American Nuclear Society

recommended programming practices to facilitate the portability of scientific and engineering computer programs

WITHDRAWN

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Recommended Programming Practices to Facilitate the Portability of Scientific and Engineering Computer Programs

Secretariat
American Nuclear Society

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Foreword

(This Foreword is not a part of American National Standard for Recommended Programming Practices to Facilitate the Portability of Scientific and Engineering Computer Programs, ANSI/ANS-10.2-1988.)

This standard is a major revision of American National Standard for Recommended Programming Practices to Facilitate the Portability of Digital Computer Programs, ANSI/ANS-10.2-1982. Both documents were prepared by Subcommittee ANS-10, Mathematics and Computation, of the Standards Committee of the American Nuclear Society (ANS). This subcommittee is sponsored by the Mathematics and Computation Division of the Society. Since its inception the Mathematics and Computation Division has encouraged and promoted the interchange of digital computer programs (codes) within the nuclear industry. The practices recommended herein are based on experience in working with programs for scientific and engineering calculations in this industry and, in general, apply to mainframe, micro, and mini computer software.

To obtain feedback from users and developers of computer programs on the importance and the desired content of a programming practices standard, a questionnaire was published in 1978 in an ANS Mathematics and Computation Division Newsletter. In addition, it was also distributed by the National Energy Software Center (previously called the Argonne Code Center) and by the Radiation Shielding Information Center (RSIC). Over 300 responses were received from engineers, scientists, programmers, systems analysts and managers. A cross-section was obtained from government, industry, and academia—both foreign and domestic. The majority of respondents expressed support for such a standard.

As a guideline, this standard recommends programming practices to facilitate the portability of computer programs prepared for scientific and engineering computation on micro, mini, and mainframe computers. It is one of four documents directed toward individuals who develop computer programs. The other three are:

ANSI/ANS-10.3-1986, Guidelines for the Documentation of Digital Computer Programs,

ANSI/ANS-10.4-1987, Guidelines for the Verification and Validation of Scientific Computer Programs for the Nuclear Industry, and

ANSI/ANS-10.5-1986, Guidelines for Considering User Needs in Computer Program Development.

The definition of "guidelines," as used here, is taken from American National Standard Quality Assurance Terms and Definitions, ANSI/ASME N45.2.10-1973:*

> "Particular provisions which are considered good practice but which are not mandatory in programs intended to comply with this standard. The term 'should' denotes a guideline; the term 'shall' denotes a mandatory requirement."

This standard is directed at the computer-independent aspects of digital computer programs. That is, the program developer is asked to accept the fact that many of the difficulties associated with the "portability of computer programs" can be avoided. Unnecessary expense, waste of effort, and loss of computing capability have occurred because the practices recommended have not been assigned sufficient importance. This is true not only in program conversion between installations but also in program

*Now incorporated into American National Standard Quality Assurance Program Requirements for Nuclear Facilities, ANSI/ASME NQA-1-1986.

modification and conversion within the originating installation. Some of the recommendations herein cover elementary practices normally followed, yet often overlooked. They can be put into practice with only a reasonable amount of additional effort over that normally expended in developing major computer programs.

These recommendations may have to be supplemented to cover local requirements for program development to accommodate the computing environment and application considerations.

In addition, the rapid advance in computing technology has caused significant impact on the choice of computers and the programming environment for scientific and engineering applications. The availability of supercomputers, the growth of minicomputers, and the widespread acceptance of personal (micro) computers all have increased the use of computer terminals and time sharing. In reviewing the technology and observing application needs, it was found that guidelines for good scientific/engineering programming have merit independent of the computer environment. The foundation for practices that facilitate use apply equally to a program designed for interactive application as well as to a program intended for batch processing. Also, support for the concept of structured programming is growing. This standard is not intended to address structured programming techniques per se; however, acceptance of structured programming ideas is a step in the direction of further improving the portability of computer programs.

The American National Standard Programming Language FORTRAN, ANSI X3.9-1978, is currently recognized as the de facto standard for much scientific and engineering computation. Thus, many of the practices recommended herein are directed at FORTRAN programming. Several "higher level" programming languages, in addition to FORTRAN, are in use, such as Algol, Pascal, PL/I, C, and Ada. Many of the recommended guidelines can be applied to these languages. Therefore, the development of and experimentation with more advanced higher level languages is encouraged. This document will be modified to acknowledge new de facto standards as they evolve. The need for compatibility within the advancing technology is recognized, and effort toward satisfying this need is encouraged.

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Contents

Section — Page

1. Scope and Objectives 1
   1.1 Scope 1
   1.2 Objectives 1

2. Definitions 1

3. Introduction 1

4. Recommendations 2
   4.1 Program Organization 2
   4.2 Programming Language 2
   4.3 Data Handling 2
   4.4 Program Features 2
   4.5 Source Statements and Variables 3
   4.6 Hardware and Software Dependencies 3
   4.7 Good Programming Practices 4

5. References 4