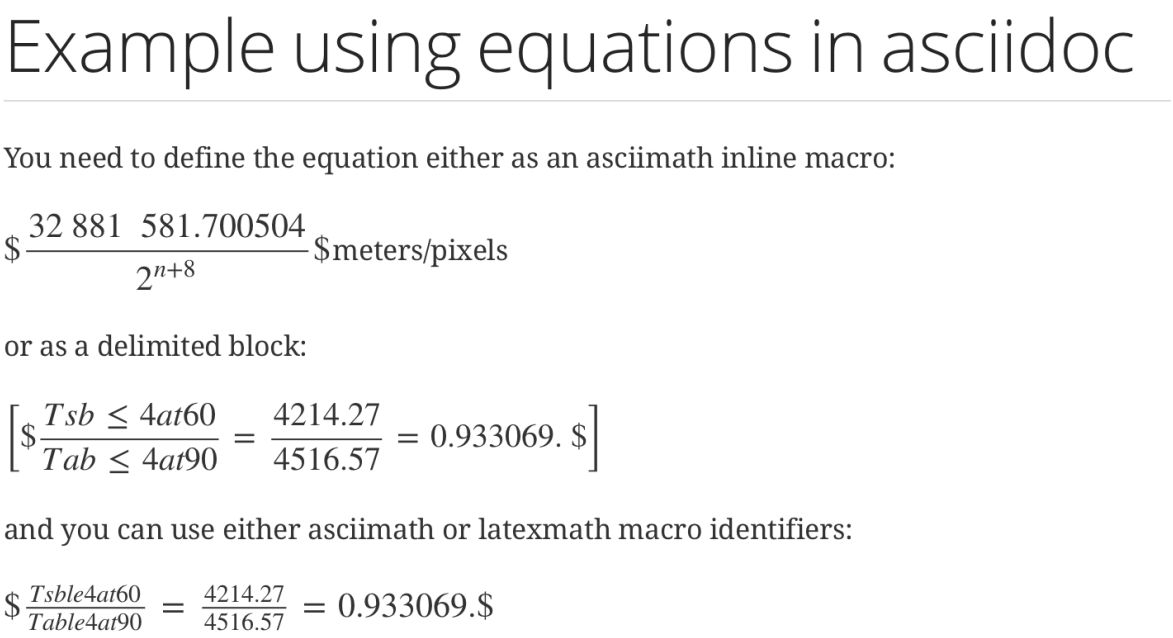

Figure 3. Screenshot from Browser: the formular is correctly displayed

That means that the stem is not supported by the asciidoctor-pdf engine, i.e. you cannot produce pdf documents that way. We recommend that you rather use screenshots from the rendered html version for your pdf.

15.1. Compiling AsciiDoc with Equations

To compile this example, you would use

```
asciidoctor -a stem=latexmath 6-math_example.adoc
```

15.2. Generate Equations

If you need some help generating equations, http://asciimath.org [http://asciimath.org] offers a great equation building and compiling tool and provides further information.

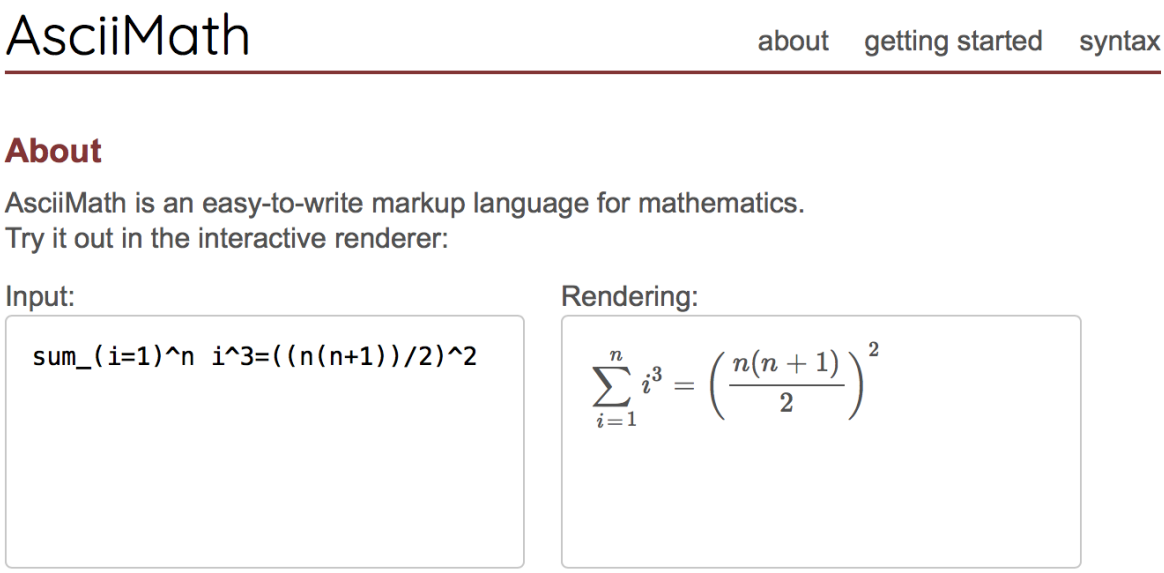

Figure 4. Screenshot AsciiMath equation tool

Appendix A: Abstract Test Suite

An Abstract Test Suite may be relevant to an Engineering Report.

An Abstract Test Suite is specified in Clause 9 and Annex A of ISO 19105. That Clause and Annex specify the ISO/TC 211 requirements for Abstract Test Suites. Examples of Abstract Test Suites are available in an annex of most ISO 191XX documents, one of the more useful is in ISO 19136. Note that this guidance may be more abstract than needed in an OGC® Implementation Standard.

NOTE	We skip level 2 headers so that asciidoc correctly numbers the subsections in the appendix.

A.1. Test module for conformance level 1

A.1.1. Conformance level 1

Test identifier	/test/case/id
Test purpose:	Confirm that the IUT satisfies all applicable requirements for conformance level 1.
Test method:	Functional testing performed in an automated and/or manual manner. Verify the behaviour of the IUT for the following operations: • GetCapabilities (mandatory) • DescribeRecord (mandatory) • GetRecords (mandatory) • GetRecordById (mandatory) • GetRepositoryItem (mandatory) • GetDomain (optional)
Requirement:	OGC 07-110: cl. 2.2
Test type:	Capability

A.1.2. Test case for validity of XML response entity

Test identifier	http://www.opengis.net/spec/xxx/conf/WRS.General-ValidResponse
Test purpose:	The XML response entity is valid.
Test method:	Validate content of response entity against corresponding element declaration.
Requirement:	OGC 07-006r1: cl. 10.2.5.1, p. 118

Test type:	Capability

A.2. Test module for conformance level 2

A.2.1. Conformance level 2

Test identifier	/test/case/id
Test purpose:	Confirm that the IUT satisfies all applicable requirements for conformance level 1.
Test method:	Functional testing performed in an automated and/or manual manner. Verify the behaviour of the IUT for the following operations: • GetCapabilities (mandatory) • DescribeRecord (mandatory) • GetRecords (mandatory) • GetRecordById (mandatory) • GetRepositoryItem (mandatory) • GetDomain (optional)
Requirement:	OGC 07-110: cl. 2.2
Test type:	Capability

A.2.2. Test case for validity of XML response entity

Test identifier	http://www.opengis.net/spec/xxx/conf/WRS.General-ValidResponse
Test purpose:	The XML response entity is valid.
Test method:	Validate content of response entity against corresponding element declaration.
Requirement:	OGC 07-006r1: cl. 10.2.5.1, p. 118
Test type:	Capability

Appendix B: XML Schema Documents

XML Schema Documents may be relevant to an Engineering Report.

The term “XML schema“ means all the XML schema parts having the same XML namespace, usually separated into multiple XML Schema Document files (with the file type “.xsd“. The XML schema parts in one XML namespace are usually separated into multiple XML Schema Documents to ease human understanding.

In addition to this document, this report includes several XML Schema Documents. These XML Schema Documents are bundled in a zip file with the present document.

The TBD abilities now specified in this document use TBD specified XML Schema Documents included in the zip file with this document. These XML Schema Documents combine the XML schema fragments listed in various subclauses of this document, eliminating duplications.

These XML Schema Documents roughly match the TBD UML packages described in Annex B, and are named:

```
TBD.xsd
TBD.xsd
```

These XML Schema Documents use and build on the OWS common XML Schema Documents specified [OGC 06-121r3], named:

```
ows19115subset.xsd
owsCommon.xsd
owsDataIdentification.xsd
owsExceptionReport.xsd
owsGetCapabilities.xsd
owsOperationsMetadata.xsd
owsServiceIdentification.xsd
owsServiceProvider.xsd
```

All these XML Schema Documents contain documentation of the meaning of each element and attribute, and this documentation shall be considered normative as specified in Subclause 11.6.3 of [OGC 06-121r9].

GetCapabilities.xsd

```
<ows:Operation name="GetCapabilities">
  <ows:DCP>
    <ows:HTTP>
      <ows:Post xlink:href="http://www.opengis.net/?">
        <ows:Constraint name="PostEncoding">
          <allowedValues>
            <ows:Value>SOAP</ows:Value>
          </ows:AllowedValues>
        </ows:Constraint>
      </ows:Post>
    </ows:HTTP>
  </ows:DCP>
</ows:Operation>
<ows:Operation name="GetTile">
  <ows:DCP>
    <ows:HTTP>
      <ows:Post xlink:href="http://www.opengis.net/?">
        <ows:Constraint name="PostEncoding">
          <ows:AllowedValues>
            <ows:Value>SOAP</ows:Value>
          </ows:AllowedValues>
        </ows:Constraint>
      </ows:Post>
    </ows:HTTP>
  </ows:DCP>
</ows:Operation>
```

Appendix C: UML model

A UML model may be relevant to an Engineering Report. This template thus includes this annex as the place for recording this UML model.

Instructions and guidelines on the usage of UML models are provided in OGC document OGC-121r9 [https://portal.opengeospatial.org/files/?artifact_id=38867].

Appendix D: Revision History

NOTE

Example History (Delete this note).

replace below entries as needed

Date	Editor	Release	Primary clauses modified	Descriptions
June 15, 2016	I. Simonis	.1	all	initial version
July 22, 2016	I. Simonis	.9	all	comments integrate
September 7, 2016	S. Simmons	1.0	various	preparation for publication
March 23, 2017	I. Simonis	2.0	all	template simplified
January 18, 2018	S. Serich	2.1	all	additional guidance to Editors; clean up headings in appendices

Table 2. Revision History

Appendix E: Bibliography

1. Zyl, T. van, Simonis, I., McFerren, G.: The Sensor Web: Systems of Sensor Systems. International Journal of Digital Earth. 2, 16–30 (2009).
2. Pross, B., Stasch, C.: OGC Testbed-13: Workflows Engineering Report. Open Geospatial Consortium, http://docs.opengeospatial.org/per/17-029r1.html (2018).
3. Open Geospatial Consortium: OGC Technology Trends, https://github.com/opengeospatial/OGC-Technology-Trends, (2018).