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## **OGC® OWS5 Compliance & Interoperability Test & Evaluation (CITE) Engineering Report**

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## **Preface**

This document summarizes the work done in the CITE thread of OWS5.

## **Forward**

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# OGC® OWS5 Compliance & Interoperability Test & Evaluation (CITE) Engineering Report

## 1 Introduction

### 1.1 Scope

This OGC™ document summarizes work completed in the OWS5 Compliance & Interoperability Test & Evaluation thread. This OGC™ document is applicable to the OGC Compliance Test Program.

### 1.2 Document contributor contact points

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

Name	Organization
Jennifer Marcus	Northrop Grumman, IT

### 1.3 Revision history

Date	Release	Editor	Primary clauses modified	Description
3/18/2008	1.0	Jennifer Marcus	Initial document	

### 1.4 Future work

Improvements in this document are desirable to more completely document work completed in OWS5/CITE thread.

## 2 References

The following documents are referenced in this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

OGC 08-044r1, *WFS-1.1: Abstract test cases for XLink*

OGC 08-xxxxx, *CSW 2.0.2 ebRIM/19115 profile*

OGC 08-041r1, *SOS 1.0 Abstract Test Suite*

OGC 08-036, *Test Suite for SPS 1.0*

OGC 08-033, *WCS Change Request – WCS 1.1.1 Abstract Test Suite*

OGC 08-034, *Test Suite for WCS 1.0.0*

ISO 19105 *Geographic information — Conformance and testing*

## 3 Terms and definitions

For the purposes of this report, the following terms and definitions apply.

### 3.1 Compliance Test Engine

OGC currently uses the Open Source Test Evaluation And Measurement (TEAM) engine which runs executable test suites to verify compliance to OGC web services standards.

### 3.2 Abstract Test Suite

Testable assertions extracted from the standard document; defined as mandatory or optional; test cases are specified independently of any particular test procedure (ISO 19105, 4.4); may be used to create an ETS for a particular test harness

### 3.3 Executable Test Suite

Set of executable test assertions written in CTL and executed by the TEAM Engine to validate compliance to an implementation standard.

### 3.4 Compliance Test Language

Compliance Test Language is an XML grammar for documenting and scripting suites of compliance tests for verifying that an implementation of a standard complies with the standard. A suite of CTL files is installed in the compliance test engine, which executes the scripts and determines whether the implementation being tested passes or fails.

### 3.5 Reference Implementation

Open source implementations of an OGC Web Service that are 100% compliant with the associated compliance tests.

### 3.6 Test Data

Static dataset provided along with executable test suites; loaded into service implementation to be tested; this data is necessary for the ETS to test the service implementation

## 4 Conventions

### 4.1 Abbreviated terms

ATS	Abstract Test Suite
ATC	Abstract Test Case
CITE	Compliance and Interoperability Test and Evaluation
CTL	Compliance Test Language
ETS	Executable Test Suite
RI	Reference Implementation

## 5 OWS5 Compliance & Interoperability Test & Evaluation (CITE) Engineering Report Overview

The participants in the CITE Thread of OWS5 developed new compliance tests and reference implementations for several standards. The following is a summary of the work items:

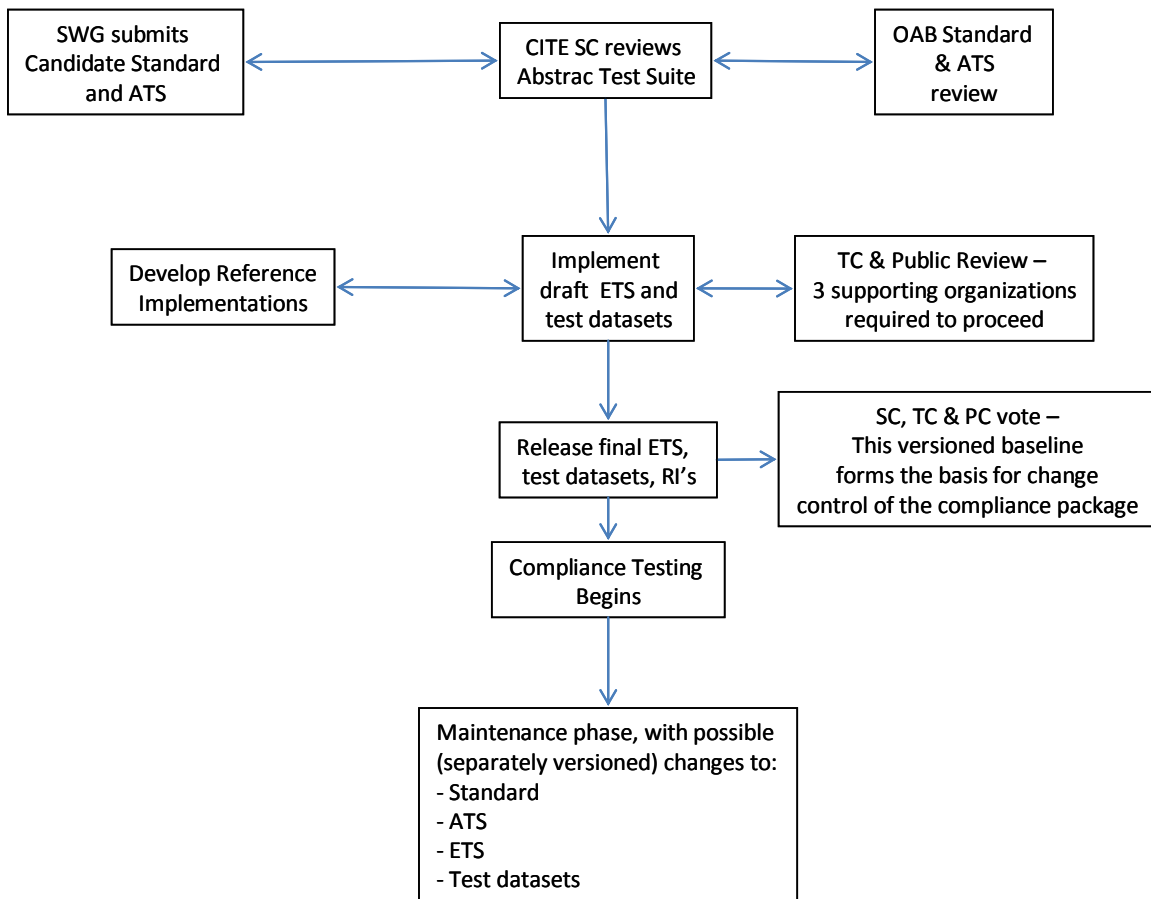
- Development of Abstract Test & Executable Test Suites
  - WCS 1.0 compliance test script ported to TEAM engine (NG TASC)
  - WCS 1.1 compliance test script (PCI)
  - WFS 1.1 XLink compliance test script (Galdos)
  - CSW 2.0.2 ebRIM/19115 profile compliance test script (Galdos)
  - SOS 1.0 compliance test script (NG TASC)
  - SPS 1.0 compliance test script (NG TASC)
- Development of Reference Implementations
  - WCS 1.1 Reference Implementation (TOPP)
  - WFS 1.1 XLink Reference Implementation (TOPP)
  - CSW 2.0.2 ebRIM/19115 profile Reference Implementation (FAO)
  - SOS 1.0 Reference Implementation (IfGI GSR)

- SPS 1.0 Reference Implementation (IfGI GSR)
- Maintenance of the TEAM Engine (NG TASC)

## 6 Development of Abstract & Executable Test Suites

The OGC Compliance Test Initiatives have come to use the following process to bring a new compliance test into the Compliance Test Program:

### CITE Workflow



The process outlined above assumes that Abstract Test Suites are submitted when the standard is submitted. Most Abstract Test Suites have been developed, to date, by the CITE thread in OWS initiatives. Test Assertions are derived from the Abstract Test Suite. Executable Test Suites are then implemented, along with development and continual testing of the Reference Implementations.

In OWS5, an open review of Abstract Test Suites was announced to the TC, PC and sent directly to the spec editors and Standards Working Group chairs. The review was held



from 11 Oct – 1 Nov 2007. An open beta period review of the Executable Test Suites was announced to the TC and PC and held from 9 Jan – 15 Feb 2008.

### **6.1 Approach & Recommended Guidance on writing Abstract Test Suites**

The CITE participants in OWS5 worked closely with several experts in the OGC community, in particular the CITE Subcommittee, Arliss Whiteside and Charles Roswell, to reach consensus on the content and format for an Abstract Test Suite.

The conclusion was for the OGC Compliance Test Program to follow ISO 19105 - Geographic Information Conformance and Testing guidelines (get exact document identifier/number). An XHTML template was defined. The following process was followed to develop ATS:

1. Read through the associated standard.
2. Document any testable assertions found in the standard.
3. Work with reference implementers and standard authors to refine the testable assertions and clarify any encountered ambiguities/issues.
4. Document any ambiguities or issues in the standard that arise during ATS development (for CRs).
5. Develop an XHTML ATS file using the template (ats-template.html) found in the following .zip file (developed by Richard Martell):  
<https://portal.opengeospatial.org/twiki/pub/OWS5/CiteHome/ats-templates.zip>.
6. Review the ATS document and solicit feedback from the reference implementers/standard authors.
7. Update the XHTML ATS based on feedback.
8. Use xhtml2ctl.xml (in the previously referenced .zip file) to translate the XHTML ATS file into a CTL document skeleton that can be filled in during ETS development.
9. Begin developing the ETS based on the ATS.
10. Execute ETS against the reference implementation.
11. Work with the reference implementers/standard authors to clarify any issues encountered during ETS development.
12. Document any ambiguities or issues in the standard that arise during ETS development (for CRs).
13. Refine the ATS if necessary based on ETS development.
14. Fix ETS issues.

15. Repeat steps 10 - 14 as necessary.
16. Document what is tested/what is not tested, namespaces, schemas, etc. with respect to the ETS - could be more detailed than the ATS version because one can describe exactly how a test tests a particular assertion and why that test may or may not be able to test certain things.

## 6.2 ATS Approach – Generating ATS from CTL

Chuck Morris, a participant in OWS5, outlined an approach to deriving an Abstract Test Suite from an Executable Test Suite. This process is not generally recommended as an ATS should be developed prior to implementing an ETS. This process was used in OWS5 for the WCS 1.0 ATS as the WCS 1.0 ETS already existed to run in the Open Group Engine and were being ported to the TEAM Engine. In the case that ETS exist without an ATS (a less than optimal case) then it would be useful to derive the ATS from the ETS, as described below.

- 1) Execute the test suite using TEAM Engine in doc mode and redirect the output into an xml file.

```
C:\teamengine>bin\test -mode=doc -source=scripts\wms-1.3.0\ctl > wms-1.3.0-doc.xml
```

- 2) Transform the xml file into an html file using the stylesheet attached to this page. Supply service and version parameters to the stylesheet.

```
C:\teamengine>java -jar apps\engine\lib\saxon9-9.0.0.1.jar wms-1.3.0-doc.xml ats.xsl service=WMS version=1.3.0 > wms-1.3.0-ats.html
```

There may be problems running TEAM Engine in doc mode if there are XPath substitutions in the assertions in any of the tests. Simple parameter value substitutions are allowed.

## 6.3 Abstract Test Suites defined in OWS5/CITE Thread

Abstract Test Suite describes the level of compliance testing being addressed within each Executable Test Script (i.e. identify whether or not a specific compliance test addresses all capabilities as described by particular web service standard such as WFS (Basic, Transactional, XLINK) as well as whether the script is written to evaluate all mandatory and optional elements of a standard. Where limitations in the test script exist with respect to testing full standard compliance they are noted within the ATS.

The following ATS were documented in the OWS5/CITE Thread. These were submitted to the CITE Subcommittee at the March 2008 TC in St. Louis, MO. The TC Chair will pass these to the appropriate SWG for approval to be added as change requests to the appropriate standard.

OGC 08-044r1, WFS-1.1: Abstract test cases for XLink

OGC 08-xxxxx, CSW 2.0.2 ebRIM/19115 profile

OGC 08-041r1, SOS 1.0 Abstract Test Suite

OGC 08-036, Test Suite for SPS 1.0

OGC 08-033, WCS Change Request – WCS 1.1.1 Abstract Test Suite

OGC 08-034, Test Suite for WCS 1.0.0

#### 6.4 Executable Test Suites

ETS were developed in the OWS5/CITE thread for WFS 1.1 xlink, CSW 2.0.2 ebRIM/19115 profile, SOS 1.0, SPS 1.0, WCS 1.1. The ETS are available for download from subversion: <https://svn.opengeospatial.org/ogc-projects/cite/>. While the tests remain in beta, they can be run from: <http://cite.geoenterpriselab.com/teamengine/>. Upon approval as official compliance tests, they will be available from the compliance engine running on the OGC site: <http://cite.opengeospatial.org/teamengine/>.

The OGC policy states that prior to approval as official OGC Compliance Tests, three implementations must “support” the ETS and be fully compliant. The ETS developers worked with implementers to achieve this goal. The following tables describe the process made during OWS5 as of the March 2008 TC. It is recommended that future CITE threads identify three supporting implementations early in the ETS development process to speed the time for approval.

##### 6.4.1 Implementations testing WCS 1.1.1

IMPLEMENTER	STATUS	END POINT	CONTACT	NOTES
TOPP (The Open Planning Project)	No failures (157 tests pass, 20 tests skipped)	<a href="http://gridlock.openplans.org:8080/geoserver-wcs/wcs">http://gridlock.openplans.org:8080/geoserver-wcs/wcs</a>	Andrea Aime aaime@openplans.org	Reference implementation temporal subset and range subset multiple fields not implemented.
PCI Geomatics	No failures (157 tests pass, 20 tests skipped)	<a href="http://ogcdemo.pcigeomatics.com:8181/wcs/wcs">http://ogcdemo.pcigeomatics.com:8181/wcs/wcs</a>	Steven Keens keens@pcigeomatics.com	Temporal subset and range subset multiple fields not implemented.
Geomatys	12 failures (149 tests pass, 16 tests skipped) as of March 5, 2008	<a href="http://demo.geomatys.fr/s/eagis/WS/wcs">http://demo.geomatys.fr/s/eagis/WS/wcs</a>	Guilhem Legal guilhem.legal@geomatys.fr	Temporal subset and range subset multiple fields tests have errors.
Mapserver / OSGeo	No passes – pretest fails	<a href="http://198.202.74.215/cgi-bin/wcs_demo">http://198.202.74.215/cgi-bin/wcs_demo</a>	Frank Warmerdam warmerdam@pobox.com	Initial discovery test fails. No contact since January 30, 2008

GMU (George Mason University)	Unknown	<a href="http://data.laits.gmu.edu:8080/cgi-bin/wcs110">http://data.laits.gmu.edu:8080/cgi-bin/wcs110</a>	Liping Di <a href="mailto:lpd@rattler.gsfc.nasa.gov">lpd@rattler.gsfc.nasa.gov</a>	Did not respond to initial email request.
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#### 6.4.2 Implementations testing SPS 1.0

IMPLEMENTER	STATUS	END POINT	CONTACT	NOTES
52North	100% passed	<a href="http://mars.uni-muenster.de:8080/OWS5SPS/SP">http://mars.uni-muenster.de:8080/OWS5SPS/SP</a>	Johannes Echterhoff ( <a href="mailto:echterhoff@uni-muenster.de">echterhoff@uni-muenster.de</a> ) Henning Bredel ( <a href="mailto:h.bredel@gmx.de">h.bredel@gmx.de</a> )	Reference implementation

#### 6.4.3 Implementations testing SOS 1.0

IMPLEMENTER	STATUS	END POINT	CONTACT	NOTES
52North	100% passed	<a href="http://mars.uni-muenster.de:8080/OWS5SOS/sos">http://mars.uni-muenster.de:8080/OWS5SOS/sos</a>	Chrisoph Stasch <a href="mailto:staschc@uni-muenster.de">staschc@uni-muenster.de</a>	Reference implementation
GEOMATYS	~80% passed	<a href="http://test.geomatys.fr/SO/Server/WS/sos">http://test.geomatys.fr/SO/Server/WS/sos</a>	Guilhem Legal <a href="mailto:guilhem.legal@geomatys.fr">guilhem.legal@geomatys.fr</a>	Began testing, but not heard from in a while.
UAH	Just starting	Unknown	Tony Cook <a href="mailto:cook@nsstc.uah.edu">cook@nsstc.uah.edu</a>	Will probably not begin testing in earnest until April.
Mapserver	Unknown	<a href="http://dev1.lan.mapgears.com/manwe/cgi-bin/mssos100_ogc_cite">http://dev1.lan.mapgears.com/manwe/cgi-bin/mssos100_ogc_cite</a>	Normand Savard <a href="mailto:nsavard@mapgears.com">nsavard@mapgears.com</a>	Began testing, but not heard from in a while.

#### 6.4.4 Implementations testing WFS 1.1 xlink

IMPLEMENTER	STATUS	END POINT	CONTACT	NOTES
GeoServer (TOPP)	100% passing	<a href="http://gridlock.openplans.org:8080/geoserver-wfs/wfs?request=getcapabilities&amp;service=wfs">http://gridlock.openplans.org:8080/geoserver-wfs/wfs?request=getcapabilities&amp;service=wfs</a>	Chris Holmes, TOPP	Reference implementation

#### 6.4.5 Implementations testing CSW 2.0.2

IMPLEMENTER	STATUS	END POINT	CONTACT	NOTES
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GeoNetwork (Archie Warnock)	100% passing	<a href="http://server.awcubed.com:8080/geonetwork/srv/en/csw?service=CSW&amp;request=GetCapabilities">http://server.awcubed.com:8080/geonetwork/srv/en/csw?service=CSW&amp;request=GetCapabilities</a>	Archie Warnock	Reference implementation
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## 7 Development of Reference Implementations

The following reference implementations were developed in OWS5.

- WFS 1.1.0 (xlink processing)
  - Geoserver 1.7.0 implementation
  - Developed by The Open Planning Project
  - Covered by GPL v2
  - Available via <http://gridlock.openplans.org:8080/geoserver-wfs/wfs?request=getcapabilities&service=wfs>
  - Documentation available at <http://geoserver.org/display/GEOS/CITE+Testing+From+OWS5>
- CSW 2.0.2
  - GeoNetwork Final Release v2.1
  - Developed by Archie Warnock
  - Covered by the Gnu Public License (GPL) v2
  - Service is available for download at: <ftp://ftp.awcubed.com/Software/CSW>.
  - Documentation available at <http://www.awcubed.com/index.php?page=csw-installation>
- SOS 1.0
  - 52 North SOS implementation v3.0.0
  - Developed by Institute for Geoinformatics (Univ. of Muenster)
  - Covered by Gnu Public License (GPL) v2
  - Available via source forge: [http://sourceforge.net/project/showfiles.php?group\\_id=122215](http://sourceforge.net/project/showfiles.php?group_id=122215)
  - The service endpoint is: <http://mars.uni-muenster.de:8080/OWS5SOS/sos>

- Documentation available at  
[http://portal.opengeospatial.org/twiki/pub/OWS5/CiteSosImplementation/how2install\\_SOS.pdf](http://portal.opengeospatial.org/twiki/pub/OWS5/CiteSosImplementation/how2install_SOS.pdf)
- SPS 1.0
  - 52North SPS implementation v1.0
  - Developed by IfGI
  - Covered by Gnu Public License (GPL) v2
  - Available via source forge:  
[http://sourceforge.net/project/showfiles.php?group\\_id=122215](http://sourceforge.net/project/showfiles.php?group_id=122215)
  - The service endpoint is: <http://mars.uni-muenster.de:8080/OWS5SPS/SPS?request=GetCapabilities&service=SPS>
  - Documentation available at  
[http://portal.opengeospatial.org/twiki/pub/OWS5/CiteSpsImplementation/HowTo-Install\\_SPS.pdf](http://portal.opengeospatial.org/twiki/pub/OWS5/CiteSpsImplementation/HowTo-Install_SPS.pdf)
  - Additional info on testing SPS can be found here:  
<http://portal.opengeospatial.org/twiki/bin/view/OWS5/CiteSpsPlugin>
- WCS 1.1.1
  - Geoserver 1.7.0 implementation
  - Developed by TOPP
  - Covered by GPL v2
  - Available via <http://gridlock.openplans.org:8080/geoserver-wcs/wcs?service=WCS&request=GetCapabilities>
  - Documentation available at  
<http://geoserver.org/display/GEOS/CITE+Testing+From+OWS5>

## 8 Maintenance of the TEAM Engine

Some bug fixes and enhancements to TEAM Engine were necessary during OWS5. These are summarized below:

1. Enhanced documentation generator to generate XML so the output can be customized with XSLT.
2. Upgraded to the latest version of Saxon.

3. Modified XMLValidatingParser to allow specifying the schema to validate by embedding an xsd:schema element.
4. Enhanced the ctl:request instruction to allow XSL elements as immediate children so parameters can be included conditionally.
5. Added built-in functions getResourceURL and encode.
6. Enhanced error handling so that if a test fails with a fatal error, TEAM engine will recover automatically and go on to the next test instead of ending the session.
7. Fixed problems running concurrent sessions in the web interface
8. Fixed code for parsing HTTP responses that use a multipart MIME format.
9. Fixed startup batch files to work when the teamengine path contains spaces.
10. Enhanced the view test page to display more information and fixed it to work with test suites that use XInclude.
11. Modified the session results page so the test tree is expanded by default, and added a ctrl-click capability to do a deep expand or contract.

## **9 Recommendations for future work**

The participants in the OWS5 CITE thread recommend the following work items be addressed in the next phases of CITE.

New Test Scripts (develop Abstract Test Suite, Executable Test Suite & Ref. Imp)

- Web Services Common 1.1
- Web Coverage Service 1.2
- KML 2.2 Validation – take ATS developed in OWS5 and write Executable Test Suite
- Web Map Context 1.1 or Component WMS

Update Test Scripts

- Enhance Web Coverage Service 1.1 test to test GMLJP2, SOAP encodings and complete all protocol tests that were not developed in OWS5
- Update SOS 1.0 to include tests for optional operations of the standard that were not developed in OWS5
- Update SPS 1.0 to include tests for optional operations of the standard that were not developed in OWS5

- Update SPS 1.0 for EO Profile testing
- Update existing W\*S tests to verify compliance in SOAP/WSDL bindings

#### TEAM Engine

- Add integrated support for SOAP and WSDL interfaces
- Performance improvements
- Provide capability for schema validation



## Annex A

### Sample Abstract Test Suite

The following are screen shots of an Abstract Test Suite developed in OWS5. This shows the format that was developed as part of this project.

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### Annex A - Abstract Test Suite for the Sensor Observation Service 1.0

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Revision History	
Revision 0.1	2007-10-2
Updated to adopt standard ATS structure (ISO 19105). Included ATS cases from the ATS developed for OWS5. Changes by Richard Mantall	

