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OVERVIEW OF THE IGES/PDES TESTING PROJECT

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FOREWORD

This document contains an introduction to some of the test methods currently being developed by the Testing Project of the IGES/PDES Organization. This is a voluntary organization which is coordinated by the United States National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS).

Readers must be aware that this area of technology is developing rapidly and that the information here reflects the "current understanding." Later versions of this document may have substantial differences. Full consensus has not been reached on all details.

This document has been created and distributed only as an aid to understanding the topic of testing product data exchange standards and software, and the participating organizations involved within the USA. It should not be used as a definitive source of technical information or for procurement purposes.

Suggestions for additions and corrections to this document should be sent to the IGES/PDES Testing Project Manager. Contact details are given in Section 9.

Acknowledgements

This document and the work described in it, are the product of many hours of voluntary effort on the part of the members of the IGES/PDES Testing Project.

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1 Introduction

1.1 Purpose

This document describes the structure of the IGES/PDES Testing Project, and some of the techniques and methodologies that it is investigating and developing.

Each section in this document provides an outline of a particular committee and gives a summary of the work that it performs. Readers are encouraged to consult the detailed documents created by each of these technical committees (these are referenced within the appropriate sections).

1.2 The need for testing

Experience has shown that data exchange translation software, based on IGES or other exchange specifications/standards, does not always perform as the user expects. The problem may be made up of several components including :

1. Restrictions or errors within the translation software
2. Use of techniques within the translation software which are inappropriate for a particular user or application
3. Inaccuracies or ambiguities within the data exchange specification itself
4. Incompatibilities between CAD/CAM/CAE ¹ systems
5. Unrealistic user expectations

All of these issues need to be addressed if data exchange is to be made predictable and reliable, and it is by generating information about the way that the translation software works (or fails) that testing can help most.

The ultimate aim of all data exchange specifications and software packages is to exchange actual production data between industrial enterprises. Therefore it is vital that users are able to test that this aim can be achieved within their working environment. Testing tools

¹For the rest of this document CAE is used to indicate the totality of CAD/CAM/CIM/CAE/FEA. See Glossary.

and methodologies are required to help users ensure that useful and accurate data can be transferred.

Many types and levels of testing are possible, all have advantages and disadvantages, but it is possible to combine the various elements to cover a wide range of requirements. As a minimum requirement, a user must be confident that any data he wishes to transfer can be converted into and out of a neutral format, such as IGES, in a consistent and accurate manner.

A first level of useful testing involves measuring the behaviour of the translation software against some documented criteria, such as syntax rules and conversion rules (or mappings). Such testing begins to establish how the implementor has chosen to convert CAE system features into IGES constructs, and *vice-versa*. This approach can be used by industrial users, or a small number of testing agencies might be established to perform the tests and publish the results. The independent agency approach avoids the need for each user to perform the same basic tests on a piece of software.

The implementors may also find that independent testing of their products can be valuable. Independent testing can provide additional quality assurance, and can avoid performing repeated benchmark tests for potential purchasers.

To avoid each user repeating tests on processors, for application specific requirements, it is possible to develop rigorous definitions of the way that particular application information is to be transferred. This allows more sophisticated and thorough testing to be performed, and thus gives a much higher level of confidence in the quality and appropriateness of translation packages. Testing at this level will begin to guarantee that all information within a particular domain can be transferred between systems.

Thorough testing can increase the quality of translator software, it can generate useful feedback to the standards makers, help to educate users, and it can increase user confidence in data exchange. All of these factors will combine to make industry more efficient and competitive by providing reliable digital based operations.

1.3 Charter of the IGES/PDES Testing Project

The IGES/PDES Testing Project was established to create and maintain a collection of test methods, data sets and software tools in order to support a variety of types of testing on IGES and STEP/PDES processors and data files. This charge includes coordinating the work of the project with that of other individuals and groups engaged in similar efforts.

1.4 Organization of the IGES/PDES Testing Project

The IGES/PDES Testing Project comprises five technical committees. These are :

1. Verification Testing Methodology (VTM) Committee
2. Application Validation Methodology (AVM) Committee
3. Interoperability Testing Methodology (ITM) Committee
4. Test Case Development (TCD) Committee
5. Testing Methodologies (TM) Committee

These five committees are coordinated by the IGES/PDES Testing Project Manager, who reports to the Technical Planning Committee and the Chairman of the IGES/PDES Organization.

In addition there is the IGES/PDES Testing Project Editorial Committee, this comprises the chairs of the above technical committees plus the IGES/PDES Testing Project Manager. It is responsible for ensuring editorial and technical consistency of all output from the IGES/PDES Testing Project, prior to submission to the IGES/PDES Edit Committee.

The National Institute of Standards and Technology (NIST) maintains a special working relationship with the testing committees. Unlike other aspects of IGES/PDES work, some of the testing activities require startup funding, or full-time effort, and thus all aspects cannot be undertaken by the voluntary IGES/PDES Organization. For example NIST is helping to establish an IGES Test Case Library.

1.5 Plans of the IGES/PDES Testing Project

Currently, a substantial portion of the IGES/PDES Testing Project effort is directed towards providing the technical resources for a National IGES Verification Testing Program. These resources have been developed and are now in a beta test phase. Following completion of the beta tests, the methodology will be refined and additional test cases will be included to produce a more comprehensive testing program for IGES 3.0 and 4.0 translators.

Another large effort is aimed at developing and approving application protocols and appropriate testing techniques. This work includes the production of documentation to help imple-

mentors write IGES/PDES application-based translators and the development of a testing program for application-based translators.

Users of IGES processors will be supported with guidelines for carrying out their own types of testing, and case studies of such exercises will be published to illustrate data exchange in operation. Additional test methods will be investigated for IGES processors, and methods will be established for STEP/PDES.

There are various other groups working on the testing of data exchange standards and related technologies. It is the intention of the IGES/PDES Testing Project to cooperate with such groups and to exchange applicable ideas.

Many aspects of this work will be outlined in future versions of this overview document, and detailed in technical committee documents.

2 Verification Testing

2.1 Introduction

To provide data on quality and usefulness of IGES processors, the IGES/PDES Organization and NIST are establishing the National IGES Verification Testing Program. This program is based upon the methodology described briefly here and detailed in the documents of the Verification Testing Methodology Committee, in particular reference [1]. The goal of this verification testing is the substantiation, by an independent agency, of an implementor's claims for the entity mappings and other processing performed by an IGES processor.

2.2 Verification testing methodology

The methodology consists of gathering from the client, for each IGES processor being tested, a set of claims for entity mappings and other processing. A formal test plan is developed to ensure that sufficient testing is conducted to verify the claims against observed outcome. This demonstrates that each claimed mapping is correctly described and constructed in accordance with the IGES specification.

This approach is designed to provide client and users with information about what to expect from a single given IGES processor (pre or postprocessor) in isolation and to provide the foundation upon which other testing activities can build. It will also provide vendors with independently derived, concrete data about their products with which to answer customer questions.

2.3 The role of a Testing Agency

Verification tests are administered by one or more independent, third party testing agencies. These agencies implement the verification testing methodology as developed by the IGES/PDES Organization.

Reference [1] provides detailed descriptions, but briefly, the methodology describes four functional areas that a testing agency must implement :

The Review Board: This is a corporate component of the testing agency which serves as an overseer of the agency's entire verification testing enterprise. The board reviews

and approves the qualifications and procedures of the IGES Verification Panel and any testing laboratories used, sets fees, and ensures that the rules of the agency are followed.

Administrative Staff: The people with documented procedures who provide logistic and administrative support for the testing enterprise of the agency. Responsibilities include scheduling meetings and tests, collecting fees, keeping records, and ensuring insurance coverage.

IGES Verification Panel: This panel, selected by the test agency review board, consists of experts in IGES and CAE data exchange. Panel members must act independently, rather than as representatives of their professional affiliation. Panel responsibilities include formulating operating procedures, reviewing verification requests, writing test plans and issuing formal summary reports of test outcomes.

Testing Laboratory: The testing laboratory actually performs the test in accordance with a test plan provided to it by the IGES Verification Panel. Responsibilities of the Testing Laboratory include establishing the test environment, executing the test cases specified and documenting results in accordance with the methodology of reference [1]. There may be more than one testing laboratory employed by the testing agency.

The flow of the verification process is depicted in Figure 1. It begins when an implementor, vendor, or other agency, called the "client," submits a completed verification request package. The completed package contains the client's claims for entity mappings between native entities and IGES entities (or *vice versa*) for a single IGES processor. This information and system-specific details for setup and operation of the implementation under test form the basis for both the test plan and later analysis of the results.

After receiving the request, the IGES Verification Panel reviews it for completeness and writes a test plan utilizing test cases available in the IGES Test Case Library. Testing agency staff then select a test laboratory, schedule the tests, and forward the test plan to the selected laboratory. The testing laboratory obtains the required test cases from the library, runs the prescribed tests according to the test plan, gathers the results, and forwards the results file to the IGES Verification Panel for analysis.

After completing the required analysis and formulating its conclusions, the IGES Verification Panel issues a summary report listing those claims that were verified and those that were not. The panel then provides a copy of the results file and the summary report to the client for review prior to any release of the data. The client has an opportunity (within 30 days) to respond, in writing, to any perceived problems. Problems are resolved by negotiation and/or retest.

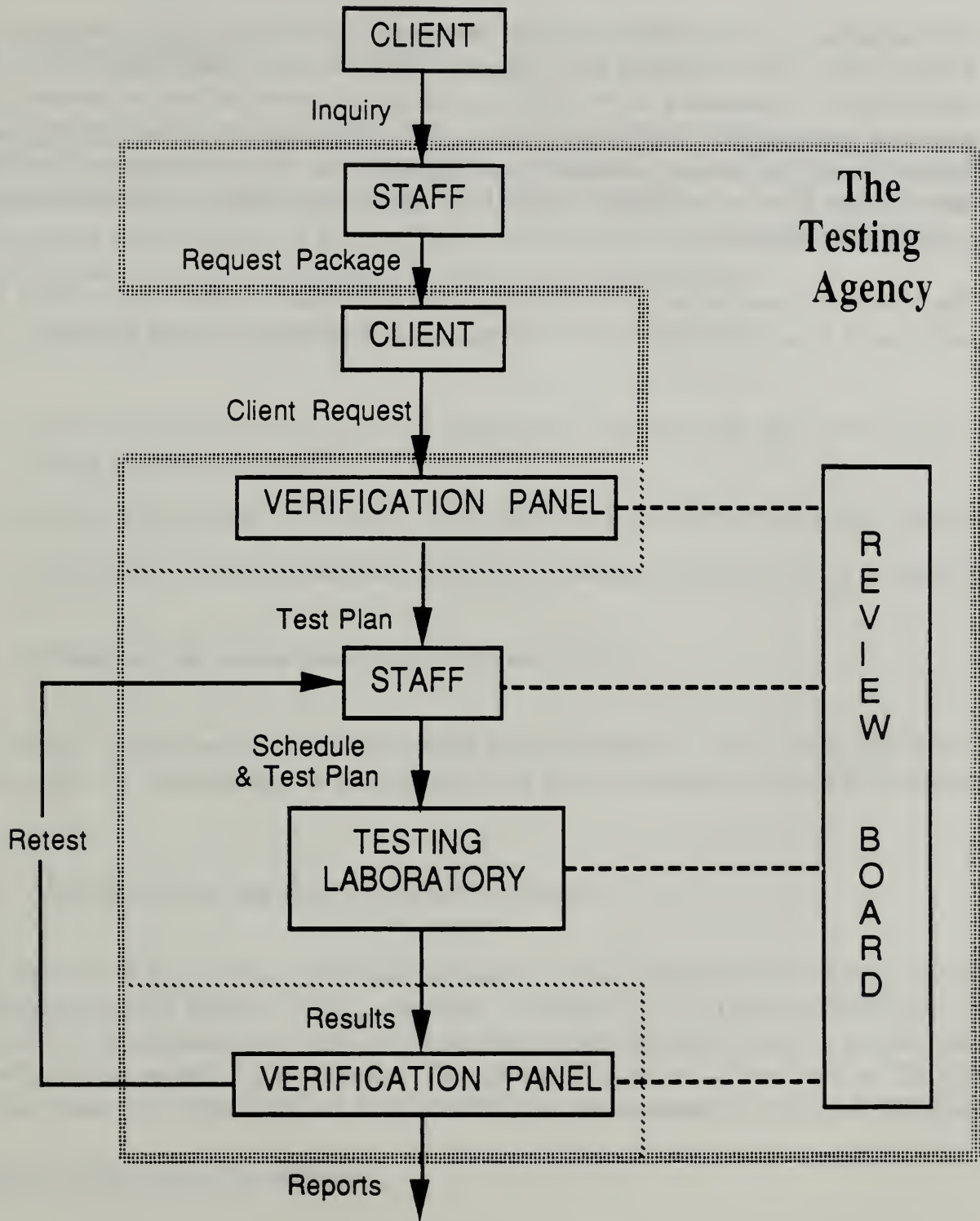


Figure 1: The flow of the verification process

2.4 Privileges and obligations of clients and users

It is important to the credibility and the usefulness of the National IGES Verification Testing Program that clients represent their support of IGES and their participation in IGES testing appropriately. Completing the verification program in no way implies the approval of an IGES processor by the IGES/PDES Organization, the testing agency, or the National Institute of Standards and Technology. In addition, participation in the beta testing of the verification methodology does not constitute having been verified and under no circumstances should be so claimed or implied.

There will be a mechanism for investigating any discrepancies discovered in IGES processors which have been submitted to the National IGES Verification Testing Program.

3 Application Validation Testing

3.1 Introduction

The Application Validation Methodology (AVM) Committee is responsible for developing and documenting procedures for ensuring that information can be completely and reliably exchanged within a specific application area. This committee provides guidelines for the development and validation of IGES/PDES application protocols and procedures for testing individual processors for conformance to these application protocols.

The AVM Committee primary work items are:

1. Define the required content of an application protocol (AP) and the procedures for testing and approving APs
2. Review draft APs at the request of the submitting IGES/PDES technical committees
3. Develop and document standard methods for testing conformance of a processor to an AP
4. Develop and document guidelines on the use of APs

The AVM Committee is also working with its counterparts in ISO TC184/SC4/WG1 to develop the AP methodology in conjunction with the development of the STEP standard.

3.2 Application protocol methodology

The concept of application protocols provides a formal procedure for specifying neutral, application-specific formats. The process for developing an AP includes identifying the information requirements of an application domain and documenting them in conjunction with an information model of that domain. The information model is then used in the selection of data constructs, from IGES or STEP/PDES, for representing the required information.

The key components of an AP are:

1. A scope and requirements statement of the application
2. An application reference model that describes the application's information structures

3. An application interpreted model that specifies the IGES or STEP/PDES constructs to be used to represent the application information
4. An AP format specification including a usage guide
5. A collection of conformance requirements and test cases

Currently there are draft IGES APs being developed as prototypes for testing and refining these concepts. The STEP/PDES community has recently initiated parallel efforts for applying the AP methods to that future standard.

3.3 Application protocol approval process

Application protocols are developed by a formal process that begins with the selection of candidate application areas. The complete process is best performed by a group of application experts, and is not covered in this document. Those who are interested in these specifics are directed to the AVM Committee document "Guidelines for the Specification and Validation of IGES Application Protocols" reference [2].

Once a candidate AP is complete and has been successfully validated (as specified in reference [2]), it must be approved by the AVM Committee. With this approval, the candidate AP will be presented to the Edit Committee of the IGES/PDES Organization for final approval.

3.4 Conformance testing of application protocol processors

Because an approved AP should contain explicit requirements for information representations and conversions, it is possible to perform very rigorous conformance testing upon any translation software which claims AP conformity. This requires that the full functionality specified by the application reference model is exercised, and that none of the format specification rules are broken.

4 Interoperability Testing

4.1 Introduction

The Interoperability Testing (ITM) Committee is responsible for developing and/or identifying documents, methodologies, and tools for ensuring that the required level of information can be adequately exchanged between CAE systems within a specific user environment. This committee provides guidelines for the development of user's requirements and provides procedures for testing the transfer of production data in accordance with these requirements.

Typical ITM committee work items are :

1. Updating and maintaining an interoperability testing methodology document.
2. Documenting case studies
3. Developing user guides on specific topics
4. Maintaining a listing and brief description of software tools which might be useful for interoperability testing

4.2 Interoperability test methodology

An interoperability test is built upon known information regarding the specific IGES processor implementations involved in the exchange. Such information could well be gained from the National IGES Verification Program and application protocol based testing. The interoperability test is conducted within the user's environment and is evaluated based upon the user's specific requirements. The evaluation determines what effect the imperfections of each implementation have on the overall translation. Depending on the user's requirements, some imperfections may be tolerable.

The key activities of an interoperability test are :

1. Establishing the user's data exchange requirements
2. Acquiring and analyzing an entity map comparison of the systems involved before specifying the scope of testing
3. Selection or development of appropriate test cases

4. Conducting the test
5. Analyzing the test results for acceptability for the specified task
6. For unacceptable test outcomes, identifying alternative mechanisms to achieve an acceptable outcome

The results of an interoperability test can provide the user of IGES processors with :

1. Increased confidence in the translation process between the specified CAE systems
2. An indication of the quality and completeness to be expected from a translation before serious costs have been incurred
3. An awareness of the capability and limitations of particular IGES processor implementations
4. The ability to identify or avoid potential translation problems with particular IGES processor implementations

In summary, interoperability tests assist the user in having more controlled and effective data exchange.

5 Test Case Development

5.1 Introduction

The Test Case Development (TCD) Committee is responsible for developing test cases and documentation for use by the IGES/PDES Testing Project, the National IGES Verification Testing Program, and for use by individuals wishing to test their own IGES processor software.

Those test cases developed by the TCD Committee will be reviewed by the IGES/PDES Organization and then added to the official IGES Test Case Library.

Typical TCD Committee work items are:

1. Providing the test cases for use in the beta-testing phase of the National IGES Verification Testing Program
2. Developing and maintaining a guide for IGES Test Case Development
3. Developing guidelines and test cases for application protocol and interoperability testing
4. Developing a methodology for specifying test case requirements, and specifying a software tool to aid test case specification
5. Documenting guidelines for writing the next generation of test cases based on the test case specification methodology.

As test case development guides are completed, it is anticipated that each technical committee responsible for revising or adding a new feature to the IGES specification, will use these guides to develop test cases for that feature. By doing this, test cases for new features will be available to the IGES community for processor testing.

Currently all test case development activity is based on IGES versions 3.0 and 4.0. No test cases are being considered for earlier versions of IGES.

5.2 Test case development methodology

The process of developing a test case includes identifying the scope of the test to be performed, determining the testing criteria, identifying the entities required, generating a test

specification, and writing a test case to satisfy the specific requirements.

The preprocessor portion of the test case takes the form of a generic script describing construction details and supporting documentation. Generic instructions ensure test case independence, avoidance of software specific terminology, and preservation of proprietary rights of CAE systems.

Each test case contains :

1. A unique identifier
2. A liability statement
3. A list of entities required for the test
4. A stated purpose for the test
5. A description of data used within the test
6. A script and results expected for the preprocessor
7. An IGES file and results expected for the postprocessor
8. A pictorial representation of the test data

The only information not resident within the test case is the system environment setting. Test cases are structured so that preprocessor and postprocessor are tested independently. A complete description of test case structure is contained in reference [4].

5.3 Test case review

When a test case has been written, either by members of the TCD Committee or a IGES/PDES technical committee, a review of the test case begins. At least three software tools analyze the test case for syntax accuracy and file integrity. All errors are corrected.

Next the test case is reviewed for completeness, consistency, and compliance with the test case specification. The test part must be created on three different CAE systems by three different proficient CAE operators. All problem areas are recorded throughout the review. In addition, each reviewer provides recommendations for improving test case instructions. Comments are evaluated by the TCD Committee and the test case modified accordingly.

Finally, each major release of test cases is brought before the Testing Project Editorial Committee. If there are no technical problems identified, the test cases are approved and sent to the Test Case Librarian for insertion into the official IGES Test Case Library.

5.4 Test case coverage

Test cases developed for verification testing will be single entity, for testing a single IGES processor at a time. Single entity is defined as being a primary entity under test but supporting entities may have to be present to create a valid environment. For example an angular dimension entity requires witness line, annotation, and leader entities.

A suite of test cases are being developed for the Verification Testing Methodology Committee, to support the National IGES Verification Testing Program as described in reference [1].

Future test cases will address attribute and functionality testing. Test cases to support application validation testing as stated in reference [2] will be based upon on this work. Test cases for the Interoperability Testing Methodology Committee will be highly specialized and directed to a specific data exchange problem, but the methodology, structures and tools developed by the TCD committee should be useful and appropriate.

It is important that test cases are developed so that the different levels of testing described in this document can build one upon the other. That is single entity testing must be done before multiple entity testing is attempted. Likewise single processor testing must be done before interoperability testing is attempted.

5.5 IGES Test Case Library

An official IGES Test Case Library is being built as a co-operative effort with the TCD Committee, IGES/PDES Organization, NIST, other Government agencies, and industry.

The official IGES Test Case Library will reside at NIST and be placed in the public domain. It is the intent of the IGES/PDES Testing Project that all approved test cases be available for use by anyone to perform testing on IGES processors. As the IGES/PDES Testing Project expands, the library will become more extensive and will contain very sophisticated and complex test cases.

Questions regarding the library of test cases should be directed to the Test Case Librarian. (Contact details are given in section 9.)

6 Testing Methodologies

6.1 Introduction

The Testing Methodologies Committee has the responsibility for collecting and disseminating information that might be appropriate or applicable to the rest of the IGES/PDES testing community.

6.2 Alternative methodologies

There has been significant progress in the testing of information technology standards and specifications such as GKS, ISO/OSI Networking, and various compilers such as Pascal and Ada. Although none of these is identical to IGES or STEP/PDES there are some similarities. Several of these standards have accredited testing services available, which means that formal procedures have been developed, and have been accepted by some national laboratory accreditation scheme.

In addition there has been significant work on the testing of data exchange specifications and standards such as SET, VDA-FS, and IGES within Europe. The finding from such work can be fed into the IGES/PDES arena through this committee to take full advantage of applicable ideas.

Conformance testing of STEP processors will require much more sophistication than the current IGES processor testing methodologies. This committee is responsible for identifying significant concepts and contributions.

7 Summary

The IGES/PDES Testing Project is addressing the problems of testing the processes and tools of data exchange in a variety of ways. The most stable of these alternatives are outlined in this document, but there are many other possibilities which have been, and will continue to be investigated.

The technical work towards a National IGES Verification Testing Program, is well advanced, but the administrative, financial, and legal aspects are outside the scope of the IGES/PDES Testing Project. A series of documents and case studies is being prepared to aid the user with in-house testing.

Work on developing and defining sufficiently rigorous rules for application-specific processors, is beginning to demonstrate that application protocols can provide a workable solution for IGES. In addition this approach offers a practical approach for STEP/PDES processors.

Carefully designed and constructed test cases form a common link between all testing methodologies, and the emphasis is moving towards providing software tools to generate test cases, as being the only realistic solution to the demand for extensive test case libraries.

The work being carried out in related fields, such as compiler and network protocol testing, by various national and international bodies is being investigated. The collection, assimilation, and dissemination of such information is seen as an important task for the IGES/PDES Testing Project.

As more work is done, this document will be updated on a regular basis. To maintain a broad view of the variety of work in this field, it will lead through to the more detailed documents of the IGES/PDES Testing Project and will act as part of the information dissemination process.

8 Terminology

This section defines the terminology for all committees and documents of the IGES/PDES Testing Project; consequently it includes some terms which do not appear within this document. Some terms are not yet in common usage within the IGES/PDES Testing Project; they appear here so that a single term may be adopted by all parties.

8.1 Glossary of Terms

The intention is to ensure that the terms used within the Testing Project have minimum conflict with the terminology being used in other related fields of software testing. To this end, the Draft Glossary being defined by the nearest equivalent ISO committee has been used as a basis, reference [5]. However it should be appreciated that currently there are some conflicts in usage, and these are marked. The conflicts will be resolved and documented, but users of these terms should be aware of the possibility of confusion or misunderstanding.

ACCEPTANCE TESTING Formal testing conducted to determine whether a software system satisfies its acceptance criteria, and to enable the customer to determine whether to accept the system for use in a specific environment. Formal testing includes the planning and execution of several kinds of tests (e. g. functional, volume, performance) to demonstrate that the implemented software satisfies the customer requirements for the software system. (Also known as “user-acceptance testing”.)

ACCEPTANCE TEST MODEL A test piece which resides on either the sending or receiving system in that system’s native data form, used in Acceptance testing.

(LABORATORY) ACCREDITATION The formalized initial and continuing process of ensuring a testing laboratory is competent to carry out specific types of tests.

NOTE: the term “laboratory accreditation” may cover the recognition of both the technical competence and the impartiality of a testing laboratory or only its technical competence. Accreditation is normally awarded following successful laboratory assessment and is followed by appropriate surveillance.

ACCREDITATION BODY A body that conducts and administers a laboratory accreditation scheme and grants accreditation.

NOTE: An accreditation body may wish to delegate fully or partially the assessment of a testing laboratory to another competent body (assessment agency). Whilst it is recognised that this may be a practical solution to extending recognition of testing laboratories, it is essential that such assessment be equivalent to that applied by the

accreditation body and that the accreditation body takes full responsibility for such extended accreditation.

APPLICATION INTERPRETED MODEL The model which specifies the IGES or STEP/PDES constructs to be used to represent the application information.

APPLICATION PROTOCOL A method to achieve consistent and reliable exchange of definition data within a specified application area. The key components of an application protocol are a conceptual information model for the application area with its supporting documentation, an application protocol format specification, and a set of application protocol format test cases.

APPLICATION PROTOCOL FORMAT An application specific format that is based on the embedding of items of information from a conceptual information model into specific entities of a data format.

APPLICATION PROTOCOL FORMAT SPECIFICATION A specification that provides a complete, rigorously defined and unambiguous means to represent the information that is required for a specific application area; consists of an application subset, the restrictions on the global, directory entry and parameter data sections and a usage guide for the application subset.

APPLICATION PROTOCOL FORMAT TRANSLATOR An application specific translator that is based on the embedding of CAD information from the application protocol information model into the CAD database format and the IGES entities in an application protocol format. The translator implements a single mapping association between a certain entity in the CAD database format and a certain IGES entity (APF preprocessor) and between a certain IGES entity and a certain entity in the CAD database format (APF postprocessor) to satisfy the needs of one application protocol and its associated application protocol format.

APPLICATION REFERENCE MODEL An information model that describes the information requirements and the information structure for an application area. The information model uses application specific terminology and rules familiar to an expert from the application area. The model is independent of any physical implementation and can be validated by an expert from the application area.

ATTRIBUTE Information, provided in specific fields within the directory entry of an IGES entity, which serves to qualify the entity definition.

CERTIFICATE OF CONFORMANCE (OR CONFORMITY) A document issued under the rules of a certification system indicating that adequate confidence is provided that an IUT is in conformance with a specific standard or technical specification as determined through the use of a specified test method.

- CERTIFICATION** The process by which a product or service is awarded a certificate of conformance.
- CERTIFICATION BODY** An impartial body possessing the necessary competence and reliability to operate or accredit operation of a certification system, and in which the interests of all parties concerned with the function of the system are represented.
- CLIENT** The organization that submits a system or implementation for any type of testing.
- CONFORMANCE** The fulfillment by an IUT of all requirements specified.
- CONFORMANCE TESTING** The testing of a candidate product for the existence of specific characteristics required by a standard; testing the extent to which the implementation under test (IUT) is a conforming implementation.
- DIRECTORY ENTRY SECTION** That section of an IGES file, consisting of fixed field data items for an index and attribute list of all entities in the file.
- ENTITY** The basic unit of information in an IGES file. The term applied to single items which may be individual elements of geometry, collections of annotation to form dimensions, or collections of entities to form structured entities.
- ENTITY TYPE NUMBER** A positive integer used to designate a specific type of entity. For example, the circular arc entity has an IGES entity type number of 100.
- FALSIFICATION TESTING** A test method developed to find errors in the implementation. If errors are found, one can correctly deduce the implementation does not conform to the standard; however, the absence of errors does not necessarily imply the converse. Falsification testing can only demonstrate non-conformance.
- FLAVORING** A condition that exists with IGES data that results from the combined effects of differing system capabilities, data base structures, user interfaces and translator mappings such that these effects results in a dispersal of information content into different sets of IGES entities.
- FORM NUMBER** An integer which is used when needed to further define a specific entity. This becomes necessary when there are several interpretations of an entity type.
- GEOMETRIC** Having to do with the shape information (points, curves, surfaces and volumes) necessary to represent an object.
- GLOBAL SECTION** That section of an IGES file consisting of general information describing the file, the file generator (preprocessor) and information needed by the file reader (postprocessor).
- IGES PROCESSOR** A generic name for a software package used to translate between CAD system and IGES (*and vice versa*). Sometimes called a translator.

IGES VERIFICATION PANEL A group of CAD industry representatives who are responsible for the formal testing procedures used in the verification process. Other duties include the creation of a test plan, production of final report and the arbitration of disputes.

IMPLEMENTATION UNDER TEST (IUT) That part of a product or service which is to be studied under testing, which should be an implementation of one or more characteristics of the standard

INSTANCE A particular occurrence of some item or relationship. Several instances may reference the same item.

INTEROPERABILITY TESTING Related to acceptance testing, but specifically applied to the examination of the information exchange between two specific IUTs and the ability of each IUT to use such information. This does not form part of conformance testing.

MODEL A particular collection of data which describes a product. This could be in an IGES file or within a CAD system.

PARAMETER DATA SECTION That section of an IGES file consisting of specific geometric or annotative information about the entities or pointers to related entities.

POINTER A number that indicates the location of an entity within an IGES file.

POSTPROCESSOR †A software unit that translates a file of product from the form of the IGES specification into the native data base form of a specific CAD/CAM system

PREPROCESSOR †A software unit that translates a file of product definition data from the native data base form of a specific CAD/CAM system into the form of the IGES standard.

PRODUCT DEFINITION data required to describe and communicate the characteristics of physical objects as manufactured products.

PROTOCOL A set of conventions or rules that govern the interactions of processes or applications within a computer system or network.

REVIEW BOARD A group of individuals working for a testing agency who are responsible for the review and approval of the testing program run by that agency.

START SECTION That section of an IGES file containing a human-readable prolog.

SUBSET A set of IGES entities that is less than the set of all IGES entities described in the IGES specification.

SUMMARY REPORT †A document, prepared by the IGES Verification Panel, describing which claims about a given translator could be verified and which could not. A summary of a verification test.

SYSTEM UNDER TEST (SUT) The computer hardware, software and communications network required to support the IUT

TERMINATE SECTION The final section of an IGES file, indicating the size of each of the preceding sections.

TESTING AGENCY An independent, corporate enterprise that is responsible for the complete execution of the IGES verification test. It is responsible for four primary functions which are : a review board, staff function, IGES verification panel and a testing laboratory(ies).

TESTING LABORATORY An organization that conducts an IGES verification test in accordance with a test plan submitted by a testing agency.

TEST PLAN A document which describes sequences of tests for a specific client. The test plan is derived from the Verification Request Package and is produced by the IGES Verification Panel.

TEST RESULTS FOLDER A folder containing the output of a verification test. It contains completed forms, the test log, incident reports, and all hardcopy generated during the test.

TEST SUITE †A collection of approved test cases.

TRANSLATOR see IGES processor

(END) USERS Those people who, in response to specific information transfer needs, move CAD data between similar or dissimilar systems and validate the results of those transfers.

VALIDATION †That activity which assures that a product or process functions and contains the features as prescribed by its requirements and specifications.

NOTE: can also be defined to mean the conformance assessment process and, when conformity is demonstrated, optionally issuing a certificate.

VERIFICATION †That testing of an implementor's claims for an entity mapping and system characteristics to assure that those claims are accurate and that the translators correctly produce and interpret IGES files in accordance with those mappings and the IGES specification. (also verification testing)

NOTE: can also be defined to mean the mathematical proof of an IUT's correctness, consistency and completeness.

VERSION NUMBER a means for uniquely designating one specification definition or translator implementation from a preceding or subsequent one.

8.2 Notes on usage of terms

This glossary is still being compiled, and some of the terms will be redefined in later editions of this document. In particular the terms marked † or ‡ should be used with caution, since alternative applications may use a similar or identical term with a different meaning.

The annotation added to this glossary is explained below.

† This definition is a modified form of an ISO definition to suit the application to IGES testing. Alternatively there is a very similar ISO defined term which might be confused.

‡ This definition conflicts with the ISO definition of the term, but is retained at present to maintain consistency with other IGES/PDES documents. The conflict will be resolved and documented, but until then the term should be used with caution.

8.3 Acronyms

AVM Application Validation Methodology - A test method, also associated with a committee of the IGES/PDES Testing Project.

CAE Computer Aided Engineering - Used within this document to indicate the sum of all activities which use computers to assist with the process of engineering and manufacturing. This would include design (CAD), manufacturing (CAM), analysis (CAA or FEA) and integrated manufacturing (CIM).

GKS Graphics Kernel System - An ISO standard for application independent computer graphics systems, with facilities for generating pictures, obtaining input from the user, and archiving.

IGES Initial Graphics Exchange Specification - A specification for exchanging product data between CAE systems. Appears in version 1.0, 2.0, 3.0, 4.0 and also as ANSI Y14.26M.

ISO International Organization for Standardization - The organization responsible for the development of international standards including STEP.

ITM Interoperability Testing Methodology - A test method, also associated with a committee of the IGES/PDES Testing Project.

- OSI** Open Systems Interconnection - The ISO series of standards covering computer networking technology.
- PDES** Product Data Exchange Specification - The US activity towards the development of STEP.
- SET** Standard d'Echange et de Transfert - The French standard (AFNOR Z68300) for data exchange and archiving.
- STEP** Standard for the Exchange of Product Model Data - The international standard currently being developed by the ISO TC184/SC4 committee.
- TCD** Test Case Development - A component of most test methods, also associated with a committee of the IGES/PDES Testing Project.
- VDA-FS** - VDA-Flächen-Schnittstelle - The German standard (DIN 66301) for the exchange of curve and surface data.
- VTM** Verification Testing Methodology - A test method, also associated with a committee of the IGES/PDES Testing Project.

9 Contact addresses

For further information on the topics discussed in this document, and the IGES/PDES Testing Project please contact :

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For information on Test cases within the public domain please contact :

IGES/PDES Test Case Librarian
National Institute of Standards & Technology
Building 220, Room A150
Gaithersburg
MD 20899.

10 References

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11. ABSTRACT (A 200-WORD OR LESS FACTUAL SUMMARY OF MOST SIGNIFICANT INFORMATION. IF DOCUMENT INCLUDES A SIGNIFICANT BIBLIOGRAPHY OR LITERATURE SURVEY, MENTION IT HERE.)

This report provides an overview of some of the test methods currently being developed by the Testing Project of the IGES/PDES Organization. The charter and structure of the IGES/PDES Testing Project is defined, and three different types of IGES testing are explained: verification testing, application validation testing, and interoperability testing. Also included is the Glossary of Terms which has been compiled for the IGES/PDES Testing Project.

12. KEY WORDS (6 TO 12 ENTRIES; ALPHABETICAL ORDER; CAPITALIZE ONLY PROPER NAMES; AND SEPARATE KEY WORDS BY SEMICOLONS)
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