

WITSML Product Certification Program: Overview and Process Guide

For WITSML Version 1.4.1

WITSML Overview	Data-object definitions and a Web services specification for the right-time seamless flow of well data between operators and service companies to speed and enhance decision making.
Version	DRAFT
Abstract	This guide describes the product testing and certification process developed for WITSML 1.4.1. This new, automated testing process supersedes all previous WITSML certification processes. Currently, it applies only to WITSML server products (not client products).
Prepared by	Energistics and the WITSML SIG
Date published	December 2014
Document type	Business case and process guide



Document Information	
DOCUMENT VERSION	1.1
Date	January 2016
Language	U.S. English

Acknowledgements

The new WITSML Product Certification Program, which features automated software testing, is the result of an extended effort by many individuals and companies over the past few years. Initially begun by the Performance and Certification sub-team of the WITSML SIG, recent efforts for this new program have been carried out by a dedicated Certification Testing Team under the SIG. We want to thank all companies involved in the process and would like to specifically acknowledge the efforts in developing and implementing the certification Testing Tool and associated tests. The Testing Tool was initially developed and provided by Pason. The process and procedures—as well as the actual work—for developing, reviewing, and finalizing the test scripts has been done by dedicated, core team members from SIG-member companies Pason, Halliburton, Schlumberger, PetroDAQ, Petrolink, Statoil, and TeyTech. Additional thanks to Statoil for making available the data used as part of the certification test data set.

Usage, Intellectual Property Rights, and Copyright

This document was developed using the Energistics Standards Procedures. These procedures help implement Energistics' requirements for consensus building and openness. Questions concerning the meaning of the contents of this document or comments about the standards procedures may be sent to Energistics at info@energistics.org.

The material described in this document was developed by and is the intellectual property of Energistics. Energistics develops material for open, public use so that the material is accessible and can be of maximum value to everyone.

Use of the material in this document is governed by the Energistics Intellectual Property Policy document and the Product Licensing Agreement, both of which can be found on the Energistics website, <http://www.energistics.org/legal-policies>.

All Energistics published materials are freely available for public comment and use. Anyone may copy and share the materials but must always acknowledge Energistics as the source. No one may restrict use or dissemination of Energistics materials in any way.

Trademarks

Energistics®, WITSML™, PRODML™, RESQML™, Upstream Standards. Bottom Line Results.®, The Energy Standards Resource Centre™ and their logos are trademarks or registered trademarks of Energistics in the United States. Access, receipt, and/or use of these documents and all Energistics materials are generally available to the public and are specifically governed by the Energistics Product Licensing Agreement (<http://www.energistics.org/product-license-agreement>).

Other company, product, or service names may be trademarks or service marks of others.

Amendment History			
Version	Date	Comment	By
1.0	December 2014	First publication for version 1.0 of the WITSML Product Certification Testing Tool and the Certification Program	Energistics and the WITSML SIG/Certification Team
1.1	January 2016	The Energistics logo and the WITSML Certification mark have been updated	Nicholette Ross

Table of Contents

- Executive Summary 5**
- 1 Introduction 7**
 - 1.1 Context for Certification 7
 - 1.2 Benefits of Product Testing and Certification 7
 - 1.3 Audience, Purpose, and Scope 8
 - 1.3.1 Audience 8
 - 1.3.2 Purpose 8
 - 1.3.3 Scope 8
 - 1.4 Documentation Conventions 9
 - 1.5 Resource Set 9
 - 1.6 History 10
 - 1.7 Future Plans 10
- 2 Overview of the Testing and Certification Process 11**
 - 2.1 Who can be Tested and Certified? 11
 - 2.2 What is the Testing and Certification Process? 11
 - 2.2.1 Testing Tool and Test Suite Overview 11
 - 2.2.2 Availability of the Testing Tool 12
 - 2.3 What is Tested? 12
 - 2.3.1 Combination of Components that is Tested and Certified 12
 - 2.3.2 Server Behaviors 12
 - 2.3.3 Pass and Fail Criteria 13
 - 2.3.4 Process for Re-testing and Contesting Results for Failed Tests 13
 - 2.4 Prerequisites for Certification Testing 13
 - 2.4.1 Test Yourself Before Submitting for the Energistics-Accredited Testing Process 13
 - 2.5 Re-Certification Requirements 13
- 3 Testing and Certification Procedures 15**
 - 3.1 Overview of Testing Tool and Environment 15
 - 3.1.1 Testing Tool Integrity and Reliability with Version Control System 15
 - 3.1.2 Test Plan 17
 - 3.1.3 Test Data Set/Data Model 17
 - 3.1.4 Test Scripts/Test Suite 17
 - 3.1.5 Testing Tool 17
 - 3.2 Roles and Responsibilities 18
 - 3.2.1 Certification Applicant (a company that wants its server to be tested and certified) 18
 - 3.2.2 Energistics 18
 - 3.2.3 WITSML SIG 18
 - 3.3 Testing and Certification Process and Procedures 18
 - 3.3.1 Prepare for Certification: Download the Testing Tool for Self-Testing 20
 - 3.3.2 Submit a WITSML Server Product for Testing 20
 - 3.3.3 Run the Test, Process the Results, and Notify Applicant 20
 - 3.3.4 Process for Retesting and Contesting Test Results 21
- Appendix A. WITSML Certification Review Team 23**

Executive Summary

A new fit-for-purpose product certification program has been developed for WITSML servers, API version 1.4.1. The keystone of the WITSML Certification Program is the WITSML Product Certification Testing Tool. The Testing Tool (software developed by the WITSML SIG and Energistics using open source technology) automates running a suite of tests that use standard WITSML queries, data-object definitions, and behaviors defined in the *WITSML Store Application Program Interface (API) v1.4.1*. If a server passes all of the required tests, then it is designated WITSML certified by Energistics.

This new, behavior-based, automated software Testing Tool and Certification Program replaces all previous self-certification programs and eliminates the variable nature of those programs by bringing consistency and objectivity to the testing process. The new program is expected to deliver the ease-of-use and reliable results needed to drive certification, ultimately improving the interoperability and data reliability provided by WITSML.

This guide:

- Explains why companies should certify their servers, describing the business benefits to both server vendors and server users/customers.
- Provides an overview of the process (so companies can understand the "big picture process") and detailed instructions for the steps a company must take to get its WITSML server product tested and certified.

Certification is available to any company that has a WITSML server product. A company that wants to have its WITSML server tested and certified must download the Testing Tool (which includes all related components for testing) to first test its server in its own environment, before submitting to the accredited testing process conducted by Energistics.

Performing self-testing first, in a company's own environment, highlights the transparency of the Testing Tool and process, increases a company's confidence that its server will pass the Energistics-accredited test, and streamlines the Energistics testing process.

Benefits of Product Certification

Product testing and certification have several benefits both to the vendor companies developing server (and client) products and to the consumer companies (both energy and service companies) that depend on those products to provide reliable data delivery from and across their drilling operations.

For energy companies and end-users, benefits include:

- **Enhanced interoperability between deployed solutions.** WITSML Version 1.4.1 has been streamlined and "tightened" to specifically enhance interoperability.
- **Ability to more accurately compare server products, feature by feature.** Consumers of WITSML server products can effectively and confidently compare the advertised functionality and capabilities of those products. Consumers can expect an appropriate level of compliance to the WITSML specification from vendor products that have been certified.

For vendors of WITSML servers, benefits include:

- **Demonstration of compliance.** Passing the certification tests demonstrates that a server product complies with a subset of behaviors of the specification and is capable of the enhanced interoperability of WITSML v1.4.1.
- **Potential to provide a competitive advantage** in the market place because it is anticipated that, for many consumer companies, certification by Energistics will become a prerequisite for provisioning (purchasing or leasing) a WITSML server.
- **Streamline development of compliant solutions**, especially for WITSML SIG members. SIG member companies can test their products during the development/implementation phase of WITSML

to maintain an appropriate level of compliance with the specification from early in the life cycle of the server product.

1 Introduction

For WITSML v1.4.1, Energistics and the WITSML special interest group (SIG) have developed an automated Testing Tool and suite of tests that are used to determine if a WITSML v1.4.1 server product conforms to behaviors specified in the *WITSML Store Application Program Interface (API)* and the WITSML schemas.

If a server product passes all relevant automated tests based on the published capabilities of the server, then it is designated as WITSML certified by Energistics. Products that have been certified can use the following logo on their marketing materials and are listed on the Energistics website as a WITSML-certified product.



Figure 1 Energistics WITSML certified product logo.

The keystone of the WITSML Product Certification Program is the WITSML Product Certification Testing Tool. The Testing Tool (software developed by the WITSML SIG and Energistics using open source technology) automates running a suite of tests that use standard WITSML queries, data-object definitions, and behaviors defined in the *WITSML Store Application Program Interface (API)* v1.4.1. This guide explains the business case for this program, provides an overview, and lists detailed procedures that a company must follow if it wants to certify its WITSML server product, v1.4.1.

1.1 Context for Certification

In WITSML v1.3.1, interpretation of parts of the API document could be ambiguous. This ambiguity led to what have commonly been referred to as “dialects” in WITSML servers. These dialects are effectively different server behaviors for the same task, and they impede the server’s ability to communicate and exchange data consistently with other WITSML servers or clients.

One of the main goals of WITSML 1.4.1 was to eliminate or reduce this ambiguity by clearly specifying deterministic behavior. Part of this process includes the introduction of standard queries with clearly defined expected responses thereby defining expected behavior from a server.

These standard queries play an important role in the certification test procedures. Where possible they are used either singularly or in groups to test elements of the schema and behavior that is defined by “MUST” statements in the API document. In some tests, these standard queries are combined with known defined (or in the case of GetFromStore-only servers, server specified) data sets to test both the prescribed behavior and the ability of the server to pass actual real-world data correctly.

With the specification of clear behaviors, the SIG is focusing on validating behavior of servers per the 1.4.1 specification. This new automated testing and certification process completely replaces the former “Self Certification” (released against v1.2 of the standard) and “v1.3.1 Tested Certification” programs.

1.2 Benefits of Product Testing and Certification

Product testing and certification have several benefits both to the vendor companies developing server (and client) products and to the consumer companies (both energy and service companies) that depend on those products to provide reliable data-delivery solutions from and across their drilling operations.

In general, the new certification program eliminates the variable nature of previous programs by bringing consistency and objectivity to the certification process.

For energy companies and end-users, benefits include:

- **Enhanced interoperability between deployed solutions.** WITSML Version 1.4.1 has been streamlined and “tightened” to specifically enhance interoperability.
- **Ability to more accurately compare server products, feature by feature.** Consumers of WITSML server products can effectively and confidently compare the advertised functionality and capabilities of those products. Consumers can expect an appropriate level of compliance to the WITSML standard from vendor products that have been certified.

For vendors of WITSML servers:

- **Demonstration of compliance.** Passing the certification tests demonstrates that a server product complies with a subset of behaviors of the specification and is capable of the enhanced interoperability of WITSML v1.4.1.
- **Potential to provide a competitive advantage** in the market place because it is anticipated that, for many consumer companies, certification by Energistics will become a prerequisite for provisioning (purchasing or leasing) a WITSML server.
- **Streamline development of compliant solutions**, especially for WITSML SIG members. SIG member companies can test their products during the development/implementation phase of WITSML to maintain an appropriate level of compliance with the standard from early in the life cycle of the server product.

1.3 Audience, Purpose, and Scope

1.3.1 Audience

This guide is for:

- **Consumer/end-user companies of WITSML servers.** Intended for IT managers, developers, and domain experts/end-users of WITSML servers to help them understand the business value of and process for testing and certification.
- **Companies that want to certify their WITSML servers** (referred to as Certification Applicants). Intended for IT people, such as software developers and product architects, who develop WITSML-enabled products and need to understand the details of the testing process.

1.3.2 Purpose

This guide was developed to:

- Provide an overview of the product testing and certification process and explain the business value for both consumers and vendors of WITSML server products.
- Explain in detail the product testing and certification process and everything that a company must do to prepare and submit a server to Energistics for testing and certification.

1.3.3 Scope

- WITSML server products, version 1.4.1.
- Does NOT include previous versions of WITSML server products or any WITSML clients.
- Supersedes any previous WITSML testing and certification processes (see Section 1.6, page 10).

1.4 Documentation Conventions

This document observes the following conventions.

Convention	Description
Document Hyperlinks: Internal	Though no special text-formatting convention is used, all section numbers and page numbers in this and related documents are hyperlinks.

1.5 Resource Set

The table below lists available resources for the WITSML Certification Program. Certification resources are available from the Energistics website at <http://www.energistics.org/product-certification-program>.

	Document/Resource	Description
1.	<p><i>WITSML Store Application Program Interface (API) v1.4.1</i></p> <p>For this document and the WITSML schemas (item 2 below) go to: http://www.energistics.org/drilling-completions-interventions/witsml-standards/current-standards</p>	The document that specifies the server behavior that the Certification Program is attempting to test and confirm.
2.	WITSML Schemas v1.4.1	The schemas produced by the WITSML Special Interest Group (SIG) and Energistics based on the WITSML API document.
3.	<i>WITSML Product Certification Program: Overview and Process Guide</i> (this document)	Describes the business case for certification, all necessary background, and the process for how companies submit their servers to Energistics for testing and certification.
4.	<i>WITSML Product Certification Testing Tool: Installation and Usage Guide</i>	Explains how to download, install, configure and use the Testing Tool, the software used to conduct tests.
5.	WITSML Product Certification Testing Tool	The software that is used—both by candidates seeking WITSML certification and Energistics—to conduct tests to determine if a particular server product conforms to behaviors as specified in the WITSML API document.
6.	<p>Certified WITSML v1.4.1 Products Web page</p> <p>http://www.energistics.org/drilling-completions-interventions/certified-v1-4-1-witsml-products</p>	Web page listing WITSML v1.4.1 certified products. That is, the products listed have completed and passed the testing and certification process described here.
7.	Problem-Reporting Process	If you discover an issue or bug with any component of the tests or the Testing Tool, please report it using one of the methods described in the <i>WITSML Product Certification Testing Tool: Installation and Usage Guide</i> .

1.6 History

Before WITSML v1.3.1, Energistics and the WITSML SIG offered a self-certification process for WITSML servers, based on reported capabilities. Vendors were responsible for listing their capabilities based largely on the GetCapabilities output of that server, particularly listing the data-objects supported; this information was then posted on the Energistics website. Once advertised, other SIG member companies were encouraged to raise any inconsistencies during a review period. After this review period, if none of the claimed capabilities were challenged, the vendor's product was deemed self-certified.

For WITSML v1.3.1, the first tested certification procedure was introduced; however, this version covered only the most widely used data-objects (well, wellbore, trajectory, log and mud log) and was intentionally focused on the delivery of data to end users rather than the detailed behavior of the server under test. Until the release of version 1.4.1, this initial tested certification and self-certification process have co-existed (to provide coverage for all data-objects).

The v1.4.1 Product Certification Program detailed in this document supersedes and replaces both self-certification and the v1.3.1 certification. However, this certification program is only available for v1.4.1.x server products.

1.7 Future Plans

As behaviors within the specification are clarified or changed because of change requests, the Test Scripts will be updated or new ones created to ensure tests match the specification. Additionally, if any issues or bugs are reported for the Testing Tool, those will be addressed.

2 Overview of the Testing and Certification Process

This chapter provides a high-level overview of key aspects of the WITSML testing and certification process.

- For benefits of testing and certification, see Section 1.2 (page 7).
- For details about the Testing Tool, Test Scripts and other key components of the testing environment, and instructions on how to get your WITSML server version 1.4.1 tested and certified, see Chapter 3 (page 15).

2.1 Who can be Tested and Certified?

Certification is open to all companies in the upstream oil and gas industry that have a WITSML v1.4.1 server product.

- For Energistics members, certification testing is a benefit of membership (no additional cost). Members have access to the certification Testing Tool, data sets, and Test Suites.
- Non-Members must pay for certification testing. For more information, contact Energistics at certification@energistics.org.

2.2 What is the Testing and Certification Process?

The new WITSML Certification Program consists of the WITSML Product Certification Testing Tool (Testing Tool) and a suite of automated Test Scripts that are run against a server to test basic server behavior for mandatory functionality as specified in the *WITSML Store Application Program Interface (API)* for WITSML version 1.4.1. If the server passes all required tests (based on its server capabilities object), the server is “WITSML certified.”

Companies that pass the test receive a WITSML-certified logo (see Figure 1, page 7) to use in marketing materials for the tested server product, and the certified WITSML server products are listed on the Energistics website (To see the list of certified products, see the link in Section 1.5 (page 9).)

Product testing is conducted using the Testing Tool—software developed by the Certification Test Team (CTT) of the WITSML SIG and Energistics—that runs tests against a specified WITSML server product.

Energistics runs the tests against the product being certified and responds to the certification applicant with test results within 5 business days.

Before submitting its server for the official Energistics testing, a certification applicant must download the Testing Tool and first test its WITSML server in its own environment. It is the responsibility of the applicant to ensure that their product is ready for certification before submitting to Energistics-accredited testing.

For information on how to download, install, and use the Testing Tool in your own environment, see the *WITSML Certification Testing Tool: Installation and User Guide*.

For processes and procedures on how to get a WITSML server tested, see Section 3.3, page 18.

2.2.1 Testing Tool and Test Suite Overview

The CTT developed the Testing Tool with the open source programming language, Python, (www.python.org) and the suite of Test Scripts in the Python scripting language. The Testing Tool runs specific tests linked to standard queries and, where applicable, defined data sets for that data-object or data-objects.

All components of the testing technology are maintained and administered by Energistics, with help from the CTT. Testing is conducted against the currently approved version of the Test Suite.

To ensure consistency for testing procedures and results, both the tool and scripts (along with test data and other supporting materials) are versioned and maintained in a version control system.

For a detailed list of all components of the Testing Tool environment, see Section 3.1, page 15.

2.2.2 Availability of the Testing Tool

The Testing Tool is available to any company that wants to certify a WITSML server product, so that companies can run the tests themselves, in their own environments—before submitting to Energistics-accredited testing. This self-test first approach provides transparency and helps streamline the Energistics testing and certification process, because companies can use the Testing Tool for troubleshooting their server products, thereby helping to ensure that these products are ready when submitted to Energistics.

For WITSML SIG members, the tools and scripts are a benefit of membership (no additional cost).

Non-members must pay a certification fee and must complete their certification attempt within a specified time frame. The fee covers all required materials and the testing process as described in this document.

The Testing Tool includes all testing technology components (e.g., test scripts, data, etc.). For information on how to download, install and run the Testing Tool in your own environment, see the *WITSML Certification Testing Tool: Installation and User Guide*.

For process details, see Section 3.3, page 18.

2.3 What is Tested?

2.3.1 Combination of Components that is Tested and Certified

Certification of an applicant's WITSML server product is specific to the version of that server product and to a combination of:

- WITSML API version.
- WITSML schema version.
- Certification Test Suite version (including the version of the Testing Tool).

NOTE: Certification testing is NOT performed against the operating system (OS) nor the hardware on which the server runs. However, if an applicant offers multiple versions of servers running exclusively on specific operating systems or hardware, then each version is considered a separate product and must be individually tested and certified. Other than this case, certification is completely independent of OS and hardware.

2.3.2 Server Behaviors

Mandatory behaviors that are tested include:

- Behaviors specified with the “MUST else error code” convention in the WITSML API document.
- Expected response to Standard queries (listed in the WITSML API document (Section 6.6.5).
- Ability to accurately store and retrieve data sets within a prescribed level of accuracy.

Not all servers have the same capabilities, so the particular Test Scripts that are run are determined by a server's capabilities, as defined by the server's capabilities object (for more information, see the WITSML API document).

Companies with GetFromStore-only servers (which cannot load a WITSML data set by means of the AddToStore interface) must supply a server configuration file and populate the server with a data set meeting the minimum requirements; for more information see, *WITSML Certification Testing Tool: Installation and User Guide*

2.3.3 Pass and Fail Criteria

PASS: A server is certified if all applicable tests for that particular server “pass.”

A server passes a test if the response from a particular Test Script meets the expectations for that test as defined in the Test Plan document. (To see an example Test Plan, see the link in Section 1.5 (page 9).)

As part of this process, any test using specific data expects that the data be returned with a numerical accuracy equivalent to 0.01% of the data value. This variation is allowed to account for variation in returned data numeric values due to rounding or unit-conversion-introduced errors. The primary expectation for a data-based test is that the data returned by the server under test is useable and accurate.

FAIL: If a server does not return the results as specified for ALL test scripts OR a server times out, then it fails the tests and is not certified.

Failures resulting from a time out will be retested; however, if that particular test (or tests) consistently times out, it will be documented as a fail.

2.3.4 Process for Re-testing and Contesting Results for Failed Tests

Pass or fail, Energistics provides a certification applicant with the log of results from the Energistics-accredited testing.

- If a server fails, the applicant can use the results log to troubleshoot its server. Applicants can address issues and re-submit a server for testing. For process details, see Section 3.3, page 18.
- Or, if an applicant disagrees with the results, the company can contest them. For details, see Section 3.3.4, page 21.

2.4 Prerequisites for Certification Testing

Before you can begin certification testing, you must:

- Be an Energistics member or, if not a member, have paid the certification fee. For information on applicable fees, contact certification@energistics.org.
- Have a publically accessible WITSML v1.4.1 server.
- Complete and submit to Energistics the WITSML Product Certification Testing form, which is available from the link in Section 1.5 (page 9).
- Conduct self-testing on your server before submitting for Energistics-accredited testing, as described in the next section.

2.4.1 Test Yourself Before Submitting for the Energistics-Accredited Testing Process

Before submitting a WITSML server product for the Energistics-accredited testing process, a certification applicant must first download the Testing Tool and run the tests on its WITSML server in the applicant's own environment.

This approach provides transparency and helps streamline the official Energistics testing and certification process, because companies can use the Testing Tool for troubleshooting products, thereby helping to ensure that their server products are ready when submitted to Energistics testing.

For information on how to download, install, and use the Testing Tool in your own environment, see the *WITSML Certification Testing Tool: Installation and User Guide*.

2.5 Re-Certification Requirements

As described in Section 2.3 (page 12), certification is for a specific version of a WITSML server product.

A certification applicant is encouraged to contact Energistics to re-certify whenever the company makes a significant change to its server product or releases support for an updated version of the WITSML specification.

For Energistics non-members, no charge for minor-release updates (for example moving from 1.4.1.1 to 1.4.1.2) will be incurred. However, re-certification against a major update of WITSML follows the standard business model as described in this document.

3 Testing and Certification Procedures

This chapter lists and explains the key components of the Testing Tool and the testing environment, roles and responsibilities of the parties involved, and all related procedures.

3.1 Overview of Testing Tool and Environment

Figure 2 shows key components of the WITSML Certification testing environment, which are explained in the table below.

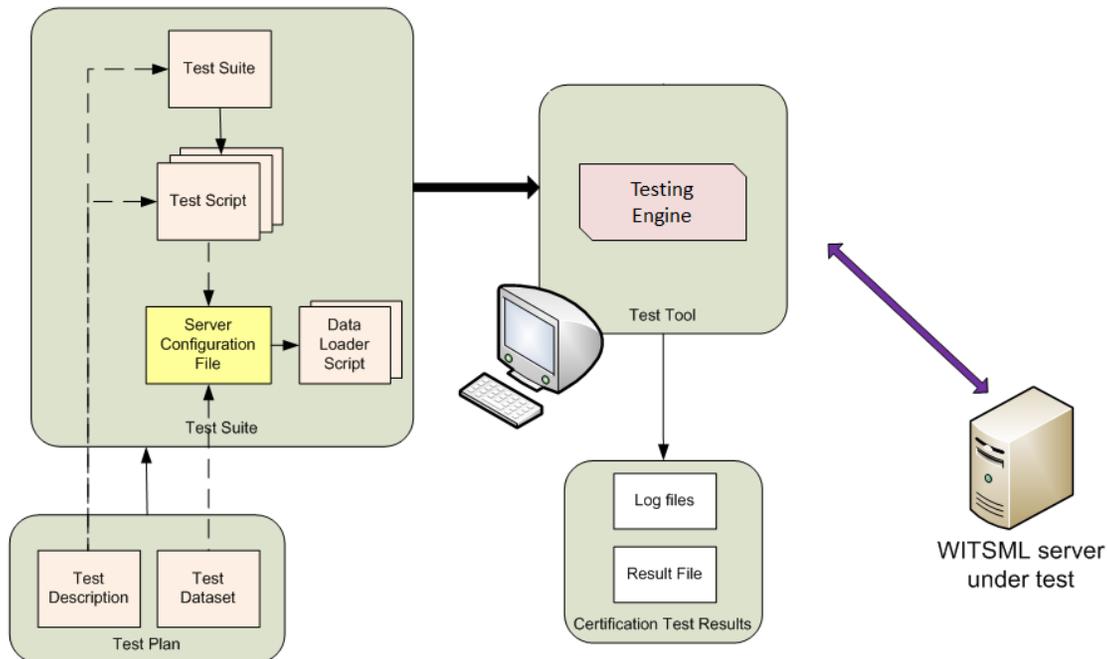


Figure 2. Overview of the WITSML Certification Testing Tool and environment.

3.1.1 Testing Tool Integrity and Reliability with Version Control System

IMPORTANT! To ensure testing integrity and reliability, most components described in the following table are kept in SourceForge, an open source version control system; when you download the Testing Tool, these related materials are included (unless otherwise specified below). For information about how to download, install, and use these components, see the *WITSML Certification Testing Tool: Installation and User Guide*.

Certification Testing Component	Description/Link to More Information
Testing Tool	The software that testers use to conduct tests against a WITSML server for the Energistics Product Certification Program. Testers can conduct all tasks from the Testing Tool. Underlying components are explained below.
Test Plan	A matrix of all tests available by WITSML function (as defined in the API). the Testing Tool only executes tests for servers that meet the minimum

Certification Testing Component	Description/Link to More Information
	<p>requirements for each test. (That is, a server is not tested for things it does not support.)</p> <p>Currently an Excel spreadsheet.</p> <p>For easy review and access, a copy of the Test Plan is available from the link in Section 1.5 (page 9).</p> <p>However, when conducting self-testing, always use the Test Plan downloaded with the Testing Tool. For more information, see Section 3.1.2 (page 17).</p>
Testing Engine	<p>The program that executes the individual Test Scripts (or the Test Suite) to be run against a specific server being tested. A version of the Testing Engine is part of the Testing Tool download.</p>
Test Scripts	<p>The scripts that are run to test a server. Each test (as defined in the Test Plan) has its own script and has minimum requirements for data contained within the server.</p> <p>For more information on Test Scripts and the Test Suite, see Section 3.1.4 (page 17).</p>
Test Suite	<p>The Test Suite is a versioned collection of all Test Scripts.</p> <p>For Energistics-accredited testing, the entire Test Suite is run; however, only the Test Scripts relevant for the server being tested (based on the server's capabilities object) are actually executed.</p> <p>Versioned and maintained in version control software and included in the Testing Tool download.</p> <p>For more information on Test Scripts and the Test Suite, see Section 3.1.4 (page 17).</p>
Test Dataset	<p>The Test Scripts require a minimal data set to be accessible from the server being tested.</p> <ul style="list-style-type: none"> • For servers that support WMLS_AddToStore, the Testing Tool contains functionality to populate the server with the required data set. • For servers that do not support WMLS_AddToStore, the applicant must populate their server with data that meets the minimum requirements of all tests as specified in the Test Plan. In addition, on request for certification, the applicant must supply Energistics with a server configuration file that details the data set contained in their server. For more information, contact Energistics at certification@energistics.org. <p>Test Data is downloaded with the Testing Tool. For more information, see Section 3.1.3 (page 17).</p>
Certification Test Results	<p>The output of the Testing Tool's execution of Test Scripts is captured in the Certification Test Results file. The Testing Tool has a default file name, which users may change when performing self-testing. For more information, see Section 3.3.3 (page 20).</p> <p>For Energistics-accredited testing, the results are sent to the applicant after the server has been tested. When testing and certification have been successfully completed, the Certification Test Results are published on the Energistics WITSML Certified Products Web page, which can be accessed from the link in Section 1.5 (page 9).</p>

3.1.2 Test Plan

The Test Plan comprises a tabulated list of the behavioral or data-based responses expected from a compliant WITSML 1.4.x server. Each test in the Test Plan comprises an English language description of these components:

- Test Purpose: Description of the behavior ("MUST" statement from the API document being tested).
- Tested Interface: For example applicable to the WMLS_GetFromStore(), WMLS_AddToStore(), WMLS_DeleteFromStore() and WMLS_UpdateToStore() interfaces.
- Prerequisites: Requirements (data or otherwise) for the server to undertake this test, for example, must contain a Trajectory data-object with at least one entry.
- Procedure: Detail of how the test is executed and if applicable, which standard queries are used.
- Expectation: Expected behavior/data delivered to constitute a pass of that test.

Updates to the Test Plan are versioned in version control software so that it is clear what components are included under each release of the certification testing workflow.

For easy reference, an example of the Test Plan is available at the link in Section 1.5 (page 9).

3.1.3 Test Data Set/Data Model

The Test Dataset and data model include details of specific data-object-related data sets and the "data model" required to run non-object-specific "behavioral" tests.

For individual tests that ascertain the ability of the server to pass/deliver data of a particular type, the test requests a data-object from a pre-defined test data set.

- For servers supporting AddToStore, the data can be loaded to the server by the Testing Tool.
- For Servers not supporting AddToStore, the certification applicant must pre-populate the server with this data set in accordance with Test Plan's expected data model. An example data model is available as a tab on the Test Plan at the link in Section 1.5 (page 9). The current version of the data model is part of the Testing Tool download. For more information, see the *WITSML Certification Testing Tool: Installation and User Guide*.

3.1.4 Test Scripts/Test Suite

Each test in the Test Plan has a corresponding Test Script that allows the Testing Tool to execute the procedure (as detailed in the English language description in the Test Plan) associated with that particular test. The Test Suite is a versioned collection of all Test Scripts.

In many cases, the Test Script can include calling a particular standard query or queries (as defined in the *WITSML Store API*) to run against a particular data item or set of data items from the data model. The Test Scripts are written in the Python scripting language and correspond to the versions of the English-language tests in the Test Plan.

Each individual script has been written by a member of the WITSML SIG's CTT and has undergone a formal review process including verification against at least 2 reference servers. The Test Scripts and Test Suite are also versioned in version control software.

3.1.5 Testing Tool

The Testing Tool is the program that executes the individual Test Scripts to be run against a specific server. This approach—a "test engine" that runs individual test scripts—was chosen so that the integrity of the Testing Tool does not have to be re-confirmed (and recompiled) each time new testing functionality is added. This approach allows phased test development and will allow new test scripts to be easily added as WITSML server functionality changes and grows.

For information on how to download and use the Testing Tool, see the *WITSML Certification Testing Tool: Installation and User Guide*.

3.2 Roles and Responsibilities

The key parties involved in the testing and certification process are: 1) the certification applicant (the vendor/company wanting to have a server certified), 2) Energistics, and 3) the WITSML SIG and its Certification Testing Team (CTT). Specific roles and responsibilities for each party are listed here.

3.2.1 Certification Applicant (a company that wants its server to be tested and certified)

An applicant that wants to test and certify a server must:

- Download and install the Testing Tool and use it to test your server before submitting to the Energistics-accredited testing. If you are not an Energistics member, first contact Energistics regarding applicable fees at certification@energistics.org.
- Complete and submit the WITSML Product Certification Testing form for each WITSML server product to be tested and certified; the form is available at the link in Section 1.5 (page 9).
- Follow all procedures and instructions described in this document.
- During active testing of your server or when actively working an issue related to testing, respond to notices or requests for information from Energistics or the CTT within 5 business days.

3.2.2 Energistics

Energistics serves as the vendor-neutral third party that:

- Maintains and disseminates information about testing and the Certification Program and process.
- Serves as the point of contact for all matters related to WITSML testing and certification; email certification@energistics.org.
- Participates in development of and verifies Test Scripts.
- Maintains Test Scripts and the Testing Tool by facilitating the Energistics community to contribute improvements.
- Runs the Energistics-accredited tests and responds with test results within 5 business days.
- Coordinates with testers for retesting or contesting of results.
- Publishes a certified server's results on the Energistics website; the results can be accessed from at the link in Section 1.5 (page 9).

3.2.3 WITSML SIG

WITSML SIG members in the Certification Testing Team (CTT):

- Developed the Testing Tool, Test Scripts, and test procedures based on the WITSML API document and schemas. This is an ongoing effort that the SIG CTT will continue to participate in.
- Reviews and helps resolve cases where a test applicant is contesting the results of the Energistics-run test.
- As required, the WITSML Executive Team helps resolve issues when an applicant is contesting test results.

3.3 Testing and Certification Process and Procedures

Figure 3 shows the high-level process for product testing and certification. The sections below explain related procedures.

IMPORTANT! Certification is specific to *one version of a server product* and the versions of these components:

- WITSML API
- WITSML Schema
- Certification Test Suite

A new version of a server product requires retesting and re-certification.

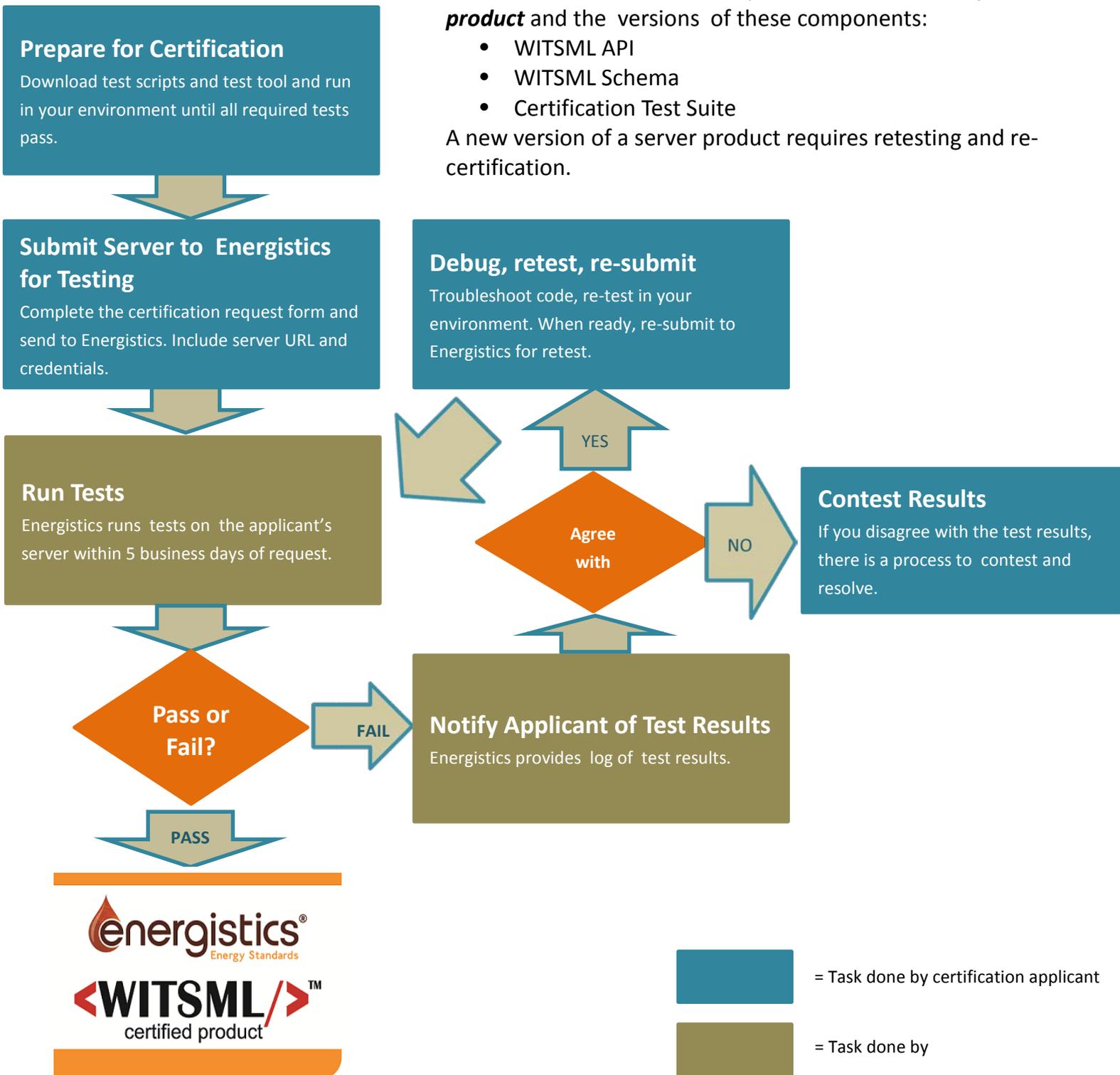


Figure 3 Overview of WITSML certification testing process.

3.3.1 Prepare for Certification: Download the Testing Tool for Self-Testing

Done by: Certification Applicant

Use the Testing Tool to first test your WITSML server in your own environment. When your server has passed all tests, you are ready to submit it to Energistics for the accredited testing.

For complete instructions on how to download, install, and use the Testing Tool, see the *WITSML Certification Testing Tool: Installation and User Guide*.

3.3.2 Submit a WITSML Server Product for Testing

Done by: Certification Applicant

Complete these steps:

1. Complete the WITSML Product Certification Testing form, which is available at the link in Section 1.5 (page 9).

This is an email form. Enter all data as indicated.

2. Click the Submit button on the form.

The form is emailed to Energistics, who immediately acknowledges receipt and runs tests and sends results within 5 business days.

3.3.3 Run the Test, Process the Results, and Notify Applicant

Done by: Energistics

On receipt of a Certification Testing form, Energistics is committed to running the Test Suite and notifying the applicant of the results within 5 business days.

3.3.3.1 If Your Server Passes

If your server passes all the individual tests required for your server (based on its server capabilities object), the information shown in the table below is posted on the results page of the Energistics website, which can be accessed from the link in Section 1.5 (page 9).

Company Name	Product Name	Schema Version	Server Capabilities	# of Tests Executed	Tests Passed	Test Results	Status
ABC	WITSML Awesome V1.0	1.4.1.1	<link to PDF>	30	30	<link to PDF>	Certified Test Suite A Jun 30, 2013
XYZ	WITSML Supreme V2.0	1.4.1.0, 1.4.1.1	<link to PDF>	45	45	<link to PDF>	Certified Test Suite A July 10, 2013

Each product listed on the Pass website page also links to more detailed results that show a human readable list of the server's WITSML capabilities and a results log of the specific tests run.

3.3.3.2 If Your Server Fails

If your server fails one or more of its required tests (as determined by the server's capabilities object), you will be notified by email, which will include the output described in Section 3.3.3.3 and procedures for re-testing or contesting the results.

3.3.3.3 Output from Certification Test

After completing the testing, Energistics sends you the following output:

- List of tests run and status of each test (pass/fail). Output from tests includes the SOAP output (request/response).
- Current versions of these components:
 - Testing Tool
 - Testing Engine
 - Test Suite
 - Test Plan
- Testing Tool environment: Details of the environment from which the tests were run, including the operating system and any key application version details.

3.3.4 Process for Retesting and Contesting Test Results

Done by: Certification Applicant

If a server fails, the applicant is notified with specific information about which test(s) failed and details of the failure. Applicants can address issues and re-submit a server for testing. Or, if an applicant disagrees with the results, the company can contest them.

3.3.4.1 *Submit for Retesting*

To submit for retesting:

- If your server fails any required test of the Energistics-accredited testing, you are required to re-run ALL tests (not just those that failed initially).
- You have up to 3 months to make corrections and request a retest. You may request up to 3 retests in a 3-month period. If your product does not pass the re-test in the allotted 3 attempts within 3 months, then a 3-month “lock-out” period is initiated, during which your server product cannot be re-submitted for certification testing.
 - If your company is a member of the WITSML SIG, there are no charges for retesting.
 - If your company is NOT a member of the WITSML SIG, your 3 retests are covered by your initial certification fee. However, if you enter a “lock-out” phase, there is an additional fee for subsequent testing.
- When you are ready to retest, notify Energistics by email at certification@energistics.org.
- Energistics will review, retest, and respond to any retest request within 5 working days.

3.3.4.2 *Contesting the Test Results*

If as a certification applicant you have previously self-tested your server (see Section 2.4.1, page 13) and disagree with the Energistics test results, you may contest the results of the test and petition for a pass status.

3.3.4.2.1 *Types of Issues*

Currently, 2 types of testing issues are defined:

- **Type 1: Issue with testing technology or environment.** You think there is a bug or error in the Testing Tool or a Test Script. In this case, the test should have passed when you did self-testing in your own environment. Be prepared to submit your self-test results.
- **Type 2: Issue with interpretation of the API specification.** You think the logic of a Test Script does not correctly test the behavior described in the API document.

3.3.4.2.2 *Contesting Process*

To contest the results, follow these steps:

1. Email your issue to certification@energistics.org. This email must include:

- The name, email, and phone number of the person to contact regarding this issue. (Energistics or a member of the review team may need to follow up with you for more information.)
 - The server product name and version.
 - Identification of the results of the test that failed that you are contesting (your results from Energistics).
 - An explanation of your issue with the test results (e.g., a problem with the tool or specific test or misinterpretation of the API document, etc.).
 - A copy of the specific test results from your self-test.
2. Energistics and the WITSML Certification Review Team (see Appendix A (page 23)) investigate the issue, attempt to determine why the results are different, and determine if it is Type 1 or Type 2 issue (as described above).
 3. **If the issue is determined to be Type 1** (issue with the Testing Tool or Test Suite), the Review Team follows the code change process for Testing Tool and Scripts (Energistics-internal document).
 4. **If the issue is determined to be Type 2** (issue interpreting the API document):
 - **If the Review Team agrees with the applicant**, the test will be corrected per the Testing Tool and Scripts change process.
 - **If the Review Team does NOT agree with the applicant**, then the applicant can follow the Energistics process to raise a Change Request (CR) against the WITSML API specification and/or a CR against the Testing Tool and the Test Suite.
 5. **If no error or reason can be found for the failure/discrepancy in environments**, the issue will be raised to the WITSML Executive Team, and they will decide the outcome of the case (e.g., pass or re-test, etc.). The decision of the Executive Team is final.
 6. Depending on results of the review, the applicant's certification status will be updated or the retesting process begun. Energistics will coordinate all communication, activities, and updates, as necessary.
- The Review Team is committed to providing feedback within 1 month of the issue being raised and a final decision from the Executive Team within 2 months of the issue being raised.

Appendix A. WITSML Certification Review Team

If issues arise during the testing and certification, Energistics has a review team composed of representatives from WITSML SIG member companies. This review team is committed to researching and resolving issues as discussed in this guide. The review team currently consists of the people listed here, who were also very involved in developing the testing and certification process and the Testing Tool:

- Craig Bye (Pason)
- Nigel Deeks (Schlumberger)
- Yash Gidh (Shell)
- Jose Guterman (TeyTech)
- Denys Metelsky (PetroDAQ)
- Bill Riegel (Halliburton)
- Joey Magsipok (Energistics)