

Version 7 of the SAS^a System: The Initial Release of the Nashville Project

Introducing Version 7 of the SAS[®] System, the initial release of the *Nashville Project*. The Nashville Project is a series of software offerings by SAS Institute, to be released over the next several years, and is designed to provide an umbrella of technology to simplify the processes of data access, data management, and data exploitation. The Nashville Project provides the framework for an enterprise's future information delivery needs and takes SAS Institute, our customers, and our solutions into the next decade of computing.

Summary

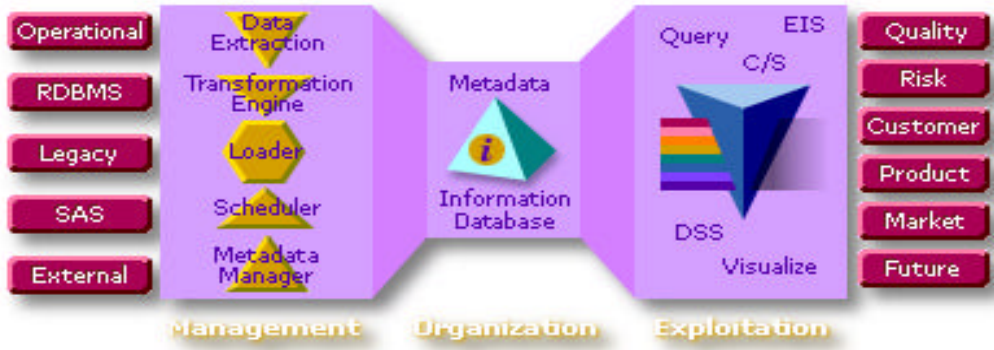
As the initial release of the Nashville Project, Version 7 introduces many new features and enhancements for managing complex enterprise problems. This release is targeted at *Technology Leaders* and *Early Adopters* who wish to gain early access to SAS Institute technology. Certain products will be released with the next stage of the Nashville Project. For that reason, each customer will want to evaluate when to use Version 6 and when to use Version 7.

This paper provides an introduction to the Nashville Project, as well as a summarized listing of Version 7 features and enhancements by product. *It is not a complete listing of new capabilities*, but should provide some guidelines to help you determine if and where your applications would benefit from the software enhancements. In particular, note the sections for:

- Features and Enhancements by Product
- Host System Enhancements
- New Products shipping with Version 7
- Products not shipping with Version 7
- Products discontinued with Version 7
- Operating System and Database Release Levels Supported

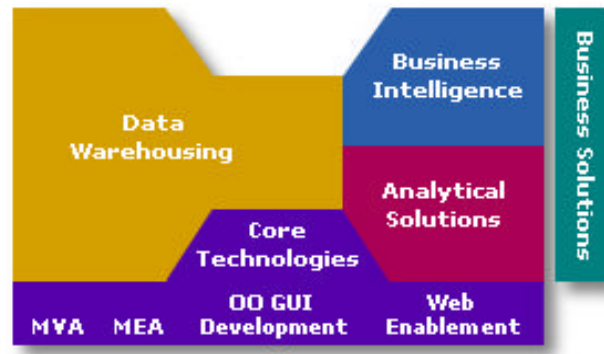
Where we are today - a quick look at Version 6

The Nashville Project builds on capabilities in Version 6 that enable a wider variety of users to benefit from SAS software. Version 6 introduced the complete process of accessing data, cleaning and transforming data, storing data and metadata, and exploiting that data with decision-support tools. Splitting software functionality between multiple platforms and data structures with MultiEngine Architecture™ and MultiVendor Architecture™ helped make this possible.



Release 6.12 of the SAS System, provides *enterprise-caliber* solutions for:

- Data Warehousing
- Data Analysis
- Business Intelligence
- Vertical and Horizontal Business Applications (Financial, Human Resource, Clinical Trial Data Management and Analysis, and Systems Data Management)



The Nashville Project

The Nashville Project further segments the functionality of the SAS System into smaller, integrated areas of technology. These technology areas are:

- **Intelligent Storage:** spanning multiple storage architectures and combining them with metadata to generate real information
- **Intelligent Server:** providing servers across all major platforms to enable the data management and analysis functions of decision support
- **Intelligent Clients:** providing the appropriate interfaces to distribute and interact with all types of users



The Nashville Project will provide more openness and flexibility in our solutions, allowing IT to more effectively utilize emerging industry technologies, optimize investments made in database systems and hardware, and support a variety of user needs and skill sets. The Nashville Project also concentrates on putting applications in place to help speed the decision-making process so that business users can be more responsive to the changing demands of today's organizations. The process begins with Version 7.

What does Version 7 provide and who is it for?

The primary goal of Version 7 is to provide the technology underpinnings for the SAS data warehousing and decision-support solutions scheduled for update in the next major release of the SAS System. (This next release is currently termed "Version 8" and production is projected for the second half of 1999.) We expect organizations that wish to get up to speed quickly with the new capabilities of the SAS System to become Early Adopters. Other organizations may want to wait until the release of Version 8.

Areas of particular interest for Early Adopters are:

- Output delivery
- Database access
- Applications development
- Graphics
- Web applications
- Data analysis

SAS Institute will continue to supply and support its Release 6.12 based-offerings for data warehousing, data mining, and vertical and horizontal solutions.

Availability and Implementation:

Version 7 will initially ship to 100 sites in the November/December 1998 timeframe. This limited shipment is to ensure that the installation process is validated and completely documented. In the first quarter of 1999, Version 7 will ship on a by-request basis to additional qualified sites.

We anticipate that these sites may utilize the newest features of Version 7 in parallel with Version 6 production systems. We encourage customers to establish a dialogue with the Institute to identify particular application areas of interest or concern when running the systems in tandem.

Summary of Version 7 Features

Base SAS Software

General - User Interface

- **SAS Explorer Window:** The SAS workspace is composed of windows that enable you to accomplish specific tasks. Along with the main programming windows (Program Editor, Log and Output), the workspace now includes SAS Explorer. SAS Explorer is a central point for managing basic SAS software tasks such as: viewing and managing tables, libraries, and members; creating new libraries and file shortcuts; and creating new library members and catalog entries.

ODS

- **Output Delivery System (ODS):** In Version 7, printed output is much more flexible. You have many more options for the output created by SAS procedures.
 - Transform procedure output into a SAS data set
 - Render output as colorful HTML pages with embedded hyperlinks
 - Interoperate with word processing software using RichText and/or Postscript files (experimental)

SAS Data Libraries

- **Long Names and Expanded Rules for SAS Names:** Most SAS names, such as variable names, members of SAS data libraries, and most catalog entries, can be up to 32 characters long. Variable labels can now be up to 256 characters.
- **Mixed case:** Variable names are displayed in the output as they were defined. They are “recognized” regardless of their input case because case insensitive compares are done when searching for a variable name on a data set.
- **Long Character Values:** The size of character variables has been increased from 200 bytes to 32K bytes.
- **The SQL Procedure:** Whenever possible, PROC SQL passes joins to the DBMS, using the SAS/ACCESS engine, rather than doing the join itself. A new option, DQUOTE=ANSI, enables you to use non-SAS names in PROC SQL. You can now store a libref definition in a SQL view with the USING LIBNAME clause. SQL views of a single base table now support update in place.
- **Common Metadata Repository (CMR):** Provides a common metadata facility for SAS applications. This will allow SAS products to share metadata information with other SAS products. For Version 7, SAS/EIS[®] software, SAS/MDDB[®] Server software (HOLAP), and External File Interface (EFI) are CMR-compliant. The products slated to join the CMR client list with their next release include SAS/Warehouse Administrator[™], Query Window, and Enterprise Miner[™].
- **Integrity Constraints:** Integrity constraints enable you to specify rules that guarantee the consistency and correctness of stored data. The rules restrict the data that can be added, updated, or deleted from a data set, and link the data in one data set to another data set.
- **Generation Data Sets:** Generation data sets enable you to keep multiple copies of a SAS data set. The copies represent versions of the data set, which is archived each time it is replaced. (Not available on OpenVMS VAX or OpenVMS Alpha, under evaluation for Version 8)
- **Audit Trail Feature** – This new feature allows the user to define a file that will contain a record of every update made to a SAS data set. The information logged includes the observation, userid, date/time of update. (beta in Version 7)
- **Logical Concatenations of SAS Libraries:** You can now reference two or more SAS libraries with a single libref in all operating environments. Each library can be associated with a different engine.
- **Logical Concatenations of SAS Catalogs:** You can now logically concatenate two or more SAS catalogs. This allows you to search through multiple catalogs to locate entries. Use the LIBNAME statement to **implicitly** concatenate SAS catalogs, the new CATNAME statement to **explicitly** concatenate SAS catalogs.
- **Indexing Enhancements:** There have been several performance improvements related to the use of indexes:
 - When creating an index, no sort is performed if the data set is already in the correct order.

- The system's ability to determine the more cost-efficient way to access the data (either by sequential reading or by using an index) is improved by storing statistics that represent the distribution of values.
- WHERE processing for an indexed data set is enhanced for the pattern-matching operators LIKE and NOT LIKE.
- The system makes greater use of composite indexes for **compound optimization**, which is the process of optimizing multiple WHERE conditions with a single composite index. WHERE expressions that contain the EQ or IN operator now support three new operators: directional inequalities, NOT operations, and truncated comparisons.
- When you append to an indexed data set, the SAS System improves performance by not updating the index until all observations have been added.

External Data Import and Export:

- **New Procedures:**
 - **The EXPORT Procedure:** Reads data from a SAS data set and writes it to an external file.
 - **The IMPORT Procedure:** Reads data from an external data source and writes it to a SAS data set.
- **External File Interface:** The External File Interface (EFI) is a point-and-click graphical interface that you can use to read data from an external file and write to a SAS data set, and vice versa. The EFI now supports 32-character variable and data set names, 256-character labels, and it is case sensitive for variable names. The EFI enables you to specify a logical record length for both list input data and list output data, and to store templates in a user-specified metabase repository. The **Import/Export Wizard**, production with 6.12, can utilize EFI. (EFI is not available on OS/390 and CMS)

Reporting Procedures

- **The REPORT Procedure:** Now supports the FORMCHAR option. If you use ODS to create HTML files from PROC REPORT, you can set the style that the procedure uses for various parts of the report. Styles determine attributes like font face, font weight, color, and, so forth.
- **The SUMMARY and TABULATE Procedures:** Now support the PRELOADFMT and CLASSDATA options that give new ways to control content and order using SAS Formats and secondary data sets. In addition, these procedures now allow multiple CLASS and VARIABLE statements, giving even greater control over content and order. In the statistics area, quantiles such as MEDIAN are now available and there is an optional algorithm for large data sets. The **SUMMARY Procedure** has two new statements, TYPES and WAYS which give control over the CLASS combinations which are analyzed, as well as a new OUTPUT stmt option which is useful for TopN reporting. The **TABULATE Procedure** includes a host of new stylistic controls via the STYLES options, which work with ODS to produce advanced HTML output.

Year 2000

- **Year 2000 Compliance:** As with recent releases of the SAS System, Version 7 is Year 2000 compliant. Additionally, the YEARCUTOFF= option can be used to specify how two-digit years in your data should be interpreted. Please note that the default value for the option has been changed in Version 7 to 1920. The default value for Version 6 releases (6.06 and higher) is 1900. For more information concerning Year 2000 compliance of SAS software products, see the Institute's Web site www.sas.com/y2k.

SAS/ACCESS® Software

- **SAS/ACCESS LIBNAME Statement:** SAS/ACCESS engines now provide direct and dynamic access to your DBMS data without using access descriptors or view descriptors. You can now assign a SAS libref directly to a DBMS and then use this libref to identify a table or view in the DBMS. This **libref.dbms_table** can be used in the DATA step and in SAS procedures just like a SAS data set. You can read, update, insert, or delete DBMS data, as well as create SAS data sets or SAS SQL views of the DBMS data. In addition, you can use options in the LIBNAME statement to specify how to connect to your DBMS and how to access and process your DBMS data. NOTE: The LIBNAME statement is not supported by all SAS/ACCESS engines.
- **SAS/ACCESS Data Set Options:** Provide greater flexibility and control over row and table locking, buffering data, indexing, the use of DBMS data types, and other DBMS functionality. NOTE: Control over locking and buffering is not available for all DBMSs.
- **Performance Optimization:** Provides several enhancements in the areas of indexing, error handling, support of DBMS objects such as triggers and stored procedures, and passing joins to the DBMS. Whenever possible, SAS software now optimizes queries to use indexes. You can also use new LIBNAME and data set options to take advantage of DBMS indexes.

SAS/AF® Software

- Complete backward compatibility with applications and classes that were developed using Version 6 of SAS/AF software.
- A new component model to facilitate development of plug-and-play components. This model supports the following methodologies for communication between components:
 - Attribute linking
 - Model/view communication through interface support
 - Events and event handlers
 - Drag-and-drop functionality
- New visual components (or controls) that provide true native appearance on the development platform, including a combo box, check box, push button, radio box, and others.
- New non-visual components (or models) that can be dropped on a frame from the new Components window. These components are designed to work automatically with many of the new controls in model/view relationships.
- A new build-time environment that incorporates improved user interfaces features such as:
 - A common Properties window that is shared by all components in a frame
 - A new Components window for creating both visual and non-visual objects on a frame
 - A redesigned Class Editor and Resource Editor
 - A new Interface Editor
- Improved object-oriented development capabilities in the SAS Component Language (formerly called Screen Control Language), such as dot syntax and improved compile-time error checking.

SAS/ASSIST® Software

- **The WorkPlace Environment:** The WorkPlace environment provides an alternative interface to the Version 6 SAS/ASSIST block-menu system. Instead of clicking on a primary menu item and being presented with another full-screen menu, clicking on a WorkPlace menu item invokes a pop-up menu, or, in some cases, a series of cascading pop-up menus. This enables you to navigate the menu system more efficiently. Alternatively, you can select Tasks from the redesigned menu bar to perform SAS/ASSIST tasks. Also, after completing a task, you do not have to return to the main menu to go to another task; the Tasks menu is available from all task windows.
- **Remote Submit:** The Run menu in each task window now contains items to establish and terminate a remote connection, and to submit your task window selections for execution on a remote host.
- **Graphics:** The Map Report window has been enhanced and streamlined.
- **Terminology:** To be more consistent with established database management system terminology, SAS/ASSIST software now uses the terms "table", "row", and "column" in place of "data set", "observation", and "variable".
- **Tutorial:** The old tutorial has been replaced by a new HTML-based tutorial that covers basic SAS/ASSIST tasks.
- **HTML Output:** SAS/ASSIST software can now generate HTML-formatted output using the SAS Output Delivery System (ODS).

SAS/CONNECT® Software

- **Asynchronous Compute Services:** The ability to execute remote submits asynchronously allows you to continue processing on your local host while the remote submit processes. Using this technique, you can start a long running task in the background to a remote host and immediately begin another task on another remote host, or continue local processing, rather than wait until the first remote task is completed.
- **Cross-Environment Data Access (CEDA):** CEDA is a facility that allows any Version 7 SAS data sets created on any directory-based host (e.g. Solaris, Windows, HP-UX, AIX®, VMS, ...) to be read by the SAS System running on any other directory-based platform. With CEDA, SAS data sets will be accessible across platforms merely by issuing a libname statement pointing to the location of the data.

It is important to understand that CEDA does not replace data transfer services or remote library services because of the following restrictions:

- CEDA is limited to Version 7 SAS data sets - views and utility files are not supported.
- Update opens are not supported.
- No WHERE expression optimization with an index.
- Limited to directory-based platforms (bound libraries on OS/390 and CMS files are not accessible using CEDA, but files in OS/390's UNIX system services are).

- **Messaging Services:** Messaging allows applications to communicate by sending each other data in messages. SAS/CONNECT software provides an SCL interface to direct and indirect messaging that allows you to develop SAS/AF applications that can communicate through a basic, yet flexible interface. Indirect messaging also allows you to write applications that communicate asynchronously with each other.
- **Remote Object Services:** Allows SAS/AF software developers to distribute selected portions of their object frameworks across remote session boundaries.
- **Agent Services:** Provides client/server-based task management for the nodes across your network. (Experimental)
- **Network Data Encryption:** SAS/CONNECT software will take advantage of the encryption services provided by SAS/SECURE™ software (a new product with Version 7) to encrypt all data that is passed over the network.

SAS/EIS® Software

- **HOLAP Support:** Allows you to take advantage of (HOLAP) Hybrid OLAP with SAS/EIS.
- **Application Screen Builder:** Gives you the ability to place two or more EIS applications on a frame and have them interact with one another. In addition to EIS applications, the Application Screen Builder lets you add any components available under SAS/AF software, as well as several SAS/EIS software components.
- **Bubble Chart:** Shows the complex relation of several analysis variables at the same time in a two-dimensional coordinate system. The bubbles can differ in color, size, and shape depending on the values that they represent.
- **Multidimensional Chart:** Lets you dynamically create a 3D bar, box, line, or area chart.
- **Multidimensional Pie Chart:** Lets you dynamically create a 3D pie chart representing multidimensional data.
- **Multidimensional Business Trends:** Enables you to forecast by using multidimensional data. You can forecast on an aggregate level or on individual subsets of the data. The results of the forecast are shown within a graph with one plot line for each forecast produced.
- **Text Viewer:** Combines six previous SAS/EIS objects into one, powerful viewer - Catalog Entry Viewer - with hotspot and traffic lighting capability. Catalog Entry Viewer replaces the Hotspots, External File Viewer, External File Viewer with Hotspots, General Reporting, Output Entry, and Source Entry objects.
- **Incremental MDDB Updates:** Enables you to add data to an MDDB without having to reload the entire database. This was experimental with Release 6.12.

- **Printing Facility:** Gives you the ability to add titles, footnotes, drill-down information, and subset information to multidimensional SAS/EIS output. You can customize margins, fonts, and set global print characteristics by type of object or globally. A new preview capability is also included. In addition, you can now print reports that contain a mixture of objects.
- **Access Control:** Enables you to provide access control with named groups of users. This security subsystem includes the ability to apply restrictions to: types of applications; functions within an application; data to view (including only certain subsets); user ID and password support (and a customizable login window); a logging facility; and more.
- **Updated Critical Success Factors (CSFs):** Now includes a speedometer and digital style CSF, in addition to the classic style. The new CSFs also give you better control of fonts, positioning, and border types.

SAS/ETS® Software

- **Time Series Forecasting System:** An improved graphical interface including enhancements to all windows and tool bars.
- **FAME Engine (SASEFAME):** A new interface engine provides seamless access to FAME databases.
- **DATASOURCE procedure:** This procedure now supports more data files.
- **MODEL procedure:** This procedure can specify general error structure models, including ARCH, GARCH, E-GARCH, and I-GARCH, for each dependent variable.
- **Additional Enhancements:** Additional changes have been made to the ARIMA and SPECTRA procedures.

SAS/FSP® Software

- **Functionality Moved to Other Products:** In Version 7, some of the capabilities that previously required SAS/FSP software will only require base SAS or SAS/AF software.
 - **FSLIST:** Will be part of base SAS software.
 - **VIEWTABLE:** Is part of base SAS software. SAS/FSP software will not be required to edit data sets using this tool. Note: On OS/390 and CMS, VIEWTABLE behaves differently, displaying the old style FSEDIT and FSVIEW windows so SAS/FSP software is required.
 - **DATAFORM and DATATABLE Objects:** Are part of SAS/AF software. Previously they were implemented via SAS/AF software, but required SAS/FSP software as well. Users will be able to browse/edit data using these objects without licensing SAS/FSP software. Note: If you are on the mainframe operating system and a DATATABLE object is displayed in a FRAME, you can only browse (not edit) the data.
- **Functionality Remaining in SAS/FSP Software:** Easy-to-use facilities for interactive data entry, editing, browsing, retrieval, and letter writing will remain in SAS/FSP software. These include the four procedures: FSEDIT, FSBROWSE, FSVIEW, and FSLETTER.

SAS/GIS® Software

- **Additional capabilities in PROC GIS:** Enhancements include the ability to define a data link as well as a

theme.

- **Images of highway markers to enhance labeling and appearances of maps.**
- **Easy to access utility to build U.S. census tract maps using SAS/GIS software-supplied data:** Maps for all 50 states are included.

SAS/GRAPH® Software

- **Web-enabled procedures:** The basic graphics procedures (GCHART, GPLOT, and GMAP) have been Web-enabled. These procedures will now create clickable GIF files to meet users' Web publishing needs. Released experimentally with Version 7 is the ability to run existing SAS jobs that use the basic graphics procedures and create Web pages with Java & ActiveX charts as an alternative to clickable GIFs.
- **3D bar & 3D pie charts:** These have been added to GCHART.
- **Improved Font Support in GIF Files:** You can now get a system font rendered into a GIF file for production of better web graphics.
- **Enhanced Graph Object:** For use with SAS/AF software, this object has been enhanced to include features such as overlays, image backgrounds and markers, color schemes, axis thinning and other enhancements in printing, etc.
- **New Data Visualization Classes:** For use with SAS/AF applications. These classes are designed for interactive navigation of multivariate data. Classes included are chart, histogram, pie and scatter.
- **Easier Use of System Fonts:** A mechanism for using system fonts in SAS/Graph has been simplified with a *Font= name of system font* statement option. You no longer have to run the font utility.
- **Graph-N-Go:** (experimental) A new application that simplifies the task of charting data using an intuitive drag-and-drop interface, and the use of data models and viewers.

SAS/INSIGHT® Software

- **Graphical Enhancements:** Including 3D surface plots, contour plots, 3D response surfaces, mean comparison circles for multiple comparisons, and color blending of up to five colors.
- **New Methods:** For fitting surface and contour plots, linear interpolation and thin-plate smoothing spline.
- **Multivariate Statistical Techniques:** Including comprehensive principal component analysis capabilities such as: biplots and component rotations, canonical correlation analysis, maximum redundancy analysis, and canonical discriminant analysis. There are also new, more robust measures of scale and test for normality for univariate data, as well as tests for differences of means across groups.

SAS/IntrNet™ Software

- **Application Load Manager (loadmgr):** A separate process that can be used to enhance the distribution of Application Dispatcher resources on a network. When installed, it records the state of all Application Servers and maintains a separate dynamic pool of available servers. These capabilities allow the Application Load Manager to distribute (load balance) Application Dispatcher requests in an optimal manner. Note: The load manager is considered pre-production on OS/390 or from any platform trying to load balance OS/390 application servers.
- **Other New Features:** Support for ODS-generated HTML and graphics.

SAS/MDDB[®] Server Software

- **Distributed Multidimensional Metadata:** (Hybrid OLAP) gives you the ability to partition your multidimensional databases (MDDBs) so that data can be split across multiple MDDBs that could reside on different servers. Data can also be accessed from relational databases, SAS tables, summary tables, flat files, and so on.
- **Flexible Memory Management:** Ability to build cubes larger than memory.
- **New Storage Mechanism:** Uses index and compression to reduce the size of the MDDBs.
- **Cross Environment Data Access (CEDA):** The ability to read MDDBs created on different hardware platforms by either binary transfer, or by NFS mounting their current location to the platform location from which you would like to access them. For more details on CEDA, please see the SAS/CONNECT software section.
- **Character Computed Values**

SAS/OR[®] Software

- **QSIM:** Provides a graphical user interface for the simulation of queuing systems.
- **PROJMAN Menu System:** Adds a graphical user interface and more powerful 'what-if' capabilities.
- **PM Procedure:** Supplies the interfaces used in PROJMAN and can be used in any application currently using the CPM procedure.

SAS/QC[®] Software

- **ADX Interface:** Provides a solution for engineers and researchers who require a point-and-click interface for designing and analyzing standard experimental designs. This new interface guides you through the logical sequences of steps required for successful design and analysis of experiments. Interactive graphics, and flat-file text and HTML-formatted reports are included. The ADX Interface is available on PCs (Windows[®] and OS/2[®]), UNIX workstations, and OpenVMS[™] (Alpha and VAX[™]).

SAS/STAT[®] Software

- **New procedures** include those for partial least squares and spatial prediction.

- **Enhancements** include the addition of confidence limits in many procedures, more exact tests, more comprehensive facilities for GEE analysis in the GENMOD procedure, and numerous other new features.
- **Experimental procedures** perform survey data analysis and nonparametric modeling, new directions for SAS/STAT software. PROC TLOGISTIC is an experimental version of the LOGISTIC procedure which includes a CLASS statement.
- **Analyst Application Enhanced:** The Project Tree organizes results by projects, and you can open data sets within those projects by directly clicking on data nodes. Data access and management facilities have been enhanced to include merging tables, and stacking and splitting columns. You can also produce basic reports such as pie charts and bar charts. The statistical capabilities of the Analyst Application have been strengthened to include survival analysis, repeated measurements, multivariate statistics, and mixed models.

Online Documentation

- **SAS OnlineDoc™ CD-ROM:** Delivered free as part of SAS software, reference documentation is now indexed and completely searchable on CD-ROM. A powerful interface makes locating information quick and easy. SAS OnlineDoc can be accessed through an internal web, an ordinary file server, networked or stand-alone, or directly from the CD-ROM. Additional copies of SAS OnlineDoc CD-ROM will be available through the Publications Division. Hardcopy versions of the books found on the SAS OnlineDoc CD-ROM will be available 2nd Quarter of 1999. An update to the CD-ROM with additional information will also ship in that timeframe.

Host System Enhancements

In addition to the general features of Version 7 that are available on all host platforms supported, there are many new host-specific enhancements as well. Below are just a few.

Windows:

Setup Support

- Improvements to Silent (unattended) Setup allow it to be used for remote, unattended installations.
- To facilitate shared network installations, the Setup program allows users to use separate SASUSER locations.
- Auto-run capability available from the SAS System CD-ROM has been enhanced. A custom web view of the SAS System CD-ROM is now available. The web view facilitates browsing the SAS System CD-ROM and integrates seamlessly with Microsoft Internet Explorer.
- Setup now handles multiple installations of the SAS System. A single uninstall action correctly removes all previously installed SAS System files.

Network and performance enhancements

- Configuration of the SAS System has been organized to maximize performance across the network.
- Version 7 has been tuned for the IA32 architecture (VTune, IAL visits).
- Improved file I/O (sequential and random).
- Enhanced X command (NOXCMD, XMIN/XMAX).

- 64-bit capabilities of NTFS and symmetric multiprocessing (SMP).
- BackOffice Logo Certification signals that the SAS System was designed for and integrates well with the applications in the Windows NT Server environment. The SAS System supports the NT security model for file system and SAS/CONNECT software access. SAS/SHARE software is also administered as a Windows NT Service (along with SAS/CONNECT software), and remote, unattended installation is possible.
- NT features are supported that improve the performance of input and output in the Windows NT operating environment. These include optimizations for both sequential and random I/O. These enhancements are most beneficial when operating on large amounts of data stored on Windows NT Server. In addition, SAS System executable images are "based" to allow optimal loading in the Windows NT virtual memory space to provide faster load times.
- Windows NT system utilities, such as Performance Monitor and Event Log, are supported for more accurate diagnostics and monitoring when deployed in a distributed server environment.
- 4-gigabyte tuning support available in Windows NT Server 4.0, Enterprise Edition. This allows SAS System applications to directly access up to 3 gigabytes of RAM in large server systems.
- Microsoft Management Console support to provide a unified interface for SAS system management functions.
- Microsoft System Management Server support to provide remote, unattended installation of the SAS System. For organizations that use SMS, this greatly facilitates the distribution of software during installation time, as well as for updates.

Application Integration

- Enhanced e-mail support for Microsoft Exchange Server. Organizations that use Exchange Server can now post information directly to public folders. Automated SAS programs can direct their output to standard locations for access by other users.
- Lotus Notes support has been improved so that SAS System output can be exported with formatting information, such as line breaks retained. Report output can now be directly exported to Lotus Notes for groupware sharing without changing the report format.
- Two ODBC drivers are available under Windows in Version 7, the SAS ODBC Driver and the Universal ODBC Driver.
 - The SAS ODBC Driver provides read and write access to ODBC data through the base SAS System. The SAS ODBC Driver allows the use of variable names up to 32-bytes as well as the use of name literals.
 - The Universal ODBC Driver enables other applications to access SAS data without requiring access to the SAS System. The Universal ODBC Driver provides read-only access to ODBC data. Through the Universal ODBC Driver, applications, such as Microsoft Excel, can directly access data stored in SAS formats without requiring the SAS application software. Sold separately, the driver provides access to the standard data sources, including SAS data sets, CFO Vision financial databases (FDBs), SAS multidimensional database (MDDb) files, and JMP files. This driver also supports access to SAS data generated on other platforms, such as UNIX and OpenVMS.

The SAS System Viewer

- Can now be activated from within other applications that support the ActiveX Document interface (such as a Web browser) to provide a more consistent interface across applications.
- The Viewer allows the selection of a tabbed workbook view to facilitate navigation when viewing multiple files.

- The Viewer provides support to export table-based file types to a file or the clipboard. The supported export file formats are CSV (comma delimited), Text (tab delimited), and Formatted Text (space delimited). Portions of the table may be exported, or the entire view of the table may be exported to a text-based file.
- To facilitate the viewing of very large SAS data sets, the Viewer can be configured to subset (filter) the number of records (observations) and the sorted order, and process a WHERE clause if one is provided. This allows much larger data files to be viewed without exhausting system memory. The settings are saved in the SAS Registry and are used the next time that a file is opened.

Windows and OS/2 GUI Enhancements:

- **ODS and HTML Integration** - The SAS System for Windows and OS/2 allows you to easily configure options about your SAS generated HTML output. You can use configure any browser to use for viewing the output. With the SAS System for Windows (only), you can also view HTML output inside the SAS System if you have Internet Explorer 4.0 installed.
- **Docking View** - For the SAS System on Windows and OS/2 we have provided a docking view area. The docking view allows you to click on results output and have the output displayed without obscuring your navigational point. You can also launch applications from the docking view. We believe the docking view makes it easier to use the SAS System.
- **User Interface** - The toolbars and menus for the SAS System on Windows have been updated to be consistent with newer Windows applications. This includes rebar style toolbars and Office compatible menus.
- **Command Bar** - The command bar has had several enhancements that should make using the SAS System for Windows and OS/2 even easier. All commands entered in the command bar are now preserved between instances of the SAS System. Additionally, we have added AutoComplete support to the command bar. With AutoComplete, previously entered commands are automatically matched as you type characters in the command bar.
- **Microsoft IntelliMouse™ Support** - The SAS System for Windows supports the Microsoft IntelliMouse. IntelliMouse support allows a way to scroll window contents without using the scrollbar. You can use the mouse wheel on the special mouse to scroll the window contents.
- **Printing** - For the SAS System on Windows we have exposed many printing settings through options so they can be set programmatically. These options include the ability to set margins, paper size, paper source, and orientation. Additionally, we have added a Page Setup dialog to set values for the entire SAS session regardless of printer. The Print Setup dialog still sets settings for a particular printer. These changes make us more consistent with other Windows applications.
- **Help** - All SAS System help in Windows and OS/2 is displayed in HTML. On Windows (only) we also provide chm (compiled HTML). Using compiled HTML, we provide indexing and searching capabilities. This functionality requires Internet Explorer 4.0. If you do not want to use this browser, you can install only HTML files.

Unix:

- **Large file access** - is now production for external files and SAS datasets greater than 2 gigabytes.
- **New GUI look and feel** - The integrated explorer and results windows are available along with the traditional LOG, PROGRAM and OUTPUT. (the old look is still available, for those who prefer)
- **ODS output** - can be directed directly to your browser via an embedded httpd server.

OpenVMS - VAX and Alpha:

General

- Foreign verb for SAS invocation instead of .cld file
- NOXCMD option - disallow any operating system commands from SAS
- XLOG option - routes X command output to the SAS log
- New behavior for PROC VAXTOAXP - VAX numerics less than 8 bytes long are increased in length by one byte when moving to Alpha
- VMS_SAS_OPTIONS symbol for specifying SAS options

GUI

- Help interface through web browser
- Email interface is production

SAS I/O

- New V7 engine processing
- Ability to specify quoted physical names
- New host data set options
- ALQMULT/DEQMULT - new options to control disk space allocation for SAS files in multiples of data set page size. ALQMULT set to 10 pages by default, DEQMULT is 5 pages by default.
- CACHENUM - I/O option that identifies number of caches used for open SAS files.
- New defaults for CACHESI ZE/ALQ/DEQ
- Large file support (VMS max of 4 terabytes) is production External I/O
- Ability to specify command expressions via key value FILENAME/INFILE statements for indexed files (new on VAX)

Formats/Informats

- Character formats width range increased from 200 to 32767

OS/390:

- **Increased support for multi-volume SAS data libraries** - The restriction that multi-volume SAS data libraries could reside on no more than 5 volumes has been removed. The limit is now the operating system limit of 200. Also new is the ability to do dynamic allocation of multi-volume SAS data libraries.
- **Spawner Program** - For SAS/IntrNet and SAS/CONNECT software mainframe users, there is an alternative method to signing on to a remote session with a TSO sign-on script. The OS/390 spawner program initiates SAS/CONNECT sessions on OS/390 systems without requiring that username and password pairs be passed over the network in clear text mode. If the local SAS session is running Release 6.09E or a subsequent release, or Release 6.11 TS040 or a subsequent release, all data that flow from the local host to the spawner program during sign on are encrypted by default. The OS/390 spawner program also supports encrypted sign ons, by default, to a OS/390 system with or without scripts. The OS/390 spawner runs as an OS/390 started task. To start the OS/390 spawner, enter the following operator command: `START SASSRVR,PORT='spawner'`
- **Wildcard support** - for member names on the FILENAME, FILE and INFILE statements.
- **Enhanced Support for PDSEs** - You can now write to multiple members of a single PDS Extended file at the same time.

- **Enhanced Support for UNIX System Services Files** - The FILESYSTEM option and flexible syntax for physical filenames allow you to access files in both file systems simultaneously.
- **New GUI look and feel** - The integrated explorer and results windows are available along with the traditional LOG, PROGRAM and OUTPUT. (the old look is still available, for those who prefer)

CMS:

- **Enhanced Shared File System support** for External I/O and SAS Libraries
- You can now **perform I/O on Shared File System resident external files and SAS Libraries** without first using the CMS ACCESS command.
- In general, any place you can specify a CMS filemode, you can instead use a **SFS directory specification**.
- **CMS Pipeline Support** -You can use standard CMS pipeline specifications in place of the external file specification in the FILE, FILENAME, and INFILE statements. This enables you to receive input from any CP or CMS command or pipeline device driver, or to route output to any pipeline device driver.
- **New GUI look and feel** - The integrated explorer and results windows are available along with the traditional LOG, PROGRAM and OUTPUT. (the old look is still available, for those who prefer)

Additional Products Shipping with Version 7

There are other products shipping in Version 7 whose major enhancements are support for features mentioned under base SAS software such as ODS, long and mixed case names, and cross-release compatibility. These products are:

- **SAS/IML[®] Software**
- **SAS/LAB[®] Software**
- **SAS/SESSION (available to customers currently licensing product under Release 6.09E)**
- **SAS/SHARE[®] Software**
- **SAS/SPECTRAVIEW[®] Software**

New Products Shipping with Version 7

- **SAS/SECURE[™] Software:** This new product protects sensitive, corporate information as it traverses the network by encrypting the data using one of several encryption algorithms. Data passed between SAS/CONNECT or SAS/SHARE sessions is protected by SAS/SECURE. SAS/SECURE software includes the encryption services of RSA's BSAFE Toolkit and Microsoft's CryptoAPI.

Products Not Shipping with Version 7

The following products will not ship with Version 7, but will be available with a later release of the SAS System:

- **CFO Vision[™]**
- **Enterprise Miner[™]**
- **Enterprise Reporter[™]**
- **HR Vision[™]**
- **IT Service Vision[™]**
- **SAS/ACCESS Interface to DATACOM**
- **SAS/ACCESS Interface to R/3**
- **SAS/ACCESS Interface to SQL/DS[®]**
- **SAS/CALC[®] Software**
- **SAS/PH-Clinical[®] Software**
- **SAS/TOOLKIT[®] Software**
- **SAS/Warehouse Administrator[™]**

Products Discontinued as of Version 7

The following products will no longer be available from Version 7 on:

- **SAS/ACCESS Interface to AS/400 on OS/2** – migration path is to use SAS/ACCESS Interface to ODBC
- **SAS/ENGLISH[®] Software**

Required Operating System Release Levels for Version 7

The table below lists the range of releases supported for each environment. For additional information please visit our technical support web page: http://www.sas.com/service/techsup/sysreq_index.html

Operating System:	Release Levels:
Microsoft Windows: Workstation	Windows 95 (Build 950 or greater) ,Windows 98 (Build 1998), Windows NT 4.0 (Build 1381: Service Pack 3), Windows NT 5.0 (in an experimental mode only)
Microsoft Windows: Server	Windows NT 4.0 (Build 1381: Service Pack 3), Windows NT 5.0 (in an experimental mode only)
IBM OS/2®	Warp 3.0, Warp 4.0
IBM AIX®	4.2, 4.3
HP HP-UX	10.20, 11.0
Sun Solaris	2.6, 2.7 (Solaris 7)
Digital UNIX	4.0d
OpenVMS Alpha	7.1
OpenVMS VAX	6.2
IBM OS/390®	V1R1, V1R2, V1R3, V2R4
IBM MVS	4.2
IBM CMS	10

RDBMSs/Supported Protocols in Version 7 - by Operating System

	AIX®	CMS	Digital UNIX	HP-UX*	OS/390®	OpenVMS Alpha	OpenVMS VAX	OS/2®	Solaris	Windows
ADABAS	--	--	--	--	6.2.2	--	--	--	--	--
AS/400	--	--	--	--	--	--	--	Discontinued *****	--	--
DB2®	UDB V5	--	--	‡ UDB V5	**** V4, V5	--	--	<u>DB2 2.1, UDB V5</u>	‡ UDB V5	‡ <u>DB2 2.1.1, UDB V5</u>
CA/IDMS	--	--	--	--	12.0	--	--	--	--	--
IMS	--	--	--	--	--	--	--	--	--	--
INFORMIX	7.30, 8.21	--	--	7.30, 8.21	--	--	--	--	7.30, 8.21	--
INGRES	1.2/01	--	1.2/00	1.2/00	--	--	--	--	1.2/00	--
ODBC	‡ 32-bit driver	--	--	3.11 driver	--	--	--	32-bit driver 2.0+	‡ 3.11 driver	32-bit driver
OLE DB	--	--	--	--	--	--	--	--	--	Experimental
ORACLE®	7.3.2.1, 8.0.4	--	7.3.3, 8.0.4	7.3.3, 8.0.4	7.3.2.3	7.3.2.3	7.3.2.3 **	7.3	7.3.2.1, 8.0.4	7.3+
PCFILE	Available	--	Available	Available	‡ Avail.	--	--	Available	Available	Available
RDB	--	--	--	--	--	7	7	--	--	--
S2K®	--	--	--	--	--	--	--	--	--	--
SQL Server	--	--	--	--	--	--	--	--	--	*** 6.5, 7.0
SYBASE	10.04, 11.1	--	10.04+	10.04+	--	--	--	10.04	10.04, 11.1, 11.1.1	10.0.4, 11.1+
UNIXDBI	Available	--	Available	Available	--	--	--	--	Available	--

-- - **Not Available**

‡ - **New with Version 7**

* If you are running HP-UX 11.0, the initial release of the SAS/ACCESS Interface engine to Oracle in Version 7 did not work. Technical Support now has a downloadable fix available. Note: the SAS/ACCESS Interface engines do work with HP-UX 10.20.

** To run SAS/ACCESS Interface to Oracle, you need to be running Open VMS V7.0 or above.

*** Starting with SAS Version 7, the SAS/ACCESS Interface to ODBC product is required to access tables in Microsoft SQL Server. Due to the divergence of the API between Sybase and Microsoft SQL Server databases, ODBC is Microsoft's standard protocol for vendors to use when accessing their data store (OLE DB is their newest protocol, to eventually replace ODBC). As such, in Version 7, the SAS/ACCESS Interface to Sybase SQL Server product will only provide access to the Sybase DBMS. Note: There is a new conversion procedure in the Version 7 SAS/ACCESS interface to ODBC (*PROC CV2ODBC*) that takes Version 6 access and view descriptors for MS SQL Server and converts them to Version 7 ODBC pass-through views.

****The SAS Version 5 Compatibility procedures for DB2/MVS are not supported in the Version 7 release of SAS/ACCESS Interface to DB2.

*****The SAS/ACCESS interface to AS/400 was released on OS/2 in the V6 timeframe but is discontinued in Version 7. The migration path for SAS System AS/400 users is ODBC on Windows. This involves an operating system shift by our users, but all of IBM's new AS/400 client code and support is for Windows.

A conversion procedure is available in Version 7 in the SAS/ACCESS Interface to ODBC under Windows. Views written using the SAS/ACCESS interface to AS/400 on OS/2 in Release 6.12, can be copied to a Windows machine. If they are already on a network, they can be accessed by pointing the SAS System for Windows to that directory. Running the conversion procedure on these views will produce PROC SQL views that operate just like the SAS/ACCESS views did in Version 6.

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