RISC System/6000

Software Offerings Overview

For the Power Seeker • Open computing • Complete connectivity • Advanced file system • Enhanced system management

IBM

First Edition (February 1990)

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Overview of AIX for RISC System/6000 Software

The AIX for RISC System/6000 system supports a wide variety of application programs. IBM offers IBM AIX Version 3 for RISC System/6000 as the foundation for IBM and non–IBM applications running on the AIX for RISC System/6000 system. Once ported, many programs designed to run on other systems supporting different versions of the AIX Operating System can also run on the AIX for RISC System/6000 system. With the support of AIX for RISC System/6000, the AIX for RISC System/6000 system can run applications as diverse as engineering and scientific graphics programs, complex banking and financial programs, and manufacturing control programs.

This document describes features of AIX for RISC System/6000 and some of the related licensed programs that IBM markets. The following publications provide more information about the AIX for RISC System/6000 product offerings referred to in this document:

- *IBM RISC System/6000 Hardware Offerings Overview*, GC23–2188
- *IBM RISC System/6000 Communications Connectivity Overview*, GC23–2190
- *IBM RISC System/6000 Documentation and Training Offerings Overview*, GC23–2192.

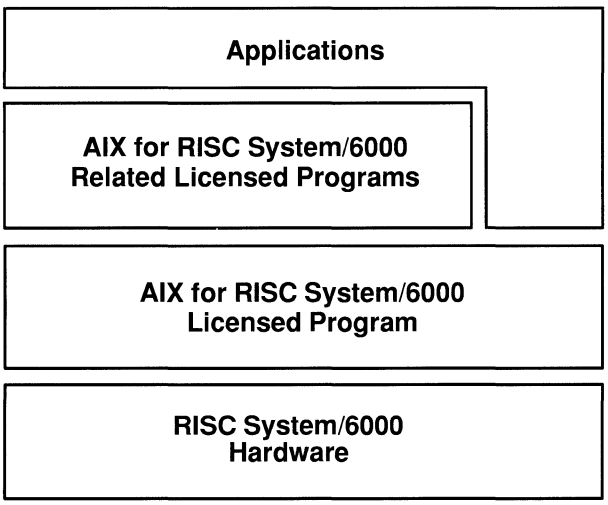

Figure 1. AIX for RISC System/6000 Software Structure.

For more information about IBM's software offerings for the AIX for RISC System/6000 system, as well as for information about the software offerings that are generally available from other sources, see your IBM marketing representative.

AIX for RISC System/6000 as a Solution that Supports Industry Standards and Specifications

AIX for RISC System/6000 and its associated software products contain features that are available in other UNIX operating systems. To provide AIX system users with compatible operating system features, AIX for RISC System/6000 has been designed to comply with a number of industry standards. The following list identifies some standards and specifications that have contributed to the design of AIX for RISC System/6000 and associated software products:

- Portable Operating System for Computer Environments (POSIX), IEEE Standard 1003.1–1988
- AT&T UNIX System V Release 2 environment
- Version 4.3 Berkeley Software Distribution (BSD)
- Draft Proposed ANSI C Standard, Document Number X3J11/88–159, dated 12/88
- X Window System Version 11, Release 3
- National Computer Security Center (NCSC) Trusted Computer System Evaluation Criteria (TCSEC) Class C2
- IBM AIX Family Definition
- IBM Systems Application Architecture (SAA) Definition.

Specific licensed programs and AIX facilities comply with additional standards. Some of these additional standards are identified in the licensed program descriptions.

AIX for RISC System/6000 as a Member of the IBM AIX Family of Products

The IBM AIX Family provides common system functions, communication capabilities, application–enabling interfaces, and user interfaces that run on a full range of IBM systems. The IBM System/370, the IBM RT system, and the IBM Personal System/2, as well as the IBM AIX for RISC System/6000 system, support AIX Family software products.

AIX for RISC System/6000, along with other associated AIX for RISC System/6000 software products, provides a set of functions that comply with the AIX Family Definition. These functions that comply with the AIX Family Definition are compatible with similar functions available on other systems running the AIX operating system. Such compatibility provides AIX users with tools to create applications that can be ported to other systems running AIX.

For a description of the AIX Family Definition, refer to *IBM AIX Family Definition Overview*, GC23–2002.

AIX as an International Solution

Many of the functions in the AIX for RISC System/6000 Operating System support national languages in addition to U. S. English. Through these functions users can interact with the AIX for RISC System/6000 system using country–specific language conventions.

International character support benefits multilingual users and multinational corporations by allowing users to create text in many languages on the AIX for RISC System/6000 system. Plus, the extensive character set allows users to create text that includes non–alphanumeric symbols (such as many mathematical symbols).

IBM AIX Version 3 for RISC System/6000 Licensed Program

The AIX for RISC System/6000 operating system is designed to optimize performance with RISC System/6000 hardware and to provide user and programming environments that support a standards–driven open–system environment. The following list identifies some industry standards and specifications that have enabled IBM to create an open–system environment with RISC System/6000 software:

- Portable Operating System for Computer Environments (POSIX), IEEE Standard 1003.1–1988. AIX for RISC System/6000 conforms to this standard.
- AT&T UNIX System V environment. AIX for RISC System/6000 is upwardly compatible from the AT&T UNIX System V environment, is derived from AT&T UNIX System V Release 1, and includes AT&T System V Release 2 and Release 3 extensions required to conform to the AT&T Base System V Interface Definition (SVID) Issue 2, with exceptions as required to conform with alternative standards such as POSIX, ANSI, or X/Open CAE .
- Version 4.3 Berkeley Software Distribution (BSD). AIX for RISC System/6000 offers 4.3 BSD–compatible function for both end users and programmers. Most 4.3 BSD commands, system calls, and library routines are supported.

To allow data and programs to be ported from other IBM systems to the RISC System/6000 system, the functions available for other IBM products were considered during the design of AIX for RISC System/6000. The following list identifies some of the IBM products and specifications that were considered:

- IBM AIX/RT Operating System Version 2.2.1. AIX for RISC System/6000 is generally source code compatible with AIX/RT Operating System Version 2.2.1 application programming interfaces that are included in AIX for RISC System/6000. As a result, in many cases only recompilation is required to migrate applications from the RT system to the RISC System/6000 system. Applications which use interfaces that have major deviations from standards may require some modification.
- IBM AIX Family Definition. AIX for RISC System/6000 complies with the AIX Family Definition which defines a common operating system environment for multiple IBM processor architectures.
- Systems Application Architecture (SAA). AIX for RISC System/6000 provides functions that allow interoperability with systems functioning in an SAA environment.

Where any conflicts or differences exist between the aforementioned items, the AIX for RISC System/6000 compatibility priority is:

1. POSIX
2. SVID
3. 4.3 BSD
4. AIX/RT.

AIX for RISC System/6000 supports multiple users, multiple concurrent tasks and contains an assortment of facilities for meeting the needs of widely varied computing environments. Many of these facilities are described in the following sections.

Kernel Features

AIX for RISC System/6000 contains a single–level native kernel that has the following features:

- POSIX IEEE Standard 1003.1, AT&T Base System V, and 4.3 BSD system call support
- Virtual memory management, which performs page fault handling and manages the allocation of real memory, paging space, and virtual storage segments
- Support for a real–time execution environment, through features such as the following:
  - Multiple interrupt and process priorities
  - Preemptive priority control and scheduling of multiple processes for execution

  - Preemptable kernel for bounded context switch latency
  - Direct control of virtual memory
  - Timer control resolution equal to 10 times processor cycle time.
- Advanced file system and program management that includes the following enhancements:
  - File system mapping to virtual memory
  - Critical file system data logging
  - Symbolic links
  - Long file names
  - Dynamic binding, load–time symbol resolution, and enhanced shared libraries
  - Support for a dynamically loadable object file System Build Facilities format, the Extended Common Object File Format (XCOFF)
  - Common linkage conventions for inter–language calls
  - Support for transfer of AIX/RT Operating System Version 2.2.1 data using backup/restore utilities.
- Fixed disk management facilities to support extendable and mirrored file systems. File systems can also span multiple fixed disks
- Multiple virtual terminal support, allowing users to run several different interactive tasks at the same time (excluding ASCII terminals and displays attached to an IBM Xstation 120).
- Inter–process communication (semaphores, sockets, signals, message queues, pipes, and shared memory).

Library Routines and Program Development Support

AIX for RISC System/6000 contains enhanced and extended libraries. These enhancements and extensions are designed to support compliance with the various UNIX operating system industry standards.

AIX for RISC System/6000 provides the following support for application program development:

- AIX XL C Compiler/6000 (**cc**), a C language compiler that is designed in consideration of the Draft Proposed ANSI C Standard, Document Number X3J11/88–159, dated 12/88. The compiler implementation for AIX systems complies with the SAA C level 2 definition, with the exceptions specified in *XL C User's Guide for IBM AIX Version 3 for RISC System/6000*, SC09–1259. The AIX XL C Compiler/6000 is also source compatible with the languages supported by the IBM RT PC C Compiler and the IBM AIX RT PC Advanced C Compiler, with some documented exceptions. The compiler provides compile time options for selecting the desired C language definition: ANS mode, SAA mode, or EXTENDED mode.
- AIX Assembler (**as**), an assembler that supports the RISC System/6000 RISC instruction set. The assembler produces object code in the XCOFF (extended common object file format) object format and supports AIX linkage conventions.
- Absolute debugger (**adb**) debugging tool, a program that allows the programmer to examine, debug, and repair executable binary files, as well as examine non–ASCII data files.
- Symbolic debugger (**dbx**), a symbolic debugging tool that contains a rich set of commands designed to simplify problem determination. **dbx** supports the C, COBOL, FORTRAN, and Pascal programming languages.
- X development environment (**xde**), an interactive multi–window program development environment for debugging application programs, which enables a programmer to control the display of such items as source code, current program state, variable values, error messages, and help text. X development environment requires the IBM AIXwindows Environment/6000 licensed program to run.
- Application Development Facilities (ADF), a set of traditional UNIX system commands and utilities that can aid in various aspects of program development.
  - Source Code Control System (SCCS), which allows programmers to account for and to document changes made to source code and documentation files. With SCCS programmers can store, update, and retrieve any version of a controlled file. SCCS also helps to protect files from unauthorized changes by controlling update permissions. SCCS records who made changes to a file, when the changes were made, and why changes were made.
  - System Build Facilities (**make**), a utility that maintains up–to–date versions of programs. The **make** command allows a programmer to

create a file of instructions for building a large program. The **make** command uses the instructions in this file to maintain an up–to–date version of this program. Each time a changes a source file (or deletes a target file), the programmer can run the **make** command to re–build the program. If the programmer changes only one file, the **make** program re–compiles only that file and re–links that file with the rest of the program.

- The libc.a subroutine library
- An enhanced floating point math library
- 4.3 BSD compatibility library.

Shells

AIX for RISC System/6000 provides the following three shells:

- Korn shell
- Bourne shell
- C shell.

Security Facilities

AIX for RISC System/6000 provides features that enable configuration of the operating system for increased security (a controlled access mode of operation). Configurable password restrictions and a hidden, encrypted password file make it possible to rigorously identify and authenticate local users. AIX also provides system administration tools for checking the integrity and consistency of system files and tables, as well as for installing programs designed to run in a controlled access mode environment (trusted programs).

Two additional AIX security features are an auditing subsystem and a trusted communication path. The auditing features allow you to record and analyze system events that have security implications and then process the resulting audit trail to extract particular types of data. The trusted communication path is designed to allow certain local users to ensure the integrity and privacy of sensitive operations.

The AIX system security facilities are designed to meet National Computer Security Center (NCSC) Trusted Computer System Evaluation Criteria (TCSEC) Class C2 security support requirements.

Base Graphics Support

AIX for RISC System/6000 provides the following graphics support:

- UNIX operating system graphics tools, including the **graph**, **spline**, and **tplot** commands
- Computer Graphics Interface (CGI) device drivers, which provide the execution support for hardcopy graphics on AIX graphics devices and screen output for the IBM AIX Computer Graphics Interface Toolkit/6000 licensed program
- PostScript printer support.

Screen Editors

AIX for RISC System/6000 contains the following full screen editors:

- vi .
- INed editor, a full–function general purpose editor that supports the creation and editing of either ASCII files or structured files.
- GNU Emacs editor, an editor that provides programmers with an environment in which they can develop and run programs. As further help for program development, some of the AIX application development tools can run within an Emacs editor session. Emacs provides context–sensitive help and support for keyboard customization.

Note: GNU Emacs, from the Free Software Foundation, is distributed for use with the AIX for RISC System/6000 licensed program and is not supported by the IBM Corporation.

System Management Facilities

Enhanced installation and system management facilities include the following functions:

- System Management Interface Tool (SMIT), a set of menu–driven services which facilitate the performance of such system management tasks as software installation and configuration, device configuration and management, problem determination, and storage management

- Automatic Input/Output device configuration
- Support for ASCII terminals to serve as the system console
- Support for remote installation from a system on a LAN
- Support for non–interactive automatic installation using a batch file
- Extensive problem determination facilities, including the following:
  - A set of menu–driven hardware problem determination facilities
  - Consolidated and enhanced trace and dump support
  - Enhanced error messages.
- Accounting services.

Communications Facilities

AIX for RISC System/6000 provides the following communications facilities:

- Network File System (NFS) support, which is compatible with Open Network Computing (ONC)/NFS version 4.0 developed by Sun Microsystems, Inc. NFS includes Yellow Pages (YP) support, Network Lock Manager, remote mapped files support, the Remote Procedure Call (RPC) API, and eXternal Data Representation (XDR). NFS uses TCP/IP to communicate on an Ethernet Version 2, IEEE 802.3, or Token–Ring local area network (LAN).
- Network Computing System (NCS) support, which provides transparent access capabilities for end users, developers, and applications. NCS uses TCP/IP to communicate on an Ethernet Version 2, IEEE 802.3, or Token–Ring LAN.
- Transmission Control Protocol/Internet Protocol (TCP/IP) facilities, including end user commands, network security support, and an application programming interface. TCP/IP can communicate on an Ethernet Version 2, IEEE 802.3, or Token–Ring LAN; an X.25 wide area network (WAN); or an asynchronous connection. Simple Network Management Protocol (SNMP) Agent support is included with TCP/IP, as well as with SNMP Management Information Base. The SNMP Agent supports the sending of SNMP trap information to a designated SNMP Manager.
- DOS Server, which allows users and applications running under IBM DOS Version 3.3 on appropriately attached IBM PCs and PS/2s to access files and printers and to run AIX programs on the RISC System/6000 host. DOS Server can communicate on an IEEE 802.3 or Token–Ring LAN or an asynchronous connection.
- Basic Networking Utilities (BNU/UUCP), which provides for remote system polling, remote system login, remote command execution, job queuing, and file transfer between IBM AIX Version 3 for RISC System/6000 and other UNIX systems with BNU facilities installed. BNU can use TCP/IP to communicate on an Ethernet Version 2, IEEE 802.3, or Token–Ring LAN; an X.25 WAN; or an asynchronous connection.
- Mail Facilities, including the 4.3 BSD mail application and the Rand Corporation Message Handling (MH) application, which allow users to generate, process, send, and receive messages across a network. Mail Facilities use TCP/IP to communicate on an Ethernet Version 2, IEEE 802.3, or Token–Ring LAN; an X.25 WAN; or an asynchronous connection. Mail Facilities can also use BNU to communicate on an asynchronous connection.
- Ethernet Version 2 and IEEE 802.3 LAN support, which requires the IBM Ethernet High–Performance LAN Adapter.
- IBM Token–Ring LAN support, which requires the IBM Token–Ring High–Performance Network Adapter.
- X.25 WAN support, including supplied user applications, an application programming interface, and support for using higher–level protocols (including SNA and TCP/IP) over an X.25 wide area network. Communications on an X.25 WAN require the IBM X.25 Interface Co–Processor/2.
- Synchronous Data Link Control (SDLC) WAN support, which requires the IBM 4–Port Multiprotocol Communications Controller.

- Asynchronous communications support, including Asynchronous Terminal Emulation (ATE). The two standard EIA–232D ports in the RISC System/6000 system unit, as well as the following adapters, support asynchronous communications:
  - IBM 8–Port Async Adapter – EIA–232
  - IBM 8–Port Async Adapter – EIA–422A
  - IBM 8–Port Async Adapter – MIL–STD 188
  - IBM 16–Port Async Adapter – EIA–232
  - IBM 16–Port Async Adapter – EIA–422A
  - IBM 64–Port Async Controller with the IBM 16–Port Async Concentrator.

For more information about communications facilities and connectivity to other systems, refer to *IBM RISC System/6000 Communications Connectivity Overview*, GC23–2190.

Documentation

InfoExplorer hypertext retrieval system, an online documentation interface which contains full hypertext search and retrieval facilities, as well as multiple task–oriented and reference–oriented navigation and retrieval aids. The online library of RISC System/6000 documentation is designed to be used with InfoExplorer.

Other Facilities

AIX for RISC System/6000 provides the following additional features:

- Enhanced printer spooler facilities
- Text Formatting System, which includes **nroff**, **troff**, **tbl**, **neqn**, **eqn**, **mm**, **pic**, and **vgrind**.

IBM AIXwindows Environment/6000 Licensed Program

The IBM AIXwindows Environment/6000 licensed program is a graphical user interface that provides the ability to develop and run advanced graphics applications, Enhanced X–Windows applications, and AIXwindows Environment/6000 applications.

AIXwindows Environment/6000 contains the following:

- AIXwindows Environment/6000, a graphical user interface that provides the user with an iconic view of the AIX file system and allows the user to manipulate the file system through icons. For example. by manipulating icons the user can browse the AIX file system, create and delete files, and perform other simple file maintenance tasks. AIXwindows Environment/6000 is based on the following user environments:
  - Open Software Foundation's OSF/Motif user interface offering
  - Guidelines from SAA CUA (Common User Access) architecture
  - Presentation Manager (PM).
- Enhanced X–Windows, an enhanced version of X Window System Version 11, Release 3 by Massachusetts Institute of Technology (MIT). Enhanced X–Windows contains language bindings for C and FORTRAN programs.
- Graphics Library (GL), a high function graphical interface library for the application programmer. GL is compatible with the GL interface of Silicon Graphics Incorporated.
- X–Windows Graphics Support Library (XGSL), a graphical interface library that provides a migration facility from AIX/RT and AIX PS/2 developed applications.
- Enhanced X–Windows Display PostScript, which allows applications to output Display PostScript to a window. The Display PostScript Interpreter provides an interactive, display–oriented environment that is independent of the window system. In addition it provides a single–image model for both display and printer data streams.

Software Considerations

AIXwindows Environment/6000 requires AIX for RISC System/6000 on the RISC System/6000 system.

Hardware Considerations

GL supports only the IBM RISC System/6000 7016 Model 730 and the IBM High–Performance 8–Bit and 24–Bit 3D Color Graphics Processors.

Display PostScript is supported on the IBM Color Graphics Display Adapter.

IBM AIX NextStep Environment/6000 Licensed Program (IBM AIX Graphic User Environment/6000)

IBM AIX NextStep Environment/6000 (marketed as IBM AIX Graphic User Environment/6000 in some countries) is a graphical user interface that is designed to support the same application programming interface as the NextStep product offered by NeXT Inc. The AIX NextStep Environment/6000 facilitates access to system utilities and applications through menus and icons. AIX NextStep Environment/6000 contains the following:

- The window server, a command–driven window manager for AIX NextStep Environment/6000 windows, used for drawing images on the display
- The Display PostScript Interpreter, the facility that provides an interactive, display–oriented environment that is independent of the window system
- The desktop workspace, the facility that manages desktop activities, such as starting applications and managing files
- The interface builder, a facility that provides graphical access to many standard interface objects and windows
- The Stepstone Objective–C Compiler, a compiler for object–oriented programming (Objective–C is an extension of the C language).

The NextStep Development Tooklit and Interface Builder provides well–defined objects and graphical cut–and–paste capabilities for designing and implementing application user interfaces. The Objective–C Compiler supports object–oriented programming to aid programmers in designing additional objects for the application toolkit.

Software Considerations

AIX NextStep Environment/6000 requires the AIX for RISC System/6000 on the RISC System/6000 system.

Hardware Considerations

AIX NextStep Environment/6000 requires one of the following displays:

- IBM 5081 Color Display, Models 16 and 19
- IBM 8508 Model 19 Display
- IBM 6091 Model 19 Display.

The program supports the following adapters:

- IBM Grayscale Graphics Display Adapter (for use only with the 8508 Display)
- IBM Token–Ring High–Performance Network Adapter and/or IBM Ethernet High–Performance LAN Adapter
- IBM Color Graphics Display Adapter
- IBM High–Performance 8–Bit 3D Color Graphics Processor
- IBM High–Performance 24–Bit 3D Color Graphics Processor.

For print functions, AIX NextStep Environment/6000 requires one of the following printers:

- IBM 4216 Personal Page Printer Model 31 (in PostScript mode only)
- IBM 4019 LaserPrinter Model 1 (in PostScript mode only).

IBM AIX Personal graPHIGS Programming Interface/6000 Licensed Program

AIX Personal graPHIGS Programming Interface/6000 provides tools for programmers to create scientific and engineering graphics applications. These tools include a set of subroutine calls for creating and manipulating graphics primitives, attributes, and text in two or three dimensions.

AIX Personal graPHIGS Programming Interface/6000 subroutines allow device–independent coding and creation of two– and three–dimensional interactive graphics programs. Programmable device input triggers allow an application to define the relationship between input devices and operator actions which cause input to occur. This in turn helps a programmer create a natural user interface for the application being developed.

AIX Personal graPHIGS Programming Interface/6000 contains the following advanced graphics programming features:

- PHIGS PLUS extensions, including direct color specification, more sophisticated rendering capabilities, and representation of graphics primitives such as curves and surfaces
- The Graphical Kernel System (GKS) interfaces, which support two–dimensional graphics development according to International Standards Organization (ISO) ISO 7942.
- The Personal graPHIGS Programming Interface, which is an application programming interface for advanced three–dimensional graphics modeling based on the ANSI and the ISO standard for Programmers Hierarchical Interactive Graphics System (PHIGS).

The graPHIGS application programming interface is functionally the same as the GDDM/graPHIGS interface under MVS or VM and the RT Personal graPHIGS interface. This, together with the device and environment independence of graPHIGS applications, allows applications to be ported with few or no changes between the RISC System/6000 system, the RT system, and the MVS and VM systems under GDDM/graPHIGS.

GDDM/graPHIGS, in turn, provides access to the IBM 5080, IBM 3250, and IBM 3270 family of devices.

AIX Personal graPHIGS Programming Interface/6000 contains the following additional features:

- Support for programs using the AIX Personal graPHIGS Programming Interface/6000 tools to provide output to an X–Windows environment that uses the Version X11 Release 3 server
- Support for programs using the AIX Personal graPHIGS Programming Interface/6000 tools to provide output directly to a screen
- GKS support for Metafile capture through Graphics Kernel System Metafile (GKSM)
- C language and FORTRAN 77 language bindings.

Software Considerations

AIX Personal graPHIGS Programming Interface/6000 requires AIX for RISC System/6000 and the IBM AIXwindows Environment/6000 on the RISC System/6000 system.

Hardware Considerations

AIX Personal graPHIGS Programming Interface/6000 requires one of the following:

- The IBM Xstation 120
- A display attached to the RISC System/6000 7016 POWERstation 730
- A display attached to a RISC System/6000 system by way of one of the following adapters:
  - The IBM Grayscale Graphics Display Adapter
  - The IBM Color Graphics Display Adapter
  - The IBM High–Performance 8–Bit 3D Color Graphics Processor
  - The IBM High–Performance 24–Bit 3D Color Graphics Processor.

IBM AIX Computer Graphics Interface Toolkit/6000 Licensed Program

The AIX Computer Graphics Interface Toolkit/6000 is a set of graphics primitives that can be called from various RISC System/6000 programming languages and used to create device–independent graphics code. The AIX Computer Graphics Interface Toolkit/6000 provides virtual device interfaces and the Computer Graphics Interface (CGI) for application programming.

The AIX Computer Graphics Interface Toolkit/6000, provides a migration path for applications developed using the IBM RT System Graphics Development Toolkit. The AIX Computer Graphics Interface Toolkit/6000 includes the following features:

- Support for AIXwindows through the Xlib routines in the Enhanced X–Windows licensed program
- Support for hardcopy and metafile capture.

Software Considerations

AIX Computer Graphics Interface Toolkit/6000 requires AIX for RISC System/6000 on the RISC System/6000 system. Additionally, for a user to write programs using the AIX Computer Graphics Interface Toolkit/6000, one of the following compilers must be installed:

- IBM AIX XL C Compiler/6000 (part of the AIX for RISC System/6000 licensed program)
- IBM AIX XL FORTRAN Compiler/6000 licensed program
- IBM AIX XL Pascal Compiler/6000 licensed program.

To use the AIXwindows system driver with the AIX Computer Graphics Interface Toolkit/6000, the IBM AIXwindows Environment/6000 licensed program must be installed.

Hardware Considerations

Running applications using the AIXwindows device driver requires one of the following:

- The Xstation 120
- A display attached to the Model 730 system unit
- A display attached to a RISC System/6000 system by way of one of the following adapters:
  - The IBM Grayscale Graphics Display Adapter
  - The IBM Color Graphics Display Adapter
  - The IBM High–Performance 8–Bit 3D Color Graphics Processor
  - The IBM High–Performance 24–Bit 3D Color Graphics Processor.

The AIX Computer Graphics Interface Toolkit/6000 is shipped on 3.5–inch diskettes only.

IBM AIX XL FORTRAN Compiler/6000 Licensed Program

The AIX XL FORTRAN Compiler/6000 generates optimized object code when the optimization compiler option is specified. The function of AIX XL FORTRAN Run Time Environment/6000 comes with the compiler.

The AIX XL FORTRAN Compiler/6000 provides the following features:

- Meets American National Standard FORTRAN Programming Language, (ANSI X3.9–1978), ISO 1539–1980(E), and Federal Information Processing Standard publication 69 industry standards
- Implements the FORTRAN interface of the SAA Common Programming Interface in the AIX for RISC System/6000 environment
- Source code compatible, with some exceptions, with:
  - IBM VS FORTRAN
  - IBM RT PC FORTRAN 77
  - IBM RT PC VS FORTRAN
  - IBM AIX/RT XL FORTRAN (except as noted in the *User's Guide for IBM AIX XL FORTRAN Compiler/6000*, SC09–1257)
- Selected VAX extensions
- Support for AIX linkage conventions
- Support for ANSI/IEEE standard 754–1985 for binary floating–point arithmetic
- Support for inter–language calls, including *value* parameter passing
- Support for the trace back table and indices
- Input/Output and Math Library support
- A FORTRAN subroutine library in archive format
- Support for dynamic linking of FORTRAN programs
- Support for the dbx symbolic debugging tool.

Software Considerations

The AIX XL FORTRAN Compiler/6000 requires AIX for RISC System/6000 on the RISC System/6000 system unit.

IBM AIX XL FORTRAN Run Time Environment/6000 Licensed Program

Applications developed using the AIX XL FORTRAN Compiler/6000 must be bound with AIX XL FORTRAN Run Time Environment/6000 for execution. The Run Time Environment can be bound using dynamic binding (requiring that the Run Time Environment be available at the time the application is executed). Alternatively, the Run Time Environment can be statically bound to the application, resulting in a larger object module, but eliminating the need for the Run Time Environment in the execution environment.

The function of the AIX XL FORTRAN Run Time Environment/6000 is included with the AIX XL FORTRAN Compiler/6000, or can be purchased separately.

The Run Time Environment provides the following features:

- Meets American National Standard FORTRAN Programming Language, (ANSI X3.9–1978), ISO 1539–1980(E), and Federal Information Processing Standard publication 69 industry standards
- Selected VAX extensions
- Input/Output and Math Library support.

Software Considerations

The AIX XL FORTRAN Run Time Environment/6000 requires AIX for RISC System/6000 on the RISC System/6000 system.

IBM AIX XL Pascal Compiler/6000 Licensed Program

The AIX XL Pascal Compiler/6000 generates optimized object code when the optimization compiler option is specified. The function of AIX XL Pascal Run Time Environment/6000 comes with the compiler.

The AIX XL Pascal Compiler/6000 provides the following features:

- Meets American National Standard Pascal Computer Programming Language (ANSI/IEEE 770X3.97–1983), ISO 7185–1983(0), and Federal Information Processing Standard publication 109 industry standards
- Source code compatible, with some exceptions, with System/370 VS Pascal (exceptions are noted in the *User's Guide for IBM AIX XL Pascal Compiler/6000*, SC09–1326)
- Support for ANSI/IEEE standard 754–1985 for binary floating–point arithmetic
- Support for inter–language calls
- Support for the dbx symbolic debugging tool
- A library of run–time routines that support input and output operations, string manipulation operations, and other language–specific operations.

Software Considerations

The AIX XL Pascal Compiler/6000 requires AIX for RISC System/6000 on the RISC System/6000 system.

IBM AIX XL Pascal Run Time Environment/6000 Licensed Program

Applications developed using the AIX XL Pascal Compiler/6000 must be bound with AIX XL Pascal Run Time Environment/6000 for execution. The Run Time Environment can be bound using dynamic binding (requiring that the Run Time Environment be available at the time the application is executed). Alternatively, the Run Time Environment can be statically bound to the application, resulting in a larger object module, but eliminating the need for the Run Time Environment in the execution environment.

The function of the AIX XL Pascal Run Time Environment/6000 is included with the AIX XL Pascal Compiler/6000, or can be purchased separately.

The AIX XL Pascal Run Time Environment/6000 library routines include support for the following types of functions that may be invoked by an AIX XL Pascal Compiler/6000 program:

- Text file data transformations between the character form found in text files and the internal data formats
- Data file access and support functions
- String manipulation functions.

Software Considerations

AIX XL Pascal Run Time Environment/6000 requires AIX for RISC System/6000 on the RISC System/6000 system unit.

IBM AIX VS COBOL Compiler/6000 Licensed Program

The AIX VS COBOL Compiler/6000 is a compiler that contains a Micro Focus–developed front end and an IBM–developed native code generator. The compiler aids the development and maintenance of COBOL applications targeted for compilation and execution on IBM System/370 host mainframes in the VM/CMS and MVS operating environments. The function of the AIX VS COBOL Run Time Environment/6000 comes with the compiler.

The AIX VS COBOL Compiler/6000 provides the following features:

- Designed to comply with the following industry standards:
  - ANSI X3.23–1985, ISO 1989–1985 (High Level)
  - ANSI X3.23–1974 (High Level)
  - Federal Information Processing Standard publication 21–2—COBOL.
- Conformance to the IBM SAA COBOL CPI
- Source code compatible, with some exceptions, with the languages supported by the following compilers (exceptions are noted in the *VS COBOL Language Reference*, (SC23–2177)):
  - IBM AIX PS/2 VS COBOL
  - IBM AIX/RT VS COBOL
  - IBM Personal Computer COBOL Compiler, Version 1.00
  - Compatibility with IBM COBOL Version 2.00
  - IBM COBOL/2.
- The following language syntax variants are supported:
  - A subset of IBM VS COBOL II
  - A subset of IBM OS/VS COBOL
  - IBM Personal Computer COBOL Compiler, Version 1.00, and IBM COBOL Version 2.00 with minor restrictions
  - IBM COBOL/2
  - Micro Focus extensions for the IBM Personal Computer
  - SAA COBOL CPI with double–byte character set (DBCS) support (publication number SC26–4354–1)
- The Animator debugging facilities
- The FORMS–2 forms generator
- Support for AIX linkage conventions
- Support for C–ISAM files
- Support for the XCOFF object module format
- Support for the dbx symbolic debugging tool
- Keyboard and screen input/output configuration utilities
- A COBOL run–time library
- A variable length file handler package
- Invocation utilities.

The AIX VS COBOL Compiler/6000 does not contain any floating–point arithmetic facilities.

The compiler allows COBOL programs to run by being interpreted, dynamically loaded, or statically linked.

Software Considerations

The AIX VS COBOL Compiler/6000 requires AIX for RISC System/6000 on the RISC System/6000 system unit.

IBM AIX VS COBOL Run Time Environment/6000 Licensed Program

AIX VS COBOL Run Time Environment/6000 contains the necessary COBOL components to execute applications developed with the AIX VS COBOL Compiler/6000 on another system.

The function of the AIX VS COBOL Run Time Environment/6000 is included with the AIX VS COBOL Compiler/6000, or can be purchased separately.

Software Considerations

AIX VS COBOL Run Time Environment/6000 requires AIX for RISC System/6000 on the RISC System/6000 system unit.

IBM AIX Ada/6000 Licensed Program

The Ada/6000 Compiler is an optimizing compiler that generates optimized object code when the optimization compiler option is specified. The function of the IBM AIX Ada Run Time Environment/6000 comes with the compiler.

The compiler provides the following features:

- Meets American National Standard Ada ANSI/MIL–STD 1815A–1983 and ISO 8652–1987 industry standards
- Ada library manager
- Symbolic debugger
- Global optimizer
- Code profiler
- Pragma interface to FORTRAN, C, and RISC System/6000 Assembler
- Source dependency lister.

Software Considerations

Ada/6000 requires AIX for RISC System/6000 on the RISC System/6000 system.

IBM AIX Ada Run Time Environment/6000 Licensed Program

The Ada Run Time Environment contains the necessary Ada components to execute applications developed with the IBM AIX Ada/6000 Compiler on another system.

The function of the Ada Run Time Environment is included with the Ada/6000 Compiler, or can be purchased separately.

Software Considerations

Ada Run Time Environment requires AIX for RISC System/6000 on the RISC System/6000 system unit.

IBM AIX System Network Architecture Services/6000 Licensed Program

AIX SNA Services/6000 allows user–provided application programs to communicate with traditional 3270, remote job entry (RJE), and peer applications within a Systems Network Architecture (SNA) network. AIX SNA Services/6000 provides an application programming interface to SNA Logical Unit (LU) 0, 1, 2, 3, and 6.2 protocols.

AIX SNA Services/6000 allows an application program to do the following:

- Connect to IBM host applications using SDLC or a Token–Ring LAN:
  - Communicate with Customer Information Control System (CICS) applications (LU 6.2).
- Connect to non–host (peer) products with LU 6.2:
  - Other RISC System/6000 systems (using X.25, SDLC, or an Ethernet or Token–Ring LAN)
  - IBM AS/400 (using SDLC or a Token–Ring LAN)
  - IBM Personal System/2 (using SDLC or a Token–Ring LAN)
  - IBM Personal Computers (using SDLC or a Token–Ring LAN).

AIX SNA Services/6000 contains the following additional features:

- Support for Physical Unit (PU) type 2.1
- Menu–based user interfaces that aid in network configuration and security
- Support for System Services Control Point–Physical Unit (SSCP–PU) sessions for transmission of network management alerts.

Software Considerations

AIX SNA Services/6000 requires AIX for RISC System/6000 on the RISC System/6000 system.

Hardware Considerations

AIX SNA Services/6000 requires one of the following adapters on the RISC System/6000 system:

- IBM Token–Ring High–Performance Network Adapter, with appropriate cables to attach to an IBM Token–Ring LAN
- IBM Ethernet High–Performance LAN Adapter, with appropriate cables to attach to an Ethernet or IEEE 802.3 LAN
- IBM X.25 Interface Co–Processor/2, with appropriate cables to attach to an X.25 packet switching network
- IBM 4–Port Multiprotocol Communications Controller and 4–Port Multiprotocol Interface Cable, with appropriate cables to attach to a modem to establish an SDLC connection to an IBM System/370 or a supported peer workstation.

IBM AIX 3270 Host Connection Program/6000 Licensed Program

The AIX 3270 Host Connection Program/6000 allows RISC System/6000 users and applications to interact with an IBM System/370 through a 3278/79 terminal emulation session. The AIX 3270 Host Connection Program/6000 enables RISC System/6000 displays, ASCII workstations (see Hardware Considerations), and the IBM Xstation 120 to emulate Models 2, 3, 4, and 5 of the IBM 3278/79 Display Stations.

The AIX 3270 Host Connection Program/6000 provides the following features:

- 3278/79 display emulation support.
- 3286/87 printer emulation support.
- Multiple sessions support within a virtual terminal, across virtual terminals, and within Enhanced X–Windows:
  - A maximum of five sessions are supported through a non–SNA Distributed Function Terminal (DFT) connection.
  - A maximum of 16 sessions are supported through a 5088 Graphics Control Unit connection.
- Multiple hosts support.
- File transfer support, with C, Pascal, and FORTRAN programming interfaces.
- Automatic logon and logoff support.
- Extended data stream support including support for seven colors, plus either reverse video, underlining, or blinking. The actual attributes displayed depend on the capabilities of the display being used.
- An application programming interface (API) that allows a RISC System/6000 application to communicate with a System/370 host application. This application programming interface supports the XL C, XL FORTRAN, and XL Pascal programming languages on the RISC System/6000 system.

The AIX 3270 Host Connection Program/6000 does not support the following 3270 features and functions:

- Security key lock
- Magnetic reader control and accessories
- Monocase switch
- Selector light pen
- Cursor select
- Video output
- APL/text character set
- Programmed symbols
- Alternate cursor
- Cursor blink
- 3270 diagnostic dump
- Explicit partitions
- Numeric lock
- Attachment to Port 0 of an IBM 3174 or 3274 Control Unit
- Response time monitor for an IBM 3174 or 3274 Control Unit.

Software Considerations

AIX 3270 Host Connection Program/6000 requires AIX for RISC System/6000 on the RISC System/6000 system.

The program also requires a host system operating in an IBM VM/CMS or IBM MVS/TSO environment and that the IBM System/370 IND$FILE be installed on the host to support file transfer.

Hardware Considerations

AIX 3270 Host Connection Program/6000 requires one of the following adapters on the RISC System/6000 system:

- IBM 3270 Connection Adapter, with appropriate cables to attach to an IBM 3174 or IBM 3274 Control Unit, an IBM 4361 Work Station Adapter, or an IBM 9370 Work Station Subsystem Controller configured in a non–SNA DFT mode

- IBM System/370 Host Interface Adapter with appropriate cables to attach to an IBM 5088 Graphics Control Unit.

For 3286/87 printer emulation support, the AIX 3270 Host Connection Program/6000 requires a printer that supports the IBM PC ASCII data stream.

The following ASCII terminals are supported (3278/79 Model 2 emulation only): IBM 3151, IBM 3161, IBM 3162, IBM 3163, DEC VT 220, and WYSE WY–50. Other ASCII terminals can be supported if the user provides appropriate configuration information.

IBM AIX 3278/79 Emulation/6000 Licensed Program

AIX 3278/79 Emulation/6000 allows RISC System/6000 users and applications to interact with an IBM System/370 through a 3278 or 3279 terminal emulation session. AIX 3278/79 Emulation/6000 also allows file transfer capabilities, including conversion between IBM EBCDIC and IBM RISC System/6000 ASCII character sets.

With AIX 3278/79 Emulation/6000 both the host–controlled 3270 session and the AIX Operating System can be active at the same time. AIX 3278/79 Emulation/6000 supports one active host session only.

AIX 3278/79 Emulation/6000 includes the following features:

- Emulation support for a subset of the functions available on the IBM 3278 Model 2 and IBM 3279 Models 2A and S2A display stations
- Support for screen print and save functions
- Support for customization of color definitions and keyboard layout.

The IBM AIX 3278/79 Emulation/6000 program does not support the following 3270 features and functions:

- Security key lock
- Magnetic reader control and accessories
- Monocase switch
- Selector light pen
- Video output
- APL/text character set
- Programmed symbols
- Alternate cursor
- Cursor blink
- Explicit partitions
- Numeric lock.

Software Considerations

AIX 3278/79 Emulation/6000 requires AIX for RISC System/6000 on the RISC System/6000 system.

AIX 3278/79 Emulation/6000 requires that the host system be operating in an IBM VM/CMS or IBM MVS/TSO environment.

The IBM System/370 IND$FILE program must be installed on the host system to support file transfer.

Hardware Considerations

AIX 3278/79 Emulation/6000 requires the IBM 3270 Connection Adapter on the RISC System/6000 system. Appropriate cables must attach this adapter to an IBM 3174 or 3274 Control Unit configured for control unit terminal (CUT) mode.

IBM AIX Network Management/6000 Licensed Program

AIX Network Management/6000 provides facilities for a RISC System/6000 system to participate in network management activities for both IBM SNA networks and TCP/IP networks.

Through AIX Network Management/6000, the RISC System/6000 system can log and report data link control alerts from communication adapters in generic alert format, as defined by the SNA Management Services architecture. The RISC System/6000 system sends these alerts to the host system as NMVTs through a SNA System Services Control Point–Physical Unit (SSCP–PU) session.

Communication to the host NetView Distribution Manager and remote login from the host to the RISC System/6000 system is through a SNA Logical Unit (LU) 0 session.

AIX Network Management/6000 provides the following features:

- Support for configuring AIX Network Management/6000 functions using the AIX system management utilities
- Support for relaying alerts to other systems on the LAN running an AIX system
- Support for running shell scripts and commands using remote login from a host user through the Host Command Facility
- Support for receiving file or data distributions from a host system as distributed by Netview/Distribution Manager.

AIX Network Management/6000 facilities for management of TCP/IP networks includes an SNMP Manager/Monitor application that works in conjunction with SNMP Agents, an application programming interface and a command interface to aid in managing/monitoring the TCP/IP network. The following services are provided:

- SNMP Manager application
- SNMP Application Programming Interface and Commands.

There is no relationship between SNA generic alert handling and the SNMP Manager application in AIX Network Management/6000.

Software Considerations

AIX Network Management/6000 requires the following software on the RISC System/6000 system:

- AIX for RISC System/6000
- AIX SNA Services/6000 for systems connected to the host using an SSCP–PU session for NetView program communication or for systems sending alerts to other RISC System/6000 systems using SNA LU 6.2 Services
- TCP/IP for systems sending alerts to another RISC System/6000 system using inetd.

AIX Network Management/6000 also requires the following software on other systems or workstations serving as network nodes. These are required only when appropriate features are desired by a user.

- IBM AIX Network Management/6000 licensed program
- IBM NetView Program (Version 2 or later)
- IBM NetView/Distribution Manager
- IBM Host Command Facility.

Hardware Considerations

Depending on the functions being used, AIX Network Management/6000 requires one or more of the following adapters on the RISC System/6000 system:

- IBM 4–Port Multiprotocol Communications Controller and 4–Port Multiprotocol Interface Cable, with appropriate cables to attach to a modem that can establish an SDLC connection to an IBM SNA host for a NetView connection, to an IBM SNA host, or to another workstation for SNA network support
- IBM Token–Ring High–Performance Network Adapter, with appropriate cables to attach to an IBM Token–Ring LAN (for either TCP/IP or SNA network support)
- IBM Ethernet High–Performance LAN Adapter, with appropriate cables to attach to an Ethernet LAN (for either TCP/IP or SNA network support)
- IBM X.25 Interface Co–Processor/2, with appropriate cables to attach to an X.25 packet switching network (for either TCP/IP or SNA network support).

IBM AIX Personal Computer Simulator/6000 Licensed Program

The AIX PC Simulator/6000 runs many IBM Personal Computer DOS, Version 3.30 application programs without modification on the RISC System/6000 system. The AIX PC Simulator/6000 can run one or more DOS programs concurrently in multiple windows and on multiple displays. The simulator can work at the console and at non–console terminals. Multiple simulator sessions can access common files.

The AIX PC Simulator/6000 includes the following features:

- Real mode Intel 80286 processor support is simulated, along with standard PC AT devices
- Diskette support (through the BIOS interface only)
- Support for DOS files to be maintained as AIX files, thus enabling DOS and AIX applications to share data.

The AIX PC Simulator/6000 does not support the following functions:

- Dedication of Micro Channel Adapters to the AIX PC Simulator/6000
- Serial port emulation
- Floating–point instructions of the Intel 80287 processor
- Direct access to the RISC System/6000 diskette controller or the Direct Memory Access (DMA) chip.

Furthermore, the AIX PC Simulator/6000 may not be able to run DOS programs that contain hardware or timing dependencies.

Software Considerations

The AIX PC Simulator/6000 requires the AIX for RISC System/6000 on the RISC System/6000 system. To run PC AT application programs, IBM DOS, Version 3.30 is also required. Some features also require the Enhanced X–Windows licensed program.

Hardware Considerations

Some PC AT application programs run using the AIX PC Simulator/6000 may have special hardware requirements.

IBM AIX Xstation Manager/6000 Licensed Program

Xstation Manager supports the attachment of an IBM Xstation 120 to a RISC System/6000 system on an Ethernet Version 2, IEEE 802.3, or IBM Token–Ring LAN. The Xstation 120 can run both Ethernet and Token–Ring sessions concurrently. Xstation Manager allows the Xstation 120 to use host–based applications using X Window System Version 11 Release 3.

The program includes the following:

- Downloadable software for the X Window System and TCP/IP
- A print facility to allow remote printing on printers attached to the Xstation
- A configuration script to add Xstations to the network and to set user parameters
- Downloadable fonts.

The Xstation Manager downloads X server software to the Xstation 120. This software is designed to allow applications running on hosts to open windows. The RISC System/6000 system or other systems on the LAN that support X Window System Version 11 Release 3 can server as host systems to the Xstation 120.

Xstation Manager is available only on 3.5–inch diskette.

Software Considerations

Xstation Manager requires AIX for RISC System/6000. The TCP/IP component of AIX for RISC System/6000 must be installed on the RISC System/6000 system.

If Xstation Manager is to be used with other systems on the LAN, the other systems must have the following software installed:

System	Required Software
RISC System/6000	
	IBM AIX Version 3 for RISC System/6000
	IBM AIXwindows Environment/6000
	TCP/IP component of AIX for RISC System/6000
RT System	IBM AIX/RT Operating System Version 2.2
	IBM AIX/RT X–Windows Version 2.1
	Interface Program for use with TCP/IP component of AIX/RT Operating System
Other	Operating System
	X Window System
	TCP/IP

Hardware Considerations

For an Ethernet Version 2 or IEEE 802.3 connection, the RISC System/6000 system requires the IBM Ethernet High–Performance LAN Adapter. The Xstation 120 comes standard with one Ethernet Version 2/IEEE 802.3 port.

For a Token–Ring connection, the RISC System/6000 system requires the IBM Token–Ring High–Performance Network Adapter. The Xstation 120 requires the IBM Token–Ring Network 16/4 Adapter/A.

National Language Support

IBM RISC System/6000 software provides support for the user to interact with the system using country–dependent language conventions and the native language of the user. National language support varies between licensed programs and even between features within a single licensed program. The following sections describe the main national language support features and provide a generalized summary of the national language features supported by each of the licensed programs described in this document.

National Language Support Features

AIX for RISC System/6000 and many of the other IBM RISC System/6000 licensed programs provide support for national language character handling. This support is provided through IBM World Trade keyboards and printers and through functions that enable national language data handling in user–developed applications. Some licensed programs provide data "pass through" to another program.

Support is available through AIX for RISC System/6000 for the following national language keyboards:

- U.S.–101 Keys
- 102 Keys (Belgium–Dutch/French)
- 102 Keys (Canadian–French)
- 102 Keys (Danish)
- 102 Keys (Finnish/Swedish)
- 102 Keys (French)
- 102 Keys (German)
- 102 Keys (Italian)
- 102 Keys (Norwegian)
- 102 Keys (Portuguese)
- 102 Keys (Spanish)
- 102 Keys (Swiss–French/German)
- 102 Keys (U.K.–English)
- 106 Keys (Japan–Katakana).

Note: Keyboards with 101 or 102 keys are supported by single–byte Code Page 850. The 106–key keyboard is supported by Shifted–Japanese Industry Standard (S–JIS), for Kanji.

RISC System/6000 software also provides national language support library subroutines for national language–dependent functions consistent with the conventions of a particular country. These conventions include the country–unique ways of representing such things as dates, times, monetary values, and numbers.

Many of the programs support national language character usage in object names, literals, and comments.

The system also supports multiple end users concurrently interacting with the system using one or more supported keyboards and respective country–dependent national language conventions. The multilingual support is provided using table–driven national language support functions. These tables are in AIX for RISC System/6000.

Many messages, screens, and prompts are enabled for translation. The actual degree of translation that occurs varies between countries, licensed programs, and program functions.

National Language Support Summary

The following table generally describes the level of international support that is provided by each licensed program. A statement of support in this table does not imply that all features of the licensed program provide complete international support.

Note: In the column headings, SB stands for Single–Byte Character Support and DB stands for Double–Byte Character Support. Check with your RISC System/6000 marketing representative to find out which programs have messages or materials that have been translated into a particular language.

Licensed Program	Support for Specialized International Features						
	Character Encoding and Handling		Characters in Literals and Comments		NLS Library Sub–routines		Comments
	SB	DB	SB	DB	SB	DB	
AIX for RISC System/6000	yes	yes	yes	yes	yes	yes	• Two different licensed programs are available, one for SBCS, one for DBCS • NFS and NCS are data "pass through" only • UNIX graphics and GNU Emacs have no NLS • Virtual Terminal, DOS Server, and InfoExplorer have no DBCS
AIXwindows Environment/6000	yes	yes	yes	yes	yes	yes	DBCS support for Enhanced X–Windows and XGSL only; two different licensed programs, one for SBCS, one for DBCS
AIX NextStep Environment/6000 (AIX Graphic User Environment/6000)	no	no	no	no	no	no	
AIX Computer Graphics Interface Toolkit/6000	yes	yes	yes	yes	yes	yes	DBCS Device Driver limitations
AIX VS COBOL Compiler/6000	yes	yes	yes	yes	yes	yes	U.S. English date on compiler listings; DBCS names in string literals only
AIX VS COBOL Run Time Environment/6000	yes	yes	yes	yes	yes	yes	
AIX XL FORTRAN Compiler/6000	yes	yes	yes	yes	yes	yes	DBCS file names for include only
AIX XL FORTRAN Run Time Environment/6000	yes	yes	yes	yes	yes	yes	
AIX XL Pascal Compiler/6000	yes	yes	yes	yes	yes	yes	
AIX XL Pascal Run Time Environment/6000	yes	yes	yes	yes	yes	yes	

Licensed Program	Support for Specialized International Features						
	Character Encoding and Handling		Characters in Literals and Comments		NLS Library Sub–routines		Comments
	SB	DB	SB	DB	SB	DB	
AIX Ada/6000	no	no	no	no	no	no	Compiler can be used to build an NLS–enabled application.
AIX Ada Run Time Environment/6000	no	no	no	no	no	no	
AIX Personal graPHIGS Programming Interface/6000	yes	yes	yes	yes	yes	yes	Full support when run on Enhanced X–Windows
AIX SNA Services/6000	yes	no	no	no	no	no	DBCS is data "pass through" only for LU 6.2; no NLS names in SNA–architected fields
AIX 3278/79 Emulation/6000	yes	no	no	no	no	no	NLS character input restrictions using 327X Controller
AIX 3270 Host Connection Program/6000	yes	no	no	no	no	no	Does not support all 3270 features
AIX Network Management/6000	no	no	no	no	no	no	Configuration support for the alert functions
AIX Xstation Manager/6000	yes	yes	yes	yes	yes	yes	
AIX PC Simulator/6000	yes	no	N/A	N/A	N/A	N/A	NLS applications must be executed at the locally–attached graphics display only

Note: In general, most licensed programs do not support national language character usage in variable names. Additionally, there are some networking and mail limitations in national language support concerning the use of international characters in names (especially in fields that belong to an architecture such as SNA. For more information consult the technical documentation for the specific licensed program.

Installation, Customization, and Support

Installation and Customization

Installation and customization of RISC System/6000 software is simplified by the IBM delivery media options and by the AIX system management tools that assist you in installing and customizing your software.

When purchasing both a RISC System/6000 system unit and the AIX for RISC System/6000 licensed program, the AIX Startup System can be pre–installed on a fixed disk. With this pre–installed Startup System, you will have a ready–to–use minimum system subset that includes:

- AIX command line support, including menu–driven system management facilities (through SMIT)
- If ordered with AIX for RISC System/6000, a graphical user interface—either AIXwindows Environment/6000 or AIX NextStep Environment/6000 (AIX Graphic User Environment/6000 in some countries)
- NFS and TCP/IP communications software support to allow connection to an Ethernet or Token–Ring LAN
- System messages and online softcopy information. (U.S. English is the default.)

Provided sufficient fixed–disk capacity is ordered, optionally installable AIX operating system extensions will be pre–loaded on your fixed disks along with the pre–installed Startup System. Additionally, other selected IBM licensed programs can be pre–loaded.

The Startup System can be installed on any RISC System/6000 fixed disk. With the Startup System installed, the system unit will IPL and be ready for selection of National Language Version support and for installation of AIX extensions and application programs. The system will also be ready for connection to a LAN as a ready–to–use client system.

When the IBM RISC System/6000 7012 Model 320 is equipped with one 120MB internal fixed disk, the Model 320 has the following restrictions:

- Optionally installable AIX extensions and other licensed programs cannot be pre–loaded on the fixed disk due to limited space. Thus, the system is dependent upon an AIX server system for access to AIX extensions and other licensed programs.
- Paging space is pre–allocated on this system and may be modified after the system has been connected to the network.
- Local user space for additional software and data is limited.

As an alternative to the pre–load/pre–install option, most IBM software for the RISC System/6000 system is available on the following media:

- 3.5–inch diskettes
- 8mm tape cartridge
- 1/4–inch tape cartridge.

The AIX system provides management tools through a menu–driven interface, SMIT, as well as through the traditional command line interface. SMIT guides you through the installation and customization process while providing you with information that can help you make decisions about your system environment. As you make decisions, SMIT runs commands that implement your decisions and records a log of these commands in a configuration history file. You can use this configuration history file to simplify and expedite the configuration of additional RISC System/6000 systems or to reinstall your system following a software update. Installation and customization can be performed using communication network facilities.

Support

IBM offers porting and conversion assistance for your key applications and has highly skilled professionals available to help you with system expansion, operations, and applications questions. Consult your IBM marketing representative for more information on these services.

RISC System/6000 Licensed Program Requirements Summary

The following table provides a general summary of the requirements of the IBM licensed programs that are available for the RISC System/6000. Some specific features of these licensed programs may have additional requirements.

RISC System/6000 Licensed Program	Corequisite Software on the RISC System/6000	Considerations
AIX for RISC System/6000, 5756–030 (Japanese Kanji support version, 5621–012)	AIXwindows Environment/6000, if using X Development Environment (**xde**)	Communications facilities require appropriate communications hardware.
AIXwindows Environment/6000, 5601–257 (Japanese Kanji support version, 5621–029)	AIX	Appropriate graphics hardware is required.
AIX NextStep Environment/6000, 5601–384 (AIX Graphic User Environment/6000 in some countries)	AIX	Appropriate graphics hardware is required.
AIX Personal graPHIGS Programming Interface/6000, 5601–230	AIX AIXwindows Environment/6000	Appropriate graphics hardware is required.
AIX Computer Graphics Interface Toolkit/6000, 5601–386	AIX AIXwindows Environment/6000, if using the AIXwindows system driver An appropriate compiler, if writing programs	Appropriate graphics hardware is required.
AIX VS COBOL Compiler/6000, 5601–258	AIX	
AIX VS COBOL Run Time Environment/6000, 5601–259	AIX	
AIX XL FORTRAN Compiler/6000, 5601–248	AIX	
AIX XL FORTRAN Run Time Environment/6000, 5601–266	AIX	
AIX XL Pascal Compiler/6000, 5601–254	AIX	
AIX XL Pascal Run Time Environment/6000, 5601–251	AIX	
AIX Ada/6000, 5706–291	AIX	
AIX Ada Run Time Environment/6000, 5706–294	AIX	

RISC System/6000 Licensed Program	Corequisite Software on the RISC System/6000	Considerations
AIX SNA Services/6000, 5601–287	AIX AIX SNA Services/6000, for relaying alerts to systems communicating with SNA protocols	Appropriate communications hardware is required.
AIX 3278/79 Emulation/6000, 5601–256	AIX	Appropriate communications hardware is required.
AIX 3270 Host Connection Program/6000, 5601–260	AIX	Appropriate communications hardware is required.
AIX Network Management/6000, 5601–253	AIX	Appropriate communications hardware is required.
AIX Xstation Manager/6000, 5601–457	AIX on the host AIXwindows Environment/6000 on the RISC System/6000 host	Appropriate communications hardware is required.
AIX PC Simulator/6000, 5601–263	AIX IBM Personal Computer DOS, Version 3.30 AIXwindows Environment/6000, for some AIX PC Simulator/6000 features	

Memory and Disk Space Requirements

The following sections are designed to aid you in determining the random access memory (RAM) requirements and fixed–disk space requirements for RISC System/6000 licensed programs. The requirement values provided in this document are accurate as of the date of this publication. However, variations to these requirements may occur as a result of modification to software components made by the manufacturer. IBM may periodically update these requirements. Please consult your IBM marketing representative for more information about RAM and disk space, or direct access storage device (DASD), requirements.

Random Access Memory Requirements

RISC System/6000 system units can be configured with up to 256 MB of RAM. The amount of RAM that a system requires for optimal performance depends upon many diverse factors. These factors include:

- The number of system users
- The sizes and number of installed licensed programs and local application programs
- The amount of memory for data being processed by applications
- The desired response time.

The AIX for RISC System/6000 licensed program requires a minimum of 8 MB of RAM. The following licensed programs also can run on a system configured with a minimum of 8 MB of RAM:

- AIXwindows Environment/6000
- AIX Personal graPHIGS Programming Interface/6000
- AIX Computer Graphics Interface Toolkit/6000
- AIX XL FORTRAN Compiler/6000
- AIX XL FORTRAN Run Time Environment/6000
- AIX XL Pascal Compiler/6000
- AIX XL Pascal Run Time Environment/6000
- AIX VS COBOL Compiler/6000
- AIX VS COBOL Run Time Environment/6000
- AIX Ada Run Time Environment/6000
- AIX 3278/79 Emulation/6000
- AIX Network Management/6000
- AIX SNA Services/6000
- AIX 3270 Host Connection Program/6000
- AIX Xstation Manager/6000.

The following licensed programs require a minimum of 16 MB of RAM:

- AIX NextStep Environment/6000
- AIX Ada/6000
- AIX PC Simulator/6000.

Fixed–Disk Space Requirements

The following procedure is designed to assist you in determining the amount of fixed–disk space that is required to support the IBM licensed programs that you plan to install on your RISC System/6000 system unit.

1. Use Figure 2 "Software Storage Requirements" to determine the storage requirements of the IBM software that you plan to install on your RISC System/6000 system unit.
2. If your storage requirements exceed 112 MB, add 16 MB for additional InfoExplorer softcopy information about using and managing AIX for RISC System/6000 and associated licensed programs.

3. If your storage requirements exceed 224 MB, add an additional 28 MB (required by AIX for RISC System/6000 for system workspace extensions).
4. If you are requesting that IBM licensed programs be distributed to you pre–loaded on a fixed disk, add 59 MB for installation workspace. This space can become free space after installation.
5. Determine how much fixed–disk space you need for your data and for any additional applications that you plan to install. Add this space to your total.
6. Use this storage total to determine the number and size of RISC System/6000 fixed disks that can accommodate your IBM licensed programs. Consider that 1 MB of software is equal to 1,048,576 storage locations, while 1 MB of fixed–disk capacity is equal to 1,000,000 storage locations.

RISC System/6000 Fixed Disk	Maximum Software per Fixed Disk
IBM 120 MB Direct Attached Disk Drive	112 MBs
IBM 320 MB SCSI Disk Drive	304 MBs
IBM 355 MB SCSI Disk Drive	336 MBs
IBM 670 MB SCSI Disk Drive	636 MBs
IBM 857 MB SCSI Disk Drive	816 MBs

The following table lists storage requirements for RISC System/6000 licensed programs and for their installable components within these licensed programs. Use this table to determine the information needed to complete Step 1 of the preceding procedure.

Software Storage Requirements	
Licensed Programs and Their Installable Components	**Fixed–Disk Storage Requirements**
AIX for RISC System/6000	
Base Operating System (BOS) Runtime	72.0 MB *
Messages/Help Text	3.7 MB (per language)*
Network Support Facilities	10.0 MB**
TCP/IP Facility	
Simple Network Mgt Protocol (SNMP) Agent	
Network File System (NFS)	
Network Computing System (NCS)	
NFS Encryption Feature (U.S. only)	0.03 MB**
InfoExplorer Softcopy Information	14.0 MB**
AIX Using/Managing (minimum subset)	
BOS Extensions 1	8.0 MB
Extended Commands	
C Shell	
CGI Device Drivers	
Remote Services	
BOS Extensions 2	4.0 MB
Accounting Services	
Asynchronous Terminal Emulation (ATE)	
Data Link Controls	
X.25 Application	
DOS Utilities	
Games	

Figure 2. Software Storage Requirements.

Notes: * Installation of this item is required.

** If the pre–install option is selected, installation of this item is required.

Software Storage Requirements	
Licensed Programs and Their Installable Components	**Fixed–Disk Storage Requirements**
AIX for RISC System/6000 (continued)	
DOS Server	1.0 MB
INed Editor Facilities	1.0 MB
GNU Emacs Editor Facilities	10.0 MB
Text Formatting System	1.9 MB
Formatting Tools	
Bibliography Support	
Writers's Tools	
Graph Commands	
XL C Compiler	2.9 MB
Base Application Development Toolkit	9.5 MB
Application Development Toolkit	
X–Development Environment (xde)	
Includes and Libraries	
InfoExplorer Softcopy Information	27.0 MB
AIX Programming	
AIX Educational	
AIXwindows Environment/6000	
AIXwindows Run Time Environment	12.0 MB**
Enhanced X–windows	
AIXwindows Desktop	
Messages/Help Text	0.25 MB** (per language)
AIXwindows Development Environment	16.5 MB
AIXwindows Toolkit	
AIXwindows Samples	
AIXwindows Fonts	
InfoExplorer Softcopy Information	23.0 MB
AIXwindows Programming	
AIX NextStep Environment/6000	
NextStep Run Time	12.0 MB**
InfoExplorer Softcopy Information	12.0 MB
NextStep Programming	
NextStep Application Development Toolkit	30.0 MB
AIX Personal graPHIGS Programming Interface/6000	6.0 MB
AIX Computer Graphics Interface Toolkit/6000	
Computer Graphics Interface Toolkit	1.0 MB
Messages/Help Text	0.01 MB (per language)
AIX XL FORTRAN Compiler/6000	
XL FORTRAN Compiler	2.8 MB
InfoExplorer Softcopy Information	5.0 MB
FORTRAN Compiler on–line pubs	
Messages/Help Text	0.06 MB (per language)
AIX XL FORTRAN Run Time Environment/6000	
XL FORTRAN Run Time Environment	0.3 MB
Messages/Help Text	0.03 MB (per language)

Figure 2 (continued). Software Storage Requirements.

Notes: * Installation of this item is required.

** If the pre–install option is selected, installation of this item is required.

Software Storage Requirements	
Licensed Programs and Their Installable Components	**Fixed–Disk Storage Requirements**
AIX XL Pascal Compiler/6000	
XL Pascal Compiler	3.1 MB
InfoExplorer Softcopy Information	5.0 MB
Pascal Compiler on–line pubs	
Messages/Help Text	0.06 MB (per language)
AIX XL Pascal Run Time Environment/6000	
XL Pascal Run Time Environment	0.25 MB
Messages/Help Text	0.02 MB (per language)
AIX VS COBOL Compiler/6000	4.5 MB
AIX VS COBOL Run Time Environment/6000	
VS COBOL Run Time Environment	2.0 MB
Messages/Help Text	0.04 MB (per language)
AIX Ada/6000	45.0 MB
AIX Ada Run Time Environment/6000	1.0 MB
AIX 3278/79 Emulation/6000	
3278/79 Emulation	0.82 MB
Messages/Help Text	0.02 MB (per language)
AIX 3270 Host Connection Program/6000	
3270 Host Connection Program	4.1 MB
Messages/Help Text	0.14 MB (per language)
AIX SNA Services/6000	
SNA	5.0 MB
SNA Services: LU 1, 2, 3, & 6.2	
SNA Services: LU 0	
Messages/Help Text	0.2 MB (per language)
AIX Network Management/6000	
Network Management	4.0 MB
Messages/Help Text	0.03 MB (per language)
AIX PC Simulator/6000	
PC Simulator	3.0 MB
Messages/Help Text	0.02 MB (per language)
AIX Xstation Manager/6000	
Xstation Manager	1.0 MB
Messages/Help Text	0.03 MB (per language)

Figure 2 (continued). Software Storage Requirements.

Notes: * Installation of this item is required.

** If the pre–install option is selected, installation of this item is required.

Glossary

Ada. A high–level programming language based on Pascal that was developed by the U.S. Department of Defense.

adapter. (1) A mechanism for connecting two unlike parts or machines. (2) A printed circuit card that modifies the system unit to allow it to operate in a particular way.

Advanced Program-to-Program Communication (APPC). A communications architecture that allows transaction programs to exchange information on a peer-to-peer basis. SNA LU 6.2 allows APPC architecture to operate on an SNA network.

alert. An error message sent to the system services control point (SSCP) at the host system.

allocate. To assign a resource, such as a disk file or a diskette file, to perform a specific task.

American National Standards Institute (ANSI). An organization sponsored by the Computer and Business Equipment Manufacturers Association through which accredited organizations create and maintain voluntary industry standards.

ANSI. See *American National Standards Institute.*

API. See *Application Program Interface.*

application program. Software that performs a particular task, such as word processing, project planning, or inventory control.

APPC. See *Advanced Program–to–Program Communication.*

Application Program Interface (API). A set of runtime routines or system calls that allows an application program to use a particular service provided by either the operating system or another licensed program.

assembler. A computer program that converts assembly language instructions into object code.

assembler language. A symbolic programming language whose set of instructions includes the instructions of the machine and whose data structures correspond directly to the storage and registers of the machine.

asynchronous terminal emulation (ATE). Emulation of a remote asynchronous terminal.

asynchronous transmission. Data transmission in which transmission of a character or block of characters can begin at any time but in which the bits that represent the character or block have equal time duration.

ATE. See *asynchronous terminal emulation.*

batch file. A number of similarly grouped programs or data to be input to the computer for processing in a single run.

binary file. A file that contains codes that are not part of the ASCII character set. Binary files utilize all 256 possible values for each byte in the file.

BIOS (Basic Input/Output System). Microcode that controls basic hardware operations such as interactions with diskette drives, fixed disk drives, and the keyboard.

browse. To look at records in a file.

cable. The physical media for transmitting signals; includes copper conductors and optical fibers.

CD–ROM. High–capacity read–only memory in the form of an optically read compact disc.

character set. A group of characters used for a specific reason; for example, the set of characters a printer can print or a keyboard can support.

C language. A general-purpose programming language that is the primary language of the AIX Operating System.

client. On a network, the computer requesting services or data from another computer.

COBOL. COmmon Business–Oriented Language. A high–level programming language, based on English, that is used primarily for business applications.

command. A request to perform an operation or execute a program. When parameters, arguments, flags, or other operands are associated with a command, the resulting character string is a single command.

compiler. A program that translates a source program into an executable program (an object program).

configuration. The arrangement of a computer system or network as defined by the nature, number, and chief characteristics of its functional units. The term can refer to both hardware and software configurations.

console. The main AIX display station.

control program (CP). Part of the AIX Operating System that determines the order in which basic functions should be performed.

control unit terminal (CUT) mode. An IBM protocol used for communications with an IBM 3174 or 3274 Control Unit. In this protocol, the RISC System/6000 system is emulating a dumb 3278/79 terminal, and the 3274 is responsible for enforcing the protocol.

CP. See *control program*.

customization. See *configuration*.

CUT. See *control unit terminal mode*.

cut and paste. In word processing, to assemble a document by adding, deleting, and relocating artwork or text, or by inserting blocks from other documents.

data. A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by human or automatic means.

data base. A set of data, part or the whole of another set of data, that consists of at least one file, and that is sufficient for a given purpose or for a given data processing system.

data communications. The transmission of data according to a protocol between computers or remote devices, usually over a long distance.

data logging. The recording of data about events that occur in time sequence.

data management. (1) The function of controlling the acquisition, analysis, storage, retrieval, and distribution of data. (2) In an operating system, the computer programs that provide access to data, perform or monitor storage of data, and control input/output devices.

data processing (DP). The systematic performance of operations upon data; for example, handling, merging, sorting, computing.

data stream. A continuous stream of data elements being transmitted, or intended for transmission, in character or binary-digit form, using a defined format.

DBCS. See *double byte character set*.

device. A mechanical, electrical or electronic machine that is designed for a specific purpose and that attaches to the computer, such as a printer, plotter, or disk drive.

DFT. See *distributed function terminal*.

distributed function terminal (DFT). A terminal that performs operations previously accomplished by the processing unit, such as managing data links, controlling devices, and formatting data.

double byte character set (DBCS). Graphics and code points for Asian languages.

dynamic loading. The loading of routines into main storage as needed by an executing program. Dynamically loaded routines are not part of the load modules of an executing program.

EBCDIC. See *extended binary–coded decimal interchange code (EBCDIC)*.

EBCDIC character. Any one of the symbols included in the eight-bit EBCDIC set.

edit. To add, change, delete, rearrange, or modify the form or format of data.

editor. A program used to enter and modify programs, text, and other types of documents and data.

EIA. Electronic Industries Association.

emulation. (1) The use of programming techniques and special machine features to permit a computing system to execute programs written for another system. (2) Imitation. For example, when one computer imitates the characteristics of another computer. Contrast with *simulation*.

error message. An indication that an error has been detected.

Ethernet. A 10-megabit baseband local area network using CSMA/CD (Carrier Sense Multiple Access with Collision Detection). The network allows multiple stations to access the medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and transmission.

extended binary-coded decimal interchange code (EBCDIC). A code developed for the representation of textual data. EBCDIC consists of a set of 256 eight-bit characters.

file system. The collection of files and file management structures on a physical or logical mass storage device.

fixed disk. A flat, circular, unremovable plate with a magnetizable surface layer on which data can be stored by magnetic recording. A rigid magnetic disk.

FORTRAN (FORmula TRANslation). A high-level programming language used primarily for scientific, engineering, and mathematical applications.

help text. Information associated with a display, menu, or prompt that explains options or values displayed.

host. (1) The primary or controlling computer in the communications network. (2) A computer attached to a network.

host application program. An application program executed in the host computer.

icon. A picture or graphical representation of an object on a display screen to which a user can point with a device such as a mouse in order to select a particular operation or perform a certain action.

IEEE. Institute of Electrical and Electronics Engineers.

initial program load (IPL). The initialization procedure that causes an operating system to commence operation.

installation. In system development, preparing and placing a functional unit in position for use.

instruction set. The set of instructions of a computer, of a programming language, or of the programming languages in a programming system.

interactive. Pertaining to a program or system that alternately accepts input and then responds. An interactive system is conversational, that is, a continuous dialog exists between user and system.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, common physical interconnection characteristics, signal characteristics, and other characteristics. (2) Hardware, software, or both, that links systems, programs, or devices.

international character support. Conversion subroutines, for languages other than American English, that translate between various character sets and date and time string formats.

Internet Protocol (IP). The protocol that provides the interface from the higher level host-to-host protocols to the local network protocols. Addressing at this level is usually from host to host.

interpreter. A program that translates and executes each instruction of a high–level programming language before it translates and executes the next instruction.

inter-process communication (IPC). Used for programs to communicate data to each other and to synchronize their activities. Semaphores, signals, and internal message queues are common methods of inter-process communication.

IP. See *Internet Protocol*.

IPL. See *initial program load*.

ISO. International Organization for Standardization.

kernel. (1) The part of an operating system that contains programs for such tasks as input/output, management and control of hardware, and the scheduling of user tasks. (2) The memory-resident part of the AIX Operating System containing functions needed frequently.

kilobyte. 1024 bytes.

LAN. See local area network.

library. A collection of functions, calls, subroutines, or other data.

library routine. A proven routine maintained in a program library.

licensed program. A software program that remains the property of the manufacturer, for which customers pay a licensing fee.

local area network (LAN). A data network on the user's premises in which serial transmission is used for direct data communication among data stations.

logical unit (LU). In SNA, a port through which an end user accesses the SNA network in order to communicate with another user, and through which the end user accesses the functions provided by system services control points (SSCPs). An LU can support at least two sessions, one with an SSCP

and one with a another LU, and may be capable of supporting many sessions with other LUs.

Logical Unit (LU) type 6.2 (LU6.2). The LU type used for SNA advanced program-to-program communications (APPC).

LU. See *logical unit.*

LU 6.2. See *Logical Unit type 6.2.*

mail. Correspondence in the form of messages transmitted between workstations over a network.

megabyte (MB). 1,048,576 in decimal notation (two to the twentieth power (2^{20}))when referring to memory capacity; in all other cases, it is defined as 1,000,000.

menu. A displayed list of items from which an operator can make a selection.

message. (1) Information from the system that informs the user of a condition that may effect further processing of a current program. (2) An error indication, or any brief information that a program writes to standard error or a queue. (3) Information sent from one user in a multi-user operating system to another.

metafile. A data file representation of a graphics picture which can be transmitted and re-edited.

NETBIOS. An operating system interface for application programs used on IBM computers that are attached to the IBM Token–Ring Network.

network. A collection of data processing products that are connected by communication lines for information exchange between locations.

object code. Machine-executable instructions, usually generated by a compiler from source code written in a higher level language (such as C language). For programs that must be linked, object code consists of relocatable machine code. Contrast with *source code.*

operating system (OS). Software that controls the running of programs and that also can provide such services as resource allocation, scheduling, input and output control, and data management.

page fault. A program interruption that occurs when an active page refers to a page that is not in memory.

paging space. Disk storage for information that is resident in virtual memory, but is not currently being accessed.

Pascal. A high–level, general–purpose programming language, related to ALGOL. Programs written in Pascal are block structured, consisting of independent routines. They can run on different computers with little or no modification.

peer. In network architecture, any functional unit that is in the same layer as another entity.

performance. One of the two major factors, together with facility, on which the total productivity of a system depends. Performance is largely determined by a combination of throughput, response time, and availability.

PHIGS. See *Programmers' Hierarchical Interactive Grahics System.*

physical unit (PU). In SNA, a set of programs that controls the actual physical hardware associated with a node.

port. (1) A part of the system unit or remote controller to which cables for external devices (display stations, terminals, printers) are attached. The port is an access point for data entry or exit. (2) An entrance to or exit from a network. (3) To make the programming changes necessary to allow a program that runs on one type of computer to run on another type of computer. (4) An access point for data input to or data output from a computer system.

problem determination. The process of identifying the source of a problem. Often this process identifies programs, equipment, data communications facilities, or user errors as the source of the problem.

Programmers' Hierarchical Interactive Graphics System (PHIGS). A proposed ANSI and ISO standard. PHIGS defines an application programming interface designed for interactive two-dimensional and three-dimensional graphics applications.

protocol. A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication.

PU. See *physical unit.*

real time. Pertaining to the processing of data by a computer in connection with another process outside the computer according to time requirements imposed by the outside process. This term is also used to describe systems operating in conversational mode and processes that can be

influenced by human intervention while they are in progress.

register. A storage device having a specified storage capacity such as a bit, byte, or computer word, and that is usually intended for a special purpose.

remote job entry (RJE). Submission of a job through an input unit that has access to a computer through a data link.

RJE. See *remote job entry*.

run-time environment. A collection of subroutines and shell variables that provide commonly used functions and information for system components.

SBCS. See *single byte character set*.

SDLC. See *Synchronous Data Link Control*.

sector. The smallest amount of information that can be written to or read from a disk or diskette during a single read or write operation.

security. The protection of data, system operations, and devices from accidental or intentional ruin, damage, or exposure.

semaphore. (1) Entity used to control access to system resources. Processes can be locked to a resource with semaphores if the processes follow certain programming conventions. (2) Provides a general method of communication between two processes that is an extension of the features of signals.

server. (1) An application program that usually runs in the background (daemon) and is controlled by the System Program Controller. (2) On a network, the computer that contains the data or provides the facilities to be accessed by other computers on the network. (3) A program that handles protocol, queuing, routing, and other tasks necessary for data transfer between devices in a computer system. (4) Provides the basic windowing mechanism. In IBM AIXwindows Environment/6000, a server handles IPC connections from clients, demultiplexes graphics requests onto screens, and multiplexes input back to clients.

shared library. A library or object file that contains at least one subroutine that can be used by multiple processes. Programs and subroutines are linked as before, but the code common to different subroutines is combined in one library file that can be loaded at runtime and shared by many programs. A key to identify the shared library file is left in the header of each subroutine.

shared memory. An area of memory simultaneously accessible to more than one cooperating process.

shell. (1) A software interface between a user and the operating system of a computer. Shell programs interpret commands and user interactions on devices such as keyboards, pointing devices, and touch-sensitive screens and communicate them to the operating system.(2) Software that allows a kernel program to run under different operating system environments. (3) The command interpreter that provides a user interface to the AIX kernel.

simulation. (1) The representation of selected characteristics of the behavior of one physical or abstract system by another system. In a digital computer system, simulation is done by software; for example, (a) the representation of physical phenomena by means of operations performed by a computer system; and (b) the representation of operations of a computer system by those of another computer system. (2) Contrast with *emulation*.

single byte character set (SBCS). Graphics and code points for U. S. English and other non–Asian languages.

SNA. See *Systems Network Architecture*.

SNMP. Simple Network Management Protocol.

source code. The input to a compiler or assembler, written in an source language. Contrast with *object code*.

SSCP. See *system services control point*.

subroutine. (1) A sequenced set of statements that can be used in one or more computer programs and at one or more points in a computer program. (2) A routine that can be part of another routine.

Synchronous Data Link Control (SDLC). A form of communications line control using commands to control the transfer of data over a communications line.

system call. A request by an active process for a service by the system kernel.

system services control point (SSCP). In SNA, the focal point within an SNA network for managing the configuration, coordinating network operator

and problem determination requests, and providing directory support and other session services for network end users. Multiple SSCPs, cooperating as peers, can divide the network into domains of control, with each SSCP having a hierarchical control relationship to the physical units and logical units within its domain.

Systems Network Architecture (SNA). (1) An IBM architecture for controlling the transfer of information in a data communications network. (2) The description of the logical structure, formats, protocols, and operating sequences for transmitting information units through, and controlling the configuration and operation of, networks.

TCP. See *Transmission Control Protocol*.

token ring. A token access procedure used with a sequential (ring) topology.

trace. (1) A record of the execution of a computer program. It exhibits the sequences in which the instructions were executed and, optionally, the values of the program variables used in the instructions. (2) A monitor in the mass storage control that records data about the activity of the system, staging and destaging. (3) To record a series of events as they occur.

Transmission Control Protocol (TCP). Used in ARPA Internet and any network following the U.S. Department of Defense standards for inter-network protocol. Provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected system of such networks. It assumes that Internet Protocol is the underlying protocol.

user interface. (1) The means by which a user communicates with a system, program, or device. (2) The hardware, software, or both that implements a user interface, allowing the user to interact with and perform operations on a system, program, or device. Examples are a keyboard, mouse, command language, or windowing subsystem.

virtual memory. Addressable space that appears to be real memory. From virtual memory, instructions and data are mapped into real memory locations.

virtual storage. Addressable space that appears to be real storage. From virtual storage, instructions and data are mapped into real storage locations.

virtual terminal. Any of several logical equivalents of a display station available at a single physical display station.

WAN. See *wide area network*.

wide area network (WAN). A network that provides data communication capability in geographic areas larger than those serviced by local area networks.

window. (1) A rectangular area of the screen in which the dialog between the user and a given application is displayed. (2) In curses and extended curses, the internal representation of what a portion of the display may look like at some point in time. Windows can be any size, from the entire display screen to a single character.

workstation. A device that enables users to transmit information to or receive information from a computer; for example, a display station or printer.

X.21. In data communications, a specification of the CCITT that defines the connection of data terminal equipment to an X.21 public data network for digital leased and circuit switched services.

X.25. In data communication, a specification of the CCITT that defines the interface between data terminal equipment and packet–switching data networks.

XL compilers. The exceptional (XL) family of compilers designed to provide consistency and high performance across multiple programming languages by sharing the same code optimization technology.

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International Business Machines
Corporation
11400 Burnet Road
Austin, Texas 78758–3493

Printed in the
United States of America

GC23–2189–00

GC23-2189-00