



## APPENDIX

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## Encryption Services

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### What Are Encryption Services?

*Encryption services* protect data that is sent between hosts across a network. Encryption services use a reversible algorithm to convert plain-text data into an unintelligible form, thus protecting data from being used by unauthorized parties.

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### Terminology

This appendix addresses encryption services for both SAS/CONNECT and SAS/SHARE software. The terms *local host* and *remote host* are used to designate local and remote sides for SAS/CONNECT and *client* and *server* sides for SAS/SHARE.

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### System and Software Requirements

You must purchase a license for SAS/SECURE in order to use the encryption services of these products:

- RSA BSAFE Crypto-C Toolkit
- New in Version 8, RSA BSAFE Crypto-J Toolkit, which supports Java clients that access SAS servers.

The RSA BSAFE Crypto-C Toolkit is supported on these platforms:

- OpenVMS Alpha
- OpenVMS VAX
- OS/2
- AIX
- Compaq Tru64 UNIX (formerly Compaq's DIGITAL UNIX)
- HP-UX
- Solaris 2
- OS/390.

The RSA BSAFE Crypto-J Toolkit runs on any platform that has installed the Java Development Kit, Version 1.1 or later.

CryptoAPI from Microsoft is an application programming interface that provides access to the cryptographic services that are provided by:

- Windows 95 (as part of Internet Explorer 3.0+)
- Windows NT 4.0+ (as part of the operating system). Service Pack 3 or a subsequent release must be installed.

You may have either or both of the following packages installed on your Windows host to use CryptoAPI:

- Microsoft Base Cryptographic Service Provider
- Microsoft Enhanced Cryptographic Service Provider.

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## Requirements for SAS Proprietary Encryption Services

You can use the SAS Proprietary fixed encoding encryption services on all platforms. Fixed encoding encryption services provided by SAS are free of charge and require no additional software license.

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## Communications Access Methods Support

Encryption services provided by the RSA BSAFE Crypto-C Toolkit and the Microsoft CryptoAPI are available with the following communications access methods on the supported hosts:

- TCP/IP
- DECnet
- NetBIOS.

The RSA BSAFE Crypto-J Toolkit supports the TCP/IP access method only.

For example, you can use encryption services to connect two UNIX hosts when using the TCP/IP access method. Also, you can connect two Windows hosts by using either the TCP/IP, the DECnet, or the NetBIOS access methods. See *Communications Access Methods for SAS/CONNECT and SAS/SHARE Software* for a definitive list of supported host connections by access method.

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## North American and International Encryption Services Packages

United States export regulations on encryption software restrict access to SAS/SECURE software and related technical data as follows:

- 1 The SAS/SECURE Domestic version may be used or accessed only within the United States or Canada by citizens or lawfully admitted permanent residents of those countries or as otherwise permitted by special export license.
- 2 The SAS/SECURE International and the SAS/SECURE for Windows versions may not be exported to terrorist supporting or embargoed destinations or parties.

In addition to export regulations, SAS software licensing documents may limit countries of use.

Because of these export key-length restrictions, encryption services are packaged in the following forms:

#### North American (U.S. and Canada)

available to North American customers and certain other customers by special export license, supports 1024-bit or 512-bit RSA keys in combination with the following algorithms:

- RC2 using 128-bit or 40-bit keys
- RC4 using 128-bit or 40-bit keys
- DES using 56-bit keys
- Triple DES using 168-bit keys.

#### International

available to International customers, supports two types of encryption:

- 512-bit RSA keys in combination with the 40-bit key algorithms RC2 and RC4
- new in Version 8, the 1024-bit RSA keys in combination with the 56-bit DES algorithm.

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## Data Encryption Algorithms

The encryption algorithms as well as the SAS Proprietary algorithm are defined as follows:

### RC2

A proprietary algorithm developed by RSA Data Security, Inc., RC2 is an alternative to DES. The algorithm expands a single message by up to 8 bytes. RC2 is a block cipher that encrypts data in blocks of 64 bits. The size of the output of the algorithm is always a multiple of the block size. The RC2 key size can range from 8 to 256 bits.

### RC4

A proprietary algorithm developed by RSA Data Security, Inc., RC4 is a stream cipher. A stream cipher encrypts one byte at a time. The RC4 key size can range from 8 to 2048 bits.

*Note:* The term *cipher* means encryption algorithm.  $\Delta$

### DES

An acronym for Data Encryption Standard, DES was developed by IBM. The algorithm expands a single message by up to 8 bytes. DES is a block cipher that encrypts data in blocks of 64 bits by using a 56-bit key.

### Triple DES

Triple DES executes DES three times on the data in order to exploit a key size that is three times that of DES. The algorithm expands a single message by up to 8 bytes. DES is a block cipher that encrypts data in blocks of 64 bits.

**SAS Proprietary**

This provides basic fixed encoding encryption services on all platforms and requires no additional product licenses. The algorithm expands a single message by approximately one-third. It uses a 32-bit key that is fixed.

The key sizes that are used are based on the encryption software that is available on your host and the value that is assigned to the NETENCRKEYLEN= option (see the next section).

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## Options

*Note:* These options do not apply to hosts that use the RSA BSAFE Crypto-J Toolkit. For Java client options, see other documentation (such as the documentation about the SAS/CONNECT Driver for Java that is provided with the SAS/IntrNet software).  $\triangle$

For hosts that use the RSA BSAFE Crypto-C Toolkit or the Microsoft CryptoAPI, here are the SAS options that set encryption services attributes.

NETENCRYPT = YES | NO

or

NETENCRYPT | NONETENCRYPT

Set this option at both the local and remote hosts. At the remote host, this option specifies that encryption is required for each connection from a local host SAS session. At the local side, this option specifies that the local host must connect only to a remote host that supports encryption.

By default, encryption is used if the NETENCRYPTALGORITHM= option is set and if both the local and remote sides are capable of encryption. If encryption algorithms were specified but either the local or the remote side is incapable of encryption, then encryption is not performed.

Encryption may not be supported at the local or at the remote host for these reasons:

- You are running a release of SAS (prior to Version 7) that does not support encryption.
- Your site has not purchased a SAS/SECURE license for a specific platform.
- You specified incompatible encryption algorithms in the local and the remote host SAS sessions.
- You do not have a cryptographic service provider installed.

NETENCRYPTALGORITHM=(*algorithm1*, *algorithm2*, ...)

If you specify more than one algorithm, enclose the algorithm names in parenthesis and use commas to separate them. If there are embedded blanks in the algorithm name, enclose each algorithm with quotation marks.

The alias is NETENCRALG.

Set this option at the remote host and, optionally, at the local host to specify one or more encryption algorithms to use in a SAS session. However, the local and remote hosts must share an encryption algorithm in common. If you specify the option in the remote host session only, the local side attempts to select an algorithm that was specified at the remote host. If you also set the option at the

local host and specify an algorithm that is not specified at the remote host, the attempt by the local host to connect to that remote host fails.

Valid values for this option are

RC2  
 RC4  
 DES  
 TripleDES  
 SASProprietary

NETENCRYPTKEYLEN = *n*

Set this option in either the local or the remote host SAS session. It specifies the key length to be used by the encryption algorithm.

The alias is NETENCRKEY.

Valid values for this option are

128	specifies 1024-bit RSA and 128-bit RC2 and RC4 key algorithms.
40	specifies 512-bit RSA and 40-bit RC2 and RC4 key algorithms.
0	no value is set. This is the default.

If you require extra security, set NETENCRYPTKEYLEN=128. If you want to save CPU, set NETENCRYPTKEYLEN=40.

By default, if you try to connect a host that is capable of only a 40-bit key algorithm with a host that is capable of both 40-bit and 128-bit, the connection using the lesser of the two key lengths is used. If both hosts are capable of 128-bit, then 128-bit is used. To explicitly set one or the other, set the NETENCRYPTKEYLEN SAS option.

NETMAC | NONETMAC

This option controls the use of Message Authentication Codes (MACs) on network communications. A Message Authentication Code is the equivalent of a checksum that is used to ensure that the original message has not been modified. The MAC integrity checking adds an extra 16 bytes to RC4 encrypted messages and an extra 24 bytes to RC2, DES, and TripleDES encrypted messages.

You set this option at either the local or the remote host. The default is NETMAC.

## SAS/CONNECT Example

### SAS/CONNECT Local Host

Specify the following statements in a local host session:

```
options netencryptalgorithm=rc4;
options remote=unxnode comamid=tcp;
signon;
```

The NETENCRYPTALGORITHM option specifies that the RC4 algorithm be used for encryption in the local host session.

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## SAS/CONNECT Remote Host

The following example illustrates the content of the executable file that a UNIX spawner program uses to start SAS and to specify encryption in a SAS/CONNECT remote host session.

```
# _____
# mystartup
# _____

#!/bin/ksh
. ~/.profile
sas dmr -noterminal -no$syntaxcheck -comamid tcp -netencryptalgorithm rc4 -nete
```

The NETENCRYPTALGORITHM option specifies that the RC4 algorithm be used for encryption of all data that is exchanged with connecting local hosts. The NETENCRYPT option specifies that encryption is required by any local host that accesses this remote host.

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## SAS/SHARE Example

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### SAS/SHARE Client

Specify the following statements in a client session:

```
options netencryptalgorithm=rc4;
options comamid=tcp;
libname sasdata 'edc.prog2.sasdata' server=rmthost.share1;
```

The NETENCRYPTALGORITHM option specifies that the RC4 algorithm be used for encryption in the client session.

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### SAS/SHARE Server

Specify the following statements in a SAS/SHARE server session:

```
options netencrypt netencryptalgorithm=rc4;
options comamid=tcp;
proc server id=share1;
run;
```

The NETENCRYPT option specifies that encryption is required by any client that accesses this server. The NETENCRYPTALGORITHM option specifies that the RC4 algorithm be used for encryption of all data that is exchanged with connecting clients.

# Glossary

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**access method**

See communications access method.

**access pattern**

the way that a particular file is being accessed: sequential, random, BY-group rewind, or two-pass sequential.

**adapter**

for PCs, one of several interchangeable terms for a piece of communications hardware. In this context, adapter is synonymous with board or card. The adapter is a printed circuit card that plugs into the PC expansion slot to attach the PC to some external connection.

**agent**

SAS source code that is used by the DOMAIN server to control the execution of a task on a remote host.

**aggregate storage location**

a location on an operating system that can contain a group of distinct files. Different host operating systems call an aggregate grouping of files different names, such as a directory or a partitioned data set. The standard form for referencing an aggregate storage location from within the SAS System is *fileref(name)*, where *fileref* is the entire aggregate and *(name)* is a specific file or member of that aggregate. See also *fileref*.

**AID key**

an acronym for attention ID key. AID keys (for example, ENTER, PA1, PA2, and the function keys) are features of the 3270 series terminals. The AID key requests the attention of the 3270 system. When you press an AID key, it becomes the first component in the 3270 data stream. It describes the action that caused the data stream to be sent.

**API**

an abbreviation for application programming interface. API is a formally defined programming language interface. Some 3270 emulation programs offer an API to enable an application to read and write 3270 screens and to type on the keyboard. An example is EHLLAPI from IBM, which is offered by most 3270 vendors as a standard program interface.

**APPC\***

an acronym for Advanced Program-to-Program Communication. This type of connection uses the LU6.2 protocol for distributed processing within an IBM Systems Network Architecture (SNA) network. The terms APPC and LU6.2 are often used interchangeably.

**ASCII**

an acronym for the American Standard Code for Information Interchange. ASCII is a 7-bit character coding scheme (8 bits when a parity check bit is included) that includes graphic (printable) and control (nonprintable) codes.

**ASCII collating sequence**

an ordering of characters that follows the order of the characters in the American Standard Code for Information Interchange (ASCII) character coding scheme. The SAS System uses the same collating sequence as its host operating system. See also EBCDIC collating sequence.

**ASCII mnemonics**

the names of ASCII control characters that you can specify in a program to invoke the associated function. For example, NUL represents the null character, CR represents carriage return, and so on.

**async**

See asynchronous communication.

**asynchronous communication**

a method of transferring data that does not require the information to be sent at a constant pace. Asynchronous (async) transmission enables data to be sent at irregular intervals by preceding each character code with a start bit and following it with a stop bit. Async communication is also called serial communication.

**asynchronous processing**

is remote processing performed in parallel to your local processing. This means that, you maintain control over your local SAS session during the remote processing. SAS/CONNECT stores the accumulated log and output from the remote processing until you request the data. Asynchronous processing is invoked by using the CONNECTWAIT=NO option in the RSUBMIT command or statement.

**attention ID key**

See AID key.

**autoexec file**

a file containing SAS statements that are executed automatically when the SAS System is invoked. The autoexec file can be used to specify some SAS system options, as well as librefs and filerefs that are commonly used.

**base SAS software**

software that includes a programming language that manages your data, procedures for data analysis and reporting, procedures for managing SAS files, a macro facility, help menus, and a windowing environment for text editing and file management.

**batch mode**

on mainframes and minicomputers, a method of running SAS programs in which you prepare a file that contains SAS statements and any necessary operating system control statements and submit the file to the operating system. Execution is

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\* identifies terms whose definitions are taken directly or paraphrased from *Microsoft Press Computer Dictionary*, 4th Edition, 1991.



completely separate from other operations at your terminal and is sometimes referred to as running in background.

**baud rate**

the rate at which data is transmitted between two devices. Baud rate is a measure of data transmission speed that is equal to the number of signal changes per second. Baud rate expresses a quantity of signals traveling over a data link per second. You can roughly estimate the characters per second by dividing the baud rate by 10. Common baud rates are 1200, 2400, and 9600.

**binary**

the name of the base 2 number system. A binary digit can have one of two values: 0 or 1. A binary digit is called a bit and is considered to be off when its value is 0 and on when its value is 1.

**block**

(1) the grouping of statements between a logical beginning and ending statement. For example, the statements between a RSUBMIT and an ENDRSUBMIT statement.  
(2) the behavior of a queue when it is opened using the POLL attribute. If a queue is blocked, then a querying function will continue to poll the queue until a message is received, thus not returning until the queue has received a message.

**board**

See adapter.

**break signal**

in SAS/CONNECT and the micro-to-host link, a signal that you send to your local host to interrupt an executing program. For PCs, you send a break signal by pressing the CONTROL and BREAK keys, or the CONTROL and C keys, simultaneously. While an RSUBMIT, SIGNON, or SIGNOFF command executes, a break signal from the local host keyboard interrupts execution. The link software displays a Break window to enable you to decide how to proceed by using special Break window commands.

**Break window**

a special class of windows for SAS/CONNECT and the micro-to-host link. Break windows enable you to handle error conditions and interruptions that you cause by issuing a control-break signal.

**buffer**

a portion of the computer's memory that is used for special holding purposes or processes. For example, a buffer might simply store information before sending it to main memory for processing. Or a buffer might hold data after it is read or before it is written.

**card**

a printed circuit board. See also adapter.

**catalog**

See SAS catalog.

**catalog entry**

See entry type and SAS catalog entry.

**CEDA**

the cross environment data access facility which can be used to transfer Version 7 or Version 8 files between heterogeneous hosts more efficiently than other SAS file transfer techniques.

**character set**

a standardized way of representing alphabetic, numeric, and control characters. The most widely used character sets are ASCII and EBCDIC.

**character set translation table**

a file that contains ASCII-to-EBCDIC or EBCDIC-to-ASCII translation information. See also keyboard translation table.

**client**

in a network, a workstation that requests services from the server. See also server.

**client/server**

an arrangement that is used on networks that treats both the server workstation and the individual client workstations as programmable devices. The processing of an application is distributed between the software that runs on the client and the server workstations. The server software accepts data or requests for processing from client software and returns the data or results to the client. The client portion of the application is typically optimized for user interaction, whereas the server portion provides centralized, multi-user functionality.

**coaxial cable**

a type of communications cable used for networks and for connecting 3270 terminals to remote host 3270 controllers. Coaxial cable can carry data at high rates and is resistant to electrical interference.

**collating sequence**

See ASCII collating sequence and EBCDIC collating sequence.

**COM port**

a serial communication port supported by the DOS and OS/2 operating systems. The COM ports are named COM1, COM2, and COM3. A COM port is also called an async or serial port.

**command file**

in SAS software, a file that contains operating system commands to be executed in sequence.

**Communication Services Break Handler window**

one of two possible windows that are displayed when a remote session is interrupted by a control break or when there is an error in a statement that is submitted to the remote host. This window offers the following selections: *continue*, *disconnect link*, *debug*, *re-send*, *snapshot screen*, *type*, *subset command*, and *invoke the Application Break Handler*. See also SAS/CONNECT Attention Handler window.

**communications access method**

the method that SAS/CONNECT sessions use to communicate with each other. Values for the communications access method are specified by using the COMAMID= system option.

**communications adapter**

See adapter and communications hardware.

**communications board**

See adapter and communications hardware.

**communications card**

See adapter and communications hardware.

**communications controller**

a machine that manages the control of communications lines so that CPU resources can be used for performing applications processing. A communications controller is also known as a communications processor, front-end processor, or transaction processor.

**communications hardware**

computer hardware that is used in connections between a terminal and a host computer or between two computers. Communications hardware usually refers to a

communications adapter, also called a communications board or a communications card. The kind of hardware that you use determines the kind of connection that you have, either async or 3270.

**Communications Manager**

the communications component for OS/2 Extended Edition software that provides multiple connections to hosts. This enables you to have several communications sessions active at the same time.

**communications options**

options that specify the communications method to use (EHLLAPI, TELNET, TCP/IP). They also specify the port or the remote host to use in establishing the link (remote host session id, such as A or B; or COM1, COM2, COM3, or host name). The options you use are based on the operating systems and communications methods involved.

**compute services**

services of the SAS System for distributed applications. These services use remote computing resources (hardware, software, and data) to execute an application more efficiently than execution on a single, local system would be. See also distributed application.

**configuration file**

an external file that contains the SAS system options that are put into effect when the SAS System is invoked.

**configuration option**

a SAS option that can be specified in the SAS command or in a configuration file. Configuration options affect how the SAS System interfaces with the computer hardware and operating system.

**control character**

a character, usually nonprintable, used for control purposes rather than for information exchange.

**control program**

a low-level software interface, such as SAS/CONNECT, between communications hardware and applications programs. A control program works in conjunction with an adapter.

**crc checksum**

one or more characters appended to the end of a data block for error checking purposes.

**CUT**

an acronym for Control Unit Terminal, an IBM 3270 network term. All control of data that flows with CUT-mode 3270 terminals is done by the 3274 type controller, in contrast to DFTs, which perform some controller functions. See also DFT.

**Data Encryption**

the protection of data that is sent between hosts across a network from being used by unauthorized users.

**data representation**

the format in which data of a specific type is represented on a computer architecture or in an operating environment. For example, on the IBM mainframe under OS/390, character data is represented by means of EBCDIC encoding; on the IBM PC, such data is represented by its ASCII encoding.

**data transfer services**

services of the SAS System for copying data to and from a remote system. By creating copies of the data on the local or the remote machine, further transfer of the data across the network may not be required for subsequent analyses on either machine.

**data translation**

the conversion of data from one data representation to another data representation. See also data representation.

**DECnet\*\***

the Digital Equipment Corporation networking software that runs on nodes in both local and wide-area networks.

**DFT**

an abbreviation for Distributed Function Terminal, an IBM 3270 network term. In contrast with CUTs, DFTs participate with the 3274 controller in controlling the flow of data. DFT mode also enables you to run more than one remote host session. DFT-mode 3270 terminal emulation is more complicated than CUT-mode 3270 emulation and uses much more memory than CUT-mode emulation programs.

**direct messaging**

the form of communication that is used by programs that exchange information by sending messages directly between each other; both portions of the application must be active for successful communication.

**distributed application**

an application, typically implemented in a client/server environment, whose components are distributed for execution over various nodes of the network. Based on the specific update and retrieval traffic, distributing the application can significantly enhance overall performance. See also client/server.

**DOMAIN server**

a utility used to provide collection management, queue management, agent scheduling, and protocol gateway services.

**download**

to copy a file from the remote host to the local host.

**DTR**

an abbreviation for Data Terminal Ready, a signal that indicates that the local host is functioning as a terminal in an async connection. The DTR signal must be held high (remain on) so that the connection between the local host and the remote host remains intact. This is especially important when you quit an async terminal emulator and then run a SAS/CONNECT async connection.

**duplex**

a feature of async communication in which a channel provides simultaneous transmission of data between the remote host and the local host (full duplex) or one-way transmission (half duplex).

**EBCDIC**

an acronym for Extended Binary Coded Decimal Interchange Code. EBCDIC is an 8-bit character coding scheme that includes graphic (printable) and control (nonprintable) codes.

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\*\* identifies terms whose definitions are taken directly or paraphrased from *The Digital Dictionary*, published by Digital Equipment Corporation, 1984, 1986.

**EBCDIC collating sequence**

an ordering of characters that follows the order in the Extended Binary Coded Decimal Interchange Code (EBCDIC) character coding scheme. The SAS System uses the same collating sequence as its host operating system. See also ASCII collating sequence.

**echoplex**

the remote echoing of characters that are typed at the local terminal as a form of confirmation of the character that is typed. Half duplex or echoplex off means that characters are not echoed but are displayed at the local terminal by the terminal hardware. Full and half duplex can also refer to the asynchronous send-and-receive capabilities of the communications line.

**EHLLAPI**

an acronym for Emulator High-Level Language Applications Programming Interface, a Communications Manager application program interface that enables users and programmers to access the 3270 host presentation space. EHLLAPI is the same as HLLAPI, but IBM uses EHLLAPI in references to Extended Edition OS/2.

**engine**

a part of the SAS System that reads from or writes to a file. Each engine allows the SAS System to access files with a particular format. There are several types of engines. See also interface engine, library engine, native engine, and view engine.

**entry**

in SAS software, a unit of information stored in a SAS catalog. Catalog entries differ widely in content and purpose. See also entry type.

**entry type**

a characteristic of a SAS catalog entry that identifies its structure and attributes to the SAS System. When you create an entry, the SAS System automatically assigns the entry type as part of the name.

**environment variable**

(1) on some hosts, a named operating system variable that represents or contains a value. The value can be specified by using an operating system option, an operating system command, or both. The environment variables that are defined in one operating system process are not available to other operating system processes. (2) in OS/2, a variable that equates one string with another under OS/2 by using the SET system option or the OS/2 SET command. The environment variables that are defined in one OS/2 process are not available to other OS/2 processes.

**external database**

a database that stores data that is not part of the SAS System, for example DB2, ORACLE, and SYBASE.

**external file**

(1) a file that is maintained by the host operating system that the SAS System can read data from and route output to. External files can contain raw data, SAS programming statements, procedure output, or output created by the PUT statement. See also fileref. (2) in a DATA step, a file that the SAS System can read by using INFILE and INPUT statements or a file that the SAS System can write to by using FILE and PUT statements.

**file specification**

the name of an external file. This name is the name by which the host operating system recognizes the file. On directory-based systems, the file specification can be either the complete pathname or the relative pathname from the current working directory.

**fileref**

a name temporarily assigned to an external file or to an aggregate storage location that identifies it to the SAS System. You assign a fileref by using a FILENAME statement or an operating system command.

Do not confuse filerefs with librefs. Filerefs are used for external files; librefs are used for SAS data libraries. See also libref.

**gateway**

a device that connects networks that use the same or different communications protocols, enabling information to be passed from one network to the other. If the protocols are different, a gateway both transfers information and converts it to a form that is compatible with the protocols that are used by the second network for transport and delivery.

**graphical user interface (GUI)**

a type of computer display format that enables a user to choose commands, start programs, and see lists of files and other options (by pointing to pictorial representations, icons, and to lists of menu items on the screen). Choices can typically be activated with the keyboard or a mouse.

**GRLINK**

a special device driver that you must always use on the remote host when using SAS/CONNECT to execute graphics statements on the remote host and display graphs on the local host.

**handshaking**

the exchange of signals between two devices over an interface for control or synchronization purposes. Data flow control is needed to ensure that data is not sent faster than the receiving device can process it. Handshaking usually involves sending signals between the device and the host computer in order to start and stop transmission of data.

**HLLAPI**

an acronym for High-Level Language Applications Programming Interface, a Communications Manager application program interface that enables users and programmers to access the 3270 host presentation space. EHLLAPI is the same as HLLAPI, but IBM uses EHLLAPI in references to Extended Edition OS/2.

**host**

the operating system that provides facilities, computer services, and the environment for software applications.

**hot key**

one or a combination of keys that enables you to switch from a local session to a remote host or from a remote host to a local session when you have a 3270 connection. The keys that you use are based on your local host and terminal emulator, if any. You must be running a control program or a resident terminal emulator to use hot keys.

**inbound packet**

a unit of bytes transmitted from a local host to a remote host.

**indirect messaging**

the form of communication that is used by programs that exchange information indirectly by storing, fetching, and browsing messages in queues. Using message queues is a form of indirect communication because both portions of the applications are not required to be active at the same time. The message is stored on the queue by one program and forwarded to one or more programs at a later time.

**interactive line mode**

a method of running SAS programs without using the SAS windowing environment. You enter one line of a SAS program at a time. SAS processes each line immediately after you submit it.

**keyboard translation table**

a file that contains 3270 scan code translation information for use with non-U.S. 3274 controllers and non-U.S. typewriter keyboards. See also character set translation table.

**libref**

the name temporarily associated with a SAS data library. You assign a libref by using a LIBNAME statement or operating system control language.

**line mode**

See interactive line mode.

**link**

in SAS/CONNECT, intercomputer communication in which one computer is a local host and the other is a remote host. The link can be used to transfer files or to distribute processing to computers other than the local host.

**local area network (LAN)**

a group of computers and other devices that are dispersed over a geographically limited area and connected by a communications link that enables any device to interact with any other that is on the network. Separate LANs can be connected to form larger networks. LANs that use the same physical and communications protocols are linked by bridges or gateways, whereas dissimilar LANs are linked by gateways. See also gateway.

**local host**

the computer on which you use a SAS session to initiate a link with a remote host. See also local session.

**local session**

a SAS session that runs on the local host. The local session accepts SAS statements and passes those that are remote-submitted to the remote host for processing. The local session manages the output and messages from both the local session and the remote session.

**Macro Facility**

a part of SAS that is used for extending and customizing SAS software. It is also used to reduce the amount of text that must be entered to do common tasks. It consists of the macro processor and the macro language.

**macro variable**

a variable belonging to the macro language whose value is a string that remains constant until you change it. A macro variable is also called a symbolic variable.

**member**

(1) a file in a SAS data library. (2) under CMS, a single file in a CMS LOADLIB, MACLIB, or TXTLIB. (3) under OS/390, a single component of a partitioned data set. (4) under OpenVMS, a component of an OpenVMS text library.

**member name**

(1) a name that is given to a SAS file in a SAS data library. Member names can reference such file types as SAS data set, a catalog, an access descriptor, or a stored program. (2) under CMS, the name of a single file in a CMS LOADLIB, MACLIB, or TXTLIB. (3) under OS/390, the name of a single component of a partitioned data set. (4) under OS/2, member name is equivalent to filename for files that are stored in a

SAS data library. (5) under OpenVMS, member name is synonymous with filename for files that are stored in a SAS data library.

**member type**

a name that is assigned by SAS software that identifies the type of information stored in a SAS file. Member types include DATA, CATALOG, MDDB, and VIEW.

**methods of running the SAS System**

(1) standard methods of operation that are used to run SAS System programs. These methods are SAS/ASSIST, SAS windowing environment, interactive line mode, noninteractive mode, and batch mode. (2) in SAS/CONNECT, in addition to standard methods that are used to run SAS System programs, a special mode of operation is invoked when you initiate a link. This mode (display manager remote) is initiated by using the DMR system option in the script that invokes the SAS System on the remote host. No output or log messages appear in the display manager remote session; they are passed back to the local SAS System session. (3) under Windows, only batch mode is supported.

**micro-to-host link**

a facility of SAS software prior to Release 6.06 that allows communication between a SAS session under DOS and a SAS session on a remote host computer. In Release 6.06 and later releases of SAS software, the capabilities of the micro-to-host link are included in SAS/CONNECT.

**multi-observation buffering**

a method of transmitting more than one observation in each exchange with a SAS server. The TOBSNO= data set option is used to specify a different number of observations per exchange than the number that is calculated by SAS software.

**NetBIOS**

an acronym for Network Basic Input/Output System. NetBIOS is an application programming interface (API) for application programs that run on nodes in a local area network (LAN).

**non-U.S. keyboard**

a keyboard that is not a standard U.S. typewriter keyboard. Non-English language keyboards often have characters that are not found on U.S. keyboards and may not have some characters that are found on U.S. keyboards.

**noninteractive mode**

a method of running SAS programs in which you prepare a file of SAS statements and submit the program to the computer system. The program runs immediately and occupies your current terminal session.

**open mode**

a way that a SAS task accesses and operates on a member in a SAS data library. There are three open modes for SAS files: input, update, and output.

**outbound packet**

a unit of bytes that is transmitted from a remote host to a local host.

**packet**

a grouping of printable characters, a sequence number, and a checksum that are transmitted over the link as a unit. The SAS/CONNECT local and remote hosts use these specially formatted packets to communicate with each other.

**parity**

(1) a form of error-checking in which an extra bit is added to each byte, so that the total number of bits in each byte forms a particular pattern or sum. For odd parity, the number of bits that are set to 1 in each byte is odd; for even parity, the number of bits set to 1 is even. (2) a simplistic technique for detecting async transmission errors.



**peer-to-peer configuration\*\*\***

data communications support that routes data in a network between two or more APPC systems that do not need to be adjacent. See also APPC and program-to-program communications.

**permanent SAS data library**

a library that is not deleted when the SAS session terminates; it is available for subsequent SAS sessions. Unless the USER libref is defined, you use a two-level name to access a file in a permanent library. The first-level name is the libref, and the second-level name is the member name.

**permanent SAS file**

a SAS file in a library that is not deleted when the SAS session or job terminates.

**physical filename**

the name that the operating system uses to identify a file.

**procedure output file**

an external file that contains the result of the analysis or the report that is produced. Most procedures write output to the procedure output file, by default. Reports that DATA steps produce by using PUT statements and a FILE statement with the PRINT destination also go to this file.

**program generator**

a SAS program that writes another SAS program. Most program generators are DATA step programs, but some procedures can also generate programs.

**program-to-program communications**

a communications protocol that allows interconnected systems, such as those in a peer-to-peer configuration, to communicate and to share the processing of programs. See also peer-to-peer configuration.

**protocol converter**

a device that enables ASCII terminals to communicate with host systems by converting the ASCII data stream to an IBM 3270 data stream and vice versa.

**queue**

a user-defined storage area for programs that communicate by using indirect messaging to place and to retrieve messages.

**reboot**

to re-initialize your PC or PS/2 (when it is already started) by pressing the CTRL, ALT, and DEL keys simultaneously. Rebooting aborts any application that is running at the time.

**remote data services**

remote library services and data transfer services of the SAS System for distributed applications. These services enable access to data that is stored in a remote environment. These data can include SAS data sets, external database files, SAS catalogs, and external files. See also data transfer services, REMOTE engine, and remote library services (RLS).

**REMOTE engine**

a SAS library engine that enables a user's SAS session to access data by communicating with another SAS session. See also remote library services (RLS) and remote session.

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\*\*\*identifies terms whose definitions are from the *IBM Dictionary of Computing*, Ninth Edition, 1991.

**remote host**

in SAS/CONNECT, the computer on which processing occurs when you execute a PROC DOWNLOAD, PROC UPLOAD, or other SAS statement that is executed with the RSUBMIT command or statement. The term remote is used to describe how you interact with the SAS session that is running on the computer; it is not related to the physical location of the computer. See also local host and remote session.

**remote library services (RLS)**

services of the SAS System for distributed applications. These services provide transparent access to remote data libraries and move data through the network as the local SAS session requests it. The data must pass through the network if it is needed subsequently by local processing. See also distributed application.

**remote processing**

the process of using communications software to process local jobs by using the CPU resources of a remote host. With SAS/CONNECT, the output and messages from a program that runs on the remote host are displayed on the local host.

**remote session**

a SAS session that runs in a special mode on the remote host. No output or log messages are displayed on the remote host. The results of a remote SAS session are transmitted back to the log and output files on the local host.

**remote submit**

to use the RSUBMIT command or statement to submit statements that are entered in a local SAS session for execution by a remote SAS session.

**resident software**

software that is loaded into the PC's memory and remains there until the machine is turned off or rebooted. Resident software uses some of the memory available to your PC session. If too much memory is taken up by resident software, you may not be able to run certain applications, including SAS software.

**return code**

a code that is passed to the operating system that reports whether a command or job step has executed successfully.

**RS-232**

a particular kind of communications connector and hardware protocol that is usually used for async and SDLC connections.

**SAS catalog**

a SAS file that stores many different kinds of information in units that are called catalog entries. A single SAS catalog can contain several different types of catalog entries. Some catalog entries contain system information such as key definitions. Other catalog entries contain application information such as window definitions, help windows, formats, informats, macros, or graphics output.

**SAS catalog entry**

a separate storage unit within a SAS catalog. Each entry has an entry type that identifies its structure to the SAS System. See also entry type.

**SAS command**

a command that invokes the SAS System. This command may vary based on operating system and site. See also SAS invocation.

**SAS/CONNECT Attention Handler window**

one of two possible windows that are displayed when a remote session is interrupted by a break signal. This window offers the following selections: abort current remote processing or continue processing the current remote submit. See also Communication Services Break Handler window.

**SAS data file**

(1) a SAS data set that contains both the data values and the descriptor information. (2) in the SAS data model, a SAS data set that is implemented in a form that contains both the data values and the descriptor information. SAS data files have the type DATA. (3) one of the formats of a SAS data set implemented in Version 6 of SAS software. A SAS data file contains both the data values and the descriptor information that is associated with the data, such as the variable attributes. In previous releases of SAS, all SAS data sets were SAS data files. SAS data files are of member type DATA. In SAS, a PROC SQL table is a SAS data file.

**SAS data library**

a collection of one or more SAS files that is recognized by SAS and is referenced and stored as a unit. Each file is a member of the library.

**SAS data set**

descriptor information and its related data values that are organized as a table of observations and variables that can be processed by SAS software. A SAS data set can be either a SAS data file or a SAS data view.

**SAS data view**

a SAS data set in which the descriptor information and the observations are obtained from other files. SAS data views store only the information that is required to retrieve data values or descriptor information.

**SAS file**

a specially structured file that is created, organized, and (optionally) maintained by the SAS System. SAS files include SAS data sets, catalogs, and MDDBs.

**SAS Installation Representative**

an individual at your site who receives installation media, installs SAS software, and is designated as SAS Institute's contact for information about new and existing software. For SAS sites running DOS or OS/2, the representative coordinates distribution of software diskettes within the site.

**SAS invocation**

the process of calling or starting up SAS by an individual user through execution of the SAS command. You invoke SAS begins to begin initialization.

**SAS log**

a file that contains the SAS statements that you have submitted, messages about the execution of your program, and in some cases, output from the DATA step and from certain procedures.

**SAS server**

a SAS session that provides data and processing services as part of a distributed application. See also distributed application.

**SAS Support Consultant**

an individual at your site who receives SAS documentation and who helps local users that have SAS problems.

**SAS system option**

an option that affects processing the entire SAS program or interactive SAS session from the time the option is specified until it is changed. Examples of items that are controlled by SAS system options include: appearance of SAS output, handling of some files used by the SAS System, use of system variables, processing observations in SAS data sets, features of SAS System initialization, and the SAS System's interface with your computer hardware and with the host operating system.

**SAS windowing environment**

an interactive, windowing interface to SAS software. Commands can be issued by typing them on the command line, pressing function keys, or selecting items from the

pull-down menus. Within one session, many different tasks can be accomplished. These tasks include preparing and submitting programs, viewing and printing results, and debugging and resubmitting programs.

**sasroot**

a term that represents the name of the directory where SAS is installed at your site or on your workstation.

**scan code**

a number that a CUT-mode 3270 emulator sends to the 3270 controller to indicate a keystroke. The scan code is related to the key's position and not its label. Each relative key position on any 3270 keyboard always sends the same scan code, but the controller can interpret it differently. How the controller interprets the code is based on the keyboard type or the foreign character set.

**SCL**

See SAS Component Language.

**SCL function**

in SCL, a mathematical relationship between variables that assigns exactly one value of the dependent variable to each combination of values of the independent variables. See also SAS Component Language (SCL).

**SAS Component Language (SCL)**

a programming language provided in SAS/AF and SAS/FSP software to develop interactive applications that manipulate SAS data sets and external files; display tables, menus, and selection lists; generate SAS source code and submit it to SAS for execution; and generate code for execution by the host command processor.

**script**

an external file that is stored on the local host that contains SAS script statements, which provide the instructions needed to establish and terminate the SAS/CONNECT link. Scripts are executed by the SIGNON and SIGNOFF commands.

**script statement**

a special SAS statement that is developed for use in scripts for SAS/CONNECT. Script statements are not used in any SAS programs except scripts.

**server**

in a network, a server is a special workstation, a machine, or a computer that is reserved for servicing other computers in the network. Servers can provide file services, communication services, and so on. Servers enable users to access common resources such as disks, data, and modems. See also client.

**snapshot**

a selection in the Communication Services Break Handler window that is displayed when a SAS/CONNECT session is interrupted. It is applicable only to 3270 access methods. Snapshot copies the remote session's 3270 screen to the local SAS Log window.

**spawner**

a program that listens for incoming requests to connect the requesting program to a program on the machine that is running the spawner.

**SQL**

See Structured Query Language (SQL).

**start bit**

a bit in asynchronous data transmission that indicates the start of a new character code.

**statement label**

a SAS name that is followed by a colon that prefixes a statement in a DATA step. It enables statements to direct execution to that statement as necessary, bypassing other statements in the step.

**stop bit**

one or more bits in asynchronous data transmission that indicate the end of a character code. The most common number of stop bits is 1, with 2 sometimes used for transmission speeds below 300 baud.

**store-and-forward application**

a program that uses indirect messaging to communicate. A message is "stored" on a queue and "forwarded" to one or more programs at a later time.

**Structured Query Language (SQL)**

the standardized, high-level query language that is used in relational database management systems to create and manipulate database management system objects. SAS software implements SQL through the SQL procedure.

**subset mode**

the local host environment available when you execute an X command with no operands in a local SAS session.

**synchronization point**

identifies the point during an asynchronous RSUBMIT at which the macro variable that is specified in the %SYSRPUT statement will be defined to the local SAS session so that you can use it in your local processing.

**synchronous processing**

when remote processing is performed serially to your local processing; meaning that, control over your local SAS session is not regained until the remote processing is complete. The results from the remote processing are transferred automatically to your local host upon completion. Synchronous processing is invoked using the CONNECTWAIT=NO option on the RSUBMIT command or statement.

**system option**

See SAS system option.

**TCP/IP**

an abbreviation for a pair of networking protocols. Transmission Control Protocol (TCP) is a standard protocol for transferring information on local area networks such as Ethernets. TCP ensures that process-to-process information is delivered in the proper order. Internet Protocol (IP) is a protocol for managing connections between hosts. IP routes information through the network to a particular host and fragments and reassembles information in host-to-host transfers.

**TELNET**

an acronym for Teletypewriter Network Protocol. TELNET is a program that provides virtual terminal services that enable you to log on to a remote host from a terminal that is connected to a local host. The local terminal performs as if it were physically connected to the remote host. TELNET, as used with SAS/CONNECT, is always executed by means of an automatic log-on script. It is not directly executed by a user.

**terminal-based communications**

a communications protocol that is designed for displaying data on a terminal. Applications that use this protocol must put all data into a screen image, including data that is not intended to be read by a user. This requirement limits the efficiency of communications if the protocol is used for communication between two processes.

**terminal emulation**

the PC imitation of an ASCII terminal or 3270 terminal for the purpose of communicating with a remote host or communications network.

**terminal emulator**

software, hardware, or a combination of the two that simulates the operation of a particular model of terminal. For example, terminal emulators simulate VT100 and IBM 3270 terminals.

**timeout**

an error condition that is produced when a required response from a device is not received. Some SAS script statements control what happens when a timeout occurs.

**toggle**

an option, a parameter, or another mechanism that enables you to turn on or turn off a processing feature.

**Token Ring network**

a local area network (LAN) formed in a ring topology that passes tokens as a means of regulating traffic on the line. On a Token Ring network, a token that governs the right to transmit is passed from one station to the next in a physical circle.

**translation table**

See character set translation table and keyboard translation table.

**transparent mode**

the mode in which the converter operates when using a protocol converter with SAS/CONNECT. Transparent mode enables the remote host to send ASCII data directly to the local host without performing the normal data conversion for 3270-type appearance.

**TTY**

an abbreviation for teletypewriter equipment. Actually, this term is used for any asynchronous terminal, not for teletype equipment.

**TTY program**

a low-level asynchronous terminal emulator that is used with PC DOS or OS/2. This program does not provide full-function terminal emulation.

**upload**

to copy a file from the local host to the remote host.

**view**

See SAS data view.

**WHERE expression**

a type of SAS expression that is used to specify a condition for selecting observations for processing by a DATA or a PROC step. WHERE expressions can contain special operators that are not available in other SAS expressions. WHERE expressions can appear in a WHERE statement, a WHERE= data set option, a WHERE clause, or a WHERE command.

**WHERE statement**

See WHERE expression.

**3270**

The IBM designation for a series of terminals, printers, and control units that are used primarily on IBM mainframes. With a 3270 adapter and emulation software, a PC can emulate a 3270 series terminal.

**3270 connection**

the link between the local host and the remote host if the adapter is a 3270 adapter.

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