Information and Communications Technology Testing ISO/IEC 17025 Application Document

March 2013

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Terms and definitions used in this document

The following terms and definitions are provided only to facilitate understanding of this document. These definitions describe terms which are defined or used in national and international standards e.g. ISO/IEC 14598.

Evaluator: The organisation that performs a software product evaluation. Referred to as 'facility' in this document.

Evaluation requester: The person or organisation that requests an evaluation. Referred to as 'customer' in this document.

Evaluation requirements: Description of the objectives of the evaluation, generally relating to the product's intended use and associated risks.

Evaluation specification: Description of the scope of the evaluation and the measurements to be performed on the product submitted for evaluation and its various components.

Means of testing (MOT): Hardware and/or software, and the procedures for its use, including the executable test suite itself, used to carry out the testing required.

Reference implementation: An implementation of one or more standards or specifications, against which a means of testing and test tools for those standards or specifications are tested, for the purposes of validation of those means of testing and test tools. The term 'validated reference implementation' is used if the reference implementation has been shown to be derived faithfully from (i.e. to be 'traceable' back to) the relevant standard or specification.

*Requester's requirements***:** An initial version of the evaluation requirements provided by the evaluation requester.

Software developer: An organisation that performs development activities during the software lifecycle process.

Software product evaluation: Technical operation that consists of producing an assessment of one or more characteristics of a software product according to a specified procedure.

Test case: A set of inputs, execution preconditions, and expected outcomes developed for a particular objective, such as to exercise a particular program path or to verify compliance with a specific requirement.

Test method: Specified technical procedure for performing a testing service including:

- the specification of all the individual test case of a test suite;

	• the test tools (both hardware and software) used to run those test cases and the way in which those test tools are used; • the procedures used to select and run the test cases; • the procedures used to analyse the observations and state the results.
Test software:	Software used to carry out or assist in carrying out the testing required.
Test suite:	A complete set of test cases that is necessary to achieve a testing objective.
Test tool:	Hardware and/or software, excluding the test suite itself, used to carry out or assist in carrying out the testing required.
Test verdict:	A statement of 'pass', 'fail' or 'inconclusive', specified in a test case, concerning conformance of the software under test with respect to that test case when it is executed.

Confidentiality

Facilities who have applied for or who have class of test 22.01 *Information security evaluation* covering the evaluation of IT security under the Australasian Information Security Evaluation Program (AISEP) should be aware that NATA will exchange information of the facility's accreditation with the Department of Defence, Defence Signals Directorate (DSD) in support of a memorandum of understanding signed by NATA and the Department of Defence. Relevant DSD staff may also attend these assessments, either as technical assessors, where appropriate, or as observers.

Information and Communications Technology Testing - ISO/IEC 17025 Application Document

This document provides interpretative criteria and recommendations for the application of ISO/IEC 17025 in the field of Information and Communications Technology Testing for both applicant and accredited facilities.

Applicant and accredited facilities must also comply with the ISO/IEC 17025 standard application document and any field annexes, policies and/or technical circulars (refer to *NATA Procedures for Accreditation).*

The clause numbers in this document follow those of ISO/IEC 17025 but since not all clauses require interpretation the numbering may not be consecutive.

4 Management requirements

4.1 Organisation

On-site testing

When testing on-site (e.g. at customer's premises) by staff of the accredited facility, the same requirements apply as those when testing is performed at the facility's permanent site.

The facility's procedures for on-site testing must be described in the facility's management system and be subject to the review and internal auditing processes.

Additional precautions may be necessary when testing on-site in order to ensure that all the requirements of ISO/IEC 17025 and this application document are met.

The following are examples of some aspects of onsite testing for which additional precautions may be necessary:

- testing staff may need additional training in the operation of on-site hardware and software;
- the facility should maintain records of the environment used during testing;
- additional action may be needed to ensure the control, security and integrity of test records;
- additional action may be needed to ensure proper integration of test equipment including test tools with the on-site hardware and software environment;

Where tests are performed using equipment or systems normally controlled by the customer, developer or user, procedures for controlling these items shall be documented.

On completion of on-site testing, if the system on which testing is performed is not under the full control of either the facility or the customer, the facility shall be responsible for the removal of all records generated during the test unless otherwise determined by the customer.

4.1.4 The desirability of testing software during the development process is recognised. In these circumstances, the facility shall have procedures for

ensuring its independence and that of its staff from the development process, and for identifying and controlling potential conflicts of interest.

4.3 Document control

4.3.3.4 The procedures to control computerised systems should address appropriate implementation of management and control configuration, maintenance of traceability between related documents, and where appropriate a combination of manual and computer based approaches.

Test methods can include test plans, test suites, test cases including relevant input data, evaluation procedures and test design specifications. These must, therefore, be controlled.

4.4 Review of requests, tenders and contracts

Facilities issuing compliance results to a published conformity assessment standard such as product testing standards, must ensure the name or identification of the published standard is evident in the scope of accreditation. The use of 'and similar standards' in scopes of accreditation is not permitted.

Consideration should be given to ISO/IEC TR 15504 when determining capability for software testing.

4.6 Purchasing services and supplies

Commercially available test tool validation services, software testing tools, hardware and such consumables as diskettes, CDs, DVDs etc are regarded as services and supplies.

4.13 Control of records

4.13.2.1 Technical records

4.13.2.1 Test tools must be identified by at least their name, supplier and version number.

5 Technical requirements

5.2 Personnel

5.2.1 Persons issuing test reports

Individuals who issue test results assume responsibility for the technical validity and accuracy of all information contained in test reports. They must have and demonstrate a sound knowledge of:

- the principles of the calibrations, measurements and/or tests they perform or supervise;
- the standards or specifications for which accreditation is sought or held;
- the facility's management system;
- ISO/IEC 17025, NATA Rules, this document and pertinent NATA Policy and Technical Circulars;

- measurement ranges and the estimation of the uncertainties of measurement associated with the test or calibration results for which the facility is accredited or seeking accreditation.

Facility staff who release test results shall hold a position within the organisation which provides authority over the calibration and/or testing activities and, where necessary, results to be rejected when they consider them to be inadequate.

Consultants to the facility may issue test reports provided they have the knowledge necessary to allow them to have authority over the testing and/or calibration activities. Consultants must also hold a written contract or agreement with the facility in which their role and authority is clearly defined and that they agree to hold confidential information relating to customers of the facility. The agreement should further indicate that the facility is responsible for work performed by the consultant including acceptance of the indemnity responsibilities detailed in NATA Rules.

5.3 Accommodation and environmental conditions

5.3.1 For ICTT, the term 'environment' includes the hardware and associated software on which the software being tested is running. The facility shall ensure that any interference from other activities in the system does not invalidate the result of the specified tests. Examples of such activities are uncontrolled network activity during a performance test, virus scanners, obsolete versions of software, and backing up.

5.3.2 The test environment and the software under test shall be controlled and records kept.

5.4 Test and calibration methods and method validation

5.4.5 Validation of methods

5.4.5.2 For software, tool verification is the process of confirming that a means of testing or test tool will produce results that are consistent with the specifications of the relevant test suites, with any relevant standards and, if applicable, a previously verified version of the means of testing or test tool.

In-house modifications to test tools must be validated.

Initial validation of a test tool shall be made by testing the test tool against a 'reference implementation', using all the test cases from the complete conformance test suite that are applicable to the reference implementation.

There shall be an overall program of means of testing (MOT) validation and test tool validation and this shall be designed and operated to ensure, whenever applicable, that the results of test tool validation are traceable to international standards of test tool equivalence. In the absence of such standards, appropriate national or international harmonisation agreements shall be used, wherever applicable, to check the reliability of test tool validation results.

A 'reference implementation', where available, should be used for test tool validation. If there is no suitable 'reference implementation', then the facility shall define procedures that it uses to check the correct operation of the test tool. Records of test tool validations must include reasons for the cases being run, date, environmental information (if appropriate), a summary of the results obtained, details of any discrepancies from the expected results and indicate the traceability to international standard test suites or appropriate authoritative

specifications. This shall apply to both validations performed by the facility or by an external supplier.

When the test method requires test software to be installed on the system under test, the facility shall check that the software has been installed correctly.

Whenever any change is made to the test tool or testing environment, or whenever there is any doubt about the correct operation of the test tool, it shall be re-validated by testing against the 'reference implementation'.

Commercial off-the shelf test tools in general use within their designed application range may be considered as sufficiently verified until a suitable means of independent validation becomes available.

5.4.6 With respect to Measurement Uncertainty of quantitative measurements related to ICTT, additional consideration should be given to measurement results that are derived by computational methods as opposed to calculation methods.

Calculation may produce a result taking into account an exhaustive and rigorous approach of all possible factors influencing the measurand (For example: thorough calculation from first principles or summation of all unique events).

Computation may estimate the measurand, by the use of simulation, empirical data sampling, or from sources of random data (For example: n empirical samples, simulation from n random numbers).

Test facilities should include a statement of uncertainty of measurement for quantitative measurements, identifying and reasonably estimating all components able to influence uncertainty of measurement.

Note: For further information please refer to:
(ILAC-G17:2002) - *Introducing the Concept of Uncertainty of Measurement in Testing in Association with the Application of the Standard ISO/IEC 17025"*

5.5 Equipment

Note: Test equipment includes both hardware and software and so the requirements of clause 5.5 also apply to test tools.

5.5.2 There shall be an overall program of means of testing (MOT) validation and test tool validation and this shall be designed and operated to ensure, whenever applicable, that the results of test tool validation are traceable to international standards of test tool equivalence. In the absence of such standards, appropriate national or international harmonisation agreements shall be used, wherever applicable, to check the reliability of test tool validation results.

5.5.3 For validation of commercial off-the-shelf test tools, reference should be made to clause 5.4.5.2.

5.5.4 Test tools should be identified by at least their name, supplier and version number.

5.5.5 Hardware shall be identified and recorded to the extent necessary for the tests being undertaken, in order to achieve repeatability and reproducibility and bearing in mind the risk of recall due to hardware errors or configuration changes. When the facility builds a machine or test kit, records must be

maintained of each item of hardware and software significant to the tests undertaken.

5.6 Measurement traceability

5.6.1 General

A record shall be maintained of all test tool validations and re-validations giving reasons for the cases being run, date, environmental information if appropriate, and a summary of the results obtained plus the details of any discrepancies from the expected results. When the test tool validation is made using a reference implementation, the facility shall document fully the expected results (i.e. previously obtained results) from using the full conformance test suite to test the nominated reference implementation.

If a reference implementation is used for test tool validation, then the procedures for carrying out the validations shall be fully documented by the facility. If there is no suitable reference implementation that could be used to validate a test tool, then the facility shall define and document the procedures and methods that it uses to check the correct operation of the test tool and provide evidence that these procedures and methods are also applied whenever the test tool is modified.

When the test method requires test software to be installed on the system under test, the facility shall specify a set of confidence tests (possibly a subset of the conformance test suite) and specify the procedures to run them to check that the test software has been installed correctly. The facility shall also specify procedures to ensure that all test software mounted on a system under test is derived faithfully from an appropriate master version held by the facility.

Whenever any minor changes are made to the test tool or testing environment, or whenever there is any doubt about the correct operation of the test tool, it shall be re-validated by testing against the reference implementation using an appropriate subset of the conformity test suite, selected in accordance with specified procedures of the testing facility. Whenever any discrepancy is shown by the running of such a subset of the test suite or whenever any major change is made to the test tools or testing environment, then the test tools shall be validated against the reference implementation using the complete conformance test suite before any further testing of customers' systems takes place.

If there are any discrepancies from expected results of validations or re-validations then the relevant test cases or the test tool itself shall be suspended from use until the discrepancies have been resolved. The facility shall specify the procedures and methods it uses to validate new versions of each test tool, including its traceability to the master copy and where relevant, the consistency with previous results.

5.6.3 Reference standards and reference materials

5.6.3.1 Reference standards

A particular implementation may be used as a reference implementation only if its behaviour when tested by the relevant conformance test suite is repeatable, and if the coverage of the conformance test cases that it is capable of

exercising, is impartial towards the range of implementations that may have to be tested by the conformance test suite.

When at least one suitable implementation becomes available for use as a reference implementation, then the relevant test tools shall be validated against it within a reasonable period of time.

Initial validation of a test tool shall be made by testing the test tool against the reference implementation, using all the test cases from the complete conformance test suite that are applicable to the reference implementation.

Validation reports shall, wherever applicable, indicate the traceability to international standard test suites or appropriate authoritative specifications, and shall provide the equivalence results and list known defects. This shall apply to both validations performed by the facility or by an external supplier.

5.7 Sampling

5.7.1 Within the context of ICTT testing, sampling refers to test case selection. Examples of sampling may include:

- selection of test cases to test different conditions and combination of variables;
- selection of regression tests to rerun;
- selection of source code to review based on risk;
- randomness testing in gaming systems. Sampling records for testing conducted must be maintained. Test records may include the following:
- test case selection;
- justification of the test case selection;
- test plan.

5.8 Handling of test and calibration items

5.8.1 The requirements of this clause apply specifically to the test items. It is recognised that interactions between the test item, the test tools and the test environment may result in modifications occurring to the test item as part of the normal installation or testing process. The intent is to prevent unintended changes from occurring and to ensure that an unmodified version of the test item is always available. In the case of software, copies of the test item may be made and used for testing provided that the copies are traceable back to the original supplied test item and are controlled e.g. by lodgement in a version control system

5.8.2 Additional labelling of equipment under test may not be necessary for hardware and software identified by a manufacturer's model type or number as well as a unique serial number and version number.

5.8.4 In the case of software, copies of the test item may be made and used for testing provided that the copies are traceable back to the original supplied test item and are controlled e.g. by lodgement in a version control system.

5.9 Assuring the quality of test and calibration results

Even though the availability of formal proficiency testing programs are rare in the field of Information and Communications Technology Testing, the facility must still be able to demonstrate how it assured the quality of it's testing activities and how they comply with the requirements of clause 5.9.1 of ISO/IEC 17025.

Where uniform test tools are available the facility is expected to make use of such tools or demonstrate validation of their alternative test method. Facilities are also responsible for checking the availability of appropriate proficiency testing programs in the future and the selection of programs when available.

Test reports which are generated automatically must undergo a periodic review for correctness. The frequency and number of test reports reviewed are to be determined by the facility. The adequacy of such arrangements will be reviewed at assessment.

5.10 Reporting the results

5.10.1 Whenever test cases are such that analysis of the observations by the test operator is required in order to interpret the results, before the results can be stated in a test report, the facility shall define objective, unambiguous procedures to be followed by the personnel doing the analysis, sufficient to ensure that repeatability, reproducibility and objectivity are maintained.

Facilities shall define and document the procedures to be followed by its staff concerning the re-running of test cases. They shall include objective criteria to decide whether to re-run a test case and procedures for ensuring that the repeatability, reproducibility and objectivity of the process for deciding the outcome e.g. pass or fail, is maintained.

5.10.3 Test reports

Test reports should indicate the test suites used to perform the tests.

5.10.5 Opinions and interpretations

When the inclusion of an opinion is required to clarify the understanding of a test result or to provide advice on possible future directions of testing or when required by the customer, such opinions must be clearly identified as such on reports.

Where a communication of said opinion or interpretation by direct dialogue with a customer has occurred, such dialogue must be written down.

References

This section lists publications referenced in this document. The year of publication is not included as it is expected that only current versions of the references shall be used.

Standards

ISO/IEC 14598-1 Information technology – Software product evaluation – Part 1: General Overview

ISO/IEC 14598-5 Information technology – Software product evaluation – Part 5: Process for evaluators

AS/NZS 14598-5 Information technology – Software product evaluation. Part 5: Process for evaluators

AS/NZS 4216 Information technology – Software product evaluation – Quality characteristics and guidelines for their use

ISO/IEC 9116 Information technology – Software product evaluation – Quality characteristics and guidelines for their use

AS/NZS 4366 Information technology – Software packages – Quality requirements and testing

ISO/IEC 12119 Information technology – Software packages – Quality requirements and testing

ISO/IEC TR 15504 Software process assessment

AS/NZS ISO/IEC 15504 Information Technology – Process Assessment (including associated parts)

ISO/IEC 29119 Software and Systems Engineering – Software Testing

NATA References

NATA - Policy Circular # 12 – NATA Requirements for the Performance of Calibrations In-house (www.nata.com.au, Publications Folder, Technical Publications link)

Other references

ISO/IEC Guide 99 (2007) *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

(ILAC-G17:2002) - *Introducing the Concept of Uncertainty of Measurement in Testing in Association with the Application of the Standard ISO/IEC 17025*

Amendment Table

The following amendments were made to the Information and Communications Technology Testing (ICTT) ISO/IEC 17025 Application Document.

Please refer to this sheet in conjunction with the NATA Procedures for Accreditation and the associated ISO/IEC 17025 Standard and Field Application Document and Annexes to ensure that you are familiar with these amendments.

AMENDMENT TABLE			
	Title	**Clause or Class of test amended**	**Amendment**
Section 1	Introduction	All	Reissued as NATA Procedures for Accreditation
Section 2	Accreditation procedures	All	Reissued as NATA Procedures for Accreditation
Section 3	Supplementary requirements for accreditation		
	Management requirements	4.1.4 4.2.1 4.5.1 4.5.4 4.13.1 4.13.2 4.13.2.1 4.13.2.3 4.14 4.15	Removed from ICTT Application Document and Reissued as ISO/IEC 17025 Standard Application Document
	Technical Requirements	5.2.5 5.4.1 5.4.2 5.4.3 5.4.6 5.6.1 5.6.2 5.6.2.2 5.6.3.2 5.7 5.9 5.10.2 5.10.2 (j) 5.10.3.1 (b) 5.10.6 5.10.7	Removed from ICTT Application Document and Reissued as ISO/IEC 17025 Standard Application Document
		5.4.6	Guidance added for the inclusion of measurement uncertainty where

			applicable in ICTT
Section 4	Equipment calibration intervals		Reissued as stand alone documents • General Equipment Table • Reference Equipment Table
Section 5	Classes of test		Reissued as a stand alone document
Section 6	References		Revised and Updated