

REFERENCE

NIST
PUBLICATIONS

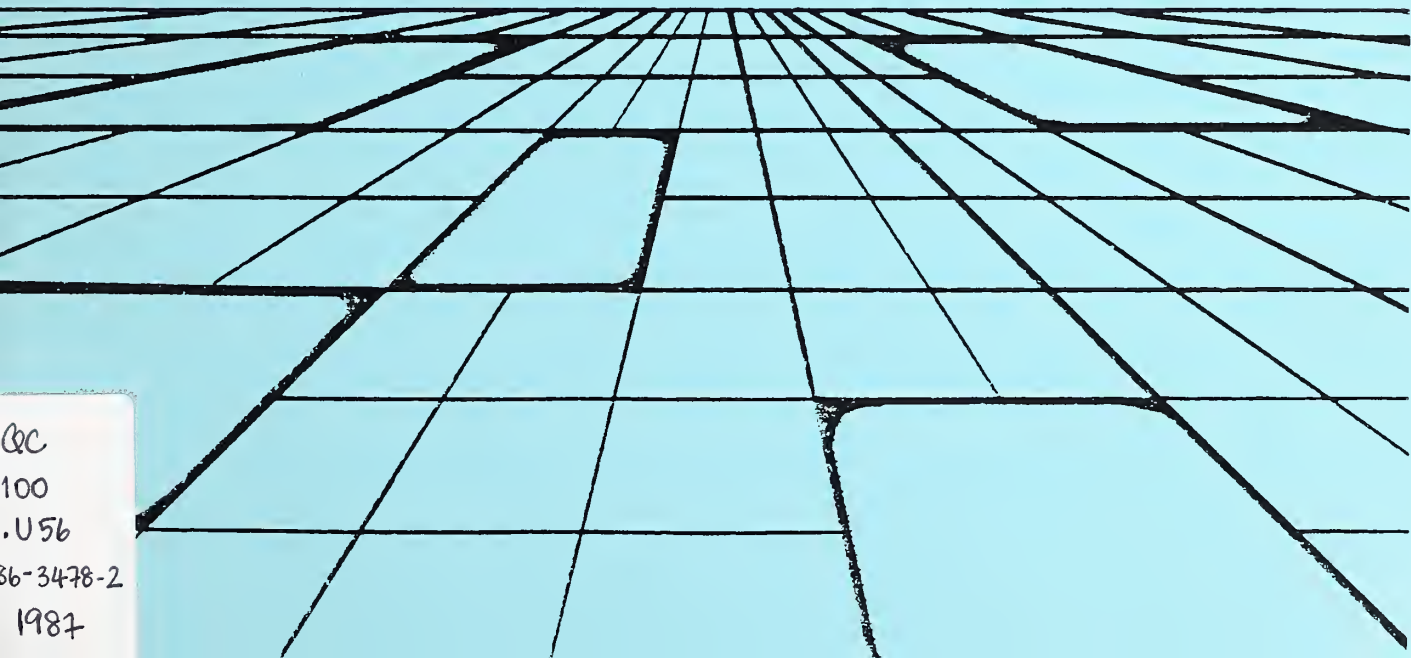


U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards

NBSIR 86-3478-2

Implementation Agreements Among Participants of OSINET

REVISED MARCH 1987



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1. GENERAL INFORMATION

This is a standing document that is revised several times a year following meetings of the OSINET Technical and Steering committees.

1.1 OSINET

The OSINET is an international resource that is being constructed to foster the development of Open Systems Interconnection. Specifically, it has the following objectives:

- o Provide an open network environment for research and development by implementors and users of OSI protocols.
- o Cooperative participant-to-participant testing.
- o Assist in the development of test services.
- o Conduct OSI research to provide results to ISO and CCITT.
- o Companies shall not be discouraged from demonstrating products. No positive actions will be taken to demonstrate functionally enhanced prototype protocols as suggested by the NCC and AUTOFACT demonstrations.

The OSINET will be geographically distributed. Long-haul services will be provided by private and/or public subnetworks offering CCITT Recommendation X.25. Local environments will include standard LANs and other subnetworks.

1.2 BENEFITS

Perhaps the most beneficial aspect of OSINET comes about through collaboration of the participants so that there is a direct transfer to participating companies of the testing methods and sample software.

Companies may participate at a level of effort commensurate with corporate interests, upon satisfying the minimum requirements of participation.

Companies may use the OSINET to demonstrate OSI capabilities from their corporate location(s).

Companies may access the OSINET from conference exhibitions to reach a rich set of demonstrable applications.

Companies may participate in a wide variety of network-related experiments (as they choose) including studies of protocol correctness and performance and network management.

1.3 ORGANIZATION AND MISSIONS

The embodiment of OSINET consists of three entities:

- o The OSINET network itself, comprised of subnetworks, intermediate systems, and end systems,
- o An OSINET Steering Committee and,
- o An OSINET Technical Committee.

The mission of OSINET is to facilitate the distributed development and testing of OSI based products by cooperating vendors and users of OSI.

The mission of the OSINET Steering Committee is to establish and manage OSINET. The Steering Committee determines and approves all OSINET projects.

The mission of the Technical Committee is to carry out the technical work assigned by the Steering Committee.

1.4 REQUIREMENTS AND COSTS FOR OSINET MEMBERSHIP

- o A participating company may either:
 - a - provide an end system on OSINET that supports the common set of protocols specified in Section 2.1 of this document (This ensures that all participants can communicate with each other over OSINET. Other protocols supported are optional and depend upon the companies' interests.), or
 - b - provide an intermediate system that supports the agreements of Section 2.1.
- o To maintain eligibility in OSINET, companies must attend three of the most recent four meetings of the Implementors' Workshop. Else companies may be admitted to OSINET by the Steering Committee on the basis of other significant participation.
- o OSINET participants are expected to maintain a certain level of participation in OSINET projects.
- o Participants shall maintain an implementation level reasonably current as determined by Steering Committee projects.

- o Personnel and other inhouse resources are determined by the participating company, after fulfilling obligations implied by the above items.

- o Initial suppliers of the backbone X.25 service are AT&T and Wang. Additional suppliers of X.25 service who wish to join OSINET are required to insure that OSINET connectivity is maintained. This can be accomplished by means of X.75 links to existing X.25 suppliers, by providing an intermediate system that uses the routing and relaying functions of the CLNP to link to an existing X.25 network, or by arranging for another participant to provide the necessary intermediate system to link to an existing X.25 network. -

- o Costs associated with the installation, monthly charges, and traffic charges depend upon the X.25 service selected for an end or intermediate system that is directly attached to an X.25 service, and how that end or intermediate system is used. See Section 3, X.25 Services.

- o Network Information Center (NIC) services, such as directory services, are being discussed. Should such services be adopted by the participants, NBS has agreed to serve as a NIC. Costs for development and operation of NIC services would be shared by companies using the services.

- o A commitment, on company letterhead, to join OSINET must be sent to Jerry Mulvenna at NBS, Building 225, Room B217, Gaithersburg, MD, 20899.

1.5 REQUIREMENTS AND COSTS FOR OSINET STEERING COMMITTEE MEMBERSHIP

- o A company desiring to participate as a member of the OSINET Steering Committee must be an OSINET member in good standing as defined in section 1.4 of this document.
- o The number of Steering Committee member companies shall be limited to 25. This number may be revised downward by action of the Steering Committee, should this be necessary to achieve optimum function of the Committee.
- o Each company may send one representative to meetings. A management level representative is required. To provide needed continuity, consistent participation by the same representative is requested.
- o Any company which has missed two out of three consecutive meetings of the Steering Committee will lose its Steering Committee membership at the next Steering Committee meeting.
- o Any company which is not a member in good standing of OSINET, as described elsewhere in this document, will lose its membership on the Steering Committee at the next Steering Committee meeting.
- o Effective 1987, seats will be vacated by action of the Committee at the last regular meeting of each calendar year. Voluntary release of company seats will be sought.
- o Effective 1987, a nominating committee will be established at the last regular meeting of each year to propose candidates for membership at the next regular meeting.
- o Effective 1988, applications for membership on the Steering Committee will be proposed annually by the nominating committee, for consideration at the first regular meeting of each calendar year.
- o OSINET members and invited guests are permitted at the Steering Committee meetings. At its discretion, the Steering Committee may choose to close its meetings, or limit participation to members.

- o No additional cost beyond those identified in section 1.4 will be charged to members of the Steering Committee.

1.6 VOTING

There is one vote allowed for each OSINET participating company. In order for a vote to be valid, the majority voting must vote yes or no. If the majority abstains, the vote does not count.

1.7 LIAISON

The Steering Committee shall liaise with other organizations on matters of policy and OSINET management. The Technical Committee shall liaise with other organizations on matters of technical interest.

2. PROTOCOLS AND SERVICES

2.1 COMMONLY IMPLEMENTED PROTOCOLS AND SERVICES

Participants have agreed that all end systems on the OSINET shall be able to communicate with each other for purposes of OSINET administration and for access to common OSINET services. Having made that agreement, it is therefore necessary to agree to a common set of protocols to provide that communication service.

All end systems will support ISO connectionless internetwork protocol, the ISO transport class 4 protocol, and the ISO session protocol (basic combined subset with full duplex). These protocols will be supported from at least March 1986 through March 1989 by companies that are participating during that time period. The backbone subnetwork service is CCITT Recommendation X.25 presently provided by ATT's ACCUNET and WANG's WANGPAC. An end system may attach directly to either of these services. An end system may instead use the IEEE CSMA/CD or Token Bus or some other subnetwork and communicate through an intermediate system attached to either X.25 service. Implementation specifications for the above protocols are as defined in Implementation Agreements Among Implementors of OSI Protocols, NBSIR 86-3385.

The above protocols shall be used to access OSINET services. Services presently being studied include a bulletin board, a host name server, an application directory, a site contacts list, and test results from network management experiments.

The above agreement is not intended to preclude experiments with, and tests and demonstrations of, implementations of other conforming sets of OSI protocols within the framework provided by OSINET. However, all OSINET projects must be approved by the Steering Committee.

2.2 SPECIAL INTEREST PROTOCOLS AND SERVICES

Aside from all participants being able to communicate and access OSINET services, various subsets of participants are interested in other protocols and services. Two are identified below.

2.2.1 X.400

Participants wishing to use electronic mail on OSINET shall use MHF and ISO session (basic activity subset) when these protocols are included in NBSIR 86-3385. These protocols shall operate over the class 4 transport service as defined in NBSIR 86-3385.

2.2.1.1 Goals of OSINET Message Project

1. To provide a basis for conducting interoperability testing of ISO standard (X.400) messaging implementations among OSINET participants.

2. To verify that the X.400 functional standard defined by the NBS OSI Implementor's Workshop agreements is a complete and unambiguous specification for interoperation; and to provide appropriate feedback to that SIG.
3. To provide expanded communication among OSINET participants thru the use of electronic mail over OSINET.
4. To promote and publicize the use of X.400 messaging protocols.
5. To encourage the use of OSINET for communication among OSI Workshop participants.

2.2.2 FTAM

Participants have agreed to support ISO FTAM. The version of FTAM that will be supported is specified in the May 1986 version of NBSIR 86-3385. The FTAM interoperability tests required to be run by each new system that joins OSINET are listed in Appendix B.

2.3 SOURCES OF IMPLEMENTATION AGREEMENTS

The long-haul services are presently provided by ACCUNET and WANGPAC. Since OSINET is intended to be international, it is expected that there will be other X.25 service providers in Europe and North America. It is hoped that the various X.25 services will evolve to a common version of CCITT Recommendation X.25, 1984.

The NBS/OSI Workshop for Implementors of OSI Protocols is an open international forum comprised of computer manufacturers, semiconductor manufacturers, common carriers, and industry and government users. It was established for the purpose of reaching implementation agreements on evolving standards from IEEE, ISO, and CCITT.

The OSINET participants have elected to implement protocols for OSINET according to the implementation specifications developed in that workshop. See NBSIR 86-3385.

It is expected that other forums and organizations might produce implementation specifications for standard protocols. The OSINET will make use of such specifications where its members have a commercial or research interest in them and when they are reviewed and approved in an international, open forum, and projects making use of them have been approved by the Steering Committee.

3. X.25 SERVICES

3.1 ACCUNET (sm) Packet Service

ACCUNET (sm) Packet Service, offered by AT&T Communications, provides low delay/high throughput packetized data transmission with high reliability and availability. The service conforms to the DCE procedures set forth in the 1980 version of the CCITT Recommendation X.25. It supports the essential (E) services and facilities of X.25 as well as some additional (A) features.

Access to the service is provided separately by DATAPHONE (R) Digital Service (DDS), with the DDS Channel Service Unit (CSU), or a 4 wire analog point-to-point private line type 3002 channel. Digital access is supported at 4.8, 9.6, or 56 kbps; analog access is supported at 4.8 or 9.6 kbps (9.6 kbps analog access may require conditioning). ACCUNET Packet Service supports software controlled logical channels that enable multiple simultaneous calls over a single physical access line: 127 such calls at speeds of 4.8 and 9.6 kbps, and as many as 511 at 56 kbps.

Currently ACCUNET Packet Service is deployed in the following cities:

Akron	Greenville	Philadelphia
Albany	Harrisburg	Phoenix
Albuquerque	Hartford	Pittsburgh
Anaheim	Houston	Portland, ME
Appleton	Huntsville	Portland, OR
Atlanta	Indianapolis	Poughkeepsie
Austin	Jackson	Providence
Baltimore	Jacksonville	Raleigh
Birmingham	Kalamazoo	Reno
Boise	Kansas City	Richmond, VA
Buffalo	Knoxville	Roanoke
Cambridge	Lansing	Rochester
Camden	Lexington	Sacramento
Cedar Rapids	Little Rock	St. Louis
Charlotte	Los Angeles	Salinas
Chattanooga	Louisville	Salt Lake City
Chicago	Madison	San Antonio
Cincinnati	Manchester	San Diego
Cleveland	Memphis	San Francisco
Colorado Springs	Miami (OJUS)	Seattle
Columbia	Minneapolis	Shreveport
Columbus	Mobile	Spokane
Dallas	Nashville	Springfield, MA
Davenport	New Haven	Stockton
Dayton	New Orleans	Syracuse
Denver	New York City	Tampa
Des Moines	Newark	Toledo
Detroit	Norfolk	Tucson
Eugene	Oakland	Tulsa

Fresno	Oklahoma City	Washington, D.C.
Ft. Wayne	Omaha	West Palm Beach
Grand Rapids	Orlando	White Plains, N.Y.
Greensboro	Peoria	Youngstown

In addition, ACCUNET Packet Service provides international access to other X.25 packet networks in the following countries:

Australia	Ireland	Spain
Belgium	Italy	Sweden
Bermuda	Jamaica	Switzerland
Canada	Japan	United Kingdom
France	Netherlands	West Germany
Hong Kong	Singapore	

ACCUNET Packet Service supports six different options for the assignment of DTE addresses to access lines. The most common of these is that an access line will have a single address assigned to it. Another option, which some participants may find useful, allows multiple addresses to be assigned to a single access line. Users may request from 1 to 10 blocks of 100 addresses to be assigned to their access line. More specific information on all six addressing options can be found in the AT&T Technical Reference PUB 54010. Participants in OSINET should let their AT&T Account Executive know which option meets their particular needs when ordering ACCUNET Packet Service.

ACCUNET Packet Service provides Virtual Call and Permanent Virtual Call services, both based on the logical channel concept. By means of Virtual Call Service set-up/clearing procedures, logical channels can be established and terminated on demand. Permanent Virtual Call Service eliminates the time required to set-up and clear each call by establishing permanent logical associations (not available for Virtual Calls) when the service is ordered. These remain in place until other service arrangements are ordered. For OSINET, AT&T is recommending that all logical channels be established by Virtual Calls.

Both Virtual Call and Permanent Virtual Call services offer a wide range of software functions to increase control over circuit parameters, set-up, and functional attributes. Packet sizes of 128 and 256 octets as well as window sizes of 2 and 3 packets are supported.

Logical channels may be established as either two-way or one-way outgoing. For OSINET, AT&T is recommending that logical channels are established only as two-way and, while it is possible to bar either incoming or outgoing calls on all logical channels, that these facilities not be provisioned.

Throughput class negotiation permits negotiation on a per call basis of the throughput classes for each direction of data transmission. Throughput classes up to and including 9600 bps are supported by ACCUNET Packet Service, limited only by access line speed. For OSINET, AT&T is recommending that the throughput class negotiation facility be provisioned.

Flow control parameter negotiation permits negotiation on a per call basis of the flow control parameters, window size and packet size, for each direction of data transmission. The default window size of 2 packets and packet size of 128 octets can be modified if both DTEs wish to use larger values and subscribe to this facility. For OSINET, AT&T is recommending that the flow control parameter negotiation facility be provisioned.

The fast select facility allows DTEs to send up to 128 octets of data in the Call Request packet and receive up to 128 octets of user data from the called DTE in a Call Connected or a Clear Indication packet, if issued in direct response to the Call Request packet. The facility may be requested on a per call basis. The fast select acceptance facility authorizes the network to transmit to the DTE Incoming Call packets which request the fast select facility. For OSINET, AT&T is recommending that the fast select acceptance be provisioned.

Table 1 lists performance parameters and typical values which may be encountered by users of ACCUNET Packet Service. These performance parameters and typical values are published by AT&T Communications as a guide for the designers, manufacturers, consultants, and suppliers of systems and equipment which would connect to the X.25 interface. The performance values are based on design objectives and reflect typical network performance from one X.25 packet switch interface to another X.25 packet switch interface. As such, these values do not reflect delays associated with access lines to/from the packet switch. They are typical, but are not meant to imply a guarantee of quality or grade of service.

Additional information is available in the following AT&T Communications Technical References:

PUB 54010, "X.25 Interface Specifications and Packet Switching Capabilities," (May, 1986)

PUB 54012, "X.75 Interface Specifications and Packet Switching Capabilities," (May, 1986)

They are available from:

AT&T Customer Information Center
Commercial Sales Rep.
P. O. Box 19901 11202
Indianapolis, IN 46219
1-800-432-6600 (Operator 101)

TABLE 1

ACCUNET Packet Service Network Performance Specifications

THROUGHPUT	Virtual Circuit Data Transfer Rate	95% of Throughput Class
------------	------------------------------------	-------------------------

AVAILABILITY	Scheduled Hours of Service	24 hours/day 7 days/week
	Loss of Service	8 hours per interface per year
	Meantime to Restore Service	5 hours (average)
BLOCKING	Service Blocking	Less than 1%
DELAY	Call Set-up	480 ms (Average Busy Hour)
	Data Transfer Delay (40 octets)	135 ms (Average Busy Hour)
MALFUNCTION	Rate of Incorrect Packet	1 per 10 million packets sent
	Restart Rate	5 per interface per year

3.2 WANGPAC

The following information has been provided by WANG.

An Overview To WangPac

WangPac is a packet switching network service offered by Wang Information Service Corporation (WISC) a wholly owned subsidiary of Wang Laboratories, of Lowell, Massachusetts.

Implemented over 18 months ago to serve the internal worldwide data communications requirements of Wang Laboratories, WangPac is based on the international packet switching technology standard of X.25. We support the common set of protocols OSINET requires.

Designed with excess capacity, Wang Laboratories currently uses less than 7% of the network. It is this excess capacity that we are making available to OSINET users as well as our commercial customers. The current configuration of the network has more than 60 locations serving in excess of 200 hosts with 10,000 users. WangPac has increased its users productivity and has provided a cost effective means of centralized support and controlled growth.

Access Protocols

WangPac currently supports the following non-X.25 access protocols.

3270

2780/3780

ASync

SNA

Network Operations Center

The NOC located in Lowell, Massachusetts, is the network's command center. Operators have the ability to perform remote diagnostics and performance analysis on lines and nodes in the network. When a problem develops, they coordinate and dispatch support and maintenance ensuring efficient network operations.

We have installed X.25 packet switching nodes in the following locations:

WangPac Domestic/Foreign PSN Locations

Atlanta, Georgia	Methuen, Massachusetts
Bloomfield, Michigan	Newport Beach, California
Boston, Massachusetts	New York City, New York
Brussels, Belgium	Oakbrook, Illinois
Burlington, Massachusetts	Oakland, California
Culver City, California	Philadelphia, Pennsylvania
Century City, California	Phoenix, Arizona
Coral Gables, Florida	Portland, Oregon
Chelmsford, Massachusetts	Princeton, New Jersey
Chesapeake, Virginia	Puerto Rico
Cincinnati, Ohio	Rochester, New York
Dallas, Texas	Rockville, Maryland
Des Moines, Iowa	Rolling Meadows, Illinois
Englewood, Colorado	Roslyn, Virginia
Farmington, Connecticut	Rutherford, New Jersey
Greensboro, North Carolina	Salt Lake City, Utah
Haverhill, Massachusetts	San Diego, California
Hong Kong	San Francisco, California
Honolulu, Hawaii	Seattle, Washington
Houston, Texas	Shaumburg, Illinois
Independence, Ohio	Singapore
Limerick, Ireland	St. Louis, Missouri
London, England	Stanford, Connecticut
Lowell, Massachusetts	Sydney, Australia
Lawrence, Massachusetts	Tampa, Florida
Marina Del Ray, California	Tewsbury, Massachusetts
	Wayne, Pennsylvania

INTERFACE SPECIFICATIONS AND PACKET SWITCHING ATTRIBUTES

This section describes the X.25 interface protocol currently supported by WISC's WangPac packet switching network.

Recommendation X.25 [1] of the International Telegraph and Telephone Consultative Committee (CCITT) specifies the interface between Data Terminal Equipment (DTE) and Data Circuit Terminating Equipment (DCE) for terminals or hosts operating in packet mode on public data networks (PDNs). FIPS 100/Federal Standard 1041 [2] specifies the general use of X.25 for the United States government. This standard defines some choices left open in Recommendation X.25. WangPac follows procedures that are in compliance with FIPS 100/Fed. Std. 1041 in areas where Recommendation X.25 allows a choice.

INTERFACE SPECIFICATIONS AND PACKET SWITCHING ATTRIBUTES

The interface described in this document is compliant to the DCE procedures set forth in the 1980 version of CCITT Recommendation X.25 and FIPS 100/Fed. Std. 1041 dated July 6, 1983.

This document provides information on the specific X.25 features currently supported including:

- o X.25 parameter values
- o action taken in areas where Recommendation X.25 offers a choice
- o unique features not presently in Recommendation X.25 of FIPS 100/Fed. Std. 1041

This document assumes the reader is familiar with CCITT Recommendation X.25 and FIPS 100/Fed. Std. 1041. Information contained within is meant to be used with the text of both of these documents.

The WangPac Network

WangPac provides a value added packet switched transport service between user interfaces. The WangPac network, (figure 2.1), consists of packet switching nodes (PSNs), packet assembler/disassemblers (PADs), interconnecting trunk lines, and packet switch access points for user connections. The user packet switch points can support access at 56kbps, 48kbps, 19.2kbps, 14.4kbps, 9.6kbps, 4.8kbps, 2.4kbps, and 1.2kbps.

WangPac network interface supports Levels 1, 2, and 3 of the DCE side of FIPS 100/Fed. Std. 1041 and 1980 CCITT Recommendation X.25 protocol for Virtual Call and Permanent Virtual Circuit Services.

Access to Public Data Networks

Within the United States, WangPac supplies Virtual Call and Permanent Virtual Circuit Services between DTEs.

For foreign countries, Virtual Call services are provided to most public packet networks worldwide.

Outline of WangPac X.25 Packet Switch Interface Protocol

WangPac supports three physical interface standards: RS-232C, RS-449, and V.35 at clock rates from 1.2 to 56 kilobits per second (kbps).

The link level protocol supports the Link Access Procedure Balanced (LAPB) procedure.

WangPac packet level interface supports both Switch Virtual Call (SVC) and Permanent Virtual Circuit (PVC) services.

WangPac supports the standard default level attributes specified in CCITT Recommendation X.25 of 128 octets for maximum size of the user data field, modulo 8 packet sequence numbering, and packet level window size of 2.

Most facilities designated by FIPS 100/Fed. Std. 1041 are supported by WangPac. In addition, WangPac provides Fast Select and Fast Select Acceptance support for virtual calls.

Additional facilities and capabilities are under consideration.

At the end of this section, there is a summary of WangPac's X.25 packet switch interface.

WangPac X.25 Packet Switch Interface Attributes

This section describes switched virtual call (SVC) service and permanent virtual circuit (PVC) service, network addressing, and self-test capability.

SVC Service

Switch virtual call service procedures and formats are in accordance with those specified in CCITT Recommendation X.25 and FIPS 100/Fed. Std. 1041. SVC service provides:

- o interface initialization
- o call setup and clearing
- o flow control
- o sequenced data transfer.

PVC Service

The capabilities described in section 5.1 hold true for permanent virtual circuits except for call setup and clearing. PVCs do not require calls. Facilities for PVCs are set at subscription time.

Network Addressing

Addresses are assigned to the user by the WangPac administration. The address format utilized is consistent with CCITT Recommendation X.121.

All addresses are 12 or 14 digits in length. The 14 digit length includes 2 digits for subaddressing.

Two types of addressing are supported, physical addressing and logical addressing.

Physical addressing allows the identification of the exact endpoint the user wishes to reach.

Logical addressing allows referencing hosts by either their physical address or by one of more location-independent logical addresses. It also gives the host control over which of the logical addresses it can be accessed by (this is optional for the host machine to implement). The logical address is 7 digits long and is mapped by the network into a physical address. There may be multiple logical addresses assigned to a single physical address or multiple physical addresses with the same logical address. The network can also translate the logical address into a physical address in the incoming call packet so the host sees only a physical address.

In the case of multiple physical addresses tied to a single logical address, there are three selection criteria that can be used:

- o Ordered List: this method selects the first active port always searching from the beginning of the list.
- o Shortest Distance: using the list of all active ports, select the destination physical address with the shortest routing distance from the source.
- o Round Robin: select the first active port starting the search from the last successfully selected port. The list will be viewed as a circular list.

Note: only active physical ports can be selected and a logical address can only have one selection criteria associated with it.

WangPac X.25 User Facility Support

WangPac supports many of the facilities described in Recommendation X.25 and FIPS 100/Fed. Std. 1041. Each section below describes a facility and the

WangPac implementation.

Closed User Group

This facility is assigned by WangPac Administration. It allows DTEs to restrict outgoing and incoming access to a "group" of registered DTEs. A DTE may belong to a single group or a number of groups.

Each group is assigned a two digit index number in the range of 00-99. DTEs will use the index number as part of the closed user group facility request to identify the particular closed user group associated with the call request. DTEs subscribed to only one CUG are not required to use the facility, WangPac will insert the facility into the call request packet automatically.

Throughput Class Negotiation

This facility permits negotiation on a per call basis of the throughput classes for data transmission. The throughput class requested in the call request packet is validated against the configured line speed. If the value requested is less than or equal to the line speed, the call is permitted, else the call is cleared.

The incoming call packet presents the DTE with the lesser of the calling DTE's requested value or the maximum throughput class for the called DTE. The value in the call connect packet must be less than or equal to the value requested in the call request packet.

The negotiated value must be the same for both directions. There is no guarantee of performance with throughput negotiation.

Flow Control Negotiation

This facility permits on a per call basis, negotiation of packet and window sizes. The values negotiated must be the same in both directions. WangPac defaults have a packet size of 128 octets and window size of 2. If no packet size or window size is requested, these values are in effect.

WangPac allows packets sizes of 16, 32, 64, 128, 256, 512, and 1024 octets to be negotiated.

Window sizes of 1-7 may be negotiated.

One Way Logical Channel Outgoing

This facility is set by WangPac Administration. It allows a user to set aside a logical channel or channels to be used exclusively for outgoing calls. The user must specify the logical channel(s) that will be used for this service.

One Way Logical Channel Incoming

This facility is set by WangPac Administration. It allows a user to set aside a logical channel or channels to be used exclusively for incoming calls. The user must specify the logical channel(s) that will be used for this service.

Outgoing Calls Barred

This facility is set by WangPac Administration. It prevents outgoing calls to be made for a DTE. This is equivalent to specifying all logical channels as being One Way Logical Channels Incoming.

Incoming Calls Barred

This facility is set by WangPac Administration. It prevents incoming calls to be made for a DTE. This is equivalent to specifying all logical channels as being One Way Logical Channels Outgoing.

Fast Select

The DTE may request this facility on a per call basis in the call request packet. The calling DTE is allowed up to 1024 octets of user data to be included in the call request packet and up to 1024 octets of user data to be received in the call connected packet or clear indication packet (if issued in direct response to the call request) from the called DTE. This facility must be requested by the subscriber, it is not activated in the standard configuration.

Fast Select Acceptance

This facility is set by WangPac Administration. It empowers WangPac to transmit to the DTE incoming call packets which contain the fast select facility. If a DTE does not subscribe to this facility, WangPac will not pass on the DTE incoming call packets with the fast select facility. This facility must be requested by the subscriber, it is not activated in the standard configuration.

This facility is set by WangPac Administration. It allows a user to make call request containing the reverse charging facility. If the access port is not configured for reverse charging and a DTE issues a call request packet with the reverse charging facility, the call is cleared. This facility must be requested by the subscriber, it is not activated in the standard configuration.

Reverse Charging Acceptance

This facility is set by WangPac Administration. It authorizes WangPac to transmit to the DTE incoming call packets which contain the reverse charging facility. If a DTE does not subscribe to this facility, WangPac will clear all calls destined to the DTE that contain the reverse charging facility.

This facility must be requested by the subscriber, it is not activated in the standard configuration.

RPOA Selection

The DTE may request this facility on a per call basis. It allows the calling DTE, in the call request packet, to specify the particular Recognized Private Operating Agency (RPOA) transit network through which the call is to be routed.

Reverse Charging

SUMMARY OF WANGPAC INTERFACE FEATURES

<u>Feature</u>	<u>Description</u>
Level 1 (Physical Level) transmission access: interface types:	1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 56kbps RS232-C, RS-449, V.35
Level 2 (Link Level) procedure	LAPB
parameter K:	7 default, 1-6 optional
parameter N1:	8248 bits
parameter N2:	20 default, 1-200 optional
timer T1 DCE:	less than or equal to 3 seconds
parameter T2 (DCE): (worst case)	less than or equal to .5 sec for speeds less than or equal to 19.2 kbps less than or equal to .25 sec for speeds greater than 19.2 kbps
sequencing:	modulo 8
Level 3 (Packet Level)	
services:	virtual call and permanent virtual circuit
packet types:	all basic packets plus diagnostic, interrupt and interrupt confirm packets
# of logical channels per DTE (default)	10 (additional logical channels available at additional cost)

LCN range:	0 - 4095
user data field:	octet aligned
packet sequencing:	modulo 8
address format	14 digits

VC user facilities*

Support Provided

Recommendation X.25 and FIPS 100

Closed User Group (CUG):	yes
CUG with Incoming Access:	yes
CUG with Outgoing Access:	yes
Bilateral CUG:	no
Bilateral CUG with Outgoing Access:	no
Throughput Class Negotiation:	yes
Flow Control Negotiation packet size:	16,32,64,128,256,512,1024
octets	
window size:	2 - 7
One Way Logical Channel Outgoing:	yes
One Way Logical Channel Incoming:	yes
Incoming Calls Barred:	yes
Outgoing Calls Barred:	yes
Fast Select:	yes
Fast Select Acceptance:	yes
Reverse Charging:	yes
Reverse Charging Acceptance:	yes
RPOA Selection:	yes

* Facilities that apply to both virtual call and permanent virtual circuits are available to both if supported.

4. SITE CONFIGURATION, LOCATION, PROTOCOLS, AND POINT OF CONTACT
INFORMATION FOR OSINET PARTICIPANTS

This section provides the information suggested by the title. Each participating company is expected to complete their subsection.

4.1 U.S. Department of Agriculture

Point of Contact: Mrs. Elaine Stout
Office of Information Resources Management
Room 447W
14th & Independence Ave., S.W.
Washington, DC 20250
(202) 475-4795
Organization ID: 23

4.2 AT&T Communications

System Name: AT&T Intermediate System
Location: Bellevue, Washington (BOEING Computer Services)
Configuration: AT&T Network Controller providing ISO/OSI internetworking
of X.25/802.3/802.4 over the connectionless network
(DIS 8473) protocol.
Point of Contact: Matthew Gierlach
AT&T
Room B-A254
60 Columbia Turnpike
Morristown, NJ 07960
Organization ID: 11

4.3 Boeing Computer Services

Location: Bellevue, Washington
Configuration: AT&T X.25 router to 802.3 and 802.4 modes
Protocols: FTAM (AUTOFACT), BCS Session
(Full Duplex), Transport
(Class 4), Internet Protocol Router
Subnetwork Point
of Attachment: 3134 206 708 1001

Point of Contact: Les Kerr
P.O. Box 24346
Seattle, WA 98124-0346
(206)763-5868

Organization ID: 12

4.4 Charles River Data Systems

Point of Contact: Eric Spiewak
983 Concord St.
Framingham, MA 01701
(617) 626-1000

Organization ID: 13

4.5 Defense Communications Agency

Point of Contact: Martin Thompson
DCEC
1860 Wiehle Avenue
Reston, VA 22090

Organization ID: 22

4.6 Digital Equipment Corporation

Subnet: British Telecom's PSS service giving
access to AT&T's Accunet via X.75

Access lines: 1 @ 9.6kb

Configuration: micro-VAX II

Protocols: FTAM, Full Session, CLNP/X.25-80, X.25-80,
VARCRLE, and UNDEF presentation contexts.

Point of Contact: Richard Benwell
REO2-G/M9
Digital Park
Imperial Way
Reading
+44-734-868711

Organization ID: 14

4.7 General Motors

Point of Contact: Gary Workman
APMES A/MD-39
30300 Mound Rd.
Warren, MI 48090
(313/575-0632)

Organization ID: 15

4.8 Hewlett Packard

Configuration: HP 1000

Protocols: FTAM, CASE, Session (BCS full duplex), Transport Class 4 and end-node connectionless IP

Point of Contact: Mary E. Ryan
Rnd R3NF
8000 Foothills Blvd.
Roseville, CA 95678
916/786-8000 x4519

Organization ID: 16

4.9 Honeywell Information Systems

Location: Phoenix, AZ

Equipment: Honeywell DPS-6

X.25 Network: AT&T AccuNet (sm)

Link Access: 1 x 9600 bps

Protocol (initially): X.25 (1980), Connectionless Internet
(end-system), Transport Class 4, Session BCS
(full duplex, FTAM)

(Planned by 1987): Session BAS, X.400 MHS (P1, P2)

Organization Name: HON01

System Identifier: HON01DS6

Application Entities:

- Application Entity Title: FTAM
- PSAP Selector: null (N/A)
- SSAP Selector: 46 54 41 4D₁₆
- TSAP Selector: 00 0116
- NSAP Address: 47 0004 0011 0001 000000000001 00₁₆

Subnetwork Points of Attachment:
AccuNet Address: 602 210 1000

Point of Contact: Bruce Carlson
P.O. Box 8000, H32
Phoenix, AZ 85066
(602) 861-4944

System Name: HIS2
Organization: Honeywell Info Systems
NSAP: 47 0004 0011 0002 00 00 00 0000C1 00
T-Selector: 0001
S-Selector: 48 49 53 46 54 41 4D

PSS Address: 02 3421 89 1010104
Location: Honeywell House
Godfrey Way
Hanworth Road
Hounslow, Middlesex, England TW4-5PW

Contact: Martin Hassenberg
Phone: 44 24 2291
Organization ID: 17

4.10 IBM

Configuration: IBM Series 1 processor, IBM 4300

Location: Palo Alto, CA
Gaithersburg, MD (NBS)
La Gaude, France

X.25 Access: ACCUNET
TRANSPAC (La Gaude)

Access Lines: 1 @ 4.8 kbps
1 @ 9.6 kbps (La Gaude)

Protocols Supported: X.25, 802.4, CLNS, Transport Class 4, Session
kernel, ACSE, FTAM

Organization Name: IBMPA
System Identifier: IBMPAMCS

Application Entities:

Application Entity Title: IBMPAFTAM
PSAP Selector: null
SSAP Selector: 49 42 4D 31 2E 46 54 41 4D

TSAP Selector: 0001
16
NSAP Selector: 47 0004 0001 0001 415257106200 00
16

Subnetwork Points of Attachment:
ACCUNET Address: 415 257 1062

Organization Name: IBMLG
System Identifier: IBMLGMCS
Application Entities:
Application Entity Title: IBMLGFTAM
PSAP Selector: null
SSAP Selector: 49 42 4D 32 2E 46 54 41 4D
16
TSAP Selector: 0001
16
NSAP Selector: 47 0004 0001 0002 208006041768 00
16

Subnetwork Points of Attachment:
ACCUNET Address: 2080 06041798

Point of Contact: Edward C. Strum
1501 California Ave., N.W.
Palo Alto, CA 94303-0828
(415) 855-3996

Henri Chorosz
011 33 93 585 772

Organization ID: 1

4.11 Industrial Networking, Inc.

Location: Southfield, MI
X.25 Attachment: ACCUNET
Configuration: a) VAX 11/750 running
VMS and Eunice operating systems
b) IEEE 802.4 LAN Attachments
Protocols: As specified in SNA 85-1
Access Lines: 1 9600 Baud
Point of Contact: Richard Parenteau
Manager, Software Engineering
23999 Northwestern Highway
Suite 100
Southfield, MI 48075
(313) 354-4616
Organization ID: 7

4.12 International Computers, Ltd.

Subnet: British Telecom's PSS Service giving access
to AT&T Accunet via X.75

Access Lines: 1 @ 4.8Kb

Configuration: PERQ running PNX

Protocols: Internet
Transport classes 0,2,3,4
Session (full)
FTAM

NSAP: 4700040002000123427820010500
SNPA: 234278200105(PSS)

Point of Contact: J.R. Cadwallader
Manager, Network Technology
Technical Directorate
Westfields West Avenue
Kidsgrove Stoke-on-Trent ST7 1TL
United Kingdom
(0782) 29681

Organization ID: 2

4.13 The MITRE Corporation

Point of Contact: Claude E. LaBarre
Burlington, MA 01730
(617) 271-8507

Organization ID: 24

4.14 National Bureau of Standards

X.25 attachment: ACCUNET and WANGPAC

Location: Gaithersburg, MD

Network Configuration: a) VAX/780 intermediate and end system
b) IBM Series 1's as end systems
c) IEEE 802.3 and 802.4 LAN attachments
d) correctness lab, performance lab, LAN
lab, and multi-processing lab attachments
via the LANs

Protocols: as specified in NBSIR-86-3385.

Organization Name: NBSWASHDC
System Identifier: NBSWASHDCNIC
Application Entities:
Application Entity Title: NBS1FTAM
PSAP Selector: null
SSAP Selector: 46 54 41 4D
16
TSAP Selector: 0001
16
NSAP Selector: 47 0004 0003 0002 7F0000000000 00
16
Subnetwork Points of Attachment: -
ACCUNET Address: 202 301 1007

Point of Contact: Jerry Mulvenna
Systems & Network Architecture Division
Building 225, Room B217
Gaithersburg, MD 20899
301/975-3631

Organization ID: 3

4.15 Department of Navy

Point of Contact: Dave Norem
NAVDAC, Code 32
Washington Navy Yard
Bldg. 218-2
Washington, DC 20374-1662

Organization ID: 20

4.16 NCR Comten

Configuration: NCR Tower XP running UNIX System V
(operating as an end system)
Location: Minneapolis/St. Paul, MN
X.25 Access: ACCUNET
Access Lines: 1 @ 9.6 kbps
Protocols Supported: FTAM, Session (BCS full duplex), Transport
Class 4, Internet Protocol, X.25
Organization Name: NCR
SSAP Selector: NCR.FTAM <==> (4e 43 52 2e 46 54 41 4d)

TSAP Selector: 00 01
NSAP Address: 4700040004000108001400329700
ACCUNET SNPA: (3134) 6124501001

Point of Contact: Rick Johnson
NCR Comten, Inc.
2700 Snelling Ave., N.
St. Paul, MN 55113
(612) 638-7767

Organization ID: 4

4.17 OMNICOM, Inc.

Point of Contact: John W. Neumann
501 Church St., N.E.
Vienna, VA 22180

Organization ID: 21

4.18 Retix

Location: Santa Monica, CA
Configuration: VAX 11/750 running
Berkeley 4.2 UNIX
Protocols: as specified in SNA 85-1
Point of Contact: John B. Stephensen
Vice President, Engineering
1547 Ninth Street
Santa Monica, CA 90401

Organization ID: 6

4.19 UNISYS

Point of Contact: Anita Skelton
3151 Camino Ruiz
Camarillo, CA 93010
(805) 987-9300

Organization ID: 18

4.20 TASC

Point of Contact: Jonathan S. Katz
One Jacob Way
Reading, MA 01867
(617) 944-6850, Ext. 2282

Organization ID: 19

4.21 Wang

Organization: WANG Laboratories, Inc.
Location: Lowell, Massachusetts

Contact: Joe Hielscher
Address: One Industrial Avenue
Mailstop 014-A1B
Lowell, MA 01851
Phone: 617-967-1030

Organization ID: 09₁₀ = 09₁₆
Organization Name: WLILWL
System Identifier: WLILWLVS1

FTAM AE Title: FTAM
PSAP Selector: null (n/A)
SSAP Selector: 46 54 41 4D₁₆
TSAP Selector: 00 01₁₆
NSAP Address: 47 0C04 0009 0001 000036070000 00₁₆ (OSI1)

Network Connection: ACCUNET Gateway
SNPA Address: 3134 617 430 1038 (OSI1)

Network Connection: WANGPAC
SNPA Address: 000000 36 07 0000 (OSI1) <-- Main System

Availability: 9-5 Eastern Standard Time

Supported Protocols: FTAM-1, VARCR/LF/UNDEF, BCS Session, TP-4
CLNP/X.25-80, X.25-80

Configuration: VS 85 connected to WangPac Network Operation
Center. WangPac gateways to AccuNet via an X.25
switch located in Lowell, MA.

Organization ID: 9

4.22 The Wollongong Group

Point of Contact: Narayan Mohanram
1129 San Antonio Rd.
Palo Alto, CA 94303

Location: Palo Alto, CA

Configuration: 3B15 processor

Protocols: FTAM, BCS Session,
Transport (Class 4), CLNS

Organization ID: 8

5. PROGRAM OF WORK

5.1 INITIAL PROJECTS

5.1.1 Initial Connectivity

The first project is to provide connectivity among all of the OSINET companies.

This is viewed as a two-step process. The first step is for each company to connect, directly or via a gateway, to ACCUNET or WANGPAC and verify operation, i.e., connection establishment, data transfer, and connection termination.

The second step is to exercise the protocol suite described in section 2.1 of this document. This is to be done by executing a subset of the FTAM tests used for AUTOFACT '85 testing. The subset is to be determined by the Technical Committee. Each company will run the FTAM tests with five other companies. The target date for completion of testing is May 4, 1987.

"Initial Connection" interoperability testing will be determined by completing testing with five (5) partners plus exchanging addressing and news information with the NIC.

- (a) Other testing can be conducted and recorded, but does not pertain to the "initial connection" interoperability completion criteria.
- (b) It may be advantageous for OSINET participants to choose their partners.
- (c) If participants decide to choose partners, they should inform INI before testing begins.
- (d) Participants should attempt to test with different hardware/software systems, if they informally arrange test partners.
- (e) All testing progress should continue to be reported to INI.
- (f) INI will continue to assign test partners.

To ensure continued interoperability, participants are encouraged to perform regression testing when changes are made to their OSINET system.

5.1.2 NIC Services

OSINET will provide Network Information Center services.

5.1.3 DoD Transition to the Use of OSI

The joint NBS, DCA, Navy, and Industry work on FTAM, MHS, VTP, and directory services as a step in the DoD transition to the use of OSI has been approved as an OSINET project.

5.1.4 1987 Product Exhibition

A 1987 product exhibition proposed by GM, et al., has been conditionally approved as an OSINET project, subject to review of a detailed proposal.

5.1.5 X.400 Message Handling Systems

OSINET can optionally be used by interested participants for the interoperability testing of electronic messaging protocols using the CCITT. X.400 Series of recommendations. It has been provisionally approved, subject to review of a detailed proposal, that testing will be based on the specifications of the NBS OSI Workshop SIG on X.400 specification, rev 1.0, as contained in NBSIR 86-3385.

5.1.5.1 Nature of OSINET Messaging Project

Participants in the OSINET Messaging project must provide network connectivity to the existing OSINET topology. Participation in the messaging project shall be an optional function for OSINET members.

An OSINET messaging participant may provide either a full end system (P1 and P2) or a message transfer service (P1 only) system. Both the PRMD-PRMD and PRMD-ADMD profiles will be utilized.

Initially, messaging participants will provide full messaging end-systems (P1 and P2) and will provide one or more PRMDs; the PRMD-PRMD profile will be utilized. The PRMD-ADMD profile will be added when an OSINET member (or applicant) administration applies and an appropriate bridge (relay) to other OSINET messaging systems is provided. Participation as an intermediate PRMD or ADMD (P1 only) will be defined when requested by an OSINET member.

5.1.5.2 Role of the Technical Committee

The Technical Committee will collect and publish (in the OSINET agreements standing document) the X.400 messaging addressing information it feels is necessary to permit inter-member message exchange. This will include the sub-network point of attachment (i.e., Accunet address), NSAP, T-selector, S-selector, PRMD name, MTA name, MTA password (if used) and the O/R names of persons who may be sent mail. Where necessary, the Technical Committee shall insure that such elements as PRMD and MTA names are unique among members.

The Technical Committee will make the above information available to members via the NIC. The TC will investigate maintaining NIC files listing the O/R names of persons who may receive mail via OSINET at each member location.

The Technical Committee will define and publish (as an appendix to the OSINET agreements standing document) a basic set of confidence tests designed to verify that mail can be successfully exchanged among OSINET messaging participants.

The Technical Committee will assign testing partners, such that each participant may execute the set of tests with at least five (5) other members.

The Technical Committee shall report on testing status to the Steering Committee.

The Technical Committee shall provide as liaison with the Workshop's X.400 SIG any questions, problems, or ambiguities detected in the messaging functional standard.

5.1.6 Directory Services

Directory Services, based on the joint ISO/CCITT standard and implementation agreements developed at the NBS/OSI Workshop, has been approved as an optional OSINET project.

6. POINTS OF CONTACT

6.1 POINTS OF CONTACT FOR COMMITTEES

Jerry Mulvenna, Chair, OSINET Steering Committee, (301) 975-3622

Edward Strum, Chair, OSINET Technical Committee, (415) 885-7392

Jim Converse, liaison for MAP/TOP Steering Committee, (716) 726-1957

6.2 POINTS OF CONTACT FOR X.25 SERVICES

ACCUNET

Steven Lind
AT&T
Room 17-5361C1
295 North Maple Avenue
Basking Ridge, NJ 07920
(201)221-2834

WANGPAC

Joe Hielscher
Wang Laboratories, Inc.
One Industrial Avenue
Lowell, MA 01851
(617) 459-5000/967-1030

REFERENCES AND BIBLIOGRAPHY

NBS

NBSIR 86-3385-1: Implementation Agreements for Open Systems Interconnection Protocols, National Bureau of Standards, Bldg. 225, Rm. B217, Gaithersburg, MD 20899.

FIPS 107, Local Area Networks: Baseband Carrier Sense Multiple Access with Collision Detection Access Method and Physical Layer Specifications and Link Layer Protocol, NTIS, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

FIPS 100, Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) For Operation With Packet-Switched Data Communications Networks, NTIS, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

IEEE

IEEE Project 802, Local Area Network Standards, P802.2 Logical Link Control, November 1982.

IEEE Project 802, Local Area Network Standards, IEEE Standard 802.4 Token - Passing Bus Access Method and Physical Layer Specification.

IEEE Project 802, Local Area Network Standards, IEEE Standard 802.3 CSMA/CD Access Method and Physical Layer Specification.

The above documents may be obtained from IEEE Standards Office, 345 East 47th Street, New York, N.Y. 10017.

ISO

Addendum to DIS 8473 Covering Provision of the Connectionless-Mode Network Service, ISO/TC97/SC 6/N3453.

Network Service Definition, DIS 8348, ISO/TC97/SC6 N2990.

Addendum to the Network Service Definition Covering Connectionless Data Transmission, DIS 8348 DAD1, N3152.

Addendum to the Network Service Definition Covering Network Layer Addressing, DP 8348 DAD2, N3134.

Internal Organization of the Network Layer, dp 8648.

Protocol for Providing the Connectionless Network Service, DIS 8473 N3154.

Information Processing Systems - Open Systems Interconnection - Transport Service Definition, ISO IS8072, 1984.

Information Processing Systems - Open Systems Interconnection - Transport Protocol Specification, ISO IS8073, 1984.

Information Processing Systems - Open Systems Interconnection - Session Service Definition, ISO DIS8326, 1984.

Information Processing Systems - Open Systems Interconnection - Session Protocol Specification, ISO DIS8327, 1984.

Information Processing Systems - Open Systems Interconnection - File Transfer Access and Management Part I: General Description, ISO DP8571/1, TC97/SC16 N1669, February 1984.

Information Processing Systems - Open Systems Interconnection - File Transfer Access and Management Part II: The Virtual Filestore, ISO DP8571/2, TC97/SC16 N1670, February 1984.

Information Processing Systems - Open Systems Interconnection - File Transfer Access and Management Part III: Service Definition, ISDP8571/3, TC97/SC16 N1671, February 1984.

Information Processing Systems - Open Systems Interconnection - File Transfer Access and Management Part IV: Protocol Specification, ISODP8571/4, TC97/SC16 N1672, February 1984.

Data Communication - X.25 Packet Layer Specification for Data Terminal Equipment, ISO/TC 97/SC6 N2641, ISO/DP 8208, 1983.

7-bit Coded Character Set for Information Processing Interchange, ISO-646, 1973.

Information Interchange--Representation of Local Time Differentials ISO-3307, 1975.

The above documents may be obtained from: Frances E. Schrotter, ANSI, ISO TC97/SC6 Secretariat, 1430 Broadway, New York, New York 10018

CCITT

X.25, Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode on Public Data Networks.

X.400, Message Handling Systems: System Model-Service Elements.

X.401, Message Handling Systems: Basic Service Elements and Optional User Facilities

- X.408, Message Handling Systems: Encoded Information Type Conversion Rules.
- X.409, Message Handling Systems: Presentation Transfer Syntax and Notation.
- X.410, Message Handling Systems: Remote Operations and Reliable Transfer Server.
- X.411, Message Handling Systems: Message Transfer Layer.
- X.420, Message Handling Systems: Interpersonal Messaging User Agent Layer.
- X.430, Message Handling Systems: Access Protocol for Teletex Terminals.

The above documents may be obtained from International Telecommunications Union, Place des Nations, CH 1211, Geneve 20 Switzerland.

ATT COMMUNICATIONS

DOC #54010 - X.25 Interface Specification and Packet Switching Capabilities, January 1984.

DOC #54012 - X.75 Interface Specification and Packet Switching Capabilities, August 1984.

See Section 3.1 for information on how to obtain these documents.

WANG

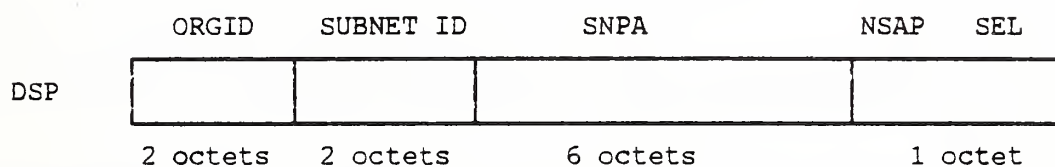
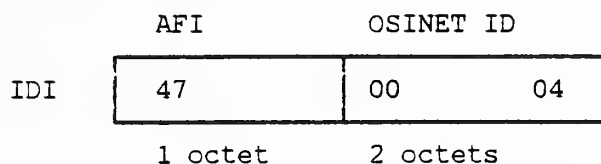
C/30 PSN X.25 Interface Specification, Release 3, Report No. 5500, November, 1983.

Packet Switch Node (PSN) 5.0 Release Note.

The above documents may be obtained from Joe Hielscher, Wang, One Industrial Avenue, Lowell, MA 01851

APPENDIX A: NETWORK ADDRESSING INFORMATION

The NSAP address form chosen by OSINET participants follows.



Routing on the X.25 backbone is based on the ORGID and possibly the subnet ID.

The SNPA is only meaningful to the destination subnetwork.

ISO has assigned OSINET an OSINET ID = 4. NBS is the administrative authority for Organization ID's. ORganization ID assignments are specified in decimal form with company site configuration information in section 4.

APPENDIX B: FTAM INTEROPERABILITY TESTS

The OSINET group has agreed that OSINET participants will run a standard set of tests which are a subset of the AUTOFACT FTAM tests to verify interoperability when they first join the network. Each OSINET participant will have a file named DIR.LIS which contains a list of other files which can be retrieved. The presentation context will be VARCR LF. The tests to be run that follow are described in a language developed for the DEC FTAM implementations. OSINET interoperability testing will be between two FTAM implementations - the FTAM tester will not be used. Accordingly, the following information should be used as a guide to the FTAM functions that must be tested.

```
FRI013.COM          ! Create and write file
set log fref$log:fri013.log
show time

!*****
!
!   FTAM reference Test Scenario  VOO3  FRI013.COM
!
!   FTAM Reference software runs as FTAM Initiator.
!   Establish FTAM connection regime.
!
!   Create, open, write data, close and deselect a file on the remote
!   system.
!
!   The terminate the connection and disconnect the virtual circuit.
!   (Assumes that the logical name FREFEMOTE translates to the
!   target remote system.)
!
CONNECT/OUTBOUND/REMOTE=FREFEMOTE
!
SEND      F_INITIATE_REQ      ! f_initiate request
RECEIVE   F_INITIATE_P        ! Wait for positive f_initiate response
!
SEND      F_CREATE_REQ-       ! Create remote file
          /remote_file=fri013.v -
          /local_file=fref$infile:fri013.r -
          /stream
RECEIVE   F_CREATE_P          ! Wait for positive f_select response
!
```

```

SEND      F_OPEN_REQ           ! f_open request
RECEIVE   F_OPEN_P            ! Wait for open response
!
SEND      F_WRITE_REQ          ! f_write request
!
SEND      F_TRANSER_END_REQ    ! Send f_transfer_end
RECEIVE   F_TRANSFER_END_P     ! Wait for f_transfer_end response
!

SEND      F_TRANSFER_END_REQ   ! f_close request
RECEIVE   F_TRANSER_END_P     ! WAIT for f_transfer_end response
!
SEND      F_DESELECT_REQ       ! Deselect remote file
RECEIVE   F_DESELECT_P        ! Wait for deselect response
!
DISCONNECT/OUTBOUND
!
!*****
exit

      FRI007.COM           ! Read attributes and read file
set log fref$log:fri007.log
show time

!*****
!      FTAM REFERENCE TEST SCENARIO V003 FRI007.COM
!
!      FTAM Reference software runs as FTAM Initiator.
!      Establish FTAM connection regime.
!
!      Select, open, read remote data, close and deselect a
!      file on the remote system
!
!      Then terminate the connection and disconnect the virtual circuit.
!      (Assumes that the logical name FREFEMOTE translates to the
!      target remote system.)
!
CONNECT/OUTBOUND/REMOTE=FREFEMOTE
!
SEND      F_INITIATE_REQ       ! f_initiate request
RECEIVE   F_INITIATE_P        ! Wait for positive f_initiate response
!
Send      F_SELECT_REQ -       ! Select remote file
          /remote_file=fri007.v -
          /local_file=fref$outfile:fri007.r -
          /stream
RECEIVE   F_SELECT_P          ! Wait for positive f_select response
!
SEND      F_READ_ATTRIB_REQ    ! f_open request
RECEIVE   F_READ_ATTRIB_P     ! Wait for read attribute response
!
SEND      F_OPEN_REQ           ! f_open request

```

```

RECEIVE  F_OPEN_P           ! Wait for open response
!
SEND     F_READ_REQ         ! f_read request
RECEIVE  F_DATA_REQ/LOOP    ! Receive f_data as long as available
!

```

```

RECEIVE  F_DATA_END_REQ     ! Receive f_data_end
!
SEND     F_TRANSFER_END_REQ ! Send f_transfer_end
RECEIVE  F_TRANSFER_END_P   ! Wait for f_transfer_end response
!
SEND     F_DESELECT_REQ     ! Deselect remote file
RECEIVE  F_TERMINATE_P     ! Wait for f_terminate response
!
DISCONNECT/OUTBOUND
!

```

```

!*****
exit

```

```

      FRI005.COM      ! Delete file
set log fref$log:fir005.log
show time

```

```

!*****

```

```

!
!      FTAM Reference Test Scenario V003      FRI005.COM
!
!      FTAM Reference software runs as FTAM Initiator.
!      Establish FTAM connection regime.
!
!      Select, delete and deselect a file on the remote system.
!
!      Then terminate the connection and disconnect the virtual
!      circuit.
!      (Assumes that the logical name FREFEMOTE translates to
!      the target remote system.)
!
!      This test will delete the file fri005.v on the remote system.
!

```

```

CONNECT/OUTBOUND/REMOTE=FREFEMOTE

```

```

!
SEND     F_INITIATE_REQ     ! f_initiate request
RECEIVE  F_INITIATE_P     ! Wait for positive f_initiate response
!
SEND     F_SELECT_REQ -    ! Select remote file
          /remote_file=fri005.v -
          /local_file=fref$outfile:fri005.r -
          /stream
RECEIVE  F_SELECT_P       ! Wait for positive f_select response
!
SEND     F_DELETE_REQ      ! f_delete request

```

```
RECEIVE F_DELETE_P          ! Wait for delete response
!
DISCONNECT/OUTBOUND
!
!
!*****
exit
```


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March 1987

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9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS <i>(Street, City, State, ZIP)</i>			
10. SUPPLEMENTARY NOTES <input type="checkbox"/> Document describes a computer program; SF-185, FIPS Software Summary, is attached.			
11. ABSTRACT <i>(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)</i> This is a standing document reflecting agreements reached by the member companies and agencies of OSINET. The OSINET is a research network established for the purposes of developing prototype tests and test systems for Open Systems Interconnection network protocols, and other OSI-related research.			
12. KEY WORDS <i>(Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)</i> implementation agreements; Open Systems interconnection; OSINET; protocol testing; test tools; workshop			
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