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DECNIS X.25 Overview

An overview of the DECNIS 500/600 X.25 implementation.

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Abstract

This document provides an overview of the X.25 capabilities of the DECNIS 500/600 multiprotocol router/bridge software and outlines the functions and features of the product. The information in this document is aimed at helping Digital resellers, account teams and support personnel in preparing customer bids.

Introduction

The DECNIS software supports multiprotocol routing over X.25 Packet Switched Data Networks (PSDNs) and can also provide X.25 gateway and relay services to connect end systems on a LAN to X.25 Data Terminal Equipment (DTE) connected directly to the DECNIS or connected over an X.25 PSDNs.

Routing over X.25

The DECNIS software supports the use of statically and dynamically assigned X.25 routing circuits. Static X.25 circuits are established when the routing circuit is enabled and remain set up until the routing circuit is disabled. Dynamically assigned X.25 circuits are established only when there is information to send over the routing circuit. They are disconnected when there is no further information to send.

The DECNIS software supports more than one connection to one or more X.25 PSDNs. The software can share outgoing calls between all the DTEs connected to a PSDN. The DECNIS software supports routing over either Permanent Virtual Circuits (PVCs) or Switched Virtual Circuits (SVCs). Each X.25 virtual circuit can run only one routing protocol. However, different routing protocols can be run over separate virtual circuits on the same X.25 DTE connection.

X.25 Gateway and Relay

When operating as an X.25 Gateway, the DECNIS software transmits and receives X.25 packets to and from any of the following systems:

- Any Digital systems which support the DNA Gateway Access Protocol (GAP).
- Any systems located on the same LAN which support the ISO Logical Link Control 2 (LLC2) protocol (as described in ISO 8881).
- Any X.25 DTE accessible over an X.25 Public Switched Data Network (PSDN) connected to the DECNIS.
- Any X.25 DTE connected directly to a serial port of the DECNIS operating in X.25 DCE mode (ISO 8208 point-to-point mode).
- Any X.25 DTE connected to any other DECNIS accessible over the DECnet/OSI routing network.

When using the DECNIS X.25 gateway service, the following Digital X.25 client systems are supported:

- VAX P.S.I. Access

- DECnet/OSI for OpenVMS VAX
- DEC X.25 Gateway Client for ULTRIX
- DECnet/OSI for DEC OSF/1 AXP
- X.25 for DEC OSF/1 Systems

When providing wide area access to an X.25 PSDN for end systems on the LAN which use LLC2, the DECNIS software fully implements the recommendations in ISO Technical Report 10029 as a CONS LAN/WAN relay.

X.25 packets can be relayed locally between any X.25 DTE attached to the DECNIS hardware unit and any other similarly attached X.25 DTE or any X.25 system connected to the same LAN. Additionally, X.25 packets can be relayed to remote X.25 DTEs accessible to other DECNIS or DEC X25gateway 100/500 servers over a DECnet/OSI routing network. The software does not support the relaying of X.25 packets generated from an X.25 DTE connected to one X.25 PSDN to an X.25 DTE connected to another X.25 PSDN.

Accounting and Security

The following accounting information is provided by the DECNIS X.25 Gateway software:

- Logging of virtual circuit accounting when calls are cleared
- Logging of accounting records to a designated Event Logging sink Logging to multiple sinks for reliability

The following security mechanisms are supported in the DECNIS X.25 software:

- Inbound and outbound calls can be controlled on the basis of the remote DTE, the application, and, if applicable, the X.25 client node
- Access to accounting sink management is restricted to authorized users
- Access to accounting source management is restricted to authorized users

Virtual Circuit and DTE Support

The DECNIS software supports both Permanent Virtual Circuits (PVCs) and Switched Virtual Circuits (SVCs) and allows multiple connections to one or more PSDNs. Most major international public X.25 PSDNs are supported (see below).

The DECNIS supports a maximum of 128 SVCs *per system* irrespective of the number of network interface cards. Note that when using X.25 relay, 2 SVCs are used for each LLC2 connection, one for the incoming connection, one for the

outgoing connection. Each DECNIS can therefore support a maximum of 64 LLC2 connections.

The DECNIS supports a maximum of 36 DTEs *per system*, irrespective of the number of available ports on network interface cards. Connection to multiple PSDNs is supported.

The number of X.25 virtual circuits and DTEs supported by the DECNIS is limited by the available memory. Each virtual circuit and DTE consumes the following amount of memory on the DECNIS management processor card:

Parameter	Maximum Number	Memory per parameter
DTE/DCE	36	56 Kbytes
SVC/PVC:	128	-
DLM routing circuit	-	23 Kbytes
DA routing circuit	-	17 Kbytes
Gateway circuit	-	6 Kbytes
Relay circuit	-	6 Kbytes

Physical Line Support

The following list outlines the X.25 characteristics of the synchronous Network Interface Cards supported by the DECNIS 500 and 600 hardware units:

- DEC WANcontroller 614 - Four-port, low-speed serial interface supporting synchronous line speeds from 1.2 Kbits/s to 128 Kbits/s. This card supports X.25 gateway functions and routing only over LAPB datalinks.

- DEC WANcontroller 618 - Eight-port, low-speed serial interface supporting synchronous line speeds from 1.2 Kbits/s to 128 Kbits/s. This card supports X.25 gateway functions and routing only over LAPB datalinks.

- DEC WANcontroller 622 - Dual-port, high-speed serial inter- face supporting synchronous operation at line speeds from 9.6 Kbits/s to 2 Mbits/s. This card supports X.25 gateway functions and routing only over LAPB datalinks.

Full details of the Network Interface Card capabilities are detailed in *DECNIS Hardware Overview*, NIPG Marketing Document number NIPG-009, and *DECNIS Software Overview*, NIPG Marketing Document number NIPG-009A.

Public Networks Supported

The following public networks are supported by the DECNIS X.25 implementation.

Country	Public Network	Country	Public Network
Argentina	Arpac	Philippines	Datanet
Australia	Austpac	Portugal	Telepac
Austria	Datex-P	Singapore	Telepac
Belgium	DCS	South Korea	Dacomnet
Brazil	Renpac	Spain	Iberpac
Canada	Datapac (1976, 1980)	Sweden	Datapak
	Faspac	Switzerland	Telepac (1978, 1980)
	Infoswitch	Taiwan	Pacnet
Chile	VTRNET	United Kingdom	BT PSS
Denmark	Datapak		Mercury 500
Ireland	Eirpac (1980)	United States	Accunet®
Finland	Datapak		Autonet®
France	Transpac		Bell Atlantic
Germany	Datex-P		CompuServe®
Hong Kong	Datapak		ConnNet
	Intelpak		Digipac
Indonesia	SKDP		Fedexitc
Italy	Itapac		Graphnet
Japan	DDX (1976, 1980)		Impacs
	Venus-P (1980)		Infonet
	TYMNET®		Mark*Net Ext Service
Luxembourge	LUXPAC		PPSNET
Malaysia	Maypac		Pulselink
Mexico	Telepac		Telenet (US Sprint)
Netherlands	Datanet 1		TYMNET®
New Zealand	Pacnet		Western Union PTN-1
Norway	Datapak		Worldnet
Pakistan	Paknet		

In addition to the public X.25 networks listed in the above table, certain private X.25 networks are supported by the DECNIS software. The appropriate profiles are included with the DECNIS software.

The DECNIS Software Product Description (SPD 36.05.xx) provides a full list of supported public X.25 networks.

X.25 Optional Facilities

The following table shows the optional facilities in CCITT Recommendation X.25 (1988) supported by the DECNIS software.

Optional Facilities	CCITT 1988	DECNIS Software Support		
		Connector	Relay	Routing
1. Online facility registration	6.1	No	No	No
2. Extended packet sequence numbering	6.2	Yes	Yes	Yes
3. D-bit modification	6.3	No	No	No
4. Packet retransmission	6.4	No	No	No
5. Incoming calls barred	6.5	N/A	Yes	N/A
6. Outgoing calls barred	6.6	N/A	Yes	N/A
7. One-way logical channel outgoing	6.7	Yes	Yes	Yes
8. One-way logical channel incoming	6.8	Yes	Yes	Yes
9. Non-standard default packet size	6.9	Yes	Yes	Yes
10. Non-standard default window size	6.10	Yes	Yes	YEs
11. Default throughput class assignment	6.11	N/A	See Note 1	N/A
12. Flow control parameter negotiation	6.12	Yes	Yes	Yes
13. Throughput class negotiation	6.13	Yes	See Note 1	Yes
14. Closed User Group (CUG)	6.14.1	Yes	See Note 1	Yes
15. CUG with outgoing access	6.14.2	Yes	See Note 1	Yes
16. CUG with incoming access	6.14.3	Yes	See Note1	Yes
17. Incoming calls barred within CUG	6.14.4	N/A	No	N/A
18. Outgoing calls barred within CUG	6.14.5	N/A	No	N/A
19. CUG selection	6.14.6	Yes	See Note 1	Yes
20. CUG with outgoing access selection	6.14.7	No	See Note 1	No
21. Absence of both CUG selection facilities	6.14.8	Yes	See Note 1	Yes
22. Bilateral CUG	6.15.1	Yes	See Note 1	Yes
23. Bilateral CUG with outgoing access	6.15.2	Yes	See Note 1	Yes
24. Bilateral CUG selection	6.15.3	Yes	See Note 1	Yes
25. Fast select	6.16	Yes	See Note 1	Yes
26. Fast select acceptance	6.17	Yes	See Note 1	Yes
27. Reverse charging	6.18	Yes	See Note 1	Yes
28. Reverse charging acceptance	6.19	Yes	Yes	Yes
29. Local charge prevention	6.20	N/A	No	N/A
30. NUI subscription	6.21.1	Yes	See Note 1	Yes
31. NUI override	6.21.2	N/A	No	N/A
32. NUI selection	6.21.3	Yes	See Note 1	Yes
33. Charging information	6.22	Yes	See Note 1	Yes
34. RPOA subscription	6.23.1	N/A	N/A	N/A
35. RPOA selection	6.23.2	Yes	See Note 1	Yes
36. Hunt group	6.24	See Note 2	No	See Note 2
37. Call redirection	6.25.1	N/A	No	N/A
38. Call deflection subscription	6.25.2.1	N/A	No	N/A

Optional Facilities (continued)	CCITT 1988	DECNIS Software Support		
		Connector	Relay	Routing
39. Call deflection subscription	6.25.2.2	See Note 3	No	No
40. Call redirection or call deflection notification	6.25.3	Yes	See Note 1	Yes
41. Called line address modification notification	6.26	Yes	See Note 1	Yes
42. Transit delay selection and indication	6.27	Yes	See Note 1	Yes
43. TOA/NPi address selection and indication	6.28	No	No	No
44. Calling Address Extension	G.3.1	Yes	See Note 1	Yes
45. Called Address Extension	G.3.2	Yes	See Note 1	Yes
46. Minimum throughput class	G.3.3.1	Yes	See Note 1	Yes
47. End-to-end transit delay	G.3.3.2	Yes	See Note 1	Yes
48. Priority	G.3.3.3	Yes	See Note 1	Yes
49. Protection	G.3.3.4	Yes	See Note 1	Yes
50. Expidited data negotiation	G.3.4	Yes	See Note 1	Yes

Notes:

1. The X.25 relay does not act on any of these fields. The information contained in these fields is passed transparently and only has end-to-end significance.
2. PSDN hunt groups are supported but each DTE must be assigned a unique address independent of the hunt group address.
3. Support for this facility depends on the user application and the X.25 client implementation. Refer to the X.25 client product documentation for details.
4. For connector mode operation, the facilities supported by the DECNIS software may be restricted by the X.25 client implementation. Refer to the X.25 client product documentation for details.

X.25 Performance

Details of the X.25 performance of the DECNIS for a single uni-directional connection with a line speed of 2M bits/s are provided in the following table.

	NPDU size	**43**	**46**	**64**	**128**	**256**	**512**	**1024**	**1450**
	Packet size	64	64	87	151	279	535	1047	1473
IP	Thruput pps		105	103	101	98	96	69	61
DECnet	Thruput pps		107	105	103	99	95	70	62
OSI	Thruput pps	117		113	111	99	73	70	59
Gateway	Thruput pps	143		134	77	26	28	18	23

Full details of DECNIS bridging and IP, IPX, DECnet and OSI routing performance are shown in *DECNIS 600 Performance,* NIPG Marketing Document Number NIPG-001.

When operating over serial line connections the overall performance and packet rate may be less than that indicated by the aggregate line speed and is determined by such factors as:

- Type of traffic (routing updates or data packets) and data rates
- Mix of protocol types
- Proportion of X.25 to leased line and Frame Relay traffic
- The path of messages passing through the product (WAN-to-WAN, WAN-to-LAN, or LAN-to-LAN)
- Communications line characteristics
- Frequency and type of errors on the serial links
- Network topology
- Protocol overhead

Conformance to ISO Standards, CCITT Recommendations and IETF RFCs

The DECNIS X.25 implementation conforms to the following X.25 standards:

- ISO 3309 - High-level Data Link Control (HDLC) Frame Structure
- ISO 7776 - High-level Data Link Control (HDLC) Procedures: X.25 LAPB-compatible DTE Data Link Procedures
- CCITT recommendation X.25 (1978, 1980, 1984 or 1988) using the LAPB or LAPBE variants of the data link
- ISO 8208 - X.25 Packet Level Protocol for Data Terminal Equipment
- ISO 8881 - Use of X.25 Packet Level Protocol in Local Area Networks (LLC2)
- ISO TR 10029 Operation of an X.25 Interworking Unit (CONS LAN/WAN Relay)
- RFC 877 - Standard for the transmission of IP datagrams over public data networks (X.25)

GOSIP Conformance

The DECNIS X.25 implementation conforms to the following GOSIPs:

- U.S. GOSIP Conformance Tested Product #172-V2 (WAN Register Code P-001)

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