Objectives

Upon completion of this course the student should be able to:

Select and code the macros to define:

◆ An X.25 physical interface from NPSI to a PSDN

◆ Virtual circuit connections to SNA and non-SNA DTEs

◆ Definitions required by NCP and VTAM to support SNA Applications

◆ Definitions required by OSI/Communication Subsystem (for MVS and VM)

◆ Definitions required by TCP/IP (for MVS and VM)

Agenda

X.25 Introduction

NPSI Overview

NPSI Definition

Class Exercise

OSI/CS and GATE

GATE Fast Connect

TCP/IP and DATE

Management Considerations

X.25 INTRODUCTION

## PART A.

X.25 INTRODUCTION

X.25 Topic Objectives

◆   The subtopics included in this X.25 overview:

   ●   Comparison of X.25 to more widely known
       connections

   ●   Permanent / Switched   Virtual Circuits

   ●   X.25 Component Identification

   ●   X.25 Physical Level Interfaces

   ●   X.25 Link Level and LAPB link protocol

   ●   X.25 Packet Level Formats / Protocols

   ●   Subscription Considerations

Leased/Circuit Switched Connectivity
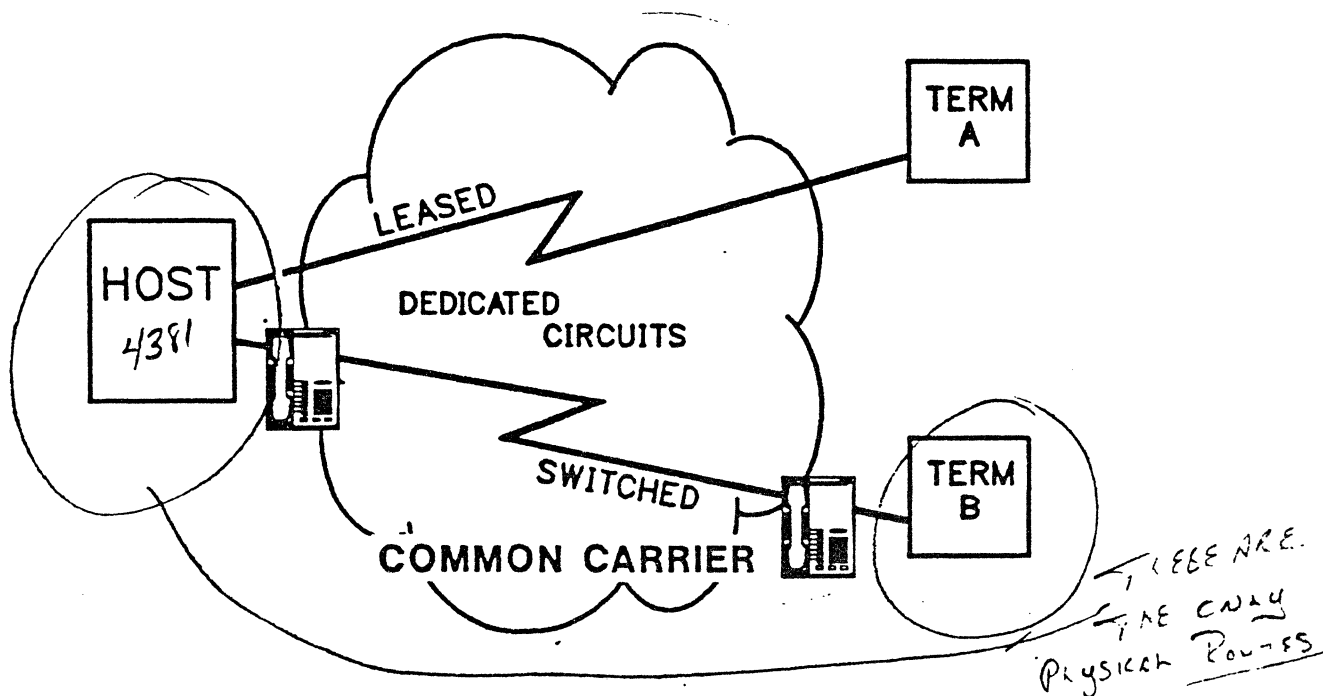
NOTES: LEASED AND CIRCUIT SWITCHED COMMON CARRIERS

◆ Common Carrier provides a dedicated end-to-end connection between
end users via "Access Services"
  ● Dialing procedures to a Public Switched Telephone Network (PSTN) and
    interface signaling procedures that enable access to other equipment
  ● Leased lines are accessed via interface signalling procedures to
    enable the carrier link
◆ "Connection Management" implemented via data link control protocols
  (SDLC, BSC, S/S....) are unknown to the carrier
◆ End users must implement compatible high level protocols (SNA, OSI,
  TCP/IP...)

Proprietary protocols run from DTE to DTE, contrasted with X.25 which
is a local protocol from DTE to DCE (the DCE being the packet switches
exposed interface to the device).

Packet Switched Data Networks

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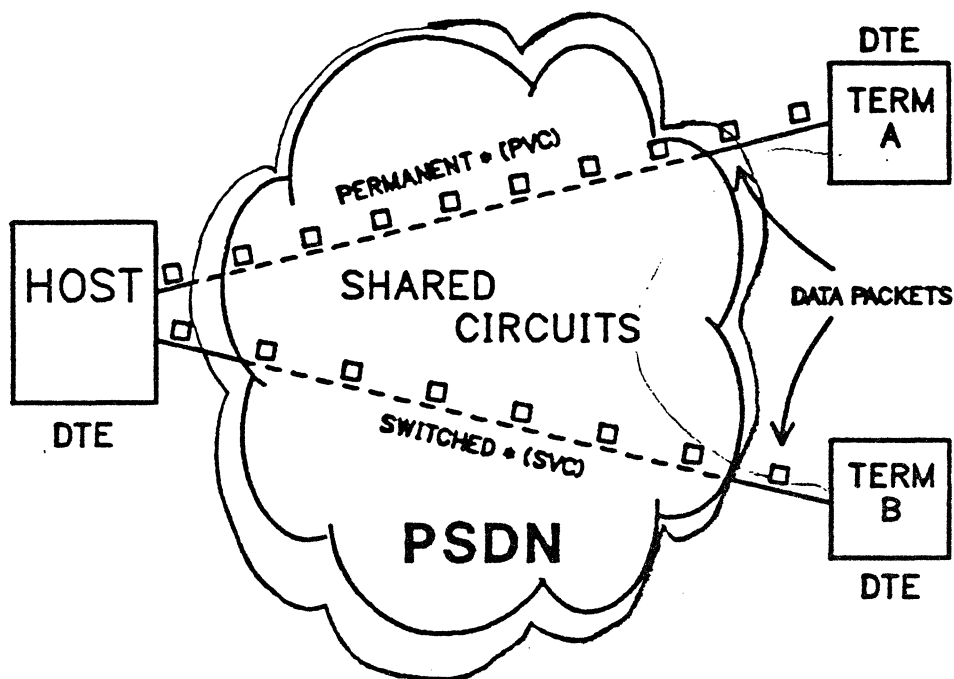
NOTES: PACKET SWITCHED CARRIER USING X.25 INTERFACES

◆ Common Carrier provides a leased access line to attach to the packet switch

◆ Users implement X.25 packet protocols to use the PSDNs "Access Services"
to obtain vircual circuits to other users

◆ Virtual circuit "Connection Management" is performed by passing special "data packets" between users.

◆ Virtual circuits can be either PERMANENT (PVC) or SWITCHED (SVC).
Differences between a PVC and an SVC exist only in the PSDN subscriptior and the packet protocols required to establish an SVC connection, or Virtual Call.

Packet Switched Data Networks /Notes

Packet Switched Data Networks

◆ **Physical access to the PSDN**

The physical access link to the carrier network (the PSDN) is via
a leased line for the purposes of OSI/C.S.. The X.32 CCITT
Recommendation does allow for dial up connections through the PSTN for
X.25 interfaces but is not supported by NPSI or the 9370 TSC so it is
omitted here.

◆ **Access Services**

Once the local X.25 interface is enabled for communication (physical
and link levels) the DTE or the DCE may use Call Packets to enable
communications over virtual calls (switched virtual circuits) similar in
concept to a circuit switched line. Permanent Virtual Circuits
are Reset by the DCE to notify the DTE that it may communicate with its
partner, similar to a leased line where carrier detect allows a user to
communicate with its partner.

◆ **Connection Management**

Connection management of a SDLC line consists of xmit and receive of
SDLC commands and responses to provide for management of the end to end
link between users. End to End Connection management in X.25 is not ●
performed at the link level since the X.25 link level signalling
terminates at the packet switch. It is therefore incumbent on the DTEs
to pass special data and control packets (or protocol data units) to
manage the virtual circuit connection.

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X.25 PSDN Components
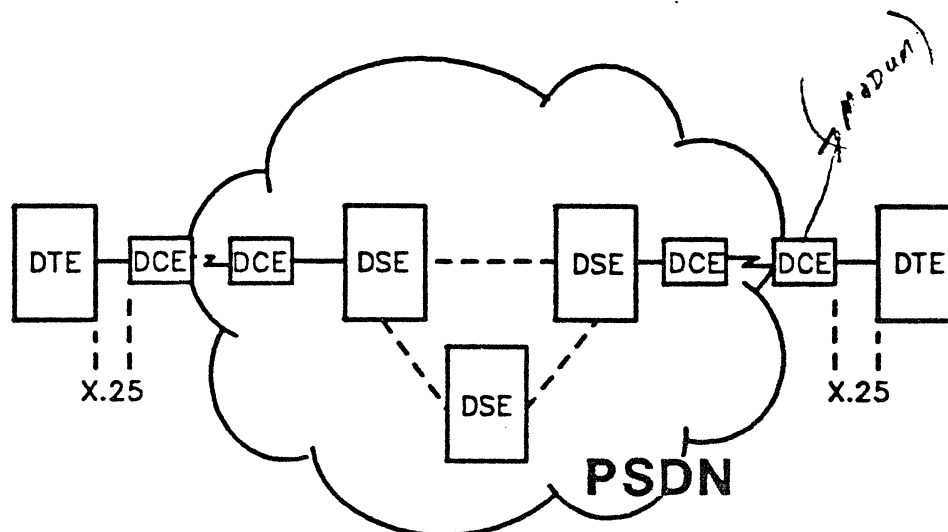
NOTES: X.25 COMPONENTS

◆ Data Terminal Equipment (DTE) –
Terminal, Controller, or Host Implementing X.25 Protocols
◆ Data Circuit Terminating Equipment (DCE) –

Modems perform data circuit terminating functions for analog lines

Data Service Unit/Channel Service Units (DSU/CSUs) are used to terminate digital lines from the carrier

◆ Data Switching Equipment (DSE) –
Intelligent controller implementing X.25 interface for user attachment, providing its own internal network architecture to route data to other packet switching nodes

Data Switching Equipment (DSEs) are network or communication controllers that provide boundary links to attached DTEs that conform to the CCITT X.25 Recommendation. They additionally provide links to other switching nodes which are used to transport packets received on the X.25 interfaces to DTEs attached to other DSEs.

Connecting X25 DTEs
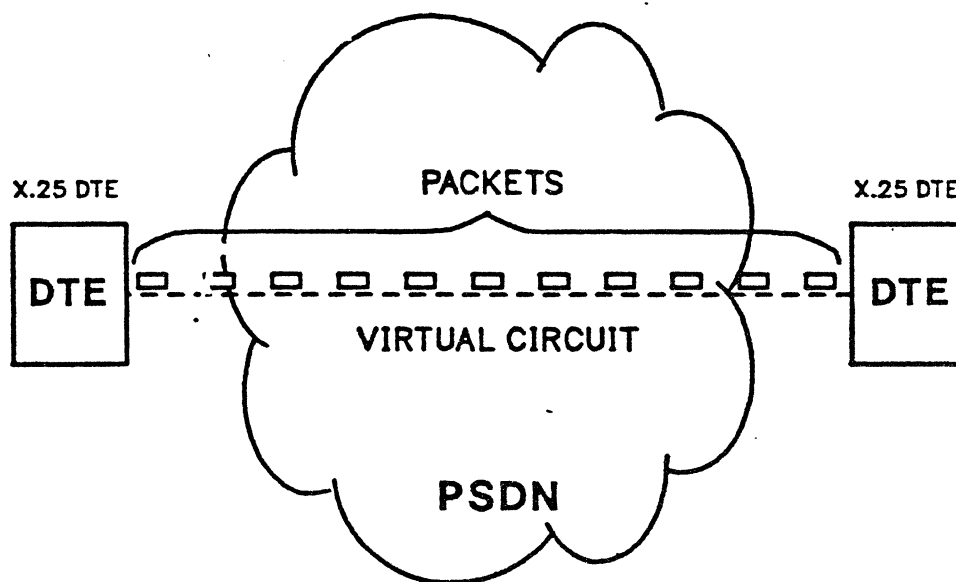
NOTES: CONNECTING X.25 DTES

In this scenario we assume that both devices are X.25 DTEs. This means
that both devices build packets to send through the PSDN network, and no
special considerations are required.

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Connecting NON-X25 DTEs
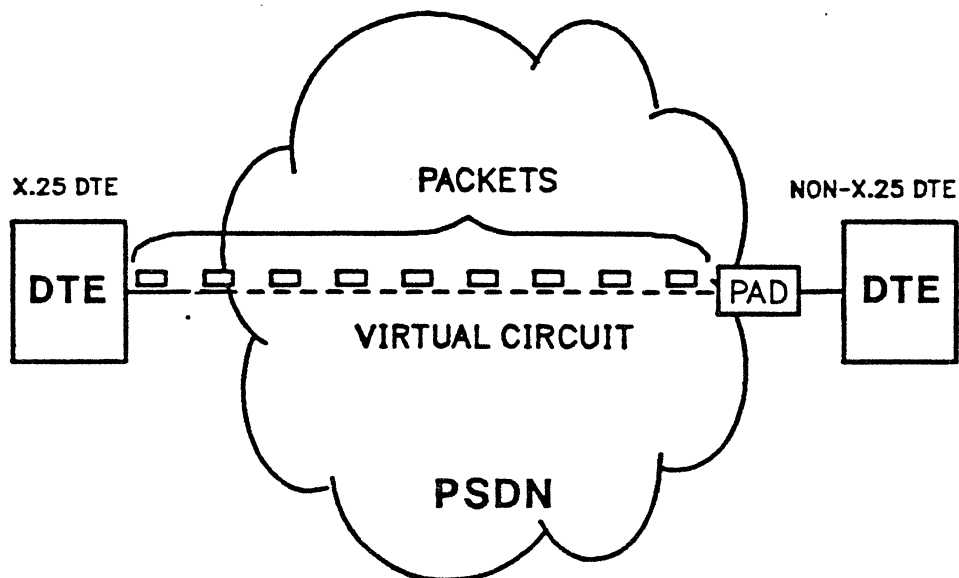
NOTES: CONNECTING NON-X.25 DTES

In this example, one of the devices involved is not an X.25 device. Since only packets can be sent through the PSDN:

◆ Data from the non-X.25 DTE must be assembled into an X.25 packet.

◆ Data to the device must be disassembled from an X.25 packet to device format.

◆ The component that performs this function is a Packet Assembler / Disassembler, or PAD.

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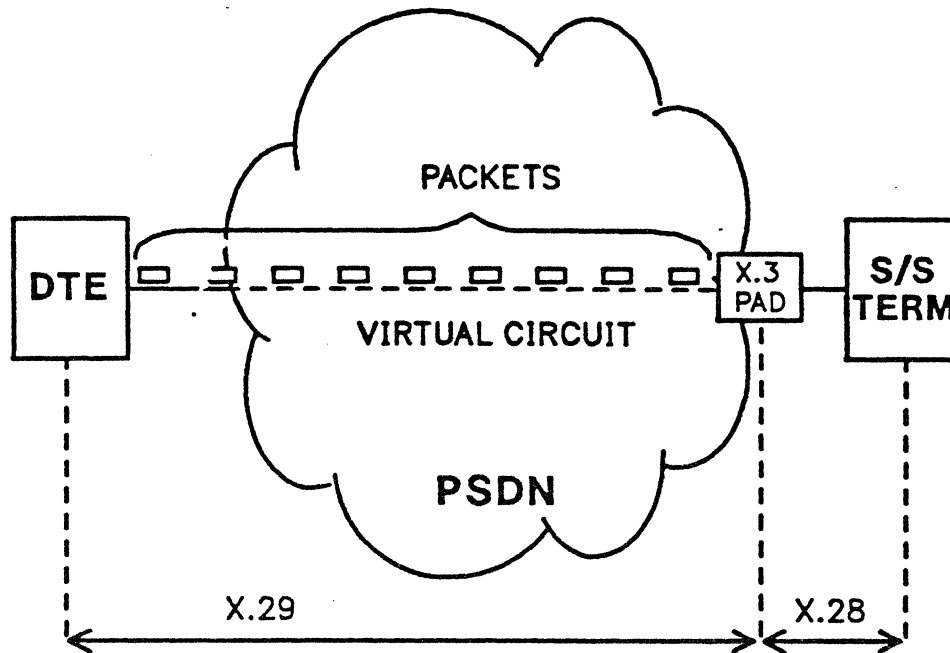
Standard X.25 PAD

NOTES: STANDARD X.25 PAD

In X.25, there is only one accepted 'de-facto' standard PAD, as defined by CCITT. (All other 'PADs' are non-standard)

◆ X.3 defines PAD functions to process data to and from an asynchronous ASCII device, commonly referred to as TWX.

◆ X.28 describes the protocol interface between the ASCII device and X.3 PAD.

◆ X.29 describes the interface between the X.3 PAD and the remote DTE. This communication is accomplished in special 'qualified' packets, which will be described later.

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X.25 Multiplexing Technique
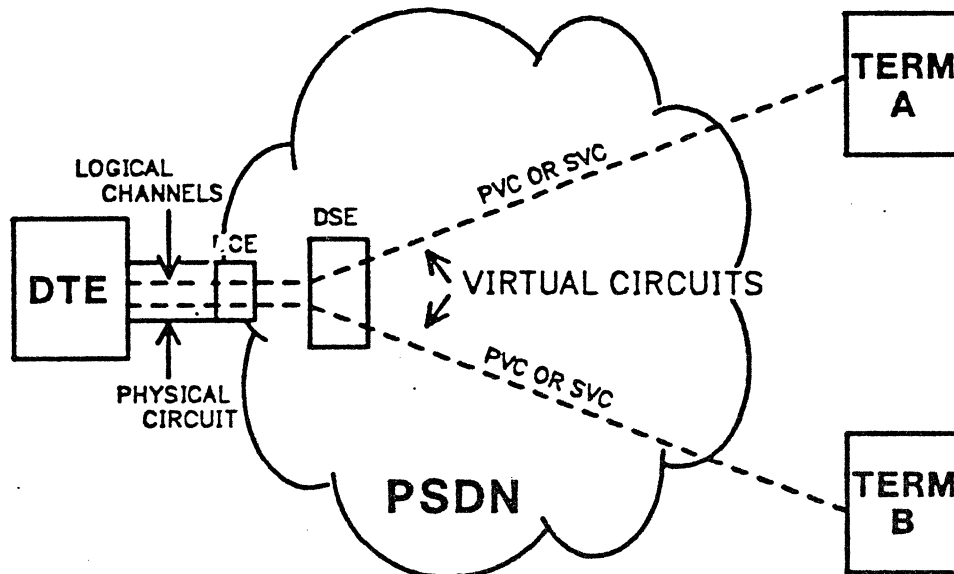
NOTES: LOGICAL CHANNELS / MULTICHANNEL LINK

◆ The physical access line between the DTE and the DCE is referred to as the PHYSICAL CIRCUIT.
◆ X.25 allows for multiplexing on the access line to a PSDN thru logical channels
◆ Each logical channel can support a single virtual circuit
◆ Up to 4096 logical channels may be mapped to a physical circuit
◆ The number of logical channels practical varies with the link speed of the physical line and the thruput requirements of the applications using the physical line
◆ Logical Channel Number 0 is USUALLY reserved, and therefore is not available for data

Logical channel zero is reserved to pass "Diagnostic" and "Restart" packets. This allows logical channel zero to be used to pass information between the DTE and DCE/DSE that affects all logical channels on the link

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Permanent Virtual Circuits
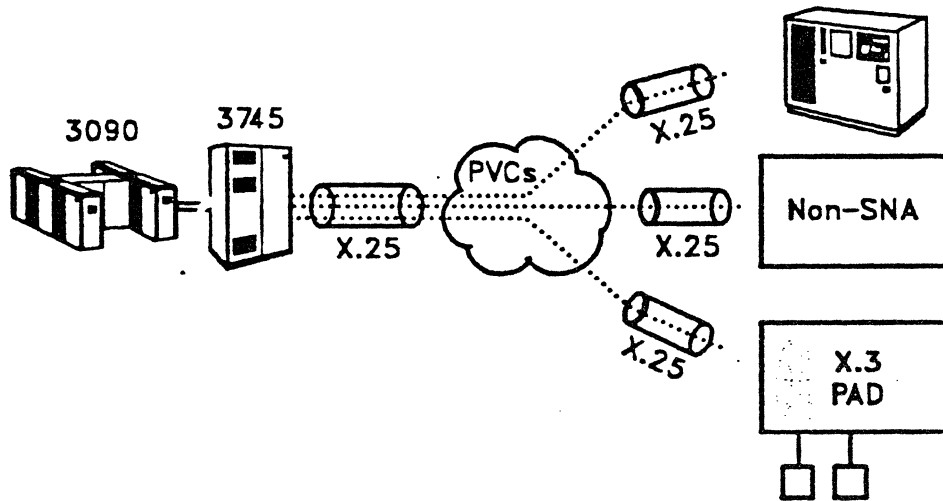
NOTES:

◆ Permanent virtual circuits are analogous to a leased line from a common carrier. The carrier agrees to maintain information about the connection in its switching nodes. When both DTEs have enabled their interface to the network the line is immediately available for use.

PVC Activation Reset

Reset by Network
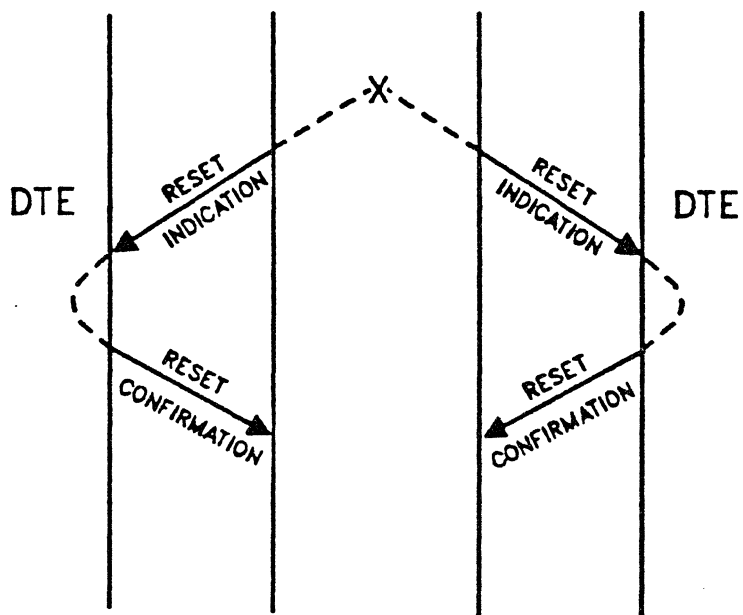
NOTES: PVC RESET / ACTIVATION

When both DTEs on a PVC are activated, the PSDN network sends a
Reset Indication packet to notify the DTEs that the PVC is active.

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Switched Virtual Circuits
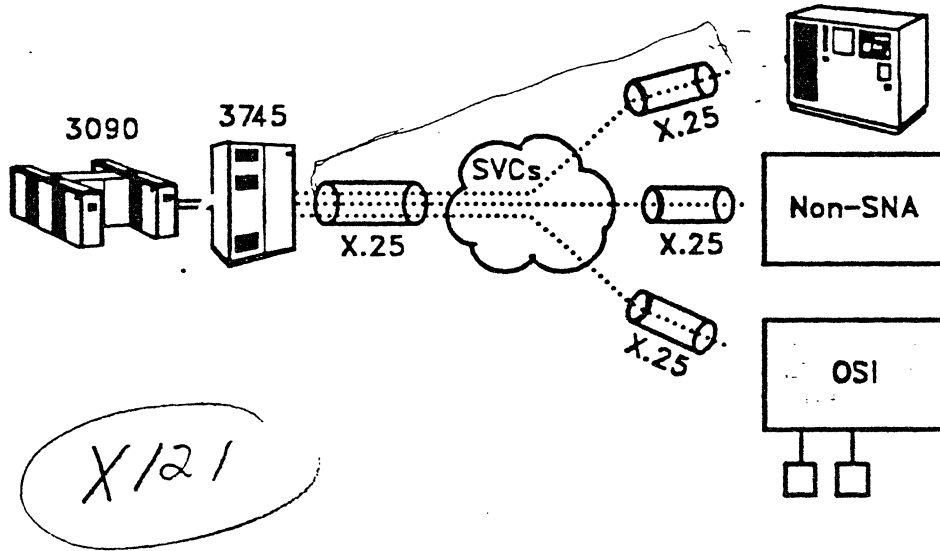
NOTES: SWITCHED VIRTUAL CIRCUITS

◆ PSDN users subscribe for a line to the network and access to the networks "facilities" and services
◆ Users enable their interface to the network using the X.25 CCITT procedures
◆ Access to other DTEs is accomplished by sending a Call Request Packet to the DSE, identifying the Called DTE Address the device
◆ DTE addresses are assigned by the network provider, most commonly by using the X.121 addressing format
◆ Switched virtual circuits are also referred to as "Virtual Calls"

Call Establishment

Call Establishment
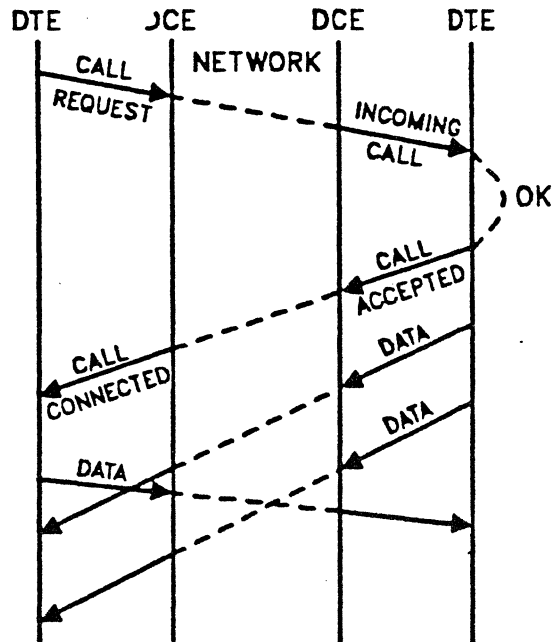
NOTES:

- ◆ DTEs place "Call Request" packet on the highest numbered outgoing logical channel available
- ◆ The DCE/DSE presents a "Incoming Call" packet to the DTE on the lowest incoming logical channel available
- ◆ The DTE receiving the incoming call may then either issue a "Call Accepted" or a "Clear Request" packet to the DSE/DCE
- ◆ The network passes a "Call Connected" packet or a "Clear Indication" to the Calling DTE to update it on the status of the circuit
- ◆ "Data Packet" flow will be allowed if the circuit is connected

The DTE building the "Call Request" may select "Facilities" it has subscribed to the network for, and may pass "Call User Data" that is meaningful to the receiving DTE. The Call User Data byte 0 (CUD0) is looked at by NPSI as a "protocol id".

The DTE receiving the incoming call may then either issue a "Call Accepted" or a "Clear Request" packet to the DSE/DCE after validating the "Calling DTE Address" and other fields (facilities, Call user data,....)

X.25 Interface Levels

X.25 LEVELS

Customer
Premises

```
        ┌─────┐   ┌─────┐              ┌────────┐
        │ DTE │───│ DCE │──────────────│ PACKET │
        └─────┘   └─────┘              │  NODE  │
                                       └────────┘
```

Level 1: PHYSICAL

Level 2: LINK

Level 3: PACKET

To Remote DTE Through
Packet-Switched Network
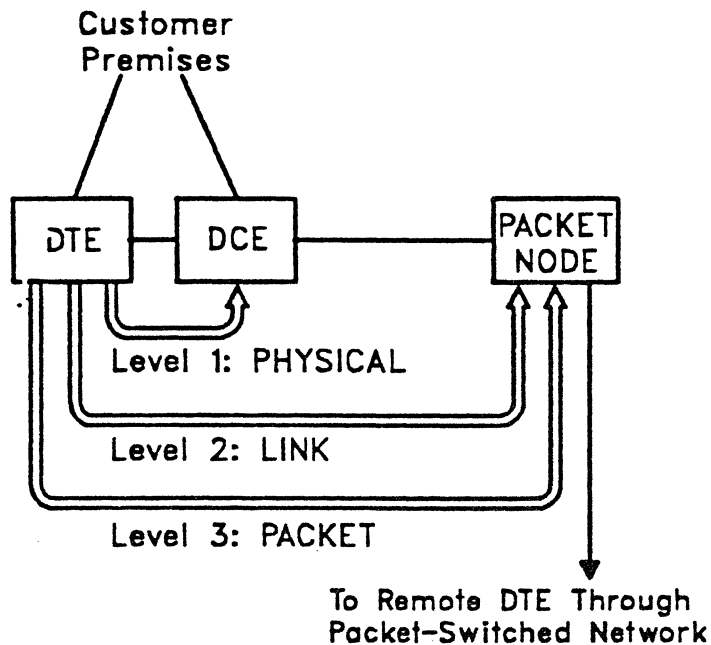
NOTES: THE X.25 INTERFACE IS DEFINED IN THREE LEVELS
◆ Physical Level
  ● X.21 and X.21 bis (Modem or DSU/CSU) interface cabling/signalling
◆ Link Level
  ● Link Access Protocol Balanced (LAPB) plus Data Link Control
    Procedures/Framing
◆ Packet Level
  ● Packet formats/protocols and management of one or more
    communication channels

The X.25 environment isolates the DTE from the internal architecture
of the Packet Switched Data Network. In the public X.25 PSDN environment
a customer leases an access line to the network (and is provided not only
the line but also the modem (or DSU/CSU) pair to terminate the line).
Since the PSDNs exposed interface to the customer site is the modem (or
the DCE) X.25 is referred to as the DTE/DCE interface even though the
link and packet layers define protocols between the DTE and the DSE.

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The Physical Level

X.25 Physical Level

Interfaces to Modem or DSU/CSU

S Jpport for common interfaces included in X.21 bis
Recommendation

RS-232/V.24
V.35
Support for high speed digital interfaces
X.21

```
NOTES: 37XX OFFERS X.21 AND X.21 BIS INTERFACES
◆ 3720 and 3725
    ● X.21 bis:    LIC1 - 19.2 kbps, LIC2 -xx.Xx kbps, LIC3 - 128 kbps
    ● X.21:        LIC 4A up to 9.6 kbps, LIC 4B - 128 kbps
◆ 3745
    ● X.21 bis:    LIC1, LIC3, LIC5 - 4.8 to 14.4 kbps, LIC6 - 9.2 to 56 kbps
    ● X.21:        LIC 4A, LIC 4B

The HONE configurators for the 37XX controllers and the SNAPSHOT
performance tool support X.25 line configurations for both the NPSI and
XI Program Products.
```

The Link Level

Framing Structure

  Link Level Addresses
  Command Framing
  Information Framing
  Frame Integrity Checking

Link Access Procedures

  Link Setup/Takedown
  Data Link Flow Control
  Full Duplex Access
  Point-to-Point Link Procedures

NOTES: THE LINK LEVEL IS STRUCTURED TO:

◆ Allow the DTE and DSE to act as peers on a point to point line

◆ Both parties may act as a primary link station to issues commands

◆ Both parties may act as a secondary link station to issues responses

◆ Both parties may flow control the interface to prevent overruns

The Link Level Frame

F L A G	. A	C	Opt. I	FCS	F L A G
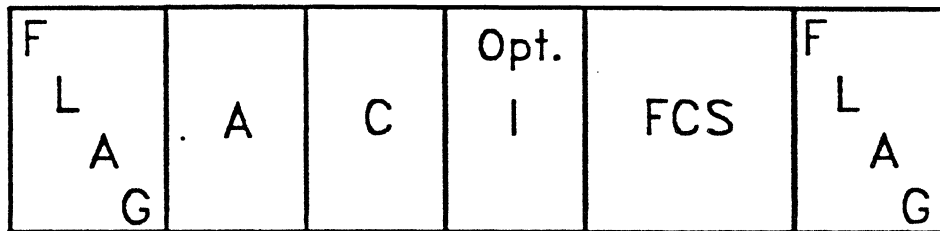
NOTES: LINK LEVEL FRAME
- ◆ Frames formats include: Supervisory, Unnumbered, or Information
- ◆ Supervisory and Unnumbered frames carry HDLC LAPB commands/responses
- ◆ Information frames carry Packets (Control or Data Packets)
- ◆ The frame format is very similar to that of SDLC
- ◆ Many commands/responses common to both SDLC and X.25 HDLC LAPB
- ◆ Link Configurations
  - ● SDLC allows for point-to-multipoint configurations
  - ● HDLC LAPB requires a point-to-point configuration
- ◆ Link Management
  - ● SDLC allows for half duplex or full duplex link management
  - ● HDLC LAPB requires full duplex management
- ◆ Link Station relationships
  - ● SDLC is a polled discipline with a master/slave or primary/secondary relationship of DTEs (called Normal Response Mode)
  - ● HDLC LAPB provides for a peer relationship of DTEs and allows either side to initiate link command or data transmission in a asynchronous manner, with provisions for resolution of command collisions (called Asynchronous Balanced Mode)

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X.25 - Frame Field Definition
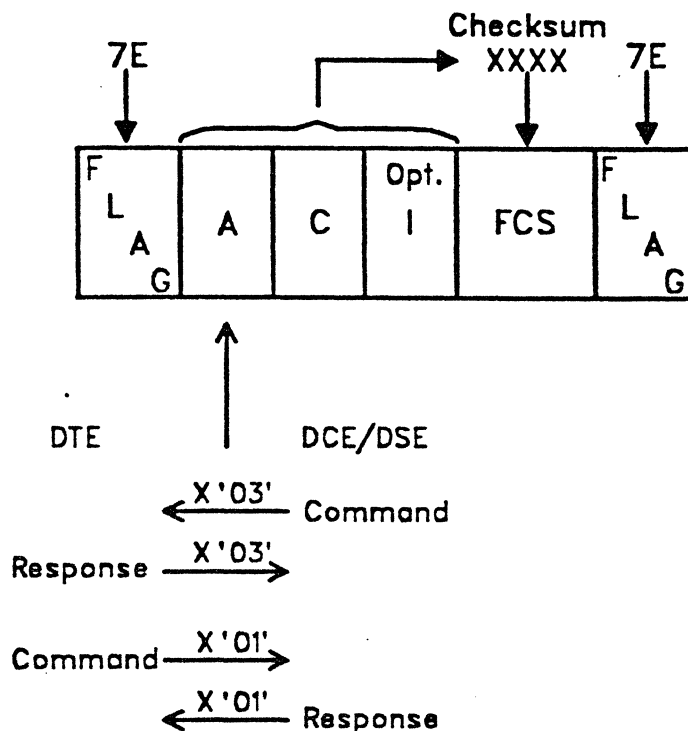
NOTES: FRAME FIELDS

- ◆ Flags - x'7E' bit pattern signals beginning and end of frame
- ◆ Address - Point to Point link using only x'01' or x'03'
- ◆ Control - Indicates frame contents (command/response, or a Packet)
- ◆ Information - Field included in Information Frame only
- ◆ FCS - Frame Check Sum - used by the receiver of a frame to verify whether data received has been corrupted in transmission

The address assigned a DTE is x'01'. This address in a command frame indicates a command from a DTE. The same address in a response frame indicates a response from the DCE/DSE.

The address assigned a DCE/DSE is x'03'. This address in a command frame indicates a command from a DCE/DSE. The same address in a response frame indicates a response from the DTE.

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LAPB Control Field Commands/Responses

X.25 Frame Control Field

FRAME TYPE	COM-MAND	RES-PONSE	BIT DEFINITION						HEX Value
'I' Frames	I		N (R) P N (S) 0						xEven
'S' Frames	RR	RR	N (R) P 0 0 0 1						x1
	RNR	RNR	N (R) / 0 1 0 1						x5
		REJ	N (R) F 1 0 0 1						x9
'U' Frames									
	SABM		0 0 1 P 1 1 1 1						2F or 3F
	DISC		0 1 0 P 0 0 1 1						43 or 53
		UA	0 1 1 F 0 0 1 1						63 or 73
		DM	0 0 0 F 1 1 1 1						OF or 1F
		FRMR	1 0 0 F 0 1 1 1						87 or 97

NOTES: CONTROL FIELD CONTENTS
- Even numbered control fields identify the frame as an Information frame, which includes a Packet in the I Field
- Odd numbered C fields are either a LAPB command or response
  - Supervisory frames ('S' Frames) are used for information frame flow control
  - Unnumbered frames ('U' Frames) are used for LAPB link control commands/responses for link state control

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LAPB Control Field Commands/Responses /Notes

X.25 - Frame Field Definition

Receive Ready (RR' command used to poll secondary for status

Receive Ready (RR) response used to acknowledge ready status

Receive Not Ready (RNR) response used to identify busy status

Reject (REJ) response rejects (information) frames received in error

Set Asynchronous Balanced Mode (SABM) used to initialize the DTE/DCE to the information transfer phase

Disconnect (DISC) terminates information transfer phase, identifying the sender as unavailable

Unnumbered Acknowledgment (UA) acknowledges receipt and acceptance of mode setting commands (SABM, DISC)

Disconnected Mode response used to identify that the device is logically disconnected from the link

Frame Reject response identifies that a received frame cannot be processed

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LAPB Link Setup Example

Link Setup Example

DTE   DCE/DSE

SABM (03 2F)
←──────────────────────────

SABM (03 2F)
←──────────────────────────

DISC (01 53)
──────────────────────────→

UA (01 73)
←──────────────────────────

SABM (03 3F)
──────────────────────────→

UA (01 73)
←──────────────────────────
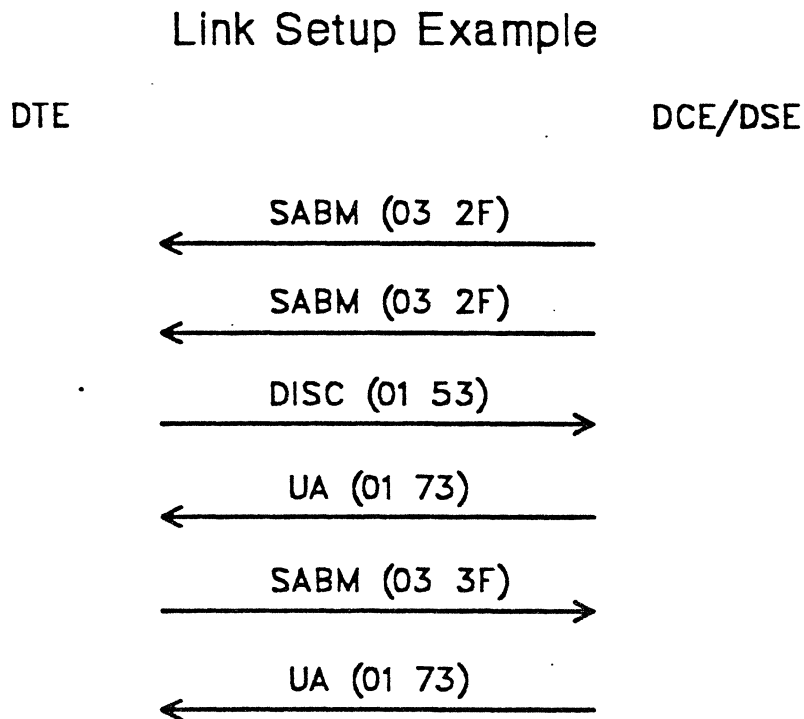
NOTES: LAPB LINK SETUP

1. Network broadcasts SABM commands with Poll bit off

2. DTE transmits Disconnect command to change its current mode

3. DCE acknowledges DTEs state change with UA response

4. DTE transmits SABM command with poll bit on

5. DCE acknowledges the change in state to information transfer phase

   Link setup procedures may vary among PSDNs. The way NPSI reacts to
link level commands from the network is described in the X.25 NPSI
Diagnosis, Customization and Tuning manual LY30-5610. NPSI always sends
the SABM command to the network to signify that it is a DTE wishing
to communicate with the PSDN, and expects a UA response.

Information Frames

INFORMATION FRAMES


```
).25 DEFINEI                    X.25 DEFINED
   │   │                         │      │
   ▼   ▼                         ▼      ▼
┌────┬───┬───┬────────────────┬───┬─────┐
│F   │   │   │                │F  │F    │
│ L  │ A │ C │    PACKET      │ C │ L   │
│  A │   │   │                │ S │  A  │
│   G│   │   │                │   │   G │
└────┴───┴───┴────────────────┴───┴─────┘
```

Packet ──────→ ┌───┬─────────────────┐
Header   │ ▶ │ END USER DATA   │
               └───┴─────────────────┘

                                    DCE/DSE DTE

Control   ⎰ ┌───┬─────────────────┐
Packets   ⎱ │   │ CALL REQUEST   │ ──────→ ·   ·
              └───┴─────────────────┘
              ┌───┬─────────────────┐
              │   │ CALL CONNECTED   │ ◀────── ·   ·
              └───┴─────────────────┘

Information   ┌───┬─────────────────┐
Packets   │   │ T-CONNECT PDU   │ ──────────→ ·
              └───┴─────────────────┘
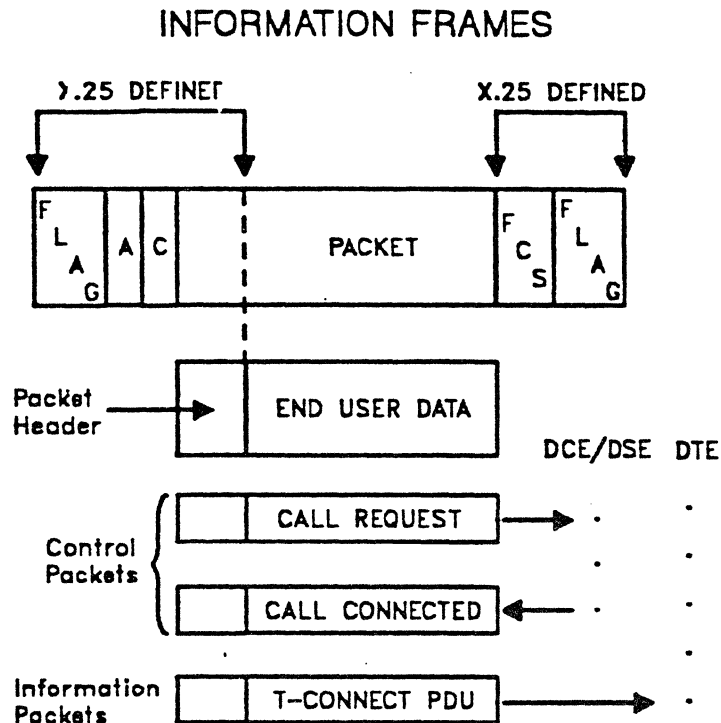
NOTES:
◆ Information frames envelope packets on the link
◆ I-Field contents may be either
    ● Control Packets for the DTE/DCE interface or
    ● Information Packets containing End-to End protocol exchanges to be
      forwarded by the PSDN to the remote DTE
◆ Information frames may be sent in both directions at the same time
   on this full duplex interface.
◆ Within the control field are the following bit indications
    ● N(s) - Send sequence number Rotates from 000 to 111
    ● N(r) - Receive sequence number Rotates 000 to 111
    ● P   - Poll bit numbered 0 or 1
◆ S-Frames are used to flow control the link level I-Frame
   transmissions

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X.25 Packet Structure

DTE   *Pu 2*   *DCE/OSI*

GENERAL FORMAT IDENTIFIER Q D 0 1	LOGICAL CHANNEL GROUP NUMBER
LOGICAL CHANNEL NUMBER	
PACKET TYPE IDENTIFIER	
PACKET TYPE DEPENDENT FIELD	

NOTES:
- ◆ Q = Qualify bit - Used in "qualified data packets"
- ◆ D = Delivery Confirmation Bit - Used to request delivery confirmation from the remote DTE
- ◆ 01 - Specifies data packet flows are Modulo 8
- ◆ 10 - Specifies data packet flows are Modulo 128
- ◆ LCGN - Logical Channel Group Number - Range 0-15
- ◆ LCN - Logical Channel Number - Range 0-255
- ◆ Packet Type Dependent Fields - varies with type of packet built
- ◆ Delivery confirmation can lessen thruput capabilities on a virtual circuit; this is not used by OSI/C.S., and is optional in the standard
- ◆ Packet level flow control is architected to be performed on the boundary link between the DCE/DSE and the DTE during data transfer
    - ● Modulo 8 uses a sequence numbering scheme that rotates through the values of 000 to 111 (in bits)
    - ● Modulo 128 uses a sequence numbering scheme that rotates through the values of 0000000 to 1111111 (in bits)
- ◆ The logical channel numbers defined for an X.25 interface are 0 to 4095, for a total of 4096 logical channels

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Data Packet Modulo 8

Data Packet

Bits

		8	7	6	5	4	3	2	1

Octets

1	General format identifier Q D 0 1	Logical channel group number
2	Logical channel number	
3	P(R) M P(S) 0	
	User data	
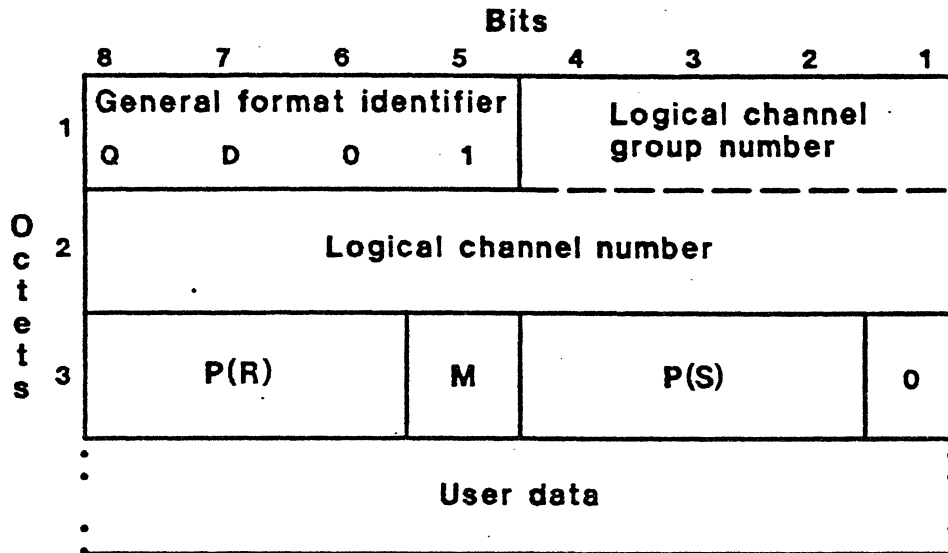
(Modulo 8)

<u>NOTES:</u>
- Data Packet - Transferred between a DTE and the DCE/DSE to send data to its virtual circuit partner
- Modulo 8 allows packets 000 to 111 (in bits) to be sent over the logical channel before the DTE must get a Receive Ready Packet to allow it to resume sending.
- The M bit is used to inform the receiver of the data packet that additional data from a information unit is continued in the next data packet sent on this logical channel
- Both directions are independently flow controlled in this manner.

If you recall there is also a Link Level Window which is the number of frames sent from the DTE to the DCE (or the DCE to the DTE). If the link level window upper edge is 7; and the packet window is 2 for each logical channel; then 4 logical channels can have two packets passed at a time within a single link window.

Receive Ready Packet Modulo 8

DTE and DCE Receive Ready (RR) Packets

Bits

	8	7	6	5	4	3	2	1

```
         8    7    6    5    4    3    2    1
      +---------------------------+-------------------------+
      | General format identifier |                         |
   1  |                           |   Logical channel       |
      |  0    0    0    1         |   group number          |
O     |---------------------------+-------------------------|
c     |                                                     |
t  2  |              Logical channel number                 |
e     |                                                     |
t     |---------------------------+-------------------------|
s     |                           |  Packet type identifier |
      |         P(R)              |                         |
   3  |                           |  0    0    0    0    1  |
      +---------------------------+-------------------------+
```
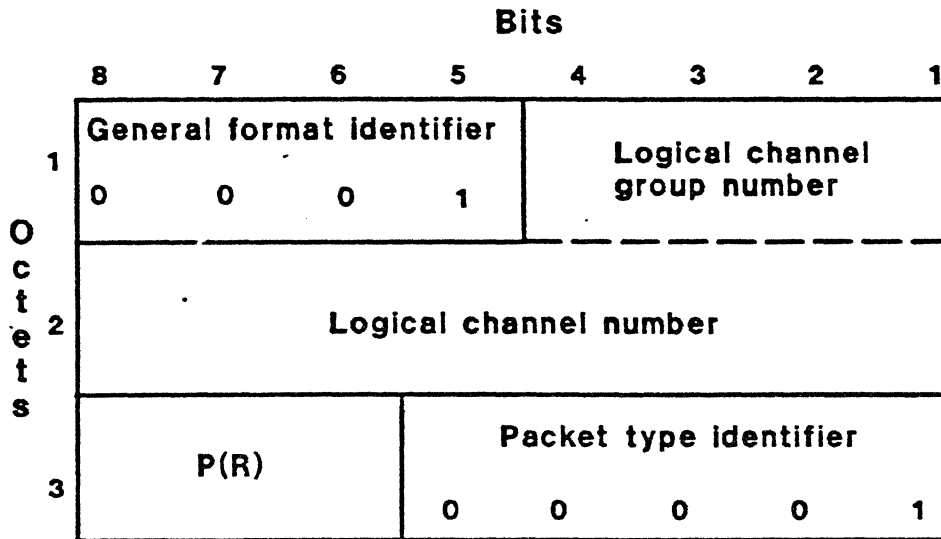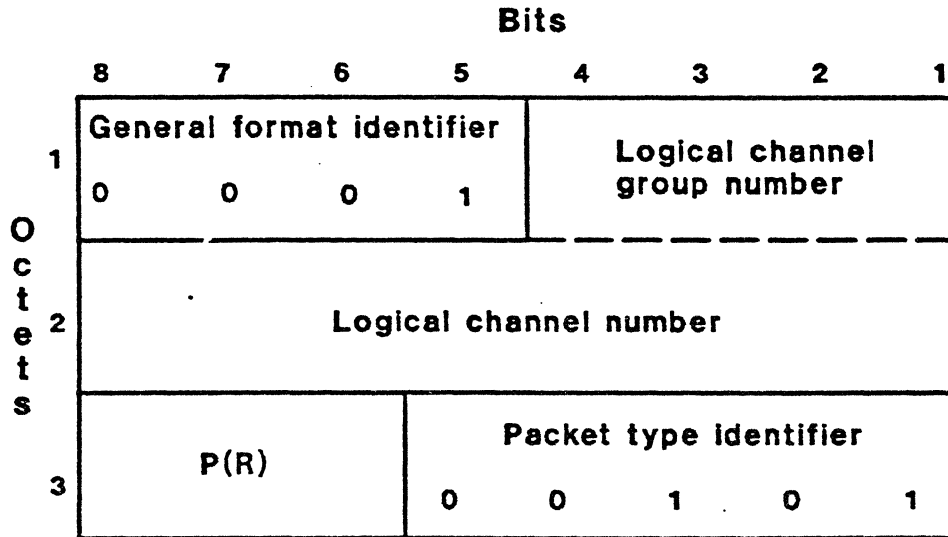
(Modulo 8)

NOTES:
- ◆ Receive Ready Packet - Transferred between the DTE and DCE to acknowledge the number of packets received
- ◆ This also opens the packet window of the receiver so that it may resume transmitting packets on the specified logical channel

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Receive Not Ready Packet Modulo 8

DTE and DCE RNR Packet Format

Bits

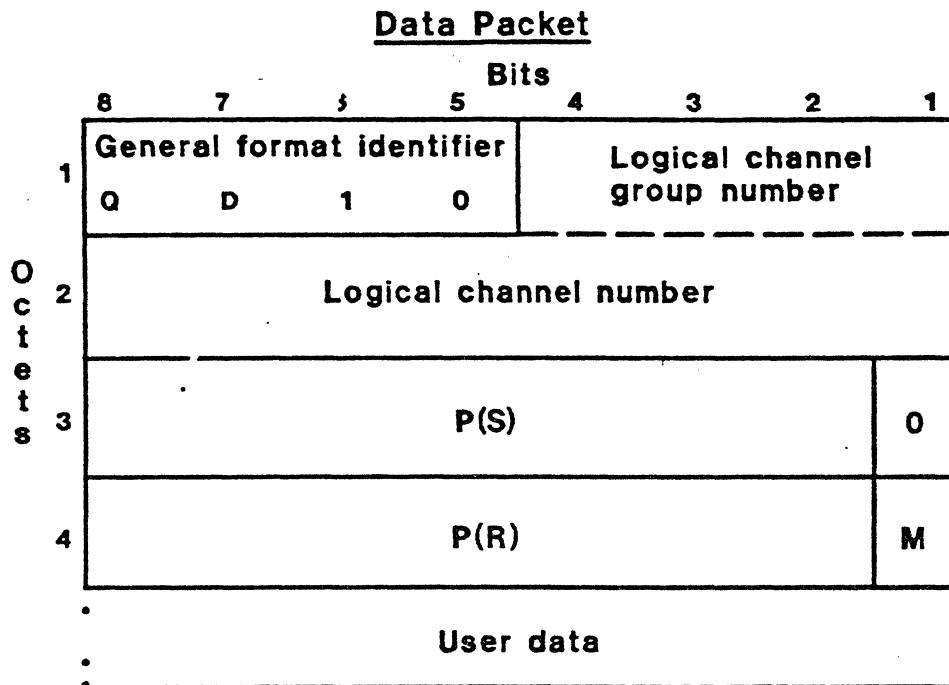| Octets	8	7	6	5	4	3	2	1
1	General format identifier 0 0 0 1				Logical channel group number			
2	Logical channel number							
3	P(R)			Packet type identifier 0 0 1 0 1				

(Modulo 8)

NOTES:
- Receive Not Ready Packet – Transferred between the DTE and DCE to acknowledge the number of packets received
- This leaves the packet window of the receiver closed so that it may not resume transmitting packets on the specified logical channel until it receives a RR packet

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Data Packet Modulo 128

Data Packet

Bits

	8	7	*j*	5	4	3	2	1
1	General format identifier Q D 1 0				Logical channel group number			
2	Logical channel number							
3	P(S)							0
4	P(R)							M
	User data							

(Octets — shown at left: O c t e t s)
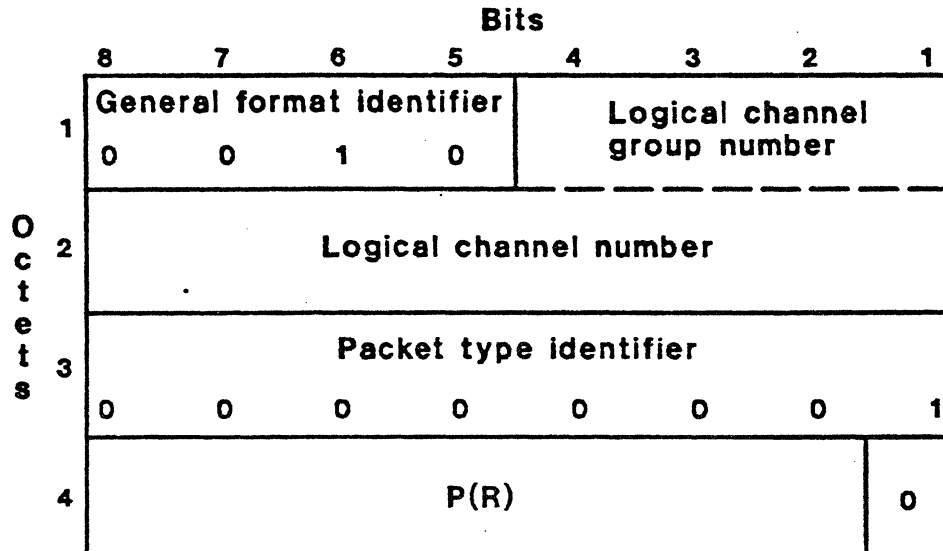
(When extended to modulo 128)

NOTES:

◆ Data Packet — Transferred between a DTE and the DCE/DSE to send data to its virtual circuit partner

◆ Modulo 128 allows packets 0000000 to 1111111 (in bits) to be sent over
the logical channel before the DTE must get a Receive Ready Packet to allow it to resume sending. Both directions are independently ꓛlow controlled in this manner.

IBM

Receive Ready Packet Modulo 128

DTE and DCE RR Packet Format

Bits

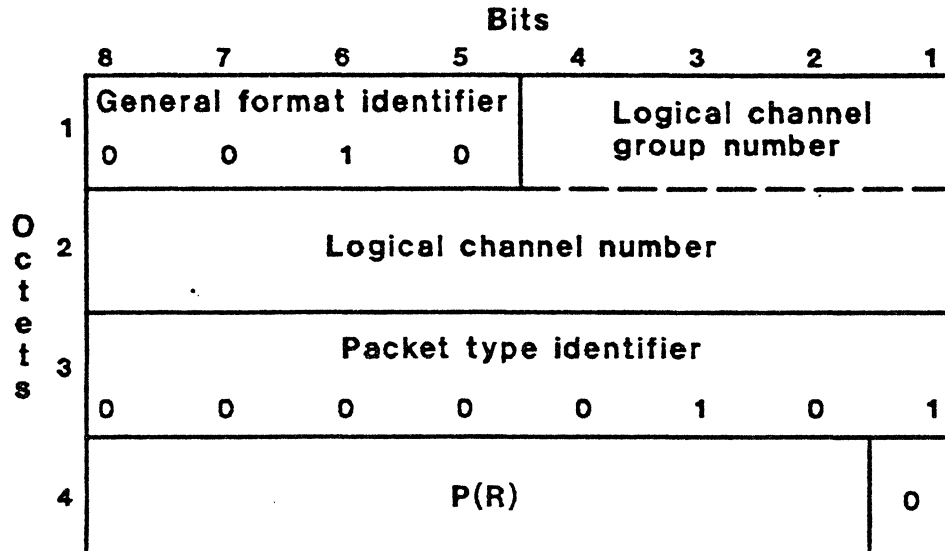|	8	7	6	5	4	3	2	1
1	General format identifier 0 0 1 0				Logical channel group number			
2	Logical channel number							
3	Packet type identifier 0 0 0 0 0 0 0 1							
4	P(R)							0

(Column header: Octets, at left of rows 1-4)

(When extended to modulo 128)

<u>NOTES:</u>
- Receive Ready Packet - Transferred between the DTE and DCE to acknowledge the number of packets received
- This also opens the packet window of the receiver so that it may resume transmitting packets on the specified logical channel

Receive Not Ready Packet Modulo 128
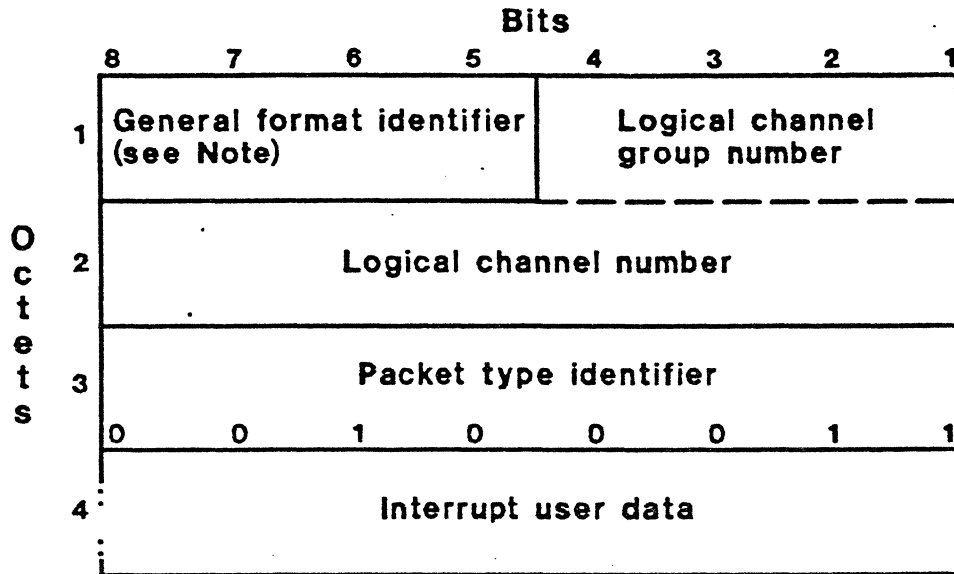
DTE and DCE RNR Packet Format

Bits

	8	7	6	5	4	3	2	1

Octets

1 — General format identifier: 0 0 1 0 | Logical channel group number

2 — Logical channel number

3 — Packet type identifier: 0 0 0 0 0 1 0 1

4 — P(R) | 0

(When extended to modulo 128)

NOTES:
- ◆ Receive Not Ready Packet – Transferred between the DTE and DCE to acknowledge the number of packets received
- ◆ This leaves the packet window of the receiver closed so that it may not resume transmitting packets on the specified logical channel until it receives a RR packet

IBM

Interrupt Packet

Bits

	8	7	6	5	4	3	2	1

Octets

1 — General format identifier (see Note) | Logical channel group number

2 — Logical channel number

3 — Packet type identifier
0 0 1 0 0 0 1 1

4 — Interrupt user data
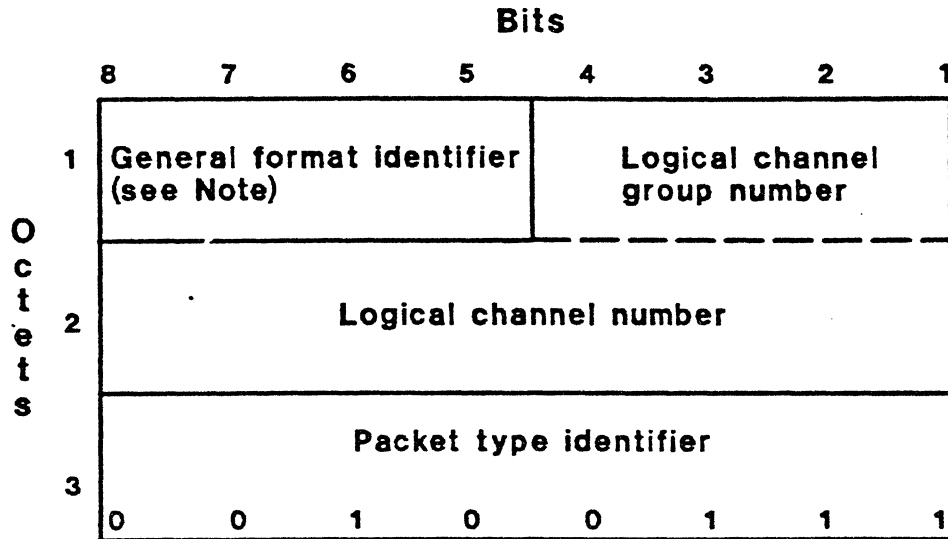
NOTES:

♦ Interrupt Packet – A packet capable of carrying data to a partner DTE that is not flow controlled with normal data packets

Interrupt Confirmation

DTE and DCE Interrupt Confirmation Packet Format

Bits

	8	7	6	5	4	3	2	1

Octets

1 — General format identifier (see Note) | Logical channel group number

2 — Logical channel number

3 — Packet type identifier

0 0 1 0 0 1 1 1

NOTES:

◆ Interrupt Confirmation Packet - Response from the partner DTE that indicates that the interrupt data has been received
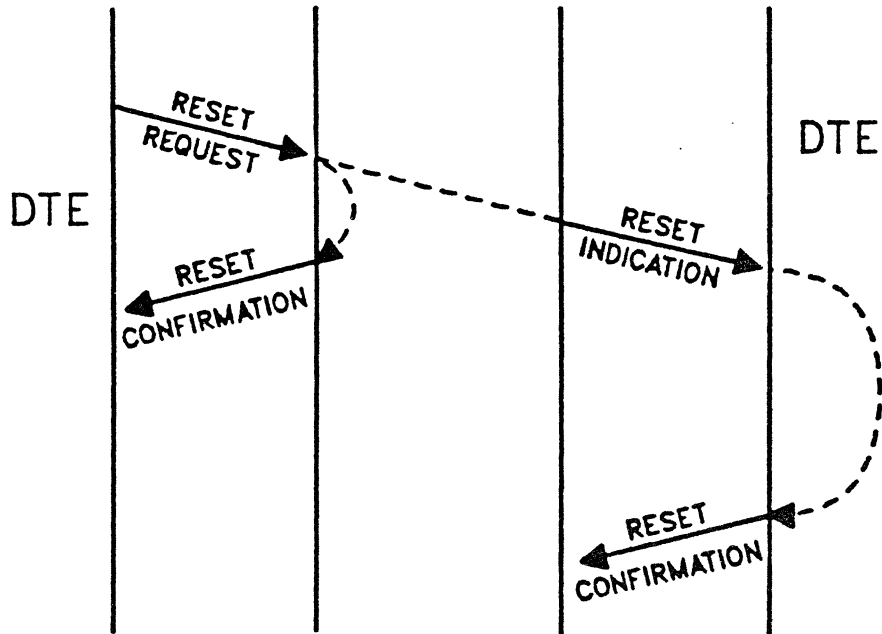
IBM

Network Reset of a VC

Reset by Network
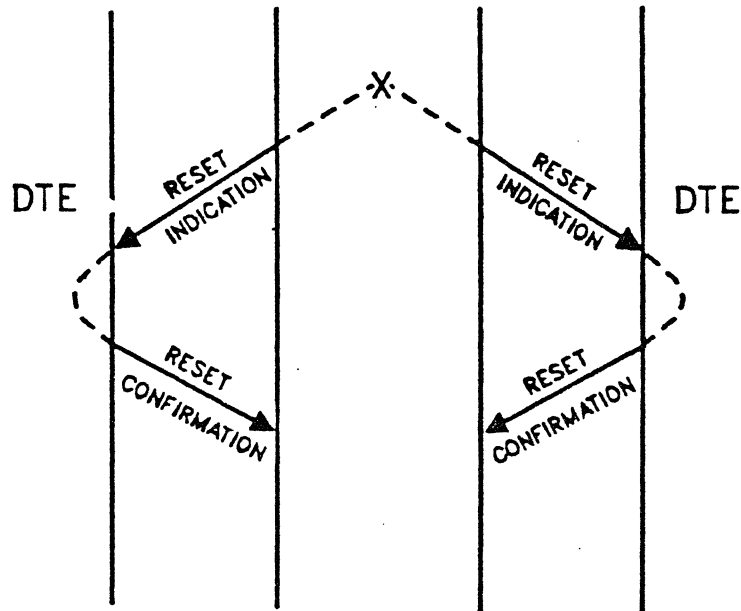
NOTES: NETWORK RESET OF A VC DURING DATA TRANSFER PHASE

If the network DTE detects an error during data transfer it will send
a Reset Request packet to reset the packet level P(S) and P(R) counters

                                                                       IBM
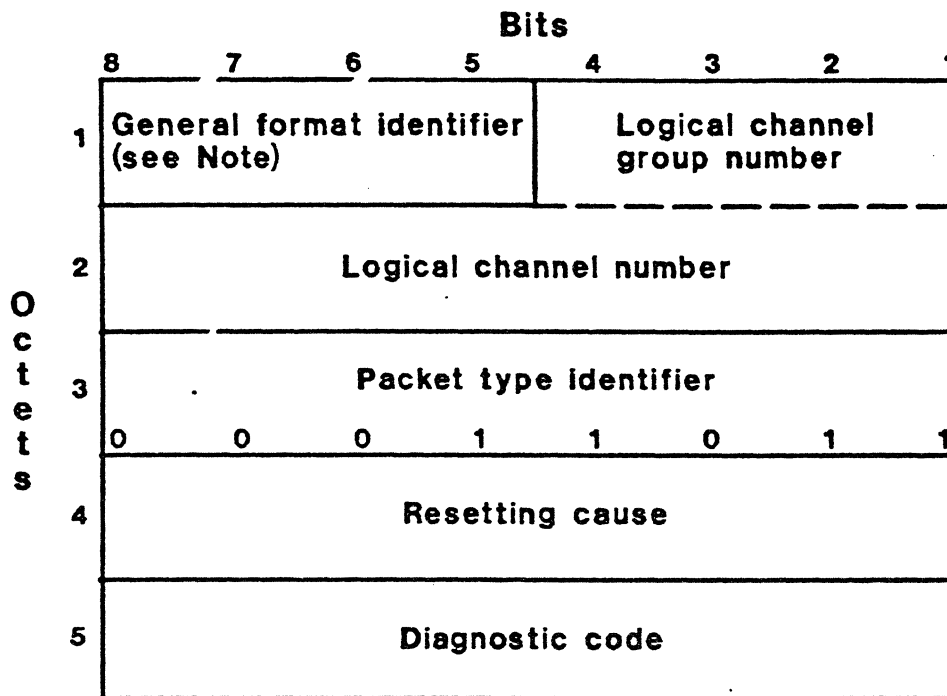
DTE Reset of a Virtual Circuit

Reset by DTE

NOTES:

- If a DTE detects an data transmission error it may issue a Reset Request packet to reset the P(S) and P(R) counters

INTRO-32   IBM

Reset Request/Indication Packet

Bits

	8	7	6	5	4	3	2	1

Octets									

1 — General format identifier (see Note) | Logical channel group number

2 — Logical channel number

3 — Packet type identifier
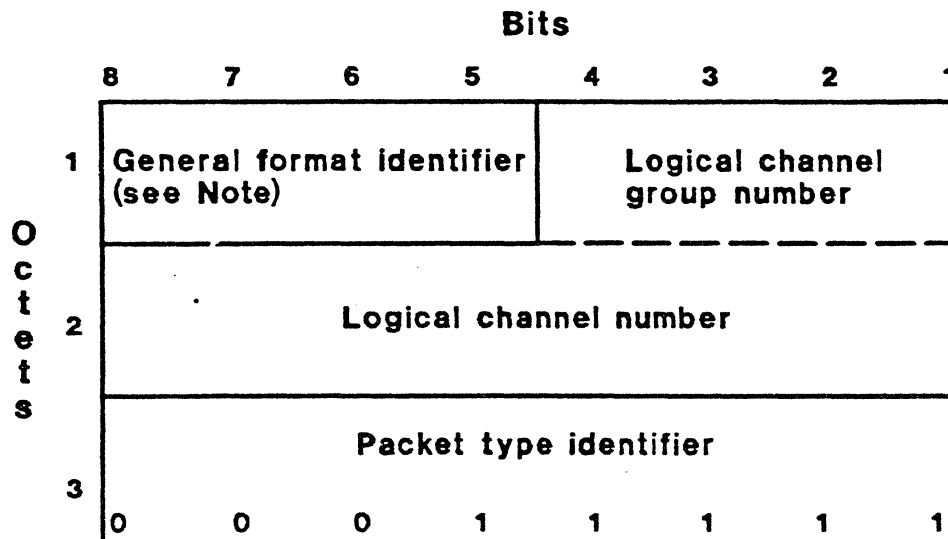0 0 0 1 1 0 1 1

4 — Resetting cause

5 — Diagnostic code

NOTES:
- ◆ Reset Request – Issued by DTE to re-initialize the virtual circuit, causing the network to discard packets in either direction.
- ◆ Reset Indication – Issued by the DSE/DCE to notify DTE of a reset logical channel.
- ◆ This also indicates a reason code for the notification.
- ◆ Reset Cause Codes
  - x'00' DTE Resetting
  - x'01' Out of order
  - x'03' Remote Procedure Error
  - x'05' Local Procedure Error
  - x'07' Network Congestion
  - x'11' Incompatible destination
  - x'1D' Network out of order
- ◆ Diagnostic codes too numerous to list
  - Diagnostic codes supported by NPSI listed and described in the LY30-5610 NPSI Diagnosis, Customization, and Tuning manual
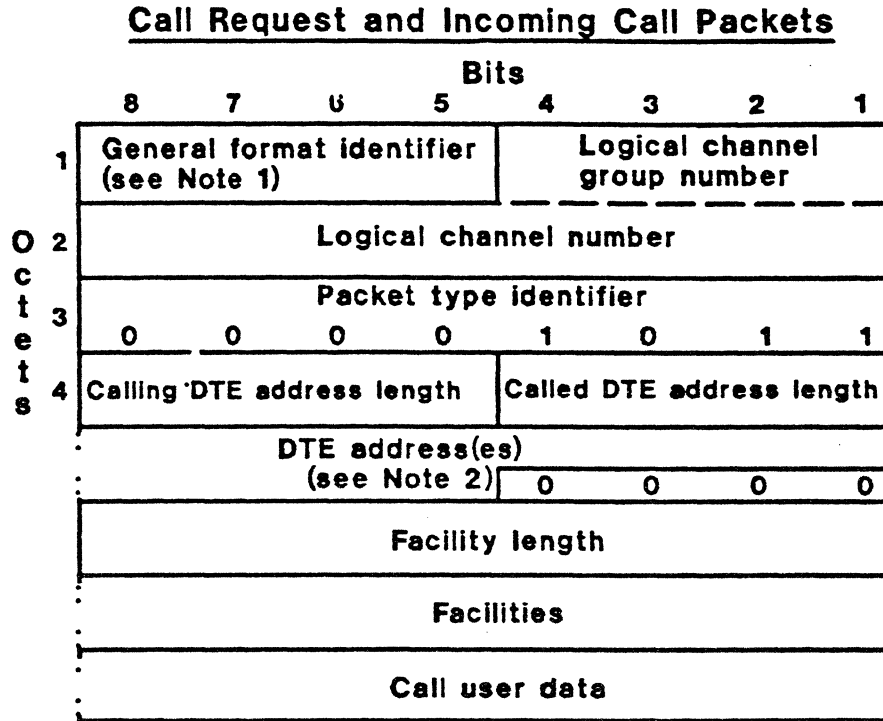
INTRO-33   IBM

Reset Confirmation Packet

DTE and DCE Reset Confirmation Packets

Bits

	8	7	6	5	4	3	2	1

```
              8      7      6      5      4      3      2      1
          +----------------------------------+----------------------------+
        1 | General format identifier        | Logical channel            |
O         | (see Note)                       | group number               |
c         |- - - - - - - - - - - - - - - - - -|- - - - - - - - - - - - - - -|
t         |                                                               |
e       2 |              Logical channel number                           |
t         |                                                               |
s         |---------------------------------------------------------------|
          |              Packet type identifier                           |
        3 |                                                               |
          |0      0      0      1      1      1      1      1             |
          +---------------------------------------------------------------+
```

<u>NOTES:</u>

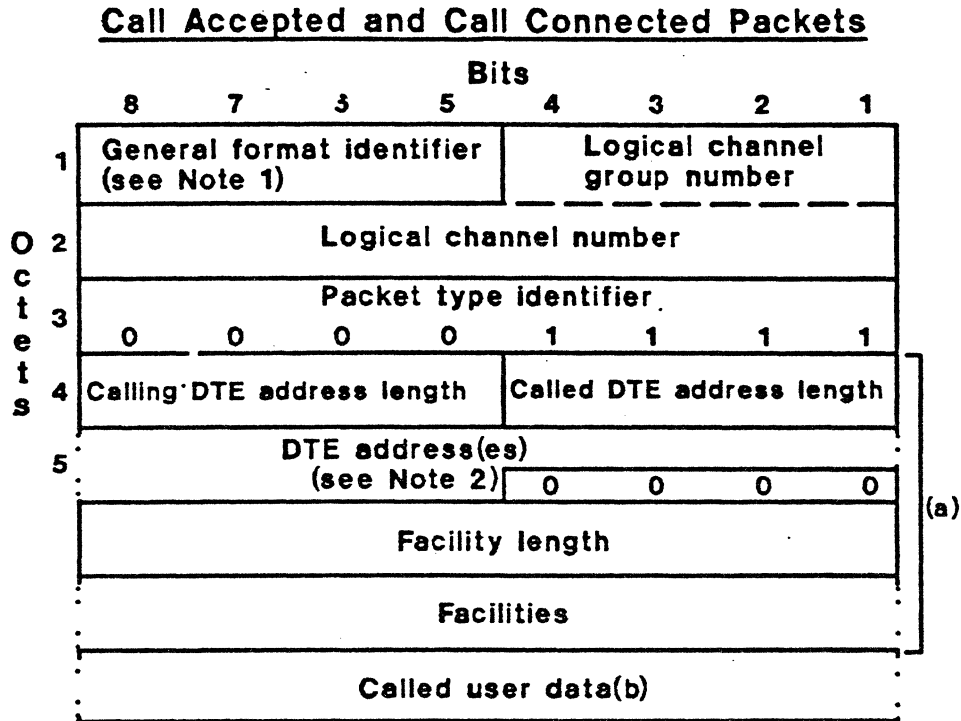- ◆ Reset Confirmation- Issued by the DSE/DCE to confirm that the logical channel/virtual circuit is being reset.

IBM

Call Request/Incoming Call Packet

Call Request and Incoming Call Packets

Bits

| | | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

|---|---|---|---|---|---|---|---|---|---|

Octets

Octet	Content								
1	General format identifier (see Note 1)				Logical channel group number				
2	Logical channel number								
3	Packet type identifier								
	0	0	0	0	1	0	1	1	
4	Calling DTE address length				Called DTE address length				

DTE address(es)
(see Note 2) | 0 | 0 | 0 | 0 |

Facility length

Facilities

Call user data

NOTES:
- ◆ Call Request - Issued by DTE to request a SVC
- ◆ Incoming Call - Issued by DSE/DCE to ask DTE to accept a call
- ◆ Some facilities you may request for NSPI subscription
  - ● Fast Select Acceptance
  - ● Throughput Class Negotiation
  - ● Default Throughput Class Assignment
  - ● Closed User Group
  - ● Reverse Charging Acceptance
  - ● Flow Control Parameter Negotiation
  - ● Non-Standard default window size
  - ● Non-Standard default packet size
- ◆ Calls from other OSI nodes to NPSI should contain a one byte protocol id in Call User Data byte 0 to signify to NPSI that this call is for OSI/C.S.. The contents of the packet are evaluated by OSI/C.S..
- ◆ Protocol ids are discussed later in this topic

Call Accepted/Connected Packet

Call Accepted and Call Connected Packets

Bits

| | 8 | 7 | 3 | 5 | 4 | 3 | 2 | 1 |

```
                 8     7     3     5     4     3     2     1
           ┌─────────────────────────────┬─────────────────────────────┐
        1  │ General format identifier   │   Logical channel           │
O          │ (see Note 1)                │   group number              │
c       2  ├─────────────────────────────┴─────────────────────────────┤
t          │              Logical channel number                       │
e       3  ├───────────────────────────────────────────────────────────┤
t          │              Packet type identifier                       │
e          │   0     0     0     0     1     1     1     1              │
t       4  ├─────────────────────────────┬─────────────────────────────┤
s          │ Calling DTE address length  │ Called DTE address length   │
           ├─────────────────────────────┴─────────────────────────────┤
        5  │              DTE address(es)                               │
           │              (see Note 2)  ┌────┬────┬────┬────┐           │
           │                            │ 0  │ 0  │ 0  │ 0  │           │  (a)
           ├────────────────────────────┴────┴────┴────┴────┤           │
           │              Facility length                    │          │
           ├─────────────────────────────────────────────────┤         │
           │              Facilities                         │          │
           ├─────────────────────────────────────────────────┤         │
           │              Called user data(b)                           │
           └────────────────────────────────────────────────────────────┘
```

NOTES:
- ◆ Call Accepted - Issued by DTE to accept an Incoming Call
- ◆ Call Connected - Issued by DSE/DCE to confirm that its Call Request has been accepted by the remote DTE

Clearing By The DTE

Clearing by DTE
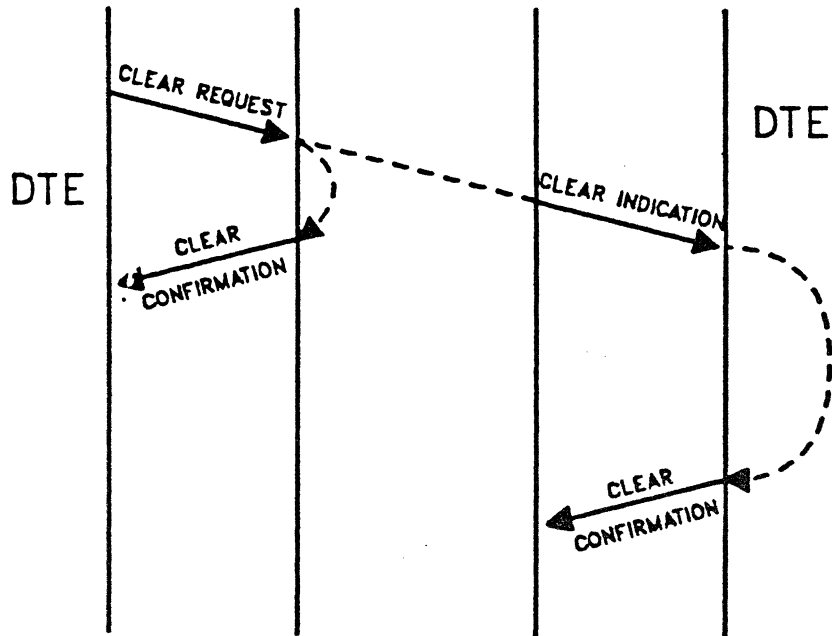
NOTES:
- ◆ Clear Request - Issued by DTE to terminate an SVC
- ◆ Clear Indication - Issued by DSE/DCE to ask DTE to accept call termination
- ◆ Clear confirmation acknowledges the end of the call
- ◆ A DTE may clear the call due to
  - ● A normal end of communications over the SVC
  - ● A error condition has been detected that the DTE cannot recover
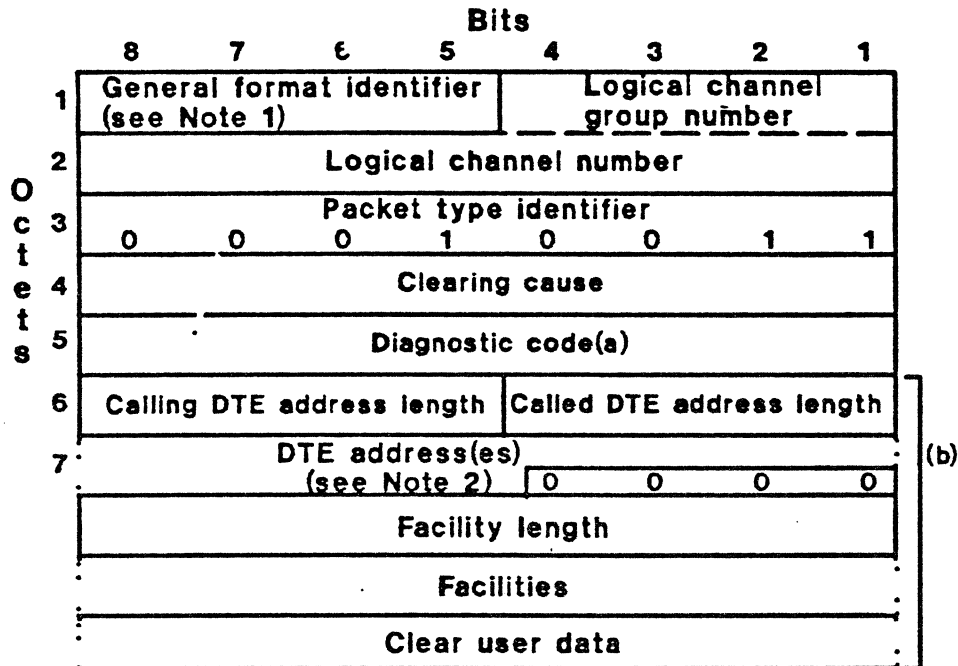
IBM

Clearing By The Network

Clearing by Network
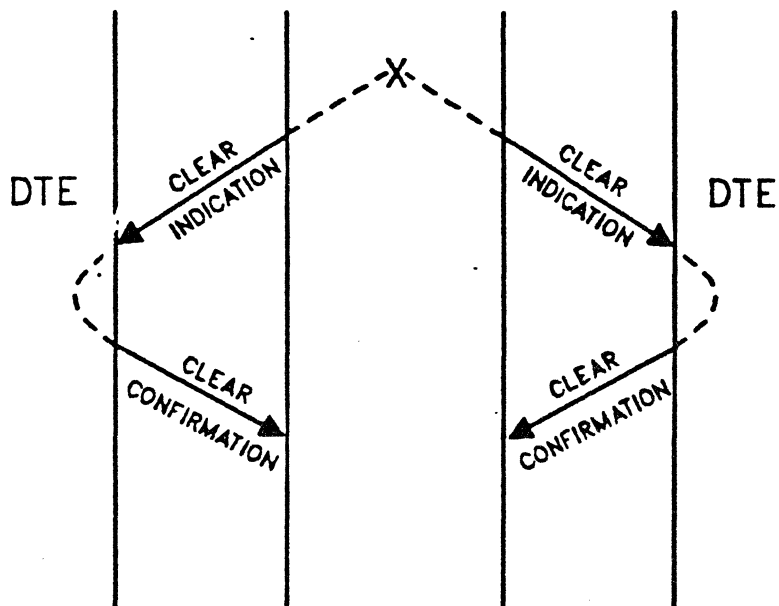
NOTES:
- ◆ Clear Indication – Issued by DSE/DCE to ask DTE to accept call termination, due to a network detected problem
- ◆ Clear confirmation acknowledges the end of the call
- ◆ The Network may clear the call due to
  - ● A error condition has been detected that the Network that cannot be recovered

                                                   IBM

Clear Request/Indication Packet

Clear Request and Clear Indication Packets

```
                              Bits
             8    7    6    5    4    3    2    1
          +-----------------------+----------------------+
        1 | General format identifier | Logical channel  |
          | (see Note 1)              | group number     |
          +---------------------------+------------------+
        2 |          Logical channel number              |
          +----------------------------------------------+
O       3 |          Packet type identifier              |
c         |  0    0    0    1    0    0    1    1         |
t         +----------------------------------------------+
e       4 |              Clearing cause                  |
t         +----------------------------------------------+
s       5 |             Diagnostic code(a)               |
          +--------------------------+-------------------+
        6 | Calling DTE address length | Called DTE address length |
          +--------------------------+-------------------+
        7 |          DTE address(es)                     |      (b)
          |          (see Note 2)   | 0   0   0   0      |
          +----------------------------------------------+
          |              Facility length                 |
          +----------------------------------------------+
          |                Facilities                    |
          +----------------------------------------------+
          |              Clear user data                 |
          +----------------------------------------------+
```

NOTES:
- ◆ Requests termination of the call
- ◆ Provides Clearing Cause Code and Diagnostic code to the Network/DTE
- ◆ Clearing Cause field
  - ● x'00' DTE Clearing
  - ● x'01' Number busy (or call collision)
  - ● x'03' Invalid Facility request or invalid call
  - ● x'05' Network Congestion or incidents on the network
  - ● x'09' Out of order
  - ● x'0B' Access barred
  - ● x'0D' Unknown number
  - ● x'11' Remote procedure error
  - ● x'13' Local Procedure error
  - ● x'15' RPOA out-of-order
  - ● x'19' Remote DTE refuses reverse charging
  - ● x'21' Incompatible destination or end of out-of-order condition
  - ● x'29' Fast selection acceptance not subscribed
- ◆ Diagnostic codes too numerous to list
  - ● Diagnostic codes supported by NPSI listed and described in the LY30-5610 NPSI Diagnosis, Customization, and Tuning manual

INTRO-39   IBM

Clear Confirmation Packet

DTE and DCE Clear Confirmation Packet Format

Bits

	8	7	6	5	4	3	2	1
1	General format identifier (see Note)				Logical channel group number			
2	Logical channel number							
3	Packet type identifier							
	0	0	0	1	0	1	1	1
4	Calling DTE address length				Called DTE address length			
5	DTE address(es)							
	Facility length							
	Facilities							

Octets 1-5 labeled vertically: **O c t e t s**

(a)
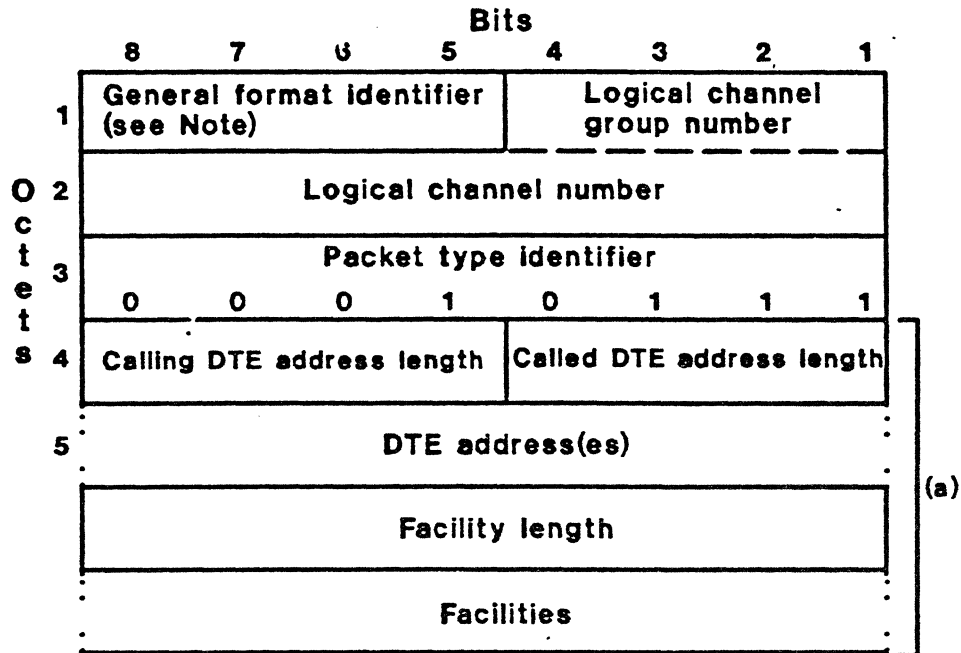
NOTES:

◆ Clear Confirmation - Issued by DTE or DSE/DCE to acknowledge the termination of an SVC

                                IBM

Network Reset of a PVC

Reset by Network
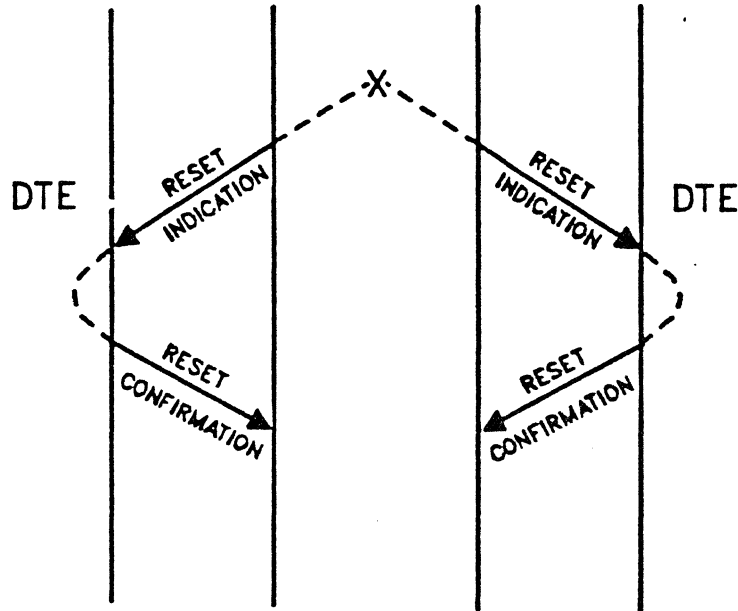
NOTES:

The way the network informs a DTE of the availability of a PVC is via a reset packet with a reset cause code indicating that state change

If the network DTE detects an error during data transfer it will send a Reset Request packet to reset the P(S) and P(R) counters

IBM

DTE Reset of PVC

Reset by DTE
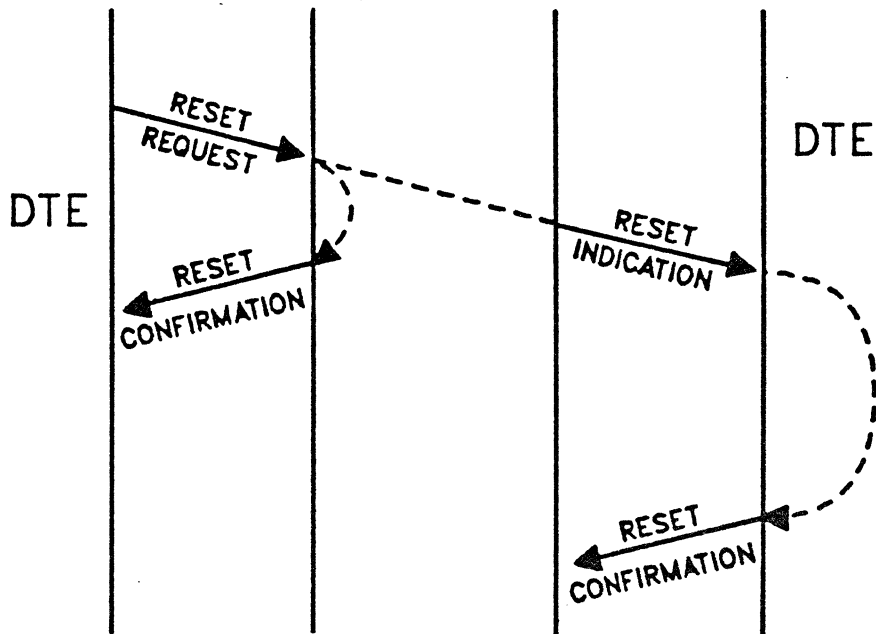
NOTES:

If a DTE detects an data transmission error it may issue a Reset
Request packet to reset the P(S) and P(R) counters

                                IBM

Reset Request/Indication Packet

Bits

	8	7	6	5	4	3	2	1

Octets

Octet	Field
1	General format identifier (see Note) / Logical channel group number
2	Logical channel number
3	Packet type identifier: 0 0 0 1 1 0 1 1
4	Resetting cause
5	Diagnostic code
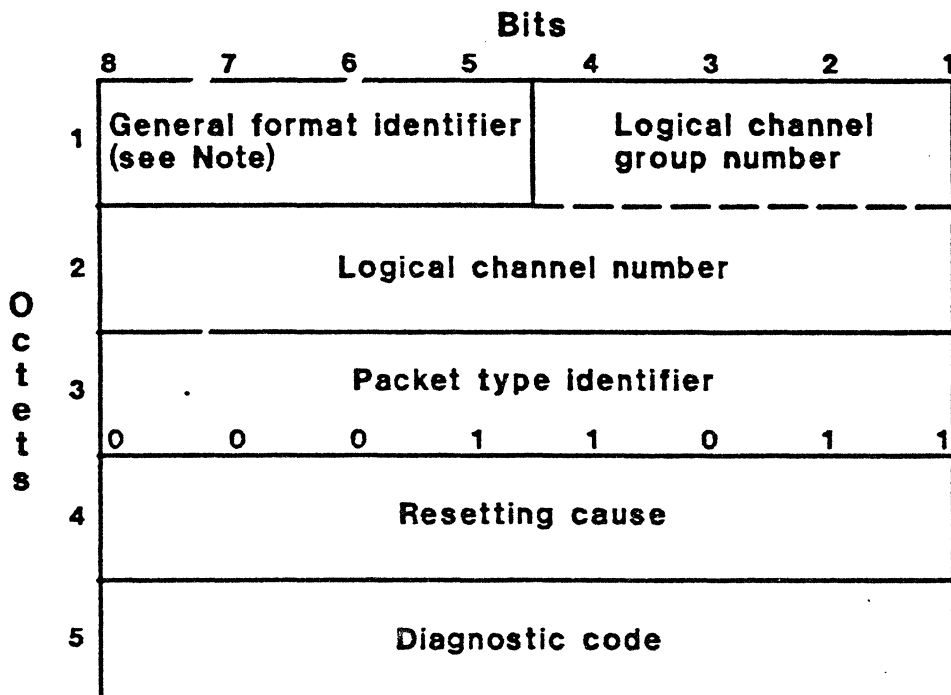
NOTES:
- ◆ Reset Request - Issued by DTE to re-initialize the virtual circuit, causing the network to discard packets in either direction.
- ◆ Reset Indication - Issued by the DSE/DCE to notify DTE of a reset logical channel. This also indicates a reason code for the notification.
- ◆ Reset Cause Codes
  - ● x'00' DTE Resetting
  - ● x'00' End of out-of-order
  - ● x'01' Out of order
  - ● x'03' Remote Procedure Error
  - ● x'05' Local Procedure Error
  - ● x'07' Network Congestion
  - ● x'09' Remote DTE operational
  - ● x'0F' Network operational
  - ● x'11' Incompatible destination
  - ● x'1D' Network out of order
- ◆ Diagnostic codes too numerous to list
  - ● Diagnostic codes supported by NPSI listed and described in the LY30-5610 NPSI Diagnosis, Customization, and Tuning manual

Reset Confirmation Packet
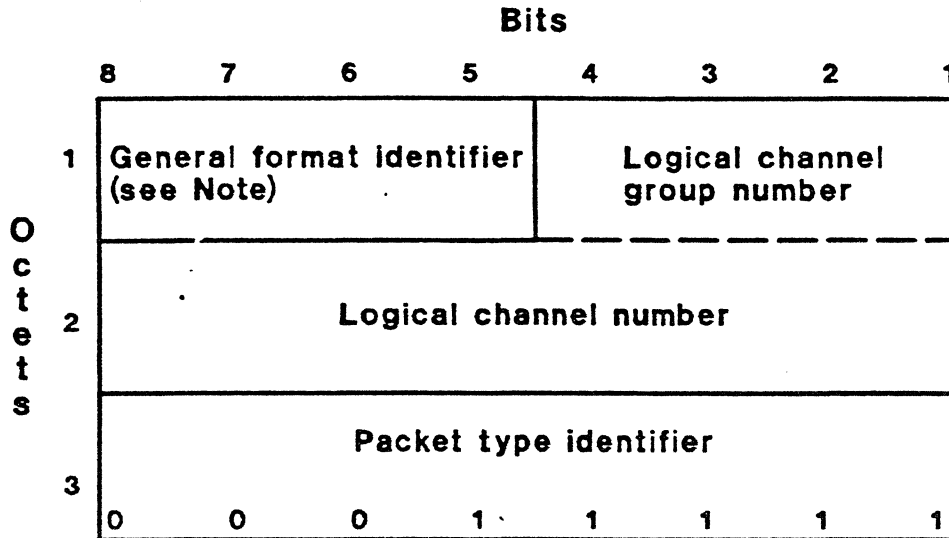
DTE and DCE Reset Confirmation Packets

Bits

	8	7	6	5	4	3	2	1

```
         8     7     6     5     4     3     2     1
      ┌─────────────────────────┬─────────────────────────┐
   1  │ General format identifier│   Logical channel      │
      │ (see Note)               │   group number         │
      ├─────────────────────────┴─────────────────────────┤
   2  │           Logical channel number                   │
      ├────────────────────────────────────────────────────┤
      │           Packet type identifier                   │
   3  │                                                    │
      │  0     0     0     1     1     1     1     1        │
      └────────────────────────────────────────────────────┘
```

Octets

NOTES:
◆ Reset Confirmation- Issued by the DSE/DCE to confirm that the logical channel/virtual circuit is being reset.

IBM

Diagnostic Packet

Diagnostic Packet Format

Bits

	8	7	6	5	4	3	2	1
1	General format identifier (see Note 1)				0	0	0	0
2	0	0	0	0	0	0	0	0
3	Packet type identifier							
	1	1	1	1	0	0	0	1
4	Diagnostic code							
5	Diagnostic explanation (see Note 2)							

(Octets, left margin label beside rows)

NOTES:

◆ Diagnostic Packet - Issued by DTE or DCE/DSE over logical channel zero to pass diagnostic information, inappropriate to be passed in the diagnostic field of a reset or clear indication packet

◆ Diagnostic codes supported by NPSI listed and described in the LY30-5610 NPSI Diagnosis, Customization, and Tuning manual

◆ Sample diagnostic codes
  • x'38' Any packet with packet length shorter than 2 octets
  • x'40' Any packet with a invalid GFI (general format id)
  • x'36' Any packet issued on an unassigned logical channel

IBM

Restart Packet

Bits

	8	7	6	5	4	3	2	1

Octets

1 | General format identifier (see Note) | 0 | 0 | 0 | 0 |

2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

3 | Packet type identifier
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |

4 | Restarting cause

5 | Diagnostic code(a)
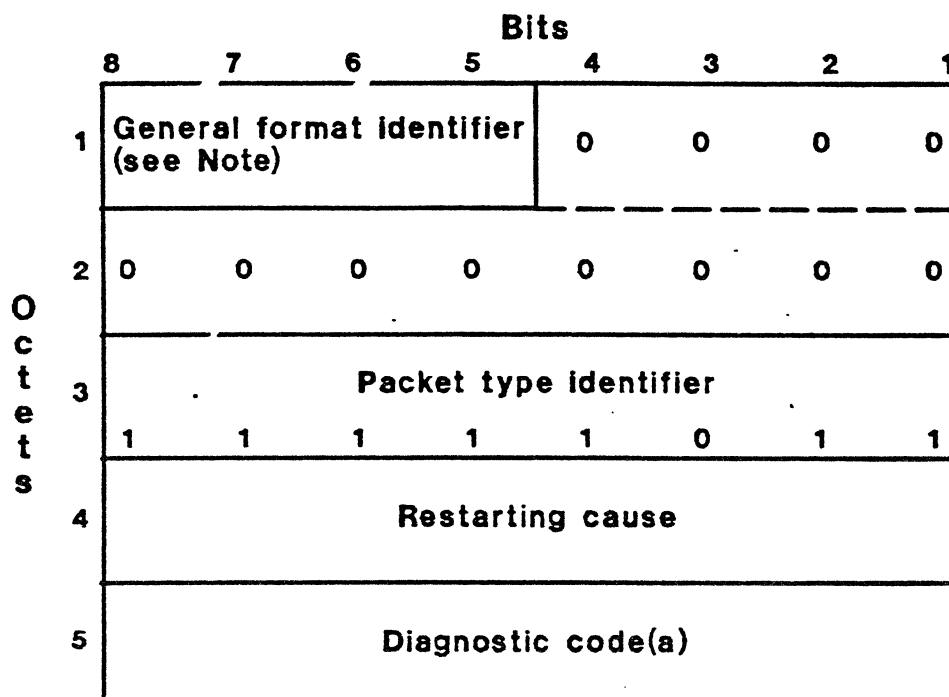
NOTES:
- ◆ Restart Packet - Issued by DTE or DCE/DSE over logical channel zero to restart communications. All PVC logical channels are RESET. All SVCs are terminated and must be set up again be the Calling DTE.
- ◆ Normally issued by NPSI to initialize the interface to the PSDN at the packet level.

Restart Confirmation

Bits

	8	7	6	5	4	3	2	1
1	General format identifier (see Note)				0	0	0	0
2	0	0	0	0	0	0	0	0
3	Packet type identifier							
	1	1	1	1	1	0	1	1
4	Restarting cause							
5	Diagnostic code(a)							

(Octets)

NOTES:
◆ Restart Confirmation - Issued by DTE or DCE/DSE over logical channel zero to acknowledge the restart of communications.

INTRO-47   IBM

DTE Subscription Considerations
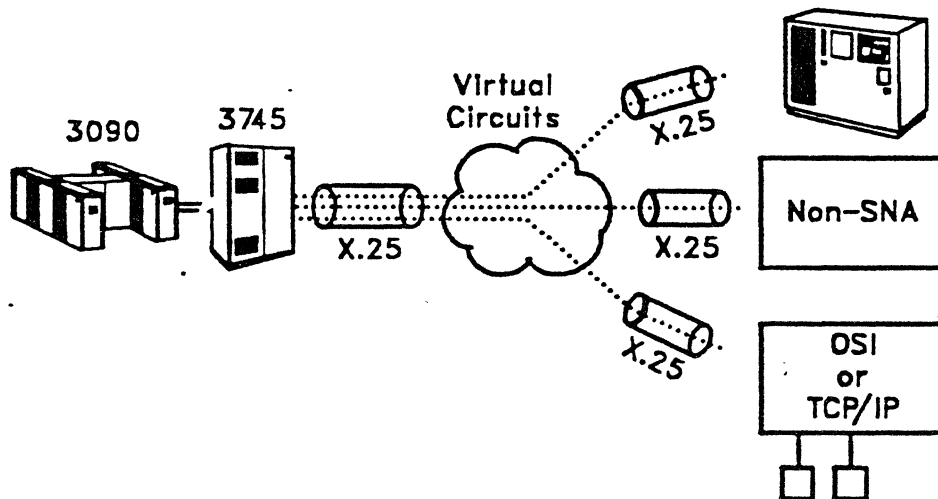
NOTES: DTE SUBSCRIPTION CONSIDERATIONS

◆ Network address of each DTE
◆ Permanent or Switched Virtual Circuits required
◆ Links speed required to support expected utilization
◆ Packet sizes the network allows you to use for data
◆ Flow control options allowed by the network
◆ Optional User Facilities needed by the DTE

The PSDN that you are dealing with should be consulted to find out
what level of support they provide for the X.25 interface. Generally
a "subscription form" is filled out for each device attached to the
PSDN. Browsing a blank copy of the form will generally identify the
options available from that carrier.

INTRO-48   IBM

International DTE Addressing Scheme

CCITT RECOMMENDATION X.121

INTERNATIONAL NUMBERING PLAN

```
  ┌─ Zone Id

      ┌─ Country Id

          ┌─ PSDN Id

              ┌─ Circuit Number

  Z  CC   X    NNNNNNNNNN
  ──────────────
      └─── Data Network Id Code (DNIC)
```
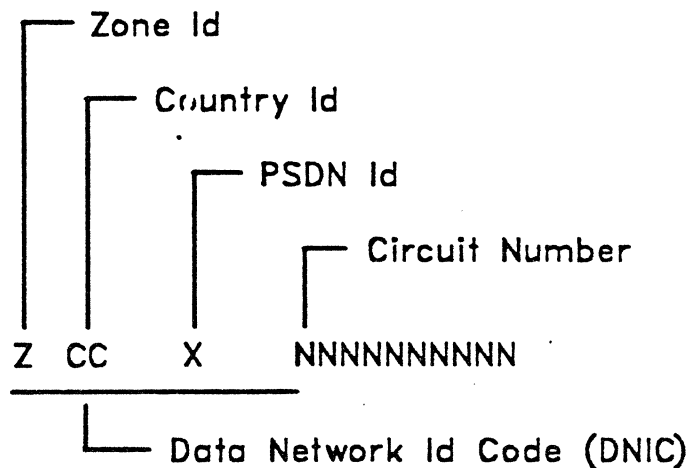
NOTES:
- Switched virtual circuits are set up by a DTE initiating a "Call Request" to the network provider
- The Call Request must contain the "Called DTE Address" in order for the provider to connect you to the correct DTE
- When a line to the network is subscribed a DTE address is assigned

The X.121 Addressing scheme provides for a standard/consistent addressing format for Public PSDNs. The DNIC codes are administered by the CCITT. DTE addresses are usually composed of a DSE address and a Line Address (device address) and are administered by the PSDN provider.

DNIC codes for some PSDNs

CCITT RECOMMENDATION X.121

PUBLIC X.25 PACKET SWITCHED DATA NETWORKS

COUNTR.	PSDN NAME	DNIC
Argentina	ARPAC	7220
Australia	AUSTPAC	5052
	MIDAS	5053
Austria	Radio Austria	2320
Belgium	DCS	2062
Brazil	Interdata	7240
Canada	DATAPAC	3020
	INFOSWITCH	3021
Denmark	DATAPAK	2382
Finland	FINPAC	2442
France	TRANSPAC	2080
Germany	DATEX-P	2624
Hong Kong	DATAPAK	4545
	IDAS	4542
Indonesia	SKDP	5101
Ireland	IPSS	2721
Israel	ISRANET	6122
Italy	DARDO	2222
Japan	DDX-P	4401
	VENUS-P	4408

COUNTRY	PSDN NAME	DNIC
Korea	DACOM-NET	4503
Luxembourg	LUXPAC	2704
Mexico	TELEPAC	3340
Netherlands	DATANET 1	2041
New Zealand	PACNET	5301
Norway	DATAPAC	2422
Portugal	SABD	2682
South Africa	SAPONET	6550
Singapore	TELEPAC	5252
Spain	IBERPAC	2145
Switzerland	TELEPAC	2284
Sweden	DATAPAK	2402
Taiwan	UDAS	4877
United Kingdom	IPSS	2341
	PSS	2342
USA	ACCUNET	3134
	AUTONET	3126
	DASNET	3110
	TELENET	3110
	TYMNET	3106

NOTES:
◆ Sample list of PSDN networks, not a complete list.

IBM

DTE Logical Channel Assignment


```
                                                    LOWEST LC
  +-----------+  +-------------------------------------+----+
  |           |  |  LCO (USUALLY RESERVED)            (    )|   PVCs
  |           |  |- - - - - - - - - - - - - - - - - - |    |
  |           |  |  PERMANENT LCs                      |    |
  |           |  |- - - - - - - - - - - - - - - - - - |    |
  |  DTE      |  |<---- INCOMING LCs                   |    |
  |           |  |- - - - - - - - - - - - - - - - - - |    |  } SVCs
  |           |  |<---- 2-WAY LCs         ---->        |    |
  |           |  |- - - - - - - - - - - - - - - - - - |    |
  |           |  |  OUTGOING LCs          ---->        |    |
  +-----------+  +-------------------------------------+----+
                                                    HIGHEST LC
```
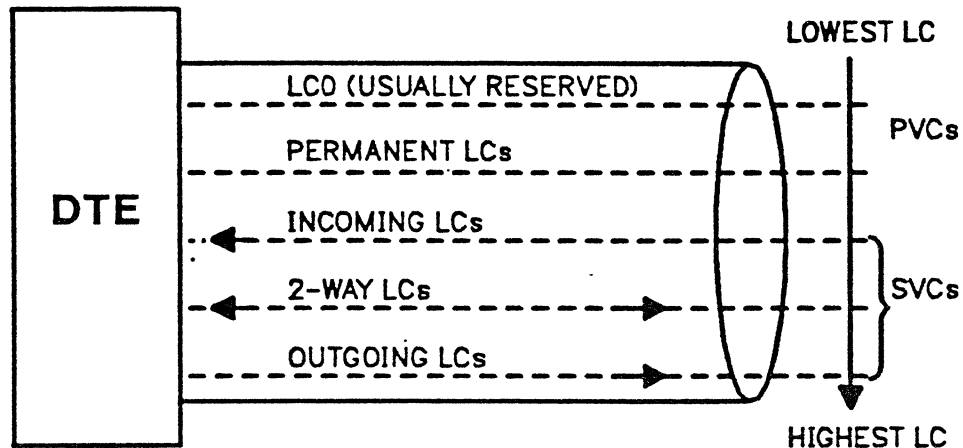
NOTES: DTE LOGICAL CHANNEL SUBSCRIPTION

PVC logical channels subscriptions are similar to a subscription for a
"leased line". As soon as the DTE enables it's interface to the network
the circuit is available for use if its partner is also available.

The next three categories are for SVCs.

Incoming Logical Channels are defined to be channels available to the
DCE to deliver Incoming Call packets to a DTE

Outgoing Logical Channels are defined to be channels available to the
DTE to deliver Call Request packets to a DCE

Two Way Logical Channels are defined to be channels available to the
DTE to deliver Call Request packets to a DCE, or for the DCE to deliver
Incoming Call packets to a DTE.

Link Speed Required
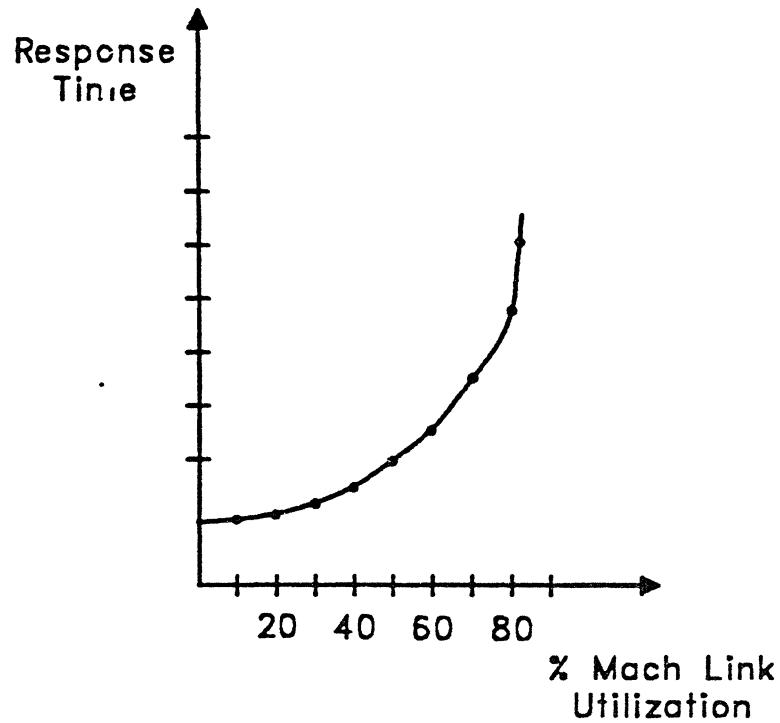
NOTES:

As a general rule of thumb X.25 links should not exceed 65%
utilization. Response times increase in a linear fashion up until this
utilization level. After reaching 65% response times may increase
exponentially.

                                                 IBM

DTE Packet Size/Windows
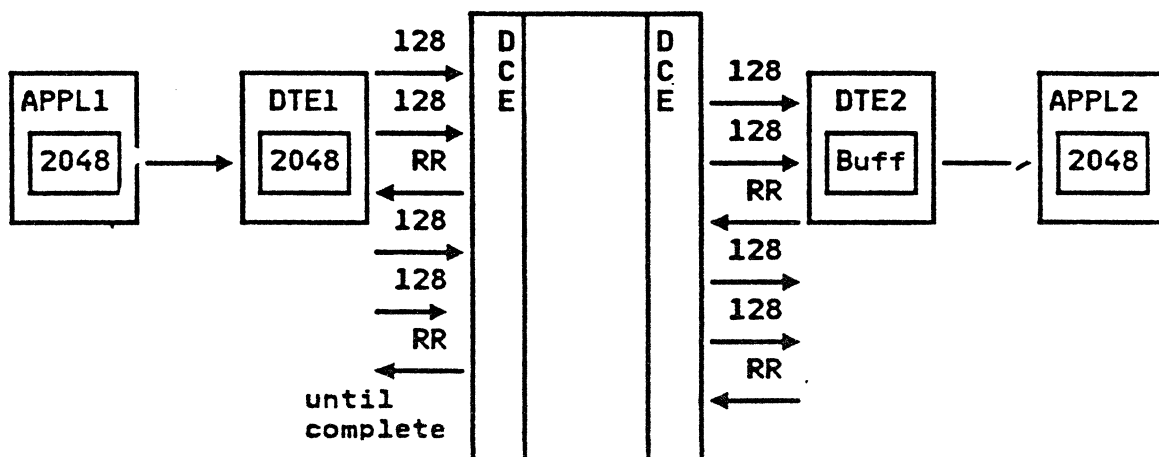
NOTES: DTE SUBSCRIPTION PARAMETERS
- ◆ Packet size default for most networks is 128
- ◆ 16, 32, 64, 128, 256, 512, 1024, 2048, 4096 are defined sizes
- ◆ Standard or Non-standard Pkt size
- ◆ Packet Window Size default for most networks is 2
  - ● Modulo 8 allows packet numbering for a logical channel in the range of 0 to 7
  - ● Modulo 128 allows packet numbering for a logical channel in the range of 0 to 127

- ◆ Flow Control Parameter Negotiation (FCPN) allows packet and window size negotiation on a per call basis.

X.25 Optional Facilities

What facilities are required by the DTE ??

Non-Standard Default Packet Size/Window

Closed User Group - Security

Reverse Charging - Local Charge Prevention

Throughput Class or Transit delay Negotiation

Call Redirection

others ??

NOTES: FACILITIES SUBSCRIPTION

When selecting facilities available from the PSDN also consult the
level of support available from the DTEs you plan to pair up on a
virtual circuit. We will discuss optional user facilities available
with NPSI when we cover NPSI support for Switched Virtual Circuits.

 IBM

Higher Level Protocols

Higher Level Protocols for DTE-to-DTE Communications

DTE
- Higher Levels
- Packet Level
- Link Level
- Physical Level

X.25

X.25

DTE
- Physical Level
- Link Level
- Packet Level
- Higher Levels

End-to-End
(DTE-to-DTE)
Protocols
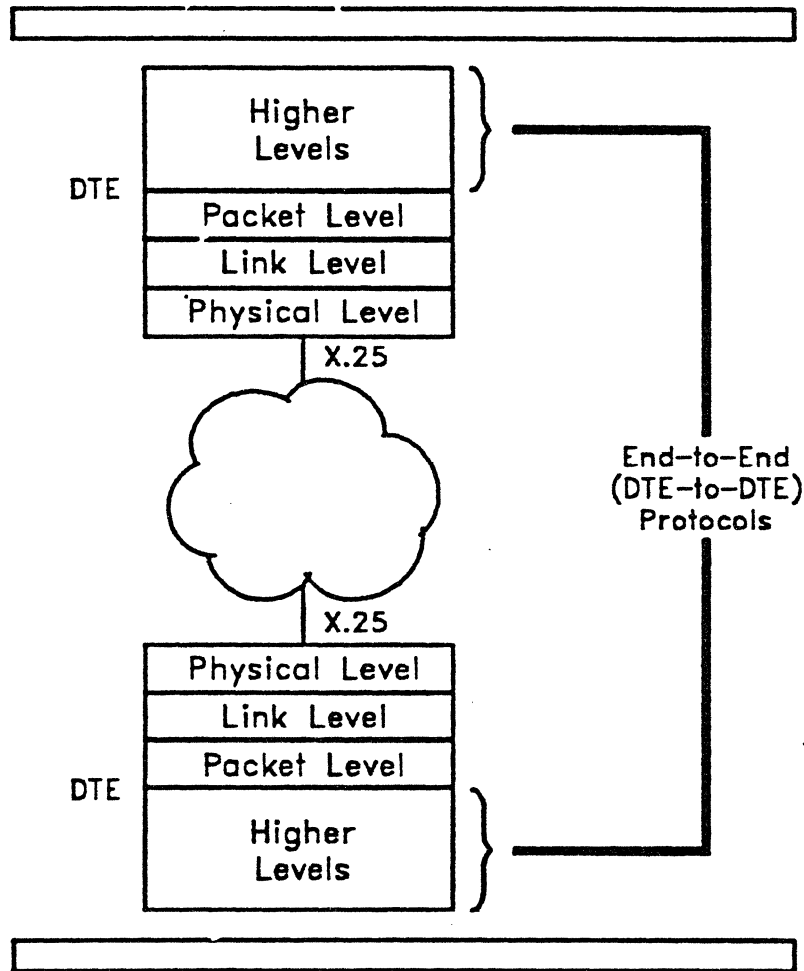
NOTES:
- Everything we have looked at has addressed base X.25 support
- In order to exchange meaningful data between systems higher level protocols must be implemented
- In our next section we will look at actual implementation of the products involved.
- We will also look at how NPSI enables a host application, such as OSI/C.S., to connect to and communicate with another system via X.25.

                      IBM

NPSI OVERVIEW

PART B.

NPSI OVERVIEW

Objectives

◆ **After completing this topic the student should be able to:**

- **Identify the types of DTEs supported by NPSI**

- **Identify logical link control types for each DTE class**

- **Describe the setup for access to a PSDN**

- **Describe the setup of PVCs, and required VTAM/NCP definitions**

- **Describe the setup of SVCs, and required VTAM/NCP definitions**

Connectivity Provided by NPSI
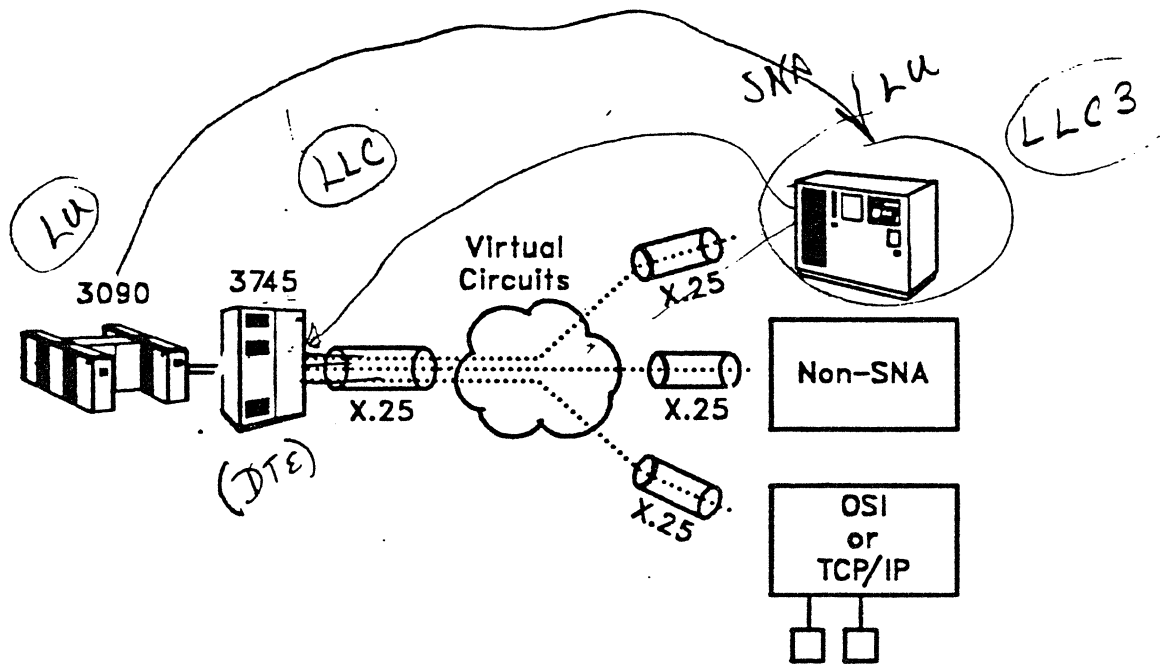
NOTES:

◆ NPSI has for some time provided IBM customers use of X.25 PSDNs as an alternate to leased or circuit switched lines

◆ NPSI may attach both SNA and non-SNA devices via virtual circuits

◆ NPSI implements logical link control protocols to provide connection management of the virtual circuit

     IBM

QLLC
Qualified Linked Logical Connection.
Packets

Connectivity Provided by NPSI /Notes

Connectivity Provided by NPSI

◆ Supports Virtual Call (SVCs) or Permanent Virtual Circuit (PVCs) to:

● SNA DTEs w/NIA Interface Adapter   (PSHC/LLC2)

● SNA DTEs w/X.25 interfaces   (QLLC/LLC3)

● Non-SNA DTEs w/X.25 Interface   (PCNE/LLC0)

● Non-SNA DTEs interfaced via a PAD   (PCNE/LLC5)

● Non-SNA DTE w/Host control   (GATE/DATE/LLC4)

    Allows special host applications (CTCPs)
    to customize VC management (used by TCP/IP and OSI/C.S.)

◆ Physical Serives Header Code (PSHC or LLC2) manages connections to SNA devices with an NIA

◆ Qualified Logical Link Control (QLLC or LLC3) manages connections to SNA devices

◆ Protocol Conversion for Non-SNA Equipment (PCNE or LLC0) manages connections to non-SNA devices

◆ General Access to non-SNA Transport Extension (GATE or LLC4) allows applications like OSI/C.S. to manage communication on "SWITCHED VIRTUAL CIRCUITS"

◆ Dedicated Access to non-SNA Transport Extension (DATE) allows applications like TCP/IP to manage communication on "SWITCHED VIRTUAL CIRCUITS"

    NPSIOV-31   IBM

PSHC Support for SNA Devices
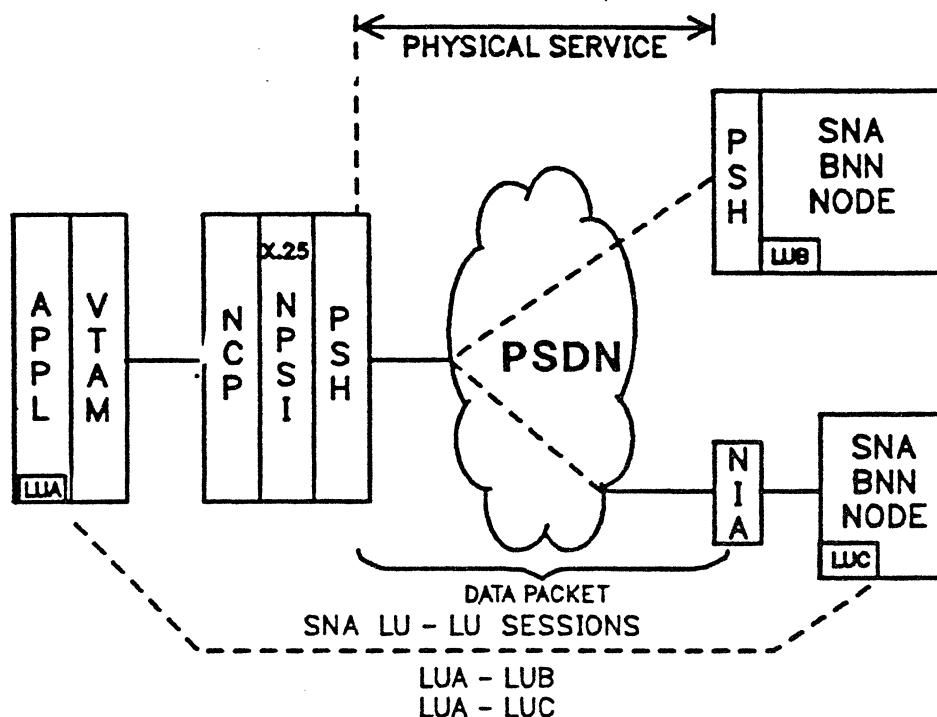
NOTES: PHYSICAL SERVICES HEADER CODE (OR LLC2)

SNA devices still receive PIUs, but enveloped in a stream of one
or more packets.

SDLC commands are converted into Physical Serivces Header commands
which are then enveloped into a Data Packets to maintain end-to-end
link control.

Used for SNA devices that do not have X.25 support. The IBM Network
Interface Adapter is connected between the PSDN and the SNA device.
The NIA provides an X.25 link on the PSDN side and an SDLC link to the
SNA device. An alternative to this is an HDLC PAD provided by the PSDN
which interfaces to NPSI via QLLC. For some non-IBM SNA devices, an
integrated PSHC function may be available.

BNN QLLC Support for SNA Devices

SNA SESSION LUA – LUB

|← QUALIFIED LLC →|

LUA

APPL VTAM NCP NPSI QLLC PSDN QLLC SNA PERIPHERAL NODE

BNN BNN LUB

SNA PU T2.1   LUC

SNA LU 6.2 SESSION LUC – LUD

BNN QLLC   LUD   SNA PU T2.1

SPAD SENERION
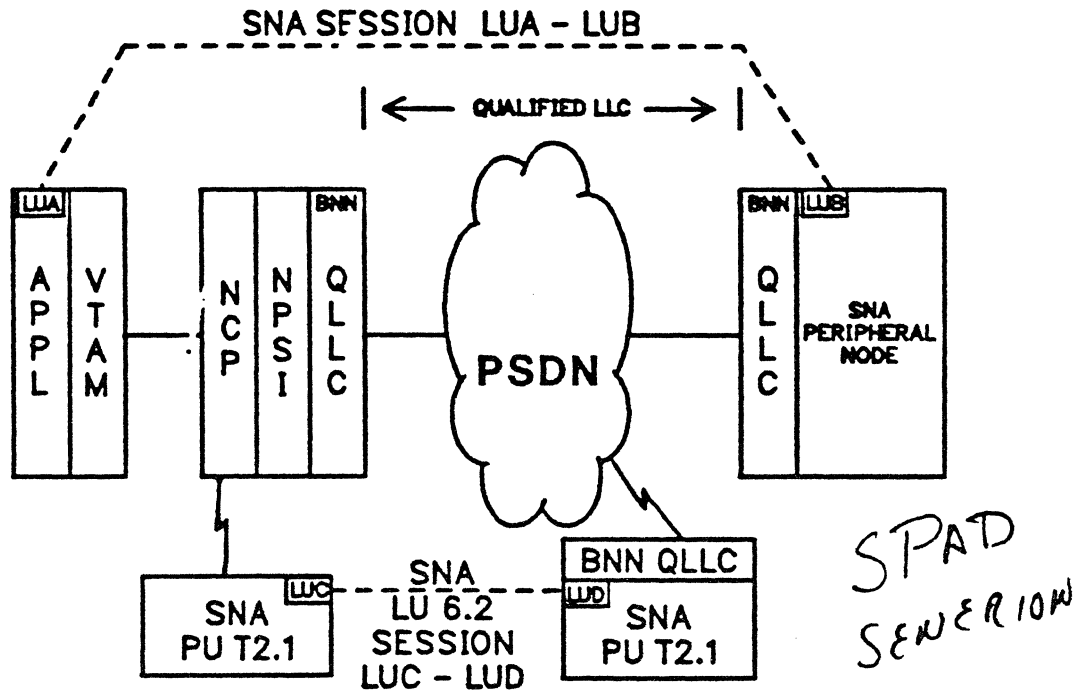
NOTES: <u>QUALIFIED LOGICAL LINK CONTROL (OR LLC3)</u>

SNA devices still receive PIUs, but enveloped in packets

SDLC commands are converted into Qualified Logical Link Units or QLLUs which are then enveloped into a Qualified Data Packet to maintain end-to-end link control.

BNN QLLC support is provided for PU T2 and PU T2.1 devices

NPSI QLLC is used to support IBM SNA devices that have "integrated" X.25 support either as a standard or as an orderable feature. Some IBM DTEs that support QLLC include: 3174, 3274, S/36, S/38, AS/400, 37xx w/NPSI, 9370 w/TSC, 4361 w/ICA, 8100, S/1, 4700, and 3710

BNN QLLC extends the standard support of NCP attached APPN nodes to APPN nodes attached via the PSDN.

NPSIOV-5   IBM

INN QLLC Support

SNA LU – LU SESSION   LUA – LUB

```
┌──┬──┐     ┌──┬──┬──┐           ┌──┬──┬──┐     ┌──┬──┐
│LUA│  │     │  │  │INN│           │INN│  │  │     │  │LUB│
│A │V │     │  │N │Q │           │Q │N │  │     │V │A │
│P │T │     │N │P │L │   PSDN    │L │P │N │     │T │P │
│P │A │     │C │S │L │           │L │S │C │     │A │P │
│L │M │     │P │I │C │           │C │I │P │     │M │L │
└──┴──┘     └──┴──┴──┘           └──┴──┴──┘     └──┴──┘
```
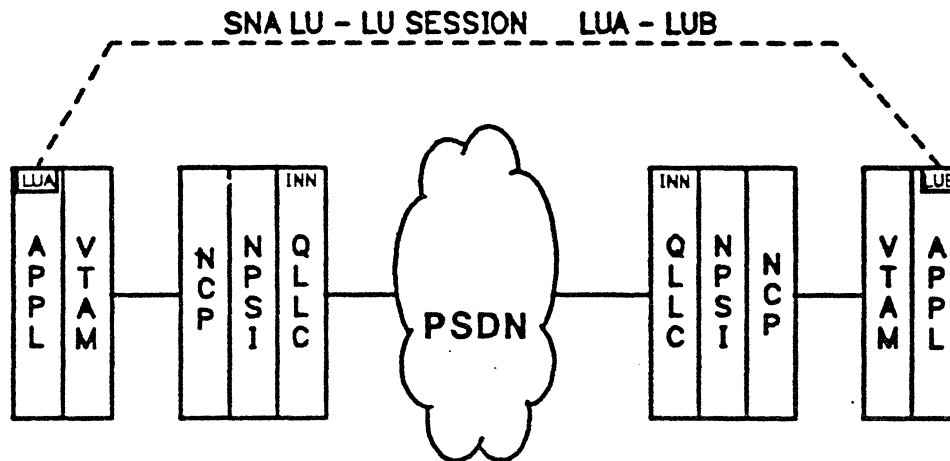
NOTES: INN QLLC SUPPORT

The standard SDLC functions provided by NCP are mapped into a set of
Qualified Logical Link Units (QLLU) to provide INN QLLC support.

QLLC support is provided to support X.25 virtual circuits between two
NPSI nodes (or a NPSI node and 9370 or 4361 host ICA).

The virtual circuit between NPSI nodes is mapped into NCP as a single
transmission Group (TG). The virtual circuit may be a PVC or an SVC.

                                           IBM

PCNE Support for Non-SNA Devices

SNA SESSION
LUA – LUS

LUA | APPL | VTAM

NCP | NPSI | LUS PCNE

PSDN
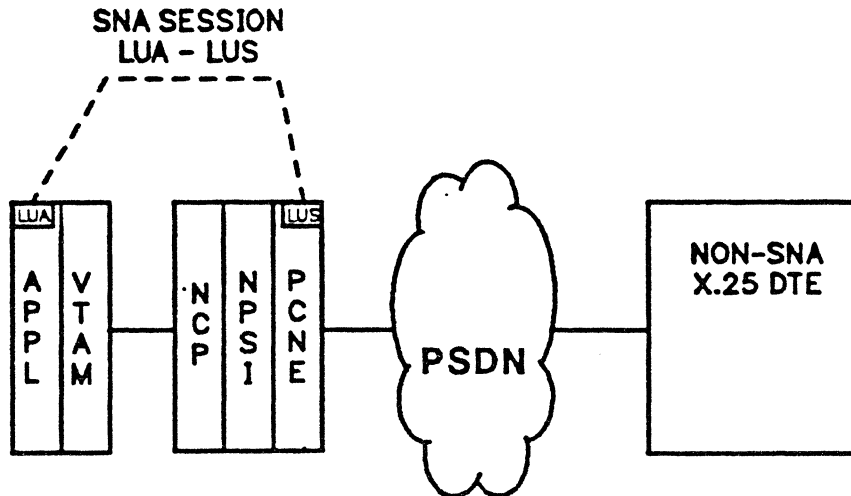
NON-SNA
X.25 DTE

NOTES: PROTOCOL CONVERTER FOR NON-SNA EQUIPMENT (OR LLC0)

NPSI provides a protocol conversion function to support non-SNA
devices, since they are not directly supported by VTAM. This function
actually simulates a PU T1 and LU T1 image within NPSI. Data between
VTAM and the PCNE simulated LU flow on SSCP-LU and LU-LU sessions.

PIUs from VTAM have the TH and RH removed by PCNE.

PIUs to VTAM have the TH and RH added by PCNE.

PCNE can optionally convert EBCDIC data to/from even or odd parity
7 bit ASCII.

Non-SNA Support for X.3 PAD
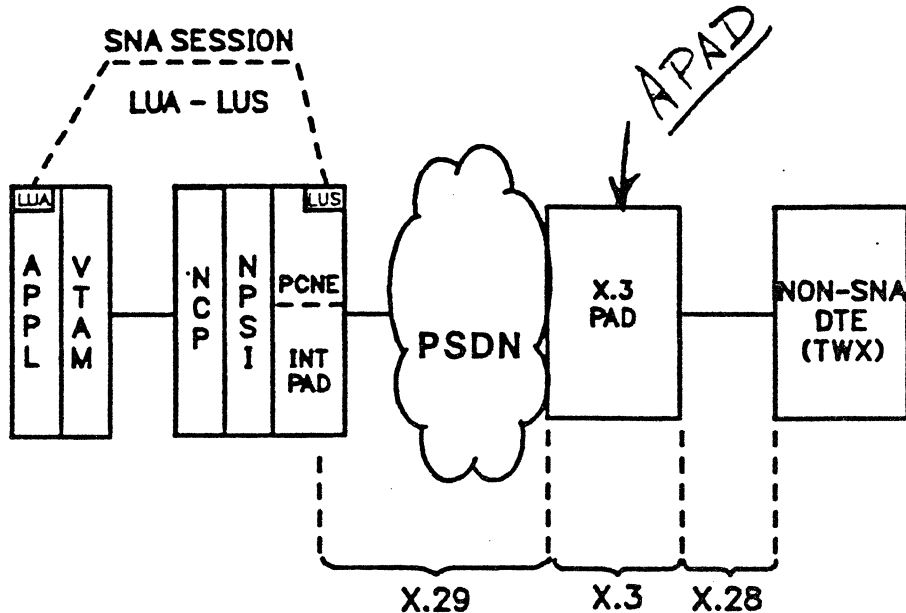
NOTES: INTEGRATED PAD (OR LLC5)

This is an extension of PCNE support

ASCII devices attached to an X.3 PAD appear to VTAM and the APPL
as a (simulated) PUT1 and LUT1. The X.3 PAD provides an X.29 interface
for control by the remote DTE.

NPSI "integrates" X.29 protocols into its control of this type of
device. A minimal number of parameters are set by NPSI. NPSI Version 3
Release 3 provides enhanced support to allow user definition of the X.3
PAD parameters.

Security consideration arise since X.3 PADs "echo" terminal input
back to the user. X.29 allows for correction of this problem allowing the
host DTE to turn off echo when seeking secure input from the terminal
user (such as passwords). NPSI Versions 2 and 3 support this X.29 control
function. Version 2 is for 3725 and 3720. Version 3 is for 3720 and 3745.

                                             IBM

NPSI Non-standard Pad Support
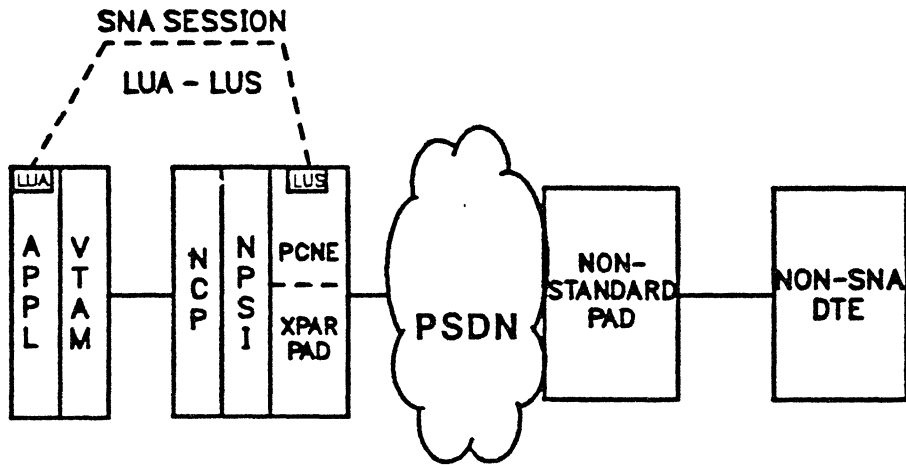
NOTES: TRANSPARENT PAD (OR LLC5)

An extension of PCNE

Mutually exclusive with "Integrated PAD" support

This support is used for non-standard PADs (BSC, or other)

NPSI allows applications to control non-standard PADs without
NPSI actually knowing what manipulations are taking place (i.e. PAD
control is "transparent" to NPSI).

NPSI simply builds Qualified Data Packets at the request of the
Application which is imbedding PAD control messages in the RU of the PIU.

　　　　　　　　　　　　　　IBM

NPSI GATE Support
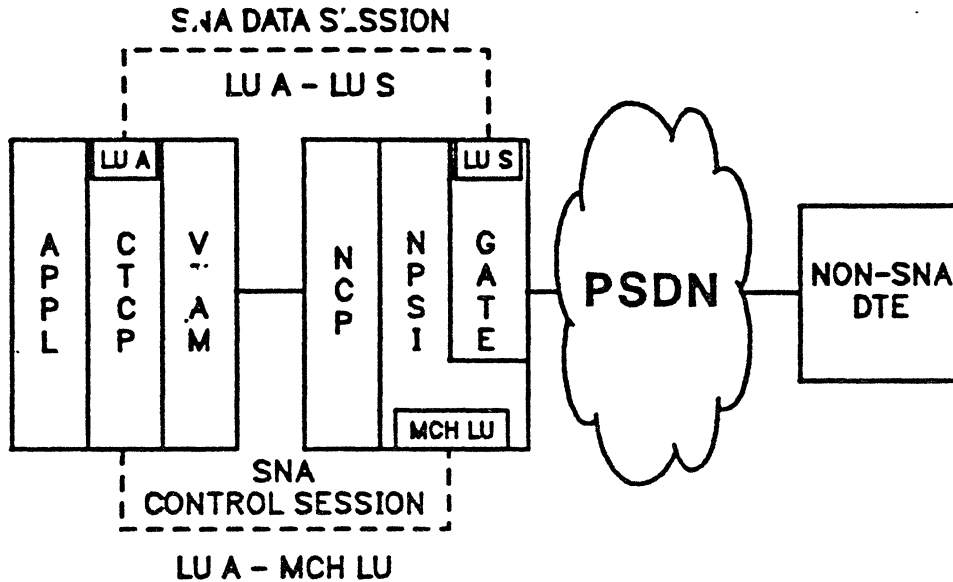
NOTES: GENERAL ACCESS TO NON-SNA TRANSPORT EXTENSION (OR LLC4)

This allows non-SNA devices to be managed entirely from a host application called a Communications and Transmission Control Program (or CTCP). In this environment a LU is represented on the Physical Line (called the MCH LU). The CTCP acquires a session with this LU to process control packets coming in on the physical link.

Users of this access link may choose to use either one of the standard NPSI LLCs or may choose to use GATE. When a user selects GATE a Data Session is established between it's simulated LU and the host application that has the session with the MCH LU.

OSI/Communication Subsystem (OSI/C.S) is a user of this function. It's CTCP is referred to as a "Line Set" and is defined on a VTAM APPL def.

Another variation of GATE is GATE Fast Connect, which is used by the GTM/OSI PRPQ.

NPSIOV-10   IBM

NPSI DATE Support
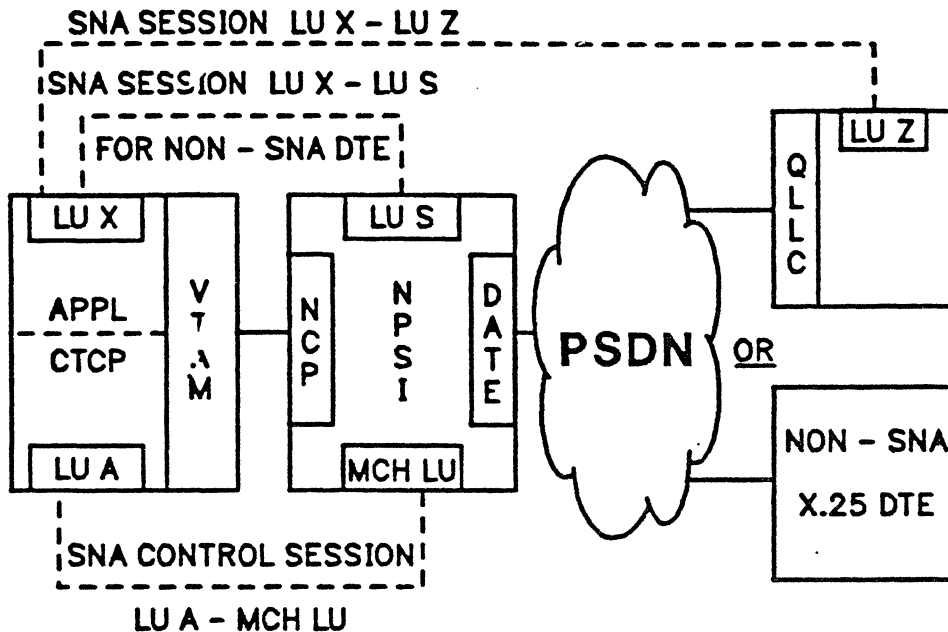
NOTES: DEDICATED ACCESS TO NON-SNA TRANSPORT EXTENSION

This is an extension of LLC0, LLC2, LLC3, LLC5.

This allows NPSI users the capability to write contorl applications
to screen calls roming in from the network. Incoming calls are screened
by the host application before accepting the call. Once accepted a data
session is established between DTE LU (real or simulated) and the
application it wishes to talk to. From then on only select control
packets are processed for this connection by the CTCP. The data session
processes the contents of Data Packets and Qualified Data packets.

TCP/IP for MVS and VM uses this function. It's CTCP is called TCPIPX25
and is defined on a VTAM APPL definition.

This is not compatible with GATE on the same MCH link

NPSI DEFINITION

PART C.

NPSI DEFINITION

NPSI Generation Process

◆ **NPSI Version 1 - Two Step Generation**

- • **Pre-Generation of NPSI** *VER 1 REL 4.3*

- • **NCP Generation w/NPSI**

◆ **NPSI Version 2 & 3 - Single Generation**

- • **NPSI generated inline w/NCP macros**

NPSI Definitions - Version 1

NPSI DEFINITION STATEMENTS

X25BUILD - Node level parameters
X25OUFT - Optional Facilities (Call in's)(Call outs)
X25VCCPT - SVC/PVC Flow Control
X25NET - PSDN Attributes
X25MCH - Physical Line *Multichannel link*
X25LCG - Logical Channels *Logical Channel Groups (1-K) under each MCH*
X25LINE - Virtual Circuits
X25PU   "   "
X25LU   "   "
X25VC   "   "
X25END - Gen Delimeter

0 - 255

Multichannel *4096*

SPEE Logical Virtual Circuits
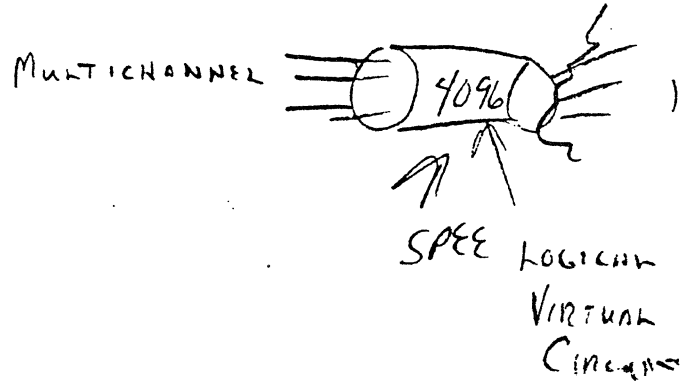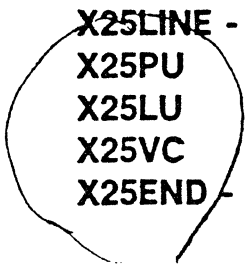
NPSI Definitions (Version 2 and 3)

```
BUILD (X25BUILD keywords moved here)
SYSCNTRL, HOST, PATH
SS and or BSC Lines, SDLC Lines
        X25.PAD   PAD SETUP PARAMETERS
        X25.TRAN
        X25.NET → DEFINES PACKET
        X25.OUFT  DEFINES OUTGOING FACILITIES
        X25.VCCPT
            X25.MCH
                X25.LCG
                X25.LINE
                X25.PU
                X25.LU
                X25.VC
        X25.END
Channel Adapter Definitions (3745)
SNI Definitions
GENEND
```

6024

CICS

VTAM

Host Prog.
Plan Installat.

BBN-

NCP

NPSI

873- 2937

STANDARD
INCOMING
CALL
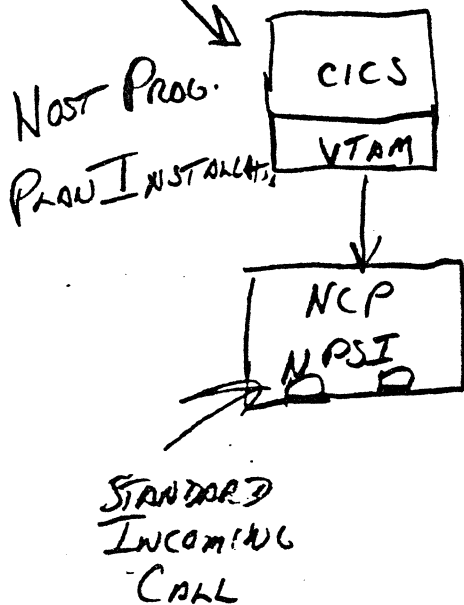
NPSI BUILD MACRO PARMS

```
BUILD  VERSION=V5R3,MODEL=3745,TYPEGEN=NCP,
        BFRS=128,USGTIER=3,X25.USGTIER=3,
```

NPSI usage tier may be greater than or equal to the NCP
usage tier.

NPSI BUILD MACRO PARMS ...

```
BUILD   VERSION=V5R3,MODEL=3745,TYPEGEN=NCP,
        USGTIER=4,X25.USGTIER=3,
        X25.IDNUMH=00,X25.MAXPIU=4K,
        X25.MCHCNT=2,X25.MWINDOW=7,
        X25.PREFIX=X,X25.SNAP=NO,
        X25.PAHINDX=1,
        other BUILD keywords........
```

Defining Network Connections

PART D.

Defining Network Connections

PSDN Network Characteristics
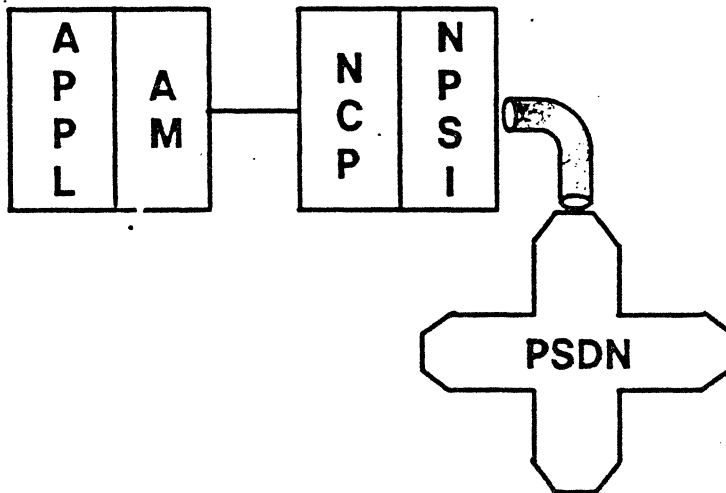
X25.NET   DM=NO,CHPINDX=3,NETTYPE=1,
          OUHINDX=3,CAUSE=IBM00,CRAFTRC=YES,
          INACTO=0,RESETINO=YES

PSDN Network Characteristics ...

VERSION 1 RELEASES

◆ NETTYPE=1

   ● Diagnostic Byte Mai.tained

   ● Valid reset cause byte

◆ NETTYPE=2

   ● No Diagnostic byte

   ● "00" Reset Cause cause byte

VERSION 2 & 3 RELEASES

When NPSI receives a Reset with cause code 07 (network congestion), if
NETTYPE is specified as:

◆ NETTYPE=1

   ● NPSI stops sending physical services physical services commands until
      it receives a:

        Reset with a cause code 00 (DTE originated)

        Reset with a cause code 09 · (Remote DTE operational)

        Reset with a cause code 0F (Network operational)

◆ NETTYPE=3

   ● NPSI continues sending physical services commands to the remote DTE
      since a TYPE 3 network (DDX-P) does not send a RESET 09

Defining The Access Link

(handwritten, top left) MODEM EMULATORS DTE DTE

(handwritten, top right) PACKET SWITCH PERFORMS DCE OR DATA SWITCHING. NPSI DOES NOT INT((DTE) IS-3174

```
A   A      N   N
P   M      C   P
P          P   S
L              I
```

(handwritten, right) HDLC LAPB
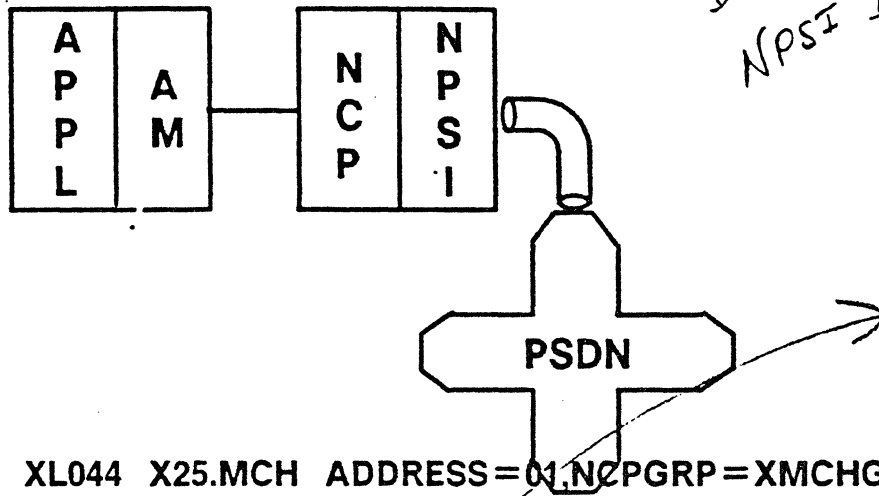
PSDN

XL044 X25.MCH ADDRESS=01,NCPGRP=XMCHGRP1,
                PUNAME=XP044,MACB=X25ACB01,
                SPEED=19200,ANS=STOP,
                STATION=DTE,DIRECT=NO,
                ENABLTO=3,DSABLTO=3,

The NPSI access link (or links) provide a physical attachment to
a PSDN. NPSI is an extension of NCP support, and its lines are
managed by VTAM. All physical and logical circuits therefore have
network names assigned to them. These names may be coded by the user
or may take default values at generation time. Default names are
described in chapter 4 of the Planning and Installation Manual.
  Default names for Multi-Channel Link (MCH)
      Group - XNETmn

    Line - XLxxx

    PU - XPxxx

    LU - XUxxx (only coded if using GATE or DATE)

    xxx is line address
    m is the sequence which this X25.NET macro appears in the gen
    n is the sequence this X25.MCH appears in under the X25.NET macro

VTAM Activation of the MCH Link

← INACTIVE
DM - ON FLAGS

Activating the Access Link

V NET,ACT,ID=XL044

VOLTAGE IN MODEM LEAD

(19.2)
X-24 RS232-24P
X-21 34-36 PIN:
56 KB

```
[VTAM]---[NPSI]--[ ]--[ ]--[DSE]    MODEMS
```

ACTLINK XL044
————————► **DTR** — *DATA TERMINAL READY*
                    ——►

DSR – *DATA SET READY*

POSITIVE RSP **◄——**
◄————————
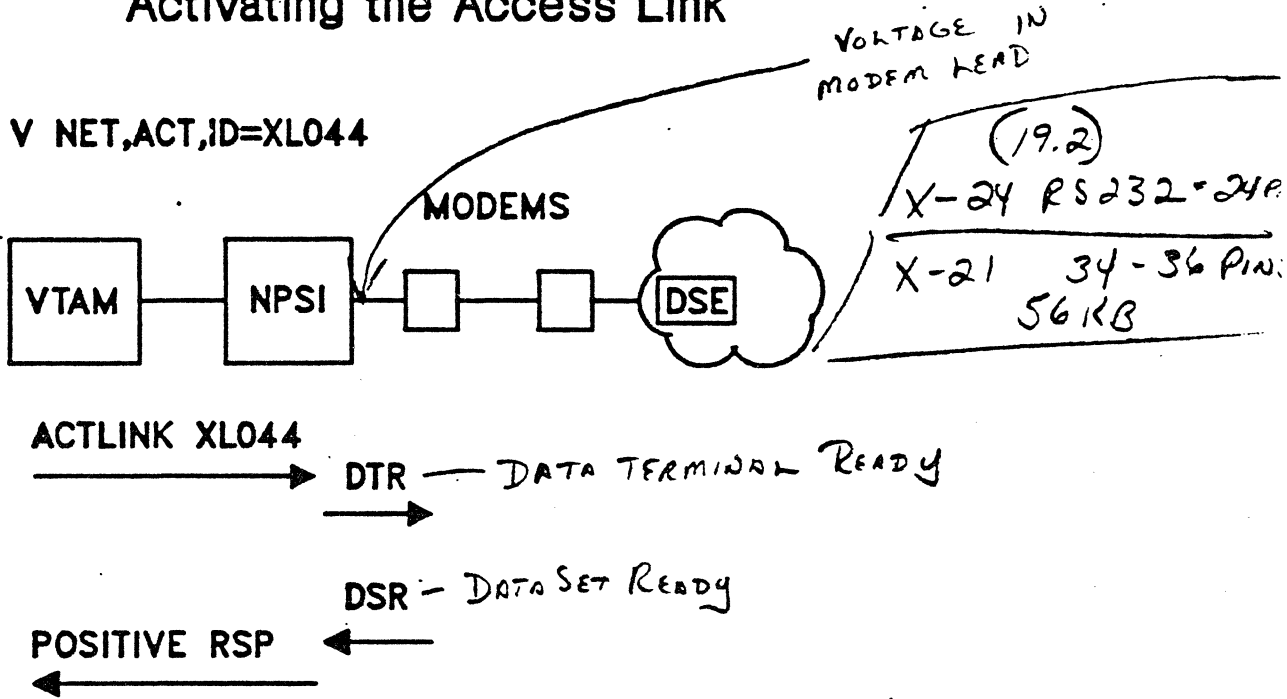
NOTES: ACTIVATION OF THE MULTICHANNEL LINK (MCH LINK)

◆ Physical access links to a PSDN are defined in NPSI on the X25. CH
   definition statement

◆ Line names may be user specified of may take NPSI defaults

   XL044 X25.MCH ADDRESS=044,ENABLTO=3,DISABLTO=3,.........

   After the NPSI/NCP gen this line appears in the NCP major node as:

   XL044 LINE ADDRESS=(044,FULL),ENABLTO=3,DISABLTO=3,UACB=(nnnX,nnnR),...

Activation of the line name (XL044) result in enabling the Physical
Level.

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Enabling PSDN Access

NPSI RESTS AS (Primary
AS Secondary) PUC' ARE RESET

← Incoming AND OUTGOING LOGICAL MODE
(full matrix)

Enabling Communication with a PSDN

V NET,ACT,ID=XPO44

VTAM — NPSI — □ — □ — DSE

MODEMS

2ND LINK STATION

3174

CONTACT XPO44 →

SNRm

SABM FRAME START ASYNC BALANCE MODE

UA

UA — FRAME ←

BOTH SIDES CAN ASYNCRONIZE
LINK LEVEL COMMANDS

CONTACTED ← RESTART PACKET →

PACKET
LABEL

ACTPU XPO44 ← RESTART CONFIRM ←

ACTPU RSP ←

PHYSICAL LINK. ACTIVATE
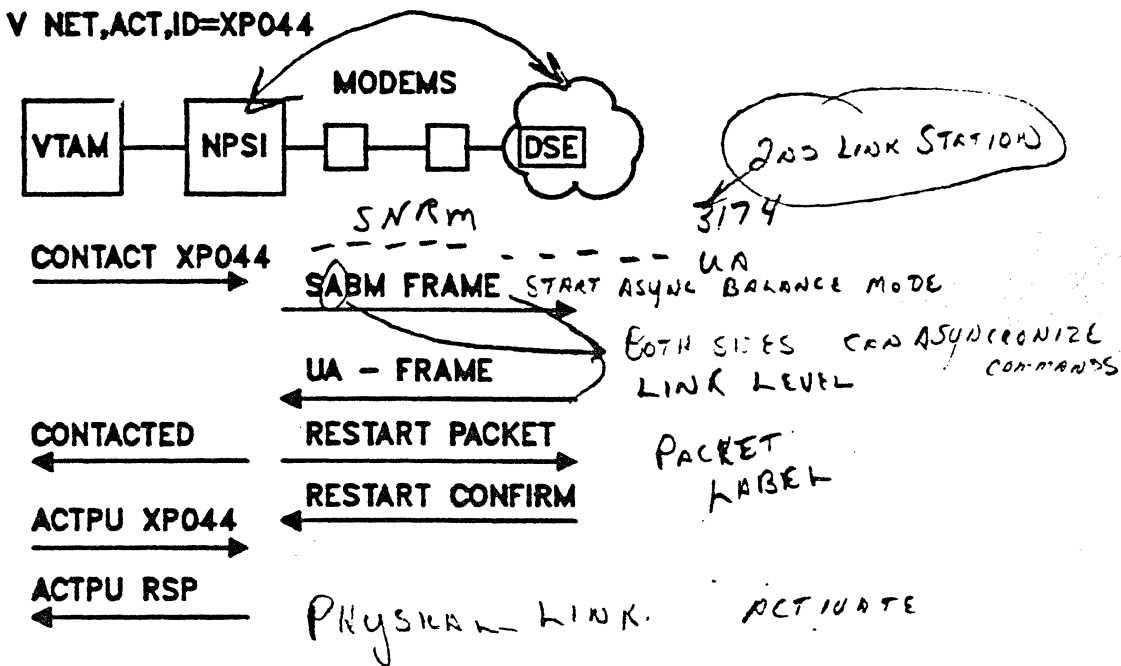
NOTES: ACTIVATION OF THE MCH PU

◆ The packet switch is represented to VTAM as a SNA Physical unit

   XLO44 X25.MCH ADDRESS=044,ENABLTO=3,DISABLTO=3,PUNAME=XPO44,...

   after the NPSI/NCP gen this PU appears to VTAM in the NCP major node as

   XLO44 LINE ADDRESS=(044,FULL),ENABLTO=3,DISABLTO=3,UACB=(nnnX,nnnR),...
   XPO44 PU PUTYPE=1,...........(referred to as the MCHPU)

Enabling PSDN Access ...

Enabling PSDN Access

◆ Activation of the MCH PU (XP044) results in initialization of the Link and Packrt Levels

◆ The SABM command issued by NPSI initializes the Link Layer

◆ Restart Request packet issued by NPSI to initialize the Network (Packet) Layer.

◆ All SVC logical channels are put into the ready state, PVC logical ch^nnels into the flow control ready state (ie reset)

◆ Restart Indication- Issued by the DSE/DCE to initialize or re-initialize the packet level.

◆ Restart Confirmation - Issued by DTE in response to a DSE/DCE Restart Indication, or by the DSE/DCE in response to a Restart Request.

Link level Flow Control

```
                   I — FRAMES
 ┌───────┐      ——N(s)=0———————→      ┌───────┐
 │       │      ——N(s)=1———————→      │       │
 │  DTE  │      ——N(s)=2———————→      │  DCE  │
 │       │             thru           │       │
 │       │      ——N(s)=7———————→      │       │
 │       │      ←———RR—N(r)=0———       │       │
 │       │      ——N(s)=0———————→      │       │
 └───────┘                            └───────┘
```
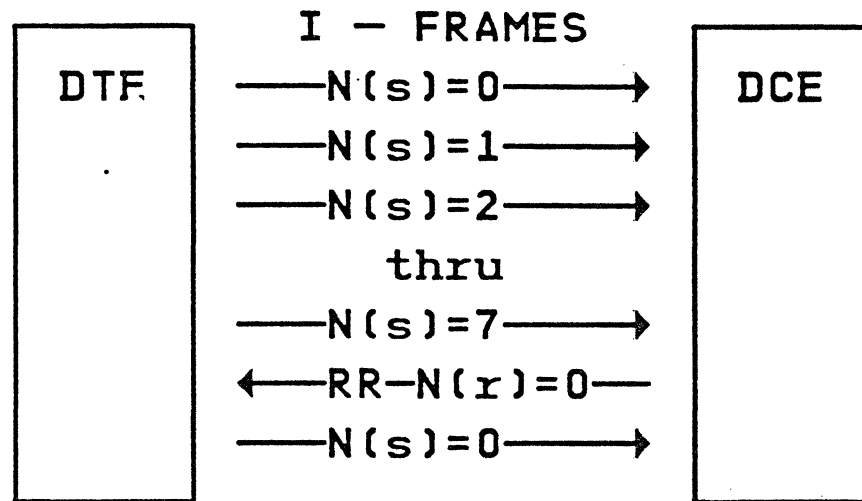
XL044 X25.MCH   MWINDOW=7,PKTMODL=8,
TPTIMER=1,T1TIMER=0,...

Flow control is performed on the physical link between a DTE and
a packet switching node, regulating the exchange of data in either
direction on the LOCAL INTERFACE.

Flow control is also performed at the virtual circuit level to
regulate the exchange of data between DTEs. A individual virtual circuit
on a access link may be inhibited from sending data, without affecting
other users of the physical connection to the switch.

In this example frames 0 and 1 might data flowing on logical channel
number 1; I frames 2 and 3 might be from logical channel number 9; etc...

Link Level Recovery Procedures

```
XL044   X25.MCH   TDTIMER=3,NDRETRY=3,NPRETRY=7
                  XMIT I Frames 0 to 7
                  ──────────────────────────────►
                     ◄──────RR N(r)=2────────
                     Start Error Recovery
                              │
                              ▼
        NPRETRY #1  XMIT I Frame # 2
                           thru
                    XMIT I Frame # 7
                  ──────────────────────────────►
                     ◄──────RR N(r)=2────────
        NPRETRY #2  XMIT I Frame 2 thru 7
                  ──────────────────────────────►
                     ◄──────RR N(r)=2────────
                    XMIT I Frames 2 thru 7
        NPRETRY #7  ──────────────────────────────►
                     ◄──────RR N(r)=2────────
                     WAIT TD Seconds
                  NDRETRY ►0 │ NDRETRY=0
                  ◄──────────────────
                              PU INOP
```
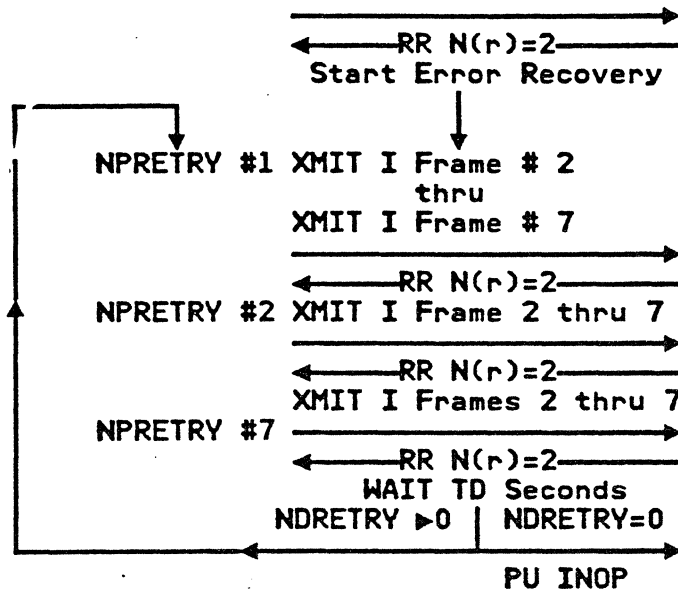
$SDLC \quad RETRIES = (M, T, N)$

$m \propto NPRETRY$

$\times TDTIMER$

Defining Usage of the Physical Link

XI044   X25.MCH   LCN0=NOTUSED,LCGDEF=(0,10),
          X25.LCG   LCGN=0
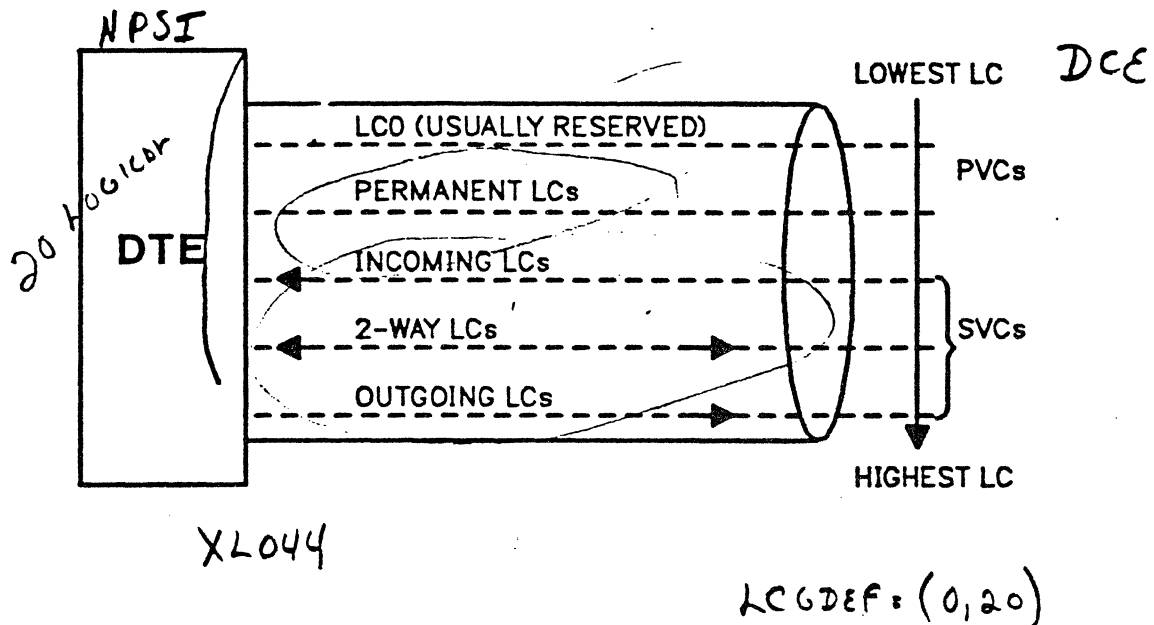
LCN0=USED or NOTUSED -
The LCN0 valu~ determines whether NPSI is to USE or NOTUSE logi~al
channel number zero on logical channel group zero. LCN0 can be reserved
by the network.
LCGDEF=(lcg,lcnhi) or ((lcg,lcnhi),(lcg,lcnhi))

LCGDEF=(0,255),LCN0=USED specifies that a range of logical channels
numbered 0 thru 255 are available for use by NPSI on this access link
(which is the full 256 channels on group zero). If 300 logical channels
were required you would code LCGDEF=((0,255),(1,43)) if LCN0=USED.

The X25.MCH specification defines which logical channel groups are
used on the access link. For each logical channel group defined, an
X25.LCG macro must be defined. Under this macro each logical channel
in the range specified must be defined by a X25.LINE or X25.VC macro.

Virtual Circuit Connect Parms

Most Vendors will allow you
PW = 2
PS = 128 omits.

X25.VCCPT INDEX=1,MAXPKTL=128,
INSLOW=(12,0),VWINDOW=2

Unsafe Danger!

X25.VCCPT INDEX=2,MAXPKTL=128,
INSLOW=(6,0),VWINDOW=2

X25.VCCPT INDEX=3,MAXPKTL=256,
INSLOW=(12,0),VWINDOW=2

X25.VCCPT INDEX=4,MAXPKTL=256,
INSLOW=(6,0),VWINDOW=2

```
     Index is relative position in VCCPT table
     Range of 1 to 99

This Virtual circuit connection parms allows the user to create CLASSES
OF SERVICE for virtual circuits. Virtual circuit definitions that follow
in the NPSI generation must specify which entry in the VCCPT table they
are to use.


As an example users assigned to use ENTRY 4 in the table use the same
 packet size as ENTRY 3, but if the NPSI node starts to experience
congestion it will slow down traffic for all users of ENTRY 3
before any user of ENTRY 4 is affected.
```

- filler page -

Defining Virtual Circuits

PART E.

Defining Virtual Circuits

WHAT SEQUENCE MUST LOGICAL CHANNELS BE DEFINED IN?

1. Any order, it doesn't matter

2. Incoming,Two-Way,Outgoing,PVCs

3. PVCs,Incoming,Two-Way,Outgoing

4. None of the above

5. I really don't know

Permanent Virtual Circuits

WHICH MACROS SHOULD BE USED FOR PVCS

SNA DTEs connected via PVCs

. **X25.LINE, X25.PU, X25.LU set**

LC PU ONE OR MORE

non-SNA DTEs connected via PVCs

X25.LINE, X25.PU, X25.LU set
or the (X25.VC macro)

ALLOWS YOU TO DEFINE
(ONE OR MORE PVC's)

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Switched Virtual Circuits

Switched SDLC To UTPM

WHICH MACROS SHOULD BE USED FOR SVCS ???

X25.LINE, and X25.PU   *No Lu.*

o*r* the X25.VC macro

Dummy Pu
" Lu
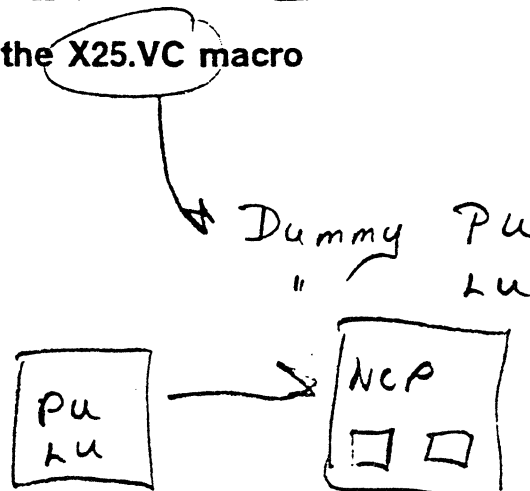
Defining PVC Connections

NPSI PVC Environment
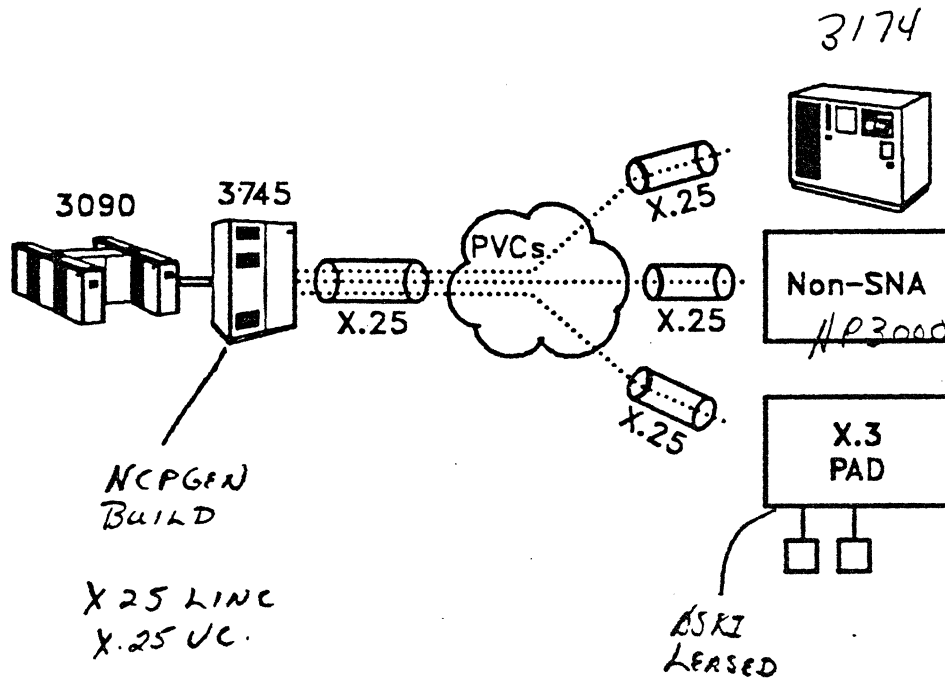
NOTES:

◆ NPSI can support PVCs to SNA, Non-SNA, and X.3 PAD devices

◆ DATE and GATE extensions may use PVCs to the nodes they control

◆ OSI/C.S.(for MVS and VM) does not support PVCs when it uses NPSI GATE

◆ TCP/IP (for MVS and VM) does not support PVCs when it uses NPSI DATE

VTAM View of PVCs

```
┌─────────┐   ┌───────┐  Leased    ┌─────────┐
│         │   │       │            │  3174   │─── LUs
│  VTAM   │───│  NCP  │            └─────────┘
│         │   │       │  Lines
└─────────┘   └───────┘       ╲    ┌─────────┐
                               ╲   │ AS/400  │─── LUs
                                ╲  └─────────┘
                                 ╲
                                  ↓
```
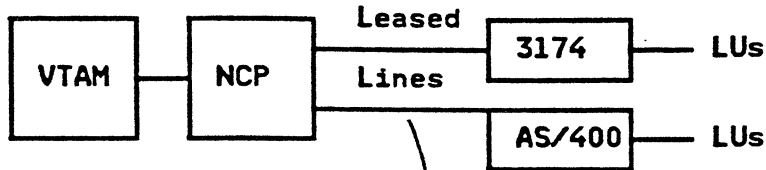
VTAM THINKS THEY ARE SDLC

NOTES:

VTAMs image of P_rmanent Virtual Circuits is that of a set of
leased lines which attach either PUT1 or PUT2 SNA nodes.

Lines must be activated by VTAM to bring PVC into service. PVC lines
can be set up to automatically start when the MCH PU has been brought up
or may be activated via VTAM operator command.

Non-SNA devices on PVCs appear to VTAM as a SNA PUT1 with a single
LU attached (LUT1 image). This LU image is simulated by NPSI.

SNA deviecs may support one or more LUs on the PVC.

VTAM View of PVCs ...

Sample PVC definition

```
XL044001 X25.LINE  TYPE=PERMANENT,.....................................
XP044001 X25.PU    PUTYPE=2,MAXDATA=521,................................
XU044001 X25.LU    MODETAB=3279INT,DLOGMODE=CICS,......................
```

after the NPSI/NCP gen this PU appears to VTAM in the NCP major node as

```
XL044001 LINE UACB=(nnnX,nnnR),....................................
XP044001 PU   PUTYPE=2,MAXDATA=521,................................
XU044001 LU   MODETAB=3279INT,DLOGMODE=CICS,......................
```

Logon Processing
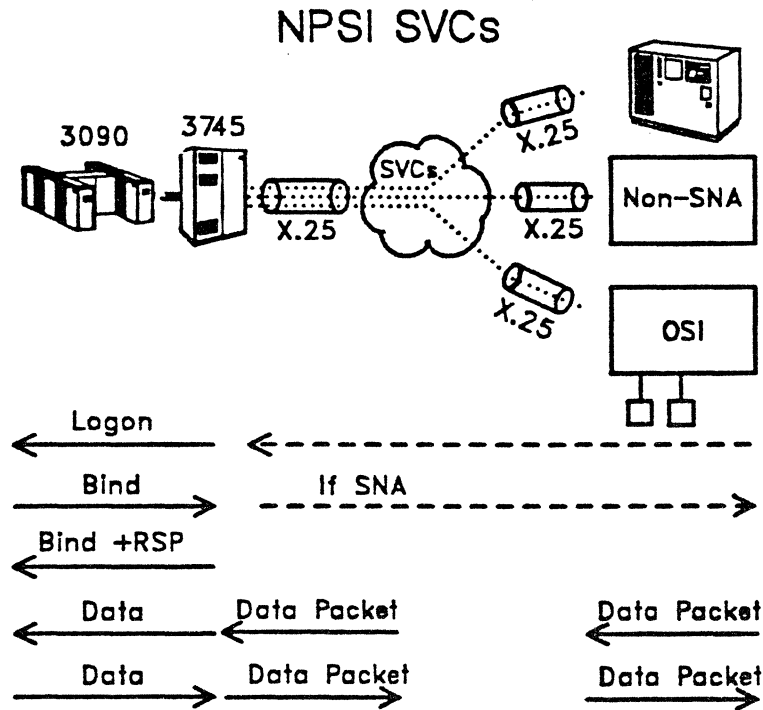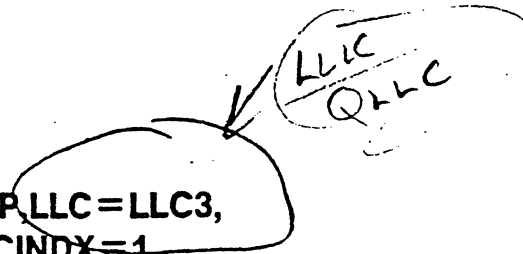
NPSI SVCs

NOTES: LOGON PROCESSING
- Logons are normally initiated by a user if the device is an SNA device (it may also be automatically logged on to an applicatio.)
- Logons normally are initiated by users of non-SNA deveices if they wish to talk to an SNA application thru VTAM (LOGAPPL also applies)

PVCs to SNA Peripheral Nodes

PVCs to SNA Peripheral Nodes ...

(handwritten annotation: LLC / QLLC)
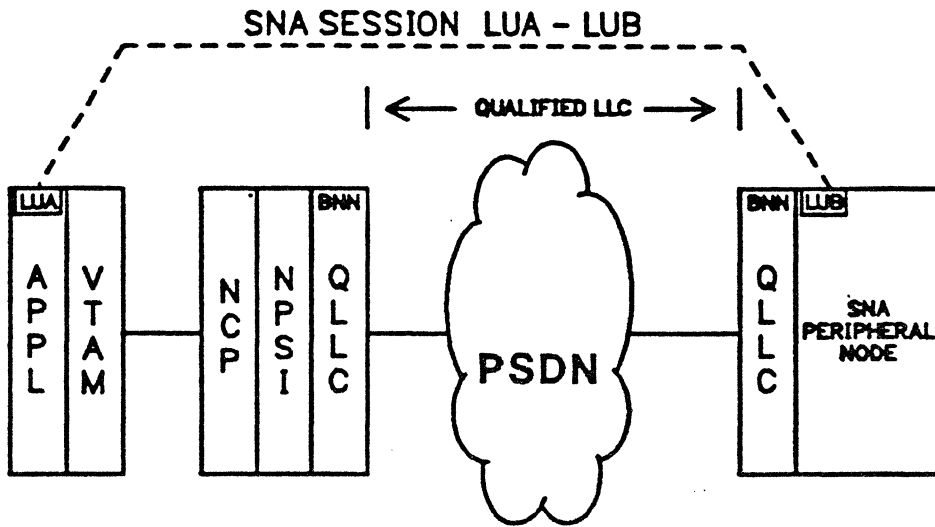
```
XL044000 X25.LINE  LCN=0,TYPE=P,LLC=LLC3,
                   DSTNODE=BNN,VCCINDX=1,
                   RETVCCT=30,RETVCTO=30


X3174CC1 X25.PU  PUTYPE=2,ADDRESS=C1,
                 MAXDATA=521,MAXOUT=7,
                 PUDR=NO,PASSLIM=12,
                 PACING=0,SSCPFM=USSSCS,
                 MODETAB=MODE3274


X3279CC1 X25.LU  LOCADDR=2,DLOGMOD=CI3279,
                 LOGAPPL=CICS1,LUDR=NO


X3279CC2 X25.LU  LOCADDR=3,DLOGMOD=CI3279,
                 LOGAPPL=CICS1,LUDR=NO
```

```
Default GROUP name for PVCs is X25Pxxxy
   xxx is physical link address
   y is lette. "A, B,..indicates the sequence of the Group on the MCH

VCCINDX is used to select packet size, packet window, slowdown priority
PU and LU definition uses the same values as on an SDLC line
```

PUT2.1 Node Support
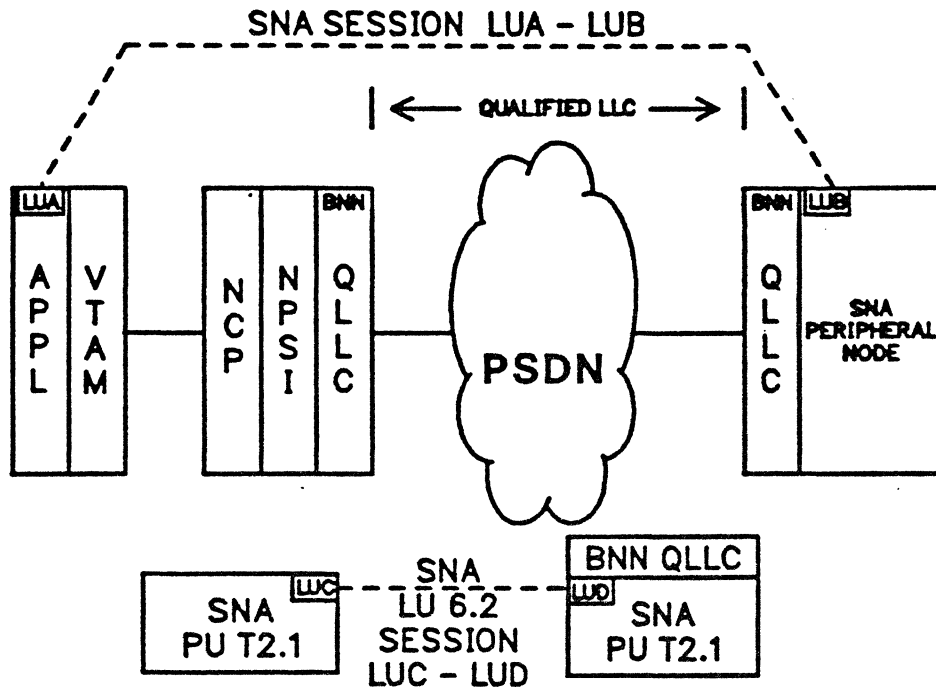
- ◆ Support for PUT2.1 LEN communication

- ◆ SVC or PVC

PVC - Permanent Virtual Circuit
SVC - Switched Virtual Circuit (or Virtual Call)

SNA Node PU/LU Definition (AS/400 Example)

```
XL044001 X25.LINE  LCN=1,TYPE=P,LLC=LLC3,
                   DSTNODE=BNN,VCCINDX=1,
                   RETVCCT=30,RETVCTO=30

X400CC01 X25.PU  ADDR=01,XID=YES,PUTYPE=2,
         PACING=7,VPACING=14,MODETAB=MTAS400,
         USSTAB=USAS400,SSCPFM=USSSCS,

X400ILU0  X25.LU  LOCADDR=0

X400DLU1  X25.LU  LOCADDR=2
X400DLU2  X25.LU  LOCADDR=3
```

Defining PVCs to other Subareas
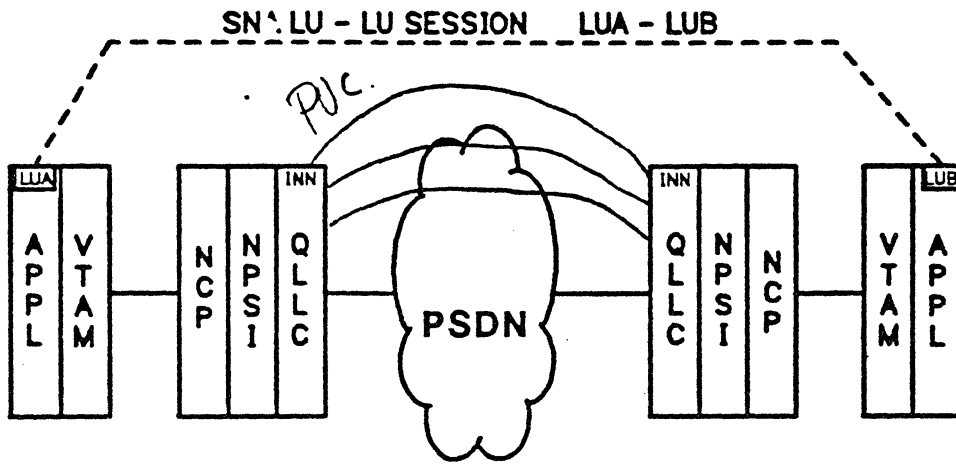
Defining PVCs to other Subareas ...

```
XL044002 X25.LINE   LCN=2,TYPE=P,LLC=LLC3,
                    DSTNODE=INN,VCCINDX=1,
                    RETVCCT=30,RETVCTO=30,
                    TRANSFR=33

XP044002 X25.PU   PUTYPE=4,TGN=22,ANS=CONT,
                  PUDR=NO,MAXOUT=7,
                  PASSLIM=254,
```

NPSI Installed in a Remote NCP

Remote NPSI MCH Link Activation
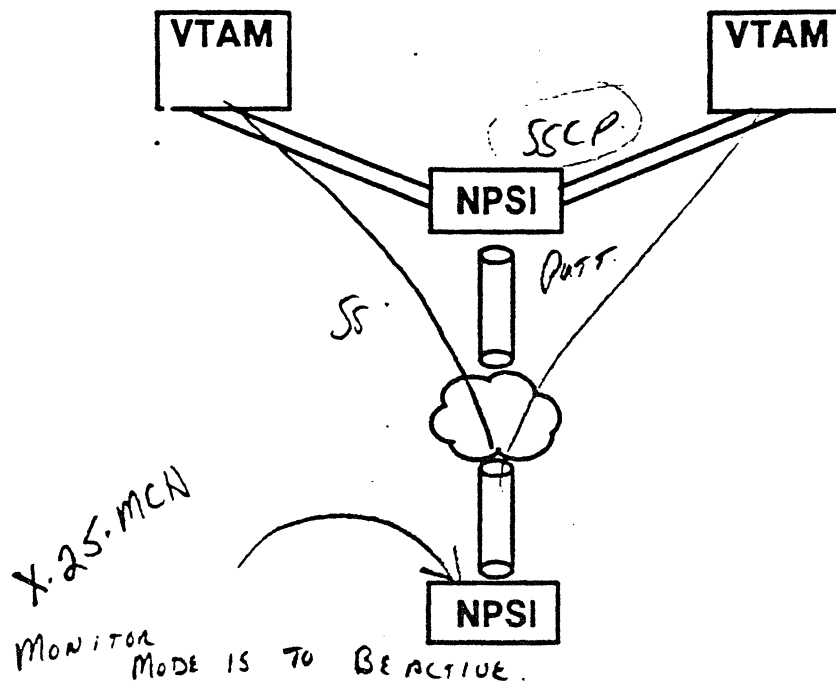
◆ SDLC Monitor Mode function extended to NPSI

   ● Readies ph_sical links to X.25 PSDN

   ● Readies INN PVC for activation

◆ Remote NCP must already be loaded

◆ X25.MNLNK macro invokes function

Remote NCP/NPSI Loaded from DISK

```
XL044  X25.MCH  ADDRESS=01,NCPGRP=XMCHGRP1,
               PUNAME=XP044,MACB=X25ACB01,
               FRMLGTH=259,PKTMODL=8,
               MWINDOW=2,DBIT=NO,
               SPEED=19200,T1TIMER=0,
               STATION=DTE,DIRECT=NO,
               ENABLTO=3,DSABLTO=3,
               ANS=NO,TPTIMER=1,NPRETRY=7,
               TDTIMER=3,NDRETRY=3,
               LCN0=NOTUSED,LCGDEF=(0,10),

       X25.MNLNK
```

```
Used in REMOTE NCP/NPSI subareas
Allows 3720/3745 loaded from disk to MCH link
Immediateley .ollows the X25.MCH macro
NO keywords coded on this definition
```

Non-SNA X.25 DTEs on PVCs

P I U

SNA SESSION
LUA – LUS

LUA					LUS
A P P L	V T A M		N C P	N P S I	P C N E

PSDN

NON-SNA
X.25 DTE

(DTE)
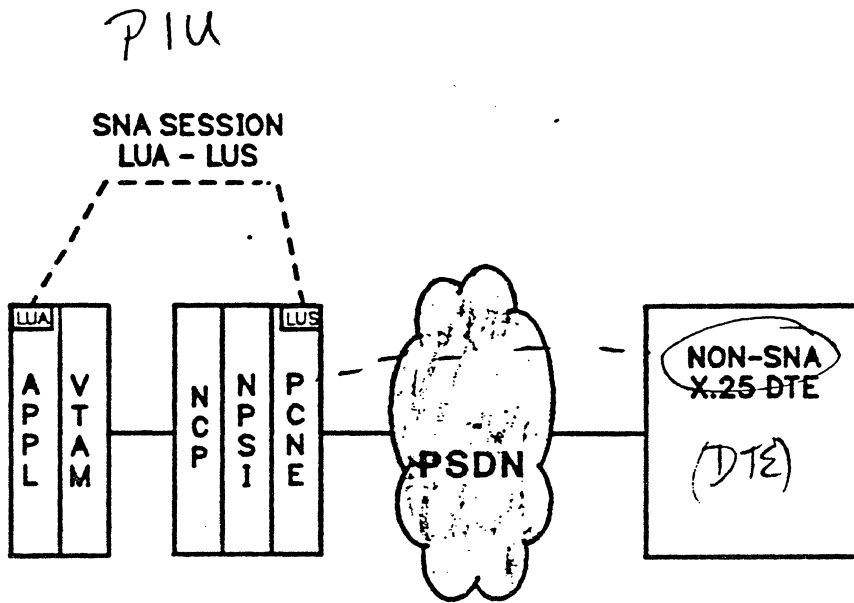
Non-SNA X.25 DTEs on PVCs ...

```
XL044003  X25.LINE  LCN=3,LLC=LLC0,TYPE=P,
                    VCCINDX=1

XP044003  X25.PU  PUTYPE=1,ADDRESS=C1,
                  MAXDATA=4096,MAXOUT=6,
                  PUDR=NO

XU044003 X25.LU  LOCADDR=0,VPACING=2,
                 PACING=(1,1),MODETAB=SIMLU1
```

$DLOGMOD = ENTRY$

$PCNE = LLC\emptyset$

$LCGDEF = (0, 20),$

X.3 PAD Support

```
PAD1     X25.PAD   INDEX=1,PADPARM=0715080001000400
PAD2     X25.PAD   INDEX=2,PADPARM=0701080001000400
TRANS1   X25.TRAN USER=1,
         DCIN0=00010203372D2E2F1605250B0C0D0E0F,
         DCIN1=101112133C5A322618193F271C1D1E1F,
```

SNA SESSION
LUA – LUS

LUA				LUS				

APPL VTAM   NCP NPSI PCNE INT PAD   PSDN   X.3 PAD   NON-SNA DTE (TWX)

X.29   X.3   X.28
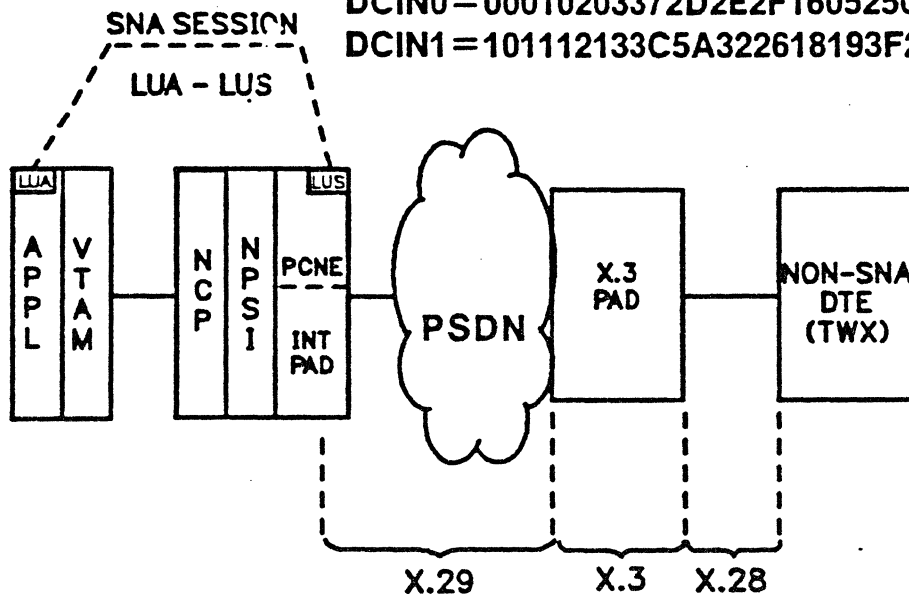
```
X25.PAD index is referred to on X25.MCH statement
  Range of 1 to 99
X25.TRAN user is referred to on X25.MCH statement
  Range of 1 to 2
```

Defining PVCs to X.3 PAD Devices

```
XL044   X25.MCH   ADDRESS=01,NCPGRP=XMCHGRP1,

           PAD=INTEG,PWPROT=YES,
           SHUTD=INVCLR,TRAN=NO,LSPRI=NO,
           PADBRKCD=(0084,0085),PADINDX=1,

XL044004  X25.LINE  LCN=4,LLC=LLC5,TYPE=P,
              VCCINDX=2

XP044004  X25.PU  PUTYPE=1,ADDRESS=C1,
              MAXDATA=65535,MAXOUT=6,
              PUDR=NO

XU044004  X25.LU  LOCADDR=0,VPACING=2,
              PACING=(1,1),
              MODETAB=SIMLU1
```

G3637

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DEF-21

Integrated (X.3) PAD Enhancements

Integrated PAD Enhancements
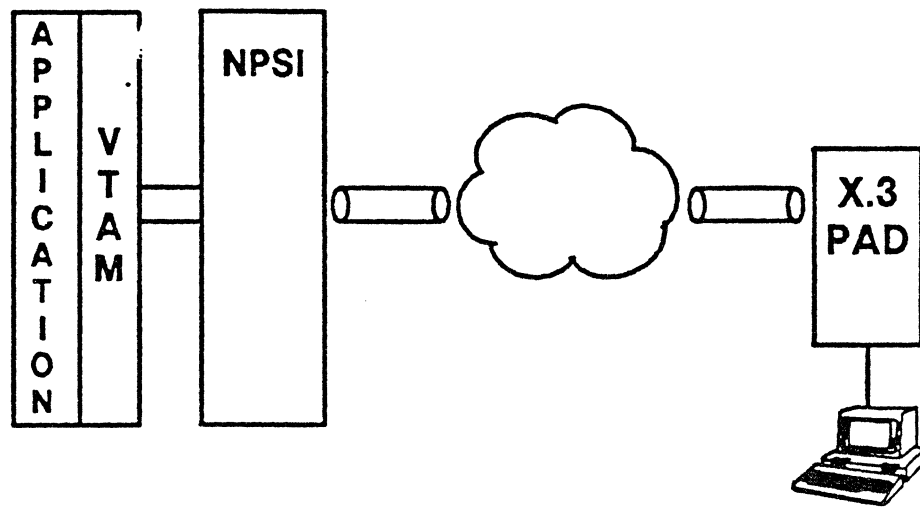
◆ **Password protection for appls (TSO,.....)**

◆ **NPSI detects if PAD supports echo function**

    ● **Q-data packet sent to the PAD to validate**

Integrated (X.3) PAD Enhancements ...

◆ **Inhibit presentation in data stream**

- **Echo function turned off if X.3 PAD supports Echo function**

- **8 character blackout message sent to the device if X.3 PAD does not support the Echo function**

◆ **Enable presentation in data stream**

- **Echo function turned on when X.3 PAD supports Echo function**

X.3 PADs interface S/S devices to an X.25 PSDN. This is the only type of device that has a PAD defined for it by the International Telephone & Telegraph Consultative Committee (CCITT). The NPSI function that supports this PAD type is referred to as Integrated PAD (integratic of the X.29 control function that can be implemented by a host/ or fron- end controller for PAD setup functions). NPSI implements a subset of the X.29 control function, which now includes manipulation of the Echo function.

Support for non-Standard PADS
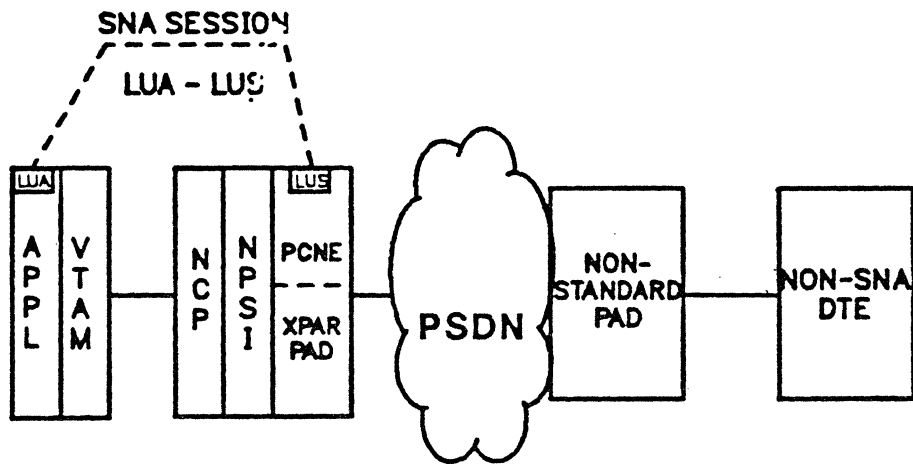

```
Application identifies packet type to build
If BYTE 0 of RU is:
    x'00'  NPSI builds DATA PACKET w/NO Q BIT
    x'02'  NPSI builds DATA PACKET with Q BIT
    x'1B'  NPSI builds RESET PACKET
    x'1B'  NPSI builds RESET CONFIRMATION PACKET
    x'23'  NPSI builds INTERRUPT REQUEST PACKET
    x'27'  NPSI builds INTERRUPT CONFIRMATION PACKET
```

Support for non-Standard PADS ...

```
XL044  X25.MCH  ADDRESS=01,NCPGRP=XMCHGRP1,
                    .
               PAD=TRANSP

XL044004  X25.LINE  LCN=3,LLC=LLC5,TYPE=P,
                 VCCINDX=3
            .

XP044004  X25.PU  PUTYPE=1,ADDRESS=C1,
                 MAXDATA=65535,MAXOUT=6,
                 PUDR=NO

XU044004  X25.LU  LOCADDR=0,VPACING=2,
                 PACING=(1,1),MODETAB=SIMLU1
```

Defining Many Non-SNA PVCs With One Macro

```
XL044  X25.MCH  ADDRESS=01,NCPGRP=XMCHGRP1,

       LCN0=USED,LCGDEF=(0,10),

       X25.VC  LCN=(5,6),LLC=LLC0,TYPE=P,
               VCCINDX=4
```

```
PVCs for non-SNA only

Default names for Virtual Circuit Links
    Line - XLxxxnnn
    PU - XPxxxnnn
    LU - XUxxxnnn
    XXX is line address
    nnn is Hexadecimal Logical Channel Number
```

Switched Virtual Circuits

Switched Virtual Circuits

SVCS, LIKE SWITCHED SDLC LINES REQUIRE ??

1. A VTAM Switched Major Node definition

2. An Auto Call units installed on the controller

3. An LUDRPOOL allocation in NCP

4. 1 and 3

5. 1 and 2

Defining SVC Support

```
XL044  X25.MCH  ADDRESS=01,NCPGRP=XMCHGRP1,

              LCN0=USED,LCGDEF=(0,10),
              LLCLIST=(LLC0,LLC3,LLC5),
              CCXDELAY=5,IDBLKC=064,
              IDBLKP=063,IDBLKG=062

       X25.VC  LCN=(7,10),TYPE=S,CALL=IN,
               VCCINDX=1,OUFINDX=1,NCPGRP=SVCGRP1

       X25.VC  LCN=(11,15),TYPE=S,CALL=INOUT,
               VCCINDX=1,OUFINDX=1,NCPGRP=SVCGRP2

       X25.VC  LCN=(16,20),TYPE=S,CALL=OUT,
               VCCINDX=1,OUFINDX=1,NCPGRP=SVCGRP2
```

(handwritten annotation) ← DIFFERENT # of 003 is DEFAULT FOR

NPSI Support of SVCs
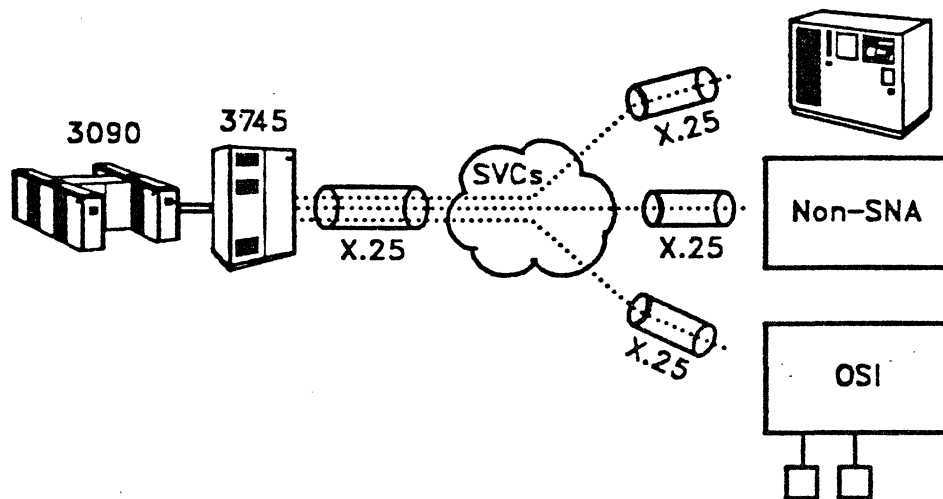
NOTES: NPSI SVC SUPPORT

◆ NPSI can impl_ment SVCs to DTEs using its support for:

- QLLC - Both BNN QLLC and INN QLLC

- PSH

- PCNE and PAD

- GATE - to support OSI/C.S.

- DATE - to support TCP/IP

VTAM Image of SVCs

VTAM Physical Image

3174 PUT2
3767 PUT1 LUT1
3767 PUT1 LUT1

PSTN

NCP
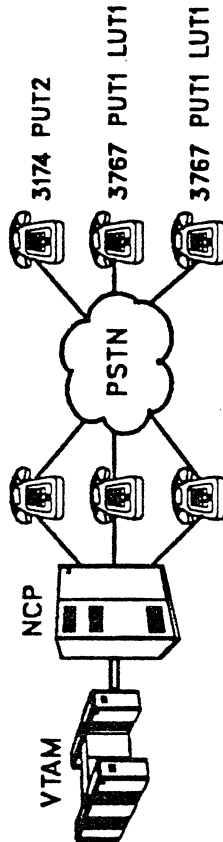
VTAM

NOTES: NPSI SVC SUPPORT

◆ VTAMs image o. the Switched virtual circuits is that of a set c.
switched SDLC lines on which a PUT1 or PUT2 device will initiate a call

◆ Switched major nodes must be coded in VTAM to support this image

NCP must be set up with a LUDRPOOL definition statement coded with:

● keyword NUMTYP1= coded to allocate LU control blocks for PUT1s in
the LUDRPOOL

● keyword NUMTYP2= coded to allocate LU control blocks for PUT2s in
the LUDRPOOL

The LUDRPOOL is generated in the NCP load module.

VTAM Image of SVCs ...

VTAM Physical Image of Network

◆ Upcoming visuals compare SDLC switched line usage to SVC usage

◆ Next foil looks e. activa⁺ion of Physical Layer and is followed
   by foils showing the activation of the Link, Packet, and Transport Layers

◆ Switched major nodes discussed as we wrap up this concept

```
        X25.VC LCN=(2,10),TYPE=S,CALL=INOUT
```

Output of the generation would represent the SVCs as switched SDLC lines

```
XL04400A LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
XP04400A PU TYPE=(1,2),.....
XL044009 LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
XP044009 PU TYPE=(1,2),.....
           .
           .
           .
XL044002 LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
XP044002 PU TYPE=(1,2),.....
```

NCP Switched Lines

NCP Switched Line
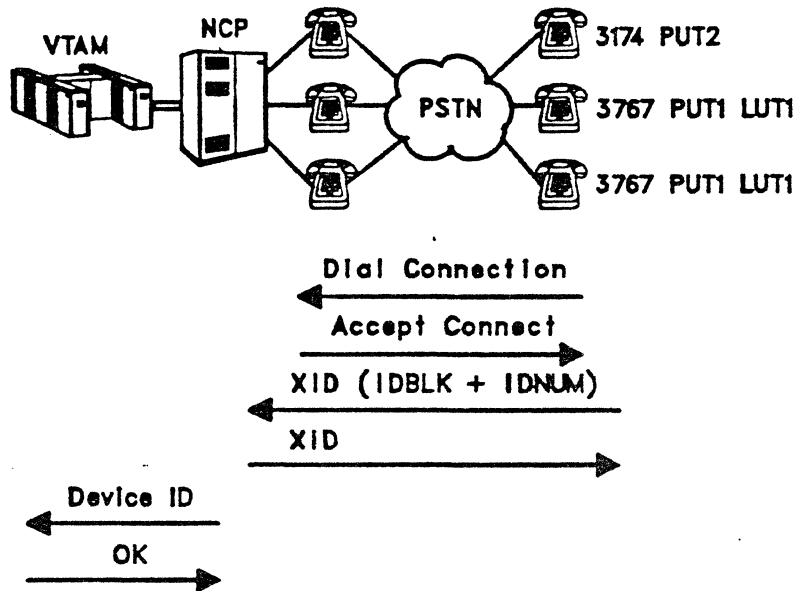
NOTES: COMPARISON OF SDLC SWITCHED TO SVCS

◆ Lets review how an switched SDLC line is brought into service and then we will look at how a NPSI SVC is brought into service

◆ SNA devices may call into NCP ports authorized for CALL=IN or INOUT

◆ The ports must first be activated

◆ A device must provide a IDBLK/IDNUM value to VTAM, which is compared against a Switched Major Node in VTAM (the SMN must have been activated)

NCP Switched Lines

NCP Switched Line

SMN PU Image →

Act PU →

SMN LU Image →

Act LU →
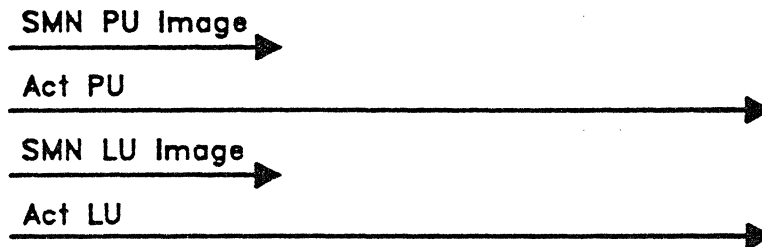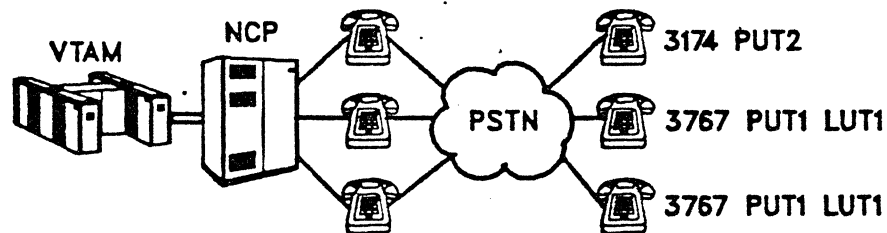
NOTES: SDLC SWITCHED (CONT)

◆ If a match is found VTAM transfers the PU image to NCP to fill in the PU control block

◆ LU images are also passed to NCP, and are filled in to LU control blocks drawn out of the LUDRPOOL

◆ The PU and LU are activated, and the end user may then LOGON to an application

SVC Incoming Call

NPSI SVCs

← Incoming Call	← Call Request
	CUDp = XX
Call Accepted →	← Call Connected
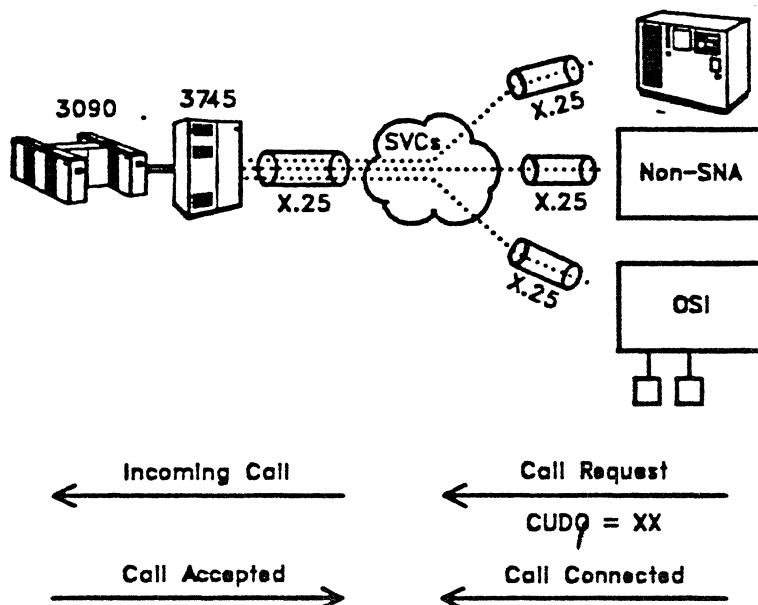
NOTES: SVC INCOMING CALL

The first byte of the Call User Data field of the call request packet
identifies to NPSI the type of logical link control to use for the DTE
(called the protocol id).
    x'C0' identifies the calling DTE as one requiring PCNE
    x'C2' identifies the calling DTE as one requiring PSHC
    x'C3' identifies the calling DTE as one requiring QLLC for INN/BNN
    x'E3' identifies the calling DTE as one requiring QLLC for INN SVCs
    x'C4' identifies the calling DTE as one requiring GATE
    x'01' identifies the calling DTE as one requiring PAD
    x'41' identifies the calling DTE as one requiring PAD
    x'51' identifies the calling DTE as one requiring PAD
    x'81' identifies the calling DTE as one requiring PAD

All calls are accepted by NPSI. Security checking done by VTAM and
applications during logon processing.

SVC Outgoing Call

NPSI SVCs

Connection Request	Call Request	Incoming Call

Connection Established	Call Connected	Call Accepted
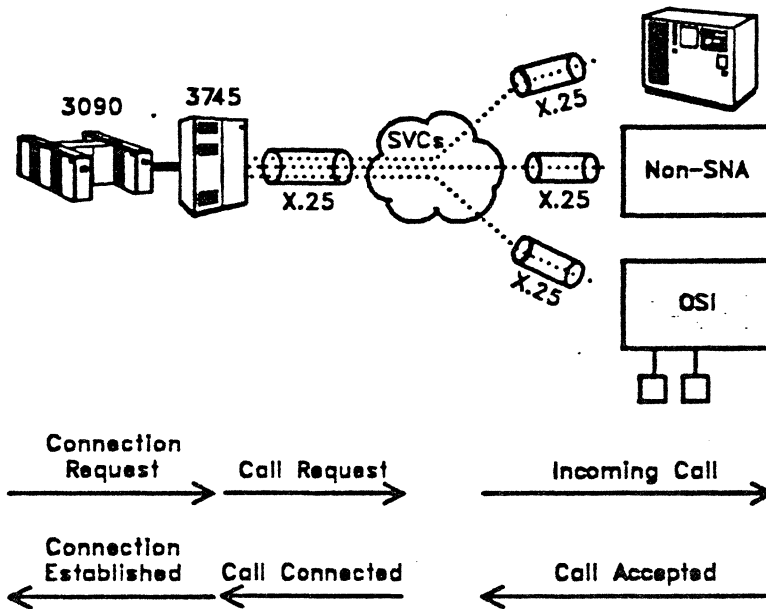
NOTES: SVC OUTGOING CALL

Outgoing calls initiated by applications issuing an acquire of an
LU that is defined in a Switched Major Node. The SMN must have already
been activated by VTAM. VTAM uses a PATH statement in the Switched
Major Node to provide NPSI the DTE address, facilities and flow control
required to enable NPSI to build a Call Request Packet.

PATH Statement for Call Out

PATH

DIALNO=NNN..N{ MMM..M}LXXYY{*ZZZZZ}

NNN..N 1- 15 digit Called DTE's address

MMM..M (optional) 1- 15 digit Calling DTE's address

LXXYY

    L is used to select LLC
    XX is 2 digit VCCPT index (for Flow Control)
    YY is 2 digit OUFT index (for Optional Facilities)

ZZZZZ 5 digit IDNUM for Type 0 or 5 VC

PATH Statement for Call Out ...

Path Definition Statement Values
- ◆ Positioned between a PU definition statement and its LU definitions
- ◆ L values may be:
  - L=0 selects LLC0 with a x'C0' placed in CUD0
  - L=1 selects LLC3 with a x'E3' placed in CUD0 for a PUT4/5
  - L=2 selects LLC2 with a x'C2' placed in CUD0 for SNA w/NIА
  - L=3 selects LLC3 with a x'C3' placed in CUD0 for SNA w/QLLC
  - L=5 selects LLC5 with a x'01000000' in the CUD
  - L=6 selects LLC5 with a x'51000000' in the CUD
  - L=7 selects LLC5 if you define a GATE CTCP/LLC selection table
  - L=8 selects LLC5 with a x'81000000' in the CUD
  - L=9 selects LLC5 with a x'41000000' in the CUD
  - L=(:) selects LLC0 if you define a GATE CTCP/LLC selection table
  - L=(.) selects LLC0 if you define a GATE CTCP/LLC selection table

X25.OUFT (SVC Call-Out)

```
X25.NET  DM=NO,CHPINDX=3,NETTYPE=1,
         OUHINDX=3,CAUSE=IBM00,CRAFTRC=YES,
         RFAC=(FASTSEL,CALLREDIR),
         NSTDFAC=(05,1F,FF)

X25.VCCPT INDEX=1

X25.OUFT INDEX=1

X25.OUFT INDEX=2,OPTFACL=0101

X25.OUFT INDEX=3,USRFILD=123,USRFIL2=456
```

.Index is relative position in OUFT table . Range of 1 to 99

Setting up Switched Virtual Circuits
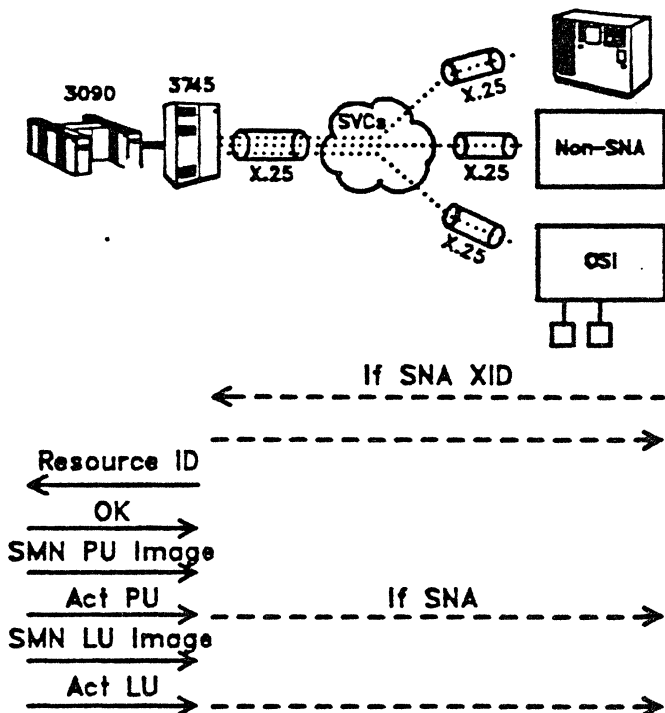
NOTES: DEVICE IDENTIFICATION PROCESS

◆ To verify if an SVC attached device should be allowed access to VTAM an XID process is used by NPSI to gain the devices IDBLK/IDNUM if it is an SNA device.

◆ Non-SNA devices cannot send XIDs to NPSI. NPSI simulates an incoming an IDBLK/IDNUM has come in from the device to satisfy this VTAM requirement.

◆ Once this is passed to VTAM, VTAM uses its standard switched support to set up the virtual circuit which it perceives is a PUT1/LUT1 device.

◆ The application then must screen the user via passwords.

Setting up Switched Virtual Circuits ...

ID values assigned non-SNA devices

NPSI assigns a default IDBLK of x'003' for all non-SNA nodes

The default IDNUM is formrd from to inputs

On the BUILD definition statement the X25.IDNUMH value provides the
first two digits of the default IDNUM. If it is coded X25.IDNUMH=02 all
default idnums for that NPSI node are in the form of x'02xxx'

The 'xxx' part of the IDNUM is assigned in sequence that the SVC Line
Names appear in the Resource Vector Table in the NCP. The values start
at a value of x'0n2' and is incremented by 2 for each successive SVn line
name. This value is created at NPSI generation time for each SVC line.

NPSI SVC lines are created by the X25.VC definition


```
        BUILD X25.IDNUMH=02
              .
              .
  XL044 X25.MCH Address =044,........,LCGDEF=(0(10),LCNO=NOTUSED
        X25.LCG LCGN=0
        X25.VC LCN=(2,10),TYPE=S,CALL=INOUT
```

Output of the generation would represent
the SVCs as switched SDLC lines


```
  XL04400A LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
  XP04400A PU TYPE=(1,2),......
  XL044009 LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
  XP044009 PU TYPE=(1,2),......
              .
              .
              .
  XL044001 LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
  XP044001 PU TYPE=(1,2),......
```

Though the default IDNUM is not shown XP04400A would be x'02002',
XP04400A would be x'02004',......,XP044003 would be x'02010',
XP044002 would be x'02012'

Switched Major Node (Call In)

SMN   *NON SNA*

```
OSIPU1    PU   PUTYPE=1,ADDRESS=C1,
               MAXDATA=4096,MAXOUT=6,
               IDBLK=003,IDNUM=02002,
               PUDR=NO


OSILU1    LU   LOCADDR=0,VPACING=2,
               PACING=(1,1),MODETAB=SIMLU1


OSIPU2    PU   PUTYPE=1,ADDRESS=C1,
               MAXDATA=4096,MAXOUT=6,
               IDBLK=003,IDNUM=02004,
               PUDR=NO


OSILU2    LU   LOCADDR=0,VPACING=2,
               PACING=(1,1),MODETAB=SIMLU1
```

NOTES: USABLE EXAMPLE FOR ANY NON-SNA DTE

◆ A switched major node is required for all resources with a switched image to VTAM.

◆ This example shows a PUT1 image for non-SNA devices.

  ● PUTYPE must be equal to one

  ● MAXOUT must be set to 6, to trigger NPSI to buffer data coming in from the DTE until the SSCP - DTE LU session is established

  ● Only one LU is simulated per non-SNA DTE

  ● The logmode entry format is documented in the OSI/C.S. manuals and the NPSI Host Programming Manual (my entry is in Logon Mode Table SIMLU1, and is the first entry in the table)

◆ You can use the same definition for a SNA device that is on a SVC as you would for a SDLC switched line.

Logon Processing
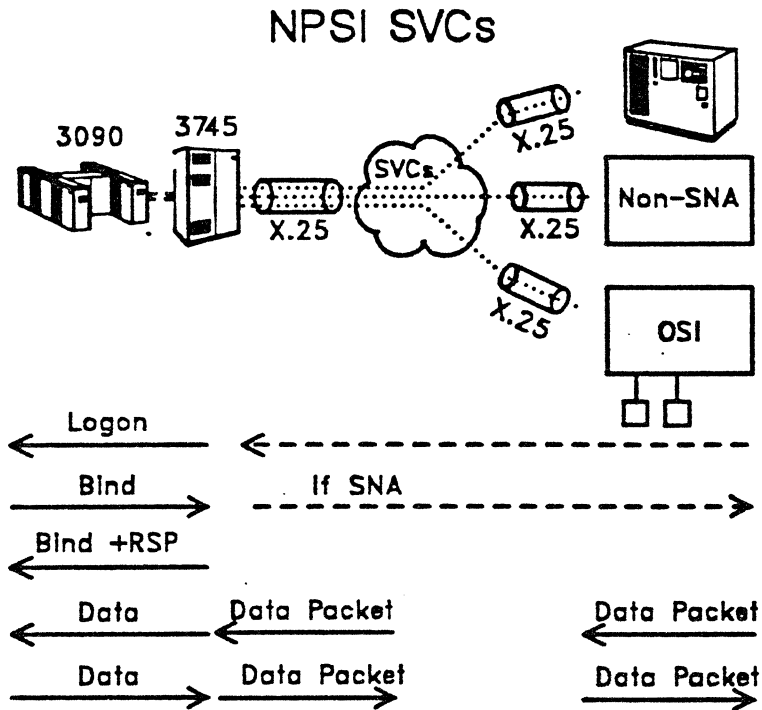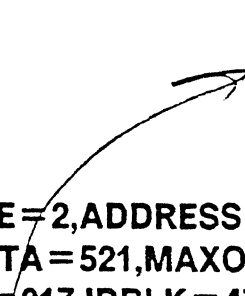
NPSI SVCs

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NOTES: LOGON PROCESSING
◆ Logons are normally initiated by a user if the device is an SNA device (it may also be automatically logged on to an application)
◆ Logons normally are initiated by users of non-SNA deveices if they wish to talk to an SNA application thru VTAM (LOGAPPL also applies)

SMN (SNA X.25 or SNA w/NIA)

→ *HARD CONFIRMED INFO*

```
X3174001 PU  PUTYPE=2,ADDRESS=C1,
             MAXDATA=521,MAXOUT=7,
             IDNUM=017,IDBLK=47935,
             PUDR=NO,PASSLIM=12,
             PACING=0,SSCPFM=USSSCS,
             MODETAB=MODE3274

X4001002 LU  LOCADDR=2,DLOGMOD=CI3279,
             LOGAPPL=CICS1,LUDR=NO

X4001003 LU  LOCADDR=3,DLOGMOD=CI3279,
             LOGAPPL=CICS1,LUDR=NO
```

```
CPNAME or IDBLK/IDNUM may be coded for an PUT2.1 node
XID=YES must be specified if this is a PUT2.1 node
```

SMN (NON-SNA DTEs)

```
LAVAX     PU  PUTYPE=1,ADDRESS=C1,PUDR=NO
              MAXDATA=4096,MAXOUT=6,
              IDBLK=003,IDNUM=02002
LAVAXAPP  LU  LOCADDR=0,VPACING=2,
              PACING=(1,1),MODETAB=SIMLU1
SFHP3000  PU  PUTYPE=1,ADDRESS=C1,PUDR=NO,
              MAXDATA=4096,MAXOUT=6,
              IDBLK=003,IDNUM=02004
SFHPAPPL  LU  LOCADDR=0,VPACING=2,
              PACING=(1,1),MODETAB=SIMLU1
NYDG001   PU  PUTYPE=1,ADDRESS=C1,PUDR=NO,
              MAXDATA=4096,MAXOUT=6,
              IDBLK=003,IDNUM=02004
NYDGAPPL  LU  LOCADDR=0,VPACING=2,
              PACING=(1,1),MODETAB=SIMLU1
```

TERM=TWX may be coded for applications like CICS, TSO...

PATH Statement for Call Out

PATH

    DIALNO=NNN..N{ MMM..M}LXXYY{*ZZZZZ}

NNN..N 1- 15 digit Called DTE's address

MMM..M (optional) 1- 15 digit Calling DTE's address

LXXYY

    L is LLC selected
    XX is 2 digit VCCPT index defined in NPSI
    YY is 2 digit OUFT index defined in NPSI

ZZZZZ 5 digit IDNUM for Type 0 or 5 VC

Subarea-to-Subarea SVC Support

INN SVC SUPPORT
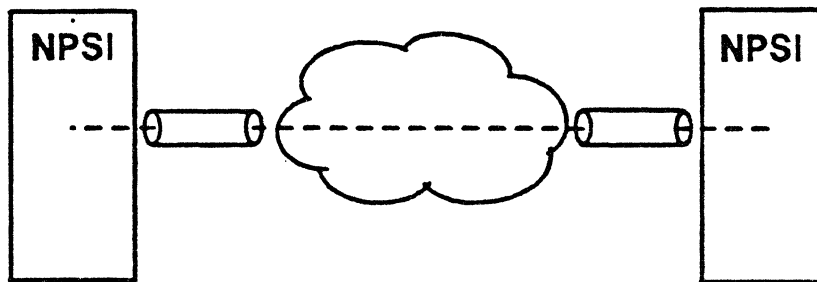
◆   X.25 SVCs compliment NCP subarea dial

●   Allows cost savings over PVCs

●   SVCs to other 37XX w/NPSI, 9370s, & 4361

SVCSC Coding w/out Short HOLD Mode

```
XL044  X25.MCH  ADDRESS=01,NCPGRP=XMCHGRP1,

       LCN0=USED,LCGDEF=(0,10),
       LLCLIST=(LLC0,LLC3,LLC5),
       SVCINN=2,SHM=NO,ACTIVTO=300,
       BRKCON=CONNECTO
```

Short Hold Mode - SVC Disconnection

SVC Short Hold Mode
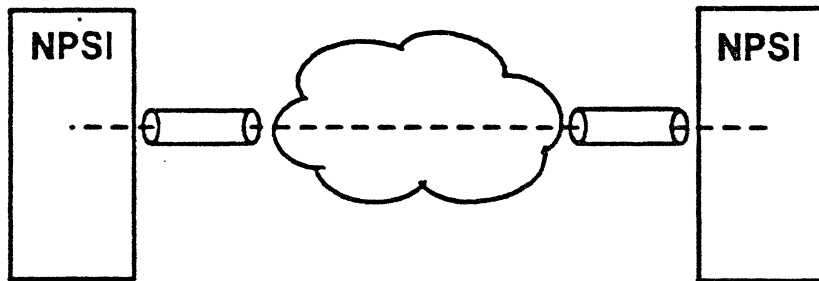
◆   Short Hold Mode Timer

   ●   User-specified at generation time

   ●   If timer expires with no traffic on SVC, the SVC is cleared

◆   SVC is reinitialized when data is to be sent or received

◆   Transparent to VTAM & NCP

MCH CODING FOR SHORT HOLD MODE

```
XL044  X25.MCH  ADDRESS=01,NCPGRP=XMCHGRP1,

        LCN0=USED,LCGDEF=(0,10),
        LLCLIST=(LLC0,LLC3,LLC5),
        SVCINN=2,SHM=YES,SDRTCNT=4,
        SDRTIME=10
```

SMN SVCSC (VTAM CALLING OUT)

```
XP044002 PU  PUTYPE=4,TGN=22,ANS=CONT,
             MAXOUT=7,SUBAREA=2,NETID=NET1,
             PASSLIM=254,IDNUM=12345,

         PATH CALL=OUT,GID=1,PID=1,
             GRPNM=SVCGRP3,
             DIALNO=123456789130301,
             SHM=YES,
             SHMTIM=45
```

Dial digits 1234567891 are the called DTE address. The CALLING DTE
address field is filled in by the DSE. It delivers the INCOMING CA'L
PACKET to the other NPSI node, which then verifies if the calling DTE
is a valid PUT4/5 to communicate with.

The digits 30301 break out to mean: 3 - LLC3 selection; 03 - VCCPT
entry 3 is to establish class of service; 01 - OUFT entry 1 is requested

SVCGRP3 is selected because it has the OUTGOING LOGICAL CHANNELS
defined.

SMN SVCSC (VTAM RECEIVING CALL)

```
XP044002 PU  PUTYPE=4,TGN=22,ANS=CONT,
             MAXOUT=7,SUBAREA=3,NETID=NET1,
             PASSLIM=254,IDNUM=12345,

         PATH CALL=IN,GID=2,PID=2,
             GRPNM=SVCGRP1,
             VERIFY=YES,
             VERID=1234567891,
             SHM=~~NO~~ yes
```

VERID is used to ensure that the CALLING DTE is a valid NCP for a
short hold mode connection

The CALLING and CALLED NPSI nodes use INN QLLC to process an XID
EXCHANGE. The IDNUMs specified in the calling and called switched major
nodes must match so that the XID exchange process does not inhibit the
TG from becoming available.

Class Exercise

Exercise Introduction

Given the configuration information, code these
definitions:
        BUILD
        X25.NET
        X25.MCH
        X25.LINE
        X25.PU - placement only
        X25.LU - placement only
        X25.VC

Exercise Configuration

Code your lab to support this configuration:

One PSDN access link (on 3745 port 6)
A 9600 bps line will be used
Network is not a DDX-P Network type
Network does not use Disconnected Mode
Max data packet allowed by net is 128 bytes
Packet Modulo 8 , Packet Window max is 7
Frame Window Size allowed is 7

Exercise Configuration ...

Three virtual circuits

     One PVC to another NPSI node

     One PVC to an SNA X.25 DTE

     Two SVCs - To be used for twoway calls by
     X.3 PAD Devices or SNA DTES with X.25
     adapters   *LLCLIST*

Logical channel group zero (LCN0) is reserved for
Diag. and Restart

Coding Area

```
BUILD  VERSION=V5R3,MODEL=3745,TYPEGEN=NCP,

    USGTIER=4,X25.USGTIER=____,

    X25.IDNUMI=02,X25.MAXPIU=4096,

    X25.MCHCNT=_____,X25.MWINDOW=_____,

    X25.PREFIX=___,X25.SNAP=NO,

    other native BUILD keywords........

        .
        .
        .
    OTHER NATIVE NCP Definitions
        .
        .
```

Coding Area

X25.NET DM=_____,CHPINDX=___,NETTYPE=___,

OUHINDX=___,CAUSE=IBM00

X25.VCCPT INDEX=1,MAXPKTL=128,

INSLOW=(12,0),VWINDOW=2

X25.VCCPT INDEX=2,MAXPKTL=128,

INSLOW=(6,0),VWINDOW=7

X25.VCCPT INDEX=3,MAXPKTL=128,

INSLOW=(12,0),VWINDOW=7

X25.OUFT INDEX=1

Coding Area (PSDN LINK ON PORT 6)

```
XL044  X25.MCH  ADDRESS=01,NCPGRP=XMCHGRP1,

              PUNAME=XP044,MACB=X25ACB01,

              FRMLGTH=_____,PKTMODL=8,

              MWINDOW=_____,DBIT=_____,

              SPEED=_____,T1TIMER=0,

              STATION=DTE,DIRECT=NO,

              ENABLTO=3,DSABLTO=3,

              ANS=NO,TPTIMER=1,NPRETRY=7,

              TDTIMER=3,NDRETRY=3,

              LCN0=_____,LCGDEF=(___,___),

              LLCLIST=_____

       X25.LCG  LCGN=_____
```

Coding Area (PVC to 3174)

```
_____   X25.LINE  LCN=___,TYPE=P,LLC=_____,

            DSTNODE=___,VCCINDX=__,

            RETVCCT=30,RETVCTO=30


_____   X25.PU  PUTYPE=2,ADDRESS=C1,

            MAXDATA=521,MAXOUT=7,

            PUDR=NO,PASSLIM=12,

            PACING=0,SSCPFM=USSSCS,

            MODETAB=MODE3274


_____   X25.LU  LOCADDR=2,DLOGMOD=CI3279,

            LOGAPPL=CICS1,LUDR=NO


_____   X25.LU  LOCADDR=3,DLOGMOD=CI3279,

            LOGAPPL=CICS1,LUDR=NO
```

Coding Area (PVC TO OTHER NPSI NODE)

```
_____  X25.LINE  LCN=___,TYPE=P,LLC=____,
               DSTNODE=____,VCCINDX=__,
               RETVCCT=30,RETVCTO=30,
               TRANSFR=33


_____  X25.PU  PUTYPE=4,TGN=22,ANS=CONT,
               PUDR=NO,MAXOUT=7,
               PASSLIM=254,
```

Coding Area (SVC POOL)

X25.VC LCN=(__,__),TYPE=S,

VCCINDX=__,OUFINDX=__

OSI/C.S. and GATE

PART F.

OSI/C.S. and GATE

OSI/C.S. Access to X.25 Subnetworks
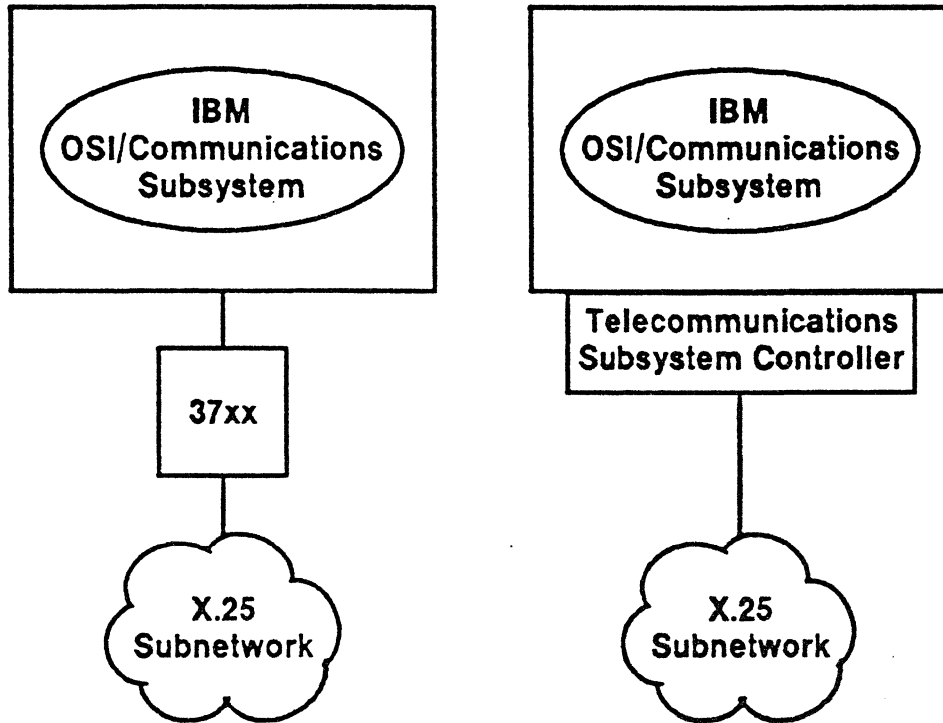
NOTES: X.25 WIDE AREA NETWORK
- ◆ OSI/C.S. uses the services of a X.25 front end processor
- ◆ In MVS environments X.25 NPSI in a 37XX provides lower three layer support
- ◆ In VM environments X.25 NPSI in a 37XX or the 9370 TSC may provide the lower three layer support

OSI/C.S.2   IBM

OSI/C.S. Access to X.25 Networks

```
                    Application
                    Presentation
                    Session
                    Transport
                                N
                                E
                    VTAM        T
                                W
        NCP                     O
        NPSI                    R
                                K
                    Link
                    Physical
```
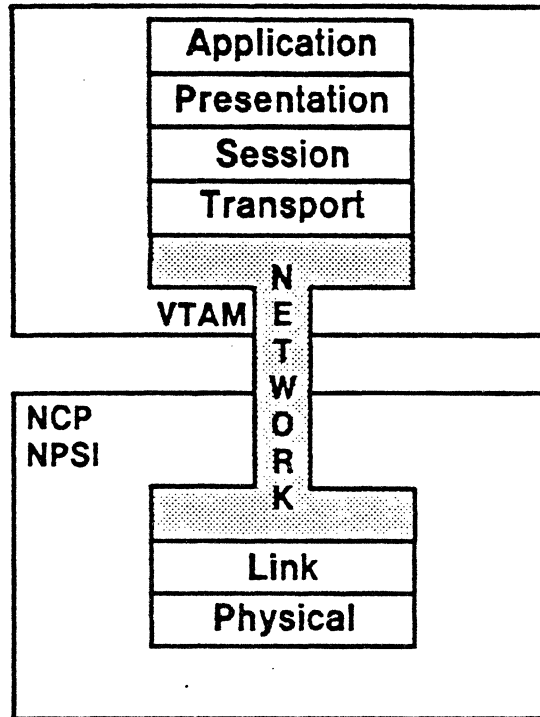
NOTES: OSI/C.S. ACCESS TO NPSI GATE
- The OSI stack in the IBM implementation is split into two components
  - OSI/C.S. in the IBM host
  - NPSI in the 37XX Communications Controller
- The OSI stack is joined together in the IBM implementation via an LU-LU session to allow OSI/C.S. to customize use of the Network Layer for OSI communication
- The LU-LU session between OSI/C.S. and NPSI allows positioning the access to the PSDN anywhere in the backbone network
- A single OSI/C.S. node may establish sessions with numerous NPSI nodes providing alternative gateways from OSI/C.S. to other open systems
- The LU-LU session is used to envelope OSI Protocol Data Units in a PIU as it passes through the backbone network
- The TH and RH of the PIU are removed by NPSI on an outbound data flow
- The TH and RH of the PIU are added by NPSI on an inbound data flow
- Layers 4-7 of the OSI architecture are implemented by OSI/C.S. and are transparent to both VTAM and NCP

OSI/C.S.3   IBM

NPSI GATE Support for OSI/C.S.
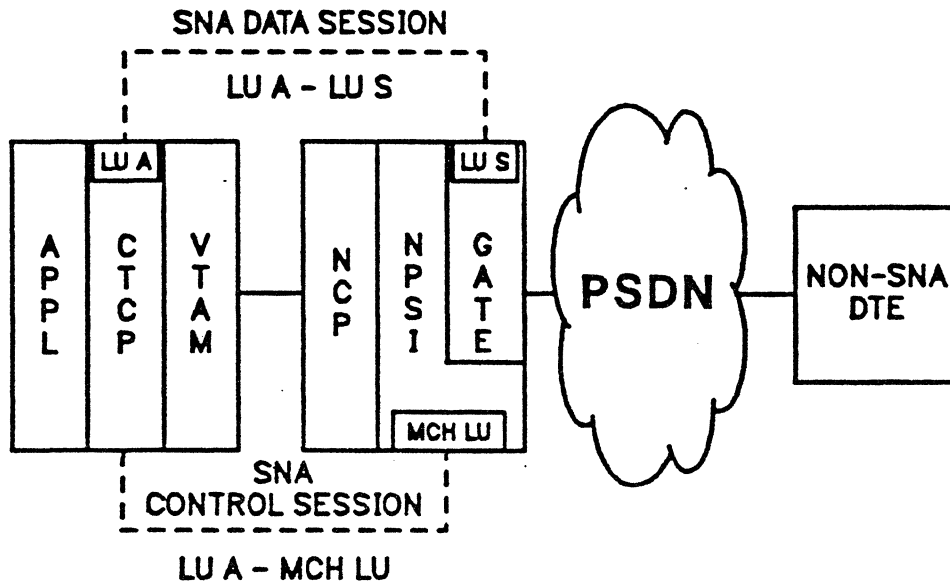
- ◆ OSI/C.S. refers to the GATE LU defined in NPSI as a "LINE NAME"

- ◆ The definition member in OSI/C.S. that references the GATE LU name is called a "LINE SET"

- ◆ The line set itself is given a "LINE SET NAME", which is also used as the LU name which the GATE LU communicates with

- ◆ LINESET1 APPL AUTH=ACQ is a sample coding for this definition
LINE SET EXAMPLE
- ◆ As an example if GATE LU XU044 is defined in an OSI/C.S. LINE SET called LINESET1 an LU-LU session would be acquired by LINESET1 for the GATE LU XU044

- ◆ The Lines XL044001,... are referred to as Virtual Circuit Lines with the last three digits x'001'... indicating the logical channel number

- ◆ Once the control session is established OSI/C.S. and GATE may begin to signal to each other what packet types are to be sent or have been received.

OSI/C.S.4   IBM

Defining X21 Support

```
XL044  X25.MCH  ADDRESS=01,NCPGRP=XMCHGRP1,

                X21SW=YES,X21INTWK=1984,
                X21RTYTO=4.0,X21RTYCT=5,
                X21INACT=40
```

OSI/C.S.5   IBM

VTAM Activation of the Access Link

Activating the Access Link

V NET,ACT,ID=XL044

MODEMS

VTAM — NPSI — [ ] — [ ] — (DSE)

ACTLINK XL044
———————————→ DTR
                      ——→

                      DSR
POSITIVE RSP ◄———
◄———————
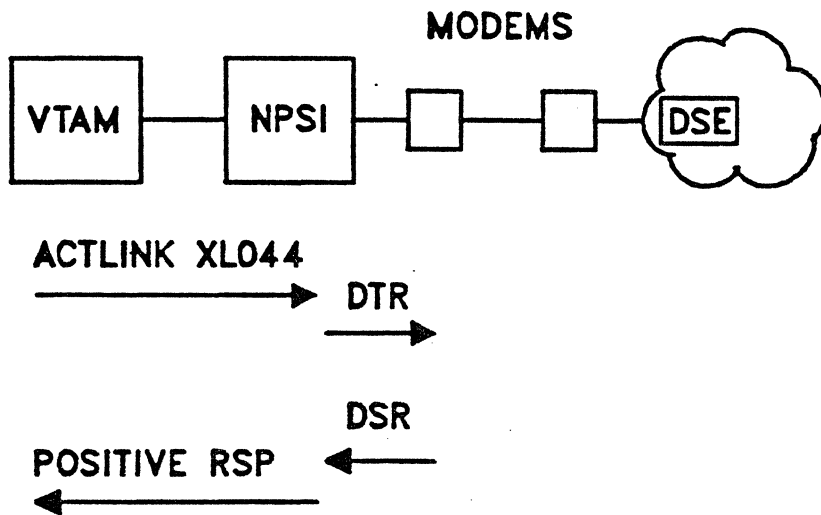
NOTES: MCH ACTIVATION UNCHANGED

◆ Physical access links to a PSDN are defined in NPSI on the X25.MCH
definition statement

   XL044 X25.MCH ADDRESS=044,ENABLTO=3,DISABLTO=3,.........

   After the NPSI/NCP gen,this line appears to VTAM as:

   XL044 LINE ADDRESS=(044,FULL),ENABLTO=3,DISABLTO=3,UACB=(nnnX,nnnR),...

OSI/C.S.6   **IBM**

. Enabling PSDN Access

Enabling Communication with a PSDN

V NET,ACT,ID=XP044

MODEMS

VTAM — NPSI — □ — □ — (DSE)

CONTACT XP044 →

SABM FRAME →

UA — FRAME ←

CONTACTED ←

RESTART PACKET →

ACTPU XP044 →

RESTART CONFIRM ←

ACTPU RSP ←
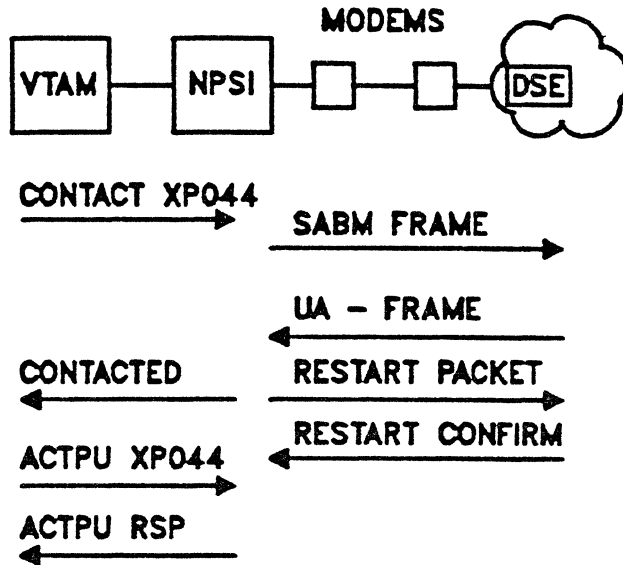
NOTES: MCH PU ACTIVATION UNCHANGED

◆ The packet switch is represented to VTAM as a SNA Physical unit

XL044 X25.MCH ADDRESS=044,ENABLTO=3,DISABLTO=3,PUNAME=XP044,...

After the NPSI/NCP gen this PU appears to VTAM as:

XL044 LINE ADDRESS=(044,FULL),ENABLTO=3,DISABLTO=3,UACB=(nnnX,nnnR),...
. LP044 PU PUTYPE=1,...........(referred to as the MCHPU)

Enabling NPSI GATE Support

◆ Activation of the GATE LU allows SNA sessions to be established between it and OSI/C.S.

◆ Once the session is established, OSI/C.S. may ask GATE to build Call Request packets to "connect" to other Open Systems

◆ Incoming Call packets coming to NPSI for OSI/C.S. are passed to the OSI/C.S. LU for processing

Enabling NPSI GATE Support

Activating the GATE LUs

V NET,ACT,ID=XU044
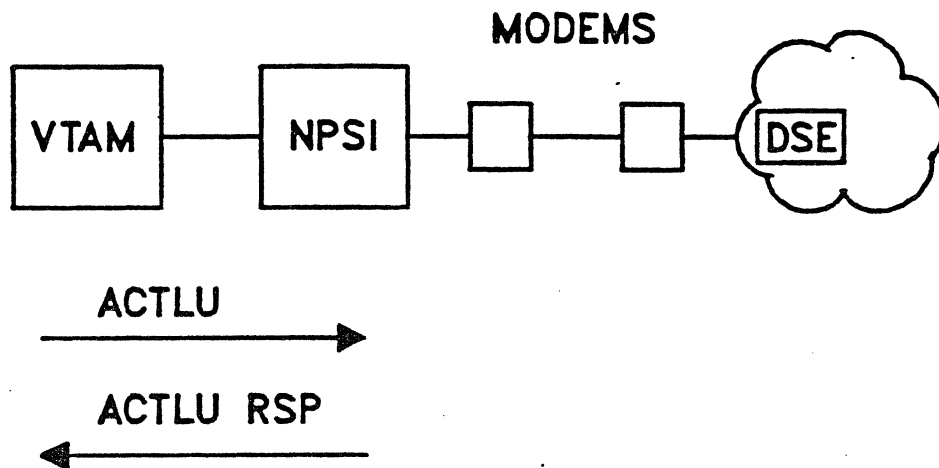
NOTES: MCH LU ONLY ACTIVATED IF GATE OR DATE ARE USED ON THE LINK

◆ OSI/C.S. uses a LU-LU control session with NPSI GATE to set up
"Network Connections" (SVCs) to other Open Systems

```
XL044 X25.MCH ADDRESS=044,ENABLTO=3,DISABLTO=3,PUNAME=XP044,LUNAME=XU044
```

After the NPSI/NCP gen this appear to VTAM as:

```
XL044 LINE ADDRESS=(044,FULL),ENABLTO=3,DISABLTO=3,UACB=(nnnX,nnnR),...
XP044 PU PUTYPE=1,...........(referred to as the MCHPU)
XU044 LU LOCADDR=0,..........(referred to as the MCHLU or GATE LU)
```

Enabling OSI/C.S. to use GATE Support

Enabling GATE Utilization of SVCs

- OSI/C.S. must acquire session with GATE LU

- Switched Major Node representing SVCs must be activated

- V NET,ACT,ID=XL044001
  - • • • =XL044002

NOTES: PRE-REQS TO USING GATE

- ◆ OSI/C.S. has an LU which it interfaces to the GATE LU

- ◆ The host LU name is defined in OSI/C.S. as a LINESET name

- ◆ The LINESET definition also includes a set of LINE names which are really the names of the GATE LUs with which the LINESET will acquire sessions.

- ◆ An application major node in VTAM must define the LINESET name as the LU name of a host application with acquire authorization

OSI/C.S.9   IBM

OSI/C.S. Line Set Control of the MCH LU

◆ **If RU byte 0 is**

- x'0B' in a PIU from OSI/C.S.to NPSI, NPSI builds a CALL REQUEST PACKET

- x'0B' in a PIU from NPSI to OSI/C.S., NPSI is passing contents of an INCOMING CALL to OSI/C.S.

- x'0F' in a PIU from OSI/C.S.to NPSI, NPSI builds a CALL ACCEPTED PACKET

- x'0F' in a PIU from NPSI to OSI/C.S., NPSI is passing contents of an CALL CONFIRMATION PACKET to OSI/C.S.

OSI/C.S. Line Set Control of the MCH LU

◆ **If RU byte 0 is**

  • x'13' in a PIU from OSI/C.S. to NPSI, NPSI builds a CLEAR REQUEST PACKET

  • x'17' in a PIU from NPSI to OSI/C.S., NPSI is passing a CLEAR CONFIRMATION PACKET to OSI/C.S.

Incoming Call For GATE /Notes

<u>Incoming Call for GATE</u>

This example assumes the call comes from the other Open System. A later example will show OSI/C.S. initiating the "Network Connection"

- DTEs placing calls to NPSI must imbed a protocol id into the call Request Packet they build to identify what type of support they require
- The protocol id can be in one of two places   -
  - In byte 0 of the Call User Data Field (CUDO)
  - or in the Subaddress field of the Calling DTE field (this is the low order digit of address)
  - The protocol ID imbedded must match how NPSI has been set up , (NPSI can be set up several ways shown on the upcoming visuals)

OSI/C.S.1   IBM

Incoming Call For GATE

NPSI SVCs
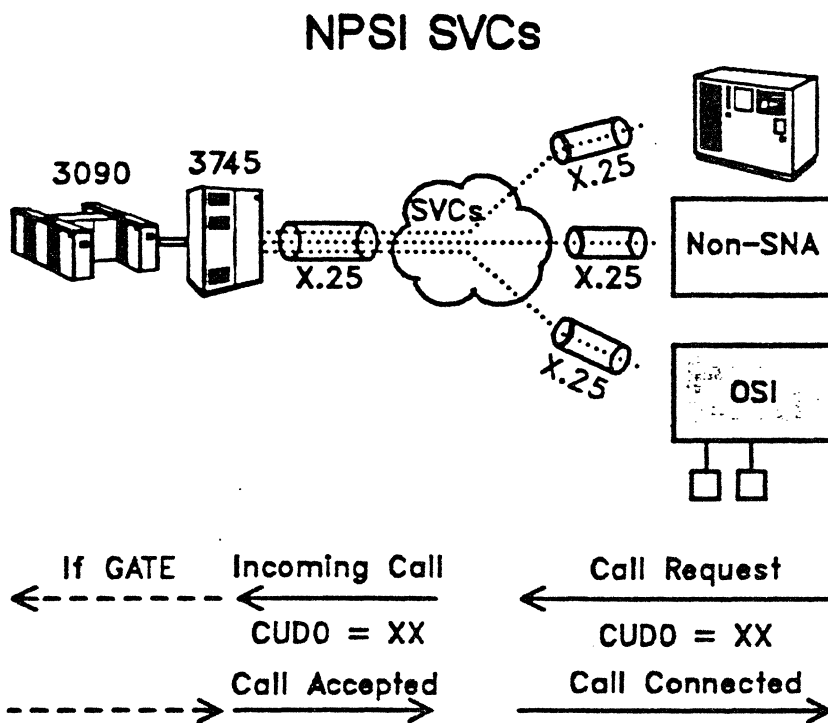
NOTES: INCOMING CALL FOR GATE

Assuming that OSI/C.S. has a session with the GATE LU and both the
Switched Major Node and Virtual Circuit lines have been activated,
OSI/C.S. and NSPI may begin to set up network connections

OSI/C.S.12   IBM

Selection of GATE CTCPs

USING CUD0 to Select a CTCP

X25.MCH

LUNAME = (XU0441,XU0442,XU0443,XU0444),
CTCP = (00,01,02,03,80,82,83,85),
CUD0 = (F0,F1,F2,F3,80,82,83,85),

NOTES: SELECTION OF GATE IS OPTIONAL

◆ Some users may require OSI/C.S. access through a GATE LU
◆ Standard LLC 0/2/3/or 5 may be used to access SNA applications
◆ Selecting Gate or Standard LLCs
◆ CALL User Data Field Byte 0 May be used to select the GATE LU
  which is in session with a particular LINESET (OSI/C.S. host LU)

///

OSI/C.S.13   IBM

CTCP Selection Table

CTCP Selection Table

X25.MCH

      LUNAME = (XU0441,XU0442,XU0443,XU0444),
      CTCP = (00,01,02,03,80,82,83,85),
      CUD0 = (F0,F1,F2,F3,80,82,83,85),

NOTES: CTCP OR LLC SELECTION BY CUD0

- ◆ Up to 28 GATE LUs per X25.MCH link in communication with up to 28 host LUs
- ◆ Each LINESET manages a subset of the VCs on the link
- ◆ CTCP acquires session w/GATE LU for the link
- ◆ Users request access to GATE LU in incoming call packet
- ◆ GATE LU routes packet data to the CTCP for processing

      OSI/C.S.14   IBM

CTCP Selection Table /Notes

CTCP Selection Table
    Correspondence table associates CUD0 value to GATE LU selected or VC Type
    CTCPs values can be 00-27 or 80,82,83,85
    CUD0 value range of 00 - FF

    Incoming Call Examples / Call User Data Byte 0:
        CUD0 X'F0' maps to CTCP X'00' - DTE wants connection thru XU0441
        CUD0 X'F1' maps to CTCP X'01' - DTE wants connection thru XU0442
        CUD0 X'F2' maps to CTCP X'02' - DTE wants connection thru XU0443
        CUD0 X'F3' maps to CTCP X'03' - DTE wants connection thru XU0444
        CUD0 X'80' maps to X'80' - Non-SNA X.25 DTE (LLC0)
        CUD0 X'82' maps to X'82' - SNA DTE w/NIA   (LLC2)
        CUD0 X'83' maps to X'83' - SNA DTE w/X.25   (LLC0)
        CUD0 X'85' maps to X'85' - Non-SNA w/X.3 PAD (LLC5)

        OSI/C.S.1   IBM

CTCP Selection via Subaddressing Digit

GATE Selection by Subaddress

<u>X25.MCH</u>

```
GATE=GENERAL,LLCLIST=(LLC0,LLC2,LLC3,LLC4,LLC5)
    SUBADDR=(YES,LLC0=0,
            ,LLC2=2
            ,LLC3=3
            ,LLC4=4
            ,LLC5=5
```

<u>NOTES:</u>
- If the other Open System does not allow for Customization of Call User Data you may choose subaddressing as an alternative
- In this case you would ask the network provider to define your NPSI access line as one that uses Subaddressing (low order digit of DTE address for NPSI would be used for this)
- DTEs calling NPSI would use the correct subaddress digit of the NPSI address to select either LLC or a single OSI/C.S.-GATE LU connection
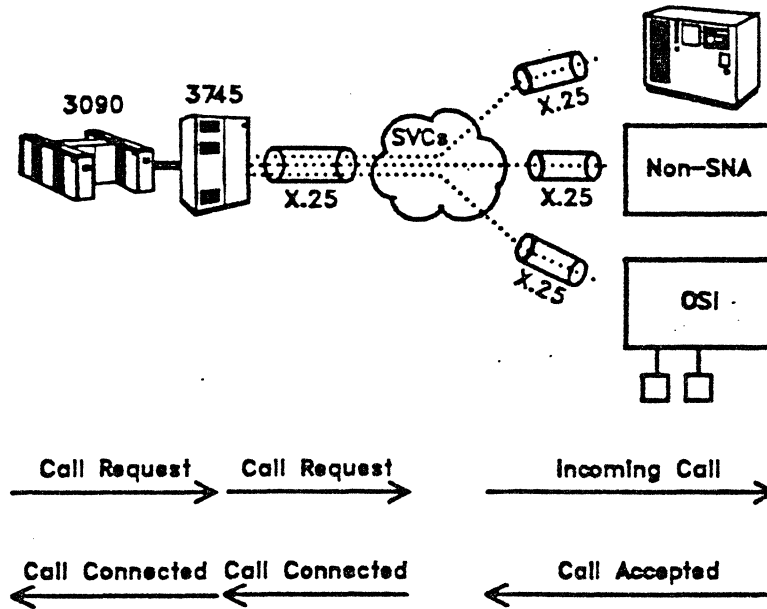- CTCP Selection via Subaddressing Digit

Example of how this works
NPSIs base address set up by the network provider 30201111111110

Selection of LLC0 via DTE calling NPSI on address 30201111111110
Selection of LLC2 via DTE calling NPSI on address 30201111111112
Selection of LLC3 via DTE calling NPSI on address 30201111111113
Selection of OSI/C.S./GATE by the DTE CALLING NPSI on 30201111111114
Selection of LLC5 via DTE calling NPSI on address 30201111111115

OSI/C.S.15   IBM

Outgoing Call Initiated by OSI/C.S.

NPSI SVCs

Call Request	Call Request	Incoming Call

| Call Connected	Call Connected	Call Accepted

NOTES: OSI/C.S. CALL OUT
- Call Requests from OSI/C.S. are initiated by placing a Call Request command on the LU-LU session with the appropriate GATE LU (LINE)
- OSI/C.S. builds the Call Command that includes not only the command, but also includes that actual contents of the packet
- NPSI builds the Call Request packet header and envelopes the data sent from OSI/C.S. in the packet

OSI/C.S.16   IBM

Outgoing Call Initiated by OSI/C.S.

NPSIs GATE interface is described in detail in the NPSI Host Programming manual (SC30-3502) and shows the format of the commands processed on the session on this command interface. Don't use the section on GATE Fast Connect since this is not implemented by OSI/C.S.

Setting up Switched Virtual Circuits
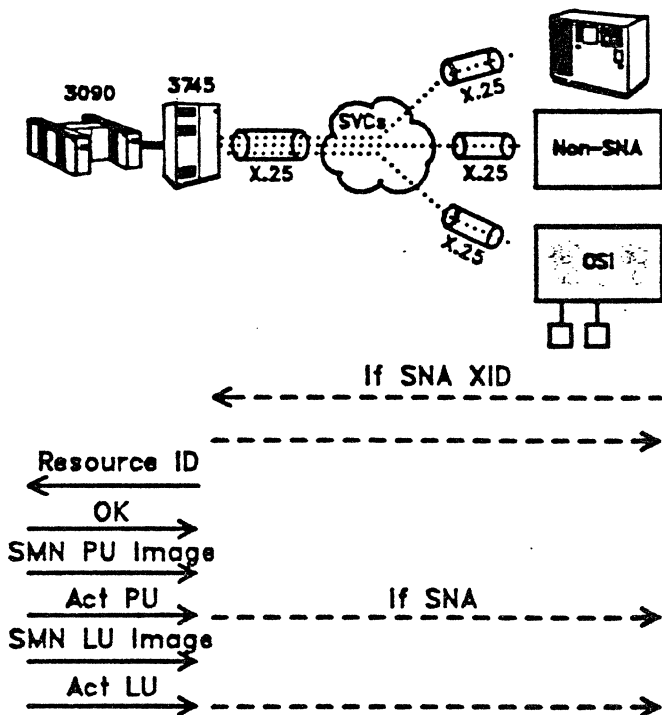
NOTES: SAME PROCESS DISCUSSED IN NPSI OVERVIEW TOPIC

- Since other Open Systems are not implementing SNA protocols there is now way for the node to pass an XID containing a IDBLK/IDNUM required by VTAM to search switched major nodes for a PU and LU image to represent the device
- NPSI simulates a IDBLK/IDNUM coming in from the device to satisfy this VTAM requirement
- Once this is passed to VTAM, VTAM uses its standard switched support to set up the Virtual Circuit LU for DATA SESSIONS with OSI/C.S.

IBM

Setting up Switched Virtual Circuits /Notes

Setting Up Switched Virtual Circuits

◆ NPSI assigns a default IDBLK of x'003' for all non-SNA nodes

◆ The default IDNUM is formed from to inputs

  ● On the BUILD definition statement the X25.IDNUMH value provides the first two
    digits of the default IDNUM. If it is coded X25.IDNUMH=02 all default idnums for
    that NPSI node are in the form of x'02xxx'

  ● The 'xxx' part of the IDNUM is assigned in sequence that the SVC Line Names appear
    in the Resource Vector Table in the NCP. The values start at a value of x'002'
    and is incremented by 2 for each successive SVC line name. This value is created
    at NPSI generation time for each SVC line.

NPSI SVC lines are created by the X25.VC definition

```
        BUILD X25.IDNUMH=02
              .
              .
  XL044 X25.MCH Address =044,.......,LCGDEF=(0(10),LCN0=NOTUSED
        X25.LCG LCGN=0
        X25.VC LCN=(1,10),TYPE=S,CALL=INOUT
```

Output of the generation would represent the SVCs as switched SDLC lines

```
  XL04400A LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
  XP04400A PU TYPE=(1,2),.....
  XL044009 LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
  XP044009 PU TYPE=(1,2),.....
              .
              .
              .
              .
  XL044001 LINE TYPE=SWITCHED,CALL=INOUT,UACB=(...........)
  XP044001 PU TYPE=(1,2),.....
```

Though the default IDNUM is not shown XP04400A would be x'02002',
XP04400A would be x'02004',......,XP044001 would be x'0200A'

Switched Major Node for OSI/C.S.

SMN (OSI DTEs)

```
OSIPU1      PU    PUTYPE=1,ADDRESS=C1,
                  MAXDATA=4096,MAXOUT=6,
                  IDBLK=003,IDNUM=02002,
                  PUDR=NO


OSILU1      LU    LOCADDR=0,VPACING=2,
                  PACING=(1,1),MODETAB=SIMLU1


OSIPU2      PU    PUTYPE=1,ADDRESS=C1,
                  MAXDATA=4096,MAXOUT=6,
                  IDBLK=003,IDNUM=02004,
                  PUDR=NO


OSILU2      LU    LOCADDR=0,VPACING=2,
                  PACING=(1,1),MODETAB=SIMLU1
```
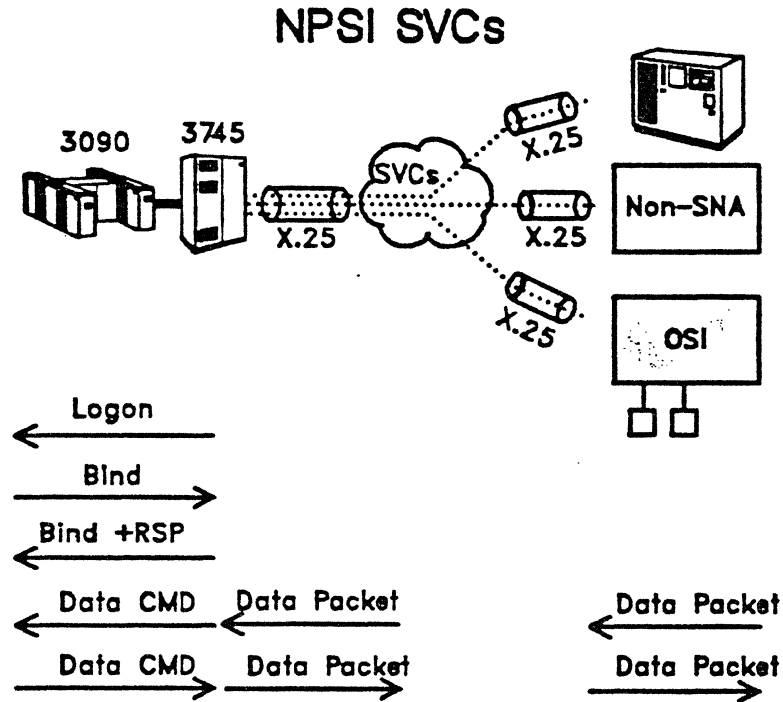
NOTES: OSI/C.S. SMN

◆ A switched major node is required for all resources with a switched
   image to VTAM. OSI/C.S. resources appear to VTAM as SNA PUs that are
   "CALLING IN" for a host connection. No PATH definition is coded,
   even if OSI/C.S. is the initiator of the SVC. A default IDBLK/IDNUM
   is passed from NPSI GATE to VTAM to be compared to the switched
   major nodes.

OSI/C.S.18   IBM

Establishing a Data Session

NPSI SVCs


```
3090   3745
                    SVCs        X.25      [Non-SNA box]
      X.25                      X.25
                                X.25      OSI
```

```
        Logon
   <------------

        Bind
   ------------>

     Bind +RSP
   <------------

   Data CMD    Data Packet              Data Packet
   <--------   <--------                <----------

   Data CMD    Data Packet              Data Packet
   -------->   ---------->              ---------->
```

NOTES: THE DATA SESSION

◆   The data session is established by NPSI building a Logon request
    asking on behalf of the VIRTUAL CIRCUIT LU that an LU-LU data session
    be established with an OSI/C.S. LU (LINESET1 in our previous examples)
◆   The data session is used to process

   ●   Data Packets with the Q Bit Off

   ●   Clear Confirmation, Reset, and Reset Confirmation control packets

   ●   OSI/C.S. notifies GATE what packet header type to build ahead of the
       data that it is sending in the RU

OSI/C.S.19   IBM

Data Session Controls - Outbound

◆ In outgoing commands from OSI/C.S. to the Virtual Circuit LU (data session) if BYTE 0 of RU is:

- x'00' NPSI builds DATA PACKET w/NO Q BIT

- x'1B' NPSI builds RESET REQUEST/INDICATION PACKET

- x'1F' NPSI builds RESET CONFIRMATION PACKET

OSI/C.S.20   IBM

Data Session Controls - Inbound

◆ **If packets are coming in to OSI/C.S. from the Virtual Circuit LU (data session) NPSI codes BYTE 0 of RU as:**

- **x'00' if a DATA PACKET has been received**

- **x'1B' if a RESET INDICATION PACKET has been received**

- **x'1F' if a RESET CONFIRMATION PACKET has been received**

OSI/C.S.21   IBM

Connection is Not Communication

Connection is not Communication
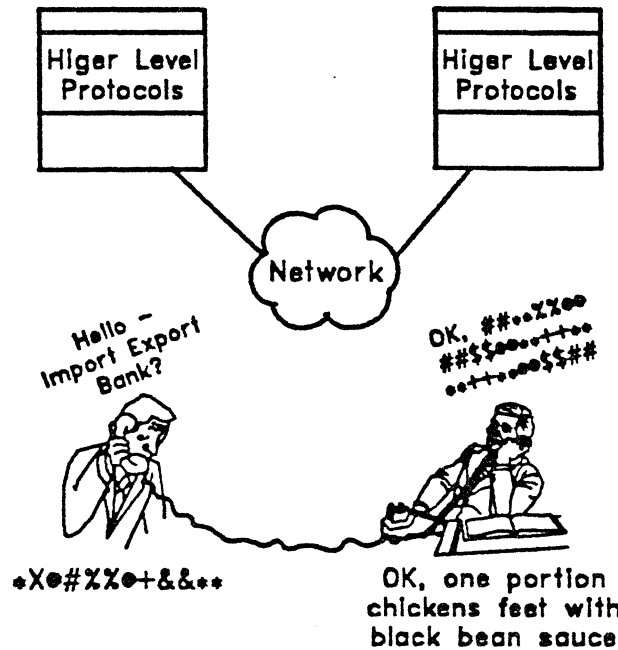
NOTES: PROTOCOL EXCHANGES
- Once the data session is established OSI Protocol Data Units may be sent to establish upper layer support between the Open Systems
- The next topic in the course will address considerations for setting up the upper layer support

OSI/C.S.22 IBM

GATE FAST CONNECT

PART G.

GATE FAST CONNECT

Fast Connect - GATE CTCP Access
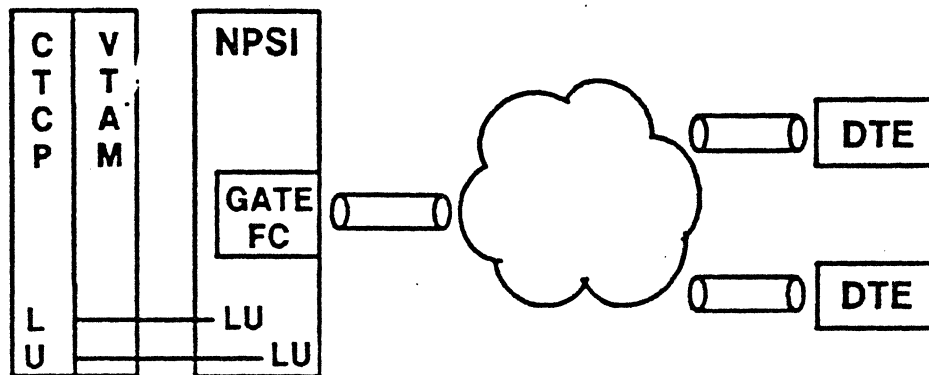
Fast Connect

◆   Former European PRPQ integrated into NPSI

◆   Dedicates link to GATE Fast Connect

◆   CTCPs acquire sessions with a pool of LUs

Fast Connect - GATE CTCP Access ...

◆ **Fast Connect Scenario**

    1.   Users initiate SVC to GATE CTCP

    2.   GATE connects user to pre-established LU-LU session, eliminating session setup requirement

    3.   CTCP may then issue security check or wait for incoming request

◆ **Similar to X.25 Fast Select, but not the same**

    ●   Fast Select facility not required

... DEF-

Defining GATE Fast Connect

X25.MCH

```
CONNECT=NO/YES/CUD/SUBD
CUD0=(01,02,03,09)
CTCP=(01,02,03,04)
LOGAPPL=(CTCP1,CTCP2,CTCP3,CTCP4)
MODETAB=(CMOD1,CMOD2,CMOD3,CMOD4)
VMODETAB=(VMOD1,VMOD2,VMOD3,VMOD4)
```

Defining GATE Fast Connect

X25.FCG

```
CTCPNO=_____,
QTY=_____,
ANS=_____,
COMMITO=_____,
MAXDATA=_____,
ISTATUS=ACTIVE/INACTIVE,
NCPGRP=_____,
OWNER=_____,
```

Defining GATE Fast Connect ...

X25.FCG

PRFLINE = _____,
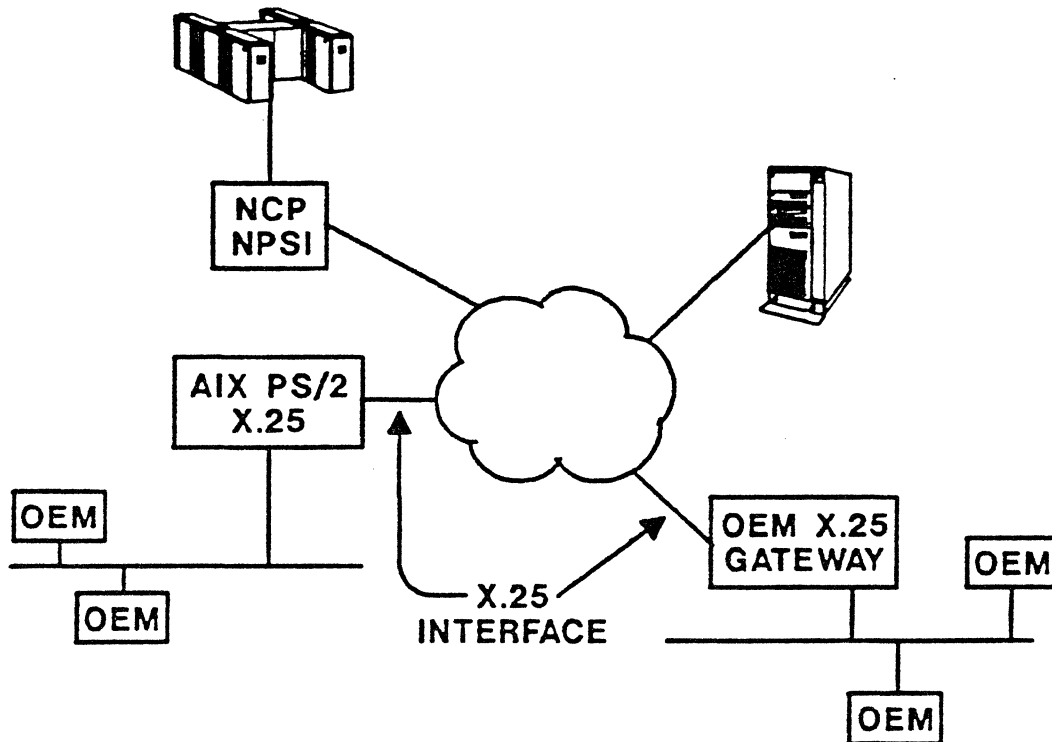PR.FPU = _____,
P.RFLU = _____,
SPAN = _____,
SUFFIX = _____

TCP/IP and DATE

PART H.

TCP/IP and DATE

TCP/IP to X.25

IBM

TCP/IP to X.25

NOTES: TCP/IP TO X.25

- ◆ TCP/IP for MVS and VM uses services of a X.25 front end processor
- ◆ In MVS, VM environments X.25 NPSI in a 37XX provides network interface layer function
- ◆ ES/9370 X.25 Communications Subsystem
  - ● 9370 integrated adapter (I/O processor feature 6130, I/O adapter 6031-0040)
  - ● Presents DTE interface to X.25 network
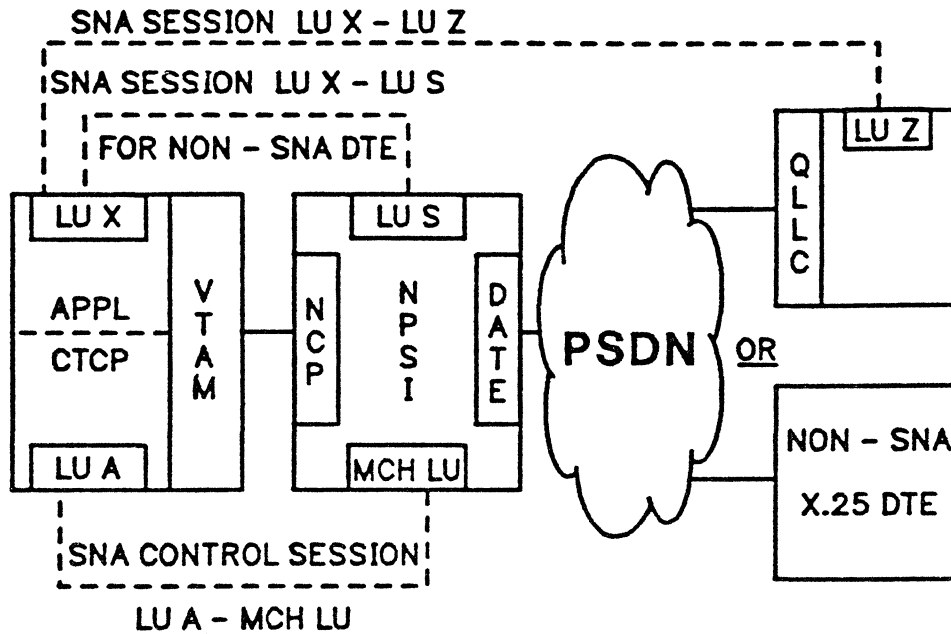 - ● Allows VM TCP/IP access from X.25 network

TCP/IP Layering

ISO 7-Layer
Reference Model

TCP/IP Internet
Layering Model
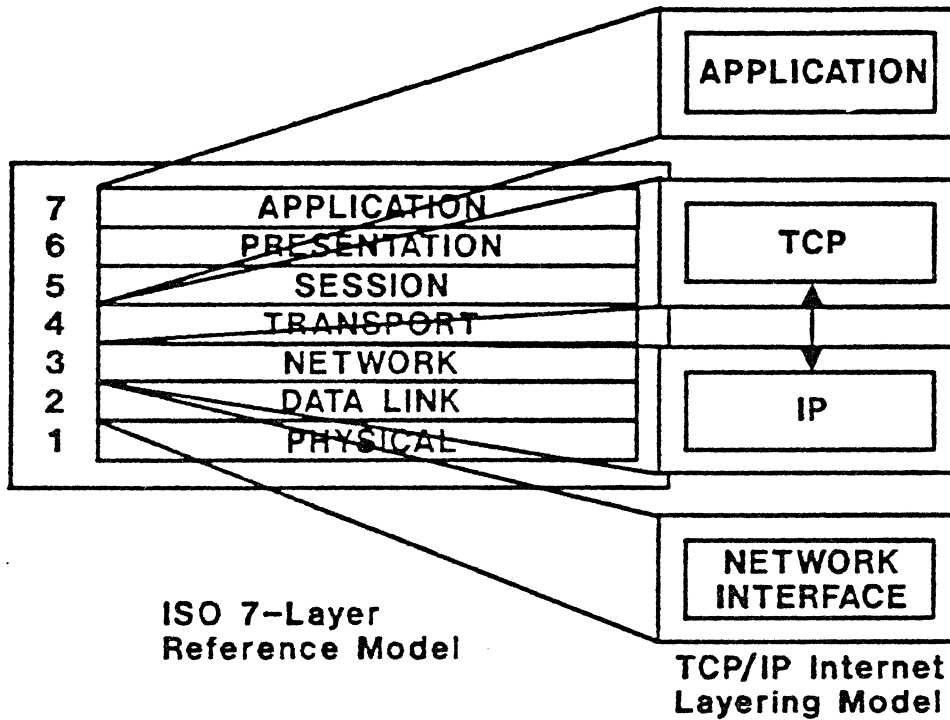
NOTES: 7 OSI LAYERS VS 4 TCP/IP LAYERS

|	
TCP	Transmission Control Protocol. Transport layer.
IP	Internet Protocol. Network Layer.
Network Interface	Data Link / Physical Layer.

IBM

NPSI DATE Support for TCP/IP

NOTES: NPSI DATE SUPPORT FOR TCP/IP

◆ TCPIPX25 serves as both the CTCP and the Application.

◆ The control session is between the TCPIPX25 and the MCH LU.

◆ Data is passed on a session between TCPIPX25 and the VC LU.

IBM
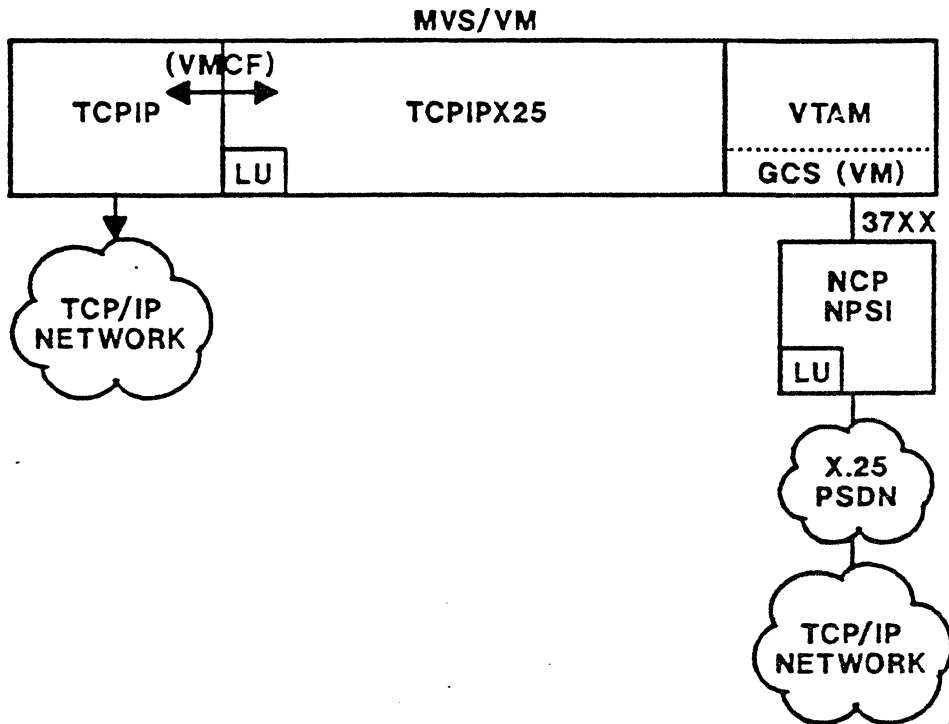
TCP/IP Function

NOTES: TCPIPX25 FUNCTION
◆ NPSI DATE CTCP comes as part of TCP/IP for MVS, VM.
◆ VTAM application that accepts data from NPSI and passes on to TCP/IP
◆ Session between NPSI DATE LU and TCPIPX25 LU.
◆ NPSI converts packets to PIU's. TCPIPX25 converts PIUs to IP datagrams.

TCP-4   IBM

TCP/IP-X.25 IMPLEMENTATION

- ◆ **NPSI DEFINITIONS**

- ◆ **VTAM DEFINITIONS**

- ◆ **TCP/IP DEFINITIONS**

NOTES: IMPL. SPECIFICATIONS

NPSI   (1) Multichannel Link (2) Virtual Circuits.

VTAM   (1) Application Major Node (2) Switched Major Node

TCP/IP   (1) Configuration file,

                                              IBM

NPSI MULTICHANNEL LINK

◆ SPECIFY DATE SUPPORT

◆ MCH LU NAME MUST MATCH NAME IN
TCPIPX25 CTCP CONFIGURATION FILE

NOTES: MCH DEFINITION

```
*
LU038     X25.MCH ADDRESS=038,           37XX LINE ADDR.              +
                  LCGDEF=(0,20),         20 LOC CH DEF.               +
                  LCN0=NOTUSED,                                       +
                  LLCLIST=(LLC0),                                     +
                  FRMLGTH=131,           FRAME LENGTH 131             +
                  GATE=DEDICAT,          DATE FUNCTION FOR TCP/IP     +
                  MWINDOW=7,             FRAME WINDOW 7 (LEVEL 2)     +
                  LUNAME=XU038,          MCH LU NAME - TCPIPX25       +
                  PUNAME=PU038,          MCH PU NAME+
                  STATION=DTE,                                        +
                  NPRETRY=10,                                         +
                  TPTIMER=3,             T1 3 SEC                     +
                  SPEED=9600
```

TCP-6   IBM

TCPIPX25 VTAM APPLICATION DEF.

```
            VBUILD TYPE=APPL
TCPIPX25 APPL   ACBNAME=TCPIPX25,PRTCT=TCPX25,
                AUTH=(ACQ),PARSESS=YES,EAS=20
```

NOTES: VTAM APPL. DEF
◆ VTAM definition for MVS TCPIPX25 program.
◆ If TCPIPX25 is run in different VTAM domain from 37XX running NPSI:
   ● TCPIPX25 application defined in domain it runs under ; TCPIPX25
     application defined as VTAM cross domain resource in NPSI domain
   ● Cross domain definitions for NPSI MCH LUs needed in TCPIPX25 domain
   ● VTAM switched virtual circuits defined in NPSI domain

 IBM

TCPIPX25 VTAM SWITCHED MAJOR NODE

◆ **VTAM DEFINITIONS FOR PSEUDO SWITCHED DEVICES**

◆ **IDNUM GENERATED DURING NPSI GENERATION**

NOTES: VTAM SWITCH. DEF

```
          VBUILD TYPE=SWNET,MAXGRP=1,MAXNO=1
VP038016 PU    ADDR=38,IDBLK=003,IDNUM=02002,                              +
               DISCNT=(YES,F),MAXDATA=1024,MAXPATH=1,PUTYPE=1,             +
               SSCPFM=USSNTO
VL038016 LU    LOCADDR=0
VP038015 PU    ADDR=38,IDBLK=003,IDNUM=02004,                              +
               DISCNT=(YES,F),MAXDATA=1024,MAXPATH=1,PUTYPE=1,             +
               SSCPFM=USSNTO
VL038015 LU    LOCADDR=0

     ... (13 PU/LU entries not shown) ...

VP038001 PU    ADDR=38,IDBLK=003,IDNUM=02020,                              +
               DISCNT=(YES,F),MAXDATA=1024,MAXPATH=1;PUTYPE=1,             +
               SSCPFM=USSNTO
VL038001 LU    LOCADDR=0
```

TCP-8   IBM

TCPIPX25 CONFIGURATION FILE

◆ **READ AT TCPIPX25 STARTUP**

◆ **USED TO DETERMINE HOW TO MANAGE NPSI MCH**
   AND VIRTUAL CIRCUITS

<u>NOTES: TCPIPX25 CONFIG. FILE</u>
```
VTAM      TCPIPX25 VTAM Application name and password
LINK      Defines:
          ◆ NPSI Multichannel link definition LU name
          ◆ X.25 Data Network Identifier Code (DNIC)
          ◆ X.25 DTE address for link,1 to 15 decimal digits.(Not needed f
          ◆ Default window size, Default packet size
          ◆ Logical channel information
DEST      ·IP address, in dotted decimal form and DTE address.
BUFFERS   Size of datagram buffers, minimum 576;
          Number of of buffers to allocate in addition
          to the minimum of 2 per logical channel. Limit on number of buffe
          queued outbound on any single virtual circuit.
TIMERS    Time, in seconds, a connection is held before it can be
          preempted for a new destination.
```
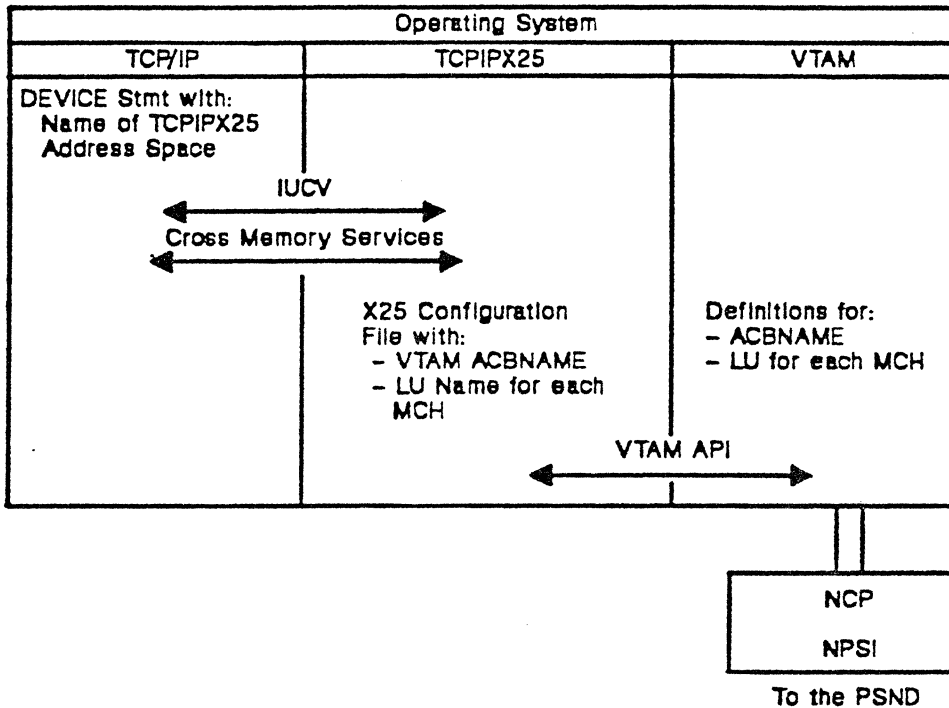
                                   IBM

MVS,VM TCP/IP X.25 SUPPORT

IBM

Operating System		
TCP/IP	TCPIPX25	VTAM
DEVICE Stmt with: Name of TCPIPX25 Address Space		

IUCV
←————————→

Cross Memory Services
←————————→

X25 Configuration
File with:
– VTAM ACBNAME
– LU Name for each
MCH

Definitions for:
– ACBNAME
– LU for each MCH

VTAM API
←————————→

NCP

NPSI

To the PSND

NOTES: STUDENT NOTE AREA

◆ IP datagrams sent from TCP/IP via MVS cross memory services or VM IUCV to TCPIPX25 CTCP.

◆ TCPIPX25 maintains virtual circuits;
 • incoming data passed to TCP/IP
 • incoming calls checked against TCPIPX25 configuration file
 • outgoing data sent to NPSI virtual circuit LU
 • outgoing calls initiated based on TCP/IP routing and TCPIPX25 configuration file

TCP-10   IBM

ENABLING DATE UTILIZATION OF SVCs

◆ **TCPIPX25 MUST ACQUIRE SESSION WITH DATE LU**

◆ **SWITCHED MAJOR NODE REPRESENTING SVCs MUST BE ACTIVATED**

◆ **NPSI FACILITATES TCP/IP MANAGEMENT OF ITS VIRTUAL CIRCUITS THROUGH**

◆

```
V NET,ACT,ID=XL038001
V NET,ACT,ID=XL038002
```

NOTES:
◆ TCPIPX25 has an LU which it interfaces to the DATE LU
◆ The host LU name is defined in TCPIPX25 configuration file
◆ An application major node in VTAM must define TCPIPX25
   as the LU name of a host application with acquire authorization

TCP-11   IBM

DATE CTCP VC MANAGEMENT

◆ **APPLICATION LU SENDS AND RECEIVES DATA PACKETS**

◆ **DATE CTCP LU SENDS OR RECEIVES CONTROL PACKETS**

NOTES: DATE CTCP VC MANAGEMENT
◆ CTCP sends or receives restart, call, clear, reset, interrupt, and qualified data packets on type 0 circuit.
◆ CTCP sends or receives restart, call, clear, reset packets on type 2 circuit. Interrupt and qualified data packets discarde
◆ CTCP sends or receives restart, call, clear, reset packets on type 3 circuit. Interrupt packets discarded, qualified data packets are handled by X.25 NPSI.
◆ CTCP sends or receives restart, call, clear, packets. All others handled by application LU.

IBM

SUMMARY

◆   THE TCP/IP MODEL PROVIDES X.25 AS AN OPTION
    AT THE NETWORK INTERFACE LAYER

◆   TCP/IP MVS,VM CAN USE X.25 CONNECTIONS FOR
    WIDE AREA NETWORK SUPPORT

◆   NPSI FACILITATES TCP/IP MANAGEMENT OF ITS
    VIRTUAL CIRCUITS THROUGH ITS DATE
    INTERFACE

◆   IP DATAGRAMS ENVELOPED IN PACKETS FOR
    TRANSMISSION TO OTHER TCP/IP HOSTS
    TRANSPARENT TO VTAM, NCP, AND NPSI

NOTES:

TCP-13   IBM

Management Considerations

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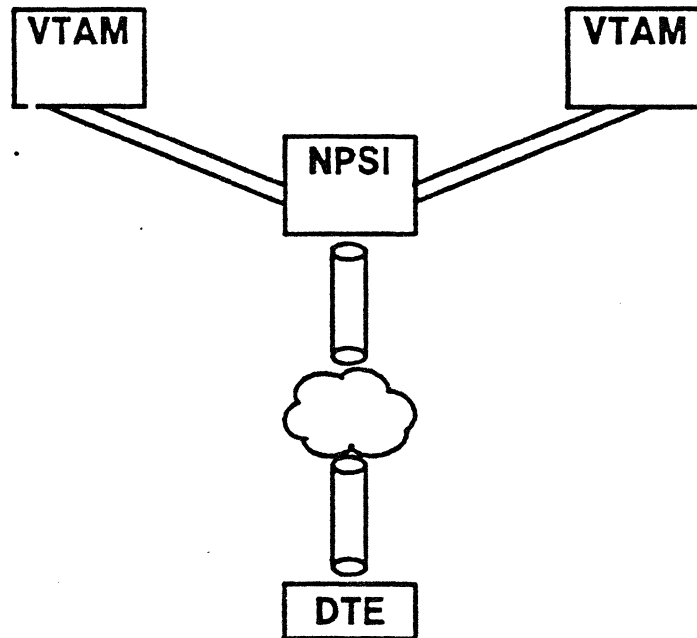
PART I.

Management Considerations

</div>

Enhanced Availability

Enhanced Availability/SSCP Loss

◆   VTAM V3 R2 & NCP 4.3 or 5.2

◆   Additional takeover information to takeover SSCP

◆   Non-disruptive loss of SSCP for

   ●   PUT 2.0 & 2.1 nodes (new for SVCs)

   ●   Non-SNA devices supported thu LU simulator provided by NPSI
       V2R1/V3R2

Enhanced Availability ...

◆ **Non-disruptive takeover & return**

   ● NPSI V2R2 provides this function

   ● PVCs & SVCs included

   ● PUT 2.0 & 2.1 SNA DTEs

   ● Non-SNA DTEs represented by the LU simulator

NetView Support for NPSI

NETVIEW

NetView records RECFMS records generated by NPSI for:

Physical Circuits Errors
Virtual Circuits Errors

For detailed information read the NPSI Diagnosis, Customization, and Tuning Guide LY30-5610

Hardware Monitor Detail Screens

NETVIEW

NetView hardware monitor identifies major cause:

Hardware
Software
Protocol: Invalid Response, or command sequence,....
Environment: Thermal, installation restriction,..
Hardware or Software
Operator or Sending Product
Undetermined

Hardware Monitor Detail Screens

NETVIEW

NetView hardware monitor identifies minor cause:

Comm. Controller Scanner
X.25 Network external to this product
Local X.25 interface
Local Modem
Customer host application
IBM Comm. Controller program
System Identification Error
Installation Restrictions
Adjacent Link Station Busy
Undetermined

TRACE SUPPORT

Trace and format all VCs on an MCH link
Selectively trace and format up to 10 VCs by VC line name

For detailed flows relative to traces reference the NPSI Diagnosis,
Customization, and Tuning Guide LY30-5610

- filler page -