NISTIR 6124

Overview of Model for United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System

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U.S. DEPARTMENT OF COMMERCE
Technology Administration
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U.S. DEPARTMENT OF COMMERCE
William M. Daley, Secretary

TECHNOLOGY ADMINISTRATION
Gary R. Bachula, Acting Under Secretary
for Technology

NATIONAL INSTITUTE OF STANDARDS
AND TECHNOLOGY
Raymond G. Kammer, Director

4. Definitions

The following definitions apply only to the document series on the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System.

Certificate Issuing Organization (CIO): An impartial body with the primary responsibility of issuing certificates of validation for computer software when that software meets all requirements for certification.

Certification System: [ISO/IEC Guide 2] A system having its own rules of procedure and management for carrying out conformity certifications.

Conformance, conformity: [ISO/IEC Guide 2] Fulfillment by a product, process or service of all requirements specified.

Federal Information Processing Standards (FIPS) 173: This standard provides specifications (developed through the U.S. Department of the Interior and the United States Geological Survey) for the organization and structure of digital spatial data transfer, definition of spatial features and attributes, and data transfer encoding and decoding.

Information Technology (IT): means any equipment or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. The term "information technology" includes computer, ancillary equipment, software, firmware, and similar procedures, services (including support services), and related resources.

Non-conformity: [ISO/IEC Guide 2] The lack of fulfillment by a product, process or service of all requirements specified.

Testing Laboratory: [ISO/IEC Guide 2] A body recognized by the CIO that carries out the procedures required to determine the conformance of a software implementation to a standard.

Sponsoring Organization: [ISO/IEC Guide 25, ISO/IEC Guide 28] An organization which plays a key role in establishing or maintaining a conformance testing or certification program for assessing implementations for conformance to a standard. This may be any source which assumes responsibility for insuring the primary components of a Certification System (i.e.., Test Suite, testing procedures, and product certification procedures) for a standard are in place. This source may be composed of one or more organizations.

Test **Method**: [ISO/IEC Guide 2] A defined technical procedure to determine one or more specified characteristics of a product.

Test Method Executive Control Committee (TMECC): A group of subject experts which provides guidance to the conformity assessment process for the purpose of maintaining integrity of the conformance process with regard to the standard(s) being tested.

Test Suite: [ISO/IEC Guide 2] The Test Suite is a systematic collection of tests designed to verify that a software product correctly supports all required features specified by the USGS SDTS/TVP standard. The Test Suite is not designed to replace the Validation Customer's quality assurance testing or systematically to detect inconsistencies or "bugs."

Validation: [ISO/IEC Guide 2] process of accomplishing the activities necessary to determine the conformance of an implementation to an Information Technology standard.

Validation testing: [ISO/IEC Guide 2] consists of a third party reviewing the Validation Customer's products, witnessing the running of the conformance tests, evaluating the test results, and reporting the results of that testing in a Validation Summary Report (VSR).

Validation Certificate: A certificate issued by authority of the CIO for a tested software product which meets all conformance requirements as specified by the TMECC.

Validation Customer: An individual or corporate confederation who enters into an agreement with a Testing Laboratory that specifies the terms and conditions for Testing Laboratory services (of any kind) to be performed.

Validation Issue: Any problem arising during a validation effort.

Validation Summary Report (VSR): A report produced by a Testing Laboratory containing the results that are observed from witness testing a specific software under test. Under the USGS requirements, a VSR indicating zero non-conformities supports the issuance of a Validation Certificate.

5. USGS Sponsoring Organization Model

The USGS SOM for the USGS SDTS/TVP standard consists of the USGS, the TMECC, the USGS recognized CIO(s), and the CIO recognized Testing Laboratory/ies.

The USGS SOM allows for multiple Certificate Issuing Organizations (CIOs), each sponsoring one or more Testing Laboratories.

While the actual testing process can be carried out by various organizations, centralized authority for the issuance of certificates provides several advantages, including the following:

a. **Centralized Directory of Tested Products**: Acquisition officers in various procurement activities departments can approach the appropriate Certificate Issuing Organization to determine what validated software are available for their projects;
b. **Uniform Test Requirements**: Offerors for an acquisition have a "level playing field" in that the offered software has been subjected to the same conformance Test Suite;
c. **Comparable Test Results**: Potential users of software validated under the same test procedures have some assurance that software from different suppliers have been subjected to equivalent testing; and
d. **Reusable Test Results**: Multiple programs may use the same test results.

The USGS SOM has selected a central authority hierarchy of firstly the USGS, then the Test Method Control Board, then the Certificate Issuing Authorities and finally the Testing Laboratories.

The functions of the Sponsoring Organization, the Test Method Executive Control Committee (TMECC), the CIO, and the Testing Laboratories are described in this document. Additional documents in support of this USGS SOM are:

a) Model for Test Method Executive Control Committee (TMECC) Organization and Procedures: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System.

b) Criteria for United States Geological (USGS) Recognizing Certification Issuing Organizations Activities and Requirements: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System.

c) Criteria for United States Geological (USGS) Recognizing Testing Laboratory/ies Activities and Requirements: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System.

d) Spatial Data Transfer (SDTS) Topological Vector Profile (TVP) Validation Procedures: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System.

Figure 1 is a diagram of the USGS Certification System for SDTS/TVP.

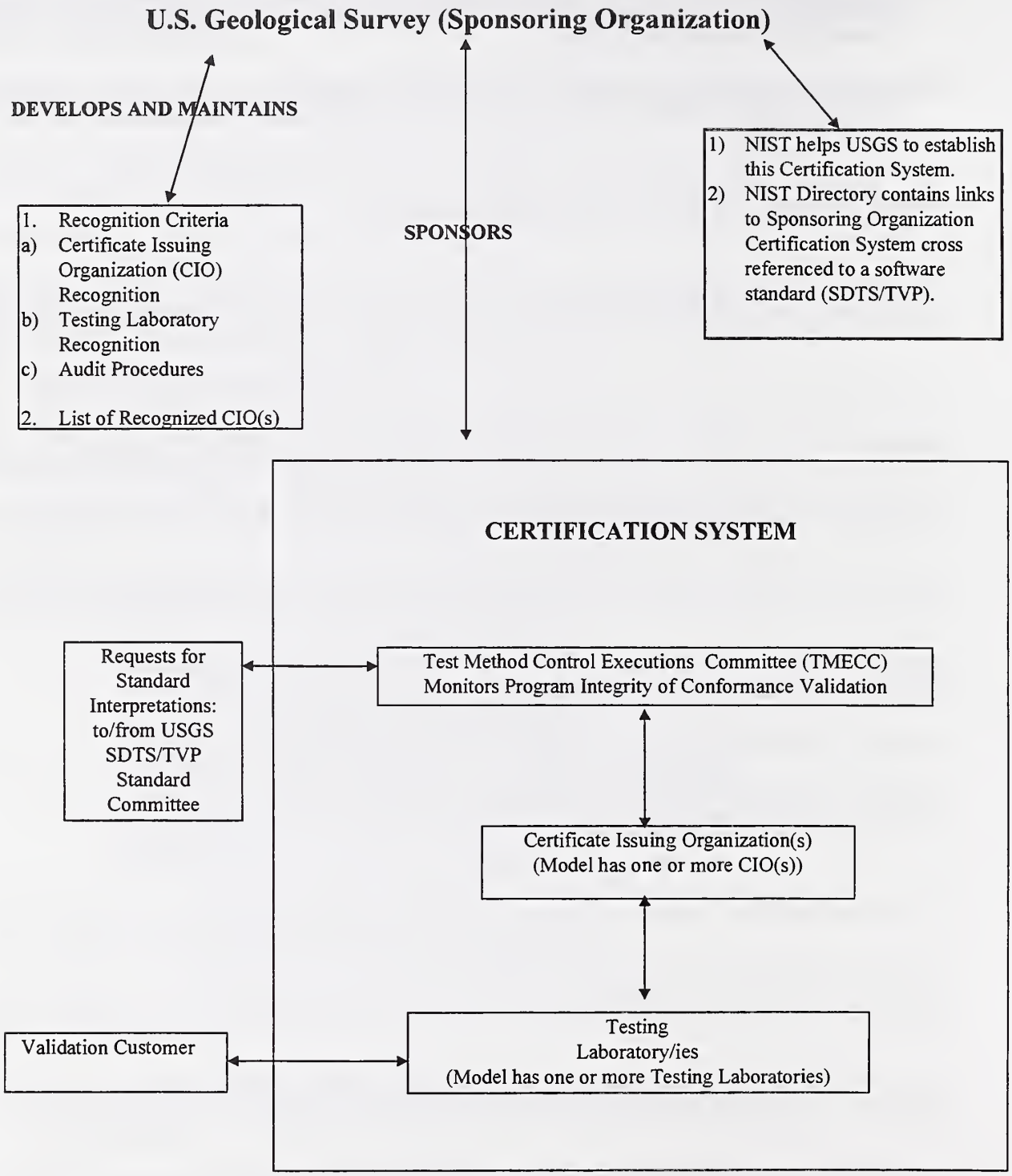

Figure 1 U.S. Geological Survey Model for SDTS/TVP Certification System

5.1 USGS Certification System

5.1.1 Sponsoring Organization: United States Geological Survey

In implementing the SOM, the USGS seeks to establish and recognize a Certification System for assessing conformance of software products to SDTS/TVP. The USGS may elect to include other organizations, (e.g. consortiums, government agencies, software industry companies or a combination) under the umbrella of this Certification System to broaden the scope of certification recognition.

The USGS has established and will maintain the (1) Criteria for Recognizing Certificate Issuing Organizations and (2) the Criteria for Certificate Issuing Organization Recognizing Testing Laboratory/ies.

The USGS has developed the USGS SDTS/TVP Validation Procedures document (see separate document entitled: Spatial Data Transfer (SDTS) Topological Vector Profile (TVP) Validation Procedures: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System) which provides operating policy and procedures that are followed in administering the USGS validation program for USGS SDTS/TVP.

The USGS may itself conduct or direct an impartial body to conduct an audit at any time to assess whether a CIO satisfies the CIO Recognition Criteria or a Testing Laboratory satisfies the Testing Laboratory Recognition Criteria.

5.1.2 Test Method Executive Control Committee

The Test Method Executive Control Committee (TMECC) is chaired by the USGS. The TMECC provides validation guidance; sets validation requirements to be followed by all USGS recognized CIO(s) and Testing Laboratory/ies; establishes the conditions for the issuance of a Validation Certificate; authorizes the Test Suite to be used to assess conformance to the USGS SDTS/TVP; recommends the schedule for issuing versions of the Test Suite; resolves Validation Issues that may arise during validation when these Validation Issues cannot be resolved through the best efforts of the CIO, the Testing Laboratory, and the Validation Customer; establishes and maintains the requirements for validation record destruction and dissemination; and, makes recommendations regarding the USGS SDTS/TVP Validation Procedures.

The minimum membership of the TMECC shall consist of USGS, the CIO(s), and the Testing Laboratory/ies. If possible, a representative from the USGS SDTS/TVP committee shall be included in the TMECC membership.

A model for organizing and developing procedures for a TMECC is provided in separate document entitled: Model for Test Method Executive Control Committee (TMECC) Organization and Procedures: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System.

5.1.3 Certificate Issuing Organization

The USGS recognized CIO must meet all USGS CIO recognition requirements; one of which requires that on a periodic basis or as required by the USGS, the CIO submits to the USGS a letter certifying the CIO desires to continue to be a recognized CIO, that the CIO continues to follow all USGS requirements and that all CIO recognized Testing Laboratory/ies follow all USGS requirements.

The CIO maintains current operating agreements with the CIO recognized Testing Laboratory/ies, issues the Validation Certificates, maintains a public list of CIO validated products (usually called a Validated Products List or VPL), effects the TMECC rulings and recommendations (such as withdrawal of tests from the Test Suite), reviews all VSRs for completeness and correctness, processes validation issues, and maintains the validation Test Suite and the validation procedures per TMECC rulings, interpretations and recommendations.

General criteria for USGS recognition of CIO(s) are provided in separate document entitled: Criteria for United States Geological (USGS) Recognizing Certification Issuing Organizations Activities and Requirements: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System.

5.1.4 Testing Laboratory

The CIO recognizes a Testing Laboratory after satisfying the USGS CIO Testing Laboratory Recognition Requirements. Each CIO recognized Testing Laboratory carries out the procedures required to establish the compliance of a software implementation to a standard. On a periodic basis or as required by the USGS, the Testing Laboratory submits to the CIO a letter certifying the Testing Laboratory desires to continue to be a recognized Testing Laboratory, that the Testing Laboratory continues to follow all CIO, TMECC, and USGS requirements.

The Testing Laboratory performs the witness testing of the Implementation Under Test (IUT), collects the results therefrom, writes the VSR, recommends to the CIO whether a Validation Certificate should be issued, interacts with the Validation Customer, receives payment from the Validation Customer for services performed, and submits Validation Issues to the CIO.

During the initial establishment of this Model, the Testing Laboratory is required to submit the USGS Testing Laboratory recognition criteria to the USGS for USGS approval.

General criteria for USGS recognition of Testing Laboratory/ies are provided in separate document entitled: Criteria for United States Geological (USGS) Recognizing Testing Laboratory/ies Activities and Requirements: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System.

6. Validation Testing

Validation testing consists of a third party (Testing Laboratory) witnessing the running of the Test Suite on the Validation Customer's IUT, evaluating the test results, and reporting the results of that testing in a VSR. Under the USGS SDTS/TVP Model, if one or more non-conformities are observed then NO Validation Certificate is issued but a VSR detailing the non-conformities may be issued at the request of the Validation Customer.

7. Validation Summary Report (VSR)

The results of the validation testing are documented in a VSR. The VSR shall describe the IUT. The VSR also contains:

a. a table showing the test results for each profile and for each of the types of products tested.
b. a description of any product options used during the validation testing process.
c. documentation of any changes made to the Test Suite and why those changes were made.
d. a description of test results for informational tests.

8. Products with Validation Certificates

A Validation Certificate is issued if all of the conformance requirements are met. A Validation Certificate is NOT issued if one or more conformance requirements are not met or when a validation is done with a superseded version of the Test Suite (see Section 9). The Validation Certificate identifies the IUT, the version of the Test Suite, the date of the beginning of the on-site witness validation testing, the Validation Certificate expiration date, the name of the CIO, the address and contact information for the CIO, the VSR identification number (issued by the CIO), the Test Suite identification, and the USGS SDTS/TVP standard against which conformance is being assessed.

Validation Certificate has a narrow scope. The results of validation apply only to the IUT and the validation Test Suite used. The results should be reproducible for the IUT tested. Therefore, it is important to accurately document in the VSR the significant software and hardware components comprising the IUT.

9. Validation with Superseded Versions of the Test Suite

A product may be validated with a superseded version of the Test Suite provided that such validation is marked prominently and boldly about this fact in the VSR and in any communication concerning the validation effort. Validation Certificates are not issued for validations using superseded versions of the Test Suite. This technical service may be needed to satisfy the validation wording of a particular procurement.

10. Validation Issue and Resolution Process

A "Validation Issue" is defined as a problem arising during a validation effort. An example of a Validation Issue may be any result from processing a Test Suite test program that is not a passed, inapplicable, or unsupported result according to the established Validation Procedure grading criteria. Another example of a Validation Issue may be a CIO interpretation of the Validation Procedures. This intentionally broad definition of a "Validation Issue" is to make certain that all relevant issues are brought to the attention of the CIO via the Testing Laboratory, without assuming that such results would be accepted without special review. The Validation Customer also provides a rationale for each Validation Issue being made (see Implementation Validation Issue Format within separate document entitled: Spatial Data Transfer (SDTS) Topological Vector Profile (TVP) Validation Procedures: Part of the United States Geological Survey Recognition of Spatial Data Transfer Standard (SDTS) Topological Vector Profile (TVP) Certification System). The Testing Laboratory on behalf of their Validation Customer forwards Validation Issues to the CIO, usually electronically.

The resolution process for Validation Issues shall be specified in the SDTS/TVP Validation Procedures. Briefly, the resolution process starts with the Testing Laboratory and escalates to the TMECC (and perhaps the SDTS/TVP Standard Committee).

11. Requests for Validation

A request for the validation of a product purporting to support the standard shall be sent to one of the recognized Testing Laboratories.

12. Publication and Proprietary Data

In general the CIO and Testing Laboratory/ies shall have the right to use all information gathered in the course of developing and administering a USGS SDTS/TVP testing program for the purpose of conducting the Validation Customer requested testing, but that neither shall release such information publicly except when reporting on the results of testing or upon the written request by the Validation Customer.

13. Suggested Procurement Wording

Appendix A contains suggested wording for procurement solicitations when a procurement activity elects to require a USGS recognized CIO issued Validation Certificate and VSR.

APPENDIX A
of
Overview of
Model for
United States Geological Survey
Recognition of
Spatial Data Transfer Standard (SDTS)
Topological Vector Profile (TVP)
Certification System

SAMPLE SOLICITATION WORDING FOR SDTS/TVP VALIDATIONS

This appendix provides suggested solicitation wording for validation for STDS/TVP implementations (Decoders, Encoders, and/or Transfers).

Role of Procuring Agency

It is not feasible to validate all STDS/TVP implementations which conform to the Specifications of STDS/TVP (FIPS 173), since formal validation can be expensive, time consuming, and resource intensive. The procuring agency has the authority to extrapolate from the test results published by the USGS recognized Certificate Issuing Organization(s), based on additional research by the procuring agency, demonstrations or warranties by the SDTS/TVP supplier, etc. The procuring agency, not Test Method Executive Control Committee, Certificate Issuing Organization or Testing Laboratory, has the responsibility of reviewing the SDTS/TVP validations in the Certificate Issuing Organization published list and determining the applicability of these validations to the procuring agency needs. The criteria for applicability of a Validation Certificate should be appropriate to the size and timing of the procurement.

This suggested solicitation wording allows for two validation options: "Delayed Validation," and "Prior Validation." "Delayed Validation" allows SDTS/TVP suppliers to offer products, which may not have been tested prior to contract award. The "Prior Validation" requires product suppliers to have their products validated with zero nonconformities prior to contract award. The procuring agency shall select the appropriate validation option and shall specify that a Validation Certificate is required. The agency shall specify appropriate time frames for validation. This information may be used to specify validation time frames that are not unduly restrictive of competition.

The sample solicitation wording for the different validation options follows:

> "All implementations of STDS/TVP (FIPS 173) that are brought into the Federal inventory as a result of this document for which validation is specified, and those implementations used by vendors to develop programs or provide services shall be validated using the official Validation System specified by the SDTS/TVP Test Method Executive Control Committee *. Validation shall be in accordance with Test Method Executive Control Committee validation procedures for STDS/TVP (FIPS 173) *. The results of validation shall be used to confirm that the implementation meets the requirements of STDS/TVP (FIPS 173) as specified in this document."

* For additional information, see the USGS World Wide Web site: http://mcmcweb.er.usgs.gov/sdts/index.html

> To be considered responsive the offeror shall:

"Provide validated STDS/TVP (FIPS 173) implementations through 'Delayed Validation', or 'Prior Validation'."

(Option 1) - "Delayed Validation"

Delayed Validation - When an agency determines that it is acceptable for implementations of STDS/TVP (FIPS 173) to be offered that have not yet been tested for conformance to STDS/TVP (FIPS 173) the following 'Delayed Validation' solicitation wording option may be used:

"The offeror shall certify in the offer that all implementations of STDS/TVP (FIPS 173), including applicable STDS/TVP (FIPS 173) options, offered in response to this document will be submitted for validation upon contract award. Implementations submitted for validation shall have the validation completed at the earliest possible date permitted by the Certificate Issuing Organization validation procedures. Unless specified elsewhere, proof of submission for validation shall be in the form of a letter scheduling the validation and the subsequent delivery by the offeror of a Certificate Issuing Organization Validation Certificate."

(Option 2) - "Prior Validation"

Prior Validation - When an agency determines that it is essential for implementations of STDS/TVP (FIPS 173) be validated (i.e., implementation has been tested and has demonstrated compliance to the STDS/TVP (FIPS 173)) for conformance to STDS/TVP (FIPS 173) prior to being offered the following 'Prior Validation' solicitation wording option may be used:

"The offeror shall certify in the offer that all implementations of STDS/TVP (FIPS 173), including applicable STDS/TVP (FIPS 173) options, offered in response to this document have been previously validated with zero non-conformities. Unless specified elsewhere, proof of validation shall be in the form of a Certificate Issuing Organization Validation Certificate."

Additional Readings

1. ISO/IEC Guide 2, General Terms and Their Definitions Concerning Standardization and Related Activities.
2. ISO/IEC Guide 25, General Requirements for the Competence of Calibration and Testing Laboratories, Third Edition 1990.
3. ISO/IEC Guide 28, General Rules for a Model Third Party Certification System for Products.
4. ISO/IEC Guide 38, General Requirements for the Acceptance of Testing Laboratories.
5. ISO/IEC Guide 39, General Requirements for the Acceptance of Inspection Bodies.
6. ISO/IEC Guide 40, General Requirements for the Acceptance of Certification Bodies - Currently under revision (April 1995).
7. ISO/IEC Guide 42, Guidelines for a Step by Step Approach to an International Certification System.
8. ISO/IEC Guide 43, Development and Operation of Laboratory Proficiency Testing.
9. ISO/IEC Guide 44, General rules for ISO/IEC and IEC International Third Party Certification Schemes for Products.
10. ISO/IEC Guide 56, An Approach to the Review by a Certification Body of its Own Internal Quality System.
11. ISO/IEC Guide 60, Code of Good Practice for Conformity Assessment.
12. ISO/IEC 91 - International Standards Organization: ISO/IEC, Guide 2, 6th edition 1991 - General Terms and Their Definitions Concerning Standardization and Related Activities.
13. ISO/IEC Technical Report 13233, Information Technology - Interpretation of Accreditation Requirements in ISO/IEC Guide 25 - Accreditation of Information Technology and Telecommunications Testing Laboratories for Software and Protocol Testing Services, 30 November 1995.
14. Test Method Control Procedures Model, Workshop on Harmonization of Programming Languages and Graphics Validations, March 15-16, 1994, NIST, Computer Systems Laboratory
15. The Sponsoring Organization Model for Recognition of Information Technology Certification Systems, NISTIR (identification number and publication date to be determined).