



## CHAPTER

## 1

# Using Communications Access Methods

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## What Is a Communications Access Method?

A communications access method is the interface between SAS software and the network protocol that you use to connect two platforms. You must specify a communications access method for both SAS/CONNECT software and SAS/SHARE software.

The access method that you choose is determined by the network protocols that you have available at your site and the host platforms that you are connecting.

*Note:* Do not confuse Communications Access Method with FTP Access Method. The FTP Access Method is a facility that is used with the FILENAME statement in SAS software that allows you to access remote files by using the FTP protocol. For more information, see *SAS Language Reference: Dictionary*.  $\triangle$

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## Types of Communications Access Methods

There are two types of communications access methods: program-to-program and terminal-based.

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### Program-to-Program Communications

Program-to-program communications access methods use networking protocols to allow two processes to interact over a network. They have these advantages over terminal-based communications access methods:

- much larger packet sizes
- data transmitted in binary form (therefore, not requiring the application to perform any character set encoding)
- message notification often performed asynchronously.

Program-to-program communications access methods may require additional system software to achieve support on all of the necessary platforms. Here is a list of program-to-program methods of communication that are supported by SAS/CONNECT and SAS/SHARE.

#### APPC

is an abbreviation for Advanced Program-to-Program Communication. This type of connection uses the LU 6.2 protocol for distributed processing within an IBM SNA network. APPC and LU 6.2 are often used interchangeably.

#### CPIC (Version 6 Only)

is an acronym for Common Programming Interface for Communications. This interface supports the IBM SAA (System Application Architecture) solution by providing a method for developing portable distributed applications. CPIC functions as a layer that resides on top of the APPC protocol.

#### **CAUTION:**

**Version 6 Only** The CPIC access method is not supported in Version 7 and later releases. However, information about this access method is included here for Version 6 users.  $\triangle$

#### DECnet

is an acronym for the Digital Equipment Corporation Networking architecture. In SAS documentation, this term describes the task-to-task communication interface over a DECnet network.

#### NetBIOS

is an acronym for the IBM Network Basic Input/Output System. This is an operating system interface for application programs that are running on nodes in a local area network.

**SPX (Version 6 Only)**

is an abbreviation for the Novell Sequenced Packet Exchange. This is a communications protocol that provides guaranteed delivery of Internetwork Packet Exchange (IPX) packets. IPX enables NetWare workstations to communicate with NetWare servers, and SPX adds the connection-oriented features required for reliable client/server communication.

**CAUTION:**

**Version 6 Only** The SPX access method is not supported in Version 7 or later releases. However, information about this access method is included here for Version 6 users. △

**TCP/IP**

is an abbreviation for Transmission Control Protocol/Internet Protocol. This is a program-to-program interface that is supported by multiple vendors over multiple vendors' hardware.

The following program-to-program-based connection types are supported by SAS/SHARE only:

**IUCV**

is an abbreviation for Inter-User Communications Vehicle. This interface is a part of the VM/CMS operating system and is used by programs that run under VM/CMS.

**VTAM LU 0 (Version 6 Only)**

is an acronym for Virtual Telecommunications Access Method. This type of connection uses LU 0 protocol for program-to-program communications with an IBM SNA network under the OS/390 operating system.

**CAUTION:**

**Version 6 Only** The VTAM LU 0 access method is not supported in Version 7 or later releases. However, information about this access method is included here for Version 6 users. △

**XMS**

is an abbreviation for Cross-Memory Services. This interface is part of the OS/390 operating system and is used by programs that run within a single OS/390 environment.

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## Terminal-Based Communications

Terminal-based communications access methods let two processes interact over a network by using a terminal interface. They have these characteristics:

- limited transmission packet size (because of the size of the terminal screen)
- limited efficiency (because they force the application to perform character-set encoding to write data to the screen even though users are not expected to read from the screen)
- message notification generally accomplished through polling.

Because of the limitations of terminal-based communication methods, these methods cannot support Remote Library Services. Terminal-based interfaces, however, are relatively inexpensive and generally available.

The following terminal-based connection types are supported by SAS/CONNECT only:

#### EHLLAPI

is an acronym for Extended High-Level Language Applications Programming Interface. EHLLAPI is a standard 3270 programming interface that uses the SNA LU2 protocol and is provided by many third-party vendors for OS/2 and Windows workstations. SAS/CONNECT first moved to this standard interface with Release 6.06 of SAS Software under OS/2. EHLLAPI, HLLAPI, and WinHLLAPI are sometimes used interchangeably. Support for Windows HLLAPI (WinHLLAPI) was added with Release 6.11 of SAS software under Windows. Release 6.11 defines a standard and consistent IBM EHLLAPI-style implementation with the addition of Windows specific extensions.

#### TELNET (Version 6 Only)

is a terminal application interface written to use the TELNET protocol. TELNET is less efficient than TCP/IP because it is layered on top of the TCP/IP protocol. Because TELNET can communicate with an asynchronous interface in the remote environment, and it can run over an existing TCP/IP network, it is useful with SAS/CONNECT when the remote host does not have a supported TCP/IP product.

#### **CAUTION:**

**Version 6 Only** The TELNET access method is not supported in Version 7 or later releases. However, information about this access method is included here for Version 6 users.  $\Delta$

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## Making Host Connections with SAS/CONNECT and SAS/SHARE Software

For both SAS/CONNECT and SAS/SHARE, you must specify a communications access method, along with other steps, to connect two SAS sessions on the same or different platforms.

You must perform steps on the local side and, sometimes, on the remote side.

For SAS/CONNECT, perform the following general steps at the local host:

- 1 Specify a sign-on script name, if applicable.
- 2 Specify the communications access method.
- 3 Specify the name of the remote host that you are connecting to.
- 4 Sign on to the remote host.

When you access a SAS/SHARE server, perform the following general steps:

- 1 Specify the communications access method.
- 2 Specify the server name.

At the remote sides for SAS/CONNECT and SAS/SHARE, you may need to ensure that a configuration file has been set up or that environment variables have been declared.

Additional tasks may be needed based on the platform and the access method that are being used. These tasks may be performed by different people, such as the user, the system administrator on the local and remote sides, or the network administrator.

For example, a user may need to set variables or options on the local side or to configure a local configuration file to automate the connection process. A network administrator may need to configure the network to prepare the access method, or the remote-side system administrator may need to configure the remote side to prepare for a connection from the local side.

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## Connecting Hosts with the Protocol Gateway Service

**CAUTION:**

**Version 6 Only** The protocol gateway service provided by the DOMAIN server is not supported in Version 7 or later releases. However, information about this service is included here for Version 6 users.  $\Delta$

The protocol gateway service of the DOMAIN server enables two SAS sessions in a networked environment that do not use a common communications access method to communicate with each other. A network comprises one or more logical domains, each of which maps a topological area according to the communications protocol or access method that it uses.

For example, an OS/390 mainframe that uses the APPC access method and a Windows 95 personal computer that uses the NetBIOS access method cannot communicate. However, a DOMAIN server that runs both the APPC and NetBIOS access methods can bridge communication between them.

The DOMAIN server offers a protocol-independent gateway service that eliminates the need for licensing, configuring, and supporting multiple access methods in a given environment.

For SAS/CONNECT, see Table 1.1 on page 8 and for SAS/SHARE, see Table 1.2 on page 9 to determine whether you can use the same communications access method to connect the platforms that you want. If you cannot use the same access method between platforms, consider using the DOMAIN server. See “Using a DOMAIN Server for Cross-Access Method Communication” on page 443 for details on setting up and using the DOMAIN server.

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## Terminology

Throughout this documentation, we have adopted terms that refer to the local and remote sides of a SAS/CONNECT and a SAS/SHARE session. Definitions follow:

**local host**

SAS/CONNECT local side; the host from which a user connects to a SAS/CONNECT remote host.

**remote host**

SAS/CONNECT remote side; the host to which a user on a SAS/CONNECT local host connects.

**client**

SAS/SHARE local side; the host from which a user connects to a remote SAS/SHARE server.

**server**

SAS/SHARE remote side; the session on the remote side that provides data processing services as part of a distributed application.

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## Supported Communications Access Methods by Host

For SAS/CONNECT, the matrix shown in Table 1.1 on page 8 identifies the communications access methods that you can use to make a connection between a local





Server Hosts	Client Hosts							
	CMS	OpenVMS	OS/2	OS/390	UNIX	Win NT, Win 95, Win 98	Macintosh (V6 only)	VSE (V6 only)
Win NT, Win 95, Win 98	APPC TCP/IP	TCP/IP DECnet	APPC TCP/IP NetBIOS SPX	APPC TCP/IP	APPC* TCP/IP	APPC TCP/IP DECnet NetBIOS SPX	TCP/IP	APPC
Macintosh (V6 only)	TCP/IP	TCP/IP	TCP/IP	TCP/IP	TCP/IP	TCP/IP	TCP/IP	none
VSE (V6 only)	APPC	none	APPC	APPC	APPC*	APPC	none	APPC

\* APPC is not available on Solaris types of UNIX hosts.

**Table 1.3** SAS/CONNECT and SAS/SHARE: Supported Access Methods According to Host Release

Host	Access Method	Access Method Available in SAS Release			
		8.00	7.00	6.12	6.09E
CMS	APPC	•	•		•
	EHLLAPI	•	•		•
	IUCV*	•	•		•
	TCP/IP	•	•		•
	TELNET				•
OpenVMS	DECnet	•	•	•	•
	TCP/IP	•	•	•	•
	TELNET			•	•
OS/2	APPC	•	•	•	
	EHLLAPI	•	•	•	
	NetBIOS	•	•	•	
	TCP/IP	•	•	•	
	TELNET			•	
	SPX			•	



Host	Access Method	Access Method Available in SAS Release			
		8.00	7.00	6.12	6.09E
OS/390	APPC	.	.		.
	EHLLAPI	.	.		.
	TCP/IP	.	.		.
	TELNET				.
	VTAM LU 0*				.
	XMS*	.	.		.
UNIX	APPC**	.	.	.	
	TCP/IP	.	.	.	
	TELNET			.	
Win NT	APPC	.	.	.	
Win 95	DECnet	.	.	.	
	EHLLAPI	.	.	.	
	NetBIOS	.	.	.	
	TCP/IP	.	.	.	
	TELNET			.	
	SPX			.	
	Win 98	APPC	.		
	DECnet	.			
	EHLLAPI	.			
	NetBIOS	.			
	TCP/IP	.			
Win 32s***	APPC			.	
	CPIC			.	
	DECnet			.	
	EHLLAPI			.	
	NetBIOS			.	
	TCP/IP			.	
	TELNET			.	
Macintosh	TCP/IP			.	
VSE	APPC				.
	EHLLAPI				.

\* The IUCV, VTAM LU 0, and XMS access methods are available only for SAS/SHARE.

\*\* The Version 7 and Version 8 APPC access method is available only for AIX and HP-UX types of UNIX hosts. The Version 6 APPC access method is available for AIX, HP-UX, and Solaris types of UNIX hosts.

\*\*\* SAS/SHARE does not support the Windows 32s host.

## Completing the Worksheet

To prepare to make a connection with SAS/CONNECT or SAS/SHARE, complete the following worksheet. Having this information on hand may be helpful when making a connection.

**Table 1.4** Sample Worksheet

<b>Data</b>	<b>You Supply</b>
Local host/Client platform	_____
Remote host/Server platform	_____
Name of remote host/server	_____
Communications access method identifier and SAS version used by each side	_____
SAS/CONNECT only: pathname of sign-on script file, if applicable	_____
SAS/CONNECT only: pathname of spawner program, if applicable	_____

After you research these topics and complete the worksheet, you are ready to make the connection.

A sample of a completed worksheet follows.

**Table 1.5** Completed Worksheet

<b>Data</b>	<b>You Supply</b>
Local host/Client platform	<b>Windows 95</b>
Remote host/Server platform	<b>UNIX</b>
Name of remote host/server	<b>RMTNODE/SHARE1</b>
Communications access method identifier and SAS version used on each side	<b>Local: TCP, version 8.00 Remote: TCP, version 7.00</b>
SAS/CONNECT only: pathname of sign-on script file, if applicable	<b>c:\sas\connect\saslink \tcpunix.scr</b>
SAS/CONNECT only: pathname of spawner program, if applicable	<b>c:\sas\connect\sasexe    \spawner</b>

**SAS/CONNECT Example:**

**UNIX Remote Host:**  
No procedures are necessary.

**Windows 95 Local Host:**

```
filename
rlink 'c:\sas\connect\saslink\tcpunix.scr'; options comamid=tcp remote=rmtnode;
signon;
```

SAS/SHARE Example:

UNIX Server:

```
options comamid=tcp; proc server
id=share1; run;
```

OS/2 Client:

```
options comamid=tcp; %let blue=rmthost.unx.sas.com;
libname tigris 'd:\remote\data' server=blue.share1;
```

You have the worksheet data ready to use for making the connection.

## SAS/CONNECT Scripts

SAS Institute provides sample script files that you may customize and use with SAS/CONNECT to sign on to and sign off a remote host. Names of script files and their locations on the operating system are provided in this documentation, where relevant. The content of selected script files is provided to draw your attention to statements that may need to be modified in order to work at your site. See Chapter 41, “Sign-on Script Files,” on page 505 for these sample script files.

*Note:* The script files were written to support Version 6 and Version 7.  $\Delta$

## SAS/CONNECT and SAS/SHARE Examples

Typical examples of how to use SAS/CONNECT and SAS/SHARE by platform, by access method, by local side, and by remote side are provided in this documentation. In addition, these examples are collected in one location in the appendices in Part 14.

## Access Method Option and Variable Summary

In order to use a specific access method, you may need to set specific options or variables based on the host that is being used. The forms that you can use to set an option or a variable include the OPTIONS statement in a SAS session or in an AUTOEXEC file, an option in a configuration file or at a SAS invocation, a SAS macro variable, or an environment variable. Each option or variable that is relevant to a specific host and access method is described individually. Methods for setting them are also provided. For a comprehensive table of options and variables and methods for setting them by host and by access method, see Chapter 38, “Access Method Options and Variables Summary Tables,” on page 487.

## Troubleshooting

If a procedure that you attempt is unsuccessful, an error message is reported to your display. See Part 13 for error-message recovery information. The messages are organized by platform and by access method.

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## How to Use This Documentation

This document organizes the steps (by platform and by access method) that you must perform in order to connect two hosts across a network. To make a connection for the local side, locate the Part that contains the specific host that you want, and then locate the appropriate access method in that Part. For example,

**Table 1.6** Finding Information for the Local Host

Question	Answer
What is the local host?	UNIX
What access method am I using?	TCP/IP
See: Part and Chapter	Part 7, Chapter 20

In most cases, after you complete the steps at the local host, you must also perform steps at the remote host, which may be documented in another Part and Chapter. For example,

**Table 1.7** Finding Information for the Remote Host

Question	Answer
What is the remote host?	OS/390
What access method am I using?	TCP/IP
See: Part and Chapter	Part 4, Chapter 7

Steps are marked clearly by product, local side, remote side, task, and audience, that is, user, applications programmer (person who writes end-user applications), system administrator, SAS/SHARE server administrator, or network administrator. The persons who perform these tasks should supply each other with network and operating system information, as necessary.

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## Using the SAS/CONNECT and SAS/SHARE Documentation Set

The following three books are used with SAS/SHARE and SAS/CONNECT software:

- SAS/CONNECT User's Guide*
- SAS/SHARE User's Guide*
- Communications Access Methods for SAS/CONNECT and SAS/SHARE Software*.

*Communications Access Methods* provides information to establish a connection between two hosts across a network. For using SAS/CONNECT or SAS/SHARE software, start with either the *SAS/CONNECT User's Guide* or the *SAS/SHARE User's Guide* and then refer to *Communications Access Methods for SAS/CONNECT and SAS/SHARE Software* when making a network connection.

*Communications Access Methods for SAS/CONNECT and SAS/SHARE Software* makes the communications access methods information in the following documentation obsolete:

*SAS/CONNECT Software Usage and Reference, Version 6, Second Edition.*

*What's New for the 6.09 Enhanced Release of SAS Software Changes and Enhancements: 6.09 Enhanced Release*

*SAS Software: Changes and Enhancements, Release 6.11*

*SAS Technical Report P-261 SAS/SHARE Software for the CMS Environment, Release 6.08*

*SAS Technical Report P-260 SAS/SHARE Software for the MVS Environment, Release 6.08*

*SAS Technical Report P-265 SAS/SHARE Software for the OpenVMS Environment, Releases 6.08 and 6.09*

*SAS/SHARE Technical Report for the OS/2 Environment, Release 6.11*

*SAS/SHARE Technical Report for UNIX Environments, Release 6.11*

*SAS Technical Report P-267 SAS/SHARE Software for the VSE Environment, Release 6.08*

*SAS/SHARE Technical Report for the Microsoft Windows Environment, Release 6.11*

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## Additional SAS Documentation

For a complete list of SAS publications, you should refer to the current *Publications Catalog*. The catalog is produced twice a year. You can order a free copy by writing, calling, or faxing the Institute (or access the on-line version of the *Publications Catalog* via the World Wide Web):

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[www.sas.com/pubs](http://www.sas.com/pubs)

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## Documentation for Other SAS Software Products

The following SAS publication may be helpful if you use the TCP/IP access method on the OS/390 platform.

- SAS Technical Report C-111, SAS/C Socket Library for TCP/IP, Release 5.01*

The following platform-specific SAS publications may be helpful, as needed:

- SAS Companion for the CMS Environment*
- SAS Companion for the Macintosh Environment, Version 6, First Edition*
- SAS Companion for the OpenVMS Operating Environment*
- SAS Companion for the OS/2 Environment*
- SAS Companion for the OS/390 Environment*
- SAS Companion for the VSE Environment, Version 6, First Edition*

- *SAS Companion for UNIX Environments*
- *SAS Companion for the Microsoft Windows Environment*

In addition to *Communications Access Methods for SAS/CONNECT and SAS/SHARE Software*, the following publications will be helpful when using SAS/CONNECT and SAS/SHARE software:

- *SAS Language Reference: Dictionary*
- *SAS Language Reference: Concepts*

## Vendor-name Documentation

The following publications provide complete details about installing and configuring a communications access method on a particular host operating system.

### CMS: APPC Access Method Documentation

- *VM/SP Release 6 Connectivity and Programming Guide and Reference (SC24-5377)*
- *VM/ESA Connectivity Planning, Administration, and Operation (SC24-5448)*
- *SNA Technical Overview (GC30-3073)*
- *SNA Formats (GA27-3136)*
- *VTAM Programming for LU6.2 (SC30-3400)*

### OS/390: APPC Access Method Documentation

- *SNA Technical Overview (GC30-3073)*
- *SNA Formats (GA27-3136)*
- *VTAM Programming for LU6.2 (SC30-3400)*
- *MVS/ESA Planning: APPC Management (GC28-1110)*

### OS/390: VTAM LU 0 Access Method Documentation

- *VTAM Installation and Resource Definition (SC27-0610 for ACF/VTAM Version 2)*
- *VTAM Installation and Resource Definition (SC23-0111 for ACF/VTAM Version 3)*

### OS/2: APPC Access Method Documentation

- *SNA Technical Overview (GC30-3073)*
- *SNA Formats (GA27-3136)*
- *VTAM Programming for LU6.2 (SC30-3400)*
- *Extended Services for OS/2 Communications Manager User's Guide (S04G-1015)*
- *Extended Services for OS/2 Communications Manager Configuration Guide (S04G-1002)*
- *Extended Services for OS/2 Problem Determination Guide for the Service Coordinator (S04G-1006)*
- *Extended Services for OS/2 Programming Services and Advanced Problem Determination for Communications (S04G-1007)*

- *Extended Services for OS/2 Communications Manager System Management Programming Reference (S04G-1116)*
- *Extended Services for OS/2 APPC Programming Reference (S04G-1025)*

## **UNIX AIX: APPC Access Method Documentation**

- *AIX SNA Server/6000 Command Reference (SC31-7100)*
- *AIX SNA Server/6000 Diagnosis Guide and Messages (SC31-7101)*
- *AIX SNA Server/6000 User's Guide (SC31-7002)*
- *AIX SNA Server/6000 Transaction Program Reference (SC31-7003)*
- *AIX SNA Server/6000 Configuration Reference (SC31-7014)*

## **UNIX HP-UX: APPC Access Method Documentation**

- *HP-UX SNAplus Installation Guide (J2220-61021)*
- *HP-UX SNAplusLink Administrator's Guide (J2220-61023)*
- *HP-UX SNAplusAPI Administrator's Guide (J2223-61008)*
- *HP-UX SNAplus Diagnostics Guide (J2220-61022)*
- *Installing and Administering X.25/9000 (36940-90018)*
- *Installing and Administering Token Ring/9000 (J21625-61001)*
- *IBM SNA: Technical Overview (GC30-#073)*
- *IBM SNA: Formats (GA27-3136)*

## **UNIX Solaris: APPC Access Method Documentation**

- *SunLink SNA Peer-to-Peer 8.0 and SunLink SNA Peer-to-Peer RunTime 8.0 Installation Guide*
- *SunLink SNA Peer-to-Peer 8.0 and SunLink SNA Peer-to-Peer RunTime 8.0 Administrator's Guide*
- *SunLink HSI/S 2.0 Installation and Administration Guide*
- *SunLink TRI/S 3.0 Installation Guide*
- *SunLink FDDI/S 2.0 Installation Guide*
- *IBM SNA: Technical Overview (GC30-#073)*
- *IBM SNA: Formats (GA27-3136)*

## **VSE: APPC Access Method Documentation**

- *SNA Technical Overview (GC30-3073)*
- *SNA Formats (GA27-3136)*
- *VTAM Programming for LU6.2 (SC31-6410)*
- *VTAM Installation and Resource Definition (SC23-0111)*

## **Windows: APPC Access Method Documentation**

- *Microsoft SNA Server Installation Guide*
- *Microsoft SNA Server Administration Guide*

## Windows: CPIC Access Method Documentation

- *Rumba Tools for APPC*
- *IBM SNA: Technical Overview (GC30-#073)*
- *IBM SNA: Formats (GA27-3136)*
- *IBM: Multiplatform APPC Configuration Guide (GG24-4485-00)*

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## Feedback

If you have comments or suggestions about this or any other SAS software documentation or about the software, we would like to hear from you. You may write to us at the Institute or contact us by e-mail at the address shown under “Additional Documentation.”

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## SAS Syntax Conventions

```
PROC DATASETS <LIBRARY=libref> <MEMTYPE=(mtype-list)>
      <DETAILS | NODetails> <other-options>;
RENAME variable-1=new-name-1 <... variable-n=new-name-n>;
```

- |  |  |
|--|--|
| <p><b>1</b> SAS keywords, such as statement or procedure names, appear in bold type.</p> <p><b>2</b> Values that you must spell as they are given in the syntax appear in uppercase type.</p> <p><b>3</b> Optional arguments appear inside angle brackets(&lt;&gt;).</p> | <p><b>4</b> Mutually exclusive choices are joined with a vertical bar( ).</p> <p><b>5</b> Values that you must supply appear in italic type.</p> <p><b>6</b> Argument groups that you can repeat are indicated by an ellipsis (. . .).</p> |
|--|--|



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