

Document: T10/98-130 revision 0  
Date: 98-03-18  
To: NCITS T10 SCSI Working Group  
From: Keith W. Parker <diogenes@europa.com>  
Subject: SCSI Socket Services (SSS) Review 98-03-18

## **SCSI Socket Services (SSS) Review 98-03-18**

### ***Project T10/1246-D***

### **Status**

***Received IEEE POSIX Socket standard***

***Integrated POSIX Socket into SSS***

***Will post first draft for next mailing***

## **Issues**

### ***POSIX Socket to be Normative reference***

Portable Operating System Interface (POSIX) - Part xx: Protocol Independent Interfaces (PII) (IEEE Std. 1003.1g: 199?)

### ***WinSock2 to be Informative reference***

Data structures will be defined and named by SSS standard

Exact usage of data structures will be left to informative reference

### **API - Application Programming Interface functions**

"Windows Sockets 2 Application Programming Interface", Rev. 2.2.2, 97-08-07  
<ftp://ftp.microsoft.com/bussys/winsock/winsock2/WSAPI22.DOC>

### **SPI - Service Provider Interface functions**

"Windows Sockets 2 Protocol-Specific Annex", Rev. 2.0.3, 96-05-10  
<ftp://ftp.microsoft.com/bussys/winsock/winsock2/wsanx203.doc>

"Windows Sockets 2 Service Provider Interface" Rev. 2.2.2 97-08-07  
<ftp://ftp.microsoft.com/bussys/winsock/winsock2/WSSPI22.DOC>

***SSS extensions to be transparent to existing functionality***

Separate error reporting for SSS

Must not break existing SCSI device drivers

***SCSI RPC Device Type***

For devices that use SCSI RPC commands exclusively

***SCSI RPC Protocol Must be Stateless***

For recovery from Hard Reset

***Optional Separation of Application Data***

For transfer directly to/from application's address space

***ONC RPC to be used as general model***

RFC-1831: RPC: Remote Procedure Call Protocol Specification 2  
<ftp://ds.internic.net/rfc/rfc1831.txt>

RFC-1833: Binding Protocols for ONC RPC Version 2  
<ftp://ds.internic.net/rfc/rfc1833.txt>

External Data Representation (XDR) will define data formats

RFC-1832: XDR: External Data Representation Standard  
<ftp://ds.internic.net/rfc/rfc1832.txt>

***Little/Big Endian Issues***

Will optionally allow "Receiver Makes It Right" endian conversion

***Need to Register RPC Program Numbers with Sun******Need RPCGEN for Linux or DOS or Windows******Target HBA Academic Donations***

Need HBA hardware with Target Mode SDK and/or information

For Computer Science class projects (mostly)

Source Code developed must be published

## POSIX / WinSock2 API / WinSock2 SPI functions

BSD UNP =

"UNIX Network Programming - Volume 1, Networking APIs: Sockets and XTI", Second Edition

by W. Richard Stevens, Prentice-Hall, ISBN 0-13-490012-X

WS2 BSD, WS2 API =

"Windows Sockets 2 Application Programming Interface", Rev. 2.2.2, 97-08-07

<ftp://ftp.microsoft.com/bussys/winsock/winsock2/WSAPI22.DOC>

WS2 SPI =

"Windows Sockets 2 Service Provider Interface" Rev. 2.2.2 97-08-07

<ftp://ftp.microsoft.com/bussys/winsock/winsock2/WSSPI22.DOC>

### Transport Service Installation & Configuration

| SSS id | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD | WS2<br>BSD | WS2<br>API   | WinSock2 API functions       | WS2<br>SPI              | WinSock2 SPI functi  |
|--------|-----------------|------------|-------------|------------|--------------|------------------------------|-------------------------|--|
|        |                 |            |             |            |              |                              | 7.1.4<br>7.1.1<br>7.1.3 | WSCInstallProvider()<br>WSCDeinstallProvider()<br>WSCGetProviderPath() |
|        |                 |            |             |            | 4.54<br>4.25 | WSAStartup()<br>WSACleanup() | 4.1.30<br>4.1.6         | WSPStartup()<br>WSPCleanup()   |
|        |                 |            |             |            | 4.31         | WSAEnumProtocols()           | 7.1.2<br>B.1            | WSEnumProtocols()<br>WSCWriteProviderOn                                |

The services will be required for runtime configuration.

### Name Service Installation & Configuration

| SSS id | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD | WS2<br>BSD | WS2<br>API | WinSock2 API functions | WS2<br>SPI                       | WinSock2 SPI functi   |
|--------|-----------------|------------|-------------|------------|------------|------------------------|----------------------------------|---|
|        |                 |            |             |            |            |                        | 5.1.1<br>7.2.2<br>7.2.3<br>7.2.1 | <b>NS Prov. Config. &amp; I</b><br>WSCInstallNameSpac<br>WSCUnInstallNameSj<br>WSEnableNSProvid |
|        |                 |            |             |            |            |                        | 5.1.2<br>6.9<br>6.1              | <b>NS Prov. Init. &amp; Clea</b><br>NSPStartup()<br>NSPCleanup()                                |

The services will be required for runtime configuration.

**Network Interface functions**

| SSS id      | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD      | WS2<br>BSD | WS2<br>API | WinSock2 API functions | WS2<br>SPI | WinSock2 SPI functi  |
|-------------|-----------------|------------|------------------|------------|------------|------------------------|------------|----------------------|
| SSS_NI_SOC  | 5.4.14          | 4.2        | socket()         | 4.21       | 4.53       | WSASocket()            | 4.1.29     | WSPSocket()          |
| SSS_NI_SOC  | 5.4.15          | 14.3       | socketpair()     |            | 4.29       | WSADuplicateSocket()   | 4.1.9      | WSPDuplicateSocket() |
|             |                 |            | closesocket() ** | 4.3        |            |                        | 4.1.7      | WSPCloseSocket()     |
|             |                 |            | ioctlsocket() ** | 4.10       | 4.38       | WSAIoctl()             | 4.1.17     | WSPIoctl()           |
| SSS_NI_OPT  | 5.4.7           | 7.2        | getsockopt()     | 4.7        |            |                        | 4.1.16     | WSPGetSockOpt()      |
| SSS_NI_OPT  | 5.4.7           | 7.2        | setsockopt()     | 4.19       |            |                        | 4.1.27     | WSPSetSockOpt()      |
| SSS_NI_NAM  | 5.4.5           | 4.10       | getpeername()    | 4.5        |            |                        | 4.1.13     | WSPGetPeerName()     |
| SSS_NI_NAM  | 5.4.6           | 4.10       | getsockname()    | 4.6        |            |                        | 4.1.15     | WSPGetSockName()     |
| SSS_NI_IS   | 5.4.8           | 3.10       | isfdtype()       |            |            |                        |            |                      |
| SSS_NI_IS   | 5.4.13          | 21.3       | socketmark()     |            |            |                        |            |                      |
| SSS_NI_CON  | 5.4.3           | 4.4        | bind()           | 4.2        |            |                        | 4.1.4      | WSPBind              |
| SSS_NI_CON  | 5.4.4           | 4.3        | connect()        | 4.4        | 4.27       | WSAConnect()           | 4.1.8      | WSPConnect()         |
| SSS_NI_CON  | 5.4.9           | 4.5        | listen()         | 4.11       |            |                        | 4.1.19     | WSPListen()          |
| SSS_NI_CON  | 5.4.2           | 4.6        | accept()         | 4.1        | 4.22       | WSAAccept()            | 4.1.1      | WSPAaccept()         |
| SSS_NI_CON  | 5.4.12          | 6.6        | shutdown()       | 4.20       |            |                        | 4.1.28     | WSPShutdown()        |
| SSS_XFR_NI_ | 5.4.10          | 13.3       | recv()           | 4.14       | 4.43       | WSARecv()              | 4.1.20     | WSPRecv()            |
| SSS_XFR_NI_ | 5.4.10          | 8.2        | recvfrom()       | 4.15       | 4.45       | WSARecvFrom()          | 4.1.22     | WSPRecvFrom()        |
| SSS_XFR_NI_ | 5.4.10          | 13.5       | recvmsg()        |            |            |                        |            |                      |
| SSS_XFR_NI_ | 5.4.11          | 13.3       | send()           | 4.17       | 4.47       | WSASend()              | 4.1.24     | WSPSend()            |
| SSS_XFR_NI_ | 5.4.11          | 8.2        | sendto()         | 4.18       | 4.49       | WSASendTo()            | 4.1.26     | WSPSendTo()          |
| SSS_XFR_NI_ | 5.4.11          | 13.5       | sendmsg()        |            |            |                        |            |                      |

**File Interface functions**

| SSS id      | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD | WS2<br>BSD | WS2<br>API | WinSock2 API functions | WS2<br>SPI | WinSock2 SPI functi |
|-------------|-----------------|------------|-------------|------------|------------|------------------------|------------|---------------------|
| SSS_XFR_FI_ | 1003.1          | 3.9        | read()      |            |            |                        |            |                     |
| SSS_XFR_FI_ |                 | 13.4       | readv()     |            |            |                        |            |                     |
| SSS_XFR_FI_ | 1003.1          | 3.9        | write()     |            |            |                        |            |                     |
| SSS_XFR_FI_ |                 | 13.4       | writv()     |            |            |                        |            |                     |
| SSS_FI_     | 1003.1          | 4.9        | close()     |            |            |                        |            |                     |
| SSS_FI_     | 1003.1          | 7.10       | fcntl()     |            |            |                        |            |                     |
| SSS_FI_     |                 | 16.2       | ioctl()     |            |            |                        |            |                     |

**Event Management functions**

| SSS id  | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD | WS2<br>BSD | WS2<br>API | WinSock2 API functions | WS2<br>SPI | WinSock2 SPI functi       |                  |                   |
|---------|-----------------|------------|-------------|------------|------------|------------------------|------------|---------------------------|------------------|-------------------|
| SSS_EM_ | 6.1             | 6.10       | poll()      | 4.16       |            |                        | 4.1.23     | WSPSelect()               |                  |                   |
| SSS_EM_ | 6.2             | 6.9        | pselect()   |            |            |                        |            | 4.1.3                     | WSPAsyncSelect() |                   |
| SSS_EM_ | 6.2             | 6.3        | select()    |            |            | 4.32                   |            | WSAEventSelect()          | 4.1.11           | WSPEventSelect()  |
|         |                 |            |             |            |            | 4.34                   |            | WSAGetOverlappedResult()  | 4.1.12           | WSPGetOverlappedR |
|         |                 |            |             |            |            | 4.30                   |            | WSAEnumNetworkEvents()    | 4.1.10           | WSPEnumNetworkEv  |
|         |                 |            |             |            |            | 4.57                   |            | WSAProviderConfigChange() |                  |                   |

**Event Management functions mapped to OS**

| SSS id | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD | WS2<br>BSD | WS2<br>API | WinSock2 API functions     | WS2<br>SPI | WinSock2 SPI functi |
|--------|-----------------|------------|-------------|------------|------------|----------------------------|------------|---------------------|
|        |                 |            |             |            | 2.6.1      | <b>Event Objects</b>       |            |                     |
|        |                 |            |             |            | 4.26       | WSACloseEvent()            |            |                     |
|        |                 |            |             |            | 4.28       | WSACreateEvent()           |            |                     |
|        |                 |            |             |            | 4.46       | WSAResetEvent()            |            |                     |
|        |                 |            |             |            | 4.51       | WSASetEvent()              |            |                     |
|        |                 |            |             |            | 4.56       | WSAWaitForMultipleEvents() |            |                     |

Requires SSS RPC to support EVENTS

**Transport Management functions**

| SSS id | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD | WS2<br>BSD | WS2<br>API | WinSock2 API functions                               | WS2<br>SPI | WinSock2 SPI functi |
|--------|-----------------|------------|-------------|------------|------------|--|------------|---------------------|
|        |                 |            |             |            | 2.8        | <b>Quality of Service</b>                            |            |                     |
|        |                 |            |             |            | 4.35       | WSAGetQOSByName()                                    | 4.1.14     | WSPGetQOSByName     |
|        |                 |            |             |            | 2.14       | <b>Protocol-Independent Multicast and Multipoint</b> |            |                     |
|        |                 |            |             |            | 4.40       | WSAJoinLeaf()  | 4.1.18     | WSPJoinLeaf()       |
|        |                 |            |             |            | 4.44       | WSARecvDsiconnect()                                  | 4.1.21     | WSPRecvDsiconnect   |
|        |                 |            |             |            | 4.48       | WSASendDisconnect()                                  | 4.1.25     | WSPSendDisconnect   |
|        |                 |            |             |            | 4.33       | WSAGetLastError()                                    |            |                     |
|        |                 |            |             |            | 4.52       | WSASetLastError()                                    |            |                     |
|        |                 |            |             |            |            |  | 4.1.5      | WSPCancelBlockingC  |

**WinSock1 Only functions - handled by WS2 DLL**

| SSS id                                       | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD | WS2<br>BSD | WS2<br>API                          | WinSock2 API functions   | WS2<br>SPI | WinSock2 SPI functi |
|--|-----------------|------------|-------------|------------|-------------------------------------|--|------------|---------------------|
| WS1 only<br>WS1 only<br>WS1 only<br>WS1 only |                 |            |             |            | 3.3<br>4.24<br>4.39<br>4.50<br>4.55 | <b>WinSock 1.1 Compatibility Issues</b><br>WSACancelBlockingCall()<br>WSAIsBlocking()<br>WSASetBlockingHook()<br>WSAUnhookBlockingHook() |            |                     |

NOT part of WinSock2 specification - for historical reference only

**Host Name functions**

| SSS id                   | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD              | WS2<br>BSD | WS2<br>API | WinSock2 API functions | WS2<br>SPI | WinSock2 SPI functi |
|--------------------------|-----------------|------------|--------------------------|------------|------------|------------------------|------------|---------------------|
| SSS_NS_HN_<br>SSS_NS_HN_ | 7.7             | 9.8<br>9.7 | gethostname()<br>uname() | 5.4.3      |            |                        |            |                     |

**TCP/IP Specific Conversion functions**

| SSS id  | IEEE<br>1003.1g          | BSD<br>UNP                      | POSIX / BSD   | WS2<br>BSD                 | WS2<br>API                   | WinSock2 API functions                               | WS2<br>SPI | WinSock2 SPI functi |
|---|--------------------------|---------------------------------|---|----------------------------|------------------------------|--|------------|---------------------|
| SSS_NS_AI_<br>SSS_NS_AI_<br>SSS_NS_AI_<br>SSS_NS_AI_                    |                          | 11.3<br>11.13<br>11.2<br>11.4   | gai_strerror()<br>getnameinfo()<br>getaddrinfo()<br>freeaddrinfo()      |                            |                              |  |            |                     |
| SSS_NS_CNV_<br>SSS_NS_CNV_<br>SSS_NS_CNV_<br>SSS_NS_CNV_                | 7.8<br>7.8<br>7.8<br>7.8 | 3.4<br>3.4<br>3.4<br>3.4        | htonl()<br>htons()<br>ntohl()<br>ntohs()                                | 4.8<br>4.9<br>4.12<br>4.13 | 4.36<br>4.37<br>4.41<br>4.42 | WSAhtonl()<br>WSAhtons()<br>WSANtohl()<br>WSANtohs() |            |                     |
| SSS_NS_IAM_<br>SSS_NS_IAM_<br>SSS_NS_IAM_<br>SSS_NS_IAM_<br>SSS_NS_IAM_ | 7.9<br>7.9<br>7.9        | 3.6<br>3.6<br>3.6<br>3.7<br>3.7 | inet_addr()<br>inet_aton()<br>inet_ntoa()<br>inet_ptom()<br>inet_ntop() | 5.4.8<br>5.4.9             |                              |  |            |                     |

Note: the WinSock2 WSA host to/from net conversion functions are protocol independent

**TCP/IP Specific Name Resolution functions**

| SSS id      | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD        | WS2<br>BSD | WS2<br>API   | WinSock2 API functions     | WS2<br>SPI | WinSock2 SPI functi |
|-------------|-----------------|------------|--------------------|------------|--|----------------------------|------------|---------------------|
|             |                 |            |                    | <b>5.3</b> | <b>WinSock 1.1 Compatible Name Resolution for TCP/IP</b> |                            |            |                     |
| SSS_NS_DB_H | 7.3             | 9.6        | gethostbyaddr()    | 5.4.1      | 5.4.10   | WSAAsyncGetHostByAddr()    |            |                     |
| SSS_NS_DB_H |                 | 11.15      | gethostbyaddr_r()  |            |  |                            |            |                     |
| SSS_NS_DB_H | 7.3             | 9.3        | gethostbyname()    | 5.4.2      | 5.4.11   | WSAAsyncGetHostByName()    |            |                     |
| SSS_NS_DB_H |                 | 11.15      | gethostbyname_r()  |            |  |                            |            |                     |
| SSS_NS_DB_H |                 | 9.5        | gethostbyname2()   |            |  |                            |            |                     |
| SSS_NS_DB_H | 7.3             | 9.10       | sethostent()       |            |  |                            |            |                     |
| SSS_NS_DB_H | 7.3             | 9.10       | endhostent()       |            |  |                            |            |                     |
| SSS_NS_DB_N | 7.4             | 9.10       | getnetbyaddr()     |            |  |                            |            |                     |
| SSS_NS_DB_N | 7.4             | 9.10       | getnetbyname()     |            |  |                            |            |                     |
| SSS_NS_DB_N | 7.4             | 9.10       | setnetent()        |            |  |                            |            |                     |
| SSS_NS_DB_N | 7.4             | 9.10       | endnetent()        |            |  |                            |            |                     |
| SSS_NS_DB_P | 7.5             | 9.10       | getprotobynumber() | 5.4.5      | 5.4.13   | WSAAsyncGetProtoByNumber() |            |                     |
| SSS_NS_DB_P | 7.5             | 9.10       | getprotobyname()   | 5.4.4      | 5.4.12   | WSAAsyncGetProtoByName()   |            |                     |
| SSS_NS_DB_P | 7.5             | 9.10       | setprotoent()      |            |  |                            |            |                     |
| SSS_NS_DB_P | 7.5             | 9.10       | endprotoent()      |            |  |                            |            |                     |
| SSS_NS_DB_S | 7.6             | 9.9        | getservbyport()    | 5.4.7      | 5.4.15   | WSAAsyncGetServByPort()    |            |                     |
| SSS_NS_DB_S | 7.6             | 9.9        | getservbyname()    | 5.4.6      | 5.4.14   | WSAAsyncGetServByName()    |            |                     |
| SSS_NS_DB_S | 7.6             | 9.10       | setservent()       |            |  |                            |            |                     |
| SSS_NS_DB_S | 7.6             | 9.10       | endservent()       |            |  |                            |            |                     |
|             |                 |            |                    |            | 5.4.16   | WSACancelAsyncRequest()    |            |                     |

The WinSock2 DLL translates these functions into calls to the Protocol Independent Name Resolution version in the following section.

**Protocol-Independent Name Resolution**

| SSS id | IEEE<br>1003.1g | BSD<br>UNP | POSIX / BSD | WS2<br>BSD | WS2<br>API     | WinSock2 API functions                      | WS2<br>SPI   | WinSock2 SPI functi         |
|--------|-----------------|------------|-------------|------------|----------------|---|--------------|-----------------------------|
|        |                 |            |             | <b>2.5</b> | <b>5.1</b>     | <b>Protocol Independent Name Resolution</b> |              |                             |
|        |                 |            |             |            | <b>5.1.2.1</b> | <b>Service Installation</b>                 | <b>5.1.3</b> | <b>Service Installation</b> |
|        |                 |            |             |            | 5.2.5          | WSAInstallServiceClass()                    | 6.3          | NSPInstallServiceClas       |
|        |                 |            |             |            | 5.2.9          | WSARemoveServiceClass()                     | 6.7          | NSPRemoveServiceC           |
|        |                 |            |             |            | 5.2.10         | WSASetService()                             | 6.8          | NSPSetService()             |
|        |                 |            |             |            | <b>5.1.2.2</b> | <b>Client Query</b>                         | <b>5.1.4</b> | <b>Service Query</b>        |
|        |                 |            |             |            | 5.2.2          | WSAEnumNameSpaceProviders()                 |              |                             |
|        |                 |            |             |            | 5.2.6          | WSALookupServiceBegin()                     | 6.4          | NSPLookupServiceBe          |
|        |                 |            |             |            | 5.2.8          | WSALookupServiceNext()                      | 6.6          | NSPLookupServiceNe          |
|        |                 |            |             |            | 5.2.7          | WSALookupServiceEnd()                       | 6.5          | NSPLookupServiceEn          |
|        |                 |            |             |            | <b>5.1.2.3</b> | <b>Helper Functions</b>                     | <b>5.1.5</b> | <b>Helper Functions</b>     |
|        |                 |            |             |            | 5.2.4          | WSAGetServiceClassNameByClassId()           |              |                             |
|        |                 |            |             |            | 5.2.1          | WSAAddressToString()                        | 4.1.2        | WSPAddressToString          |
|        |                 |            |             |            | 5.2.11         | WSAStringToAddress()                        | 4.1.31       | WSPStringToAddress          |
|        |                 |            |             |            | 5.2.3          | WSAGetServiceClassInfo()                    | 6.2          | NSPGetServiceClass          |

## General Reference Information

Portable Operating System Interface (POSIX) - Part xx: Protocol Independent Interfaces (PII) (IEEE Std. 1003.1g: 199?)

Portable Operating System Interfaces for Computer Environments (IEEE Std. 1003.1: 1990)

RFC-1831: RPC: Remote Procedure Call Protocol Specification 2  
<ftp://ds.internic.net/rfc/rfc1831.txt>

RFC-1832: XDR: External Data Representation Standard  
<ftp://ds.internic.net/rfc/rfc1832.txt>

RFC-1833: Binding Protocols for ONC RPC Version 2  
<ftp://ds.internic.net/rfc/rfc1833.txt>

"UNIX Network Programming - Volume 1, Networking APIs: Sockets and XTI", Second Edition  
by W. Richard Stevens, Prentice-Hall, ISBN 0-13-490012-X

"Power Programming with RPC" by John Bloomer  
O'Reilly & Associates, Inc., ISBN 0-937175-77-3

"Linux Kernel Internals" by M Beck, H Bohme, M Dziadzka, U Kuntz, R Magnus, D Verwoner  
Addison-Wesley, ISBN 0-201-87741-4

"Windows Sockets 2 Application Programming Interface", Rev. 2.2.2, 97-08-07  
<ftp://ftp.microsoft.com/bussys/winsock/winsock2/WSAPI22.DOC>

"Windows Sockets 2 Protocol-Specific Annex", Rev. 2.0.3, 96-05-10  
<ftp://ftp.microsoft.com/bussys/winsock/winsock2/wsanx203.doc>

"Windows Sockets 2 Service Provider Interface" Rev. 2.2.2 97-08-07  
<ftp://ftp.microsoft.com/bussys/winsock/winsock2/WSSPI22.DOC>

"Windows Generic QOS Mapping (Draft)" Ver. 2.9, 09/11/97 5:19PM  
<ftp://ftp.microsoft.com/bussys/winsock/winsock2/wsgqos.doc>

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SCSI Socket/SSL Services (SSS) Command Set

Diogenes' Unofficial SCSI Socket Services (SSS)  
<http://www.europa.com/~diogenes/SSS/>

Diogenes' SCSI Magic File Drive Systems Manifesto  
<http://www.europa.com/~diogenes/DSMFDSM/>