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A WORKING GLOSSARY OF
COMPUTER SOFTWARE TERMS

INTRODUCTION

This glossary contains working definitions of software terms which were compiled during the General Accounting Office study of computer software conversion in the Federal Government. Some are from the American National Standards Institute vocabulary (1971). For other, newer terms, we coined our own definitions. While ours are neither standard nor official, we suggest that they may be useful working definitions for others.

The study's report to the Congress, Millions in Savings Possible in Converting Programs From One Computer To Another, (GAO Report No. FGMSD-77-34), was published on September 15, 1977.

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GLOSSARY OF COMPUTER SOFTWARE TERMS

Applications programs/
applications software

Computer programs which directly automate the functions or problems of end users (lay persons). Applications programs automate both business applications such as payroll and scientific applications such as statistical calculations.

Assembler/assembly
language

A lower level computer language in which the programmer represents single machine language statements, or groups of them, by terse mnemonic codes. Programs written in assembly language are typically able to run only on the make of computer for which they are originally developed.

Automatic data
processing (ADP)

Data processing largely performed by automatic means and, by extension, the discipline which deals with the methods and techniques of that processing.

Business data
processing

Data processing which automates clerical and administrative tasks such as payroll, personnel skills inventory, accounts receivable, and inventory. Contrast with scientific data processing which includes simulations, war games, and statistical data reduction.

Chief programmer team
(operation)

An organization for computer programming wherein a very superior programmer is the technical leader of a team consisting, as a minimum, of a chief programmer himself, a backup programmer, and a programming librarian/programming secretary. As needed, the team may be augmented with two to three additional members and may consult specialists. The key concepts are those of:

- Making programming a public "engineering" practice instead of a private art.
- Providing support so that a very superior creator can concentrate on creating.

Closed shop

The operation of a computer facility in which most productive problem programming is done by a group of specialists. Problem originators (users) do not do their own programming in such a shop.

COBOL
(Common business
oriented language)

A higher level language (compiler language) developed circa 1960 to provide an easily learned English-like language for business data processing applications. Since its inception, COBOL has seen widespread use in business applications and augmentation of its original features. There have been three ANSI standards: 1960, 1968, and 1974. Federal Standard COBOL (FIPS PUB 21) has become the official standard for business applications.

Coder

One who expresses a problem design, or part of a problem, in a computer language. Typically, the term "coder" is used in the derogatory sense of a person who does little analysis and planning, but merely expresses someone else's design in a computer language.

Comments

English prose which may be interspersed among the computer language statements of a computer program to explain their action to human readers of the program. Special markers on the comments cause the computer to ignore them. Properly done comments are a valuable form of internal documentation because they are embedded in the program itself; therefore they stay with the program.

Compiler

A computer program whose purpose is that of translating higher level language statements into a form that can directly activate the computer hardware.

Computer program

A formal expression of the sequence of actions required for a data processing task. The program is the programmer's specification of the task(s) to the computer in a formal notation which can be processed by the computer. (See programming language.)

Data

Any representations, such as numeric digits, alphabetic characters, or analog quantities, to which meaning is or might be assigned. :

Data bank

A comprehensive collection of libraries of data. Each library

in the data bank is made up of one or more files; each file is a collection of records, and each record is made up of a collection of items. Examples:

--Item: pay rate of an employee.
--Record: the employee pay record, including SSAN, pay rate, and year-to-date totals.

--File: the employee pay file made up of the pay record for all the firm's employees.

--Library: the personnel library made up of the:

- Pay file;
- Skills inventory file;
- Health insurance file.

--Data bank: made up of all the firm's libraries, including the:

- Personnel library;
- Vendor library;
- Customer library;
- Inventory library.

Data processing

The execution of a systematic sequence of operations upon data. Synonymous with information processing.

Data reduction

The transformation of raw data into a more useful form, e.g., smoothing to reduce noise.

Decision table

A table of all contingencies that are to be considered in the description of a problem, together with the action(s) to be taken for each contingency. Decision tables are sometimes used in place of flow charts for problem description and documentation.

Development support
library (programming
support library)

An automated facility with which a programming librarian maintains program development files, including source code versions, test data sets, and narrative documentation. The library contains up-to-date representations of programs and test data in both computer- and human-readable forms. The librarian maintains the library according to a set of office and computer procedures which separates clerical and book-keeping operations from programming tasks.

Direct access

Pertaining to the process of storing data, in, or getting data from, a storage device in such a manner that surrounding data need not be scanned to locate the desired data. Also, the time required to get desired data from the storage device is independent of the location of the data.

Documentation

Narrative, schematic, or tabular material which accompanies a computer program or is embedded in it. Computer program documentation has the purposes of recording and explaining:

- The development of a computer program.
- The way in which it was constructed, including important decisions between alternatives.
- The way it is intended to operate in normal, frequently encountered circumstances.

--The way it is intended to operate in abnormal or infrequently encountered circumstances.

--What tests have been made to verify its correctness.

Computer program documentation may be internal to the program in the form of:

--Embedded comments or remarks (English which appears among the actual program statements but does not affect the operation of the programs).

--Self-descriptive programmer--chosen names for variables and procedures.

--Well organized, "structured," (see elsewhere) organization of the actual program statements themselves.

Or external to the program in the form of:

--Flowcharts (see elsewhere).
--HIPO charts (see elsewhere).
--Narrative.
--Decision tables (see elsewhere).

Emulate

To imitate one hardware system with another, by means of an electronic attachment, such that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated system.

Extension

(E.g., to a source language.) An additional feature beyond what is regularly available in the standard.

Field

In a record, a specified area used for a particular item of data; e.g., the card columns which represent a wage rate.

File

A collection of related records treated as a unit, e.g., one line of an invoice may be a field, a completed invoice may form a record, the set of records may form a file, a collection of files a library, and all the libraries of an organization its data bank.

File maintenance

The activity of keeping a file up to date by adding, changing, or deleting data.

Flowchart

A graphical representation for the definition, analysis, or solution of a problem, in which symbols are used to represent operations, data, control, etc. A schematic visual description of the logic of a program module.

FORTRAN

(FORMula TRANslating system). A compiler language primarily used for computer programs which automate scientific or mathematical calculations. The DOD standard for scientific applications.

Generality

The generality of a computer program means its solution of a problem in such a way that it will serve a variety of users with the same general kind of problem. A simple example is that of a payroll program which writes a warning message if the net pay it calculates for someone is more than a certain amount. A program with less generality would have a fixed limit; a program with more generality would allow each individual user to specify his/her own limit value, or to turn off the warning feature altogether.

Generate

To produce a program by selection of subsets from a set of skeletal coding under the control of parameters, i.e., to

produce a program by use of a generator (see below).

Generator

A software package which contains a number of routines to accomplish specific functions. These routines are capable of accepting input parameters and modifying themselves as the parameters indicate. Generators are used to make the implementation of specific, limited tasks very convenient. Typically, the user fills out a set of parameter forms defining his or her task. An example is the report generator.

Hardware

The physical equipment of a computer system, e.g., mechanical, magnetic, electrical, or electronic devices. Contrast with software.

Higher-level language (HLL)

A computer language the statements of which must pass through an intermediate translation process before it can cause the sequence of actions it expresses to be done by the computer. Higher-level languages (HLLs) are used to provide the human programmer with more convenient languages for programming in the interests of increasing productivity and reducing errors.

Hierarchy plus Input, Process, and Output (HIPO)

A design and program documentation method which represents functional structure and data flow in a series of three types of diagrams. These diagrams are: the visual tables of contents, which name the program modules and specify their hierarchical relationships, the overview diagrams, which describe the input, processing, and output for members

of the hierarchy, and the detailed diagrams which extend the overview diagrams to include more specific Input, Processing, and Output detail with narrative.

Integrated data processing

Data processing in which the coordination of data acquisition and all other stages of data processing is achieved in a coherent system, e.g., a business data processing system in which data for orders and buying are combined to accomplish the functions of scheduling, invoicing, and accounting.

Item

In general, one member of a group major element; e.g., a record may contain a number of items such as fields or groups of fields. If used as data item, then synonymous with field.

Library routine

A proven routine that is kept in a program library.

Load module

A computer program in a form that is suitable to be immediately executed, by the circuitry of the computer.

Maintenance

Any activity intended to eliminate faults or to keep hardware or programs in satisfactory working condition, including tests, measurements, replacements, adjustments, and repairs.

Minicomputer

A relatively new development in the ADP field which defies definition because of the diverse technological and marketing characteristics of the equipments to which it

is applied. A recent GAO report described a mini-computer thus:

(1) Technical: a simple computer system costing \$50,000 or less, whose technical features are either smaller or simpler than those of large computers. Also, a minicomputer is typically capable of operating in a "harsher" environment than that required by larger computer systems.

(2) Marketing: The system software available with minicomputers is limited. A minicomputer can often be bought new in a "stripped" condition, excluding products and services that must often be bought with a larger system.

Medium

The material on which data are recorded; e.g., paper tape, cards; magnetic tape.

New programing
technology(ies)

A collection of software development practices, procedures, and techniques, largely developed by IBM, which has demonstrated striking examples of improvement in the software development process. These items include:

- Structured programing
- Topdown development
- HIPO documentation
- Development support library
- Chief Programmer Team
- Structured walk throughs
- Automated programmer productivity aids, such as the Structured Programing Facility (SPF).

Object code Output from a compiler or assembler which is itself executable machine code or is suitable for further processing to produce executable machine code.

Open shop Pertaining to the operation of a computer facility in which most productive problem programming is performed by the problem originator rather than by a group of programming specialists. Contrast with closed shop.

Operating system Software which controls the execution of computer programs and which may provide scheduling, debugging, input/output control, accounting, compilation, storage assignment, data management, and related services.

Packaged software Software which is sold by a vendor (e.g., a "software house") in the form of a prepared "package" consisting of the program(s) itself, documentation such as flowcharts and users' manuals, and, perhaps test data with which to demonstrate the correct operation of the program after it is installed in the client's computer.

Peripheral equipment In a data processing system, any unit of equipment, distinct from that central processing unit, which may provide the system with outside communication.

PL/I A general purpose compiler language, developed by IBM, which combines many of the features of the earlier computer languages--FORTRAN, COBOL, and ALGOL. PL/I was designed to be suitable for either scientific or business applications.

Precompiler

A computer program which processes the source code of another computer program immediately before that program is to be compiled. It may provide the programmer:

- The ability to use convenient abbreviations which are not acceptable to the compiler itself: the precompiler expands ("transcribes") the shorthand version into source code which is acceptable to the compiler.
- The ability to use non-standard programming statements which are not acceptable to the compiler. This may be done to aid structured programming in a language that is not well suited to it. The added statements are translated into standard language statements (called a structured programming precompiler).
- The ability to enforce standards. The source statements written by a programmer can be "edited" for usages which violate the standards the programmer is supposed to be following.

Problem description

In information processing, the statement of a problem. The statement may also include a description of the method of solution, the solution itself, the transformation of data, and the relationship of procedures, data, constraints, and environment.

Problem oriented language

A programming language designed for the convenient expression of a given class of problems.

Procedure oriented language:

A programming language designed for the convenient expression of procedures used in the solution of a wide class of problems.

Productivity aids/automated productivity aids/programmer productivity aids

Facilities which automate a number of the clerical tasks associated with computer programming. (A development support library is a collection of such aids.) Important aids are: editor facilities which a programmer may use to rapidly manipulate the source statements of a program and library maintenance routines which enable a programmer to conveniently store and reuse programs that have already been developed.

Program (computer program)

A series of instructions that will cause a computer to process data. It may be in a high level source form, which requires intermediate processing before the computer can execute it, or it may be in an object form which is directly executable by the computer.

Program library

A collection of available computer programs and routines, or portions of programs. The contents of the library are stored for reuse. If they are complete programs, they may be simply reused as is. Parts of programs may be copied into other programs to reduce labor and standardize the use of those copied parts in new programs.

Programing librarian

A person who is one of the three nucleus members of the Chief Programmer Team. This person maintains and operates the development support library. Duties include code creation ("keypunching"), submission of computer runs, and filing and logging of all outputs.

Programing language

A scheme of formal notation by which a programmer specifies computer programs to the computer hardware. There are hundreds of programing languages in existence, ranging from machine-oriented languages very difficult for a human to follow or use to higher-level languages which require intermediate translation before they can be used by the machine.

Programed check

A check procedure designed by the programmer and implemented specifically as a part of his program.

Programer

A person mainly involved in designing, writing, and testing computer programs.

Real time

Pertaining to the performance of a computation during the actual time that the related physical process transpires, in order that results of the computation can be used to guide the physical process.

Robustness

The quality that causes a software program or set of programs to be able to handle, or at least avoid disaster in the face of, unexpected

circumstances, for example, when given improper data. An example is the deliberate inclusion of program logic to process anticipated errors in the input. An example of such anticipatory action is to test for the presence of alphabetic data that was accidentally keypunched into a location reserved for numbers; when such an error is detected, the record containing it is shunted aside from further processing.

Simulation

The representation of certain features of the behavior of a physical or abstract system by the behavior of another system; e.g., the representation of physical phenomena by means of operations performed by a computer or the representation of operations of a computer by those of another computer.

Software

A set of computer programs, procedures, and possibly associated documentation concerned with the operation of a data processing system; e.g., compilers, library routines, and manuals. Three categories of software are:

--Applications software, which is done to automate the data processing of an end user (lay person). Applications software may automate business data processing functions such as payroll and inventory control, or it may automate scientific data processing such as the statistical calculation of a standard deviation.

--Utility software, which provides conveniences to the programmers who are developing applications software. These conveniences include programs which draw flowcharts of other programs and programs which provide a generalized sorting capability.

--Systems software, which controls operation of the machine resources. Systems software includes supervisory control programs (SCP), which assign machine resources to user programs and schedule their execution, and compilers (see elsewhere).

Software engineering

A term coined in 1967 by the Study Group on Computer Science of the NATO Science Committee to imply the need for software manufacture based on the types of theoretical foundations and practical disciplines that are traditional in established branches of engineering. Software engineering is concerned with the development and implementation of large-scale software systems on production-model computers. Software engineering includes a broad range of topics related to the controlled design and development of high-quality computer software. They include:

- (1) Programing methodology:
 - Structured programing.
 - Egoless programing.
 - Software quality assurance.
 - Programing productivity aids.

(2) Management of software projects:

- Chief programmer teams.
- Program support library.
- HIPO technique.
- Structured walkthroughs.

Source language

A computer program written in a source language, such as FORTRAN or COBOL, must be processed by an intermediate program (e.g., compiler) into a form that can instruct the machine directly (object module) before the problem solution expressed in the source language can be performed by the machine.

Source program

A computer program written in a source language.

Standards enforcer

A computer program used to automatically determine whether prescribed programming standards and practices have been followed.

Statement

A meaningful expression in a source language.

Structured programming

The arrangement of the source statements of a computer program so that the static representation of the program (human-readable text) reflects as closely as possible the dynamic execution of the program by the computer. Structured programming imposes a discipline upon programmers to think through the problem and organize the program because it forbids "patching." Structured programming is done to enhance programmer comprehension of the problem, and enhance the maintainability and legibility of the code. Also, it has been found that fewer errors are made

when structured programming is used.

Structured walkthroughs

Technical conferences or reviews intended to analyze design, detect errors and exchange knowledge and ideas. All technical members of the project team have their work product technically reviewed with emphasis on error detection.

Subroutine

A routine that can be part of another routine or program. A subroutine is often stored for use by several programs which need a common calculation, e.g., standard deviation (mathematical subroutine).

Syntax

- (1) The structure of expressions in a language.
- (2) The rules governing the structure of a language.

Systems analysis

The art or science of analyzing a user's information needs and devising aggregates of machines, people, and procedures to meet those needs.

Systems analyst

One who does systems analysis.

Systems software

Programs which run the computer system and aid the application programmer in doing his/her task. Systems software is typically developed by a vendor and sold to a computer user. The vendor who sells systems software may be the same vendor who sold the user the computer (still the most common case) or may be an independent software vendor.

Text editor

A computer program used to manipulate text, for example, to erase, insert, change, and move words or groups of words. The text manipulated may be another computer program.

Top-down development

An architectural discipline for computer program development wherein the high-level functions are coded and tested in an outline form early in the development process. Lower-level detail is added and tested progressively. A program development method which gives order to the implementation of a software system. From specifications and interfaces the complete package is constructed beginning with the highest levels of control, e.g., job control languages and operating system services, progressing to program control modules and extending to successively more detailed levels of program modules in a hierarchically descending structure. The effect of this approach is twofold. First, the actual system integration effort occurs simultaneously with the development; and second, an increasingly capable operational system is in use during development.

Transaction file

A file containing relatively transient data to be processed in combination with a master file. For example, in a payroll application, a transaction file indicating hours worked might be processed with a master file containing employee name and rate of pay.

Utilities

Computer programs which provide commonly needed services, such as transferring data from one medium to another (cards to tape), and character conversion. Vendors of large computer systems commonly supply a set of utilities with their systems.

Write

To record data in a storage device or data medium.