

### Application Programmer's Interface (API) Standards

Standards at the API promote program and programmer portability. A standard at this level specifies a set of operations on a variety of graphics objects. An API standard provides for the portability of applications across a wide range of computer hardware, operating systems, programming languages, and graphics devices. A program written to an API standard at one facility in one environment should be easily transferable to another facility in a different environment. Facility dependencies should be the major area requiring modification.

The specific functions supported by a particular API standard provide certain capabilities. The application programmer, by identifying the capabilities needed, determines the API better suited for the application. As shown in Figure 2, there are currently two graphics API standards, GKS and PHIGS.

GKS provides a functional description of a two-dimensional (2D) graphics interface. It provides the basic graphics support required by a wide variety of application requiring the production of computer-generated pictures. A procedural language binding of a functional standard specifies the exact name for each operation, its parameter sequence, and the data types for the parameters. FORTRAN, Pascal, Ada and C language bindings are parts of GKS.

GKS is suitable for use in graphics programming applications that employ a broad spectrum of graphics, from simple passive graphics output (where pictures are produced solely by output functions without interaction with an operator) to interactive applications; and which control a whole range of graphics devices, including but not limited to vector and raster devices, microfilm recorders, storage displays, refresh displays, and color displays.

PHIGS provides for the definition, display, modification, and manipulation of 2D and graphical data. It provides functionality to support storage of graphics and application data in a hierarchical form. Information may be inserted, changed, and deleted from the hierarchical data storage with the functions provided by PHIGS. Language binding specifications for PHIGS include FORTRAN, C and Ada.

PHIGS is specifically designed to meet the performance requirements of such demanding applications as Computer Aided Design/Computer Aided Engineering/Computer Aided Manufacturing, command and control,

molecular modelling, simulation and process control.

Capabilities in PHIGS but not in GKS include: the centralized hierarchical data storage; the dynamic and responsive nature of interactions; the addition of a modeling capability; and support for color models other than Red-Green-Blue (RGB).

### Interoperability Standards

Graphics Interoperability standards allow graphical data to be interchanged between graphics devices. As shown in Figure 2, there are three graphics interoperability standards, CGM, (future) CGI, and IGES.

CGM is used for the storage and transfer of picture description information. It enables pictures to be recorded for long term storage, and to be exchanged between graphics devices, systems, and installations. As indicated in Figure 2, the storage mechanism for CGM is in the form of a neutral file format called a metafile. The software which creates the metafile is known as a CGM Generator. The software which reads and displays a CGM metafile is known as an Interpreter.

CGM specifies a semantic interface that describes 2D graphical entities using primitives (like polyline, text, and ellipse) and attributes (like color, line width, interior style, and fonts). CGM is compatible with the specification of 2D elements in GKS. A data encoding specifies the exact sequence of bits used to represent each operation and its parameters. CGM contains three types of data stream encodings (binary, character, and clear text) to provide the implementor choices depending on the particular application.

IGES provides a method for representing and storing geometric, topological, and non-geometric product definition data that is independent of any one system. Where CGM transfers graphical pictures, IGES transfers a graphical database which can be processed to represent a picture. Thus IGES represents more than just purely graphical data. As Figure 2 indicates, the storage mechanism for IGES is in the form of a neutral format that must be translated by a Preprocessor and Postprocessor for conversion between systems. IGES permits the compatible exchange of product definition data used by various computer aided design/computer aided manufacturing (CAD/CAM) systems.

The future CGI standard is designed to specify the exchange of information at the Virtual Device Interface. It will provide an interface between the device independent and device dependent parts of a graphic system. Since CGI

contains information at a virtual level, it can be used to create a CGM. A CGM can also be output on a CGI device in a straightforward manner.

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### Approval of Federal Information Processing Standards Publication 172-1, VHSIC Hardware Description Language (VHDL)

**AGENCY:** National Institute of Standards and Technology (NIST), Commerce.

**ACTION:** The purpose of this notice is to announce that the Secretary of Commerce has approved a revised standard, which will be published as FIPS Publication 172-1, VHSIC Hardware Description Language (VHDL). This FIPS adopts language specifications contained in ANSI/IEEE 1076-1993, IEEE Standard VHDL Language Reference Manual.

**SUMMARY:** On April 12, 1994 (59 FR 17336-17338), notice was published in the **Federal Register** that a revision to Federal Information Processing Standard 172, VHSIC Hardware Description Language (VHDL) was being proposed for Federal use.

The written comments submitted by interested parties and other material available to the Department relevant to the revised standard was reviewed by NIST. On the basis of this review, NIST recommended that the Secretary approve the revised standard as a Federal Information Processing Standards Publication, and prepared a detailed justification document for the Secretary's review in support of that recommendation.

The detailed justification document which was presented to the Secretary is part of the public record and is available for inspection and copying in the Department's Central Reference and Records Inspection Facility, Room 6020, Herbert C. Hoover Building, 14th Street between Pennsylvania and Constitution Avenues, NW, Washington, DC 20230.

This FIPS contains two sections: (1) An announcement section, which provides information concerning the applicability, implementation, and maintenance of the standard; and (2) a specifications section which deals with the technical requirements of the standard. Only the announcement section of the standard is provided in this notice.

**EFFECTIVE DATE:** This revised standard becomes effective May 1, 1995. Prior to

that date the requirements of FIPS PUB 172 apply to Federal VHDL procurements. This delayed effective date is intended to provide sufficient time for implementors of FIPS PUB 172 to make enhancements necessary for conformance of products to FIPS PUB 172-1.

**ADDRESSES:** Interested parties may purchase copies of this revised standard, including the technical specifications section, from the National Technical Information Service (NTIS). Specific ordering information from NTIS for this standard is set out in the Where to Obtain Copies Section of the announcement section of the standard.

**FOR FURTHER INFORMATION CONTACT:** Dr. William H. Dashiell, telephone (301) 975-2490, National Institute of Standards and Technology, Gaithersburg, MD 20899.

Dated: January 18, 1995.

**Samuel Kramer,**  
*Associate Director.*

### Federal Information Processing Standards Publication 172-1

*199X Month Day*

Announcing the Standard for VHSIC Hardware Description Language (VHDL)

Federal Information Processing Standards Publications (FIPS PUBS) are issued by the National Institute of Standards and Technology (NIST) after approval by the Secretary of Commerce pursuant to Section 111(d) of the Federal Property and Administrative Services Act of 1949 as amended by the Computer Security Act of 1987, Public Law 100-235.

1. Name of Standard. VHSIC Hardware Description Language (VHDL) (FIPS PUB 172-1).

2. Category of Standard. Software Standard, hardware Description Language.

3. Explanation. This publication is a revision of FIPS PUB 172 and supersedes that document in its entirety.

This publication announces the adoption of the Federal Information Processing Standard (FIPS) for VHDL. This FIPS adopts American National Standard Hardware Description Language VHDL (ANSI/IEEE 1076-1993) as stipulated in the Specifications Section. The American National Standard specifies the form and establishes the interpretation of programs expressed in VHDL. The purpose of the standard is to promote portability of VHDL programs for use on a variety of data processing systems. The standard is used by implementors as the reference authority in developing

compilers, interpreters, analyzers, simulators or other forms of high level language processors, and is used by digital hardware designers, and by other computer professionals who need to know the precise syntactic and semantic rules of the standard and who need to provide specifications for digital hardware descriptions.

4. Approving authority. Secretary of Commerce.

5. Maintenance Agency. U.S. Department of Commerce, National Institute of Standards and Technology (NIST), Computer Systems Laboratory (CSL).

6. Cross Index. ANSI/IEEE 1076-1993, IEEE Standard VHDL Language Reference Manual.

7. Related Documents.

a. Federal Information Resources Management Regulations (FIRMR) subpart 201.20.303, Standards, and subpart 201.39.1002, Federal Standards.

b. Federal ADP and Telecommunications Standards Index, U.S. General Services Administration, Information Resources Management Service, April 1994 (updated periodically).

c. NIST, Validated Products List, NISTIR 5475 (republished quarterly). Available by subscription from the National Technical Information Service (NTIS).

d. FIPS PUB 29-3, Interpretation Procedures for FIPS Software, 29 October 1992.

8. Objectives. Federal standards for high level digital design information and description languages permit Federal departments and agencies to exercise more effective control over the design, production, management, and maintenance of digital electronic systems. The primary objectives of this Federal hardware description language standard are:

- to encourage more effective utilization of design personnel by ensuring that design skills acquired under one job are transportable to other jobs, thereby reducing the cost of programmer retraining;
- to reduce the cost of design by achieving increased designer productivity and design accuracy through the use of formal languages;
- to reduce the overall life cycle cost for digital systems by establishing a common description language for the transfer of digital design information across organizational boundaries;
- to protect the immense investment of digital hardware from obsolescence by insuring to the maximal feasible extent that Federal hardware description language standards are

technically sound and that subsequent revisions are compatible with the installed base.

- to reduce Federal inventory of electronic digital replacement parts by describing these parts in a form which enable suppliers to quickly retool manufacturing facilities to meet Federal needs.

- to increase the sources of supplies which can satisfy government requirements for mission specific electronic digital components.

Government-wide attainment of the above objectives depends upon the widespread availability and use of comprehensive and precise standard language specifications.

9. Applicability.

a. Federal standards for hardware description languages are applicable for the design and description of digital systems developed for government use. This standard is suitable for use in the following digital system applications:

- primary design and description of digital systems, subsystems, assemblies, hybrid components, and components;
- formal specifications of digital systems throughout the procurement, contracting and development process;
- test generation for digital systems, subsystems, assemblies, hybrid components, and components;
- re-procurement and redesign of digital systems, subsystems, assemblies, hybrid components, and components.

b. The use of FIPS hardware description languages applies when one or more of the following situations exist:

- When using a formal language for specifying a formal design specification for a complex digital system.
- The digital system is under constant revision during the development process.
- It is desired to have the design understood by multiple groups, or organizations.
- The system under development is to be designed by multiple groups, or organizations.
- Accurate unambiguous specifications are required in the bid and contracting process.

10. Specifications. The Specifications for this standard are the language specifications contained in ANSI/IEEE 1076-1993, IEEE Standard VHDL Language Reference Manual.

This FIPS does not allow conforming implementations to extend the language. A conforming implementation is one that does not allow inclusion of substitute or additional language elements in order to accomplish a

feature of the language as specified in the language standard. A conforming implementation is one which adheres to and implements all of the language specifications contained in ANSI/IEEE 1076-1993 except where the language standard permits deviations and which specifies conspicuously in a separate section in the conforming implementation description all such permitted variations. Also, such conformance shall be with default language processor system option settings.

The ANSI/IEEE 1076-1993 document does not specify limits on the size or complexity of programs, the results when the rules of the standard fail to establish an interpretation, the means of supervisory control programs, or the means of transforming programs for processing.

11. Implementation. The implementation of this standard involves three areas of consideration: acquisition of VHDL processors, interpretation of FIPS VHDL, and validation of VHDL processors.

11.1 Effective Date. This revised standard becomes effective May 1, 1995. VHDL processors acquired for Federal use after the effective date shall implement FIPS Pub 172-1. Prior to that date requirements of FIPS Pub 172 apply to Federal VHDL procurements. This delayed effective date is intended to give implementations that conform to FIPS Pub 172 time to make the enhancements necessary to enable conformance to FIPS Pub 172-1.

A transition period provides time for industry to produce VHDL language processors conforming to the FIPS Pub 172-1. The transition period begins on the effective date and continues for 12 months thereafter. The provisions of FIPS Pub 172-1 apply to orders placed after the effective date of this publication; however a processor conforming to the FIPS Pub 172-1, if available, may be acquired for use prior to the effective date. If, during the transition period, a processor conforming to FIPS Pub 172-1 is not available, a processor conforming to FIPS Pub 172 may be acquired for interim use during the transition period.

11.2 Acquisition of VHDL Processors. Conformance to FIPS VHDL should be considered whether VHDL processors are developed internally, acquired as part of an ADP system procurement, acquired by separate procurement, used under an ADP leasing arrangement, or specified for use in contracts for hardware description services. Recommended terminology for procurement of FIPS VHDL is contained in the U.S. General Services

Administration publication Federal ADP & Telecommunications Standards Index, Chapter 4 Part 1.

11.3 Interpretation of FIPS VHDL. The National Institute of Standards and Technology provides for the resolution of questions regarding the specifications and requirements, and issues official interpretations as needed. All questions about the interpretation of this standard should be addressed to: Director, Computer Systems Laboratory, ATTN: FIPS VHDL Interpretation, National Institute of Standards and Technology, Gaithersburg, MD 20899, Voice: 301-975-2490, FAX: 301-948-6213, dashnell@alpha.ncsl.nist.gov e-mail.

11.4 Validation of VHDL Processors: The validation of VHDL processors for conformance to this standard applies when NIST VHDL validation procedures are available. At the present time NIST does not have procedures for validating VHDL processors. NIST is currently investigating methods which may be considered for validating processors for conformance to this standard.

For further information contact: Director, Computer Systems Laboratory, Attn: FIPS VHDL Validation, National Institute of Standards and Technology, Gaithersburg, MD 20899, Voice: 301-975-2490, FAX: 301-948-6213, dashnell@alpha.ncsl.nist.gov e-mail.

#### 12. Waivers.

Under certain exceptional circumstances, the heads of Federal departments and agencies may approve waivers to Federal Information Processing Standards (FIPS). The head of such agency may redelegate such authority only to a senior official designated pursuant to section 3506(b) of Title 44, U.S. Code. Waivers shall be granted only when:

a. Compliance with a standard would adversely affect the accomplishment of the mission of an operator of a Federal computer system, or

b. Cause a major adverse financial impact on the operator which is not offset by Government-wide savings.

Agency heads may act upon a written waiver request containing the information detailed above. Agency heads may also act without a written waiver request when they determine that conditions for meeting the standard cannot be met. Agency heads may approve waivers only by a written decision which explains the basis on which the agency head made the required finding(s). A copy of each such decision, with procurement sensitive classified portions clearly identified, shall be sent to: National Institute of Standards and Technology, ATTN: FIPS Waiver Decisions, Technology Building, Room B-154, Gaithersburg, MD 20899.

In addition, notice of each waiver granted and each delegation of authority to approve waivers shall be sent promptly to the Committee on Government Operations of the House of Representatives and the Committee on Governmental Affairs of the Senate and shall be published promptly in the **Federal Register**.

When the determination on a waiver applies to the procurement of equipment and/or services, a notice of the waiver determination must be published in the *Commerce Business Daily* as a part of the notice of solicitation for offers of an acquisition or, if the waiver determination is made after that notice is published, by amendment to such notice.

A copy of the waiver, any supporting documents, the document approving the waiver and any supporting and accompanying documents, with such deletions as the agency is authorized and decides to make under 5 U.S.C. Section 552(b), shall be part of the procurement documentation and retained by the agency.

13. Where to Obtain Copies. Copies of this publication are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161, telephone (703) 487-4650. (Sale of the included specifications document is by arrangement with the American National Standards Institute.) When ordering, refer to Federal Information Processing Standards Publication 172-1 (FIPSPUB172-1), and title. Payment may be made by check, money order, or deposit account.

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## Technology Administration

### Metric Policy Interagency Council and Commerce Department; Metric Town Meeting

**ACTION:** Notice.

**SUMMARY:** The Department of Commerce and the Interagency Council on Metric Policy will hold a Metric Town Meeting to listen to the concerns and ideas of the private sector for accelerating the transition to the metric system including actions that the Government can take to make it easier for industry to convert to metric use. Written submissions of views are welcome. All, however, are encouraged to participate in person at the Metric Town Meeting to benefit from sharing of views. Those wishing to speak should briefly describe their topic(s) and summarize their