SNA
Technical Overview

Course: CW-9118-0066-9005 5/93

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Developed by:
NCR Education Services

COURSE OVERVIEW

PURPOSE

This course will describe the IBM hardware and software used in SNA networks. It will also describe the relationship between non-IBM SNA products and IBM SNA products. This course is intended to provide people with the ability to talk to the IBM systems programmers about the generation parameters for the non-IBM SNA products. It is not intended to teach anyone how to do an IBM software product generation.

OBJECTIVES

After successfully completing this course the student will be able to:

- o Identify the common IBM hardware and software products required for SNA communication
- o Identify IBM PU-T2 products that are emulated by non-IBM SNA products
- o List and describe the LU types
- o List and describe the PU types
- o Describe the flow of data and control information between a PU_T2 and the IBM host both logically through the SNA hierarchy and physically through the SNA network
- o List the network management products that are typically available in an SNA network and identify when each would be used
- o Given a description of a PU_T2 product, appropriate reference material, and sysgen listings for VTAM, NCP, and CICS; modify the sysgen parameters to correctly define the PU_T2 product.
- o Define the following terms:

PIU	TCAM	DISOSS	network address	session
TH	CICS	PROFS	local address	
RH	NCP	PU	subarea	
RU	IMS	LU	domain	
LH	TSO	SSCP	bracket	
LT	DIA	conversation	chain	
VTAM	DCA		segment	

PREREQUISITES

NCR personnel should have successfully completed:

Data Communications Systems Concepts (665005).

NOTE: This course provides an overview of the NCR SNA products. Students should continue researching or attending courses on the specific NCR SNA products they will be supporting.

PERFORMANCE EVALUATION CRITERIA AND GRADING SCALE

A letter grade for the course will be assigned by the instructor based upon quizzes following the indicated lessons and a final exam. The grade score is based on the following criteria:

A - COMMENDABLE

- o Achieved 93% average or greater on written quizzes/exercises
- o Completed 93% average or greater of all workshop activities with minimal assistance from the instructor
- o Performance consistently exceeded standards set by the course objectives

B - PROFICIENT

- o Achieved 84-92% average on written quizzes/exercises
- o Completed 84-92% average of all workshop activities with minimal assistance from the instructor

C - COMPETENT

- o Achieved 75-83% average on written quizzes/exercises
- o Completed 75-83% average of all workshop activities with minimal assistance from the instructor

I - INCOMPLETE

- o Achieved less than 75% average on written quizzes/exercises
- o Did not complete most workshop activities
- o Did not meet minimum performance standards as set by course objectives

COURSE OUTLINE

LESSON 1: SNA OVERVIEW

Early Computer Systems
Message Flow thru Network
End Users
Logical Units
Physical Units
Systems Services Control Point
Subareas and Domains
Path Control Network
Goals of SNA and SDLC

* Quiz

LESSON 2: SNA DATA FLOW

Message Formats
Data Flow
Application Level Response Types
Chains
Segments
Bracket Protocol
Transaction Modes
Pacing
Format Identification
Examples

* Quiz

LESSON 3: LU SESSIONS

Session and LU types
SNA Products by LU Type
Session Establishment
BIND Format
Examples

* Quiz

LESSON 4: PU_T2 PRODUCTS

Introduction
Interactive Terminal Systems
Batch Entry Systems
Vocational Systems
Mini Processor Systems
Micro Systems

LESSON 5: SOFTWARE OVERVIEW

Products Introduction
Software Family Members

LESSON 6: OPERATING SYSTEMS

Introduction
CPU Types
Evolution of IBM Operating Systems
Function of an Operating System
DOS/VSE
OS/VS1
MVS
VM

LESSON 7: NCP SOFTWARE

Introduction
Communication Controller Hardware
Components of NCP
NCP Data Flow
Transmission Control
Emulation Processing

* Quiz

LESSON 8: ACCESS METHODS

Access Method Functions
VTAM Components
VTAM Network Initialization
System Start-of-Day Procedure
LU-LU Session Establishment
Application Program Interface
Data Transfer
Session Termination

* Quiz

LESSON 9: IBM SUBSYSTEMS

Introduction
CICS
DISOSS
IMS
TSO
POWER/VS
RES
JES2
JES3

*Quiz

LESSON 10: DATA FLOW THROUGH THE NETWORK

Introduction
Functional Layers (7) of Software
Hardware Components
Software Components
Sessions
Message Transformation
Reminders

LESSON 11: ADVANCED PROGRAM-TO-PROGRAM COMMUNICATIONS

Emergence of APPC
Processing Concepts
PU_2.1 Connectivity
LU6.2 Software Components
LU6.2 Interprogram Characteristics
LU6.2 Functional Software
Conversation Functions
Current LU6.2 Implementations

* Quiz

LESSON 12: NETWORK MANAGEMENT

Introduction
SNA CNM
CNMA and CNMS Relationship
NETVIEW
NCCF
NPDA
TARA
NLDM
OCCF
INFO/System
LPDA

LESSON 13: SYSGEN OVERVIEW

Introduction
Installation
Generation
Linkage Editing
Single Stage Gen
Two Stage Gen
Maintenance

LESSON 14: ACF/NCP GENERATION

Introduction
NCP Network Information
NCP Gen Process
BUILD and HOST Macros
GROUP Macro
LINE Macro
PU Macro
LU Macro
Coding Considerations
Sample NCP Parameters

* Quiz

LESSON 15: ACF/VTAM GENERATION

ACF/VTAM Installation Considerations
Network Definitions
VTAM Routing
VTAM Session Related Tables
NCP Definitions
Switched Major Nodes
Session Establishment
Parameter Checklist
Sample VTAM Parameters

* Quiz

LESSON 16: CICS GENERATION

Introduction
CICS Tables
Terminal Control Table
Sample TCT Entries

* Quiz

LESSON 17: NCCF GENERATION

Introduction
NCCF Gen Statements
Customizing NCCF
Sample NCCF Parameters

** Final

APPENDICES

Appendix A: System Generation Listings

Appendix B: Glossary

LESSON 1: SNA OVERVIEW

PURPOSE

This lesson provides detailed information on the concepts of SNA.

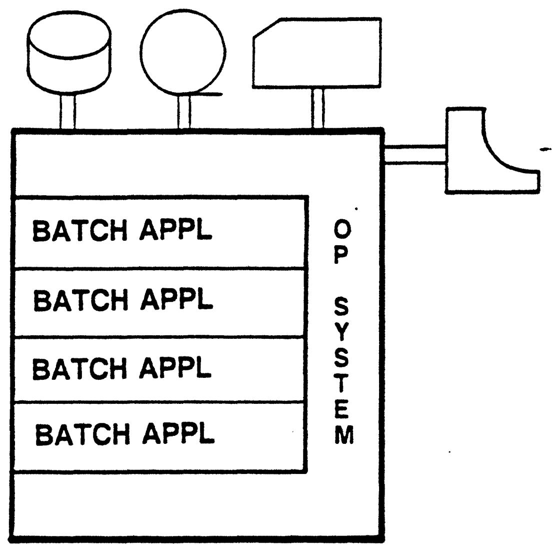
OBJECTIVES

After completing this lesson the student will be able to:

- o Describe the physical flow of data through an SNA network.
- o Define the terms end user, subarea, domain, and peripheral node.
- o List the three types of Network Addressable Units and responsibilities of each.
- o List the PU types and describe the responsibilities of each.
- o Describe the Path Control Network feature and its components.
- o Describe the reason for the development of SNA and use of SDLC.

REFERENCES

- o Systems Network Architecture Concepts and Products IBM GC30-3072-0
- o Systems Network Architecture Technical Overview IBM GC30-3073-0
- o Systems Network Architecture - Introduction to Session Between Logical Units IBM GC20-1869-2



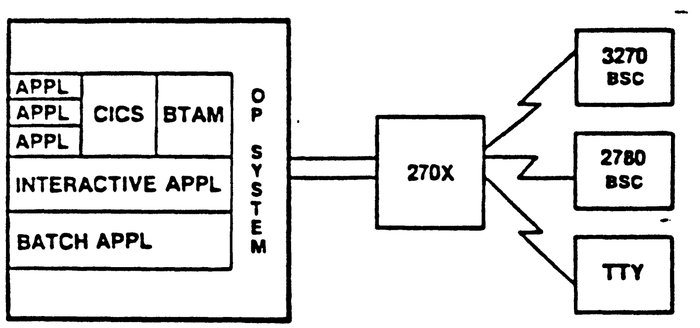
EARLY COMPUTER SYSTEMS

o Updating master file records continued to utilize the "batch method" of transaction input, using methods of established office clerical procedures before computers.

o These earliest computers did not have the physical ports for link communications, nor did they possess software needed to communicate with remote sites.

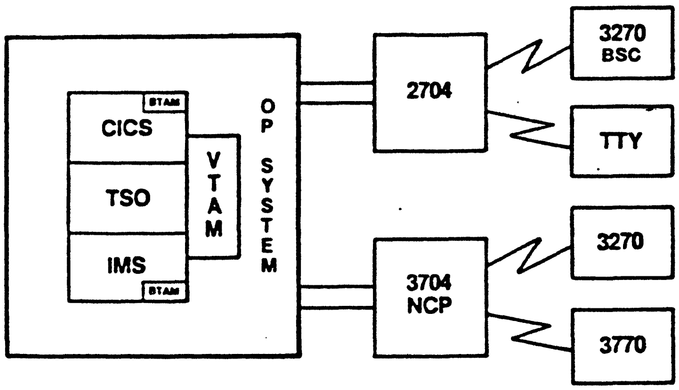
o The only external devices available were some type of peripheral storage device, such as disc or magnetic tape, for retention of company files and an operator's I/O console printer for conversation with the operating system.

o Later, the systems console (i.e. CRT) would make its appearance.



EARLY COMMUNICATIONS SYSTEMS

- o Before long, terminals at remote locations were able to perform **REMOTE BATCH PROCESSING** with a host processor. Transactions were collected at the remote site and transmitted at some convenient time of day across a communication link facility to the host where they were processed.
- o Next to evolve, was **INTERACTIVE TRANSACTION PROCESSING** whereby an operator would enter a transaction which was processed completely and the relevant file(s) dynamically updated.
- o These changes necessitated both hardware and software changes to the systems:
  - an early hardware change was an early type of communications controller (i.e. IBM 270X) which contained adapters and a scanning device.
  - software changes required highly specialized application programs that included communication drivers for generating and preparing the data for transmission to a remote terminal.
- o Eventually, to eliminate duplication of **communication Driver Software** in each application program, this software was incorporated as a functioning part of the operating system. (i.e. BTAM)
- o To provide even more flexibility, **TERMINAL CONTROL** software was developed to act as an interface between network software and the user's program, both which resided in the host processor (i.e. CICS).



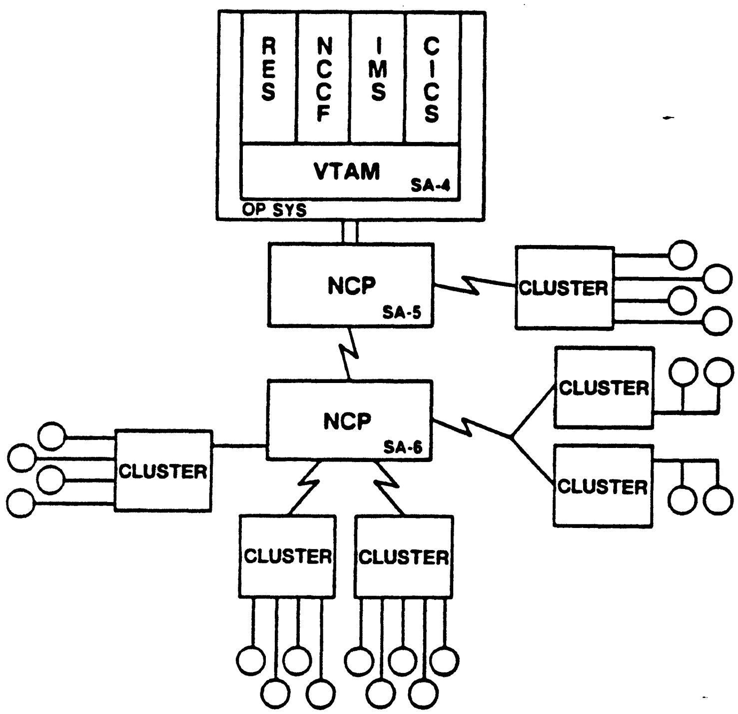
- o To isolate the more routine communication functions, a **Front-end Processor** (FEP) or **Communications Controller** was designed to store communication software that would handle such functions as polling, selecting, statistical gathering and error recovery for the distant network resources.

- o For the host to communicate with the FEP, an **Access Method**was developed to perform specialized communication tasks to assist these software subsystems that actually handled the communication processing.

- o The **Access Method** supports and controls terminal traffic, message switching functions between terminals that need to communicate with each other, and controlling the flow of messages between the host and the FEP.

- o The Access Method controls the network's communication functions.

SNA MESSAGE FLOW



Message Flow Through Physical Components

1. User enters data on remote peripheral device
2. Data transmitted from peripheral device to Cluster Controller
3. Data transmitted to Communications Controller
4. Data transmitted to host
5. Data is processed by application program in the host
6. Data is returned to terminal via reverse path

Message Flow In Cluster Controller (programmable)

1. Receives message from terminal
2. Calls and sends data to appropriate subsystem program within Cluster Controller
3. Formats message for transmission to host
4. Sends message to Communications Controller
5. Returns message to terminal via reverse path

Message Flow In Cluster Controller (non-programmable)

1. Receives message from terminal
2. Passes message to Communications Controller
3. Returns message to terminal via reverse path

Message Flow in Communications Controller

1. Receives message over SDLC link
2. Checks addressing in message and modifies format of that address
3. Passes message to channel interface
4. Returns message via reverse path

Message Flow In Host

1. Message passes across the channel interface (Common Trunk)
2. Operating system receives the message and passes it to the Access Method (AM)
3. Access Method notifies the appropriate application subsystem
4. Application subsystem calls in user's application program
5. Data is processed by the user's program
6. Processed message returns via reverse path

END USERS

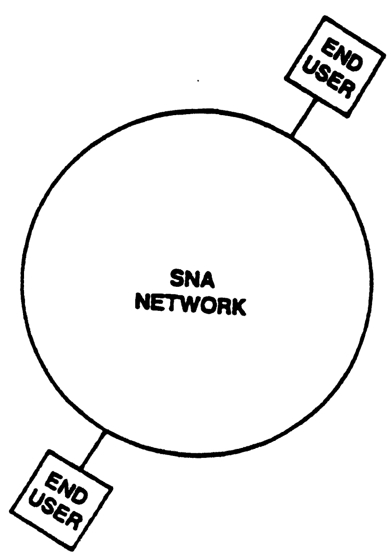
The SNA architecture is the supporting framework for end-users to **send** and **receive** data and other network transmissions through a network(s).

o **End-users** may be:

- Terminal Operators
- Applications (except Transaction Programs in APPC discussed in Lesson 11)
- I/O Devices

o **End Users** are not considered part of the SNA network, but merely take advantage of its services.

o Neither are they defined anywhere in the SNA specifications. Therefore, end-users need some way to access the network.



NETWORK ADDRESSABLE UNITS (NAUs)

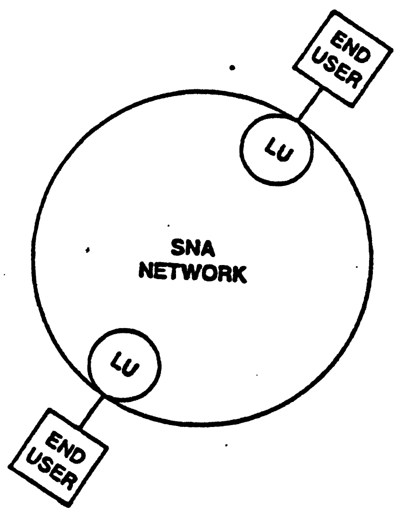
Network Addressable Units are the functioning entities in an SNA environment.

They are the **source** and **destination** of all information flowing within the SNA network.

There are **three types** of Network Addressable Units:

1. LOGICAL UNITS

- o **Logical Units** comprise software in the nodes and are a part of the defined network. They provide access to the network for end users. They allow users to take advantage of services provided by SNA.



- o There may be **one user per LU** (ex: terminal) or **multiple users** per LU (ex: application subsystems or distributed processors).
- o Every LU has a **network name** and **network address.** The user knows the network name, but the SNA software converts that name into an address for network message routing purposes.
- o LUs can be temporarily connected (logically) to allow end-users to exchange data. This connection is called a **session.**
- o The ultimate purpose of SNA is to allow end-users to connect and exchange data. All other procedures and network elements support this connection.

2. PHYSICAL UNITS

- **Physical Units** (PUs) are also **Network Addressable Units (NAUs.)**

- The PU is actually software in each node that provides services for that node and its network resources (links, terminals, cluster controllers, communications controllers and hosts).

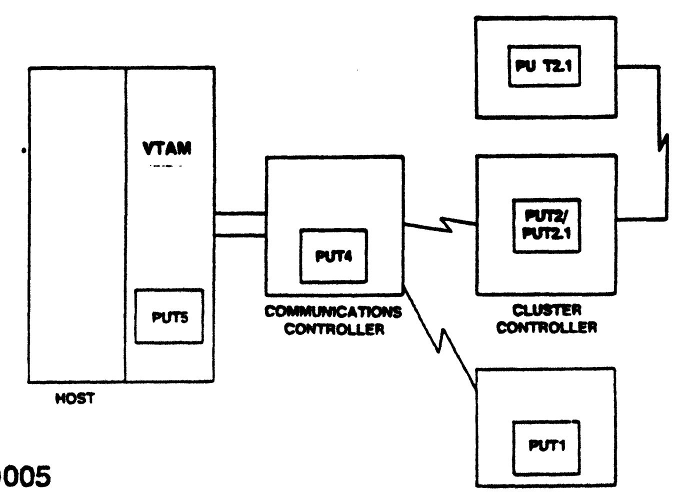
- A **node** is characterized as either a communications or cluster controller where a single link terminates or where multiple links converge.

- There are different types of PUs and they vary in their capabilities and responsibilities. The PUs are **identified by the services** which they perform and the **number of devices that each can support.**

- The format of a message transmitting from node to node may change depending upon the type of Physical Unit through which is moves.

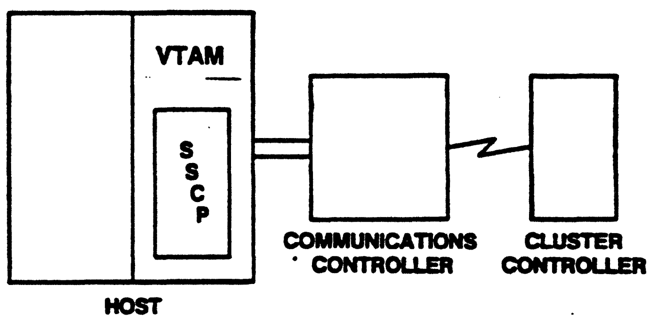
- Five types of Physical Units have been identified.

  - PU-T5 = Host processor (part of VTAM)
  - PU-T4 = Communications Controller (NCP)
  - PU-T2 = Cluster Controller or Distributed processor
  - PU-T2.1 = Distributed processors that may be directly connected together
  - PU-T1 = Single terminal without terminal controller or pre-SNA controller



3. SYSTEM SERVICES CONTROL POINT

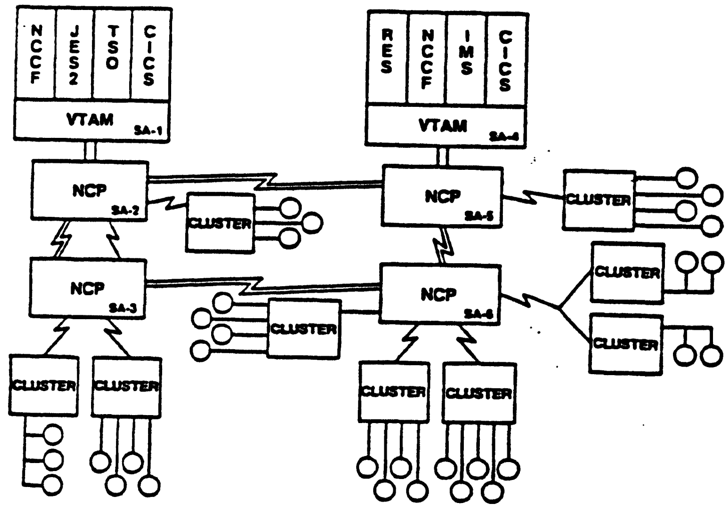
- o **System Services Control Point**(SSCP) is also a NAU.
- o The SSCP which manages all or a portion of the SNA network is a part of the access method known as VTAM.
- o The network operator and certain programs can interface with the SSCP to manage the network (activate and deactivate devices, receive statistics, vary the network, etc.)



The **SSCP** performs the following functions:

- o manages the network resources in accordance with commands issued by the operator or programs.
- o coordinates session activation and deactivation between NAUs. (except in PU-T2.1 to PU-T2.1 situations)
- o collects error statistics from PUs in its domain
- o transforms network names into network addresses
- o provides an interface for an operator to control and monitor the network

DOMAINS, SUBAREAS AND PERIPHERAL NODES



- o A **Subarea** consists of either a Communications Controller and its attached devices (PU-T2, PU-T2.1, and PU-T1) or a Host processor and its channel-attached devices.

  Each subarea incorporates a sophisticated "network address" scheme for purposes of message routing and address conversion.

- o **Peripheral nodes** are attached to subarea nodes, but may be peer attached to each other when implementing Advanced Program-to-Program (APPC) environments.

  Pre-APPC peripheral node's subarea identification will be included as part of the "network address".

  In comparision to subareas, the addressing scheme in peripheral nodes is less sophisticated and reflects a "local address" identifying the local device and has no message routing capabilities.

- o A **Domain** consists of all devices, subarea nodes and their attached peripheral nodes under the control of the one SSCP that was defined in the VTAM System Generation process.

  Networks may be of considered 'single-domain' or 'multiple-domain', depending upon the number of SSCPs defined.

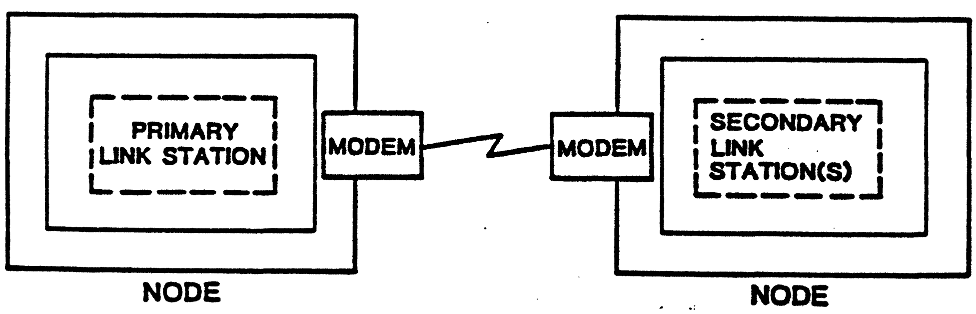
NAUs and the Path Control Network

Path Control Network component is composed of structures which provide for the transmitting of the information originating from the Network Addressable Units.

Data Link Component

o The Path Control Network utilizes the **Data Link Control Components** (DLC Driver) and protocols specific to that type of link being incorporated, (i.e. S/370 channel-interface, non-switched SDLC, switched SDLC).

- the data link control components actually govern the message sequencing and error-free transmission of data over each link.
- the components are:
  * **primary link station** which controls the transfer operations using SDLC commands
  * one or more **secondary link stations** which respond to the directions of the primary
  * the **link** itself that connects the two stations



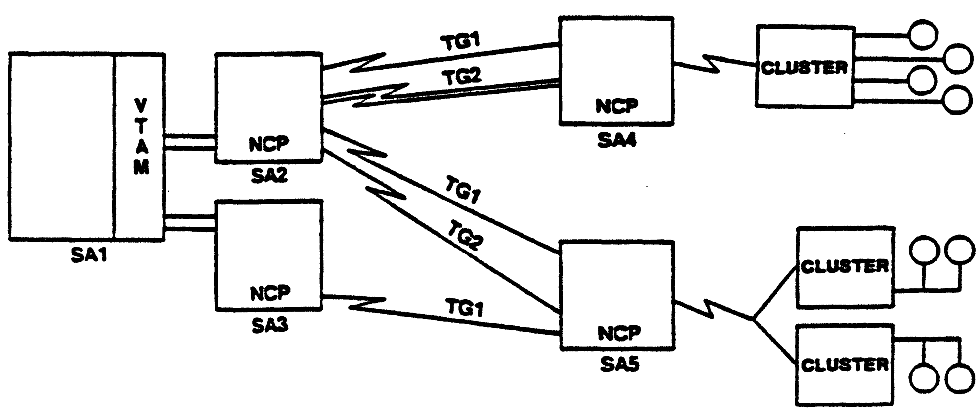
Path Control Network

Path Control Components

- o Resident in all SNA nodes is the **Path Control Component** which serves many functions. Among these functions are:
  - routing
  - network to local address conversion and vice versa

- o Some Path Control structures:
  - **Transmission Group** - one or more links, defined as a group between subarea nodes whose purpose is to evenly distribute traffic between the nodes and ensure continuing session activation in the event one link of the group fails.
  - **Explicit Route** - the physical path between two end-to-end subarea nodes. A maximum of eight may be assigned.
  - **Virtual Route** - a 'logical path' between two end-users that permits the assigning of a transmission priority value to the traffic passing over a given explicit route.

- o Also, the term, **Route Extension**, which is that part of the overall path consisting of the final link between the boundary subarea and the peripheral nodes.



WHY SNA?

- o To appreciate today's SNA, it would help to consider a few data communication-related problems that existed prior to 1974 when SNA was released by IBM:
  - there existed nearly 180 different products; 30 access methods, and 30 different protocols
  - devices or terminals were assigned a permanent 'address' relative to the channel they were attached to (until reconfigured)
  - devices or terminals were allocated to a given application program until that program ceased executing, and each program required its own dedicated set of terminals and devices
  - re-configuration was time-consuming and inflexible
  - only terminals and devices that were in the same product family and performed similar function could be attached to the same telecommunication line
  - inability to concentrate multiple lines from remote sites into a single 'trunk'
  - remote communication controllers non-existent
  - all data communications control software was performed in the host computer

AND SO...

- o SNA became IBM's corporate approach and marketing tool.
- o It was an early attempt at distributive processing outside of the host.
- o SNA is a set of specifications or architecture designed to be efficient, effortless, cost effective, reliable, provide a method of transmitting data through a network and for controlling the network's resources.

WHY SDLC

- o As mentioned earlier, there existed many divergent link protocols within the computer industry that supported only a particular product.
- o SDLC was to provide for the orderly transfer of data by means of addressing, controlling flow, error detection and recovery and no loss of data.
- o SDLC permitted messages to flow in both directions; from the host to the secondary, and vice versa.
- o It provides high throughput relative to line capacity by reducing the number of transmissions, especially acknowledgements, and the elimination of control characters.
- o Prevents duplicate messages and congestion from occurring.
- o Supports half and full duplex transmission modes; point-to-point and multiple-point configurations.
- o SDLC is independent of the products or devices that are incorportated into the network.
- o With SDLC, there was the ability to maintain seven outstanding frames on the link before an acknowledgement was required, thus reducing the number of transmissions (or 127 frames outstanding if using the Extended Mode).
- o The Control field of the link header can identify

  - a Supervisory frame
  - an Unnumbered frame
  - an Information frame

  format for purposes of link transmission and frame sequence error-checking.
- o As a bit-oriented protocol, the length of the frame could be of any length and was not encumbered with multiple control characters.

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REVIEW LESSON 1

Identify the component which the question best describes:

1. Permits the network operator to monitor and control the overall network.

2. Provides end-user access to the SNA network for the purpose of transmitting data.

3. Controls all or a portion of a domain.

4. Provides the means for assigning a priority of data being transferred over an Explicit Rooute.

5. Provides the functions of an interface between the application subsystems in the Host and the remote network operations.

6. Displays and/or stores statistical information gathered from remote physical units upon the request of a network operator.

7. Identify the Network Addressable Units.

8. An end-user may be described as either:

Circle the proper True/False answer for the questions below:

9. T F Peripheral nodes may be attached to a PU-T2/2.1, PU-T4 or PU-T5 node and route messages from subarea node to subarea node through the network.

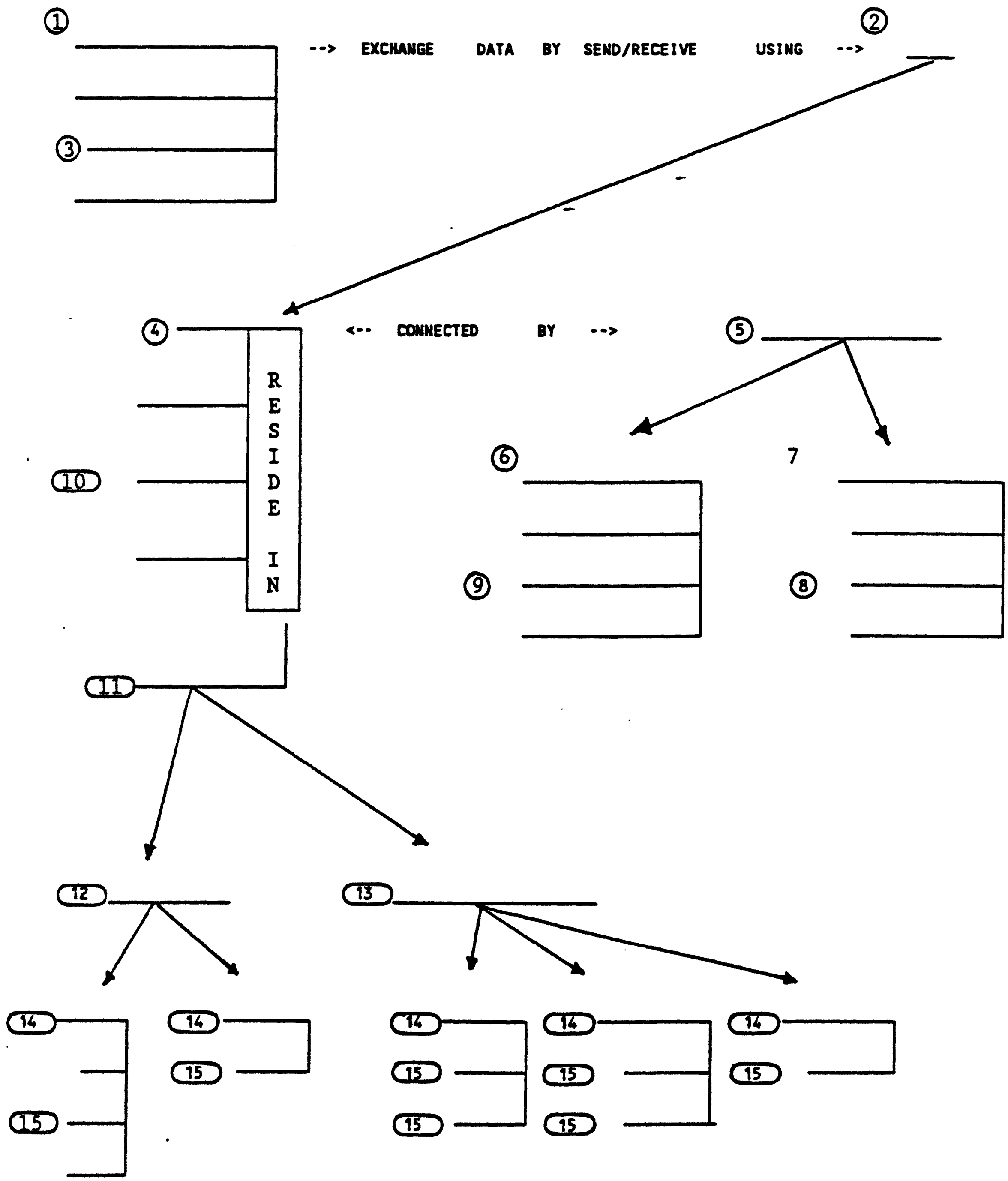
6. T F Subarea nodes may be attached to PU-T2/2/1, PU-T4 or PU-T5 nodes and use a local addressing scheme to identify the source and destination of the data.

7. T F A domain consists of all hardware, communication nodes, logical units, physical units and multiple SSCPs.

8. Below are 15 definitions. Read each numbered question, determine the correct answer, then write the answer by the diagram's corresponding circled number.

   1. Operators, programs or I/O devices that send and receive data through the network.
   2. The architecture which describes the formats, protocols, and procedures for transmitting information through a network.
   3. Three examples of end-users.
   4. The term referring to Logical Units, Physical Units, and SSCP.
   5. The protocol feature responsible for routing and linking the Network Addressable Units (NAUs) together.
   6. The Path Control Network components responsible for transferring data between adjacent nodes via some type of link protocol.
   7. Path Control Network components responsible for routing data between nodes across some type of link.
   8. The three Path Control Component items.
   9. The three Data Link Component items.
   10. Identify the three Network Addressable Units.
   11. A term describing a processor where a single link connection or multiple links may converge.
   12. A term describing a host or communications controller which utilizes a network addressing scheme for routing messages.
   13. A term describing a node attached to subarea node or to a similar peer node which utilizes a local addressing scheme.
   14. The Physical Unit numerical designation types associated with this type of node.
   15. Network Addressable Units which may reside in this particular node.

SNA COMPOSITE DIAGRAM



LESSON 2: SNA DATA FLOW

PURPOSE

This lesson describes the flow of data and control information through an SNA network.

OBJECTIVES

After completing this lesson the student will be able to:

- o Describe the different fields that comprise an SDLC frame.
- o Describe the different levels of message acknowledgement.
- o Describe the different types of request responses.
- o Describe the three transmission modes.
- o Define a chain and describe when a chain is used.
- o Define segmentation and when it is used.
- o Describe when and how bracket protocol is utilized.
- o Define pacing and describe when pacing is used.
- o List the different types of FIDs and identify when each would be used.

REFERENCES

- o System Network Architecture Concepts and Products, IBM GC30-3072-0
- o Systems Network Architecture - Introduction to Sessions Between Logical Units, IBM GC20-1869-2

MESSAGE FORMATS

SDLC Frame

			Data	
LH	TH	RH	RU	LT

RU = Request/Response Unit

May include data, DIU, FM headers, string control bytes, device control characters; response to request unit, or sense data. May be any length.

RH = Request/Response Header

Involves Request/Response Indicator, RU category, format indicator (whether FM headers are present in RU or not), bracket indicators, chain indicators, change direction indicator, response indicators, sense data indicator, and pacing indicator. Length is three bytes.

TH = Transmission Header

Indicates Format Indicator (FID) type, sender's address, receiver's address, and sequence number of message. Length depends on FID type and may be from two bytes to 26 bytes in length.

PIU = Path Information Unit

Combination of TH + RH + RU

LH = Link Header

Includes DLC flag, secondary link station address, control field (i.e., type of frame, poll/final bit, and frame count). Length is three or four bytes.

LT = Includes Frame check sequence (FCS), DLC flag. Length is three bytes.

BLU = Basic Link Unit

Includes DLC header and trailer + PIU

BTU = Basic Transmission Unit

Involves one or more PIUs

DATA FLOW

In an SNA network, **data flow** is controlled by several different software layers. The **DATA LINK LAYER** in each node actually controls the flow from one node to the adjacent node.

If appropriate, the Cluster Controller polls each of its terminals.

The Communications Controller polls each of its attached Cluster Controllers and any adjacent Communications Controllers.

The DLC Communications Drivers perform polling services for the peripheral devices in the network. A message sent from a terminal to an application in the Host may have required three or more "polls" and received three or more acknowledgements.

```
HOST            COMMUNICATION      CLUSTER          TERMINAL
               CONTROLLER        CONTROLLER
               RR  --------------->
               <------------------ NO DATA
                                     RR --------->
                                   <------------- DATA
                                     RR --------->

               RR ---------------->
               <------------------ DATA
               RR ---------------->

READ ------------>
<--------------- DATA
ACK ------------->
```

MESSAGE TRANSFER AT DATA LINK CONTROL LAYER
(with polls)

DATA FLOW CONT'D

Once the message has been successfully received by the Data Link Layer, it may have to be acknowledged by a higher layer.

It is this second acknowledgement of SNA which ensures "end-to-end delivery" of all messages. The **APPLICATION LAYER** receiving a request unit, will prepare a **response unit** indicating that the message was received correctly or was unacceptable.

This **message acknowledgement** at the Application Layer is returned through different SNA layers until it reaches the Data Link layer. The Data Link layer is unaware of the contents of the message. It treats this response as a message and passes the response across all of the links, with link acknowledgements occurring as necessary.

The need for a response on the **link level** is indicated in the **Link Header.**

The need for a response on the **Application level** is indicated in the **Request Header.**

```
HOST     COMMUNICATIONS     CLUSTER     TERMINAL
           CONTROLLER      CONTROLLER
                           <-------------- DATA
                           RR ------------>
               <------------ DATA
               RR ---------->
<------------ DATA
ACK --------->


RESPONSE ---->
<--------- ACK
               RESPONSE ------->
               <------------ RR
```

REQUEST AND RESPONSE TRANSFER (Withoutpolls)

At this point the host could answer the terminal's "request" by transmmitting a reply, using another "request" message to do so.

APPLICATION LEVEL RESPONSE TYPES (RESPONSE PROTOCOLS)

There are three response protocols:

- o Definite response (DRI)
- o Exception response (ERI)
- o No response

With **definite response**, the receiver must respond whether the PIU is correct or incorrect.

With **exception response**, the receiver will only respond to those PIUs that were incorrect.

With **no response**, the receiver will not respond.

It is possible to have a combination of definite and exception responses occurring during message exchanges.

The **type of response protocol required** for each request (message) is maintained with a combination of bits in the **Request Header.**

The type of responses permitted in a session is determined when the BIND command is issued during session establishment.

TRANSMISSION MODES

Transmission modes reference how the LUs in a session know when to **SEND** and when to **RECEIVE.** Three modes have been defined in SNA. The transmission mode is identified during the session establishment.

- o Full Duplex
- o Half-Duplex Contention
- o Half-Duplex Flip-Flop

Full duplex mode implies both session partners may send and receive **t the same time.** Neither partner is required to ask permission of the other before transmitting data.

```
PARTNER A                              PARTNER B

     (sending data)                  (receiving data)
     ------------------------------------->
     ------------------------------------->
    <-------------------------------------
    <-------------------------------------
    <-------------------------------------
     (receiving data)              (sending data)
```

Half-duplex contention mode implies only one session partner may SEND at a time. Whenever either LU has data to send, it simply transmits the message.

If both attempt to transmit simultaneously, one of the LUs will quit sending. Parameters in the BIND command determine which LU will be the **WINNER** in a contention situation, and which LU will be the **LOSER.**

Once one of the LUs is sending a message, it retains control until the entire message is sent, which may consist of one or more RUs. At this point, the two LUs are once again in contention, and either one may attempt to send an RU.

```
     PARTNER A                                PARTNER B

          DATA  ---------------------------------->
          DATA  ---------------------------------->
  (loser) DATA  ---------> <---------------------- DATA (winner)
                <--------------------------------- DATA
          DATA  ---------------------------------->
          DATA  ---------------------------------->
```

TRANSMISSION MODES CONT'D

Half-duplex flip-flop mode implies only one session partner may SEND at a time. The partners simply alternate sending messages. This is the most frequently used transmission mode.

Protocols for the LU which is sending or receiving is controlled with a bit in the RH called the **Change Direction Indicator (CDI).**

After one LU is through transmitting, it turns "on" the CDI in the last request it is sending. This signals the other LU that it may begin transmitting a request.

```
PARTNER A                      PARTNER B
     <------------------------ DATA
     <------------------------ DATA
     <------------------------ DATA,CDI

  DATA -------------------------->
  DATA,CDI ---------------------->

     <------------------------ DATA
```

CHAINS

A **chain** is composed of one or more requests that are considered part of the same message. Chains are used to prevent the overflow of the sender's or receiver's logical buffers.

The maximum size of an RU is specified in the BIND command. Often, the request that an end-user wishes to send is larger than the maximum RU size of either the sender or the receiver.

The sending LU can divide the larger RU into multiple RUs for transmission to the receiving LU. Chaining is maintained from LU to LU or end-to-end.

Two indicators are set in the RH implying that a chain is **beginning (BC)** or **ending (EC)**. If neither indicator is set, the RU is in the **middle** of a chain.

A chain may consist of only one RU. Both the BC and EC indicators will be set on in that situation and the meaning is **only in chain.**

However, if one request in the chain is received incorrectly (by the Application Layer) the entire chain is retransmitted, beginning with the first request message.

Responses to chains are usually accomplished with a combination of exception responses and definite responses. The final RU in the chain would require definite response. All others would require only exception response.

```
TERMINAL            CLUSTER                 HOST
  ---------------------->
    (message 1920 bytes)

                     BC,DRI,ERI,DATA1 --------->

                        DRI,ERI,DATA2 --------->

                        DRI,ERI,DATA3 --------->

                     EC,DRI,    ,DATAX --------->

                     <--------------------- + RSP
```

SEGMENTATION

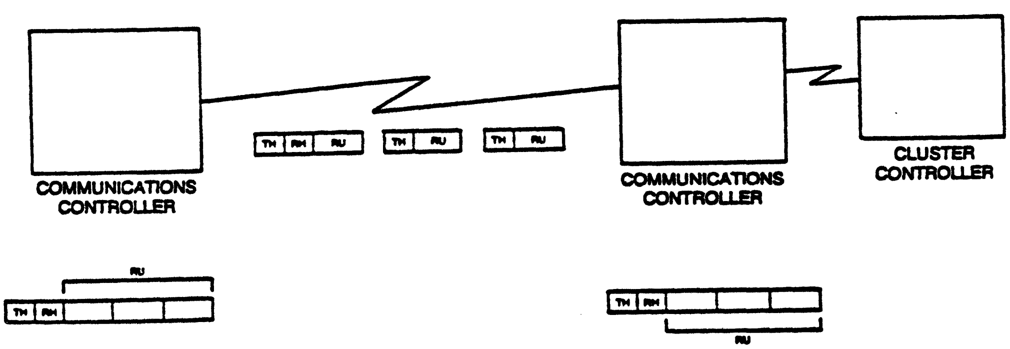
Different products have varying maximum physical buffer size limitations. As such, **segmentation** is used to prevent the overflow of an adjacent receiving node's buffers. Segmentation occurs on a link basis between adjacent nodes.

The maximum size that an adjacent node can receive is specified in the sender's NCP GEN.

If the request to be sent is larger than that which the adjacent node can receive, the RU will be divided into **multiple smaller segments** and transmitted individually. The receiving node will re-assemble the segments to the original RU size, then check that the next node can receive that RU.

A combination of two bit settings in the TH will indicate **first segment (FS)** or **last segment (LS).** If neither of the bits are set, this implies **middle segment (MS).** In the event there is only a **single segment**, then both bits would be set.

Only the first segment will contain an RH. The subsequent segments will only consist of a TH and RU.



BRACKET PROTOCOL

Multiple chains or multiple RUs (if chains are not used) may be grouped together and are called **brackets.** The bracket defines a single **unit of work** (i.e., a transaction). When bracket protocol is used, then all data RUs must be within brackets.

Brackets are used to prevent unrelated requests or responses from appearing within the processing of a session transaction (i.e. printer or database update).

The BIND command identifies whether brackets will be used and who can start or end a bracket. The **FIRST SPEAKER** and **BIDDER** will be identified.

Bit indicators are set in the RH identifying the **beginning (BB)**, **middle (MB)**, and **end** of a bracket (EB), or **only** bracket (OB).

The FIRST SPEAKER may begin a bracket any time THE BIDDER is not transmitting.

BIDDER **FIRST SPEAKER**

```
      <------------------------------- BB,BC,DRI,ERI,    ,data
      <-------------------------------       DRI,ERI,    ,data
      <-------------------------------    EC,DRI,    ,CDI,data

+RSP ------------------------------------->

BC,DRI,ERI,    ,data ---------------------->
EC,DRI,ERI,CDI,data ---------------------->

      <------------------------------- BC,DRI,ERI,    ,data
      <-------------------------------    DRI,ERI,    ,data
      <------------------------------- EC,DRI,    ,CDI,data

+RSP  ------------------------------->

EB,BC,DRI,ERI,    ,data ------------------->
      DRI,ERI,    ,data ------------------->
   EC,DRI,ERI,    ,data ------------------->

      <----------------------------------- -RSP
```

The BIDDER has **two optional protocol techniques** that may be used to seek permission to transmit.

- BID Command
- Implied BID

BID Command

The BIDDER may ask permission by sending first a **BID** command. The FIRST SPEAKER may accept or reject the BID.

EXAMPLE OF BID COMMAND

BIDDER **FIRST SPEAKER**

```
  BID ----------------------------------->
      <---------------------------------  -RSP
      <---------------------------------   RTR
  +RSP ---------------------------------->
BB,BC,DRI,ERI,    ,data ------------------>
      DRI,ERI,    ,data ------------------>
```

messages continue ...

Implied BID

Or optionally, the BIDDER may simply begin transmitting the first request and also set the bits "on" to indicate **BEGIN BRACKET** in the request header.

This is referred to as an **"Implied bid"**.

The last RU of the first chain **must** ask for a Definite Response. This permits the FIRST SPEAKER the opportunity to either accept or reject the implied bid.

EXAMPLE OF IMPLIED BID

BIDDER **FIRST SPEAKER**

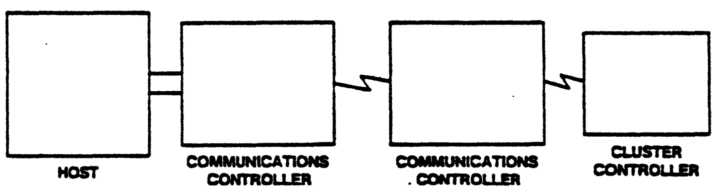
```
BB,BC,DRI,ERI,    ,data ------------------->
      DRI,ERI,    ,data ------------------->
   EC,DRI,   ,    ,data ------------------->
         <------------------------------ +RSP
   BC,DRI,ERI,    ,data ------------------->
   EC,DRI,ERI,     data ------------------->
EB,BC,DRI,ERI,     data ------------------->
   EC,DRI,ERI,    ,data ------------------->
```

PACING

Pacing is an SNA technique allowing the component receiving data to regulate the rate at which data is transmitted to it. This prevents the PLU from sending PIUs into the network faster than the NCP can transmit them or faster than the SLU itself can process the data.

Pacing may occur between the Host and Communications Controller or between the Communications Controller and the Cluster Controllers.

Pacing values are defined through parameter statements during the Sysgen process. These parameters may be associated with the LU definitions in either the VTAM or NCP gen listings or in the Logon Mode Table in VTAM.



VPACING - the parameter in VTAM or NCP that indicates the number of requests that may be sent between the PLU and the Communications Controller, before a pacing response is anticipated. The value may be zero through 63.

PACING -the parameter in VTAM or NCP that species flow of data pacing from an NCP boundary node to a peripheral node. The value may be zero through 63.

LOGON MODE TABLE - under certain conditions, the PLU and SLU (at BIND time) may override the VPACING or PACING values. It may indicate no pacing is to be implemented (unlimited RUs).

PSNDPAC - primary send pacing count
SRCVPAC - secondary receive pacing count
SSNDPAC - secondary send pacing count

This means that an SLU could have different pacing values depending on which application subsystem it is in session with at that time.

TRANSMISSION HEADER

FORMAT IDENTIFICATION

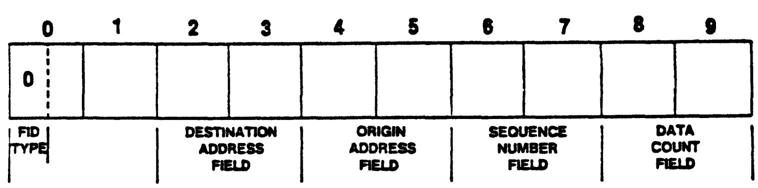
The Transmission Header consists of control information that is created and used by Path Control to route the messages and control their flow within the network.

SNA PIUs are classified according to where they occur as they travel through the network. This classification is called **Format Identification** or FID type.

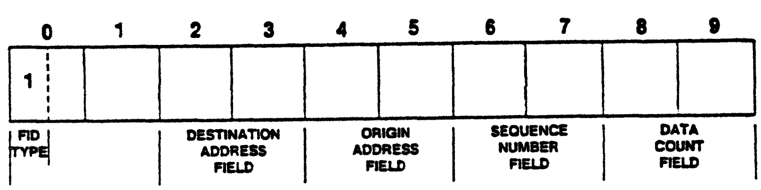
The type of **FID** is identified by Path Control in the first field of the Transmission Header. This is used by the receiving Path Control to identify the length of the Transmission Header (2-26 bytes) and determine the format of its fields.

Six different types of FIDs have been identified:

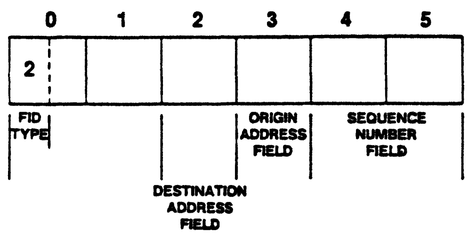
FID0 identifies messages to or from 3270 BSC devices that move between subareas when either or both do not support Explicit and Virtual route protocol. (16 bits for network address).



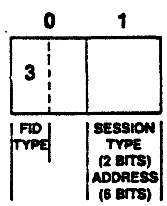
FID1 identifies messages to and from SNA devices moving between subarea nodes when either or both nodes do not support the Explicit route and Virtual route protocols. (16 bits for network address)



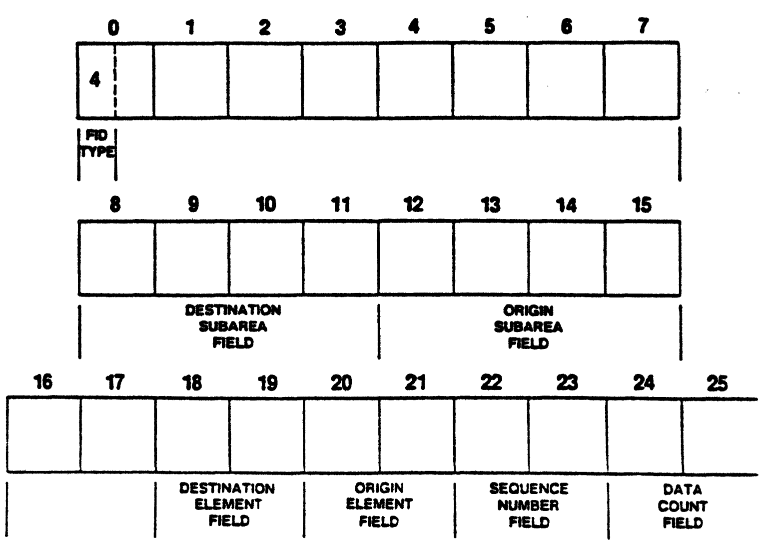
FID2 identifies messages between a subarea node and a PU-T2 peripheral node or between two PU_T2.1 nodes. (8 bits for local address)



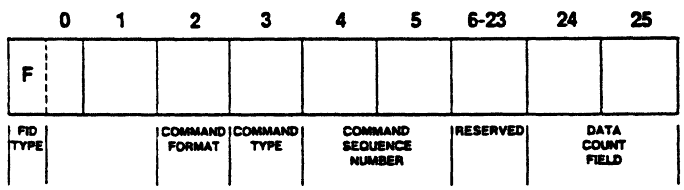
FID3 identifies messages between a subarea node and a PU-T1 peripheral node. (6 bits for local address)



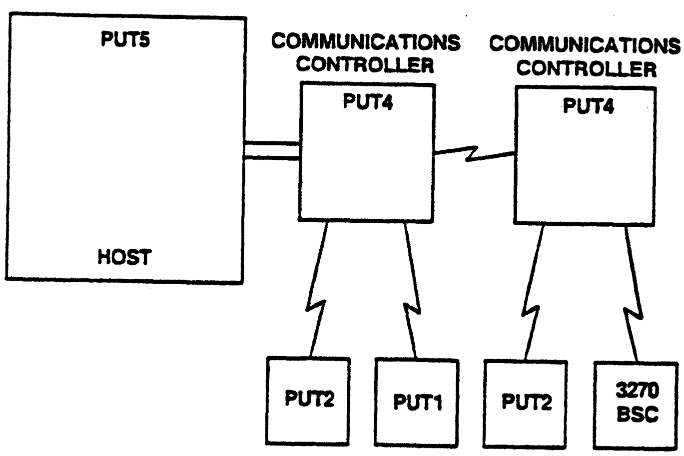
FID4 identifies messages between subarea nodes when both nodes support Explicit route and Virtual routes. (48 bits for network address)



FIDF identifies messages containing special commands for Transmission Group control (sequencing) that are sent between subarea nodes that support Explicit and Virtual route protocol.



The Transmission Header of a PIU will alter its field formats as it moves through the network from node to node.



CHAINING EXAMPLE (TOWER)

```
SEQ=005b,   TYPE=GOOD INPUT,   DRVR STAT=0000,   Tue Jan 26 07:51:17 1988
        | LH      | TH          DAF  OAF       #  | REQ   ER     |
        |         | OS                             | BC    PI     |
0000:   | C7   0A | 2C   0C    04   C1   00   09 | 02    91   00 |  F5   C6   11   D8   E7
           G  SMM   2C  NUL    PF  SOF  NUL  RLF  STX     j  NUL     5    F  DC1    Q    X
0010:     13   11   40   5B    1D   E8   C5   E7   E3    C5   D5    C4   C5   C4   40   C8
          TM  DC1         $   IGS    Y    E    X    T     E    N     D    E    D         H
0020:     C9   C7   C8   D3    C9   C7   C8   E3   C9    D5   C7    40   E3   C5   E2   E3

           I    G    H    L     I    G    H    T    I     N    G          T    E    S    T
0030:     11   C2   E3   1D    60   C6   D6   E4   D9    40   C6    C9   C5   D3   C4   E2
         DC1    B    T  IGS     -    F    O    U    R          F     I    E    L    D    S
0040:     40   C1   D9   C5    40   C4   C9   E2   D7    D3   C1    E8   C5   C4   40   C2
                A    R    E          D    I    S    P     L    A     Y    E    D         B
0050:     C5   D3   D6   E6    4B   11   C3   C5   1D    60
           E    L    O    W     .  DC1    C    E  IGS     -

SEQ=005b,   TYPE=GOOD INPUT,   DRVR STAT=0000,   Tue Jan 26 07:51:17 1988

0000:     C5   C1   C3   C8    40   C6   C9   C5   D3    C4   40    C8   C1   E2   40   C1
           E    A    C    H          F    I    E    L     D          H    A    S         A
0010:     D5   40   C5   E7    E3   C5   D5   C4   C5    C4   40    C8   C9   C7   C8   D3
           N         E    X     T    E    N    D    E     D          H    I    G    H    L
0020:     C9   C7   C8   E3    C9   D5   C7   11   C3    F3   1D    60   C6   C5   C1   E3
           I    G    H    T     I    N    G  DC1    C     3  IGS     -    F    E    A    T
0030:     E4   D9   C5   4B    40   C5   C1   C3   C8    40   C6    C9   C5   D3   C4   40
           U    R    E    .          E    A    C    H          F     I    E    L    D
0040:     C9   E2   40   C9    C4   C5   D5   E3   C9    C6   C9    C5   C4   40   C1   E2
           I    S         I     D    E    N    T    I     F    I     E    D         A    S
0050:     40   E3   D6   1D    60   E6   C8   C9   C3    C8
                T    C  IGS     -    W    H    I    C     H

SEQ=005b,   TYPE=GOOD INPUT,   DRVR STAT=0000,   Tue Jan 26 07:51:17 1988

0000:     40   C5   E7   E3    C5   D5   C4   C5   C4    40   C8    C9   C7   C8   D3   C9
                E    X    T     E    N    D    E    D          H     I    G    H    L    I
0010:     C7   C8   E3   C9    D5   C7   40   11   C5    C3   1D    60   C6   C5   C1   E3
           G    H    T    I     N    G       DC1    E     C  IGS     -    F    E    A    T
0020:     E4   D9   C5   40    E3   C8   C1   E3   40    C6   C9    C5   D3   C4   40   C9
           U    R    E          T    H    A    T          F    I     E    L    D         I
0030:     E2   40   E2   E4    D7   D7   D6   E2   C5    C4   40    E3   D6   40   C8   C1
           S         S    U     P    P    O    S    E     D          T    O         H    A
0040:     E5   C5   4B   11    C5   6D   1D   60   C5    C1   C3    C8
           V    E    .  DC1     E    _  IGS    -    E     A    C     H
```

```
SEQ=0060,   TYPE=GOOD OUTPUT,   DRVR STAT=0000,   Tue Jan 26 07:51:19 1988

0000:  C7   D1
        G    J


SEQ=0061,   TYPE=GOOD INPUT,   DRVR STAT=0000,   Tue Jan 26 07:51:19 1988
       LH        TH                                MC   ER
                 OS                                     PI
0000:  C7   2C   2C   0C   04   01   00   0A   00   91   00   D6   40   C2   C5   40
        G   2C   2C  NUL   PF  SCF  NUL  SMM  NUL    j  NUL    O         B    E
0010:  E5   C5   D9   C9   C6   C9   C5   C4   11   C6   D3   1D   60   E3   C8   C1
        V    E    R    I    F    I    E    D  DC1    F    L  IGS    -    T    H    A
0020:  E3   40   C9   E3   40   C9   E2   40   C4   C9   E2   D7   D3   C1   E8   C5
        T         I    T         I    S         D    I    S    P    L    A    Y    E
0030:  C4   40   E6   C9   E3   C8   40   E3   C8   C5   40   C3   D6   D9   D9   C5
        D         W    I    T    H         T    H    E         C    O    R    R    E
0040:  C3   E3   11   C6   7A   1D   60   C8   C9   C7   C8   D3   C9   C7   C8   E3
        C    T  DC1    F    :  IGS    -    H    I    G    H    L    I    G    H    T
0050:  C9   D5   C7   40   C6   C5   C1   E3   E4   D9
        I    N    G         F    E    A    T    U    R


SEQ=0061,   TYPE=GOOD INPUT,   DRVR STAT=0000,   Tue Jan 26 07:51:19 1988

0000:  C5   4B   40   C9   C6   40   E3   C8   C5   40   C6   C9   C5   D3   C4   E2
        E    .         I    F         T    H    E         F    I    E    L    D    S
0010:  11   C7   E3   1D   60   C1   D9   C5   40   C4   C9   E2   D7   D3   C1   E8
      DC1    G    T  IGS    -    A    R    E         D    I    S    P    L    A    Y
0020:  C5   C4   40   E6   C9   E3   C8   40   E3   C8   C5   40   C3   D6   D9   D9
        E    D         W    I    T    H         T    H    E         C    O    R    R
0030:  C5   C3   E3   40   C8   C9   C7   C8   D3   C9   C7   C8   E3   C9   D5   C7
        E    C    T         H    I    G    H    L    I    G    H    T    I    N    G
0040:  1D   60   E3   C8   C5   D5   40   D7   D9   C5   E2   E2   40   E3   C8   C5
      IGS    -    T    H    E    N         P    R    E    S    S         T    H    E
0050:  40   D7   C6   F1   40   D2   C5   E8   4B   40
            P    F    1         K    E    Y    .


SEQ=0061,   TYPE=GOOD INPUT,   DRVR STAT=0000,   Tue Jan 26 07:51:19 1988

0000:  C9   C6   11   C8   F3   1D   60   E3   C8   C5   40   C6   C9   C5   D3   C4
        I    F  DC1    H    3  IGS    -    T    H    E         F    I    E    L    D
0010:  E2   40   C1   D9   C5   40   D5   D6   E3   40   C4   C9   E2   D7   D3   C1
        S         A    R    E         N    O    T         D    I    S    P    L    A
0020:  E8   C5   C4   40   C3   D6   D9   D9   C5   C3   E3   D3   E8   11   C9   5B
        Y    E    D         C    O    R    R    E    C    T    L    Y  DC1    I    $
0030:  1D   60   E3   C8   C5   D5   40   D7   D9   C5   E2   E2   40   E3   C8   C5
      IGS    -    T    H    E    N         P    R    E    S    S         T    H    E
0040:  40   D7   C6   F2   40   D2   C5   E8   4B   40   11   4B
            P    F    2         K    E    Y    .       DC1    .
```

SEGMENTATION EXAMPLE (7950)

```
SEQ=0066,  TYPE=GOOD OUTPUT,  DRVR STAT=0000,  Tue Jan 26 07:51:21 1988

0000:  C7  F1
        G   1


SEQ=0067,  TYPE=GOOD INPUT,  DRVR STAT=0000,  Tue Jan 26 07:51:21 1988
       LH      TH                             REQ  ER
               OS                             EC   PI
0000: |C7  4E |2C  0C  04  01  00  0B |01  91  00 | D3  C4  40  C8  C1
        G   +  2C NUL  PF SCF NUL  VT SOH   j NUL   L   D       H   A
0010:  E2  40  D5  D6  40  C5  E7  E3  C5  D5  C4  C5  C4  40  C8  C9
        S       N   O       E   X   T   E   N   D   E   D       H   I
0020:  C7  C8  D3  C9  C7  C8  E3  C9  D5  C7  4B  11  4D  F3  1D  F0
        G   H   L   I   G   H   T   I   N   G   . DC1   (   3 IGS   0
0030:  E3  C8  C9  E2  40  C6  C9  C5  D3  C4  40  C9  E2  40  D9  C5
        T   H   I   S       F   I   E   L   D       I   S       R   E
0040:  E5  C5  D9  E2  C5  40  E5  C9  C4  C5  D6  4B  1D  60  11  50
        V   E   R   S   E       V   I   D   E   O   . IGS   - DC1   &
0050:  D3  1D  60  E3  C8  C9  E2  40  C6  C9
        L IGS   -   T   H   I   S       F   I


SEQ=0067,  TYPE=GOOD INPUT,  DRVR STAT=0000,  Tue Jan 26 07:51:21 1988

0000:  C5  D3  C4  40  C9  E2  40  C2  D3  C9  D5  D2  C9  D5  C7  4B
        E   L   D       I   S       B   L   I   N   K   I   N   G   .
0010:  1D  60  11  D2  F3  1D  60  E3  C8  C9  E2  40  C6  C9  C5  D3
      IGS   - DC1   K   3 IGS   -   T   H   I   S       F   I   E   L
0020:  C4  40  C9  E2  40  E4  D5  C4  C5  D9  E2  C3  D6  D9  C5  C4
        D       I   S       U   N   D   E   R   S   C   O   R   E   D
0030:  4B  1D  60  11  D7  F3  1D  E8  D7  D9  C5  E2  E2  40  D7  C6
        . IGS   - DC1   P   3 IGS   Y   P   R   E   S   S       P   F
0040:  F1  40  C9  C6  40  C4  C1  E3  C1  40  C9  E2  40  C3  D6  D9
        1       I   F       D   A   T   A       I   S       C   O   R
0050:  D9  C5  C3  E3  40  D7  C6  F2  40  C9
        R   E   C   T       P   F   2       I


SEQ=0067,  TYPE=GOOD INPUT,  DRVR STAT=0000,  Tue Jan 26 07:51:21 1988

0000:  C6  40  C9  D5  C3  D6  D9  D9  C5  C3  E3  40  40  40  11  D8
        F       I   N   C   O   R   R   E   C   T             DC1   Q
0010:  E6  1D  40  40  1D  60
        W IGS          IGS   -


SEQ=0068,  TYPE=GOOD INPUT,  DRVR STAT=0000,  Tue Jan 26 07:51:21 1988

0000:  C7  51
        G  51
```

NCR HOST LINK DATA CAPTURE

ge 1 of 7 1719 : 6B7(hex) bytes captured.

	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-A	-B	-C	-D	-E	-F	0123456789ABCDEF
0)	C2	F1	C2	71	C2	F1	C2	71	C2	F1	C2	71	C2	F1	C2	71	*B1B.B1B.B1B.B1B.*
10)	C2	F1	C2	71	C2	F1	C2	71	C2	F1	C2	71	C2	F1	C2	71	*B1B.B1B.B1B.B1B.*
20)	C2	F1	C2	71	C2	F1	C2	71	C2	F1	C2	71	C2	F1	C2	71	*B1B.B1B.B1B.B1B.*
							DAF	OAF	SEQ #		REQ	DRI	BB CDI				
30)	C2	F1	C2	7E	2C	00	01	02	00	02	03	80	A0	7D	5C	F2	*B1B=.........'*2*
			LH		TH						RH						
40)	11	5C	F0	81	82	C2	11	C2	71	C2	11	C2	71	C2	11	C2	*.*0abB.B.B.B.B.B*
50)	71	C2	11	C2	71	C2	11	C2	71	C2	11	C2	71	C2	06	2C	*.B.B.B.B.B.B.B..*
				SEQ #		RSP +								LH		TH	
60)	00	02	01	00	02	83	A0	00	C2	08	2C	00	02	01	00	07	*.....c..B.......*
						RH			LH		TH				SEQ#		
70)	03	81	40	F1	40	11	40	7B	F1	F1	61	F2	F1	61	F8	F6	*.a 1 . #11/21/86*
	RH	PI DRI	EB														
80)	40	F0	F8	7A	F2	F9	7A	F4	F8	1D	60	40	40	40	11	5B	* 08:29:48.- .$*
90)	E9	3C	5C	6F	00	11	5B	E9	40	11	C1	4D	40	40	40	C2	*Z.*?..$Z .A(B*
														RSP	IPR		
A0)	11	C2	B1	C2	11	C2	A0	2C	00	01	02	00	07	83	01	00	*.B.B.B.......c..*
						LH		TH				SEQ#		RH			
B0)	C2	B2	2C	00	01	02	00	07	83	80	00	C2	51	C2	B1	C2	*B.......c..B.B.B*
	LH		TH				SEQ#		RH	+RSP							
C0)	51	C2	B1	C2	51	C2	B1	C2	51	C2	B1	C2	4A	2C	00	02	*.B.B.B.B.B.B¢...*
				REQ	DRI PI	BB EB						LH		TH			
D0)	01	00	08	03	81	C0	F1	C2	11	40	7B	F1	F1	61	F2	F1	*....a(1B. #11/21*
		SEQ#		RH													
E0)	61	F8	F6	40	F0	F8	7A	F2	F9	7A	F5	F0	1D	60	40	40	*/86 08:29:50.- *
F0)	40	11	D7	F0	3C	D9	40	00	11	D7	F0	1D	60	5C	40	D5	* .P0.R ..P0.-* N*

NCR HOST LINK DATA CAPTURE

Page 2 of 7 1719 : 6B7(hex) bytes captured.

	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-A	-B	-C	-D	-E	-F	0123456789ABCDEF
100)	C3	C3	C6	F2	40	40	40	40	C1	C2	11	D9	40	3C	5A	50	*CCF2 AB.R .!&*
110)	00	11	D9	40	1D	60	C3	40	D5	C3	C3	C6	F2	40	40	40	*..R .-C NCCF2 *
120)	40	E3	C8	C5	40	C6	D6	D3	D3	D6	E6	C9	D5	C7	40	C1	* THE FOLLOWING A*
130)	D9	C5	40	C1	C2	C2	D9	C5	E5	C9	C1	E3	C9	D6	D5	E2	*RE ABBREVIATIONS*
140)	40	C6	D6	D9	40	D5	C3	C3	C6	40	C1	D5	C4	40	E5	E3	* FOR NCCF AND VT*
150)	C1	D4	40	C3	D6	D4	D4	C1	D5	C4	E2	7A	11	5A	50	3C	*AM COMMANDS:.!&.*
160)	5B	60	00	11	5A	50	1D	60	11	5A	5C	40	40	40	40	40	*$-..!&.-.!* *
170)	40	40	40	40	40	40	40	40	C3	D6	D4	D4	C1	D5	C4	40	* COMMAND *
180)	40	40	40	40	40	40	40	40	40	40	40	C1	C2	C2	D9	C5	* ABBRE*
190)	E5	C9	C1	E3	C9	D6	D5	11	C1	4D	40	40	40	11	5B	E5	*VIATION.A(.$V*
1A0)	5C	5C	5C	11	5B	61	6F	6F	6F	11	5C	F0	12	40	40	11	****.$/???.*0. .*
1B0)	40	40	05	13	C2	51	C2	D1	C2	51	C2	D4	2C	00	01	02	* ..B.BJB.BM....*
1C0)	00	08	83	01	00	C2	71	C2	D6	2C	00	01	02	00	08	83	*..c..B.BO......c*
1D0)	80	00	C2	91	C2	D1	C2	91	C2	D1	C2	91	C2	D8	2C	00	*..BjBJBjBJBjBQ..*
1E0)	01	02	00	03	03	80	A0	7D	5C	F0	11	5C	F0	C2	B1	C2	*.......'*0.*0B.B*
1F0)	D1	C2	B1	C2	D1	C2	AC	2C	00	02	01	00	03	83	A0	00	*JB.BJB.......c..*

- 1B0): C2 D4 — LH; 2C 00 01 02 … — TH
- 1C0): 00 08 — SEQ #; 83 01 00 — RH (IPR); C2 D6 — LH; 2C 00 01 02 — TH; 00 08 — SEQ #; 83 — RH
- 1D0): 80 00 — + RSP; C2 D8 — LH; 2C 00 … — TH
- 1E0): 00 03 — SEQ #; 03 80 A0 — RH (REQ)
- 1F0): C2 AC — LH; 2C 00 02 01 — TH; 00 03 — SEQ #; 83 A0 00 — RH (+ RSP)

NCR HOST LINK DATA CAPTURE

3 of 7 1719 : 6B7(hex) bytes captured.

-0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-A	-B	-C	-D	-E	-F	0123456789ABCDEF	Annotations
C2	AE	2C	00	02	01	00	09	03	81	40	F1	40	11	40	7B	*B........a 1 . #*	LH (C2 AE); TH (2C 00 02 01 00 09), SEQ # (00 09); REQ, RH (03 81 40)
F1	F1	61	F2	F1	61	F8	F6	40	F0	F8	7A	F2	F9	7A	F5	*11/21/86 08:29:5*	
F3	1D	60	40	40	40	11	5B	E9	3C	5C	6F	00	11	5B	E9	*3.- .$Z.*?..$Z*	
40	11	C1	4D	40	40	40	11	5B	E5	40	40	40	C2	B1	C2	* .A(.$V B.B*	
11	C2	B1	C2	1A	2C	00	01	02	00	09	83	01	00	C2	D1	*.B.B.......c..BJ*	LH (C2 1A); TH (2C 00 01 02 00 09), SEQ # (00 09); IPR, RH (83 01 00)
C2	1C	2C	00	01	02	00	09	83	80	00	C2	F1	C2	11	C2	*B.......c..B1B.B*	LH (C2 1C); TH (2C 00 01 02 00 09), SEQ # (00 09); RH +RSP (83 80 00)
F1	C2	11	C2	E0	28	00	02	01	00	0A	03	81	C0	F1	C2	*1B.B\.......a{1B*	LH (C2 E0); TH FIRST SEGMENT (28 00 02 01 00 0A); REQ, RH (03 81 C0)
11	40	7B	F1	F1	61	F2	F1	61	F8	F6	40	F0	F8	7A	F2	*. #11/21/86 08:2*	
F9	7A	F5	F5	1D	60	40	40	40	11	C1	50	3C	C2	60	00	*9:55.- .A&.B-.*	
11	C1	50	1D	60	11	C1	5C	40	40	40	40	40	40	40	40	*.A&.-.A* *	
40	40	40	40	40	7E	7E	7E	7E	7E	7E	7E	40	40	40	40	* ======= *	
40	40	40	40	40	40	40	40	7E	7E	7E	7E	7E	7E	7E	7E	* ========*	
7E	7E	7E	7E	11	C2	60	3C	C3	F0	00	11	C2	60	1D	60	*====.B-.C0..B-.-*	
11	C2	6C	40	40	40	40	40	40	40	C1	E4	E3	D6	E6	D9	*.B% AUTOWR*	
C1	D7	40	C6	E4	D3	D3	40	40	40	40	40	40	40	40	40	*AP FULL *	
40	40	40	C6	E4	D3	D3	11	C3	F0	3C	C5	40	00	11	C3	* FULL.C0.E ..C*	

```
                          NCR HOST LINK DATA CAPTURE

age 4 of 7              1719 : 6B7(hex) bytes captured.

      -0 -1 -2 -3 -4 -5 -6 -7   -8 -9 -A -B -C -D -E -F    0123456789ABCDEF

300)  F0 1D 60 11 C3 7C 40 40   40 40 40 40 40 40 40 C1   *0.-.C@          A*
310)  E4 E3 D6 E6 D9 C1 D7 40   D5 D6 40 40 40 40 40 40   *UTOWRAP NO       *
320)  40 40 40 40 40 40 D5 D6   11 C5 40 3C C6 50 00 11   *      NO.E .F&..*
330)  C5 40 1D 60 11 C5 4C 40   40 40 40 40 40 40 40 C1   *E .-.E<         A*
340)  E4 E3 D6 E6 D9 C1 D7 40   E8 C5 E2 40 40 40 40|C2   *UTOWRAP YES     B*
                                                     LH
350)  E2|20 00 02 01 00 0A|40   40 40 40 40 40 40 40 E8   *S......         Y*
        TH    MIDDLE SEGMENT
360)  C5 E2 11 C6 50 3C C7 60   00 11 C6 50 1D 60 11 C6   *ES.F&.G-..F&.-.F*
370)  5C 40 40 40 40 40 40 40   40 40 40 40 40 40 40 C4   **               D*
380)  40 D5 C5 E3 6B 40 40 40   40 40 40 40 40 40 40 40   * NET,            *
390)  40 C4 C9 E2 11 C7 60 3C   C8 F0 00 11 C7 60 1D 60   * DIS.G-.H0..G-.-*
3A0)  11 C7 6C 40 40 40 40 40   40 40 40 40 40 40 C4 40   *.G%            D *
3B0)  D5 C5 E3 6B C9 C4 7E 40   40 40 40 40 40 40 40 40   *NET,ID=          *
3C0)  40 40 40 C4 C4 11 C8 F0   3C 4A 40 00 11 C8 F0 1D   *   DD.H0.¢ ..H0.*
3D0)  60 11 C8 7C 40 11 4A 40   3C 4B 50 00 11 4A 40 1D   *-.H@ .¢ ..&..¢ .*
3E0)  60 11 4A 4C C4 40 D5 C5   E3 6B D9 D6 E4 E3 C5 6B   *-.¢<D NET,ROUTE,*
3F0)  C4 C5 E2 E3 E2 E4 C2 7E   40 40 40 40 40 40 40 40   *DESTSUB=         *
```

NCR HOST LINK DATA CAPTURE

```
: 5 of 7              1719 : 6B7(hex) bytes captured.

    -0 -1 -2 -3 -4 -5 -6 -7   -8 -9 -A -B -C -D--E -F    0123456789ABCDEF

))  40 40 40 40 C4 D9 11 4B   50 3C 4C 60 00 11 4B 50    *    DR..&.<-...&*
))  1D 60 11 4B 5C C4 40 D5   C5 E3 6B D5 C3 D7 E2 E3    *.-..*D NET,NCPST*
))  D6 D9 6B C9 C4 7E 7F D5   C3 40 40 40 40 40 40 40    *OR,ID="NC       *
))  40 40 40 40 40 C4 D5 40   D6 D7 C5 D9 C1 D5 C4 F1    *     DN OPERAND1*
))  40 D6 D7 C5 D9 C1 D5 C4   F2 11 4C 60 1D 60 3C 4D    * OPERAND2.<-.-.(*
))  F0 60 11 C1 4D 40 40|C2   E4|24 00 02 01 00 0A|40    *0-.A(  BU...... *
                        LH      TH    LAST SEGMENT
))  11 5B E5 40 40 40 11 5C   F0 12 40 40 11 40 40 05    *.$V   .*0.  .  .*
                                             IPR
))  13 C2 F1|C2 7E|2C 00 01   02 00 0A|83 01 00|C2 11    *.B1B=......c..B.*
             LH    TH                  RH
))  C2 71 C2 11|C2 70|2C 00   01 02 00 0A|83 80 00|C2    *B.B.B.......c..B*
                LH    TH                  RH  +RSP
))  31 C2 71 C2 31 C2 71 C2   31 C2 71 C2 31 C2 71 C2    *.B.B.B.B.B.B.B.B*
))  31 C2 71 C2 31 C2 71|C2   26|28 00 02 01 00 0B|03    *.B.B.B.B........*
                        LH      TH   FIRST SEGMENT RH
))  81 C0|F1 40 11 40 7B F1   F1 61 F2 F1 61 F8 F6 40    *a{1 . #11/21/86 *
))  F0 F8 7A F3 F0 7A F0 F0   1D 60 40 40 40 11 4C 60    *08:30:00.-   .<-*
))  3C 4D F0 00 11 4C 60 1D   60 11 4C 6C D7 D5 C1 D4    *.(0..<-.-.<%PNAM*
))  C5 7F 6B C1 C4 C4 D9 7E   7F C6 C9 D9 E2 E3 40 C2    *E",ADDR="FIRST B*
))  11 4D F0 3C 4F 40 00 11   4D F0 1D 60 11 4D 7C E8    *.(0.| ..(0.-.(@Y*
```

NCR HOST LINK DATA CAPTURE

```
Page 6 of 7                1719 : 6B7(hex) bytes captured.

       -0 -1 -2 -3 -4 -5 -6 -7   -8 -9 -A -B -C -D -E -F    0123456789ABCDEF

 500)  E3 C5 7F 6B D3 C5 D5 C7   E3 C8 7E F2 F5 F6 11 4F   *TE",LENGTH=256.|*
 510)  40 3C 50 50 00 11 4F 40   1D 60 11 4F 4C 40 40 40   * .&&..| .-.|<   *
 520)  40 40 40 40 40 40 40 40   40 40 40 D3 D6 C7 D6 C6   *           LOGOF*
 530)  C6 40 40 40 40 40 40 40   40 40 40 40 40 D3 D6 C7   *F            LOG*
 540)  11 50 50 3C D1 60 00 11   50 50 1D 60 11 50 5C 40   *.&&.J-..&&.-.&* *
 550)  11 D1 60 3C D2 F0 00 11   D1 60 1D 60 11 D1 6C 40   *.J-.K0..J-.-.J% *
 560)  40 40 40 40 40 40 40 40   D3 C9 E2 E3 40 C3 D3 C9   *        LIST CLI*
 570)  E2 E3 7E 40 40 40 40 40   40 40 40 40 40 40 40 D3   *ST=            L*
 580)  C3 11 D2 F0 3C D4 40 00   11 D2 F0 1D 60 11 D2 7C   *C.K0.M ..K0.-.K@*
 590)  40 40 40|C2 28|24 00 02   01 00 0B|40 40 40 40 40   *   B.......     *
                LH    TH    LAST  SEGMENT
 5A0)  D3 C9 E2 E3 40 E2 E3 C1   E3 E4 E2 7E 40 40 40 40   *LIST STATUS=    *
 5B0)  40 40 40 40 40 40 40 40   D3 E2 11 D4 40 3C D5 50   *        LS.M .N&*
 5C0)  00 11 D4 40 1D 60 11 D4   4C 40 40 40 40 40 40 40   *..M .-.M<       *
 5D0)  E5 40 D5 C5 E3 6B C1 C3   E3 6B C9 C4 7E 40 40 40   *V NET,ACT,ID=   *
 5E0)  40 40 40 40 40 40 40 40   40 C1 11 D5 50 3C D6 60   *         A.N&.O-*
 5F0)  00 11 D5 50 1D 60 11 D5   5C 40 40 40 40 40 E5 40   *..N&.-.N*     V *
```

NCR HOST LINK DATA CAPTURE

```
of 7              1719 : 6B7(hex) bytes captured.

-0 -1 -2 -3 -4 -5 -6 -7   -8 -9 -A -B -C -D -E -F    0123456789ABCDEF

D5 C5 E3 6B C9 D5 C1 C3   E3 6B C9 C4 7E 40 40 40   *NET,INACT,ID=   *
40 40 40 40 40 40 40 40   40 C9 11 D6 60 3C D7 F0   *         I.O-.PO*
00 11 D6 60 1D 60 11 D6   6C 40 40 40 40 40 40 40   *..O-.-.O%       *
40 40 40 40 E6 C8 D6 40   C1 D4 40 C9 6F 40 40 40   *    WHO AM I?   *
40 40 40 40 40 40 40 40   40 5B 11 D7 F0 1D 60 3C   *         $.PO.-.*
D9 40 60 11 C1 4D 40 40   40 C2 31 C2 B1 C2 31 C2   *R -.A(   B.B.B.B*
                             IPR                LH
B2 2C 00 01 02 00 0B 83   01 00 C2 51 C2 B4 2C 00   *.......c..B.B...*
   TH                RH               LH    TH
01 02 00 0B 83 80 00 C2   71 C2 B1 C2 71 C2 B1 C2   *....c..B.B.B.B.B*
            RH +RSP
71 C2 B1 C2 71 C2 B1 C2   71 C2 B1 C2 71 C2 B1 C2   *.B.B.B.B.B.B.B.B*
71 C2 B1 C2 71 C2 B1 C2   71 C2 B1 C2 71 C2 B1 C2   *.B.B.B.B.B.B.B.B*
71 C2 B1 C2 71 C2 B1 C2   71 C2 B1 C2 71 C2 B1 C2   *.B.B.B.B.B.B.B.B*
71 C2 B1 C2 71 C2 B1                                *.B.B.B.         *
```

REVIEW LESSON 2

1. Within the frame diagram below, label the sequence of the fields from left to right. Indicate which fields are related to SDLC protocol and which are related to the SNA architecture protocol.

Identify in which headers or fields of the frame, the following bits or information would be present:

2. The Secondary Link Station address:

3. The Change Direction Indicator bit:

4. The Segmentation bits:

5. The user data:

6. The Request Indicator bits:

7. The Frame Check Sequence value:

8. The beginning and ending Flag:

9. Sense Data:

Circle the proper True/False answer for the questions below:

10. T F During a session, a Request message may indicate either "no response", "definite response", or "immediate response".

11. T F The information (bits) indicating that an SDLC frame needs to be retransmissed is located in the Request Header of the frame.

12. T F Chaining is a protocol which permits a single large request unit (RU) to be split into smaller message units during session activity.

13. T F Pacing is a technique controlled by the sending LU session partner so that it can transmit any number of messages in succession to its session partner.

14. T F Chaining is a protocol associated between partner LUs (session) as determined by the RU size.

15. T F Segmentation is a protocol associated between adjacent physical nodes as determined by Path Information Unit size.

16. T F The only type of Request replies permitted during Definite Response protocol are "positive responses".

17. T F The only type of Request replies permitted during Exception Response protocol are "positive and negative responses".

18. T F In Half-Duplex Flip-Flop protocol, either the First Speaker or Bidder may begin a bracket at their own discretion.

19. T F The three types of SNA protocol acknowledgement are "Session Leve", "Link Level", and "Frame Level".

LESSON 3: LU SESSIONS

PURPOSE

This lesson describes the different types of logical units and the procedure for establishing sessions between logical units.

OBJECTIVES

After completing this lesson the student will be able to:

- o Describe the four kinds of sessions between NAUs.
- o Describe the meaning of Profile and identify the three groups.
- o Describe the LU-LU session types and their characteristics.
- o Describe the establishment procedure for an LU-LU session.
- o Be able to identify the format of a BIND command.

REFERENCES

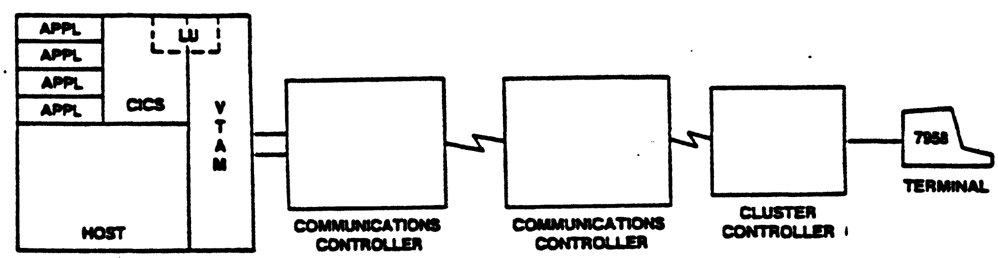
- o System Network Architecture Concepts and Products IBM GC30-3072-0
- o VTAM Concepts, IBM Independent Study Program I0057
- o SNA - Sessions Between Logical Units, IBM GC20-1868
- o An Introduction to Advanced Program-To-Program Communication (APPC), IBM GC24-1584

SNA SESSION TYPES

SNA supports four different types of sessions between NAUs.

- o SSCP-PU
- o SSCP-LU
- o SSCP-SSCP
- o LU-LU → Logon Session

Before an LU-LU session can be established, each LU and all PUs in the path between the LUs must be in session with the SSCP.



- o **SSCP-PU** - always the first session established in order to start the processes for that node. The session is used to control the activation or deactivation of the Path Control Network components; convey status information regarding the physical configuration, and stays in force as long as LU-LU sessions or that node are active.

- o **SSCP-LU** - must be established to start the processes for the LU. This session conveys status information or conducts tests, and must also stay in force while the LU is active.

- o **SSCP-SSCP** - this session will be started automatically at start of day prior to any "cross-domain" sessions occurring.

- o **LU-LU** - established to allow end-users to communicate, to specify what protocol rules to follow, and to notify SSCP and NCP of the two LUs in session.

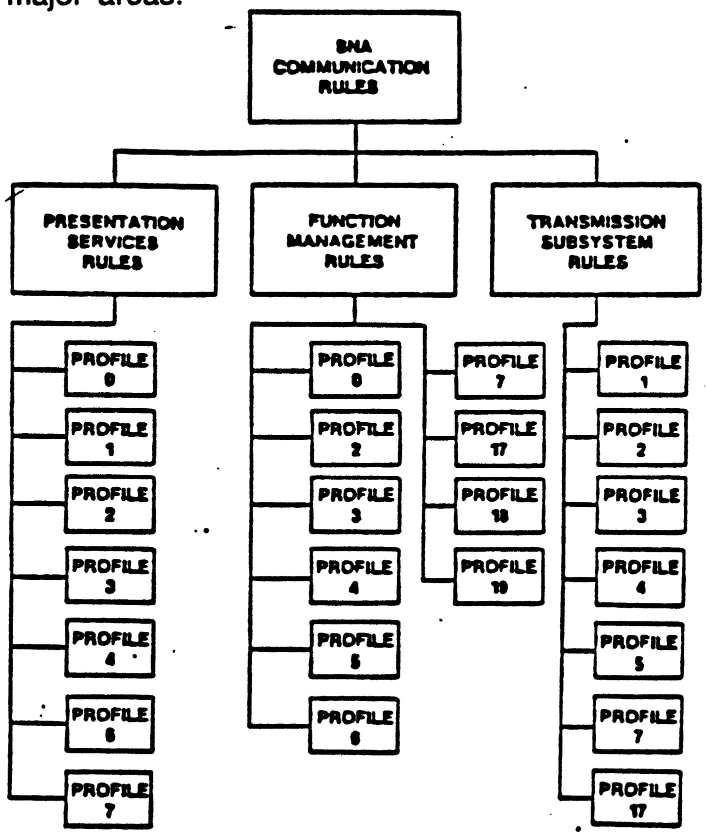
PROFILE

In an LU-LU session, the related functions and formats are referred to as **protocols.** **Protocol** may be defined as a set of rules, requirements, sequences, and procedures for transmitting information to and from a particular type of terminal in a telecommunications network. They are grouped into three major areas:

- o Presentation Services (PS)
- o Function Management (FM)
- o Transmission Subsystem (TS)

The predefined protocols within these groups are further defined and subdivided into what is called **profiles.**

The profile number is selected which subsequently provides the protocols for the LU-LU session.



Presentation Services - defines such things as code set, the usage of FM headers, and whether the terminal devices will be controlled by the 3270 data stream or the SNA character string (SCS). The LU type is defined by the PS profile type (i.e. they are the same).

Function Management Services - controls such things as whether the data flow will be full or half-duplex, whether flip-flop or contention will be used, and the rules for chaining and bracketing.

Transmission Services - defines such things as the size of the message (RU), the pacing, and how sequence numbers are used.

LU-LU SESSION TYPES

Various types of sessions exist because of different hardware equipment that was developed (ex: printers or display terminals) and the different processing functions that this equipment could perform (ex: interactive or remote batch processing).

The two terms, **LU session type** and **LU type**, are used interchangeably. Both refer to the subset of SNA functions and the format of the data supported when two LUs are in session.

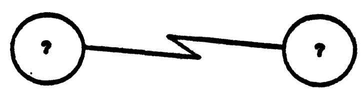
Two LUs communicating in a session must use the same format and subset of functions. Therefore they must be of the same LU type.

Type 0 LU-LU Sessions

Type 0 sessions are for communications that do not fall within the pre-defined grouping of profiles. Presentation Services usage is defined by the users.

Within LU 0, several subsets have been defined. An example is LUO (3614) which means that the Presentation Service usage will match that required by the 3614 ATM applications.

LU 0

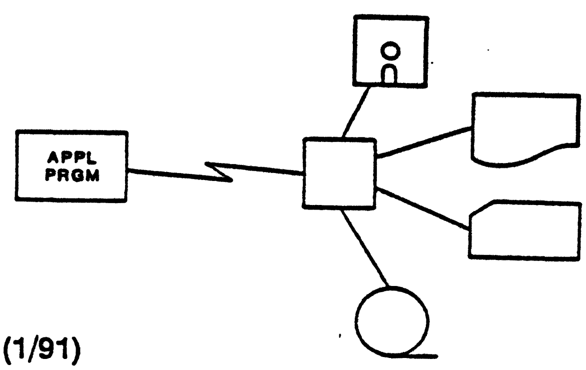


Type 1 LU-LU Sessions

Type 1 sessions allow communication between host application programs and single or multiple device terminals. The devices on the terminal may include CRTs, printers, diskettes, disks, and card reader/ punches. The display of the data on the terminal will be controlled by the SNA character string (SCS).

Primarily used with printers and RJE workstations.

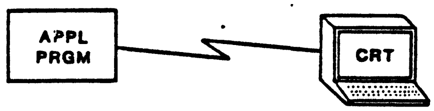
LU 1



Type 2 LU-LU Sessions

Type 2 sessions allow communication between host application programs and a single display device. The 3270 data stream (DSC) will be used to control the display of the data on the device. Fields may reflect such attributes as being protected or unprotected; displayed or non-displayed; or have extended highlighting features.

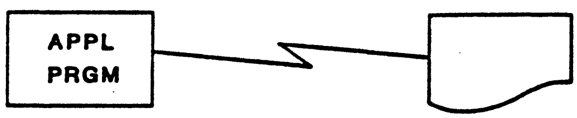
LU 2



Type 3 LU-LU Sessions

Type 3 sessions allow communication between application programs (in the host) and a single printer, not having a keyboard. The 3270 data stream will be used to control the display of the data on the printer.

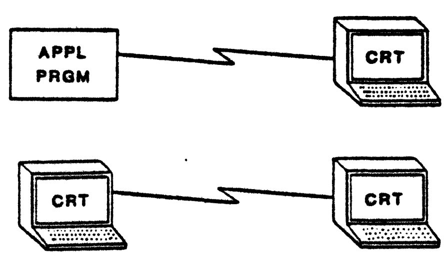
LU 3



Type 4 LU-LU Sessions

Type 4 sessions allow communication between two terminals or between host application programs and single or multiple device terminals. The devices on the terminal may include CRTs, printers, disks, card reader/punches, as well as word processing equipment. Type 4 sessions are similar to LU1 sessions, but have extra capabilities of Word Processing and operating without a host SSCP, when the terminal partners can handle the SSCP functions. Additionally, both session partners may be equal rather than having one partner control the session. Peer-to-peer partners both share the recovery responsibilities and either may send the BIND command. The LU that sends the BIND becomes the defacto PLU. The SCS data stream will control the display of the data.

LU 4

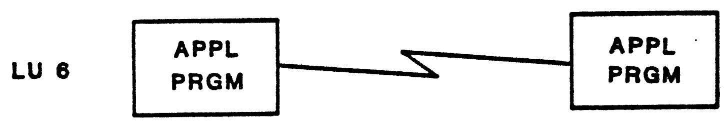


Type 6 LU-LU Sessions

Type 6 sessions allow communication between application subsystems. Examples are CICS to IMS, CICS to CICS, or IMS to IMS. The session partners are the subsystems. The programs running under the control of the subsystem are the end users.

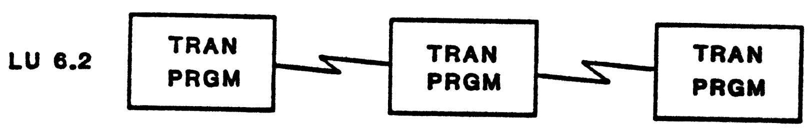
SCS and SNA field formatted data stream are used to describe the format and layout of the data transmitted.

The session partners may be equal.



Type 6.2 LU-LU Sessions

Type 6.2 sessions allow any to any communications. Any LU may have a session with any other LU regardless of whether the LUs are in the same host, in the network, or in both. The LUs do not require an SSCP for session establishment. Additionally, each LU may support more than one end user (called Transaction Programs or TP). Another term used frequently for this session type is **APPC or Advanced Program-to-Program Communication.**



Type 7 LU-LU Sessions

A specialized family of workstations made up of display consoles or other terminal devices designed for different applications involving interactive use. Similar to 3270 Information Display product line.

LU TYPES AND PROFILE IDENTIFIERS

LU Type	PS Profile	TS Profile	FM Profile	PS Characteristics
0	0	2,3,4,7	2,3,4,7,18	Any option desired.
1	1	3,4	3,4	SNA character string; DP media support; FM headers types 1,2,3, or more *Batch Devices*
2	2	3	3	3270 data stream; no FM headers; display support. *Such as a monitor*
3	3	3	3	3270 data stream; no FM headers; printer support.
4	4	7	7	SNA character string; FM header types 1,2,3, or more; DP and WP media support; (primarily office automation).
6	6	4	18	SNA character string; 3270 data stream structured field format; Logical message services (LMS) data stream; User defined data stream; Program to program communication *PC's or intelligent W/S. W/S has communication*
6.2	6	7	19	Generalized Data Stream; peer to peer communication.
7	7	7	7	5250 data stream; no FM headers; display support. *AS400 Language*

SNA PRODUCTS BY LU TYPE

	IBM PLU	IBM SLU	NCR SLU
LU0	CICS IMS	3600 3650 3660 3790 S/34 DPPX Series 1 DPCX S/36	5000 BAS* ITX* VRX* TOWER* TCOS SNA 7000
LU1	CICS IMS TSO RES JES2 JES3 NCCF TCAM 3630 NOSP VSPC	DPCX DPPX 3270 3630 3767 3770 3790 S/32 S/34 S/36 S/38	7950 5000 BAS* TOWER ITX VRX WORKSAVER 7000
LU2	CICS IMS TSO NCCF TSO TCAM NOSP VSPC	DPCX DPPX 3270 3790 S/36	7950 5000 BAS* TOWER ITX VRX WORKSAVER 7000 TCOS SNA
LU3	CICS TCAM	DPCX 3270 3790 S/36	7950 5000 BAS* TOWER WORKSAVER ITX* VRX*
LU4	CICS IMS RES S/34 S/38	5250 6670 S/34 DPCX	
LU6	CICS IMS		
LU6.2	CICS S/38 8100 DISPLAYWRITER SCANMASTER		TOWER ITX* VRX*

* Requires user programming to implement.

LU-LU SESSION ESTABLISHMENT

A session may be **requested** by either a PLU, an SLU, or another element in the network (program or operator).

PLU Initiated

The application program may initiate the session if the SLU is a device such as an unattended printer or if the time the session is needed is known only to the application program.

The application program or subsystem may send either of the following Application Program Interface (API) macros to VTAM:

- **SIMLOGON** - this macro sends an initiate request to SSCP when the application program wishes to initiate the session and act as PLU. If the SLU is disabled or at its session limit, optionally this request may be queued. A second macro, OPNDST OPTCD = ACCEPT would accept any pending activation.
- **OPNDST OPTCD=ACQUIRE** - (Open Destination Option Code = Acquire). OPNDST will result in a session being established only if the requested SLU is available. Initiating a session and accepting the resulting pending active session in one operation is known as **"acquiring a session"** .

NOTE: These are not SNA commands, but rather commands exchanged between host applications and VTAM.

SLU Initiated

The SLU may initiate a session by depressing a key on a terminal or entering a character-coded LOGON.

The SLU may send one of the following commands to the SSCP:

- **Formatted logon INITSELF** - usually sent by a programmable controller.
- **Character-coded LOGON** - normal terminal-type logon usually sent by a non-programmable controller.
- REQSESS - Request Session. Sent by a subsystem wishing to establish a session with another subsystem which will be the PLU.

Third Party Initiated

A session may be initiated by a logical unit that will not be one of the active session partners, such as a network operator.

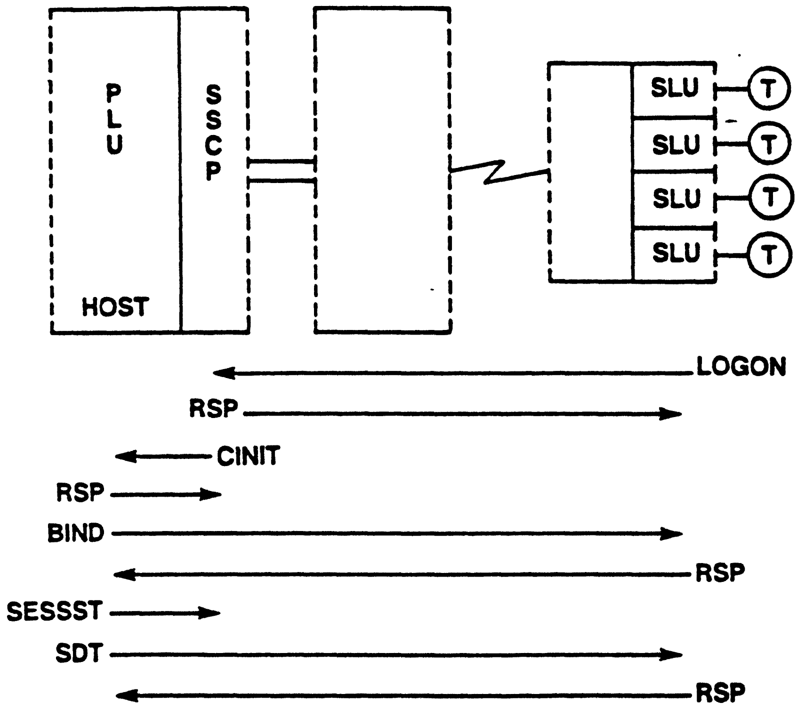
o V NET,LOGON = __________, ID = _________

(Vary Network) The first blank contains the name of the PLU application subsystem and the ID field contains the SLU network name.

Start of Day

A session can be initiated at start of day if the logical unit has a controlling application subsystem and when the following macro is included in that portion of the VTAM Sysgen which defines the SLU.

o LOGAPPL = __________________
(the blank contains the PLU name)



Session Establishment Procedures

NOTE: In order for LU-LU sessions to be established, the SSCP must already be in session with all PUs in the path and with both LUs to be in the session.

1. First, the SSCP would require one of the above mentioned activation requests.

2. The SSCP sends a positive response (RSP) to the SLU and a control initiate (CINIT) RU to the PLU

3. The PLU sends a BIND RU to the SLU. The BIND contains the profile usages of Presentation Services, Transmission Subsystem, and Function Management. It also identifies the session (LU) type.

   Sometimes the BIND is negotiable; that is the LU receiving the BIND may accept or reject the profiles and parameters sent with the BIND. - A field in the BIND identifies whether the parameter may be negotiated.

4. The SLU sends a positive (or negative) response RU (RSP) to the PLU.

   If the BIND was negotiable, the +RSP will contain the altered session parameters that the first LU may accept or reject.

   However, if the BIND receiver agrees with the parameters in the BIND, the parameters returned with the +RSP will be the same as in the BIND.

5. The PLU sends a session started RU (SESSST) to the SSCP informing it that the LU-LU session was successful.

6. The PLU sends a start data traffic (SDT) command to the SLU to acknowledge that session setup is complete and flow of data messages may begin.

7. The SLU sends a positive response to the PLU.

SESSION ESTABLISHMENT PREVENTION (may be others)

- o The SLU may not be allowed to talk to the PLU.
- o Insufficient buffer resources.
- o Maximum session limit by one of the LUs was reached.
- o SSCP determines that destination LU is not its domain.
- o Destination logical unit is not active.
- o Mismatch of LU session types.
- o The parameters sent in the BIND may not be acceptable

```
      -0 -1 -2 -3 -4 -5 -6 -7   -8 -9 -A -B -C -D -E -F    0123456789ABCDEF
000)  C1 31 C1 71 C1 31 C1 71   C1 31 C1 71 C1 31 C1 71   *A.A.A.A.A.A.A.A.*
010)  C1 31 C1 71 C1 31 C1 72   2C 00 00 03 00 00 03 80   *A.A.A.A.........*
020)  00 C3 C9 C3 E2 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.CICSA.A.A.A.A.A*
030)  71 C1 51 C1 71 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.A.A.A.A.A.A.A.A*
040)  71 C1 51 C1 71 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.A.A.A.A.A.A.A.A*
050)  71 C1 51 C1 71 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.A.A.A.A.A.A.A.A*
060)  71 C1 51 C1 71 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.A.A.A.A.A.A.A.A*
070)  71 C1 51 C1 71 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.A.A.A.A.A.A.A.A*
080)  71 C1 51 C1 71 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.A.A.A.A.A.A.A.A*
090)  71 C1 51 C1 71 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.A.A.A.A.A.A.A.A*
0A0)  71 C1 51 C1 71 C1 51 C1   71 C1 51 C1 71 C1 51 C1   *.A.A.A.A.A.A.A.A*
0B0)  71 C1 51 C1 71 C1 51 C1   71 C1 46 2C 00 03 00 00   *.A.A.A.A.A......*
0C0)  00 83 80 00 C1 48 2C 00   03 00 00 07 03 80 00 15   *.c..A...........*
0D0)  E3 C8 C1 D5 D2 40 E8 D6   E4 40 60 60 40 D3 D6 C7   *THANK YOU -- LOG*
0E0)  D6 D5 40 E6 C9 D3 D3 40   C3 D6 D4 D4 C5 D5 C3 C5   *ON WILL COMMENCE*
0F0)  40 D4 D6 D4 C5 D5 E3 C1   D9 C9 D3 E8 15 C1 51 C1   * MOMENTARILY.A.A*
```

BIND Format

Byte #

Byte #		Description
0	-	identifies RU as a BIND (X'31')
1	-	identifies whether the BIND is negotiable or non-negotiable
2	-	identifies FM profile to use
3	-	identifies TS profile to use
4-7	-	identifies FM usage (protocols used - half or full duplex, chain and bracket rules)
8-13	-	identifies TS usage (pacing, maximum RU size)
14	-	identifies PS profile (session type)
15-25	-	identifies PS usage (FM headers, data stream, screen or buffer size)
26-27	-	cryptography
28-n	-	data

	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-A	-B	-C	-D	-E	-F	0123456789ABCDEF
100)	B1	C1	51	C1	B1	C1	51	C1	B1	C1	51	C1	B4	2C	00	00	*.A.A.A.A.A.A....*
110)	03	00	07	83	80	00	C1	71	C1	B1	C1	71	C1	B1	C1	71	*...c..A.A.A.A.A.*
120)	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	*A.A.A.A.A.A.A.A.*
130)	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	*A.A.A.A.A.A.A.A.*
140)	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	*A.A.A.A.A.A.A.A.*
150)	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	*A.A.A.A.A.A.A.A.*
160)	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	*A.A.A.A.A.A.A.A.*
170)	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	*A.A.A.A.A.A.A.A.*
180)	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	*A.A.A.A.A.A.A.A.*
190)	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	C1	B1	C1	71	*A.A.A.A.A.A.A.A.*
1A0)	C1	B1	C1	71	C1	B1	C1	6A	2D	00	03	01	00	C7	6B	80	*A.A.A.A!.....G,.*
1B0)	00	31	01	03	03	B1	B0	30	80	00	02	85	85	02	00	02	*...........ee...*
1C0)	00	00	00	00	00	00	00	00	00	00	00	00	04	C3	C9	C3	*.............CIC*
1D0)	E2	00	C1	71	C1	D1	C1	71	C1	D6	2D	00	01	03	00	C7	*S.A.AJA.AO.....G*
1E0)	EB	80	00	31	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*....AjAJAjAJAjAJ*
1F0)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*

	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-A	-B	-C	-D	-E	-F	0123456789ABCDEF
200)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
210)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
220)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
230)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
240)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
250)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
260)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
270)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
280)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
290)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
2A0)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
2B0)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
2C0)	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	C1	91	C1	D1	*AjAJAjAJAjAJAjAJ*
2D0)	C1	91	C1	D1	C1	91	C1	D1	C1	8C	2D	00	03	01	00	C8	*AjAJAjAJA......H*
2E0)	6B	80	00	A0	C1	91	C1	F1	C1	91	C1	F8	2D	00	01	03	*,...AjA1AjA8....*
2F0:	00	C8	EB	80	00	A0	C1	B1	C1	F1	C1	B1	C1	F1	C1	B1	*.H....A.A1A.A1A.*

```
FEF ASCB 00FBA610            JOBN ACFINF
    BUFF    VTAM    /CT461L02    LRC(000,000)    INBOUND
    VTAM    TH=44000000 00000000 00000001 00000015 1C000001 00260000 0007  RH=038000
                                 C3C9C3E2                                               *CICS                  *
    TIME    52538.454965
FEF ASCB 00FBA610            JOBN ACFINF
    BUFF    CT461L02/VTAM        LRC(000,000)    OUTBOUND
    VTAM    TH=40000000 00000000 00000015 00000001 1C000026 00010000 0003  RH=838000

    TIME    52538.469257
FEF ASCB 00FBA610            JOBN ACFINF
    BUFF    CT461L02/VTAM        LRC(000,000)    OUTBOUND
    VTAM    TH=40000000 00000000 00000015 00000001 1C000026 00010002 0032  RH=038000
                                 1540E3C8 C1D5D240 E8D6E440 606040C3 C9C3E240  *. THANK YOU -- CICS *
                                 E6C9D3D3 40C3D6D4 D4C5D5C3 C540D4D6 D4C5D5E3  *WILL COMMENCE MOMENT*
                                 C1D9C9D3 E84B15                               *ARILY..             *
    TIME    52538.476193
FEF ASCB 00FBA610            JOBN ACFINF
    BUFF    VTAM    /CT461L02    LRC(000,000)    INBOUND
    VTAM    TH=44000000 00000000 00000001 00000015 1C000001 00260002 0003  RH=838000
    TIME    52545.812853
FEF ASCB 00F63250            JOBN CICSFAST
    BUFF    CT461L02/A06CICS     LRC(000,000)    OUTBOUND
    VTAM    TH=40000000 00000000 00000015 00000001 1D000026 000F2711 0027  RH=6B8000
                                 31010303 B1B03080 00028585 02000200 00000000  *...........ee.........*
                                 00000000 00000007 C1F0F6C3 C9C3E200           *.........A06CICS.     *
    TIME    52546.200095
FEF ASCB 00F63250            JOBN CICSFAST
    BUFF    A06CICS /CT461L02    LRC(000,000)    INBOUND
    VTAM    TH=44000000 00000000 00000001 00000015 1D00000F 00262711 0004  RH=EB8000
                                 31                                            *.                     *
    TIME    52553.417982
FEF ASCB 00F63250            JOBN CICSFAST
    BUFF    CT461L02/A06CICS     LRC(000,000)    OUTBOUND
    VTAM    TH=40000000 00000000 00000015 00000001 1D000026 000F2712 0004  RH=6B8000
                                 A0                                            *.                     *
    TIME    52554.528341
FEF ASCB 00F63250            JOBN CICSFAST
    BUFF    A06CICS /CT461L02    LRC(000,000)    INBOUND
    VTAM    TH=44000000 00000000 00000001 00000015 1D00000F 00262712 0004  RH=EB8000
                                 A0                                            *.                     *
    TIME    52561.814266
```

REVIEW LESSON 3

1. Identify the different methods a session between logical units may be initiated.

2. Identify the different session types that may be established between the Network Addressable units.

3. Briefly describe or define what is meant by the term "profile".

4. How may categories of SNA protocols (profiles) are there? Identify them.

Circle the proper True/False answer for the questions below:

5. T F In order for a Seconday Logical Unit to request a session with an application at the host, the logon message is first received by the Primary Logical Unit at the host to be involved.

6. T F Before any user session data may be exchanged between the logical units, a Start Data Traffic command must be sent from the Primary Logical Unit to the Secondary Logical Unit.

7. T F The rules and regulations for a session between the logical units are exchanged and agreed upon in a BIND command sent by the Primary Logical Unit to the Secondary Unit.

Identify the following Session Types:

8. T F An LU Type 2 session involves data exchanged between peer level Transaction Programs.

9. T F An application program involved with remote batch processing of data is called an LU Type 1 session.

10. T F Application programs involving devices whose presentation methods are unknown to the SNA datastreams is called an LU Type 0 session.

11. T F Terminals exchanging data in a Word Processing environment are called LU Type 3 session.

12. T F Application programs residing at the Host and processing single transactional data from remote terminals is called an LU Type 6.2 session.

13. Using the sample data capture print out, answer the following questions:

    a. On which offset line (extreme left of page) do you find the beginning of the first actual data message (PIU)?

    b. Which logical unit sent the message?

    c. What LU-LU session type is specified in the BIND command?

    d. What are the profile types indicated for this session?

	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-A	-B	-C	-D	-E	-F	0123456789ABCDEF
00)	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	*A1A1A1A1A1A1A1A1*
10)	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	*A1A1A1A1A1A1A1A1*
20)	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	*A1A1A1A1A1A1A1A1*
30)	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	*A1A1A1A1A1A1A1A1*
40)	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	*A1A1A1A1A1A1A1A1*
50)	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	*A1A1A1A1A1A1A1A1*
60)	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	*A1A1A1A1A1A1A1A1*
70)	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	C1	F1	*A1A1A1A1A1A1A1A1*
80)	C1	F1	C1	F1	C1	F1	C1	F1	C1	EE	2D	00	04	01	00	56	*A1A1A1A1A.......*
90)	6B	80	00	31	01	03	03	B1	A0	30	80	00	02	87	87	02	*,............gg.*
A0)	0C	01	00	00	00	E1	00	00	00	00	00	00	00	00	0E	D5	*...............N*
B0)	C3	C3	C6	F1	F0	F0	F1	00	C1	F1	C1	11	C1	F1	C1	1E	*CCF1001.A1A.A1A.*
C0)	2D	00	01	04	00	56	EB	80	00	31	C1	11	C1	11	C1	11	*..........A.A.A.*
D0)	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	*A.A.A.A.A.A.A.A.*
E0)	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	*A.A.A.A.A.A.A.A.*
F0)	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	C1	11	*A.A.A.A.A.A.A.A.*

LESSON 4: MAJOR IBM PU_T2 PRODUCTS

PURPOSE

This lesson will provide examples of major IBM SNA cluster controllers and distributed processors.

OBJECTIVES

After completing this lesson the student will be able to:

- List the major IBM SNA distributed processors and cluster controllers and describe the attributes of each

REFERENCES

- The IBM Evolving Network Strategies, Nov. 1980, Yankee Group Research, Inc.
- The New IBM, Dec. 1982, Yankee Group Research, Inc.
- An Introduction to the IBM 3270 Information Display System, IBM GA27-2739-15
- IBM 3790 Communication System Host System Programmer's Guide, IBM GC22-90
- An Introduction to the IBM 3790 Communication System, IBM GA27-2807-4
- IBM 3650 Programmable Store System Introduction, IBM GA27-3163-2
- IBM System/38, IBM GC21-7728-6

INTRODUCTION

Cluster Controllers and Distributed processors that must be connected to a PU-T4 or PU-T5 are considered PU-T2s.

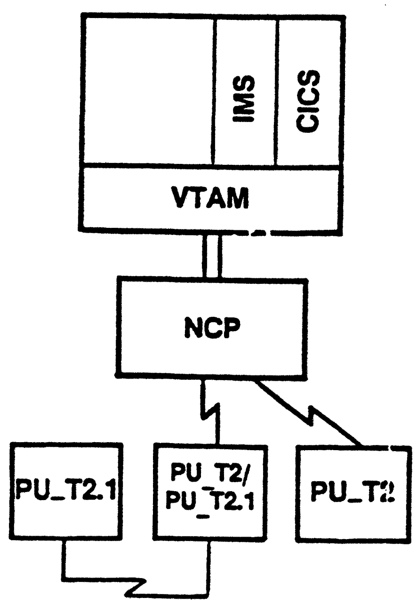
Those that may connect to another Cluster Controller or Distributed processors are considered PU-T2.1.

Many of the products are defined for specific applications or environments. Others are general purpose. All have different types of SNA capabilities.

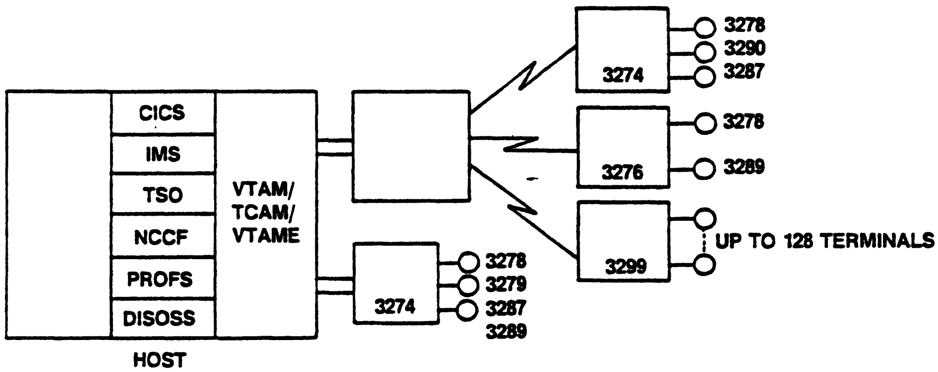
The PU-T2 and PU-T2.1 products can be classified into five groups:

	EXAMPLES:
o Interactive Terminal Displays	(IBM 3270)
o Batch Entry Systems	(IBM 3790)
o Vocational Systems	(IBM 3650 Programmable Stores)
o Mini Processor Systems	(Series 1; S/34; S/34; S/38)
o Microcomputers	(PC)

This lesson will provide an example of each.



IBM 3270 INFORMATION DISPLAY SYSTEM (Interactive)



Background

Announced in 1971, the 3270 product line provided a versatile general-purpose office system offering application software for inquiries, online data entry, personal computing, document development, program development, and a means of monitoring the system's operations. The individual products available for customer selection offered diverse characteristics.

3270 Product Family

- o Cluster controllers (3271, 3272, 3274)
- o Display stations (CRTs) (3277, 3278, 3279, 3178)
- o Printers (3262, 3268, 3284, 3286, 3287, 3288, 3289)
- o Table-top, integrated controller/display stations (3275, 3276)
- o 3290 flat screen CRT
- o 3299 terminal multiplexor

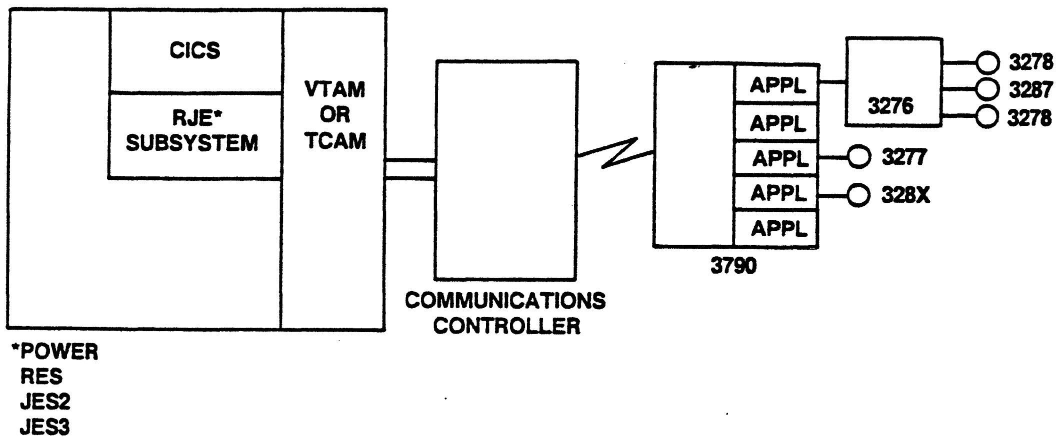
Evolution

- o First generation - Binary Synchronous Communications (BSC - 1971)
- o Second generation - SDLC
- o Third generation - SNA/SDLC (1977)
- o Fourth generation - Extended Features
- o Fifth generation - New devices

SNA Capability

- o PU-T2
- o LU1 - SNA character string (SCS) printer support
- o LU2 - 3270 data stream (DSC) and extended data stream CRT support
- o LU3 - 3270 data stream (DSC) printer support

IBM 3790 COMMUNICATION SYSTEM (Remote Batch)



Background

An operator-oriented system consisting of operator terminals, printers, and tape units that provided a distributed processing facility. It was designed to meet the needs of a remote site staffed with clerical personnel. Programs are assembled and stored at the host in libraries, then transmitted to the remote controller where the programs could be initiated either by the host or the 3790 operator; attended or unattended.

3790 Product Family

- o 3791 programmablecontroller (up to 31 programs can be executing concurrently)
- o Designed for distributed processing of batch data
- o Supports up to six remote 3276 integrated control unit display clusters
- o Supports 3277 CRTs and 3284, 3286, 3287, 3288 printers

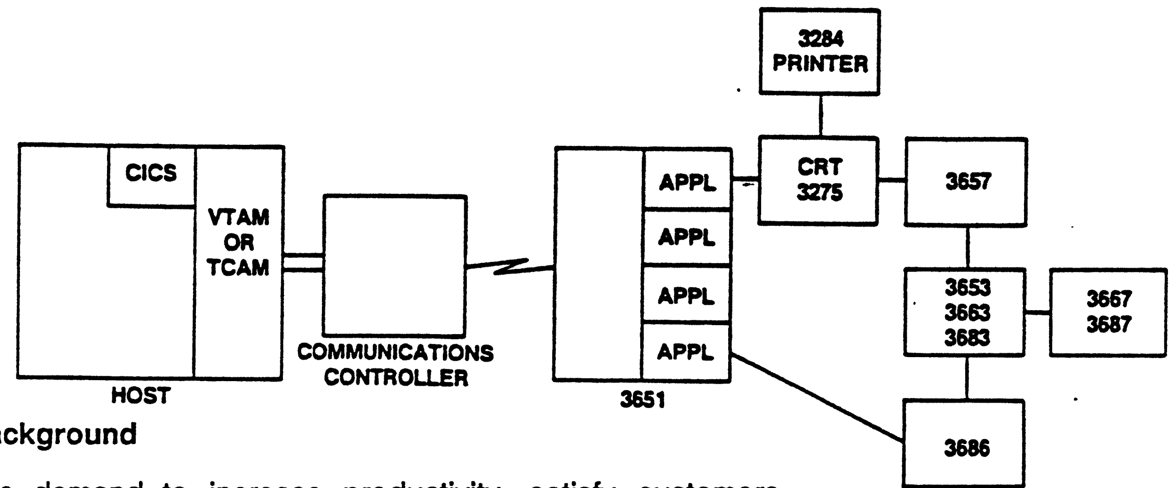
Host Communication Possiblities

- o Host to 3790 database access (interactive)
- o Host to 3790 batch data transfer
- o Host to 3277 CRT (host programmed services)
- o Host to 3270 type of printer (3284, 3286, 3287, 3288 3289 printer directly attached to 3791)
- o 3790 RJE function

SNA Capability

- o PU-T2
- o 3790 sends field formatted logon
- o LU0 (full function)
- o LU1 (RJE)
- o LU2 (CICS; IMS)
- o LU3 (3270 data stream - DSC)

IBM 3650 PROGRAMMABLE STORE SYSTEM (Vocational)



Background

The demand to increase productivity, satisfy customers, and remain competitive lead to the development of industry specific applications. Store systems were to provide management that ability to monitor sales and productivity of the entire chain of stores or an individual stores.

Following are examples of related vocational applications:

- o 3600 Financial Communications System - geared for tellers, officers, and management of financial institutions.
- o 3630 Plant Communications System - manufacturing operations.
- o 3650 Retail Stores System - retail environment
- o 3650 Programmable Store System - a highly customer-tailored system. Combined machines, programs, and communication facilities connected loop-fashion for large retail or supermarket stores
- o 3660 Supermarket Systems - improved super-market facility with customer checkout scanners
- o 3680 Programmable Stores - POS terminal for various operations (i.e.drugs stores, hardware retail, restaurants, supermarkets)

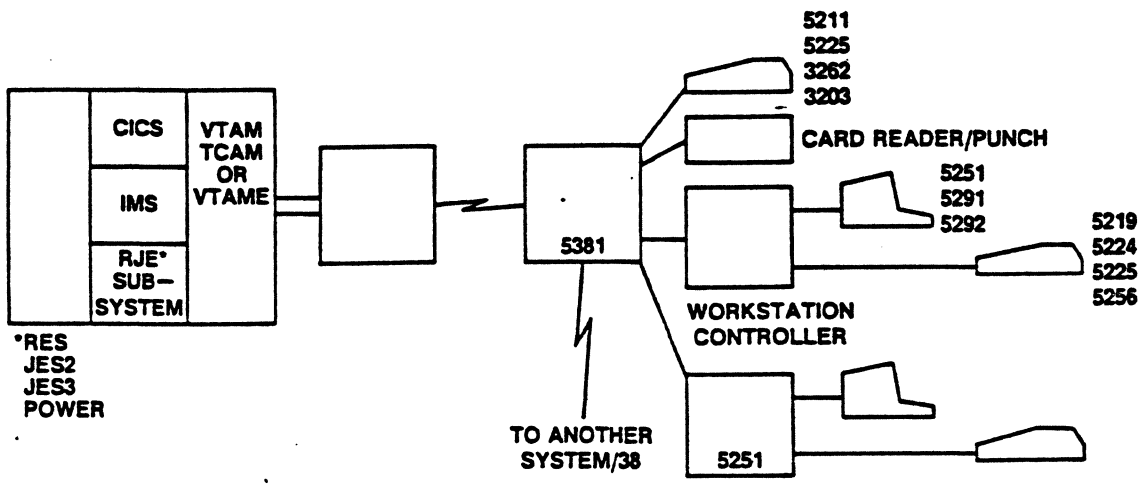
3650 Programmable Stores Product Family

- o 3651, controller located in store
- o 3653, 3663, 3683 POS terminals
- o 3687 checkout scanners
- o 3275, 3686 display stations
- o 3784, 3284 printers
- o 3657 ticket unit
- o 3767 communication terminal
- o 7481 data storage unit as backup for 3651 failure

SNA Capabilities

- o PU-T2
- o LU0 (3650 Pipeline LU)
- o LU2 (3600 Financial Communications System)
- o No Function Management Headers

SERIES 1; S/32; S/34; S/36; and S/38 (Miniprocessor)



Background

General purpose mini-processors intended for the first-time users in data processing. The systems include a variety of I/O devices and attached peripherals. Protocols range from S/S, BSC to SDLC and physical sizes range from rack mounted (S/1), desk size (S/32), to larger floor models (S/38).

General Overview

- o Developed specifically for interactive jobs
- o supports interactive or batch jobs
- o 3270 emulation (BSC only)
- o supports BSC and SDLC terminals
- o connects to SNA host via SNA/SDLC
- o User friendly - intended as entry system
- o 16K - 128K byte memory for Series 1
- o 1024K - 8192K bytes main memory for S/38.

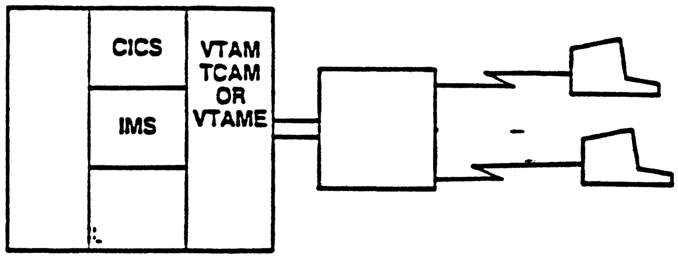
S/38 Product Family

- o 5381, 5382 controller with CPU and main storage, keyboard, and display screen.
- o 5211, 5225, 3262, 3203 high speed printers
- o 3410, 3411, 3430 magnetic tape
- o 5250 Information Display System
- o 5256, 5219 table-top printers
- o 3270 Information Display System
- o S/38 Operating System
  - Control Program Facility (CPF) supporting user interface providing control language, libraries, operator services, communications, data management, and diagnostics.
  - S/38 could act as remote host computer or as terminal to mainframe.
  - Can be connected to another S/38 on peer-to-peer basis performing Advanced Program-to-Program Communications (session type LU6.2).
  - Supports device emulation for:
    - 3270 Information Display System
    - remote 5250 Information Display systems
    - IBM PC 5250 stations (LU4 sessions)
    - IBM PC display station adapter

SNA Capability

- o PU-T2
- o PU-T2.1
- o LU1 RJE (S/32; S/34; S/38)
- o LU2 (S/34; Series 1)
- o LU3 3270 device emulation
- o up to 50 simultaneous LU-LU sessions per line

Microcomputers



Background

With increasing communication line costs and the availability of less expensive hardware, microcomputers serve an alternative form of cluster controller from previous standards. Their computing power has increased steadily.

Through emulation software (hardware/software), the microcomputer may appear as a data terminal to the host. It is the ability of PCs to gain access to data stored in a computer's database and manipulate that data that makes them so functional.

Product Family

- o IBM 3270 PC - local processing resource with graphics terminal for S/370- based computers. (1985)
- o IBM 3270 PC AT - for high-end commercial users; doubled processing power of PC; two graphics versions; color available on 3179 display station.
- o IBM 3270-XT - 512-640 KB internal memory with color; can be accessed from S/370 host.
- o IBM RT PC - high-end, high performance technical workstation (8 users) supporting display units, color plotters, non-impact printers, streaming tape that can develop graphics/engineer applications. (1986)

SNA Capability

- o PU-T2
- o PU-T2.1
- o LU2
- o LU6.2

LESSON 5: SOFTWARE OVERVIEW

PURPOSE

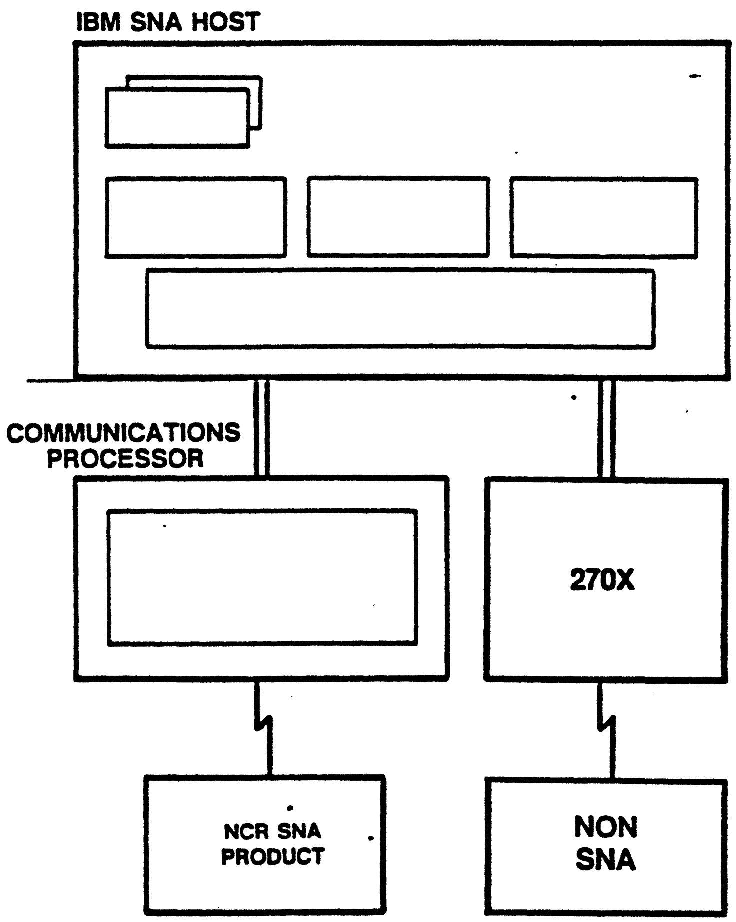
The purpose of this lesson is to introduce the student to IBM software products.

OBJECTIVES

After completing this lesson the student will be able to:

- o Identify the IBM SNA software hierarchy
- o Describe why each is necessary:
  - Operating system
  - Communications access method
  - Transaction Processing Subsystems
  - Other subsystems (JES, TSO, RJE)
  - NCP (and X.25)
  - Network Management

INTRODUCTION



For SNA to function properly and efficiently, several different software subsystems are required to be present in the host and communication controllers. Each piece of software has a specific function to perform. All devices and resources in the network must be correctly defined to the different software systems in order for the systems to properly process data received from or for those devices.

THE FAMILY MEMBERS

Operating System

The operating system controls the operation of the host by scheduling activities, loading and supervising the execution of programs, allocating internal storage for I/O device data, initiating and controlling I/O operations, analyzing interrupts, and controlling multiprocessing operations.

Operating systems have gone from primitive to highly functional in the last twenty years. Lesson 6 will explain what the operating systems can do and the differences between them.

Example: MVS, DOS, etc.

Communications Access Method

The communications access method is primarily responsible for routing data between the host and other devices in the SNA network. It enables the host application programs to exhange data into and out of the network without any concern for channel or communication line protocol.

VTAM is the only SNA access method supported today.

VTAM owns all network resources which makes possible resource sharing and network management. It also provides common services such as connection and disconnection of links and sessions, error recovery, and storage management.

Example: VTAM

Application Subsystems

Application subsystems control communication between interactive application programs and terminal devices. Some of these subsystems are transaction processing subsystems, sometimes referred to as TP monitors.

Examples of devices needing to interface to these subsystems include automatic teller machines, airline reservation terminals, and point-of-sale terminals.

Some application subsystems are designed for office automation. Two examples are DISOSS and PROFS. These subsystems are designed to create and exchange office documentation among a variety of devices.

Example: CICS, IMS, etc

User Provided Applications

User applications are just that, whatever application programs the user needs to accomplish his or her tasks. These are likely to include payroll, inventory, personnel, etc.

Example: Payroll, Inventory, etc

Network Management

Network management products are very important to SNA networks. It is network management applications that capture the data that informs the systems programmer how efficiently the network is running.

Depending on the network management product, the systems programmer or network operator may be able to monitor the network and detect early signs of degredation that could lead to a total or partial collapse of the network. By interpreting data captures or traces and isolating the cause, more serious problems may be averted, thereby saving the customer both downtime and dollars.

Example: NetView (NCCF, NPDA, NLDM), TARA, etc

Remote Job Management Subsystems

Remote job management subsystems, such as JES and POWER, allow a remote operator to submit data for processing at the host. These subsystems store the data until convenient for processing. After processing, the host can return the generated output to the same remote site or to a different destination.

Example: JES, POWER, etc.

Communications Processor Software

The most significant portion of the communications processor software is NCP.

NCP is responsible for relieving burdensome non-host tasks from the host itself, such as polling and addressing (selecting) stations on the links and dialing and answering stations over switched links.

It also performs message routing duties between nodes, handles network address conversion, character code translation, and provides multiple link connections between adjacent communication processors.

It can act as a local or remote concentrator gathering, queueing, and multiplexing messages from clusters of terminals for transmission over one or more high-speed trunk lines.

One communications processor software option is **NTO**, which provides support for asynchronous and BSC terminals.

Another is the X.25 interface **(NPSI)**, which allows the user to access a public data network or common carrier such as Telenet or Tymnet.

Example: NCP, X.25, etc.

LESSON 6: OPERATING SYSTEMS

PURPOSE

This lesson will introduce the student to the IBM Operating Systems which are typically found in SNA hosts.

OBJECTIVES

After completing this lesson, the student will be able to:

- List the evolutionary progress of IBM operating systems
- Identify the acronym and meaning of the four prevalent operating system

REFERENCES

- System/370 Principles of Operation IBM GA22-7000
- 4300 Processors Principles of Operation IBM GA22-7070

IBM CPU TYPES

IBM CPUs (PU-T5) cover a broad spectrum of size and sophistication, and are suited to an infinite number of implementations. To examine a few of IBM's offerings:

MAJOR IBM SYSTEMS			
SYSTEM	YEAR AVAILABLE	RELATIVE SIZE	UNIQUE CHARACTERISTICS
S/360	1964	SMALL	HARDWARE and SOFTWARE DISTINCT ENTITIES
S/370	1970	MEDIUM TO LARGE	VIRTUAL STORAGE
303X	1978	MEDIUM TO LARGE	WATER COOLED
43XX	1979	MEDIUM	SMALL SIZE, ICA
308X	1980	LARGE	HELIUM COOLED
309X	1985	LARGER	
9370	1986	MEDIUM	RACK-MOUNTED
S/390	1990	LARGE	COUPLED CPUs

System/360

Introduced in 1964, this paved the way for computer systems that followed. The most significant point about this processor family was that for the first time, hardware and software were two different entities.

In terms of hardware, the System/360 consisted of a modular family of upward compatible processors, an idea which was carried over to its successors.

System/370

Also a family of upward compatible general-purpose computers, introduced in 1970. It offered a wide range of performance levels and storage capacities, fast internal performance, a choice of channel capabilities, virtual storage, and data communications.

303X Processor Systems

In 1977, these processors were introduced as "interim" systems. They were architectural extensions of the S/370 but offered few capabilities and/or features not found on the S/370.

308X Processor Systems

In 1980, the 308X systems were announced and featured IBM's marketing expression RAS or Reliability, Availability, and Serviceability. Some new features included newer chip technology, shared memory, and channel switching.

This series also introduced helium cooling. Previous processors were water cooled. The cooled helium circulated through the hardware, maintaining more consistent temperatures.

4300 Family of Processors

Introduced in 1979, this family of heavily micro-programmed processors filled the low-end of the market that until this time has been dominated by the S/370 family. It was a seven model series suitable for computation intensive, high throughput. The 4300 included an integrated communications adapter (ICA) which in effect placed NCP functions in the host and this required VTAME or VTAM Version 2 be incorporated in the host.

Two significant advancements accompanied the 4300. One was IBM's major improvements in semiconductor manufacturing and the other was the ability to distribute mainframes to remote sites, paving their entry into the distributed data processing market by emphasizing compatibility with central site hardware and software.

The 4300 is S/370 compatible, supporting all major operating systems and peripherals. Main memory storage ranges from 4MB-32MB and disc storage from 262MB-5160GB.

The seven model series 4300s are generally found in medium sized shops, ideally suited for commercial or engineering/scientific applications that are computation intensive or demand high throughput.

309X Processor

In 1985, IBM announced an even more powerful processor called the Sierra. Its numeric designation is the 309X series.

9370 Processor

Announced in 1985, this processor is designed for the mid-range size of processors and is suitable for general business, scientific, engineering or other technical environments.

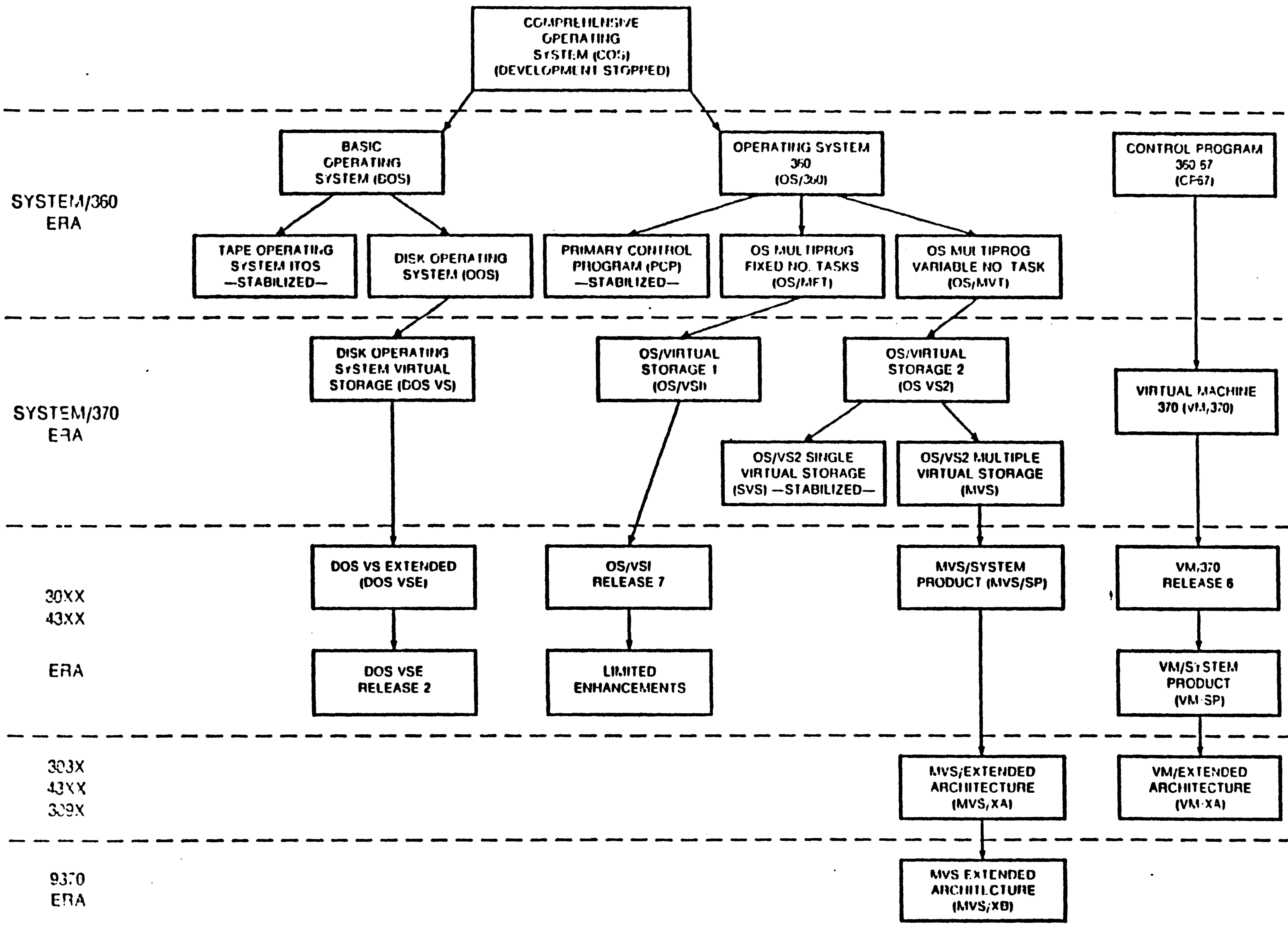
It supports the operating systems of MVS, DOS, and VM/SP. The memory range is 4MB-16MB and the disc storage is 368MB-5160GB (billion bytes).

S/390 PROCESSORS

This is the latest generation of mainframes released by IBM under the title of **Enterprise System 9000.** The new mainframe architecture is called **ESA/390.**

Some of its key functional advances are fiber optic channels, 200 million instructions per second, up to 9GB of processor storage, and linking of as many as 48 processors which can be centrally managed.

There are five different models which can be selected, all which support the operating systems of MVS/ESA, VM/ESA, and VSE/ESA.


COMPREHENSIVE OPERATING SYSTEM (COS) (DEVELOPMENT STOPPED)
SYSTEM/360 ERA
BASIC OPERATING SYSTEM (BOS)
OPERATING SYSTEM 360 (OS/360)
CONTROL PROGRAM 360 67 (CP67)
TAPE OPERATING SYSTEM (TOS) —STABILIZED—
DISK OPERATING SYSTEM (DOS)
PRIMARY CONTROL PROGRAM (PCP) —STABILIZED—
OS MULTIPROG FIXED NO. TASKS (OS/MFT)
OS MULTIPROG VARIABLE NO TASK (OS/MVT)
SYSTEM/370 ERA
DISK OPERATING SYSTEM VIRTUAL STORAGE (DOS VS)
OS/VIRTUAL STORAGE 1 (OS/VS1)
OS/VIRTUAL STORAGE 2 (OS VS2)
VIRTUAL MACHINE 370 (VM/370)
OS/VS2 SINGLE VIRTUAL STORAGE (SVS) —STABILIZED—
OS/VS2 MULTIPLE VIRTUAL STORAGE (MVS)
30XX
43XX
ERA
DOS VS EXTENDED (DOS VSE)
OS/VSI RELEASE 7
MVS/SYSTEM PRODUCT (MVS/SP)
VM/370 RELEASE 6
DOS VSE RELEASE 2
LIMITED ENHANCEMENTS
VM/SYSTEM PRODUCT (VM SP)
303X
43XX
309X
MVS/EXTENDED ARCHITECTURE (MVS/XA)
VM/EXTENDED ARCHITECTURE (VM XA)
9370 ERA
MVS EXTENDED ARCHITECTURE (MVS/XB)

OPERATING SYSTEM EVOLUTION

An attempt was made at one single operating system called the **Comprehensive Operating System (COS)**, but it was never released.

One problem facing the software developers was the vast difference in size and speed of the various CPU models. It followed, therefore, that System/360 operating system development would be divided into two basic sections: small systems and large systems.

First, let's consider the Operating System developments for the small users up to the present:

For small systems, the **Basic Operating System (BOS)** was the first to be released, and it was soon followed by the **Tape Operating System** (TOS) and **Disk Operating System** (DOS). The Tape and Disk Operating Systems were, for the most part, identical, with the exception that DOS had its software components resident on disk and TOS was resident on tape.

IBM dropped support for TOS after 1969, as the cost of direct access storage devices (DASD) became less expensive and IBM became less interested in maintaining a slow operating system.

In 1970, IBM announced their support of the **virtual storage** concept, and with it new equipment, namely the **System/370.** Existing software could use this hardware, but could not make full utilization of the new hardware features. Those operating system enhancements would come later.

Thus, for the low-end user, DOS was upgraded to DOS/VS. There were a few JCL enhancements, but nothing outstanding.

In the late 1970s, software enhancements were made to DOS/VS and major internal changes were made to improve its performance. The result was **DOS/VSE** (or simply VSE as it is often referred to). Presently, users of DOS/VSE are being encouraged to migrate typically up to MVS.

Next, consider the Operating systems for the larger user:

In the 1960s, IBM had developed **OS/360** and was distributing it to its large system users. Its internal design was much different than DOS and TOS in that it could handle a large number of tasks in a more efficient manner. It was also designed to keep many of its routines resident in main storage for very fast access. Two or more processors could share core storage under the control of a single operating system.

OS/360 actually had three different versions, again depending somewhat on size but more on user shop sophistication. The three versions were:

- o Primary Control Program (PCP)
- o Multiprogramming - Fixed number of Tasks (MFT)
- o Multiprogramming - Variable number of Tasks (MVT)

Of the different System/360 models, one was a little different than the others.

Another evolution was in progress, however, within the OS environment. OS users divided themselves into low-end and high-end. For the **low-end OS user, VS1** replaced OS/MFT and for the **high-end, VS2** replaced OS/MVT. VS2 Release 1 was known as Single Virtual System (SVS) but Release 2 and subsequent releases are referred to as **Multiple Virtual Systems** (MVS), by far the most prevalent of IBM's operating systems.

MVS was enhanced to take advantage of additional hardware features in the 30XX processors and it became known as MVS/SP.

In the late 1970s, the 30XX and 43XX processors were announced, and along with them, further software enhancements. IBM had developed a 31-bit addressing format in order to address more memory and this was referred to as MVS/XA. MVS is estimated to have over 12 million lines of coding.

Because these same hardware features have not been added to the 43XX processors, MVS/SP performance on 43XX processors has been decreasing with each new release.

In 1988, IBM announced a further addressing scheme for its MVS operating system. This was a 37-bit to 47-bit scheme that would allow much greater memory accesses. The new operating system would be referred to as MVS/XB.

And lastly, consider the unique **Guest Operating System:**

Again, during the 1960s, a "testing" operating system had been developed by users, not by IBM. The **Model 67** had features that allowed users to develop an operating system which would be able to supervise other operating systems on the same processor as if each had its own real hardware system. This operating system was called **CP-67**, and it was the forerunner of **Virtual Machine/370.**

With the advent of virtual storage, IBM could see the advantage of the virtual machine concept. A joint effort was reached between Massachusetts Institue Technology (MIT) and IBM to create a development-testing environment to accommodate multiple operating systems ("guests") in one host. And, in 1971, IBM announced **VM/370.**

Again, in the late 1970s with the release of the 30XX and 43XX processors, VM/370 was enhanced to take advantage of additional hardware features in the 30XX processors and the name now was referred to as VM/SP.

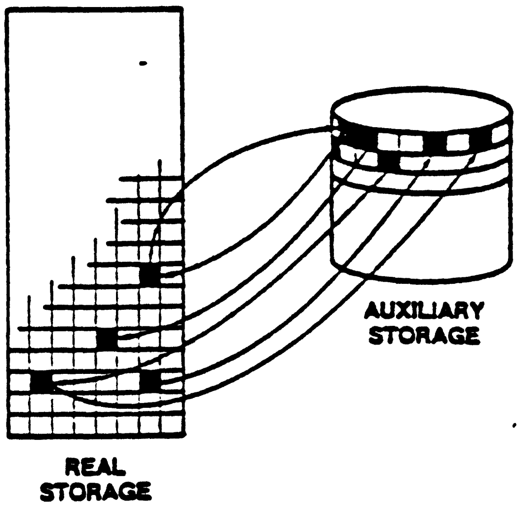
In 1988 and since the development of Extended Architecture, IBM is enabling VM/XA to run on all S/370 products. On the higher level machines, VM/XA will be able to support four "guest" operating systems concurrently.

However, VM/XA SP may require hardware upgrades to gain the full benefits provided by the hardware and software.

VIRTUAL MEMORY

Various methods have been employed in the past to allow large programs to execute in small areas of memory. Until 1970 it was the user's responsibility to manage this use of memory.

In 1970, IBM announced its support of virtual memory when it integrated virtual memory capability into its main operating systems.



The operating system divides the available real storage into two- or four-kilobyte pieces called **page frames.** It also divides the allocated portion of auxiliary storage (disk files), called the **page data set** (page file), into the same size pieces. This auxillary storage is called **virtual memory.**

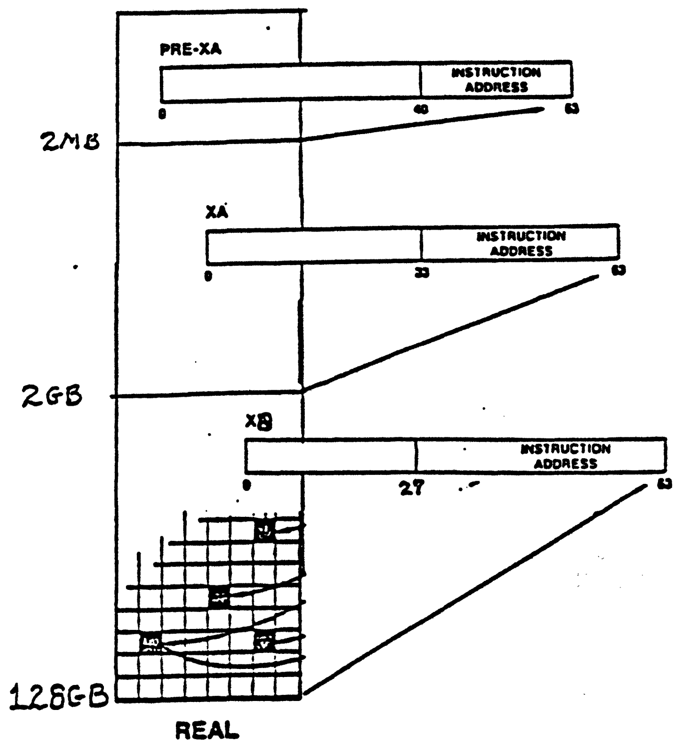
As a program executes, it is loaded from its library of residence to the virtual storage area immediately before execution. To execute the program, the operating system moves **pages** of the program from the page file to real storage. As the program continues to execute, more pages must be fetched. As pages are no longer needed, they are returned to the page file. This makes the location in real storage available for another page. All of this paging operation is handled by the virtual storage operating system and is transparent to the user.

Extended Architecture

In 1983, a further extension was available for both MVS and VM. The 308X architecture was changed to allow 31-bit addressing in the Program Status Word (PSW) to address more memory.

Until this change, addressing was limited to about 16 million bytes of storage by the 24-bit address.- The change now allows addressing of up to 2 billion bytes (or gigabytes) of storage.

In 1988, further addressing extensions were made for MVS that allowed a 37-bit address to access up to 128G bytes (128 billion bytes of storages)! This could pave the way for new mainframe architectures.



Both MVS and VM changed names to refelct the new **Extended Architecture** and became MVS/XA and VM/XA.

It is worth noting that no major enhancements have been made to VS1 in the past few years. IBM appears to be moving in the direction of support for only three major operating systems: DOS/VSE, VM/XA and MVS/XA.

DOS/VSE
DOS/VSE SP

- o Small to medium hardware.
- o No Multiple Processor support
- o Maximum virtual size of 16 million bytes.
- o Only 12 partitions.
- o Limited JCL function.
- o Operator Intervention.

This operating system has been designed for entry to medium size hardware systems and is limited in its ability to manage a large system.

At present, the maximum machine size of 16 million bytes of virtual storage is divided into a maximum of twelve partitions each having a fixed size as determined by the systems programmer. It cannot make use of any multiple-processor configuration. Job Control Language (JCL) is still somewhat primitive, and many decisions must be made by the console operator.

For example, consider a situation where three jobs named A, B and C have to execute in that sequence. Often it is the operator who has to decide from console messages and printed output whether job A has completed correctly before job B can be executed. The same decision must be made about job B before job C can be executed. This decision time can hold up the operator and the system.

With DOS/VSE, nearly all disk, tape and printer forms mount messages are handled on the system console. This also has the result of causing the system to wait for an operator reply.

VS1
OS/VS1

- o Runs in medium size hardware.
- o Maximum virtual size of 16 million bytes.
- o 51 regions maximum.
- o No multiple processor support.
- o Sophisticated JCL.
- o Less operator intervention.

VS1 is designed to handle medium size hardware systems and to be an entry into the VS2/MVS. It can support up to 51 concurrent tasks, of which 15 can be user jobs. VS1 cannot make use of any multiprocessor hardware but it is reasonably efficient with a large number of resources.

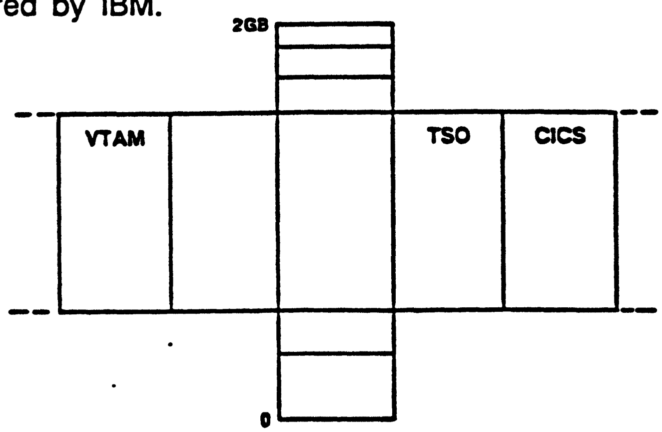
VS1 JCL is very flexible and allows the system to make more decisions. This allows the console operator to make only operational decisions rather than the scheduling decisions the DOS/VSE operator ususally has to make.

MVS
OS/VS2
MVS/XA
MVS/XB

- o Requires medium to large hardware system.
- o Multiple processor support.
- o Supports two billion bytes real storage.
- o Can handle over 4000 concurrent tasks.
- o Flexible JCL.
- o Less operator intervention.
- o Security and Integrity.
- o Good resource handler.

MVS is designed for medium to large systems. It is designed to handle an extremely high number of resources, including multiple-processor configurations, shared-DASD (Direct Access Storage Device), and other resources the other operating systems cannot use.

The is the most comprehensive operating system offered by IBM.



MVS JCL has many parameters to allow programmer flexibility and could be considered a superset of VS1 JCL.

One master operator console and multiple secondary consoles allow operator consoles to be located in strategic locations so operators may work more efficiently.

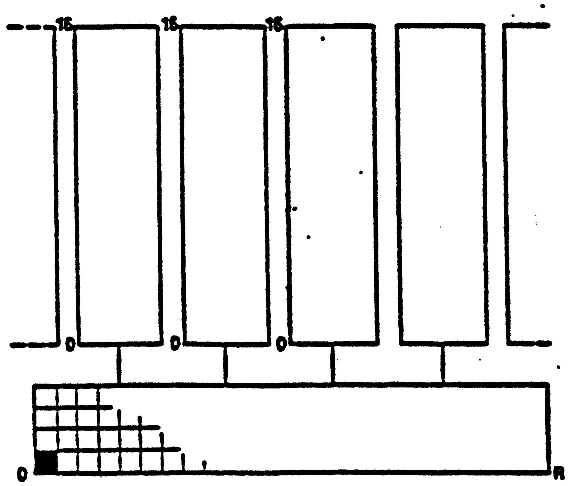
Another important aspect is that of security and integrity. MVS has been designed to provide the user with both, and IBM is committed to maintaining this philosophy. Again, no other system has that commitment.

VM/SP
VM/XA

- o Interactive, used for processing by one of the "guest systems"
- o Designed for time-sharing. (time-slice)
- o Multiple "guest" operating systems.
- o Good migration aid.
- o Aid for system testing.

VM/SP is like no other IBM operating system. It has the specific function of running multiple operating systems and/or timesharing networks using Conversational Monitoring System (CMS). It is not designed to run batch jobs, except through one of its "guest operating systems".

The Virtual Machine concept emerged in the late 1960s but did not really take hold until the late 1970s. As larger, faster machines were introduced, one way the increased processing power could be used was by running more than one DOS/VS(E) system in one hardware system with VM/SP. Or, the user could migrate from DOS to VS1 or MVS by having both the old and the new operating systems running in the same hardware system. It could also be used to test a new release of the operating system by installing and testing it in a separate virtual machine.



Prior to 1985 SNA users could not communicate with VM/CMS except through one of the guest operating systems and a special software system called VCNA.

In 1985 IBM announced that VTAM could work directly with VM.

OPERATING SYSTEMS ENVIRONMENT

The following figure is a representation of what size of hardware system is required for each IBM's host operating systems.

OPERATING SYSTEM	VERSION	CPU 370								CPU 43XX					CPU 303X			CPU 308X			CPU 309X
		115	125	135	138	145	148	158	168	4321	4331	4341	4361	4381	3031	3032	3033	3081	3083	3084	
DOS	DOS/VS	●	●	●	●	●	●	●		●	●	●									
	DOS/VSE	●	●	●	●	●	●	●		●	●	●									
VS1	VSI			●	●	●	●	●	●			●			●	●	●				
MVS	MVS							●	●			●			●	●	●				
	MVS/SP							●	●			●	●	●	●	●	●	●	●	●	
	MVS-XA																●	●	●	●	●
VM	VM/370		●	●	●	●	●	●	●												
	VM/SP									●	●	●	●	●	●	●	●	●	●	●	
	VM/XA												●	●			●	●	●	●	●

Note that this figure gives a suggested correlation and does not imply any restrictions or recommendations.

LESSON 6 REVIEW

1. Which two operating systems available today evolved from OS/360?

2. Which operating system evolved from BOS?

3. Which operating system evolved from one originally developed by users that supported guest operating systems?

4. List the three most prevalent operating systems one would expect to encounter in an IBM host environment.

5. List the unique characteristics of IBM's latest mainframe release.

LESSON 7: NCP SOFTWARE

PURPOSE

This lesson will provide an overview of the software which is used in both an IBM and an NCR Comten network controller. Emphasis will be on the main SNA software program, Network Control Program (NCP).

OBJECTIVES

After completing this lesson the student will be able to:

- o List the components of the Network Control Program
- o Identify the function of each NCP component
- o Describe the flow of data from an SNA terminal to a host.

REFERENCE

IBM

- o ACF/NCP/VS Network Control Program Installation, IBM SC30-3154
- o ACF/NCP Release 2 Data Flow, IBM SR20-4621
- o ACF/NCP 2.1 Program Logic, NCR Comten CP-SF51-100

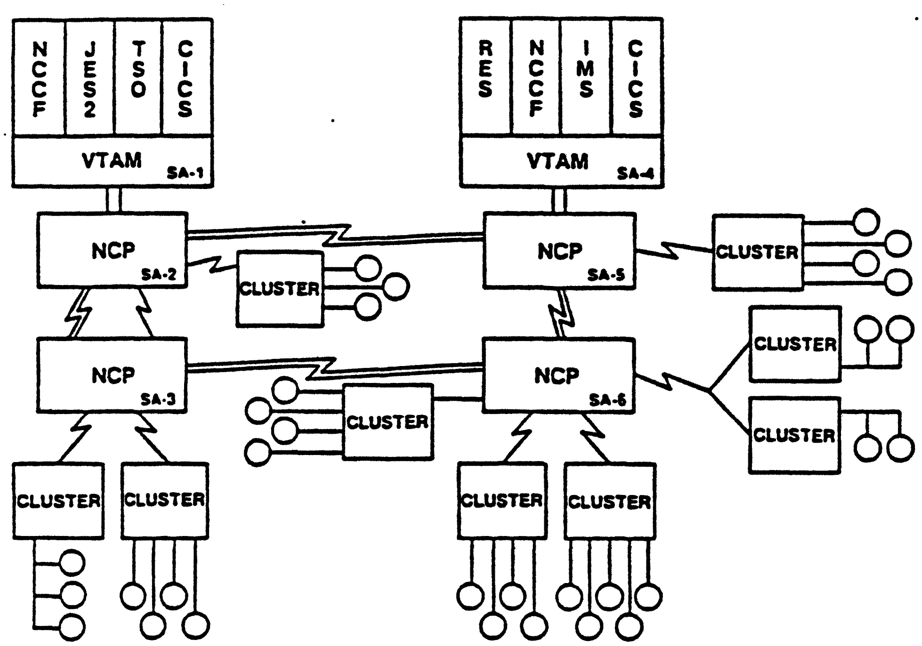
INTRODUCTION

This lesson will discuss communications controllers and the **Network Control Program** (NCP) software. The NCP resides in the communications controller and is the link between user's terminal and the host.

Software for the Communications Controllers is first defined in the form of macro instruction source statements, then compiled, processed, and finally loaded in the communications controller.

These definitions include:

- all **links** connected to the Controller
- all **Physical Unit** nodes in the NCP's subarea
- each **SDLC address** for each of the Physical Units
- all **Logical Units** required in the peripheral nodes
- each **local address** for each Logical Unit
- the **Virtual and Explicit Route** the messages should follow through the network
- each **SSCP**that the NCP will communicate with

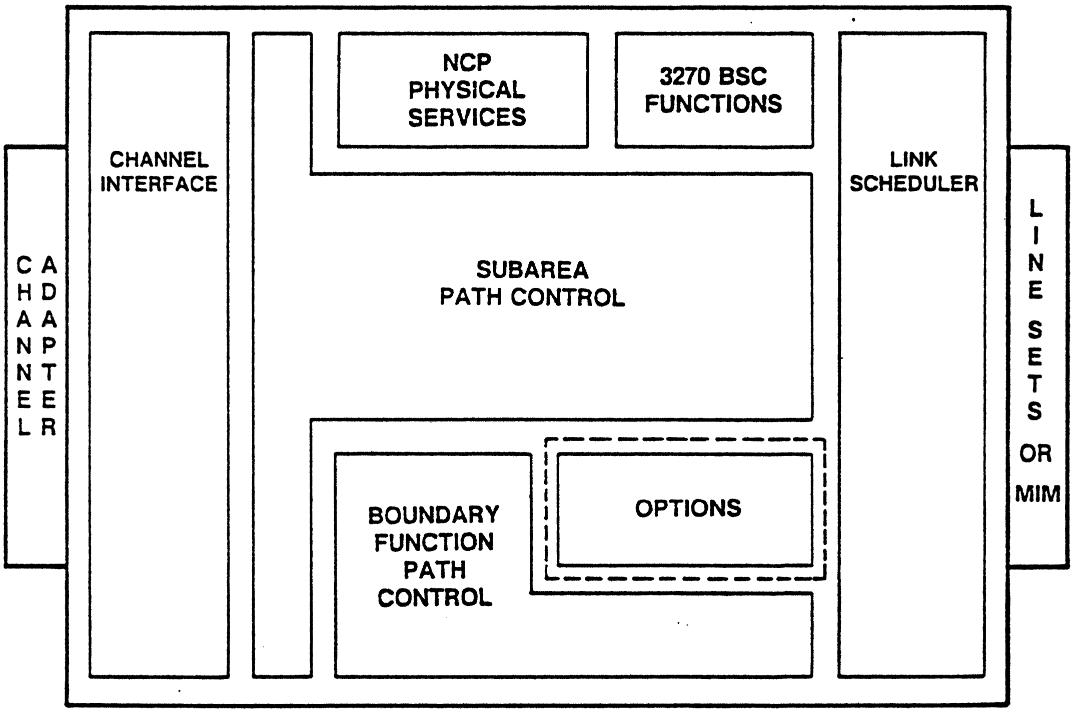


COMMUNICATIONS CONTROLLER HARDWARE

COMMUNICATIONS CONTROLLERS AND PROCESSORS					
	MODEL	YEAR	MEMORY SIZE	# LINES	CHARACTERISTICS
IBM	2701 2702	1963	---	4 16	Non-programmable 1 Host BSC - S/S
IBM	2703	1965	---	176	Non-programmable 1 Host BSC - S/S
Comten	3670	1972	512K	384	Programmable 4 Hosts
IBM	3704	1972	64K	32	Partly Programmable 2 Hosts
IBM	3705	1973	512K	352	Partly Programmable 2 Hosts
Comten	3650	1975	1M	128	Programmable 2 Hosts
Comten	3690	1978 1983	1M 4M	384 512	Programmable 8 Hosts Concurrent 1.39 MIPS
IBM	3725 3725/6	1983	2M	96 256	Programmable 8 Hosts (6 Concur) .75 MIPS
Comten	5620	1985	4M	32	Programmable 2 Hosts
IBM	3710	1984			Communications Controller (Does not run NCP) Not attached Host)
Comten	5660	1986	16M	1,024	8 Hosts
IBM	3745	1988	4-8M	512	16 Hosts

COMPONENTS OF NCP

NCP is made up of several software components which direct and control the flow of data, and interface with the hardware components of the communications controller.



Channel Interface

All messages sent between the host and host-connected communications controller pass through a channel interface of hardware and software.

The Channel Interface transfers this information to the NCP buffer pool at high-speed channel rates. A channel can transmit bits or bytes in parallel in a single operation between main storage and attached I/O devices. (SDLC links transmit bits in serial fashion and at slower speeds).

Once a complete PIU has been received, it is presented to the Subarea Path Control module in NCP for further routing decisions.

NCP Physical Services

The NCP Physical Services module controls all resources owned by this NCP, and receives commands such as Activate Link (ACTLINK) and CONTACT. It is also responsible for the orderly shutdown of the network in the event of a failure.

Subarea Path Control

The Subarea Path Control module routes all traffic which flows through this node. Path Control first inspects the subarea portion of the destination address field (DAF) in the PIU transmission header. If it is not the same subarea number as this node, the PIU will be forwarded to another subarea. This subarea Path Control will pass control and the PIU to the link scheduler, which will send it to the next adjacent subarea node.

However, if the message is destined for this subarea, subarea path control passes the message to the appropriate NCP component.

Link Schedulers

There are actually three different link schedulers, but their basic function is the same. The link scheduler is responsible for moving transmission data to and from communications lines, out of and into NCP buffers, and handling errors which occur on a line.

The three types of link schedulers are:

- o SDLC link scheduler
- o Pre SNA (BSC or S/S) line protocols
- o X.25 for NCP Packet Switching Interface (NPSI)

The SDLC link scheduler is responsible for SDLC (link level) protocol. It is here that the link header and link trailer are added to or removed from the PIU.

A link header contains a starting flag, the address of the secondary PU, and a control field. A link trailer contains a frame check sequence field and an ending flag. Each end of the link uses this information to ensure the accuracy of the information being transmitted over the link.

Boundary Function Path Control

The Boundary Function Path Control module receives all SNA traffic destined for this subarea except commands directed to Physical Services. It also receives messages (if any) to be sent through a public network via NPSI software.

The Boundary Functions must convert a FID type 1 or 4 to either a FID3 or FID2 depending on the type of PU that will receive the PIU. The PIU is then sent to the link scheduler for transmission to the proper destination.

Network Terminal Option (NTO)

An **optional** software module, this application product extends the capabilities of ACF/NCP in a Communications Controller to permit non-SNA terminals (TTY) to function in an SNA network.

NCP Packet Switching Interface (NPSI)

Another optional module. Users who wish to communicate through a Public Data Network using X.25 protocol may choose this NPSI application product along with the NCP software.

If the communication is destined for an SNA device, NPSI only substitutes X.25 link packet protocol for SDLC link protocol.

When communication is between NCP and a non-SNA device, NPSI also performs the PU and LU function for that device. It then converts the SNA information to a message format understandable for the X.25 network protocol.

3270 BSC Functions

This pre-SNA function handler is responsible for message destined for Bi-synchronous (BSC) 3270-equivalent devices.

This part of the software converts a FIDO PIU into the proper BSC format. This includes adding the STX, ETX and other control characters. The subarea path control will pass only a FID type 0 to the pre-SNA handler. If subarea path control receives a FID4 which is for a BSC device, it must convert the FID4 to a FID0 before sending it to the handler. The pre-SNA function handler passes the BSC message to the link scheduler for transmission to the device using bisynchronous link protocol.

A BSC device does not have a PU or LU. The PU and LU functions are performed by the pre-SNA function within the NCP.

NCP DATA FLOW

This section will discuss the flow of SNA messages through the NCP. The example assumes a channel-attached communications controller.

Transmission Header Formats

The Transmission Header (TH) portion of the PIU can have one of six formats. The first nibble of the TH is the Format Identifier (FID) and can be a 0, 1, 2, 3, 4 or F in hexadecimal.

FID 0 is used for a message being sent to a 3270 BSC device when explicit routes are not supported.

FID 1 is used for a message being sent between adjacent subareas involving SNA devices when explicit routes are not supported.

FID 4 is used for a message being sent between adjacent subareas when explicit routes are supported.

FID 2 is used for a message being sent from a subarea to an adjacent PU-T2 or PU-T2.1 (APPC).

FID 3 is used for a message being sent from a subarea to an adjacent PU-T1.

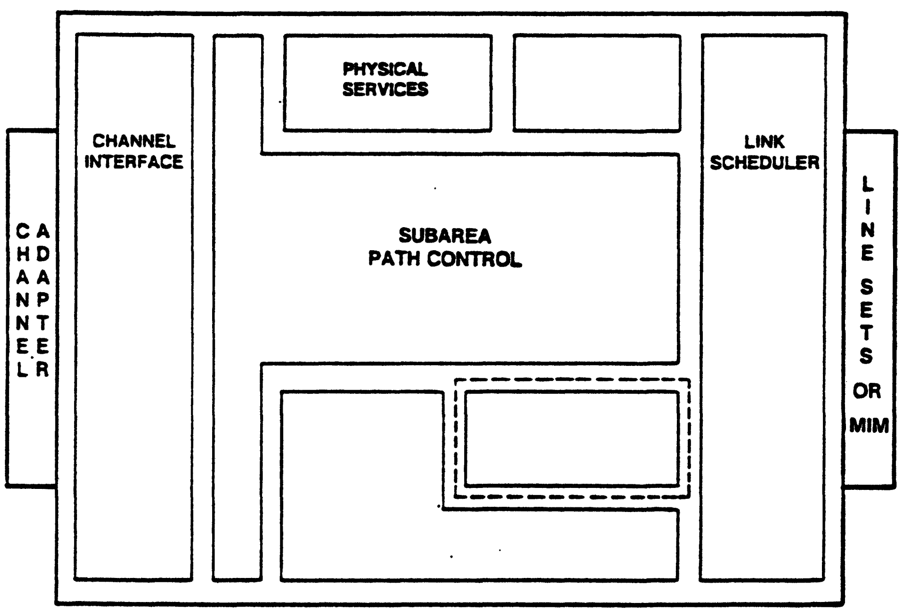
FID F is a special command sent between adjacent subareas when both support explicit routes and it involves Transmission Group resequencing.

MESSAGES DESTINED FOR THIS NCP

An ACTPU command destined for this NCP is passed to the Physical Services from Subarea Path Control for processing.

ACTLINK commands for lines attached to this NCP are also passed to Physical Services for processing. Physicial services then notifies the Link scheduler to cause DTR to be turned on. The Link scheduler notifies Physical Services when DSR is returned. Physical Services then prepares the response.

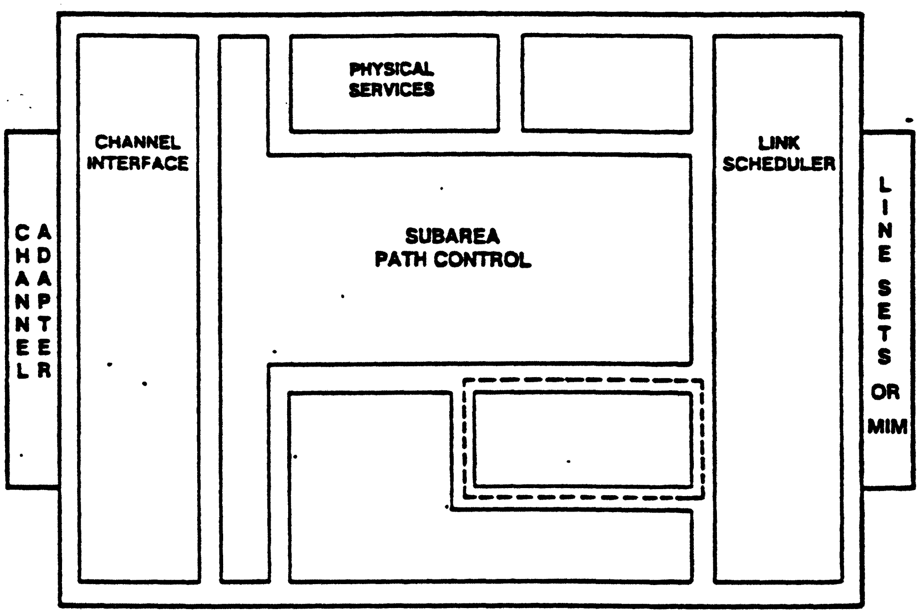
A separate ACTLINK command will be directed to each link to be connected.



MESSAGES DESTINED FOR OTHER SUBAREAS

Subarea Path Control checks the destination subarea and routes the message straight through to the link scheduler.

SUBAREA	LINE

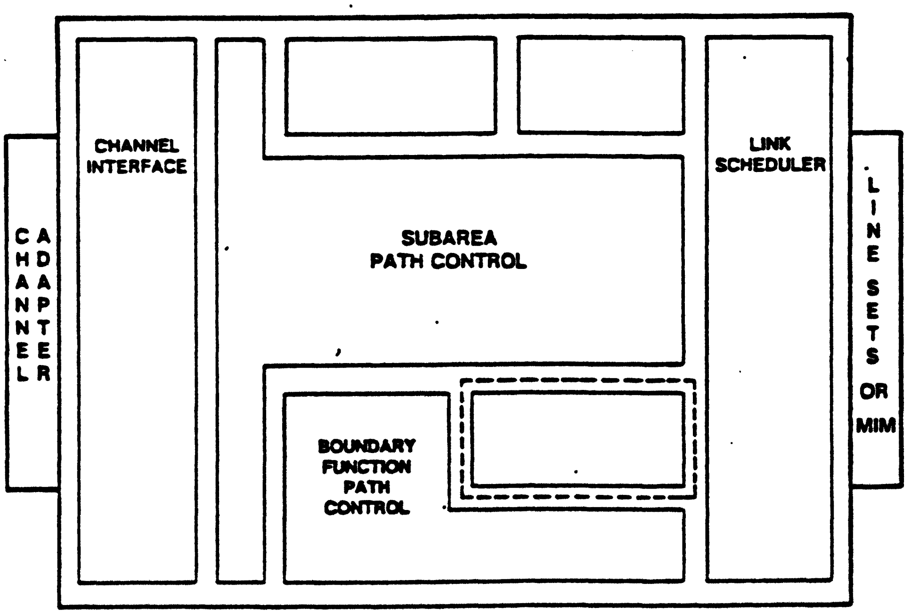


MESSAGE DESTINED FOR PUs AND LUs IN THIS SUBAREA

Subarea Path Control inspects the **destination subarea** value of the **Network Address** and passes the message to Boundary Function Path Control. Boundary Function Path Control **converts the element address** of the Network Address to a **local addresss** which identifies the **SLU** in the peripheral node and forwards the message to the proper link scheduler.

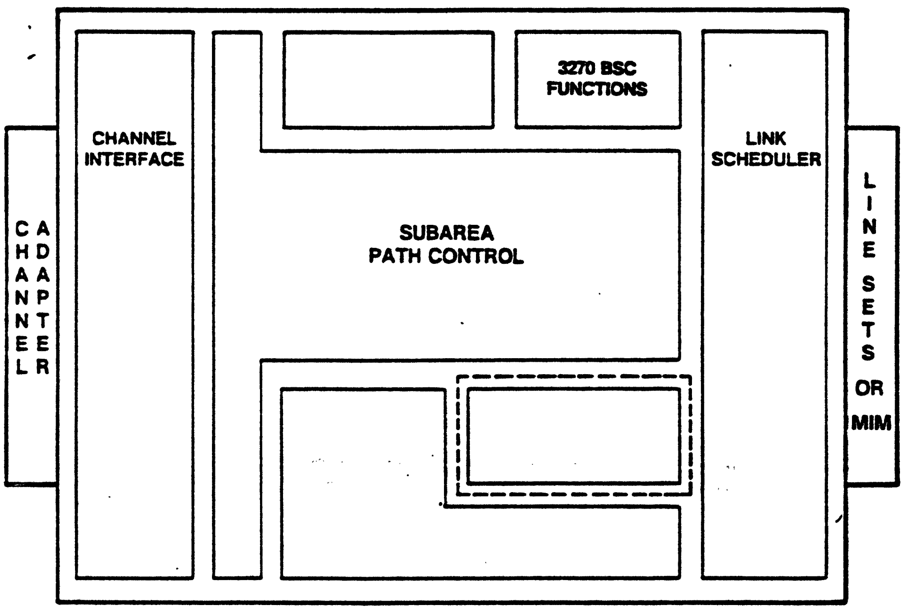
If the message being processed is a BIND, ACTPU, or ACTLU command, Boundary Function updates its session tables identifying the address of both participants.

PLU	SSCP	ELEMENT	LINK	DLC	LOCADR



MESSAGES DESTINED FOR 3270 BSC DEVICES

Subarea Path Control passes the message to the 3270 BSC Function. The 3270 BSC Functions will remove the TH and RH and will pass the message to the Link Scheduler for transmission using 3270 link protocol.

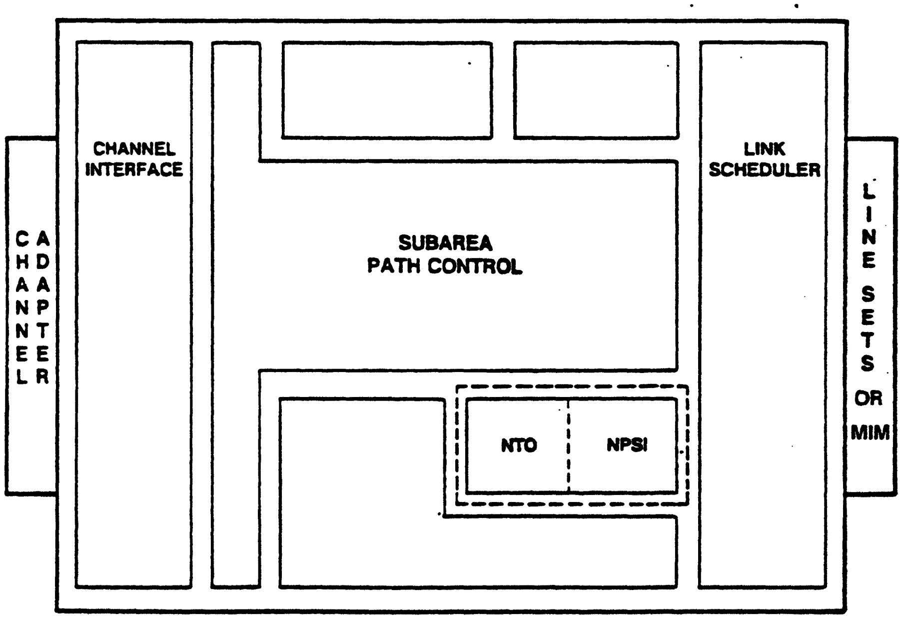


MESSAGES DESTINED FOR NON-SNA DEVICES

If the receiving device is not an SNA device, subarea path control passes the message first to Boundary Function for conversion from network to local address. At this point subarea Path Control only knows that the message is destined for this subarea; it does not know what kind of device is receiving the message.

For Non-SNA Devices -

> Boundary Function is responsible for passing the message to Network Terminal Option. NTO removes the TH & RH and passes the message to the link scheduler for transmission using the appropriate link protocol. NTO also processes any responses that are required.

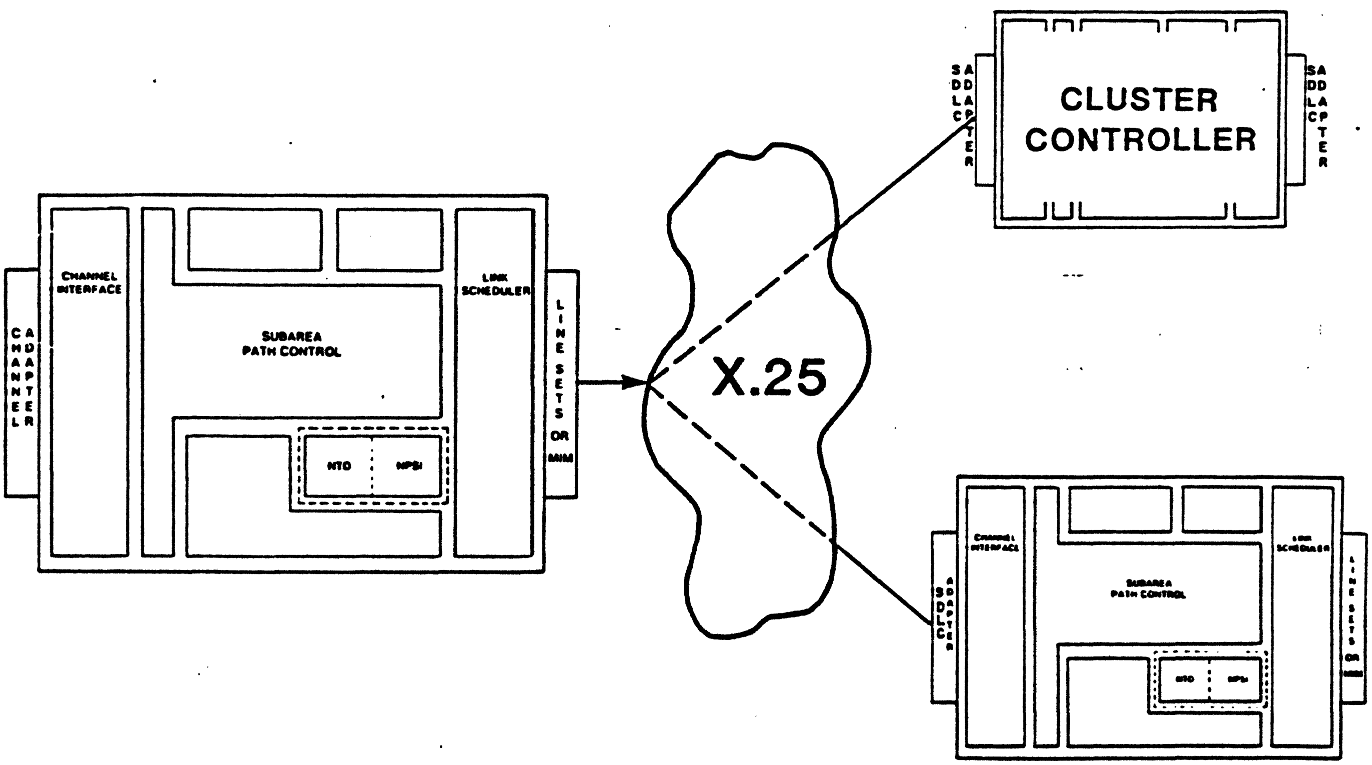


MESSAGES DESTINED FOR NON-SNA LINKS

For messages destined for public data network (X.25) subarea Path Control may route the message two ways -

The first is directly to the NCP Packet Switching Interface (NPSI) for messages destined to other subareas.

The second is to Boundary Function for messages destined to a peripheral node attached to this subarea. Boundary Function performs the FID conversion before passing the message to NPSI.



TRANSMISSION CONTROL

This section will mention two methods used by the NCP to control its resources and its traffic.

Slowdown

The NCP can receive messages from either the Access Method or the SDLC links only as long as it has available buffers. Normally it will send and receive at the same average rate.

When NCP receives more data than it sends during a given time interval, its supply of buffers can become critical. Should this happen, not even priority messages could pass through the network.

To prevent this, NCP continuously monitors its buffers and when the supply reachs a pre-determined threshold level, it will automatically enter a **slowdown** state.

The systems programmer may set a threshold value specifying 12, 25, or 50 percent as the minimum percentage of available buffers to maintain. When this percentage is reached, then slowdown will occur. Under certain conditions during initialization, NCP may dynamically alter these percentages the programmer set.

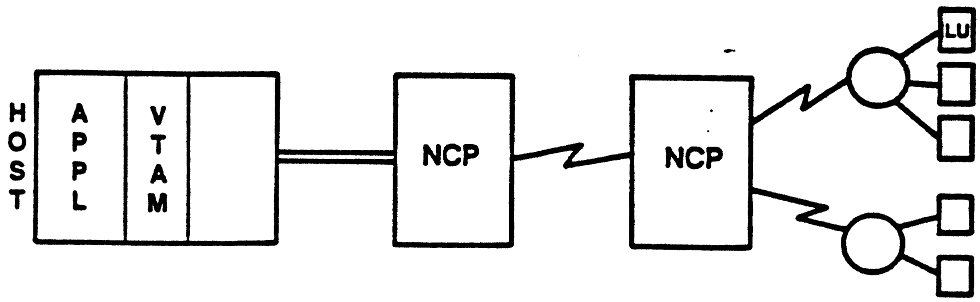
While in the slowdown state, it will reduce the amount of data it receives from SDLC links and the Access Method, but will continue to send at the same rate. When buffer supply is sufficient once more, the program will automatically resume normal operation.

Good system tuning which uses PACING (discussed below) as a tool can minimize slowdown.

Pacing

There are two levels of pacing:

- VPACING: SSCP to NCP
- PACING: NCP to LU



VPACING is a VTAM parameter and controls the amount of data VTAM sends to the NCP for a single device.

PACING is an NCP parameter. It controls the amount of data sent from the Boundary NCP to the receiving device in the attached cluster controller.

The purpose of PACING is to limit the number of PIUs sent to a logical unit (LU) before an acknowledgement is required. This prevents needless transmission to a logical unit that is momentarily unable to process them or sending messages at such a rate that the device cannot keep up.

An example of such a device is a printer. A printer can receive a lot of data at once but cannot print the data as fast as it is sent. PACING is the mechanism which slows the data transmission to the rate at which it can be printed.

The proper combination of PACING and VPACING ensures that there will always be data ready to be transmitted to a device without overloading the NCP with data stacked up for a device.

Remember, NCP will permit the primary and secondary session partners to negotiate pacing parameters (if permitted as defined in the BIND command) during session establishment. This could override the pacing values that were defined to NCP during its Sysgen process.

EMULATION PROCESSING

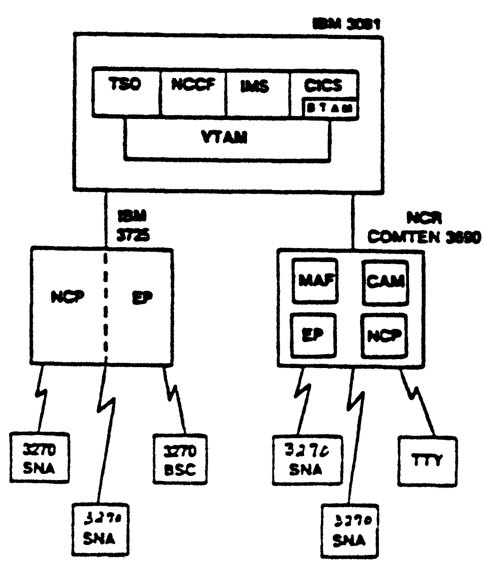
o The functions of NCP can be divided into two major categories: **Network Control Functions (NCP) and Emulation Functions (EP).**

- EP: emulation processing performs functions equivalent to those provided by IBM's 270X non-programmable controllers. This emulation processing allows 270X users to run their applications unchanged when a 37X5 replaced the 270X controller.

o The software placed in the Controller can perform one or the other, or both, depending on how the program was genned. In the event that both duties could be performed, the environment is referred to as **Partitioned Emulation Processing** or **PEP.**

o Each communication line at sysgen time is specified for which attribute it is capable of handling (NCP, EP, or PEP). If the line is specified as EP, then it supports Emulation Processing. If the line is specified as NCP, then network control functions are supported in conjunction with the access method.

o If a line was specified to handle both functions, then the operations of that line can be changed by a command via the access method. During the Sysgen process, each communication line is associated with an emulation subchannel address.



REVIEW LESSON 7

1. SNA messages transmitted through an NCP node will ALWAYS pass through which one of the following components:

   a. Physical Services
   b. Boundary Function
   c. Subarea Path Control
   d. Link Scheduler

2. Listed below are functions of the NCP software components. On the line at the right, fill in the name of the appropriate software component.

Inspects the destination subarea number of the network address ________________________

Assembles data for transmission over the different links. ________________________

Converts message formats between 3270 BSC devices and SNA PIUs ________________________

Transmits data from NCP buffers to the Access Method buffers ________________________

Converts FID4 transmission header to a FID2 for a PU-T2 device ________________________

Processes an Activate Link command intended for this subarea ________________________

3. Starting with number 1, number the following software functions in the proper sequential order as they would occur for any data sent from a remote terminal to a program in the host.

   _______ Subarea Path Control

   _______ VTAM

   _______ Link Scheduler

   _______ Channel Interface Scheduler

   _______ Boundary Function Path Control

LESSON 8: VTAM

PURPOSE

This lesson will describe the functions of the SNA access method, VTAM.

OBJECTIVES

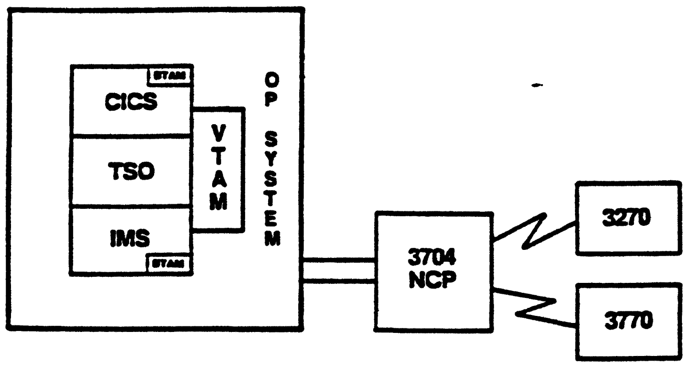
After completing this lesson the student will be able to:

- o State the purpose of an access method and describe its relationship to other software systems in the network
- o Identify the major difference between VTAM, TCAM, BTAM, and CAM
- o List the major functions of VTAM
- o List the major components of VTAM
- o Describe VTAM network initialization
- o Describe steps that occur to logon an LU-LU session
- o Describe the flow of data and control information through VTAM
- o Describe steps that occur when LU-LU session terminates

REFERENCES

- o I0057 VTAM concepts (IBM Independent Study Program)

ACCESS METHOD FUNCTIONS



A **Telecommunications Access Method** is software that is comprised of a set of macro definitions with associated operands that define the network's resources.

VTAM software consists of libraries which contain information about:

- various **applications programs**
- the **transmission links**
- **switched remote nodes and devices**
- any **locally-attached nodes and devices**
- the **Logon Mode Tables** (LOGMODETAB)
- the **Unformatted Systems Service Tables** (USSTAB)
- **routing paths**
- **cross-domain** session requirements
- **Exit routines** for user programs.

VTAM resides in the Host processor and provides the **interface** between application programs and application subsystems wanting to **Send** and **Receive** data through the operating system.

Some of the functions an Access Method may perform are:

- o formats messages for transmission
- o routes messages to proper applications subsystem
- o controls the network (starting, stopping, changing configuration)
- o schedules or queues messages for transmission
- o ensures end-to-end delivery of messages
- o handles error conditions
- o allocates network resources
- o assists in LU-LU session establishment and termination

ACCESS METHODS

An **Access Method** is a program in its own right which executes in the host machine under an operating system which supports and provides services to its domain or cross-domain resources.

Over the years, there are been several different access methods used at one time or another. Some of them are:

- o VTAM
- o TCAM
- o VTAME
- o BTAM
- o CAM

VTAM

As of 1985 there is only one IBM SNA access method: Virtual Telecommunications Access Method (VTAM). VTAM will only communicate directly through channel-link protocol to any host-connected devices. For remote devices (Asynch, BSC, or SDLC) that are supported, NCP provides the link protocol communication.

ACF/TCAM

TCAM has been an access method since the 1960's. It was modified wo work with SNA in the 1970's and in 1985 became a VTAM subsystem.

TCAM provided message switching and message construction capabilities, plus was able to queue inbound or outbound data for transmission in real memory, not on disc storage. This resulted in less time-consuming I/O access time upon later retrieval of the queued messages.

ACF/VTAME

In the late 1970s, IBM 4331 and IBM 4321 processors were designed with integrated communications adapters in the host. Consequently, a separate Communications Controller was not required. The functions normally performed by NCP were now performed by VTAME. Today these extra functions are a standard part of VTAM, so there is no separate product.

BTAM FUNCTIONS

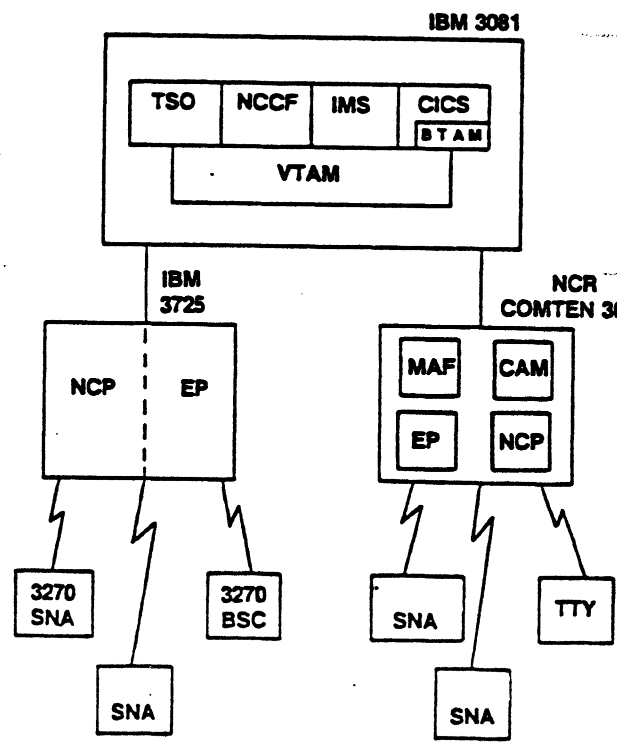
Basic Telecommunications Access Method (BTAM) is the major non-SNA access method. However, there are also many others.

BTAM is a very simple access method. It is associated with **only one subsystem or application.** Therefore there must be repeated copies of BTAM or some other pre-SNA access method (e.g. RTAM or QTAM) in a Host for each application subsystem requiring its features and functions.

When BTAM is used, the subsystem or application program is responsible for device characteristics and for polling and selecting the devices.

BTAM works in conjunction with the non-programmable 270X series of communications controllers. It will also work with Emulation Processing or Partitioned Emulation Processing in a 37X5 communications controller.

Non-SNA messages enter the host through a different channel than SNA messages. They do not pass through the SNA access method to reach BTAM.



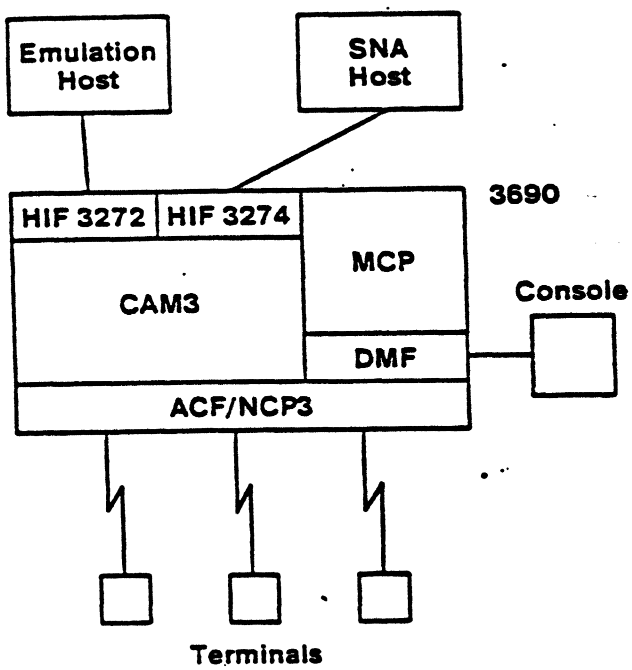
NCR COMTEN'S CAM

NCR Comten offers a product that moves the SNA access method functions into the front end processor. The product is called Communications Access Method (CAM).

CAM can offload from the host many of the typical AM functions including:

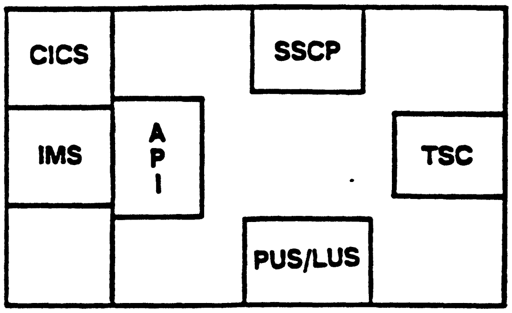
- o starting and stopping network elements
- o establishing and terminating sessions
- o routing

CAM also supports application programs that can be written by the users. Currrently NCR Comten offers an application program called Automatic Message Switch for message switching at the front end processor.



COMMUNICATIONS ACCESS METHOD 3

MAJOR VTAM COMPONENTS



Application Program Interface

- o Processes commands from the application
- o checks for completion of operations, notifies application of completions
- o example: SEND; RECEIVE commands

PU Services

- o performs Boundary Function services for channel attached devices
- o Manages route to various sub-modules

LU Services

- o VTAM's portion of the PLU
- o also performs services for the SLU
- o sends BIND and SDT
- o notifies the SSCP a session is started

Transmission Subsystem Component

- o Formats TH and RH for outbound PIU
- o Interprets TH and RH for inbound PIU
- o Controls pacing
- o Selects outbound route
- o Interfaces to Operating System for input and output
- o Forwards RU to the appropriate VTAM component

SSCP

- o activates and deactivates network elements
- o processes logon and logoff requests
- o maintains status tables of all network elements

VTAM NETWORK INITIALIZATION

Two methods for network Start-of-day activation:

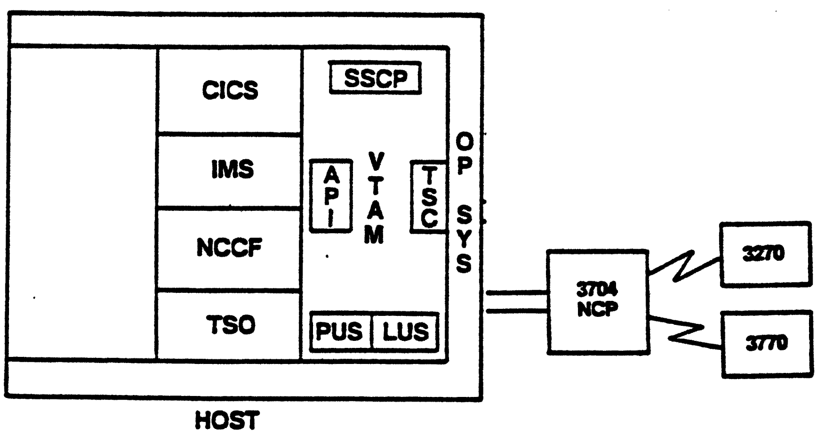
- **Hierarchial** -

  Activation begins with the most superior resource VTAM, then SSCP, then the Physical Unit in the Host, followed by the Links, Physical Units, and Logical Units in the network.

- **Cascade** -

  Activation involves only a portion of the network, such as a selected subarea or even just portions of a particular subarea.

To simplify this start-of-day task, job control strings may be genned into the software to activate either the entire network or just a portion of the network for the operator.



START-OF-DAY ACTIVATION

A step-by-step example might take place as follows:

- o "Power-up" local and remote physical resources (processor, controllers, modems, work-stations, etc.)
- o Begin IPL (Initial Program Load) of disc Operating System into processor memory, and Operating System assumes control.
- o Operator issues system commands to start the Access Method. Access Method will activate respective SSCP, PUs (SSCP-PU) and links.
- o SSCP-LU sessions may be established with application subsystems in the host.
- o Under control of the Access Method, a loader utility program down-loads NCP into each proper Communicatons Controller.
- o SSCP-PU session established with adjacent NCP.
- o SSCP issues ACTLINK commands for link station activation (DTR/DSR)
- o SSCP-PU session established in Cluster Controllers
- o SSCP-LU session established in Cluster Controllers
- o LU-LU sessions may now be established, either by the SLU, PLU, start-of-day routine, or by the network operator.

LU-LU SESSION ESTABLISHMENT

A **temporary connection** permitting two end-users to exchange network data is called an **LU-LU session**. When the session is established, the characteristics of that session are determined by the exchange of a BIND command between partners.

To establish an LU-LU session, a "logon" must first occur.

Format for an SLU logon:

logon applid(name) logmode(name) data(user data)

- **logon:** Constant value which describes the function of the SLU request

  Corresponds to an table entry in the VTAM USSTAB (Unformatted Systems Services Table).

- **applid:** Application subsystem name which the SLU seeks to establish a session.

- **logmode:** Corresponds to a table entry in the logon mode table.

  May be either a specific or defaulted entry in a LOGMODETAB (logon mode table) which identifies the proper BIND parameters for the session.

- **data:** Information included with the logon request and forwarded to the application program by the operator.

Example: **logon applid**(CICS) **logmode**(R3270) **data**(040338)

Terminal Logons

Three methods to establish a session from a terminal.

- o **Unformatted** (long version)
  - logon applid(name) logmode(name)

- o **Unformatted** (short version)
  - ex: CICS
logon TSO
IMS

- o **Field Formatted**

  Programmable devices generally send field formatted logons. Non-programmable devices generally send character coded logons.

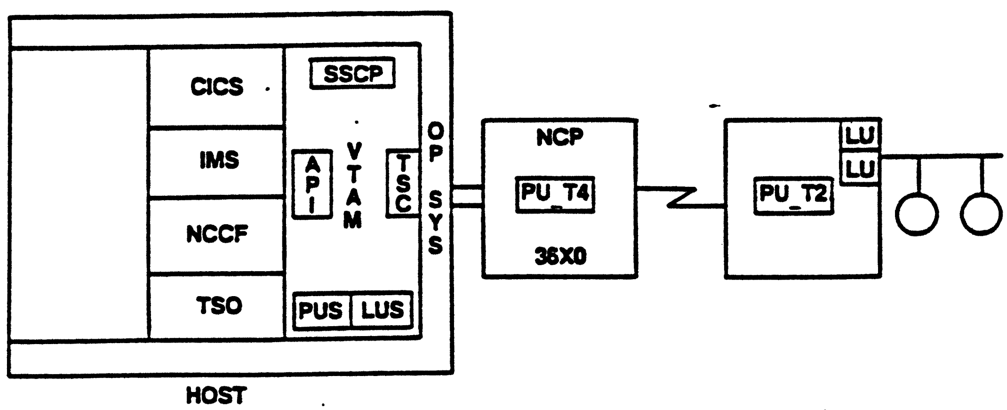
  - INITSELF (true SNA command)

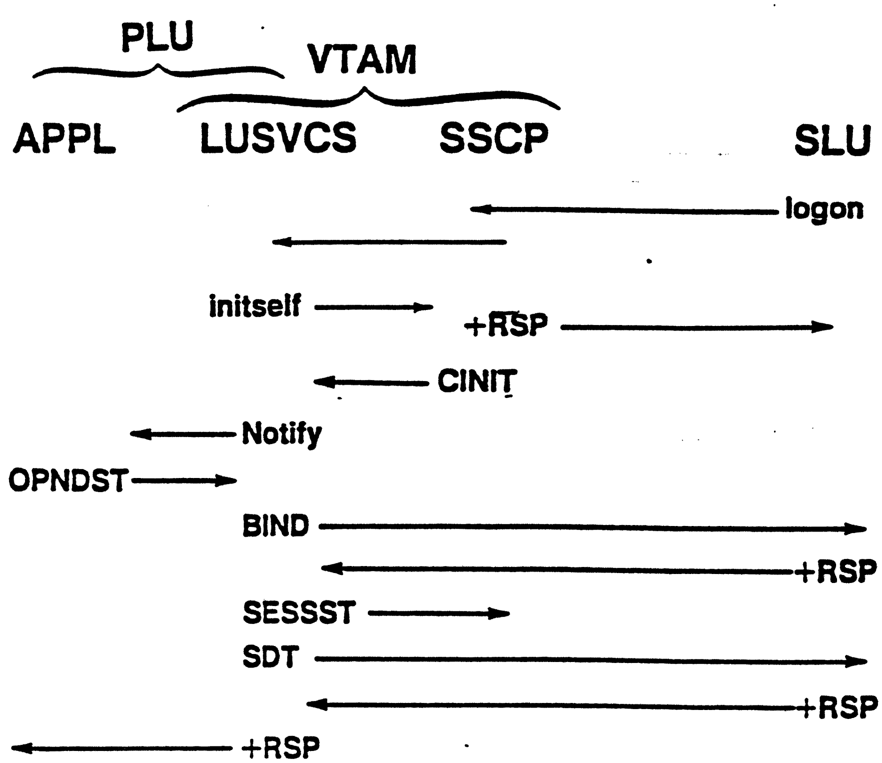
TH	RH	INIT SELF	LOGON MODE	REQUESTED APPL NAME	PASS WORD	DATA

PLU or Third Party Initiated Sessions

Sessions that are established as a result of an application or subsystem command or by a network operator may identify the correct logon mode entry or may assume a default logon mode entry.

SESSION ESTABLISHMENT PROCESS





DATA TRANSFER

- Sending or receiving of data by the Application program must refer to an **RPL of Request Parameter List** which is a control block area used by the application program to describe most of its requests:

- The FORMAT for the RPL and some of its associated macros appear as follows:

  RPL AM = VTAM
  ACB = acb address
  AREA = address of output area from which data will be written
  RECLEN = length in bytes of user data found at AREA
  STYPE = REQ or RESP
  SEQNO = sequence number found in the Transmission Header
  RESPOND = no response; definite response; exception response
  CONTROL = DATA or some SNA command
  CHAIN = begin; middle; end chain
  CHNGDIR = change direction indicator
  BRACKET = begin; middle; end bracket

- Using this information and the information in the session control block, the TSC portion of VTAM builds the PIU (TH + RH + RU). It then notifies the Operating System that a message is ready to be sent.

- After the message has been sent, VTAM places feedback information into the RPL control block to be examined by the application program. This information indicates completion of transmission and status of the transmission.

ACCEPTING DATA

The Application program may accept data (requests) and responses by three different methods:

- o RECEIVE instruction
- o SEND instruction
- o EXIT routine

RECEIVE

If a **RECEIVE** is used, the application can issue it at any time. The RECEIVE will be available and waiting for an incoming Request message from a terminal.

The Receive command will move data received by VTAM into an input area inthe application program or sets the RPL fields to indicate that data has been received.

SEND

If **SEND** is used, it can transmit a data request or send a response to a previous request it received.

The SEND operation is not considered complete until the response is received.

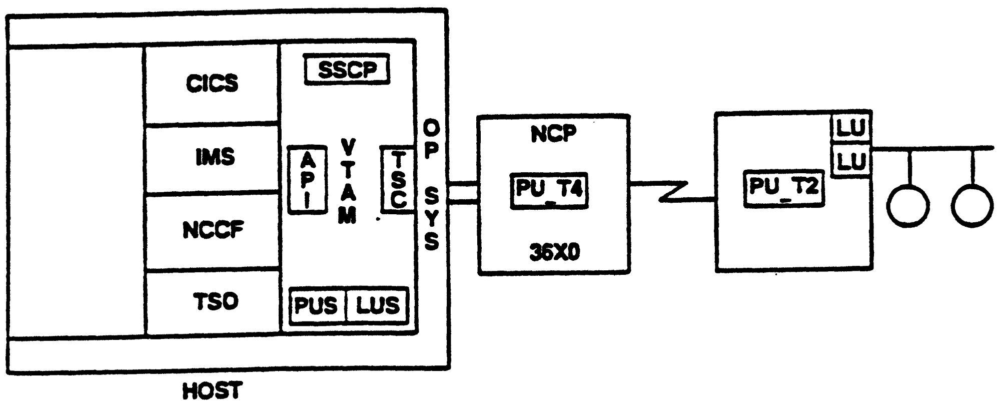
EXIT

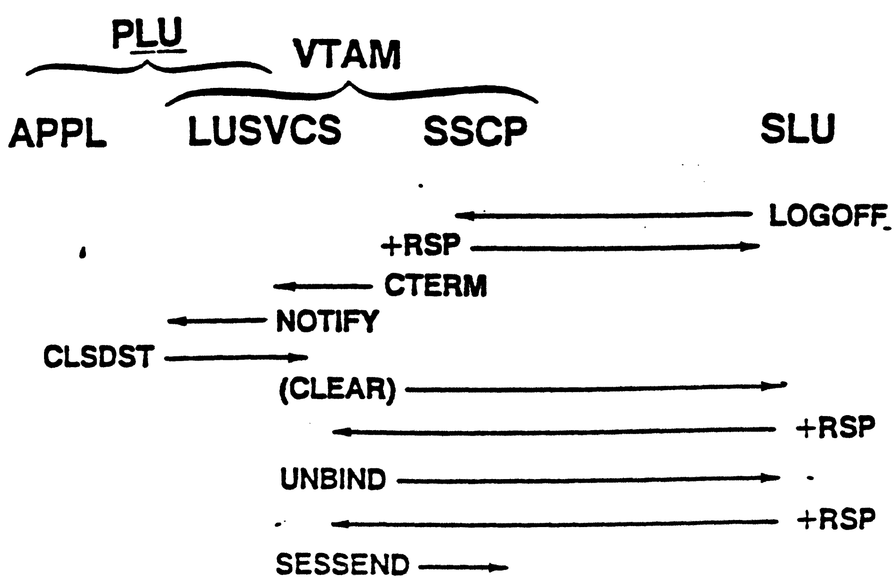
An **EXIT** routine can also be used to process responses from the terminal. Whenever a response is received, VTAM will forward it to the proper response exit routine for processing.

SESSION TERMINATION

Either session partner may request the termination. The LU for a terminal initiates the shutdown usually from an operator controlled terminal (CRT), while the application would initiate the shutdown for an unattended terminal (printer).

If the SLU requests the termination process, it can send the logoff request either to SSCP or to the PLU. Regardless who receives the request, eventually VTAM's LU services sends an UNBIND to the SLU.





REVIEW LESSON 8 QUIZ

Circle the proper True/False answer for the questions below:

1. T F The Physical Services component of VTAM controls the activation and deactivation of the various network resources.

2. T F The Transmission Subsystem Component is responsible for handling routing functions within VTAM?

3. T F The Application Program Interface (API) is an command interface between the Application Subsystems and the other components in VTAM.

4. T F LU Services is responsible for formatting incoming and outgoing PIUs and interfaces with the queues of the Host's Operating System.

5. T F SSCP issues the session BIND command and the SDT command.

6. T F It is the responsibility of SSCP to maintain network resource session tables.

7. T F The Transmission Subsystem Component routes incoming messages to the proper VTAM component.

8. T F LU Services is responsible for notifying SSCP that it and the partner LU have agreed to the session characteristics and are now in session.

LESSON 9: IBM SUBSYSTEMS

PURPOSE

This lesson describes the most commonly used of the subsystems that support SNA.

OBJECTIVES

After completing this lesson, the student will be able to:

- o List the major IBM subsystems
- o Identify the LU types supported by each subsystem

REFERENCES

- o Demystifying the BIND, Presentation at SHARE 58 by Jay Burnside
- o CICS General Information Manual, IBM GC33-0155-0
- o OS/VS Remote Entry Services, IBM GC28-6878-4
- o DOS/VS POWER: Installation Guide & Reference, GC33-6048-1
- o JES3 System Programming Library: Installation, Planning, & Tuning, IBM SC23-0041-2
- o JES2 System Programming Library: Installation, Initialization, & Tuning, IBM SC23-0046-2
- o IMS/VS General Information Manual, IBM GH20-1260-11
- o IBM System/370 and 4300 Processors VSE/POWER, IBM SH12-5329

INTRODUCTION

There are several different classes of application subsystems.

There are Terminal Monitors, RJE subsystems, and Network Management subsystems.

Terminal Monitors (Teleprocessing Monitors)

- o CICS
- o IMS
- o TSO

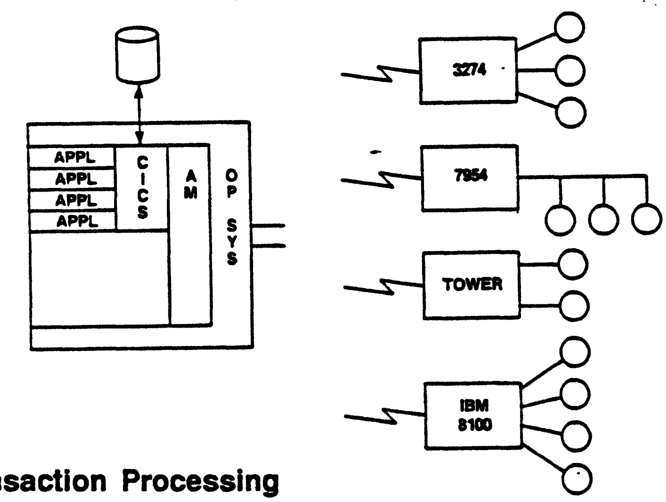
RJE Subsystems

- o POWER
- o RES
- o JES2
- o JES3

Network Management

- o NetView
- o NCCF
- o NLDM
- o NPDA

CUSTOMER INFORMATION CONTROL SYSTEM (CICS)



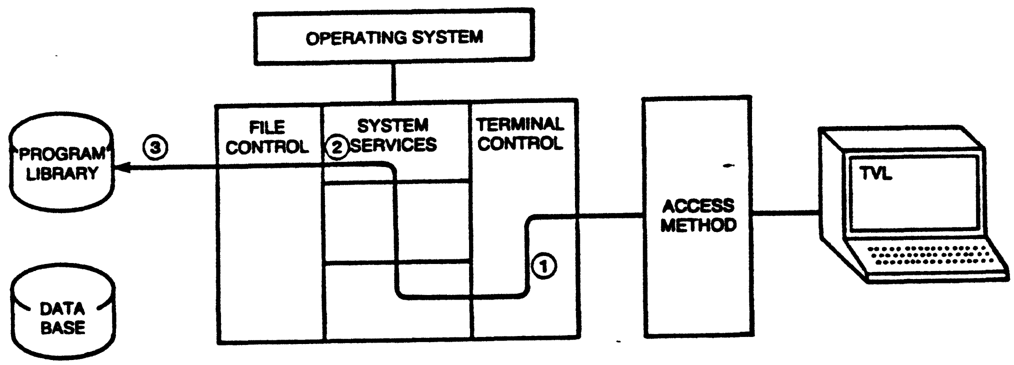
Terminal Monitor or Transaction Processing

Definition - CICS operates between the communications interface software (VTAM) and the user application program. It controls all transactions entering the application subsytem (CICS).

Features:

- o calls and activates the user's application program upon request by local or remote terminals or subsystems.
- o queues transactions for processing when resource is available.
- o removes or adds communication control characters as transactions enter or leave the system.
- o controls concurrently running programs for many online users.
- o starts recovery procedures following abnormal termination.
- o may perform some screen control.
- o provides security features to prevent unauthorized access to files.
- o monitors performance/provides statistics

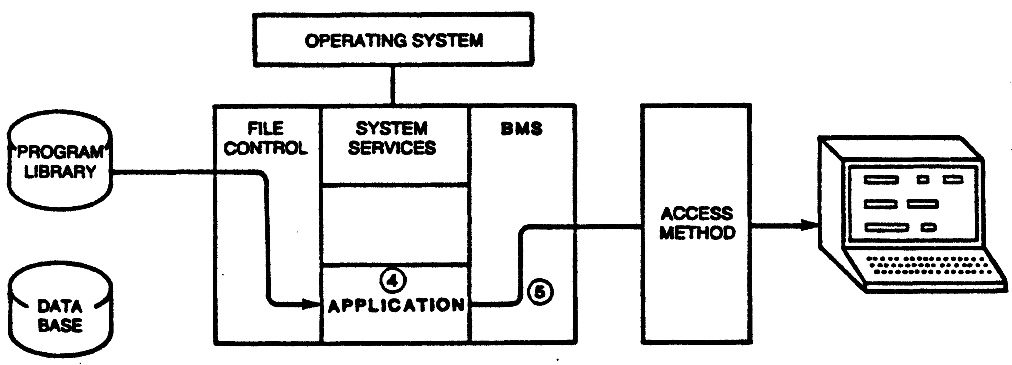
How CICS Works



1. End-user logons to CICS; identifies themselves, and indicates user application program to execute. CICS terminal control accepts the input and places it in a work area.

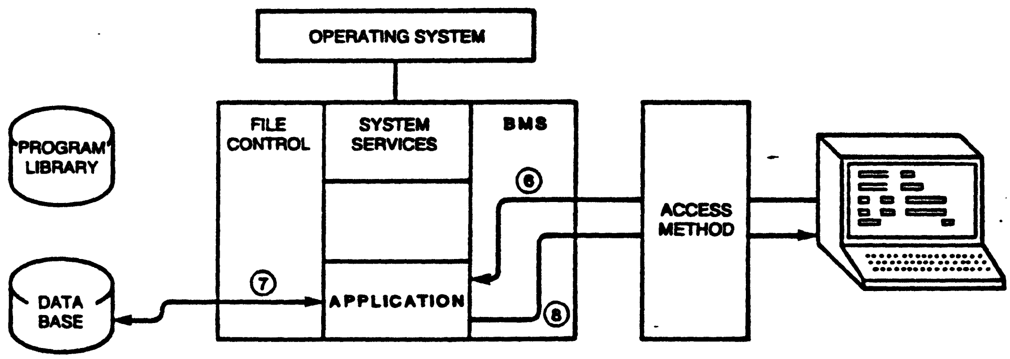
2. System Services (interface between CICS and Operating System) determines if program already resides in memory or needs to be loaded from program library disc storage.

3. Program to execute is either already in memory or loaded from program library.



4. Application runs as a concurrent job under control of CICS.

5. Application Program Services may format a menu to send to the terminal, allowing the operator to input further requests.



6. Application Program Services accepts the operator's response.

7. File Control will then access the proper database files for the requested information.

8. Again, Application Program Services will format the database information and forward it to the terminal.

Operating System Support

- o DOS/VSE
- o OS/VS1
- o VS2/MVS
- o MVS/XA

Access Method Support

- o VTAM
- o BTAM

Functions Performed

- o Online Inquiry only to Centralized Database.
- o Online Inquiry and Update to Database.
- o Online Data Entry to create files at host for subsequent processing or to be accessed by another user.
- o Handles online message switching between terminals which does not involve data processing or file access.

LU Support

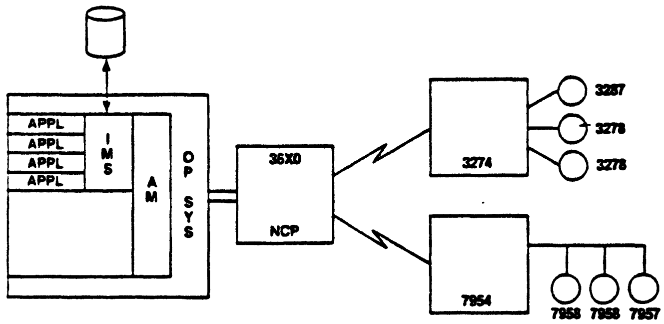
- o LU0
- o LU1
- o LU2
- o LU3
- o LU4
- o LU6.0
- o LU6.1
- o LU6.2

BIND Image

Each terminal is defined in the CICS **Terminal Control Table.**

CICS may modify the CINIT to create a BIND based on information in its Terminal Control Table.

INFORMATION MANAGEMENT SYSTEM (IMS)



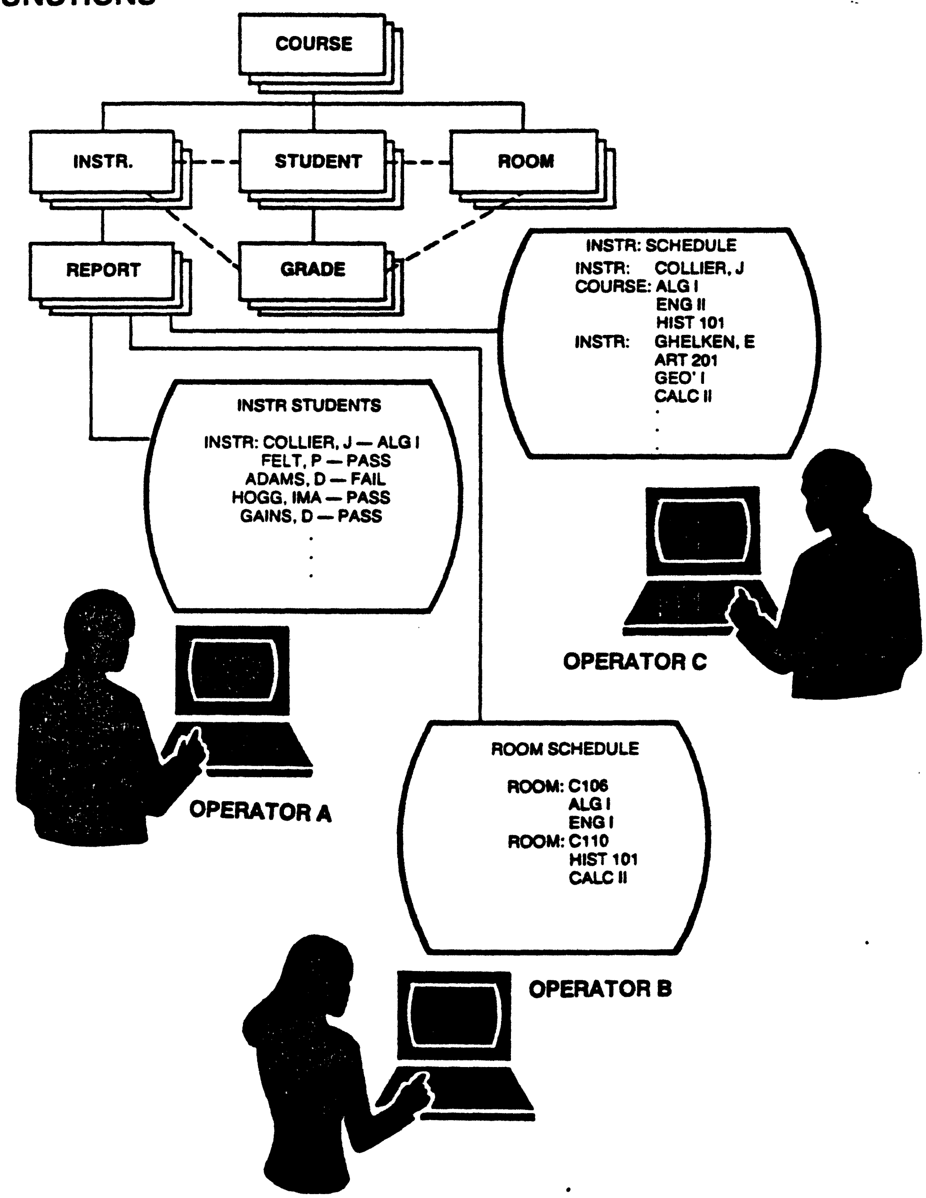
Data Base Manager

Definition: - a method of providing users with the ability to organize, consolidate, and integrate various data records to serve one or more applications in a single database environment.

Features: -

- o Database records are stored as interrelated, individual segments in an hierarchial manner, such that each segment is related to and in some way dependent upon the segment above it.
- o Database record information is stored only once.
- o Database may be shared by many applications stemming from different departments within a company.
- o Application program is independent of physical structuring of the database.
- o Security is provided to limit operators or other applications access to the database.
- o Permits both batch and online access to database.
- o Recovery control and logging control facility available.

HOW IT FUNCTIONS



- Operator A produces display of instructor, listing all of that instructor's students and their grades.
- Operator B produces display of each room and the classes that are taught in that room.
- Operator C produces display listing each instructor and the courses that each instructor teaches.

Data Communication Feature

- o Optional feature that extends the functions of DL/1 and IMS to the online, real-time environment.
- o Permits users to sit at terminals, enter transactions, and have the results displayed
- o Terminal/Teleprocessing Monitor
- o Message Format Service - simiplifies the development and maintenance of terminal-oriented programs.
- o Multiple System Communication (IMS-IMS) - permits the linkage of multiple IMS systems to distribute processing loads to satisfy geographical or other business requirements.
- o Intersystem Coupling (CICS-IMS) - permits data to be exchanged between other IMS-IMS or IMS-CICS systems.
- o Performs routing, queuing, and interfacing to VTAM.

Operating System & Support

- o MVS
- o VS1

Access Method Support

- o VTAM
- o BTAM

Functions Performed

- o Inquiry
- o Update
- o Data Entry
- o Message Switching

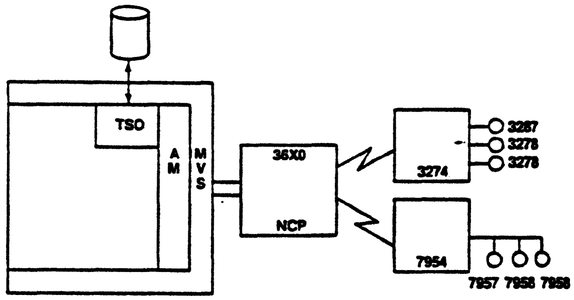
LU Support

- o LU0
- o LU1
- o LU2
- o LU4
- o LU6.1
- o LU6.2

BIND Image

Logical terminals are defined to IMS. Each logical terminal is associated with the physical terminal. IMS does use the logmode table entry. However, IMS may change the maximum RU size and the FM and TS usage fields based on the LU's definition to IMS.

TIME SHARING OPTION (TSO)



Online Editor - an interactive, online editor providing the facility for multiple users to use the computer's resources on a shared basis for creating and manipulating data, programs, and JCL (job control language) files.

Features -

- o each user receives a time-slice of the processor's execution time
- o provides debugging tools
- o System programmers: for maintaining system libraries, catalogs, and procedure libraries.
- o Application programmers: developing new applications and maintaining existing programs.
- o Programming Librarians: creating, maintaining, and controlling development and production libraries.
- o Job Retrieval
- o Data/Text Entry

Operating System Support

- o MVS

Access Method Support

- o VTAM

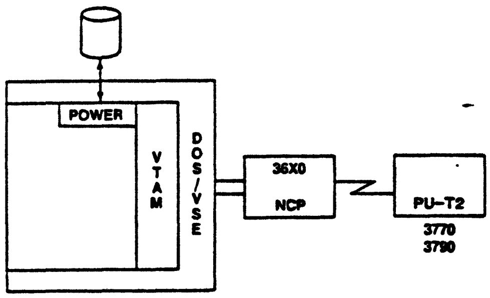
LU Support

- o LU1
- o LU2

BIND Image

TSO does use the logon mode table entry with certain modifications. It first checks the BIND for specific fields. Depending on the FM Profile and the LU type, TSO may modify the max RU size or the Presentation Services usage.

PRIORITY OUTPUT WRITERS, EXECUTION PROCESSORS AND INPUT READERS (POWER/VSE)



RJE System

Definition - an application to improve throughput of a computing system by separating input and output operations and the internal computing operations of the application programs, a process known as **spooling** or **Simultaneous Peripheral Operations On-Line.**

Features -

- o accepts input data and stores on input queues on disc.
- o jobs are transferred to partitions and executed.
- o job output is stored on output disc (or tape). queues before final processing.
- o output may be spooled at remote site on diskettes or disc.
- o provides operator monitoring capabilities.
- o supplies accounting information for each job run.

Operating System Support

o DOS/VSE

Access Method Support

o VTAM

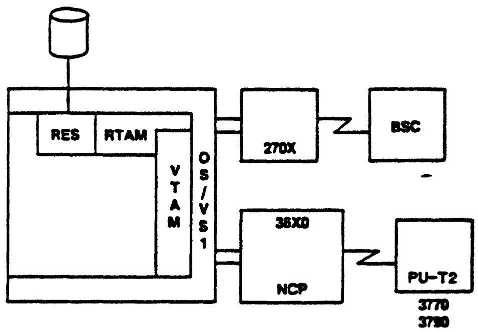
LU Support

o LU1

BIND Image

POWER uses the BIND image in the logmode table.

REMOTE ENTRY SERVICES (RES)



RES System

Definition - a method of transmitting jobs efficiently and conventiently from remote sites to the OS/VS1 operating system for execution.

Features -

- o RES accepts data from remote sites
- o schedules jobs for execution
- o routes output to originator or to some other user
- o permits messages to be broadcast to a specific user, the central operator, or to all other users
- o permits the operator to monitor the status of the job(s) submitted
- o remote workstations may be unattended
- o spools output

Operating System Support

o OS/VS1

Access Method Support

o VTAM
o RTAM -access method controlling transmission of data between the centrol processor and the remote sites. RTAM controls BSC terminals directly and interfaces with VTAM for SNA terminals.

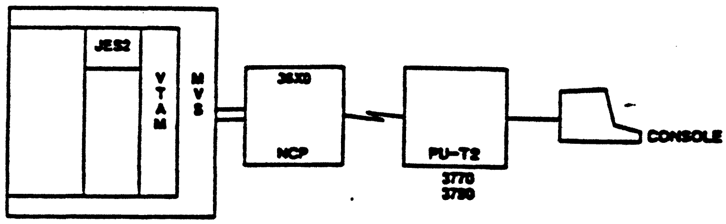
LU Support

o LU1 o LU4

BIND Image

RES uses the BIND in the logmode table entry without changes.

JOB ENTRY SYSTEM 2 (JES2)



RJE

Definition - permits selected jobs, files, operator commands and messages, and job accounting information to be entered from one node, **and possibly** routed to another for execution, and lastly be directed to one or more nodes for output.

Features -

- o Ability to route input between Hosts.
- o Schedules or queues jobs for execution.
- o Ability to route output.
- o Permits application to application communication.
- o Ability to spool the output for later transmission.
- o Operator has ability to monitor and control job.
- o Account information is collected and produced by each node that participated in the processing of the job.

Operating System Support

o MVS

Access Method Support

o VTAM

LU Support

o LU0
o LU1

BIND Image

JES2 modifies the BIND based on parameters coded for it.

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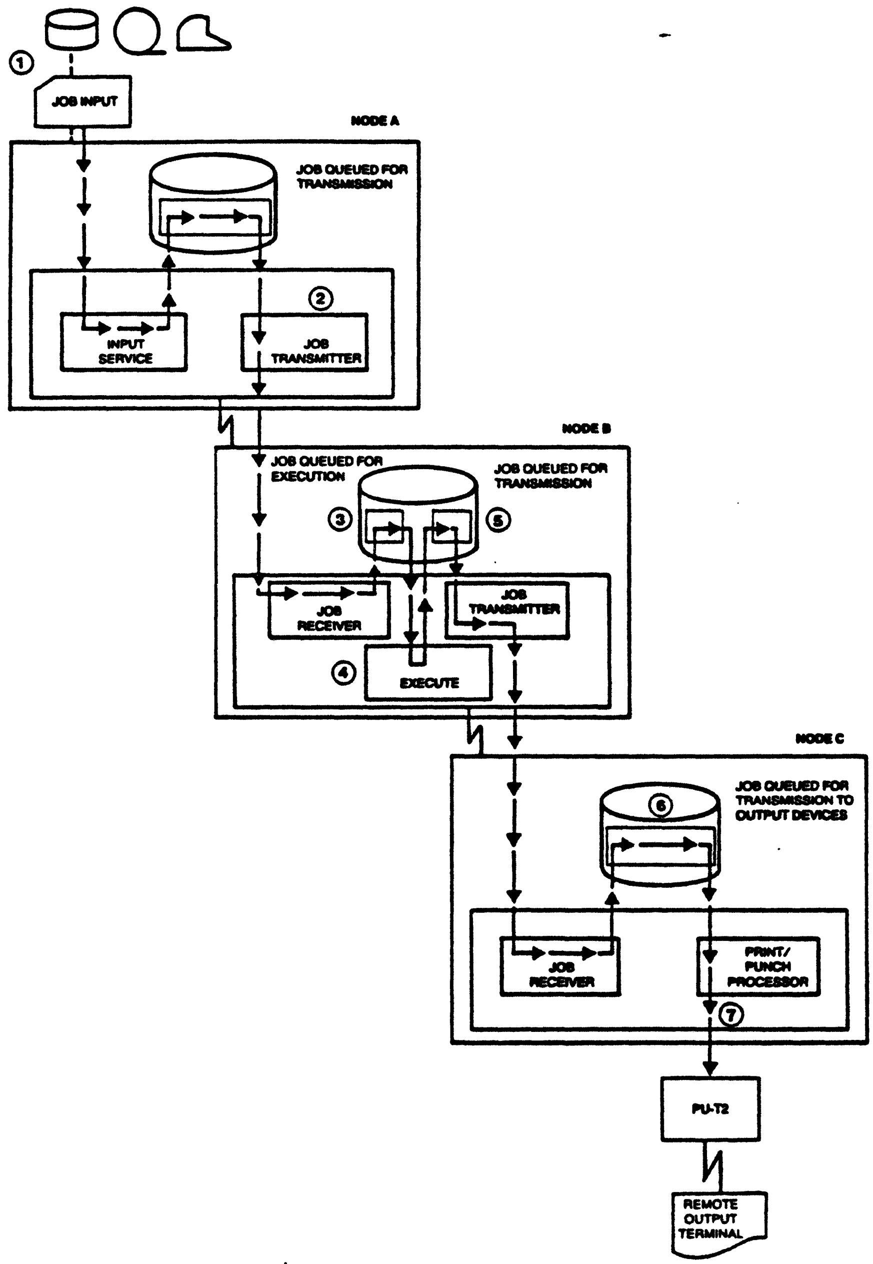
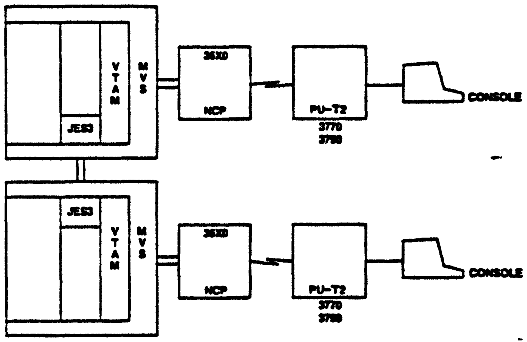
HOW IT FUNCTIONS



1. Job data is input and placed on transmission queue.
2. When ready, job data is transmitted to adjacent node.
3. Job data received is placed on execution queue.
4. Job is executed.
5. Completed job is placed on output queue for destination transmission.
6. Completed job is placed on queue for final output transmission to terminal device.
7. Final job data is transmitted to device.

JOB ENTRY SYSTEM 3 (JES3)



RJE

Definition - in addition to the normal features of RJE, JES3 provides enhanced management control over jobs submitted for execution by providing an advanced operations and scheduling feature to balance the workload, and an approach which allows multiple processors to maintain a single image for operations, job scheduling, and resource management.

Features -

- o accepts input data
- o queues and schedules jobs for execution
- o handles job setup functions
- o monitors execution of job
- o schedules deadlines
- o spools output for later processing
- o job are not selected for execution until all resources are available

Operating System Support

- o MVS

Access Method Support

- o VTAM

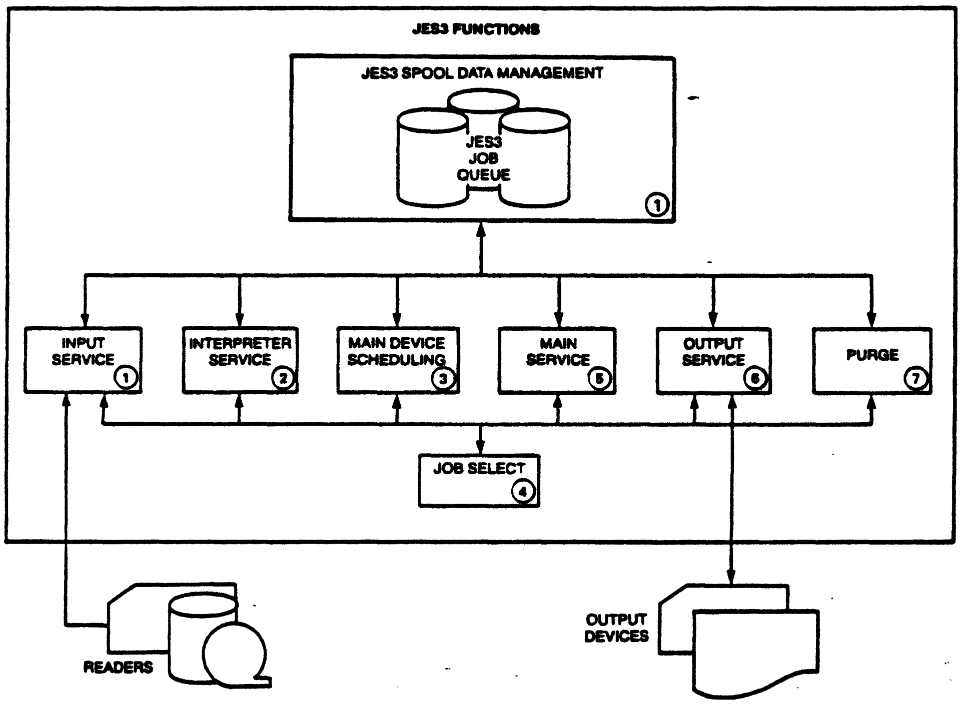
LU Support

- o LU0
- o LU1

BIND Image

JES3 uses the BIND in the logmode table without changing it.

HOW IT WORKS



1. Job data is input where it is analyzed and placed on the job queue.
2. Converts JCL statements; determines resource requirements and builds control blocks.
3. Setup of resources (devices, volumes, and files) associated with the job are requested.
4. Job is selected for execution either with normal options, priority options, or specific sequence.
5. Job is executed and monitored.
6. Completed job is scheduled for output, first; then actual output phase takes place.
7. Purge releases all of the job's resources.

REVIEW LESSON 9

1. Column A contains a list of functions for the test items in Column B. On the line at the left of each function, write the letter of the test item from Column B that describes that function. Each response in Column B may be used once, more than once, or not at all.

Column A	Column B
______ 1. A subsystem that performs complex duties such as gathering job data input, checking for availability of resources, queueing jobs for execution, monitoring jobs as they execute, spooling output, and outputting job to device terminals.	A. JES3 B. CICS C. TSO D. IMS
______ 2. A time-share subsystem that is predominantly utilized by programmers for program-type development work.	E. JES2
______ 3. A transaction processing system session between interactive application programs and the devices to which the application is connected.	
______ 4. A subsystem that permits input to be sent to an initial node, then to be routed to another node(s) for execution and output.	
______ 5. A collection of logically related, but independent, records stored together without unnecessary redundancy to serve one or more applications concurrently.	

2. List the application subsystems that support all LU-LU session types.

LESSON 10: DATA FLOW THROUGH THE NETWORK

PURPOSE

This lesson provides an overview of data flow through the network components.

OBJECTIVES

After completing this lesson the student will be able to:

- o Describe the seven functional layers of an SNA network
- o Describe how a message moves through the network
- o List the components of a message as it passes through the network nodes

REFERENCES

- o System Network Architecture, Format and Protocol Reference Manual: Architecture Logic IBM SC30-3112

LAYERED STRUCTURE OF SNA

SNA is a classic example of an **hierarchically layered architecture** composed of two structures, namely **NAUs** and the **Path Control Network.**

These layered functions are **modular** in nature and **independent** of each other.

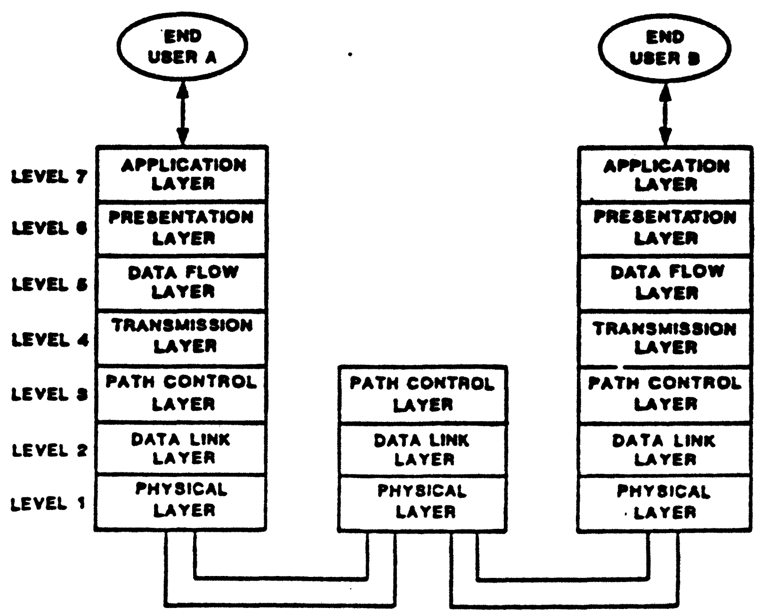
All interaction, whether end-user or specific SNA network is controlled, conducted and managed by these peer components based on specific protocols. That is to say, a layer in one node will interact with the same peer layer in another node.

Separation of layers enables changes in one layer to be performed without affecting functions in any of the other layers.

SNA FUNCTIONAL LAYERS

The services that SNA provides may be categorized as:

- o **NAU Services** - services that are associated with the SSCP, PU, and LUs.
- o **Path Control Network Services** - services associated with the two layers that make up the path control network itself.



APPLICATION LAYER LAYER 7

- This layer is the highest layer and provides the actual support for the end user.
- This is the end-user interface to the network
- Some of the responsibilities of this layer are:
    - Allows two programs to communicate without regard to any of the network protocols.
    - Allows a database to be accessed without having to specify to the program where the database is located.

PRESENTATION LAYER: LAYER 6

- This layer converts and reformats the data between two session partners.
- Some of the responsibilities of this layer are:
    - Data Formatting
    - Compression and Compaction of data
    - Screen Formatting
    - Code Set Conversion (ASCII <--> EBCDIC)

DATA FLOW LAYER LAYER 5

- The services of this layer pertain to the flow or integrity of the data within a particular session:
- It may provide the following services:
- DATA FLOW:
    - Flow Direction
    - Chaining
    - Bracketing
    - Response Control
- SESSION SERVICES:
    - Session Partner Verification
    - Network to Local Address Conversion (and vice versa)
    - Virtual Route Choice
    - Queuing

TRANSMISSION LAYER LAYER 4

- This layer provides end-to-end control functions for the data passing between two LU session partners.
- Some of its responsibilities are:
  - Session Level Pacing
  - Request/Response Header construction
  - Transmission Header Sequence Checking
  - Encryption

PATH CONTROL LAYER: LAYER 3

- This layer is responsible for providing a path through the network (from node to node) for the data.
- Some of its responsiblities are:
  - Selection of link for Routing
  - Transmission Header Construction
  - Boundary Function Path Control
  - Message Segmentation
  - Message Sequencing
  - Virtual Route Pacing

DATA LINK LAYER: LAYER 2

- This layer is responsible for the error free transmission over the physical link.
- Some of its responsibilities are:
  - Link Header and Trailer construction
  - Data Transfer
  - Error Detection and Error Correction
  - Retransmission of error frames

PHYSICAL LAYER LAYER 1

- This is the lowest layer which is responsible for establishing, maintaining, and disconnecting the link stations. It specifies the mechanical aspects such as the dimensions of the plugs and sockets, the pin assignments (functions), voltage levels, and sequence of activation or deactivation of these pin signals

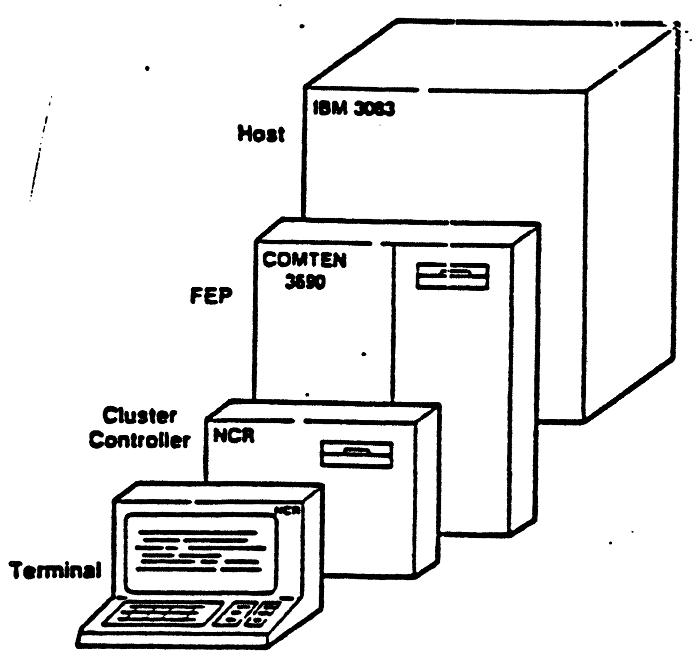
- SNA does not define this physical layer. The definitions for this layer have been the responsibility of various standards organizations, such as the Electronics Institute Association (EIA) or Consultative Committee International for Telegraph and Telephone (CCITT).

EXAMPLE OF DATA FLOW THROUGH THE NETWORK

This lesson will now trace a message unit as it travels from the end user's terminal to the host application, and also follows that message's reply as it returns from the host application to the terminal.

Remember that the message unit represents a "request for information", and the reply represents the "return of the requested information".

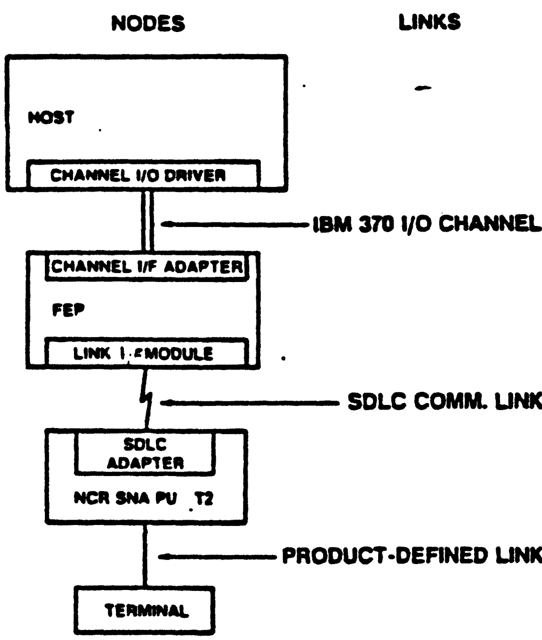
The reply does not represent the SDLC link level response nor is it an SNA positive or negative response. The reply does represent the information returned by the host application after processing the original user message.



The User's View of the Network

HARDWARE COMPONENTS

The message travels through a number of hardware components from end user terminal to host.

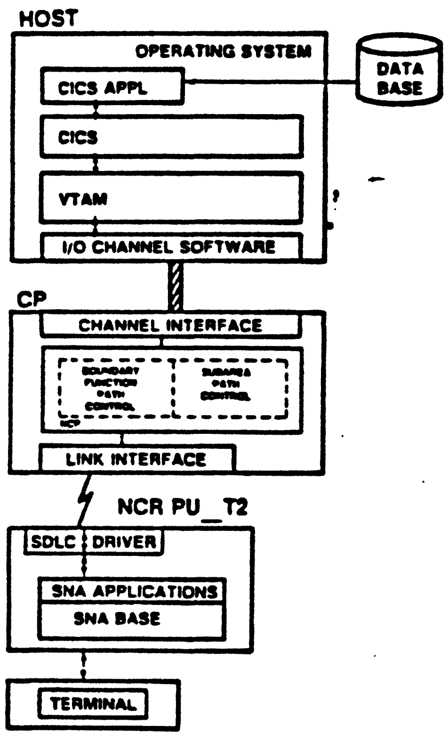


The hardware components consist of:

- o Terminal
- o Product-defined link
- o NCR SNA PU-T2 product (cluster controller)
- o SDLC line and modems
- o Communications controller (or Front End Processor (FEP))
- o IBM 370 I/O Channel
- o Host processor

SOFTWARE COMPONENTS

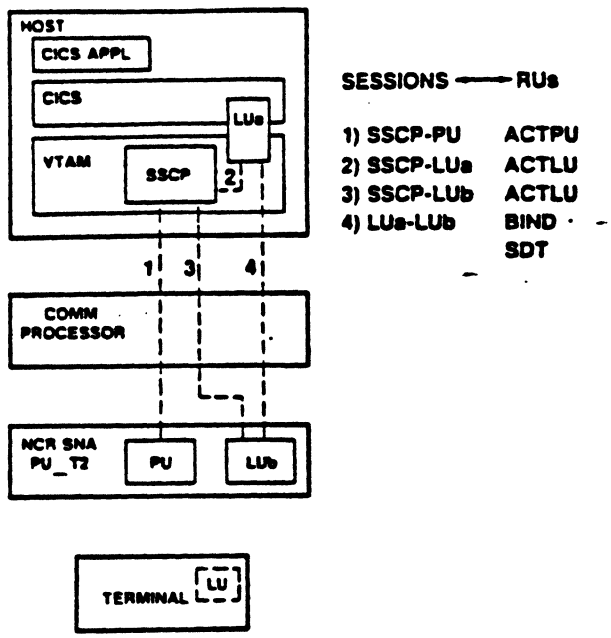
The message must also navigate many software products and modules before it reaches the host application.



Grouped by the nodes in which they are found, these software modules include:

- o NCR SNA PU-T2
  - SNA application software
  - SNA base software
  - SDLC Driver
- o Communications Processor
  - Link Interface
  - Boundary Function
  - Subarea Path Control
  - Channel Interface
- o Host
  - I/O Channel Driver
  - VTAM
  - CICS
  - CICS Application and Data Base

SNA SESSION ESTABLISHMENT



The following sessions must have been established prior to communication between the terminal and CICS.

- o SSCP-PU
- o SSCP-PLU
- o SSCP-SLU
- o PLU-SLU

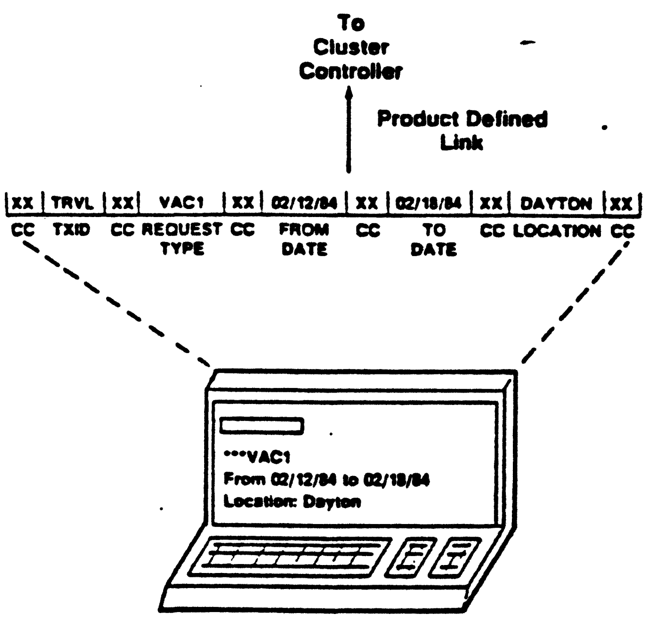
The LU which represents the terminal end user is in the NCR SNA PU-T2 and is designated LUb. The LU representing the CICS application is shared between VTAM and CICS and is designated LUa. LUa and LUb must be in session before the end user can send a request for information to CICS. The SSCP in VTAM must have previously activated the PU in the NCR cluster controller and also have activated both LUa and LUb.

The span of SNA is from the cluster controller to CICS. Both end users (terminal operator and CICS application) are outside the span of SNA. It is therefore easy to see how SNA is transparent to the end user.

MESSAGE TRANSFORMATION

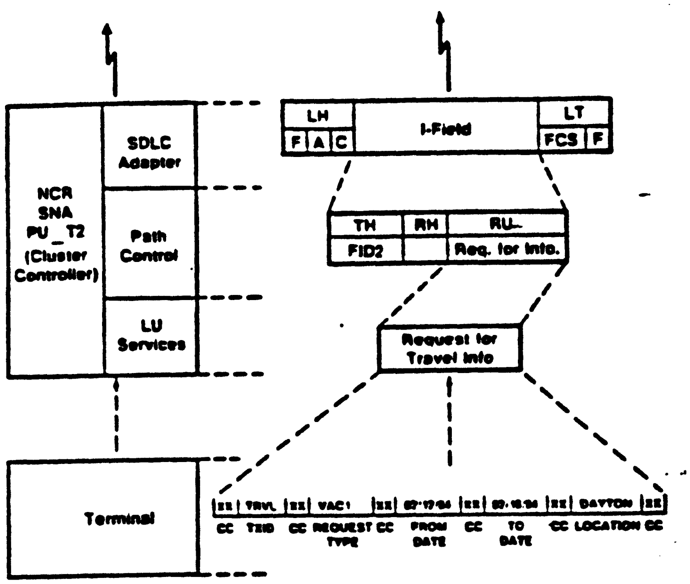
As data flows through the network, its format changes. Various kinds of control information are added or changed.

Terminal To Product Defined Link



The end user is requesting information on hotel vacancies in Dayton from 2/12/84 to 2/18/84. This information is transformed by the terminal into a character string containing the data and some control characters. It is this character string that is transferred across the product-defined link to the cluster controller.

Product Defined Link To SDLC Link



LU Services receives the character string from the link. LU Services formats the character string into an RU, adds the RH, and passes both to Path Control. Path Control adds the TH (FID2).

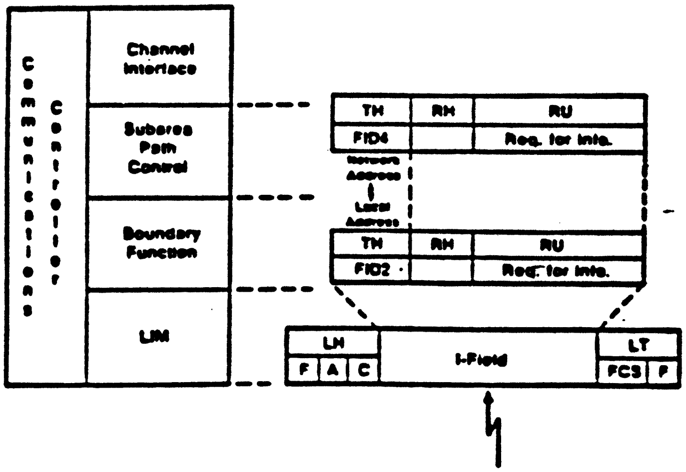
Within the TH, the Origin Address Field was assigned by the LU. The Destination Address Field was assigned when the session was bound.

At this point, the message is in PIU format.

Path Control passes it to the SDLC driver and adapter, where the LH and LT are appended to the PIU. The PIU itself constitutes the I-Field portion of an SDLC frame.

With the message embedded in the SDLC frame, the frame can now be shipped across the SDLC link to the communica-tions controller.

SDLC Link To NCP



At the FEP end of the SDLC link, the message is received by the **Link Interface Module (LIM).** LIM is a generic name for that component in the FEP which interfaces to the SDLC link.

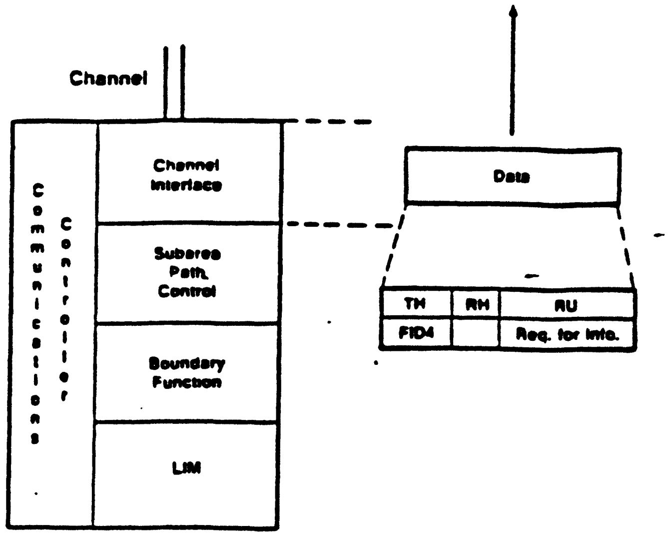
In the IBM Front-End Processor, it is known as a **Line Set.**

In the Comten Front-End Processor, it is known as a **Modem Interface Module (MIM).**

In either case, the LIM receives the message and removes the link header and trailer before passing the message to the NCP Boundary Function. The message is once again a PIU.

THe LIM passes the message to Boundary Function for the FID conversion.

NCP To Host

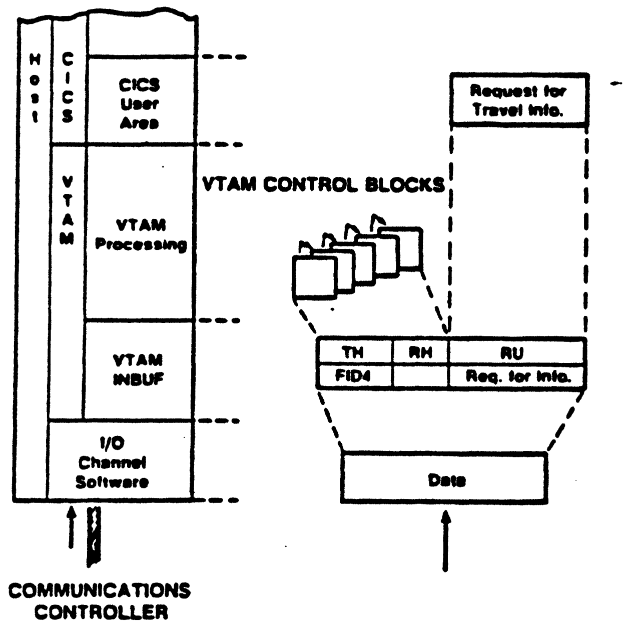


After receiving the PIU, NCP modifies the TH. The TH has indicated FID2 until now, which contains the local address. NCP changes it to FID4, which contains the network address.

The PIU is then passed to the Channel Interface Adapter, or the Channel Adapter as it is called by IBM. The CIA sends and receives data from the IBM 370 Channel which does not recognize any message unit formats. For this reason, the PIU crosses the channel simply as unformatted data.

VTAM

The message has now arrived at the host.

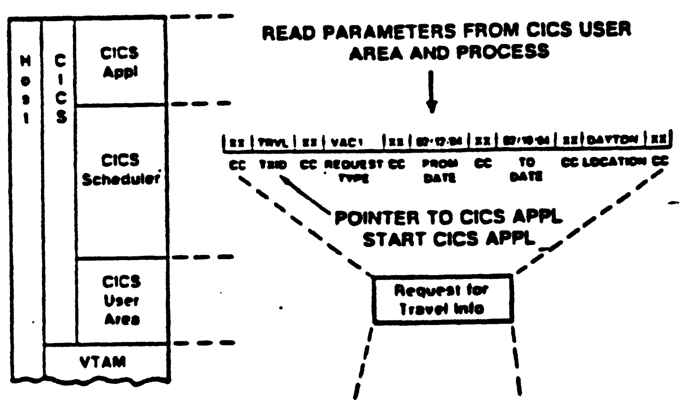


The data is received at the host side of the channel by the channel I/O software, which places it in a VTAM input buffer. At this point, the messagee is once again a recognizable PIU.

VTAM separates the data (RU) from the TH and RH. The information in the TH and RH is used by both VTAM and CICS.

VTAM passes the data to CICS and points to the area in memory where the TH and RH control information is stored.

CICS



Once the message is in the CICS user area, the CICS scheduler applies a pointer to the appropriate CICS application (TRVL), which then begins to execute.

The CICS application looks at the message in the CICS user area to determine the parameters of its information search.

The message actually never arrives at the application, but stays in the CICS user area.

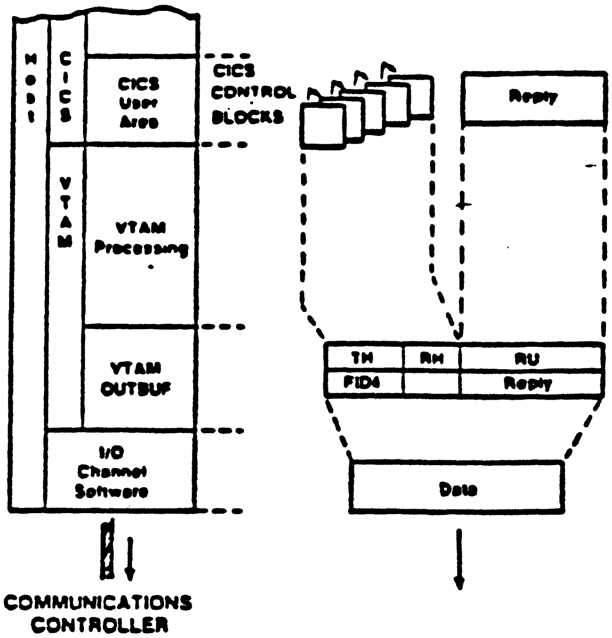
Processing The Request

The original message requested information on hotels and rates in Dayton from 2/12/84 to 2/18/84. The CICS application processes it as follows:

- o Identifies Dayton as the basis for the search
- o Sets limits on the search from 2/12/84 to 2/18/84
- o Searches data base
- o Assembles all hotels which are available candidates for this itinerary
- o Prepares a list of these hotels and their rates for the reply
- o Calls CICS with the reply

When the application has completed the processing, it calls CICS.

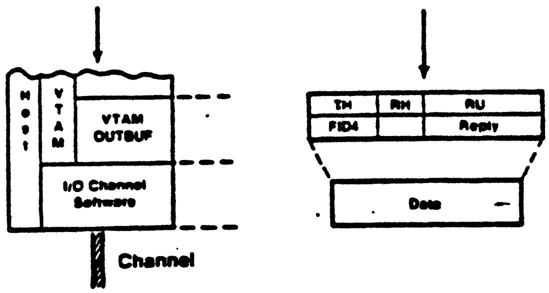
RETURNING THE REPLY CICS TO VTAM



CICS formats the reply and issues a SEND instruction to VTAM with the appropriate pointers.

VTAM accepts the RU and formats the TH and RH from the information in the control blocks and from information in its own tables.

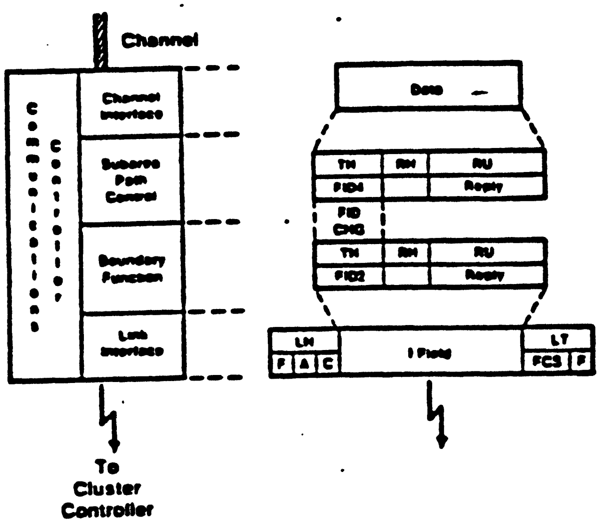
VTAM To NCP



VTAM now moves the PIU to its TSC component and calls the I/O channel software. The I/O channel software moves the data to the appropriate channel and ships it out.

NCP To PU-T2

The path back through the front end processor is simply the reverse of its original path.



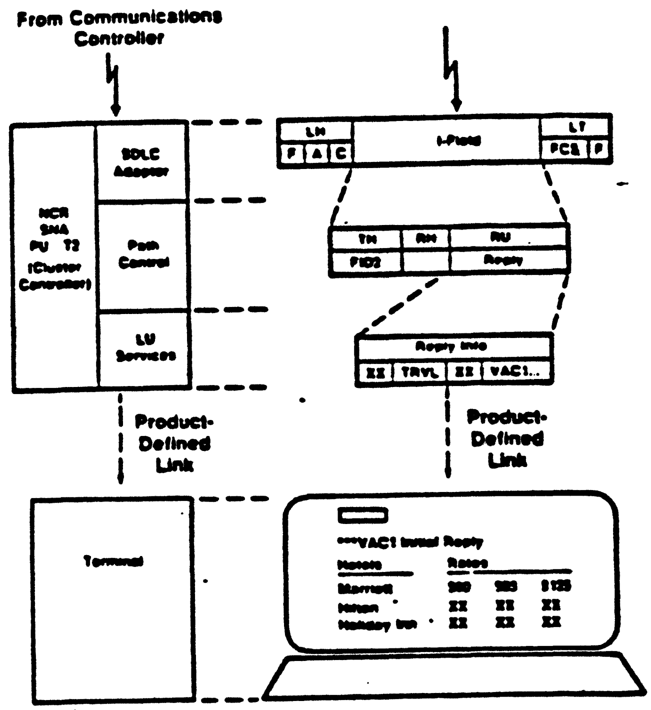
Data is received from the channel by the Channel Interface Adapter (CIA) and NCP recognizes it as a PIU.

When NCP passes the PIU to Boundary Function, the FID type is changed back from FID4 to FID2.

The LH and LT are added before the LIM ships the reply back to the cluster controller.

The reply crosses the SDLC link to the cluster controller as an SDLC frame.

PU-T2 To Terminal



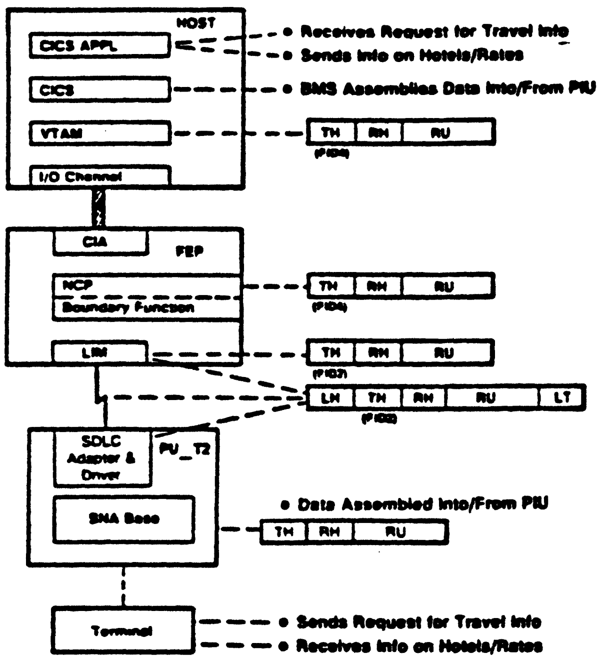
The SDLC Adapter in the cluster controller receives the SDLC frame from the SDLC link.

The SDLC driver removes the LH and LT, and passes the PIU to the SNA PU subsystem software which in turn passes the RU to the proper application software (LU).

The application software transmits the data across the product-defined link to the terminal.

When the reply is received at the terminal, it is displayed on the screen according to the way in which CICS formatted it.

DATA FLOW SUMMARY



REMINDERS

Bracketing

The original request for hotel reservations used the BB bit setting. However, our request/reply example was probably not the entire bracket.

Brackets consist of a number of messages, going both directions, which constitute a complete transaction.

So although we have requested and received information on available hotels and rates, this transaction is not complete until we have selected our preference, placed the reservation, and received confirmation.

The reply which provided confirmation of the reservations would carry the EB bit setting.

LESSON 11: ADVANCED PROGRAM-TO-PROGRAM COMMUNICATION

PURPOSE

This lesson will introduce the newest SNA definitions of APPC, namely LU 6.2 and PU-T2.1.

OBJECTIVES

After successfully completing this lesson the student will be able to:

- o Discuss reasons for the emergence of APPC.
- o Discuss processing concepts of Host vs. Distributed Processing.
- o Discuss the PU-T2.1 controller and connectivity.
- o Discuss the APPC interprogram communication characteristics.
- o Discuss the LU6.2 functioning software features.
- o Discuss the Transaction Program Interface verbs.
- o Identify the products and architecture of Office Processing, namely, DISOSS, DIA, DCA, and SNADS.

REFERENCES

- o <u>An Introduction to Advanced Program-to-Program Communication</u>
  IBM GG24-1585
- o <u>Transaction Programmer's Reference Manual for LU Type 6.2</u>
  IBM GC30-3084

REASONS FOR APPC EMERGENCE

- o The ability for network users to decentralize data processing within their organizations and place computational analysis, storage and retrieval of information at departmental or geographic distribution points is a result of:

  - modern technology producing intelligent workstations, mini- and micro-processors.

  - more cost effective methods of producing hardware and firmware.

- o Some inherent problems with interactive processing of a host-controlled environment is the tendency of the network utilization to degrade as:

  - traffic volume increases.

  - additional terminals are configured into the network.

- o Consequently, support for a distributed, small system within the classical subarea network was made available, regardless of the vendor's machines or geographical location

- o This enhanced SNA protocol is known as **ADVANCED PROGRAM-TO-PROGRAM COMMUNICATION** (APPC) and offers a common protocol among different types of products available on the market.

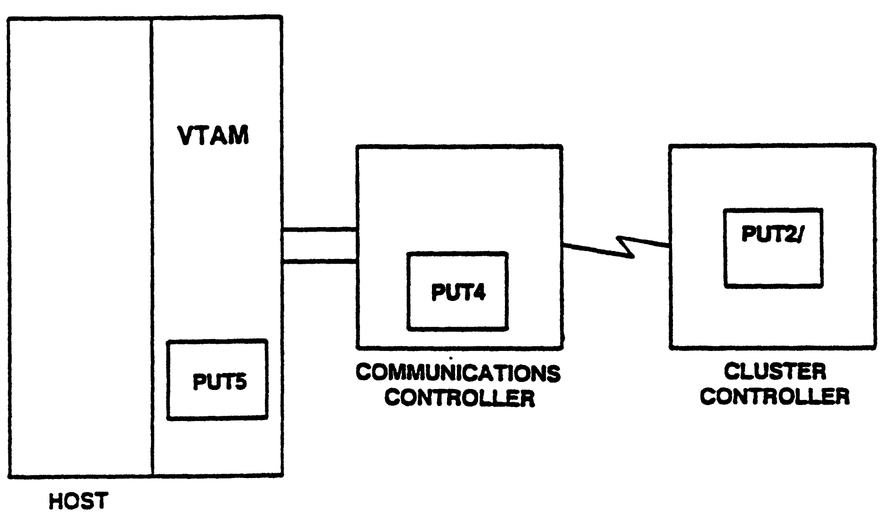
- o In the future, this architecture will provide a single, strategic LU type that will replace all previous LU types.

- o APPC is supported by CICS, IBM's departmental processors (ie. S/36, S/38, Series 1) and intelligent workstations.

PROCESSING CONCEPTS

Host Controlled

- Host communications involve a **single mainframe processor** which strictly controls how data will be stored, processed, and manipulated.
- The host application programs control the various screen formats, prohibit free input by the operator and disallow all but the required input.
- The host program will perform the functions of a **PLU** and the software at the remote end performs the role of the **SLU**.
- A peripheral node (PU-T2.0) communicating with a host processor can only support a **single communication link.**
- Despite popular belief, host systems were never intended to provide timely access for remote users as part of a larger network.
- General Network examples: Remote Batch Processing
  General Inquiry
  ATM
  Reservation Systems



PROCESSING CONCEPTS

Distributed Processing or Peer Processing

- o **Distributed Processing** is defined as two or more Transaction Programs sharing resources and executing co-operatively on multiple systems.

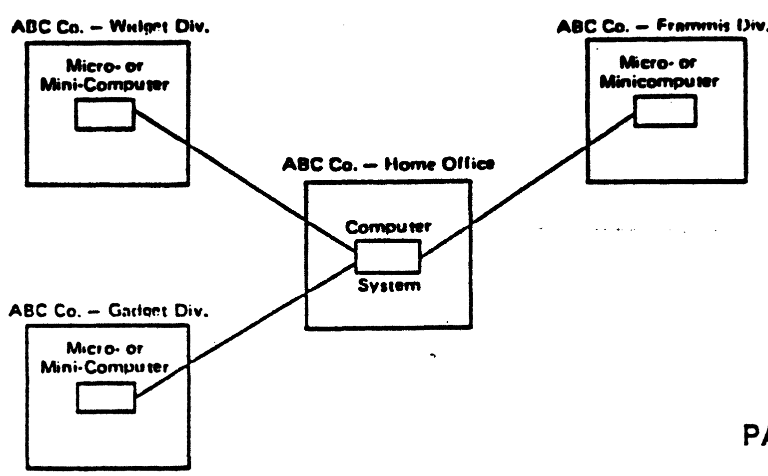
- o A **Transaction Program (TP)** is usually encountered in an Interactive environment, resulting in single transaction being processed. This processing may involve a single transaction program , several TPs, or a system services program (i.e., utility routine) written by a vendor.

- o As implied by the name, the control is no longer centralized, but rather scattered across departmental, geographic, or time-zone lines.

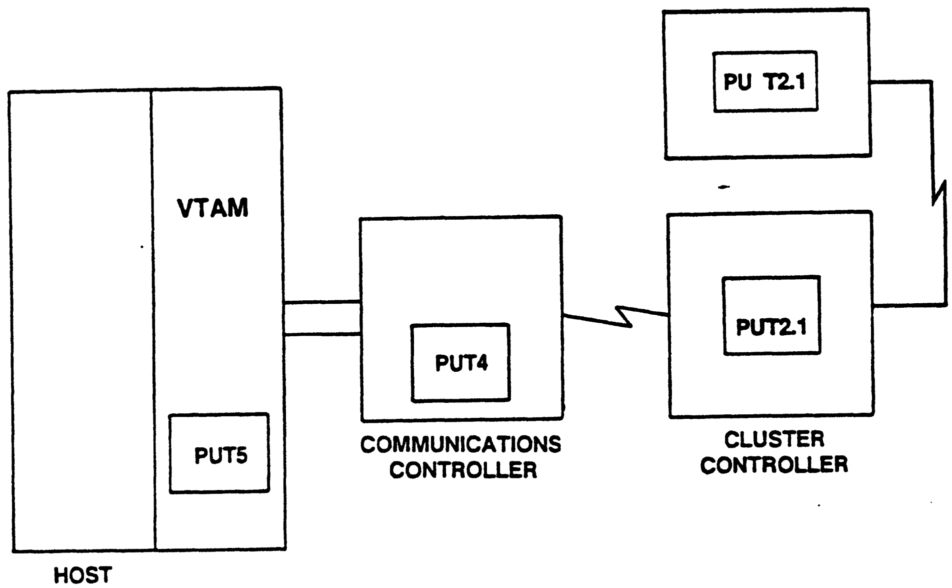
- o A great deal of programming coordination is required between the different TPs to ensure that:

  - Data formats are compatible
  - Communication sequences are compatible
  - The synchronization of processing sequences is compatible
  - The functions of the applications are similar
  - Access to database(s) is available for all applications
  - error recovery responsibilities are identified

- o Distributed examples: Database inquiries
  Documment distribution
  Office or Word Processing
  related functions



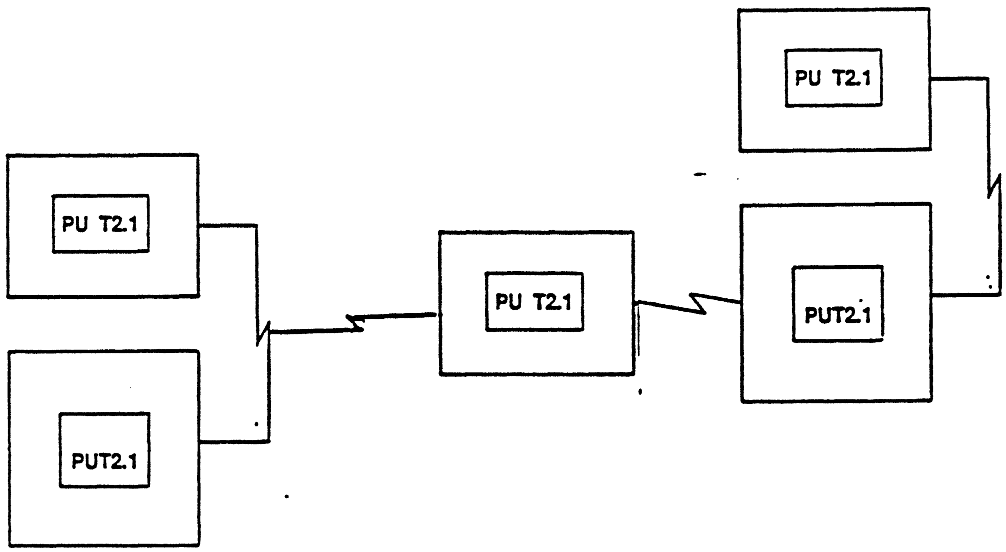
PHYSICAL UNIT TYPE 2.1 CONNECTIVITY



HOST CONNECTED

- Connectivity to a host processor would impose the same restraints as any PU-T2.0 node.
- PU-T2.1 node would be under the control of the SSCP in the host processor.
- PU-T2.1 node would only be able to support **Secondary Logical Units** when communicating with any application subsystems in the host.

PHYSICAL UNIT 2.1 CONNECTIVITY



PEER-TO-PEER CONNECTION

- This is an enhanced generation of the PU-T2.0 software which provides a subset of SSCP functions.
- Node will support either SDLC **Primary** or **Secondary** link station(s)
- The peer nodes are permitted to negotiate which of the link station roles they will assume, that is, primary or secondary.
- The PU-T2.1 does not have a global view of the entire network; but only sees itself and its attached resources.
- Does not require an SSCP-PU or SSCP-LU session as does a PU-T2.0 node.
- The PU-T2.1 supports the new PC devices and the functions they perform.
- PU-T2.1 nodes may be attached to other PU-T2.1 nodes.

PARALLEL vs. MULTIPLE SESSIONS

The use of parallel sessions is an improvement over a single session.

Below is a contrasting table showing the number of sessions required for 20 separate terminals in pre-APPC SNA as opposed to APPC:

	PRE-APPC	APPC
FUNCTION	MULTIPLE LUs	PARALLEL SESSIONS
SYSTEM DEFINITIONS	21 SESSIONS 1 SSCP-PU 20 SSCP-LU	2 SESSIONS 1 SSCP-PU 1 SSCP-LU
END-USER DEFINITIONS	20 LU NAMES	1 LU NAME
NETWORK MANAGEMENT	21 LUs	1 LU
NETWORK ADDRESS USAGE	20 STATIC	1 STATIC
SESSION USAGE	RIGID, DEDICATED	FLEXIBLE, DYNAMIC

CONTRASTING SESSIONS vs. CONVERSATIONS

A conversation uses a minimal amount of overhead when compared to non-LU6.2 sessions and is usually thought of as involving only a single transaction being transmitted in one direction.

	PRE-APPC	APPC
CONNECTION	SESSION BETWEEN LUs	CONVERSATION BETWEEN TRANSACTION PROGRAMS
CONNECTION TIME	EXTENDED	SHORT TIME-SLICE
SESSION PARTICIPATION	SHARED BY LUs	EXCLUSIVE USE BY TRANSACTION PROGRAM
INITIATED BY	SSCP	LU6.2
START-UP OVERHEAD	TIME-CONSUMING	SIMPLE BRACKET INITIATION

LU6.2 COMPONENTS

Presentation Services

- Activates the Transaction Program
- Enforces correct verb and parameter usage
- Buffers data records prior to transmission
- Interacts with Resources Manager for requested conversations
- Interacts with Half-Session to transfer data to partner LU

Resources Manager

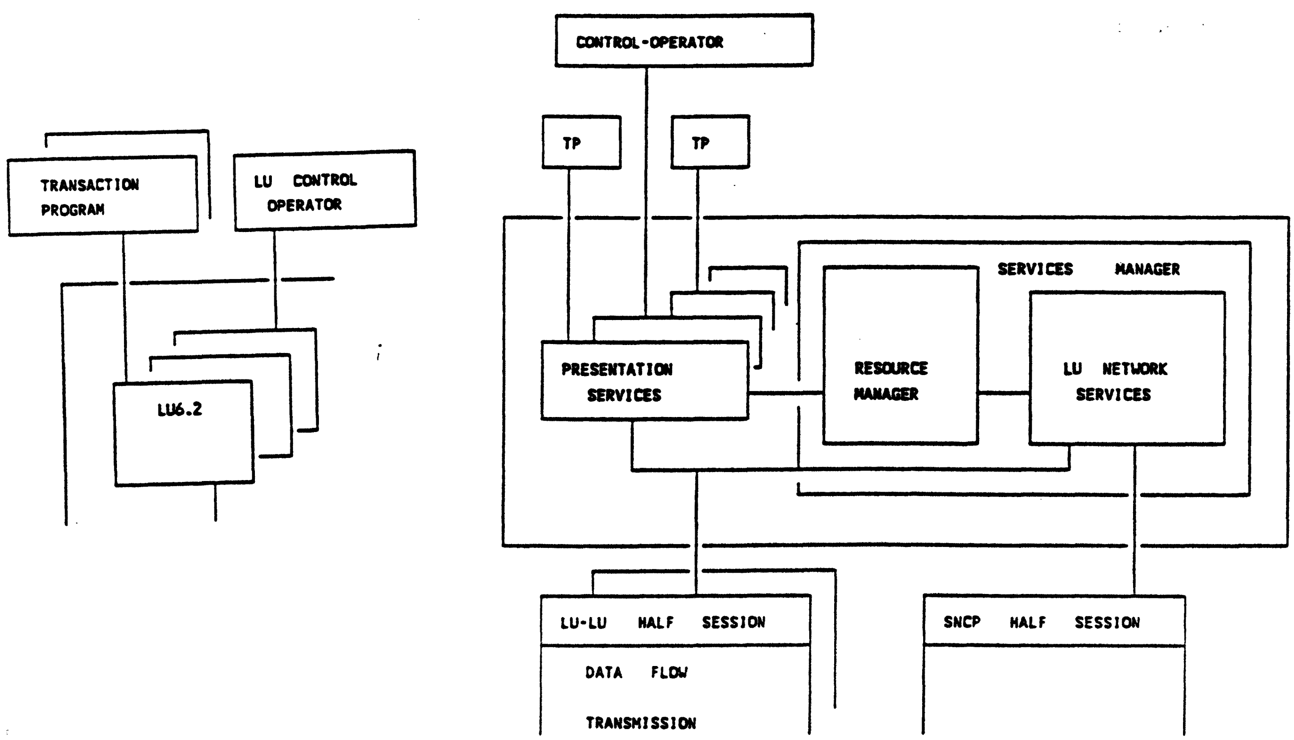
- Creates destroys conversations
- Selects session to be used by a conversation
- Requests LU Network Services activate/deactivate sessions

LU Network Services

- Sends and receives the BIND
- Negotiates session parameters during BIND exchange

Half Session

- Blocks data into correct RU size
- Builds Request Header and enforces correct usage
- Creates/enforces chaining protocol
- Creates/enforces bracket protocol
- Provides session-level pacing

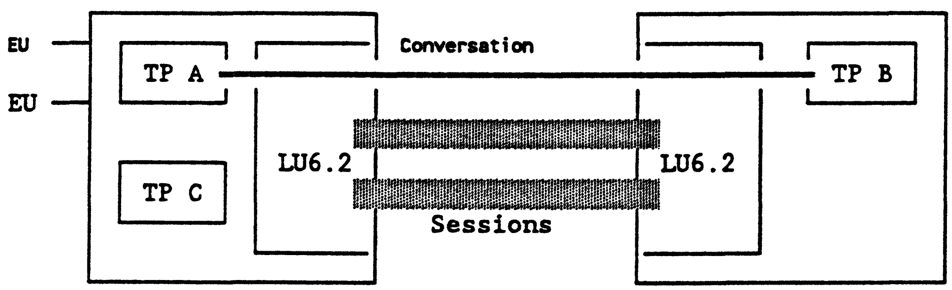


LU6.2 INTERPROGRAM COMMUNICATION CHARACTERISTICS

- o It is the LU6.2 software capabilities that provide for interprogram communications and permit distribution of the processing among multiple programs in a network.

- o It is the API structure that allows programs to communicate with each other in order to process a given transaction.

- o The structure of LU6.2 session has the following characteristics:



- **Concurrent program activation -**
  many distributed TP programs may be active at any one time in order to send and receive information among themselves.

- **Conversation overhead -**
  to achieve the most efficient use of the session, LUs may support either a single or parallel session between themselves or mix the conversations serially over the session.

- **Conversations** -
  the TP will ask the LU6.2 session for a **time period of exclusive use** of an available session, which is a long-term connection between two LUs. The session time-frame granted to the TP by the LU is known as a **conversation** or a unit of work.

- **Conversation Lifetime** -
  the time allocated to a conversation is determined solely by the transaction programs. The conversations may be single messages or many messages. It may be of short duration or long duration. Understandably, a conversation could continue indefinitely, interrupted only by a line failure.

- **Data transfer** -
  Conversations will use two-way alternate method of transferring data. One program issues verbs to **SEND** data; the other program issues verbs to **RECEIVE** data. When the sending program is through sending its data, it transfers control to the other program so that it may send data.

- **Error Notification** -
  Partner Transaction Programs may inform its partner that an error has been detected.

- **Commitment Control** -
  Referred to as "synch points", data may be defined as being either **protected** or **unprotected.** Synch points indicate a marker in which all data received prior to the marker is considered protected and permanently updated.

- **Mode of Service** -
  Programs are able to allocate the desired mode of transmission as either **interactive** or **batch.**

Verb Sets

Verbs are defined to **SEND** data, **RECEIVE** data, and control the conversations and/or sessions. They serve the needs of system service programs and application transaction programs.

There are two categories of verbs:

Conversation verbs

- o Basic - utilized by application programs and service programs
- o Mapped -utilized strictly by application programs using a high-level programming approach
- o Type-independent - intended for use with both mapped and basic conversations

Control Operator

A person, namely the **Control Operator,** has the permission and ability to describe and control the availability of certain resources within the LU6.2 node or with a remote LU6.2.

The Control Operator is supplied with a Control Operator Transaction Program and certain Control Operator verbs:

- o Change number-of sessions (CNOS)
  - These verbs, used by the control-operator, perform functions related to the control of the LU.
    - verbs which allow the number of sessions permitted between partner LUs to be increased or decreased.
    - verbs which initialize, delete, or display the local LU's operating parameters.

LU6.2 FUNCTIONAL SOFTWARE

The functions and protocols are divided into a

- **BASE SET**

  A set of verbs, parameters, status codes, and indicators which all products must implement.

- **OPTIONAL SET**

  A set of verbs, parameters, return codes, and indicators which a product **MAY** support, depending on the product.

  The product may support some of the options, or none.

The BASE and OPTIONAL set are further divided into

- **LOCAL SUPPORT**

  Verbs, parameters, return codes, and indicators which the product supports by the **local TP.**

  It is also used in the context of the TP which issues the verbs requesting a **conversation** (i.e., point-of-reference).

- **REMOTE SUPPORT**

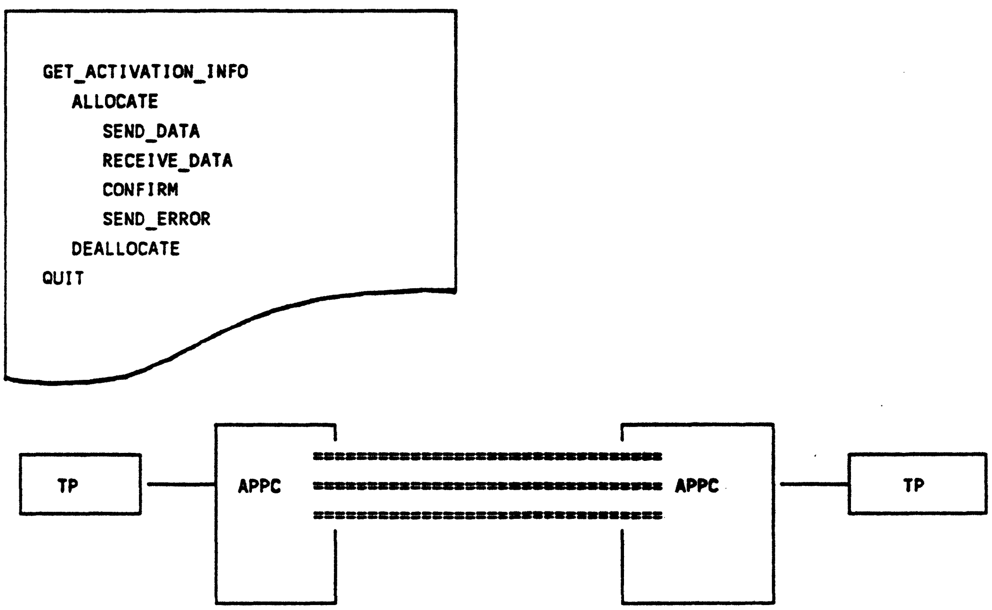
  Verbs, parameters, return codes and indicators supported by the product at the remote end of a conversation.

  This is simply the point of reference as viewed by the local transaction program.

Tranaction Program Interface Verbs

Developing an APPC transaction program involves the designing and writing of the program. Once you decide what you wish your program tasks and learn how to use the APPC verbs, writing the code is straightforward.

The basic flow of an APPC application program is to:



ATTACH TO THE APPC SUBSYSTEM [GET_ACTIVATION_INFO]

- This verb attaches you to the APPC subsystem

START CONVERSATION [ALLOCATE]

- Initiates a conversation with remote partner program and supplies parameters for specifying session properties, sync points, password, and security to partner program

END DATA [SEND-DATA]

- Loads send buffer with logical formatted record for the partner program

RECEIVE DATA [RECEIVE_AND_WAIT] PREPARE_TO_RECEIVE

- receives information from partner program or waits to receive data.

CONVERSATION CONTROL [CONFIRM] CONFIRMED]

- TP may request verification that data sent to partner program was received successfully or processing of transaction by partner was accomplished
- TP also has synchroniztion capabilities which allow program to update their resources(files) at specified instances and to "backout" these changes because of a failure at some point.

ERROR HANDLING: [SEND_ERROR]

- may inform partner program that your program detected an error of specific type

DEALLOCATE [DEALLOCATE]

- terminate the conversation and directs type of deallocation

DETACH FROM APPC [QUIT]

- must disconnect when through with conversation with partner program and all conversations deallocate

LU 6.2 IMPLEMENTATIONS

DISOSS

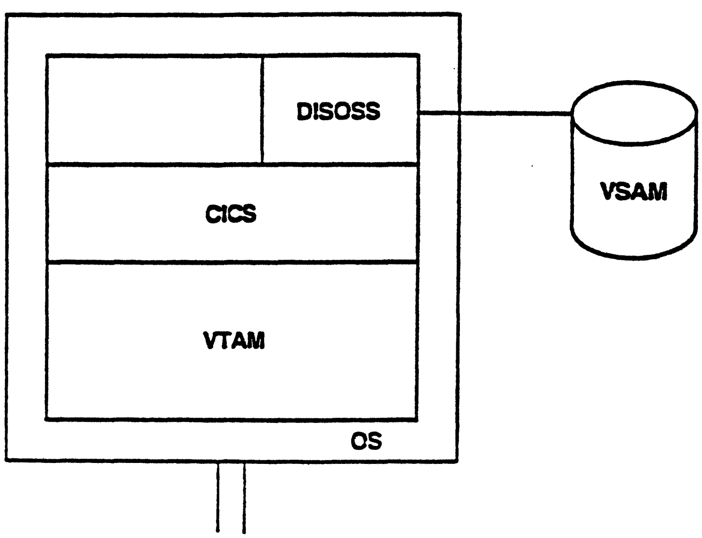
The first application level definitions for LU 6.2 are in the area of office automation. IBM has defined formats for word processing control characters and has also defined formats and methods for document and information distribution.

Distributed Office Support System (DISOSS) is the product residing in the Host that relies on CICS/VS for supporting all LU 6.2 office automation products.

Its goal is to offer a centralized infomation filing and retrieval system that allows management to distribute information throughout the network in a timely manner.

IBM defines a <u>document</u> as a report, a form letter, regulations, correspondence, customer records and image documents.

IBM has another system that is used primarily for office automation called the **Professional Office System(PROFS)**. PROFS runs under the control of VM operating system which does not support LU 6.2. However, DISOSS does communicate with PROFS, so users of LU 6.2 may make use of PROFS.



DIA SERVICES

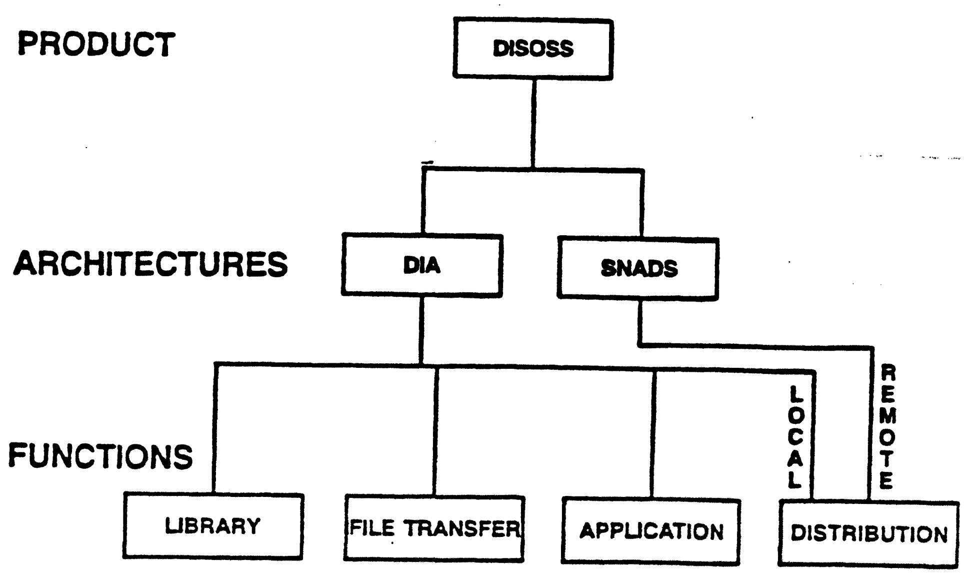
Library - a central library used for filing and retrieving of documents for later distribution. A document profile may be stored with each document identifying author, document name, subject, expiration date, keywords, etc. Documents can be deleted from the library or a search based on profile may be performed for a particular document.

Distribution - allows information from a workstation or from the library to be distributed to one or more recipients. Document may originate from source/recipient node or from the document library (OSN). Will maintain a status of incoming/outgoing distributions and permit operator to assign a priority for distribution.

DIA document distribution is not end-to-end, but synchronous between source/office nodes.

Application - an interface for user written programs to access DISOSS using CICS and provides method of modifying documents in the library.

File Transfer - allows transferring of documents between private libraries.



COMPONENTS OF DIA

DIA

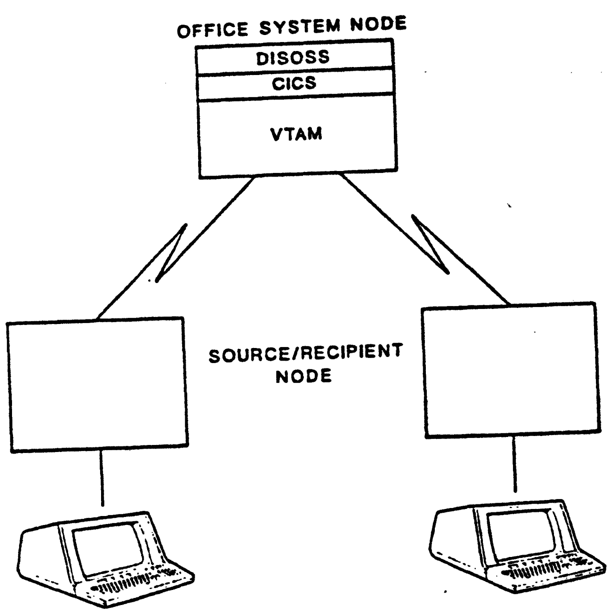
The **architecture** defined for document distribution within a single DISOSS host network is **Document Interchange Architecture (DIA).** DIA defines the control information needed for routing and storing documents from the source node to the office node.

Office System Node (OSN)

- o provides document distribution and library services to network users
- o able to distribute information to other Office System Nodes.

Source/Recipient Node (SRN)

- o User's interface to the office network
- o Acts on behalf of the user to request network services



DCA

The **architecture** defined for word processing is **Document Content Architecture (DCA).** DCA defines all control characters relating to such things as

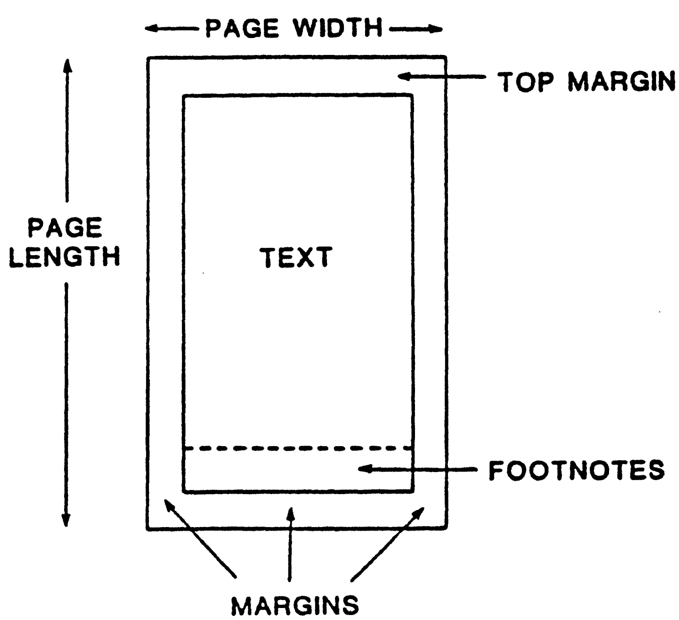
margin size	tabs
character size & set	punctuation formats
line spacing	number copies
dictionary	text color
centering	

DCA has two formats:

Revisable Form Text - document can be edited
- contains embedded control characters
- conveys intent of author

Final Form Text - document is only for display
- editing not possible

DCA control information will be a part of the RU.



SNADS

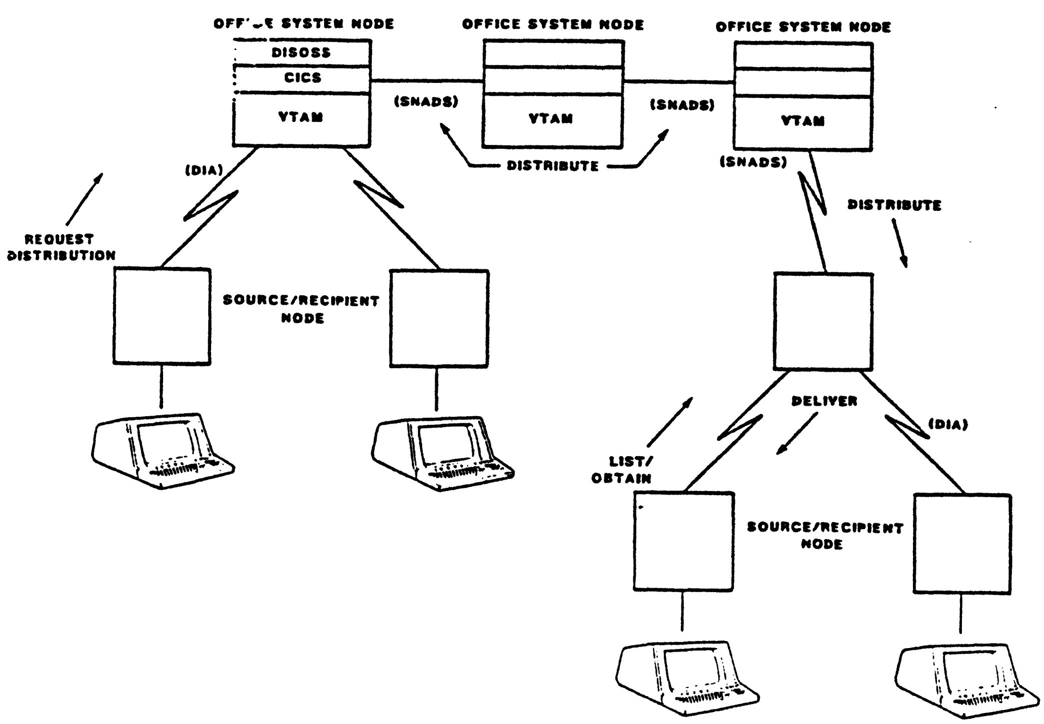
The **architecture** comprised of programs, queues, and data structures defined for distributing any type of information anywhere in a network, regardless of the number of hosts, is called **SNA Distribution Services (SNADS).** SNADS is a "store and forward" system that will route information anywhere in the network and hold that information until the receiver is ready to accept it or is available.

SNADS is a set of architected TPs that run under LU6.2.

Message unit is a DIU or Document Information Unit

SNADS is **asynchronous** in execution in that the recipient node does not need to be actively available at the time the document is transmitted.

Routing is determined through distribution tables located in each node. The "store and forward" feature is accompanied with indefinite delays, delayed responses, and shifting of communication responsibility. Delays may be determined on priority basis or time-of-day parameters.



REVIEW LESSON 11

Circle the correct for the questions below:

1. An architecture for distributing any type of information anywhere in a multi-host network in a "store and forward" method.

   a) APPC b) DCA
   c) SNADS d) PU-T2.1

2. A logical connection between transaction programs.

   a) session b) conversation
   c) connection d) establishment

3. An asynchronous method of transmitting documents in which the receipient node doesn't need to be active at the time the document is sent.

   a) APPC b) DISOSS
   c) synchronous d) asynchronous

4. An architecture for defining the output appearance of documents.

   a) DCA b) DIA
   c) SNADS d) SNA

5. A distributed processing type of program which processes a single transaction at a time.

   a) Application Subsystem b) Network Control Program
   c) Transaction Program d) LU Network Services

6. An enhanced SNA protocol which offers a common protocol among different types of products ("any-to-any").

   a) APPC b) SNADS
   c) Protocol Converter d) Protocol Analyzer

7. A peripheral node with software configured capable of supporting peer-to-peer connections with similiar processors.

   a) PU-T2.0 b) PU-T1
   c) PU-T5 d) PU-T2.1

8. IBM's application offering for customers requiring word processing and office automation.

   a) DISOSS b) APPC
   c) DCA d) DIA

Circle the correct True/False answer to the questions below:

9. T F The direct user of the LU6.2 is the transaction program.

10. T F The direct user of the transaction program is the end-user.

11. T F SNADs is an architecture that is synchronous in its execution.

12. T F DIA provides file transfer, application, distribution and library services for those persons having access to it.

LESSON 12: NETWORK MANAGEMENT

PURPOSE

This lesson provides detailed information on the concepts of Communications Network Management (CNM) in an SNA network. The major products available today are also identified.

OBJECTIVES

After completing this lesson, the student will be able to:

- o Define the term Communication Network Management
- o Recognize and define the following CNM acronyms: CNMA, CNMI, CNMS
- o Identify the sessions utilitized for CNM

REFERENCES

- o IBM SNA Formats and Protocols Manual: Architectural Logic, IBM SC30-3112
- o Network Communications Control Facility: General Information Manual, IBM GC27-0429
- o Network Problem Determination Application General Information Manual, IBM GC34-2010
- o Network Logical Data Manager: General Information Manual, IBM GC30-3081
- o Threshold Analysis and Remote Access: General Information Manual, IBM GC34-2055
- o Network Performance Analyzer: General Information Manual (A/N), IBM GB21-2478
- o Link Problem Determination Application: General Information Manual, IBM G320-5914
- o T.P. Sullivan, "Communications Network Management Enhancements For SNA Networks", IBM SYSTEM JOURNAL, Vol 22, Nos 1/2, 1983.

WHY, COMMUNICATIONS NETWORK MANAGEMENT?

The hierarchical growth and diversification of communication networks imposed new requirements on **Communications Network Management** products.

Networks are becoming:

- Increasingly complex.
- Terminals and processors are located in different locations.
- Networks are composed of multi-vendor equipment.
- Operations are often unattended.
- Computer operations and education knowledge varies.
- The data processing functions distributed a geographical area.

Users require assistance in monitoring and controlling the network in order to determine:

- If the system is operating properly.
- If the system is sufficiently responsive.
- If there are any developing problems.
- What kind of problems are occurring?
- Where are the problems?

WHAT IS COMMUNICATION NETWORK MANAGEMENT (CNM)??

CNM is:

The task of keeping a network running efficiently and responsively once it has been designed and implemented.

CNM is a set of tools, techniques, applications, and network functions that assist the customer in planning, operating, maintaining and controlling the network.

CNM DATA

SNAdefines specific requests/responses RUs for the exchange of maintenance services. The types of data that can be collected and analyzed are:

- o Requesting/returning storage dumps
- o Initiating/terminating tests
- o Returning status and test results
- o Reporting data on:
  - SDLC tests
  - Engineering change levels
  - Diagnostic modem results
  - Directly attached resources

THE RELATIONSHIP BETWEEN CNMAs and CNMSs

CNMA

A Communication Network Management Application (CNMA) provides services for several Physical Units (PUs)

CNMAs request, record, manage, and analyze Network Service (NS) information.

The CNMA Logical Unit (application LU) is designated as a network management LU to the access method (VTAM).

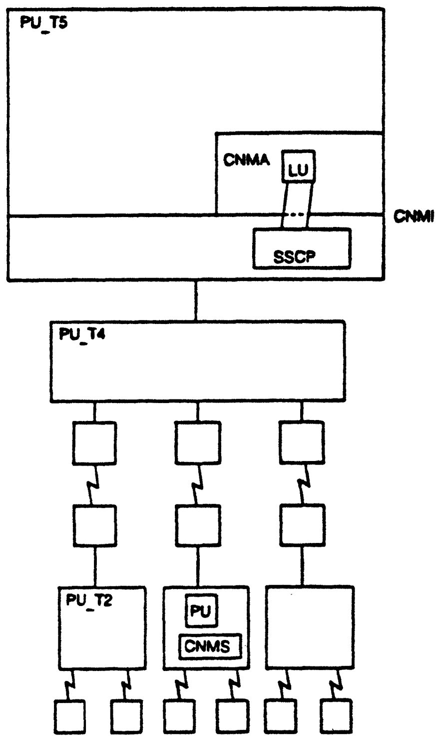
CNMS

The Communication Network Management Services (CNMS), on the other hand is distributed throughout the network.

It monitors, collects, and stores Network Service (NS) information in the PU for the node. The PU sends this information to the CNMA whenever this information is requested.

There may occur crucial events when the PU will send the information to the CNMA before it has been requested. The most common is when an event has taken place that the CNMA must be notified immediately. This is known as ALERT data.

CNMA - SSCP COMMUNICATION



The interface between SSCP and CNMA is the **Communications Network Management Interface (CNMI)**, which is only used for Communications Network Managment.

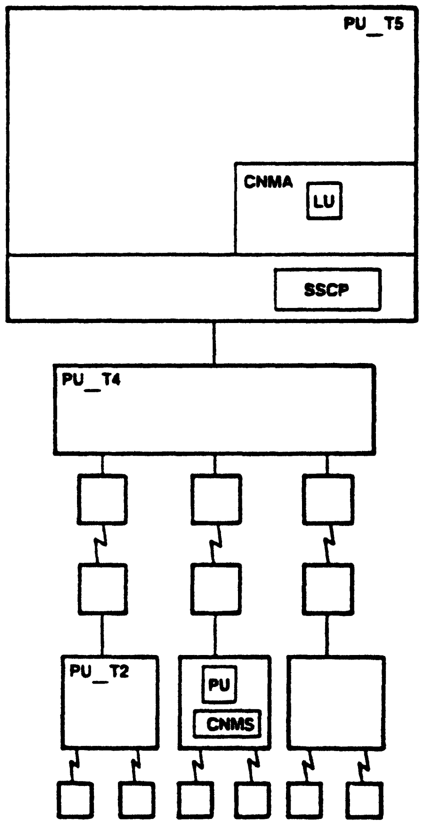
This interface is similar to the API.

CNMI uses the commands **FORWARD**and **DELIVER.** These are the only RUs that are currently authorized to use this interface.

The CNMA communicates with the SSCP by establishing an SSCP-LU session.

- o **FORWARD** - (LU --> SSCP) - command from CNM application to SSCP and contains the network address of the CNMS node and target address if destined for a peripheral node.
- o **DELIVER** - (SSCP --> LU) - command from SSCP to the CNM application with the network services information that was originally requested.

CNM IN THE NETWORK



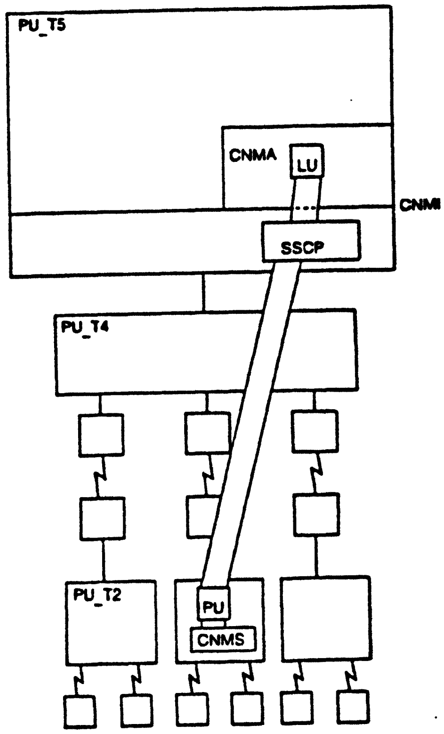
Communication Network Management consists of two components:

- **CNMA** - applications (one set per domain) that reside in the host which provide network management and network operators interface.

  Examples: NCCF, NPDA, TARA, NLDM

- **CNMS** - services that are distributed throughout the network, typically one set per PU that reside in remote nodes.

SSCP - CNMS COMMUNICATION



The SSCP communicates with the CNMS via the SSCP-PU session. Two commands are used:

- o **REQMS** - Request Maintenance Statistics
- o **RECFMS** - Record Formatted Maintenance Statistics

These two RUs have several different formats (or types). Each type carries a specific kind of information.

In this example, if the CNMA sends a REQMS Type 1, the CNMS responds with a RECFMS Type 1, and the same holds true for all of the other types of REQMS/RECFMS communication.

The CNMS has one extra type of RECFMS that is used to pass unsolicited information to the host. Sending unsolicited information to the host is called an ALERT.

CNM Maintenace Codes

A further description of these two commands and their types follows:

- **REQMS - Request Maintenance Statistics:**

  Type 1 SDLC Test Requests
  Type 2 Summary Error Data Requests
  Type 3 Communication Adapter Error Statistics
  Type 4 PU/LU Dependent Data
  Type 5 Engineering Change Levels
  Type 6 Link Connection Subsystem Data

- **RECFMS - Record Formatted Maintenance Statistics:**

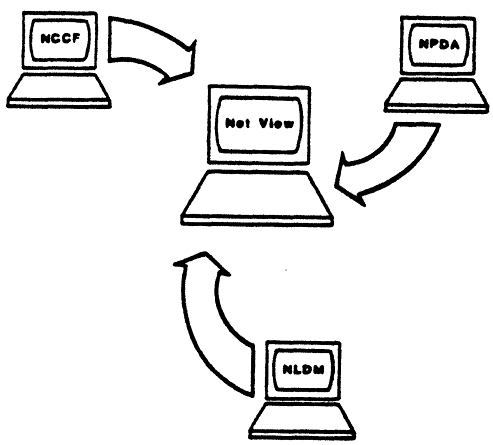
  Type 0 Alert Data - to notify CNMA of an event that affects the PU/LUs inability to perform its intended function which may require intervention and/or action. May also include what caused the alert.

  Type 1 SDLC Test Responses
  Type 2 Summary Error Data
  Type 3 Communication Adapter Error Statistics from peripheral PU

  Type 4 PU/LU Dependent Data - user written

  Type 5 Engineering Change Levels
  Type 6 Link Connection Subsystem Data

NETVIEW



In 1986 IBM released **NetView**, a family of software products offering a network management solution. It combines the key components of five previously developed program products that may be performed at a single network operator terminal.

The operator may focus attention on:

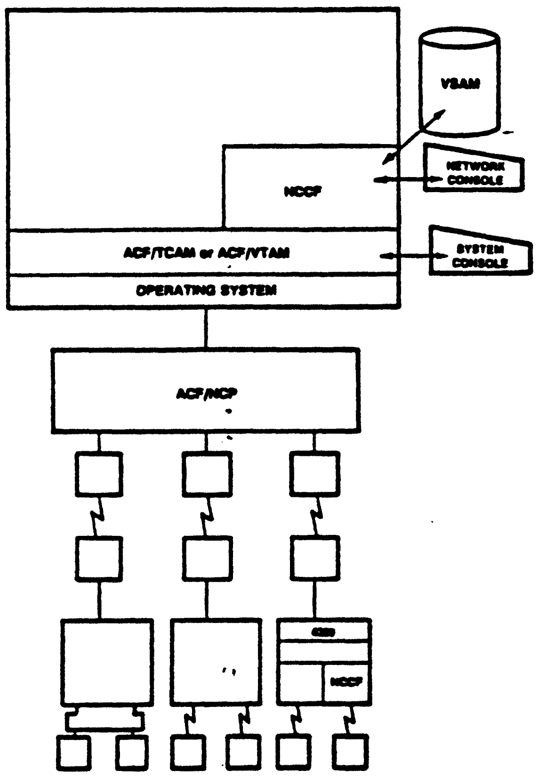
- o operations management - the ability to run the network on a real-time basis
- o problem management - the ability to detect, access, record, and correct system problems.
- o performance management - the ability to observe the utilization of the system's resources with suggestions on how to improve response time and other service activities.

The previous programs combined to form **Netview** are:

- o **NCCF - Network Communications Control Facility**
- o **NLDM - Network Logical Data Manager**
- o **NPDA - Network Problem Determination Application**

NCCF

o Network Communications Control Facility



NCCF is a program product (application subsystem) designed to work with VTAM/TCAM to simplify the task of managing a network.

NCCF's purpose is:

To give network operators control of the network by allowing an operator to enter VTAM commands and to provide a base for other CNM Applications.

Without NCCF, VTAM commands and messages would be handled by the local systems console attached to the host and would restrict management if network involved multiple host and/or not in the same city.

To facilitate good network management control, NCCF will support many terminals comprising **network operator terminals.**

NCCF Control Functions

With NCCF being the foundation for many other network management applications, various optional control functions were made available to the user for individual **customization**:

- **Command List** (CLISTS) - a group of commands and special instructions which are labeled with a unique name. To execute the list, the operator enters that name. CLISTs increase productivity of the operator, decrease required indepth knowledge on the part of the operator, can automate responses to standard messages, and can be nested to that one CLIST may cause another CLIST to execute.

  For example, an operator wishing to perform a start-of-day activation for multiple LUs would need to type in"

  v net,act,id=cas2l02
  v net,act,id=cas2l03
  v net,act,id=cas2l04
  v net,act,id=cas2l05
  v net,act,id=cas2l06

  A CLIST would perform these steps with only a single command being entered by the operator.

- **User Exits** - within the source code of NCCF, exit locations have been allocated to the user for customization. These exits allow a user to edit data flowing to or from NCCF.

  The exit routine is designed for a specific event. When the event occurs, NCCF passes control to the appropriate exit routine for processing, then returns control to NCCF. Exit routines must be written in assembler language, assembled, and link-edited.

- **Command Processors** - users may customize and enhance NCCF for conditions that are not currently handled by NCCF. These processors are invoked by an user-created command previously defined to NCCF and link-edited.

- **Cross-Domain** - operator(s) in one domain may communicate with NCCF in another domain.
- **Span of Control** - operator(s) may be limited to access of only a portion of the network's resources.
- **Scope** - the ability to restrict commands or operands for a particular operator or for a group of operators when using NCCF.
- **Security** - a data security checking feature that requires an operator to enter an identification, a password, and a profile number in order to access NCCF.
- **Hardcopy Log** - maintains a log of network activity and allows a printout.

```
NN     NN                           VV          VV
NNN    NN   EEEEEE  TTTTTTTT  VV          VV   II   EEEEEE  WW          WW
NNNN   NN   EE         TT      VV        VV    II   EE      WW    W     WW
NN NN  NN   EEEE       TT       VV      VV     II   EEEE     WW  WWW   WW
NN  NNNN    EE         TT        VV VV         II   EE        WWWW WWWW
NN   NNN    EEEEEE     TT         VVV          II   EEEEEE     WW   WW
NN     NN                          V

                              DOMAIN = NCCF2

       OPERATOR ID ==>                 (OR LOGOFF)
          PASSWORD ==>
           PROFILE ==>                 (PROFILE NAME, BLANK=DEFAULT)
      HARDCOPY LOG ==>                 (DEVICE NAME, BLANK=DEFAULT, OR NO)
RUN INITIAL COMMAND ==>                (YES OR NO, DEFAULT=YES)

     ENTER LOGON INFORMATION
```

The fields of the NETVIEW logon screen have the following functions:

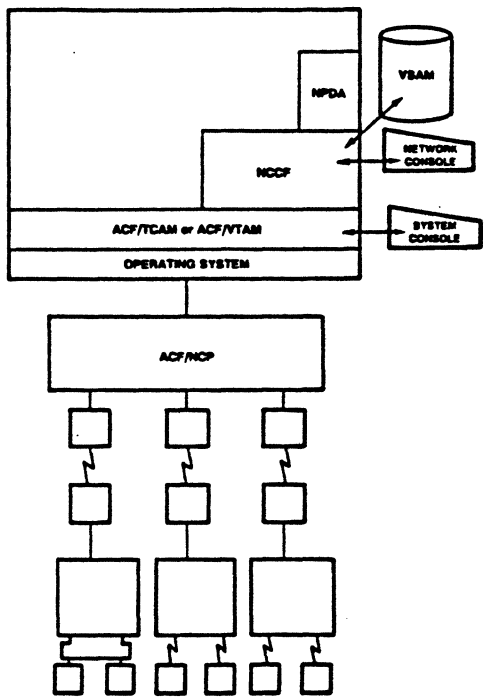
- o **Operator ID** - establishes profiles available to the operator
- o **Password** - prevents unauthorized logons
- o **Profile** - allows the operator to select the profile that will be used
- o **Hardcopy** - allows the operator to select the device that the hardcopy will go to
- o **Execute Initial Command** - the profile that is selected determines the initial command that will be executed. This field permits the operator to specify 'no' and override the profile.

```
 NETWORK COMMUNICATIONS CONTROL FACILITY   NCCF2 AJ40      02/03/88 12:27:05
 * NCCF2     DD CASP7,ME
   NCCF2     IST039I  DISPLAY  FAILED- UNIDENTIFIABLE KEYWORD
 C NCCF2     DISPLAY NET,ID=CASP7,ME
 * NCCF2     DD CASP7,E
 C NCCF2     DISPLAY NET,ID=CASP7,E
   NCCF2     IST097I  DISPLAY  ACCEPTED
 ' NCCF2
IST075I  VTAM DISPLAY - NODE TYPE= PHYSICAL UNIT
IST486I  NAME= CASP7    ,STATUS= ACTIV            ,DESIRED STATE= ACTIV
IST081I  LINE NAME= L122      , LINE GROUP= GRSDMIX1 , MAJNOD= C28711H
IST136I  SWITCHED SNA MAJOR NODE = SWNDCASE
IST654I  I/O TRACE= OFF ,BUFFER TRACE= OFF
IST752I  GPT TRACE STATUS = TRRES
IST355I  LOGICAL UNITS:
IST080I  CAS7L01  ACT/S      CAS7L02  ACT/S      CAS7L03  ACTIV
IST080I  CAS7L04  ACTIV      CAS7L05  ACTIV      CAS7L06  ACTIV
IST080I  CAS7L07  ACTIV
IST314I  END
 ----------------------------------------------------------------------------

 ???
```

NPDA

o Network Problem Determination Application



NPDA is a program product tht runs under the control of NCCFin a host processor and supports both SNA and BSC 3270 terminals. It was developed to permit a network operator to ppinpoint the cause of a network problem, such as a failed node.

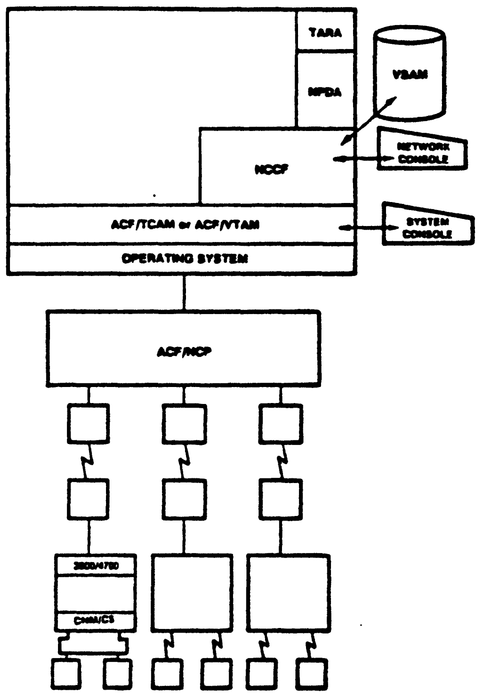
NPDA will:

- o assist in predicting a situation that is about to occur based on preset threshold values and alert the operator.
- o detect deteriorating line/response conditons for the remote nodes.
- o collect data generated by various hardware and software components (remote/local resources).
- o interpret error records and recommend possible solutions.
- o pass gathered statistics to NPDA for storage

Through menus, the operator may display this recorded information and identify the problem site(s).

TARA

o Threshold Analysis and Remote Access Feature



TARA is also a program product under the control of NCCF which provides problem determination support for the IBM 3600/4700 Financial Communications System.

TARA provides alert messages to the NCCF operator(s) when outages occur in the 3600 loop, when loop quality becomes degraded, when transaction response becomes degraded, and when a user application in the controller detects an error.

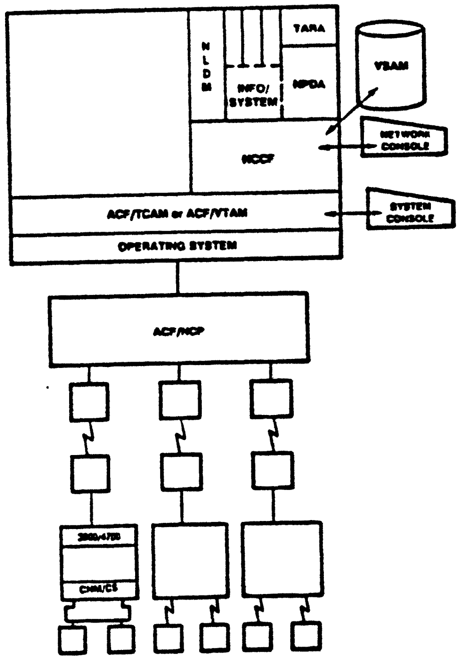
TARA is unique in that it monitors the activity of the terminals rather than network elements. This is necessary because ATMs in the 3600/4700 family are typically unattended.

TARA provides for centralized operator control of 3600/4700 systems and allows multiple systems to be controlled from a central site.

TARA allows an operator at the central site to communicate with the 3600 System Monitor and to solicit message logs/statistics as if the operator were at a directly attached terminal.

NLDM

o Network Logical Data Manager



NLDM is a program product under control of NCCF which collects data from the access method and NCP, correlates this data concerning the various sessions and routes and provides the user with online access to the collected data. Its primary purpose is to determine why an LU failed.

Data is displayed to the operator in the form of:

- o **Session Awareness -**
  - session history - history of all sessions for the node
  - session activation - parameters used for each session (BIND,ACTPU,ACTLU,etc)
  - provides list of all NAUs in session
- o **Session Trace Information -**
  - maintains log of PIUs for selected LUs
- o **Session Configuration -**
  - displays up to 4 nodes with their network names for a given session

```
_DM.LIST                                                                PAGE    1
                              RESOURCE NAME LIST
IST TYPE: ACTIVE   SLU                                               DOMAIN: NCCF2
----------------------------------------------------------------------------------
SEL#    NAME      STATUS     SEL#    NAME      STATUS      SEL#    NAME      STATUS
( 1)  BR043D00    ACTIVE     (16)  H263        ACTIVE      (31)  L0ABT12    ACTIVE
( 2)  CAS2L01     ACTIVE     (17)  H264        ACTIVE      (32)  L0ABT13    ACTIVE
( 3)  CAS5L01     ACTIVE     (18)  H266        ACTIVE      (33)  L0ABT19    ACTIVE
( 4)  CAS6L01     ACTIVE     (19)  H267        ACTIVE      (34)  L0ACT01    ACTIVE
( 5)  CAS6L03     ACTIVE     (20)  H268        ACTIVE      (35)  L0ACT14    ACTIVE
( 6)  CAS7L01     ACTIVE     (21)  H271        ACTIVE      (36)  L0A3T01    ACTIVE
( 7)  CSD6L01     ACTIVE     (22)  H272        ACTIVE      (37)  L0A5T11    ACTIVE
( 8)  CSD6L02     ACTIVE     (23)  H277        ACTIVE      (38)  L0A5T12    ACTIVE
( 9)  CSD6L03     ACTIVE     (24)  H278        ACTIVE      (39)  L0A5T13    ACTIVE
(10)  CTNDCCB     ACTIVE     (25)  IM1L010F    ACTIVE      (40)  L0A7T02    ACTIVE
(11)  DVMK3021    ACTIVE     (26)  ISTPDCLU    ACTIVE      (41)  L0A7T07    ACTIVE
(12)  G03D3605    ACTIVE     (27)  L0ABT02     ACTIVE      (42)  L0A7T10    ACTIVE
(13)  H26E        ACTIVE     (28)  L0ABT04     ACTIVE      (43)  L0A7T11    ACTIVE
(14)  H26F        ACTIVE     (29)  L0ABT05     ACTIVE      (44)  L0A7T13    ACTIVE
(15)  H262        ACTIVE     (30)  L0ABT10     ACTIVE      (45)  L0A7T14    ACTIVE

TER TO VIEW MORE DATA
TER SEL# (SESS LIST), SEL# RTS (RESP TIME SUM) OR SEL# RTT (RESP TIME TREND)
D==>
```

```
NLDM.SESS                                                            PAGE    1
                               SESSION LIST
NAME: CAS6L03                                                  DOMAIN: NCCF2
------------------------------------------------------------------------------
      ***** PRIMARY *****  **** SECONDARY ****
 SEL#   NAME    TYPE  DOM    NAME    TYPE  DOM      START TIME        END TIME
 ( 1) A06CICS  LU    NCCF2  CAS6L03  LU    NCCF2  11/09 09:36:53  *** ACTIVE ***
 ( 2) VTAM1    SSCP  NCCF2  CAS6L03  LU    NCCF2  11/09 07:34:12  *** ACTIVE ***
 ( 3) NCCF2004 LU    NCCF2  CAS6L03  LU    NCCF2  11/09 09:34:50  11/09 09:34:59
 ( 4) NCCF2    LU    NCCF2  CAS6L03  LU    NCCF2  11/09 09:34:43  11/09 09:34:48
 ( 5) A06CICS  LU    NCCF2  CAS6L03  LU    NCCF2  11/09 09:31:56  11/09 09:34:14


END OF DATA
ENTER SEL# (CONFIG), SEL# AND CT (CONN. TEST), SEL# AND STR (TERM REASON)
CMD==>
```

```
M.CON                    SESSION CONFIGURATION DATA                      PAGE   1
----------- PRIMARY ---------------+--------------- SECONDARY --------------
E A06CICS   SA 00000001  EL 0006    !    NAME CAS6L03    SA 0000000A   EL 06BC
-----------------------------------+----------------------------------------
AIN NCCF2                                                   DOMAIN NCCF2
            +--------------+                +--------------+
PUS  (0000) ! SUBAREA PU   ! ----   VR 00 ----  ! SUBAREA PU   ! CPS8060 (0000)
            +------+-------+        TP 00   +------+-------+
                   !                               !
            +------+-------+        ER 00   +------+-------+
CICS (0006) !      LU      !       RER 00   !    LINK      ! L120
            +--------------+                +------+-------+
                                                   !
                              COSNAME       +------+-------+
                              LOGMODE RM3278 !     PU       ! CASP6   (02C9)
                                            +------+-------+
                                                   !
                                            +------+-------+
                                            !      LU      ! CAS6L03 (06BC)
                                            +--------------+

ECT PT, ST (PRI, SEC TRACE), RT (RESP TIME), P, ER, VR
==>
```

```
NLDM.SPRM.BIND                    SESSION PARAMETERS                          PAGE   1
----------- PRIMARY --------------+---------- SECONDARY --------------+- DOM -
NAME A06CICS  SA 00000001 EL 0006 ! NAME CAS6L03  SA 0000000A EL 06BC ! NCCF2
----------------------------------+-----------------------------------+-------
RU BIND    TYPE REQ           NEGOTIABLE NO   TS PROFILE  3  FM PROFILE  3
FID 4
------------ FM USAGE/PLU ------------+------------ FM USAGE/SLU -------------
MULTIPLE RU CHAINS ALLOWED            ! MULTIPLE RU CHAINS ALLOWED
REQUEST CONTROL MODE IS IMMEDIATE     ! REQUEST CONTROL MODE IS IMMEDIATE
PRI ASKS FOR DEF OR EXCEPT RESP       ! SEC ASKS FOR DEF OR EXCEPT RESP
2-PHASE COMMIT N/A                    ! 2-PHASE COMMIT N/A
COMPRESSION WILL NOT BE USED          ! COMPRESSION WILL NOT BE USED
PRIMARY MAY SEND EB                   ! SECONDARY WILL NOT SEND EB
--------------------------------------+---------------------------------------
FM HEADERS ARE NOT ALLOWED              CONTENTION WINNER IS THE SECONDARY
BRACKETS ARE USED - RESET STATE=BETB    HDX-FF RESET STATE: N/A
BRACKET TERMINATION RULE 1 USED         SEC-PRI PACING 1 STAGE, SEND COUNT  0
ALTERNATE CODE SET WILL NOT BE USED             RECEIVE COUNT  0 MAXRU    256
SEQ NUMBERS N/A            BIS N/A      PRI-SEC PACING 2 STAGE, SEND COUNT  2
SEND/RECEIVE MODE IS HALF-DUPLEX FLIP           RECEIVE COUNT  1 MAXRU    256
RECOVERY RESP IS CONTENTION LOSER       LU TYPE: 2
ENTER TO VIEW MORE DATA
ENTER 'R' TO RETURN TO PREVIOUS DISPLAY - OR COMMAND
CMD==>
```

```
..PIUT                     SESSION TRACE DATA                              PAGE    1
-------- PRIMARY ---------------+----------- SECONDARY ---------------+- DOM -
: A06CICS  SA 00000001 EL 0006 ! NAME CAS6L03  SA 0000000A EL 06BC ! NCCF2
-------------------------------+-------------------------------------+-------
|   TIME    SEQ# DIR   TYPE    ******** REQ/RESP HEADER ******** RULEN SENS N
  09:38:58 0004 P-S DATA      ....LC.ER.........................  213       T
  09:39:00 0000 S-P (+)RSP    ....OC.NR...PAC...................    0
  09:48:24 0001 S-P DATA      ....OC.ER.......BB...CD...........    1
  09:48:25 0005 P-S DATA      ....OC.ER...PAC...EB..............    2
  09:48:26 0000 S-P (+)RSP    ....OC.NR...PAC...................    0
  09:48:41 0002 S-P DATA      ....OC.ER.......BB...CD...........    7
  09:48:44 0006 P-S DATA      ....FC.ER.........................  256       T
  09:48:44 0007 P-S DATA      ....LC.ER...PAC...................  196       T
  09:48:45 0008 P-S DATA      ....OC.ER............CD...........    0
  09:48:46 0000 S-P (+)RSP    ....OC.NR...PAC...................    0



OF DATA
R SEL# OR COMMAND
=>
```

```
M.PIUT.HEX                 SESSION TRACE DATA                              PAGE    1
-------- PRIMARY ---------------+----------- SECONDARY ---------------+- DOM -
E A06CICS  SA 00000001 EL 0006 ! NAME CAS6L03  SA 0000000A EL 06BC ! NCCF2
-------------------------------+-------------------------------------+-------
# ************************ TH ************************ * RH * *** RU *** N
) 400000002000036D000000010000000A1D000006 06BC13350004 EB8000 31
) 400000002000 02CF0000000A00000011D0006BC00061336 0004 6B8000 A0
```

```
) 400000002000036D000000010000000A1D00000606BC13350004 EB8000 31
) 40000000200002CF0000000A00000011D0006BC000613360004 6B8000 A0
) 40000000200003A1000000010000000A1D00000606BC13360004 EB8000 A0
) 40000000200002E50000000A00000011C0006BC000600010004 4B8100 C8
) 40000000200003A9000000010000000A1C00000606BC00000003 830100
) 40000000200003B3000000010000000A1C00000606BC00010004 CB8000 C8
) 40000000200002FD0000000A00000011C0006BC000600020103 0290C0 F5C71DF05C T
) 40000000200002FE0000000A00000011C0006BC000600030103 009100 E54040E5E5 T
) 40000000200002FF0000000A00000011C0006BC0006000400D8 019000 40C9C9C9C9 T
) 40000000200003D2000000010000000A1C00000606BC00000003 830100



501 HEX MODE IS SET TO 'ON'
R SEL# OR COMMAND
=>
```

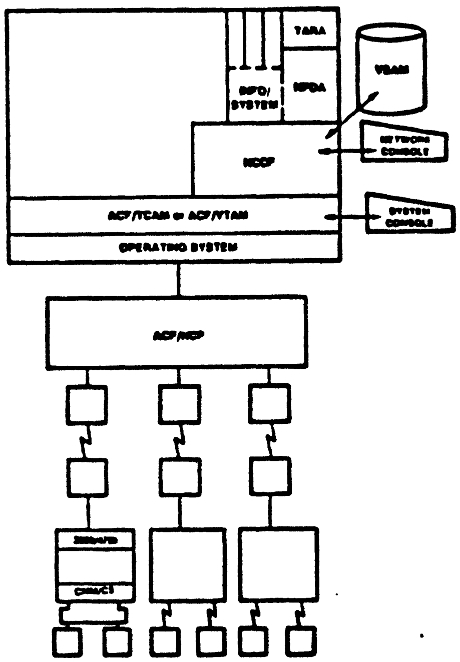
```
NLDM.DIST                                                         PAGE    1
                          DISPLAY TRACE REQUESTS
                                                             DOMAIN: NCCF2
------------------------------------------------------------------------------
        RESOURCE      NETID       TRACE       BY             AT
        GLOBAL                     OFF
        CAS5L03                    ON        AJ43        11/09 09:28:00
        CAS2L04                    ON        AJ43        11/09 09:28:42
        CAS6L03                    ON        AJ43        11/09 09:38:12




END OF DATA
ENTER 'R' TO RETURN TO PREVIOUS DISPLAY - OR COMMAND
CMD==>
```

Info/System

o Information/System



INFO/SYSTEM is a management tool and the method by which an organization is able to direct and control its departmental activities to meet its' objectives. It both simplifies and automates the processing of System Management data and the System Network Control Center.

o **Problem Control** - applications for recognizing, recording, tracking, resolving, and reporting of problems that have affected the resources and to implement corrective measures.

o **Change Management** - applications for planning, coordinating, tracking and implementing modifications to the network.

o **Configuration Management** - applications for recording, updating, and controlling the physical and logical configuration of all the network's resources.

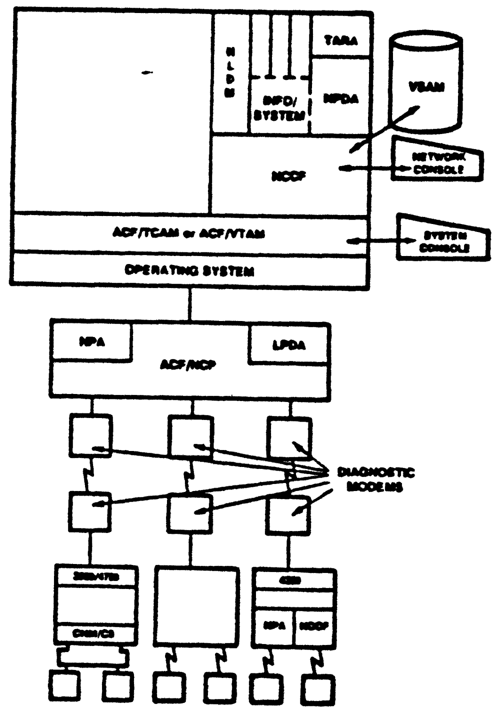
o **Performance Management** - applications for monitoring, tuning, and reporting the system's performance.

LPDA

o Link Problem Determination Application

Support for:

o IBM 386X Modems
o NCR Comten 716X Modems



LPDA provides Link Problem Determination Data by generating diagnostic test commands to these diagnostic modems:

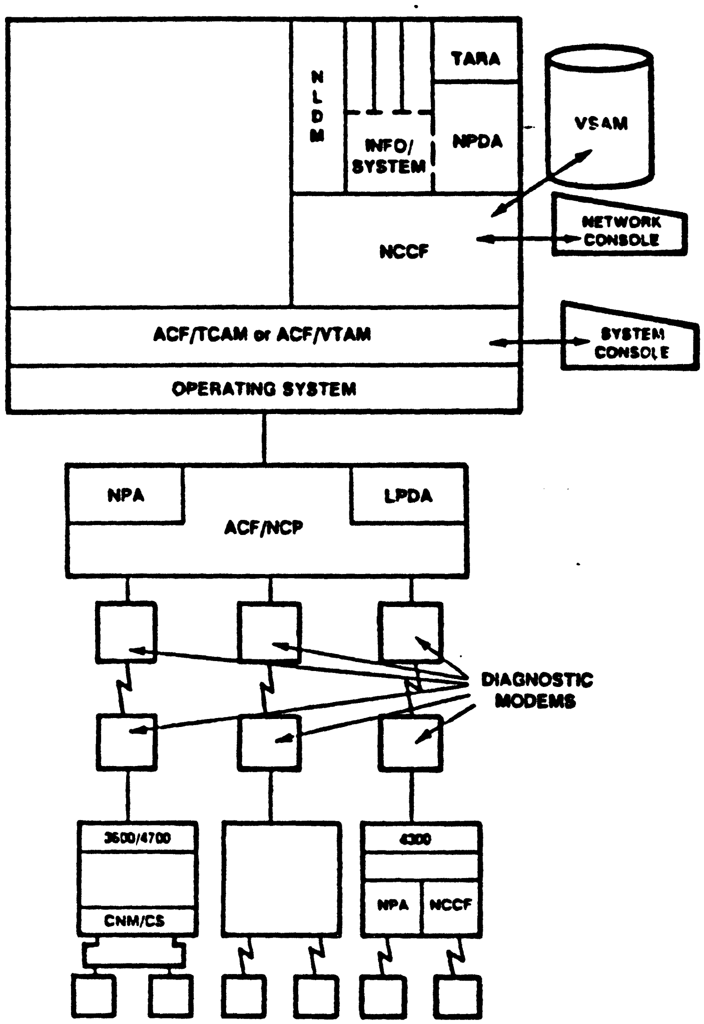
- o either dynamically, or
- o upon detection of some type of permanent link or link station error, or
- o when certain threshold values are exceeded, or
- o upon request from NPDA.

The data provided may consist of:

- Modem status
- Signal quality measurement
- Terminal interface status
- Detects failing data links and modems
- Works in conjunction with NPDA
- Tests may be done from central
- Alerts when thresholds reached
- Alerts LPDA of remote power failures, etc.

NPA/NPM

- Network Performance Analyzer/Network Performance Monitor



- Monitors communications controllers and line utilization
- Gathers statistics on NCP, line, message traffic
- Monitors data and alerts operator when high/low criteria exceeded
- Provides network capacity planning
- Gathers statistics using LU-LU sessions (rather than LU-SSCP-PU)

REVIEW LESSON 12

1. Provide a definition of Communication Network Management?

2. On what types of sessions is CNMS data transmitted?

   ______________ - ______________

   ______________ - ______________

3. Provide a short definition for the following terms.

   a. CNMA

   b. CNMS

   c. CNMI

4. What two commands are associated with CNMA-SSCP communications?

5. What two commands are associated with CNMS-SSCP communications?

LESSON 13: SYSTEM GENERATION OVERVIEW

PURPOSE

This lesson provides an overview of the various procedures used to generate network software.

OBJECTIVES

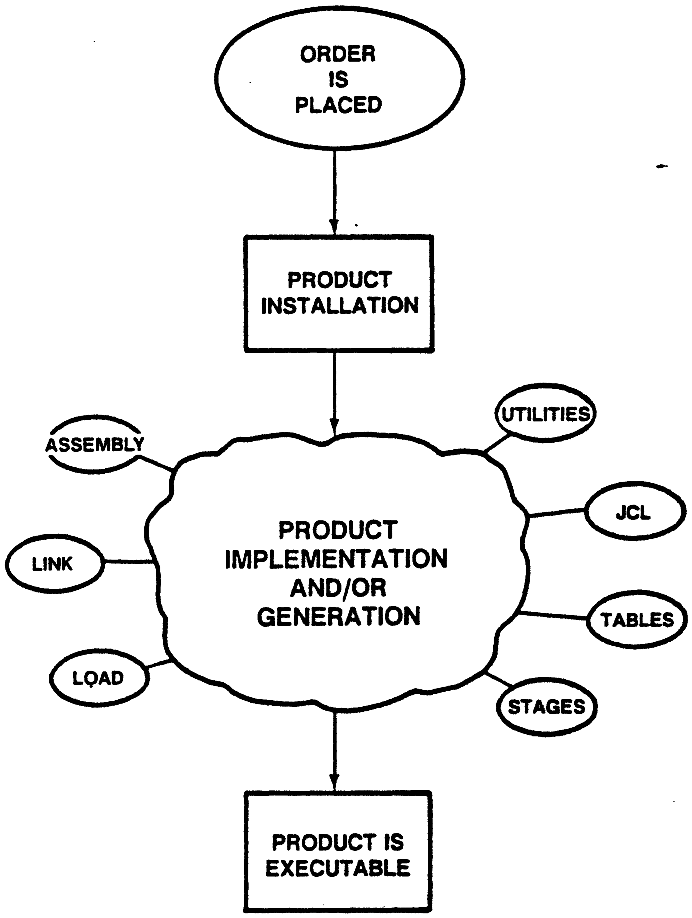
After completing this lesson, the student will be able to:

- o Describe the communications system generation process
- o Describe what is meant by "gen stage"

REFERENCES

Installation and Resource Definition: IBM SC27-0610-2

INTRODUCTION



This lesson explains what happens between the time that a customer orders an IBM software product and the time that the product is operational. Specifically, this lesson deals with the process of product implementation and generation in very general terms, and prepares the student for the more specific product generation lessons which follow.

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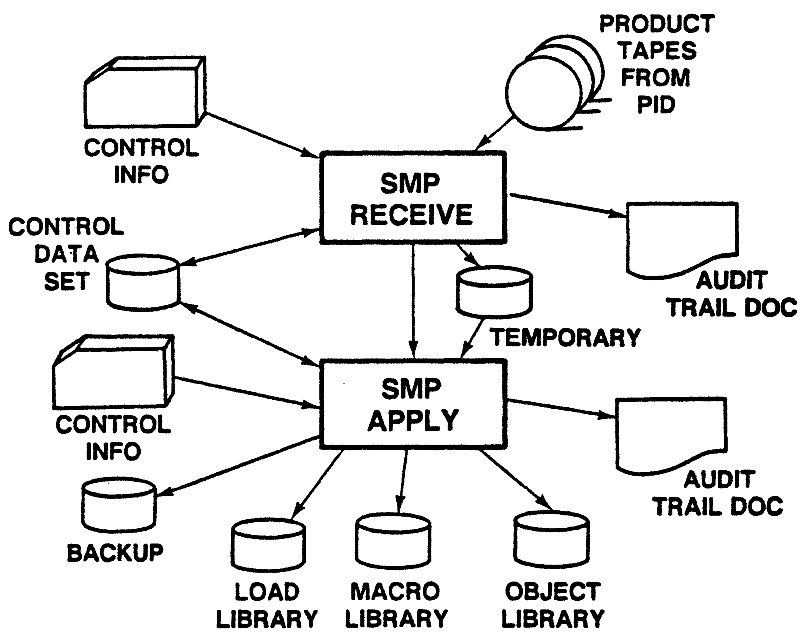
INSTALLATION

Before a software product can be generated for a user's unique requirements, it must be installed. This step involves taking the software off the distribution medium and transferring it to the system libraries.

In MVS or VS1 systems, the systems programmer uses **System Modification Program (SMP)** to install and subsequently maintain each product. SMP ensures there is a proper record of installation and updates and maintains a history of all related activity.



In a VSE system, the systems programmer may use the **Maintain System History Profile (MSHP)** procedure to install and maintain the product. MSHP performs much the same function as SMP.

GENERATION

It is at this point that the person responsible for installing the NCR product may be involved in the generation process.

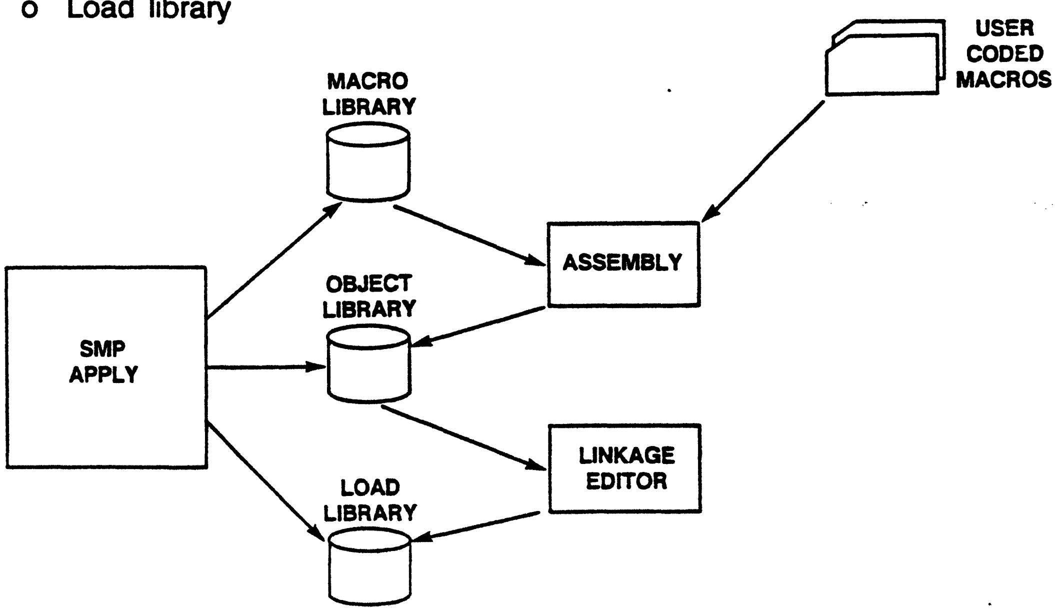
This overview of the generation (or gen) process is generally applicable to the products listed below. More detail is provided in subsequent lessons for some of these products.

- o VTAM/TCAM
- o NCP
- o CICS/IMS/TSO
- o NCCF
- o NPDA
- o NLDM
- o RES/POWER/JES2/JES3

The gen process is a batch process. Input is provided in card image format. The input consists of macros and parameters describing the macros that create a version of software that is tailored to the user's configuration.

The gen process involves three libraries that were created during the installation. They are:

- o Macro library
- o Object library
- o Load library



MACRO LIBRARIES

Macro libraries contain the **master set of macro statements** that will be used to define the software.

The systems programmer coded macro statements are processed (assembled) with the master macro statements (in the macro library) during the generation process.

The output of this assembly is put into the object library.

OBJECT LIBRARIES

Object libraries (known as relocatable libraries in DOS/VSE), contain **machine readable code.**

The object library is created during the installation process. It intially contains code that is machine readable at the installation time, but must still be combined **(link edited)** with other code before it is usable.

During the assembly process, the macro statements are converted to machine readable code and are placed in the object library also.

The object library is the input for the linkage editor.

LOAD LIBRARY

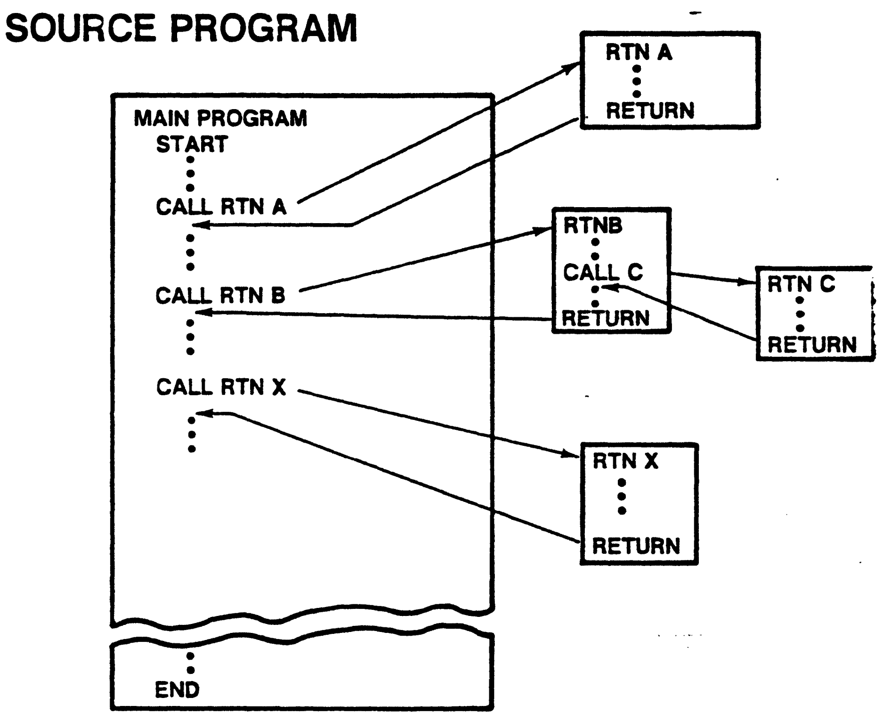
The load library is also initially created during the installation process.

Certain modules of code from the source tape are **machine readable** at installation time and do not need to be combined with other modules before they can be executed. These are placed immediately in the load library.

The load library also **contains the code** that **defines the user's network.** This code was created by the user defined macro state-ments being assembled and link edited.

LINKAGE EDITOR

The linkage editor reads object code produced by the assembler or another compiler and produces an executable module which it places in a load library. It also resolves any external references.

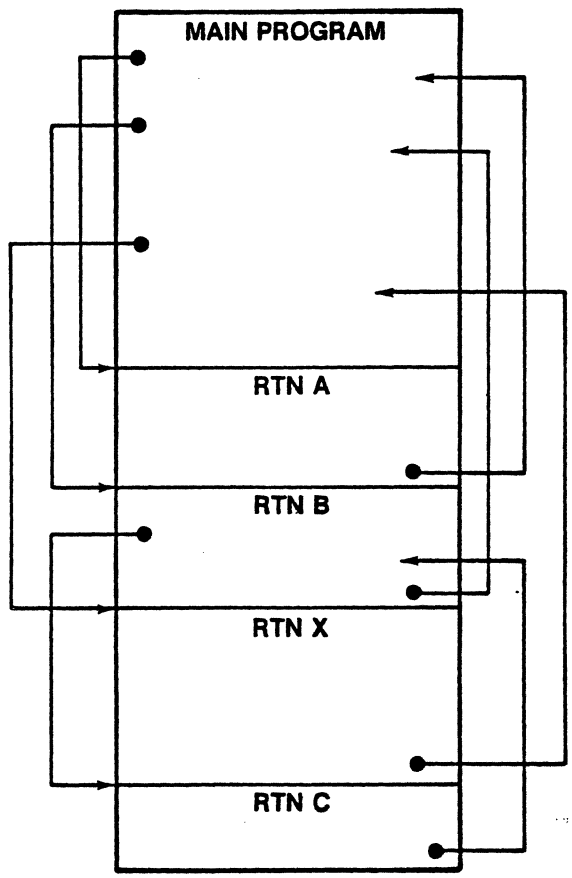


A source program consists of a main program which calls various modules to perform certain tasks. Each of these modules may return control to the main program or may in turn call yet another module.

The linkage editor resolves these external references (calls to modules) by creating pointers to specific addresses for the starting point of the called module.

LINKAGE EDITOR

OBJECT PROGRAM CODE



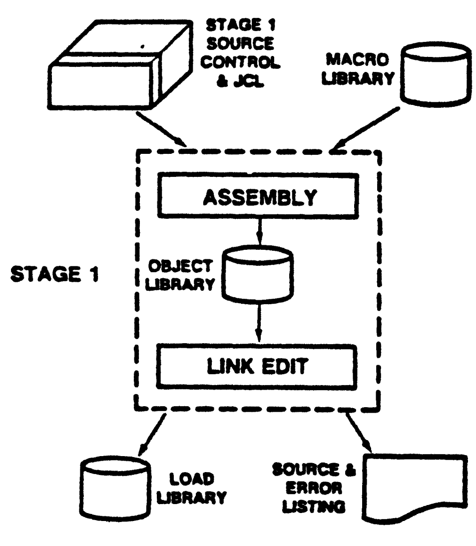
SINGLE-STAGE GEN

The simplest generation is usually composed of an Assembly step and a Link Edit step. This is referred to as a Single Stage Gen.

Products such as CICS and VTAM use many tables, which reflect the configuration of the system. These tables may be used to track active or inactive terminals, keep a record of active sessions within the network, and etc. The systems programmer must code, as input to the gen process, all the necessary table entries using the appropriate macros and parameters.

At one step in the gen process, these macros and parameters are compiled. This is known as Table Assembly.

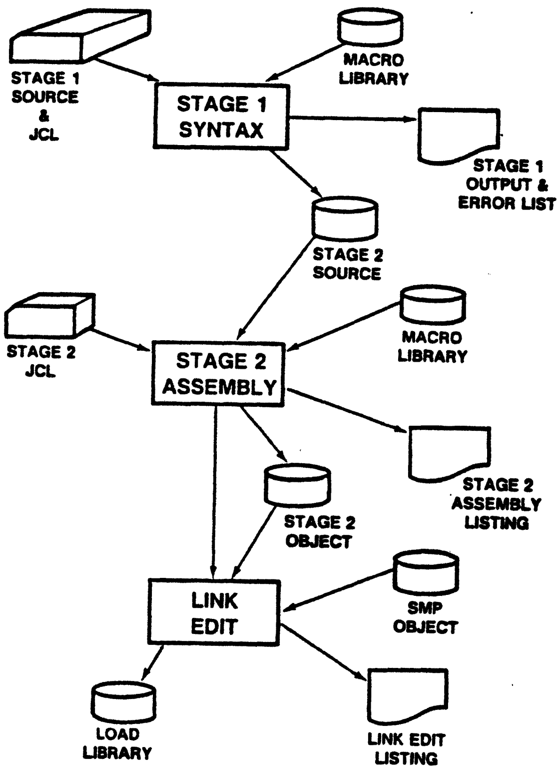
A single-stage gen usually involves only the Table Assembly and Link Edit steps. The gen typically takes less than a half-hour to execute, but the coding done prior to execution takes somewhat longer.



VTAM and CICS, once installed and generated, require that certain tables be modified often. These modifications reflect such changes as different user programs, terminals, network nodes, and passwords. The changes are made through single-stage gens.

TWO-STAGE GEN

Some products, such as NCP, require a more involved generation process. This process is referred to as a Two-Stage Gen.



Configuration parameters are coded for the first stage macros and then fed into the assembler. The purpose of this assembly is to check for syntax errors and basic parameter conflicts in coding. Errors must be corrected and the Stage 1 assembly rerun until the output is error free. Stage 2 will not run to completion if there are any errors in Stage 1.

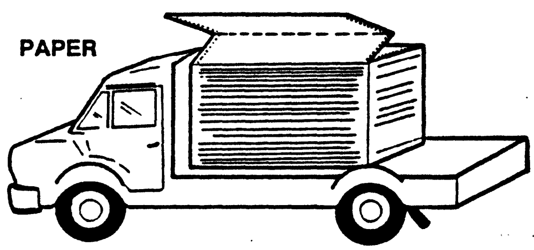
When Stage 1 runs error free, it produces another set of macro parameters. It places these macro parameters on a disk file to be used as input for the second stage.

Stage 2 is usually made up of two execution steps, an Assembly and a Link Edit. Stage 2 runs approximately an hour when the system is quiet. If the system is busy, it may take two or more hours to run to completion. For this reason, Stage 2 jobs are often run overnight.

The assembly (or assemblies) in Stage 2 produces at least one machine-code object module. This object module must have external references resolved by the linkage editor before it can be executed.

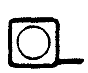
STAGE 2 OUTPUT LISTINGS

- PAPER

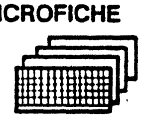


- MAGNETIC TAPE

- MICROGRAPHICS
  - MICROFILM



  - MICROFICHE



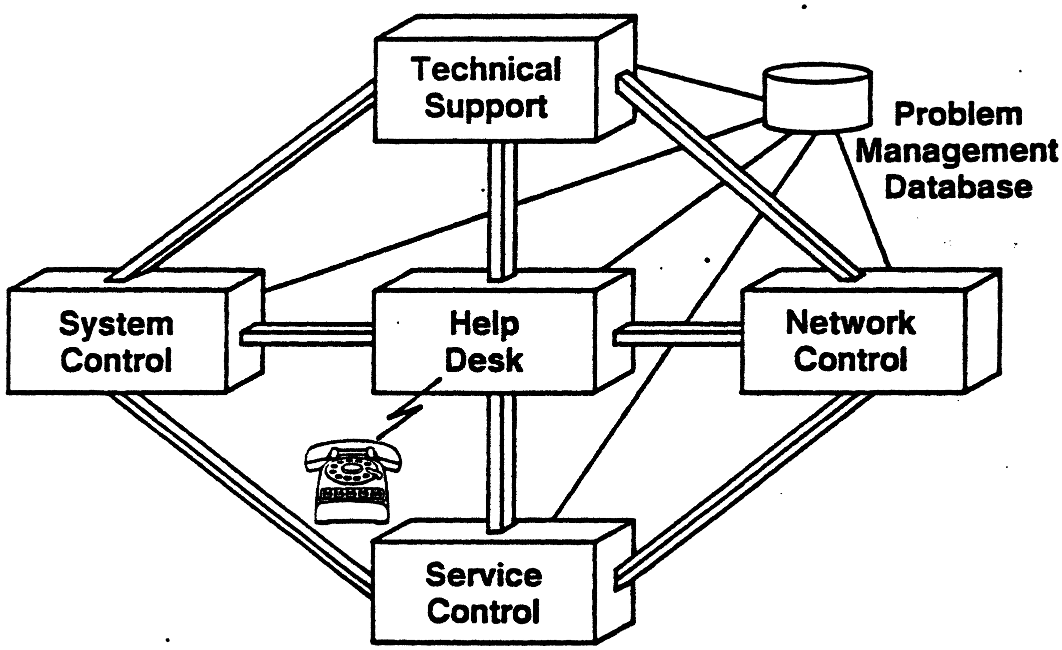
SYSTEM NETWORK CONTROL CENTER

The System Network Control Center (SNCC) is a host site organization with the objective of providing end user satisfaction through the following:

- System availability
- Consistent response time
- Timely problem resolutioon

The major functions performed by the SNCC are:

- User Help Desk
- System Control
- Network Control
- Technical Support
- Service Control



USER HELP DESK

The major function of the Help Desk is to provide efficient and timely resppoonse to the problems of the end user. It provides the user with a single point of contact within the host system environment when all local procedures and expertise have been exhausted at the remote site. The Help Desk compiles manaagement information about the problems and collects information for each call, such as received date and time, user name, call category and type, Help Desk personnel name, problem description and resolution.

NETWORK CONTROL

This group is responsible for the online communications system which involves initiaizing the network, the links, the controllers, and the terminals. This also includes the physical and logical connections to the application programs.

SYSTEM CONTROL

These responsibilities provide for the support of the system production process. This would include backup, recovery and bypass procedures.

TECHNICAL SUPPORT

Technical Support is responsible for providing problem determination assistance to the other groups. It has the tools and skills necessary to isolate and define the cause of system failures.

SERVICE CONTROL

This group provides management functions for all the other groups described. It does not provide one of the levels of support. It would be involved in service contracts with the user, reporting performances of the system, monitors the other levels of support and evaluates overall service to the user.

LEVELS OF SUPPORT

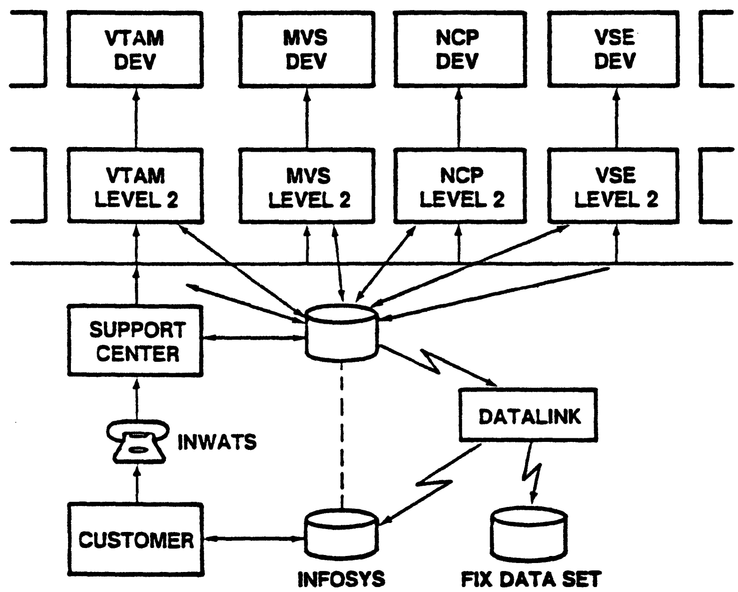
First Level - includes the job responsibilities and skills related to problems in procedures, applications or user terminal operaations.

Second Level - includes the job responsibilities and skills relating to problems of failing network and system components such as hardware, software and applications.

Third Level- includes the job responsibilities and skills related to problems which cross multiple technical specialties, or are of an intermittent nature and are not easily isolated.

MAINTENANCE

The operating system systems programmer is usually the person responsible for maintaining the product components.



When a problem occurs within an IBM product, the systems programmer consults the Information System database to see if that problem has been previously reported to the IBM Support Center.

To report a problem, the customer must contact the Support Center. If a similar problem is located on the Information System database, the Support Center ships the fix for that problem to the customer by mail, express, or datalink.

If no similar problem has been reported, the Support Center refers the customer to Support Level 2. If level 2 cannot identify the problem, they refer it to the Product Development team. By the time the Product Development team is involved, the customer has collected considerable information about the problem, and has probably sent dumps, traces, symptoms, and other information to the Level 2 location. This information is used to determine the problem and develop a Program Temporary Fix (PTF) for the customer.

LESSON 14: NCP GENERATION

PURPOSE

This lesson will provide the student with the information necessary to contribute to the generation of a Network Control Program for both an IBM and an NCR Comten controller, which will support an NCR SNA PU-T2 communications product.

OBJECTIVES

After completing this lesson, the student will be able to:

- List the information that must be provided to the NCP Systems Programmer in order to gen NCP to support NCR SNA products.
- Given a description of a PU_T2 product provide the GROUP, LINE, PU, and LU macros for the product on a dedicated line and on a switched line.

REFERENCES

- ACF/NCP/VS Installation, IBM SC30-3154
- ACF/VTAM Planning and Installation Reference, IBM SC27-0610

NCP INSTALLATION OVERVIEW

A systems programmer must have the following to properly define the network and all the devices attached to it:

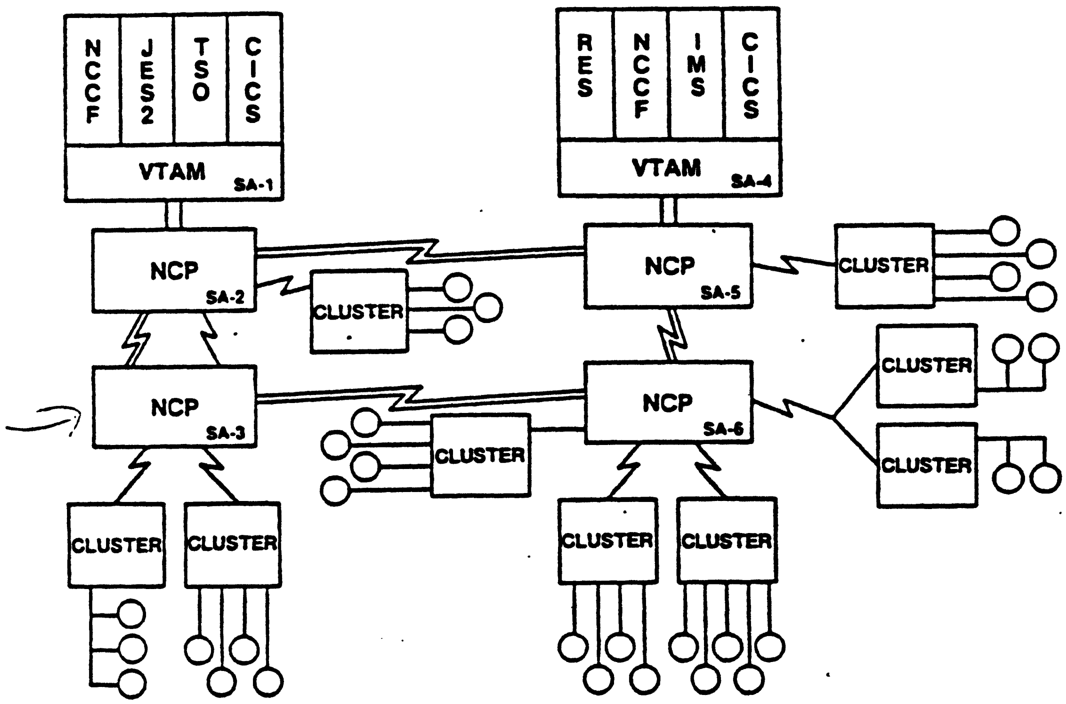
- o Network Configuration Information
- o Documentation for Library Installation and Reference Manuals
- o Libraries
- o VTAM Parameters
- o Device Features
- o NCP Parameters

This lesson will primarily be concerned with the device features and the NCP parameters which define them to the network.

NETWORK CONFIGURATION

The systems programmer who is responsible for the network keeps a copy of the network configuration for reference. Whenever the network changes, the configuration listing or drawing will be modified to reflect the change.

Below is a simple network example for which the NCP is to be generated.



The following information must be defined for each NCP:

- o All **Link Stations**
- o All **PUs** in each peripheral node
- o The **SDLC address** for each peripheral node PU
- o All **LUs** for each dial-up peripheral node
- o The **local address** for each dial-up Logical Unit (LU)
- o All **adjacent subareas** and their identification number
- o **Explicit route** definitions
- o Which **SSCP** owns the NCP

PROCESS TO BUILD NCP

Achieving an operating **Network Control Program** is a three-step process:

- o **Define the program:** consists of macro instructions and the appropriate job control statements defining the elements of the network.
- o **Generating the program:** the source macro statements are compiled in an assembly and link-edit process, the output being the required control program.
- o **Loading the Network Program:** a loader utility program in the host will download the NCP to the local or remote controllers.

During the **generation (sysgen)** phase, NCP will create the following:

- o **Network address** for each line, PU, and LU in its subarea
- o **Address table** mapping the network address to the appropriate line, SDLC address, and local address for each NAU (element number)

During **Daily** processing, NCP creates:

- o **Session tables** for each of its active NAUs
  - identifies which NAUs are in an SSCP type session and which are in LU-LU sessions
  - identifies the network address of the session partner

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NCP MACROS

The network configuration is described to NCP through a set of generation macros. Each macro describes a portion or unit of the network. Following is a list of the major NCP macros.

BUILD
— DEFINES NCP TO VTAM

HOST
— DEFINES ACCESS METHOD TO NCP

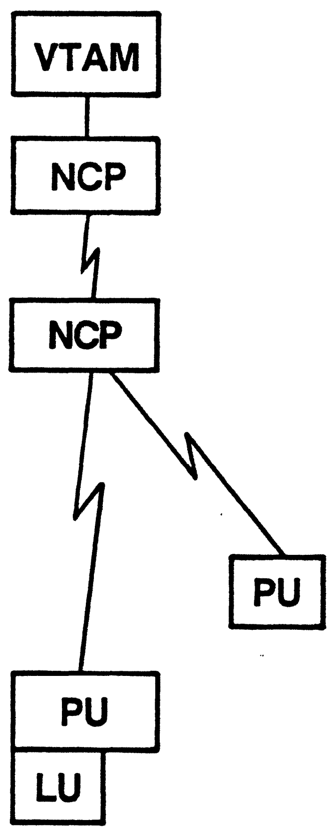
PATH
— DEFINES ROUTE TO OTHER SUBAREAS

GROUP
DEFINES A GROUP OF LINES WITH COMMON CHARACTERISTICS

LINE
— DEFINES ONE LINE OF THE GROUP TO NCP

PU
— DEFINES THE PU ATTACHED TO THE LINE

LU
— DEFINES EACH LU WITHIN A PU



NETWORK NCP MACROS

BUILD: macro occurs only once in an NCP generation input. The BUILD macro defines general characteristics of the network such as

- size of the buffers in the buffer pool
- the number of subareas
- subarea ID of the NCP.

HOST: macro occurs once for each access method in the network to which an NCP may be connected. It specifies the characteristics of the access method that the NCP will be communicating with and identifies such things as:

- the number of NCP buffers for receiving data from the access method
- the size of the access method's buffers
- subarea address of the host

Neither of these macros is dependent upon the types of devices or the characteristics of the device connected to the NCP.

PATH: macro is used to describe the route to other subareas. The path is defined in terms of:

- the final destination subareas for the message
- the intermediate adjacent subareas
- the explicit route to use
- the transmission group number for the explicit route

NCR SNA DEVICE INFORMATION

It will be necessary to communicate to the systems programmer all the information about the devices being added to the network.

Using the following PU-T2/2.1 Cluster Controller as an example, the following is the type of information the Systems Administrator needs to know:

- o Cluster Controller
  - PU Type 2 or Type 2.1
  - Buffer size
  - SDLC Address
  - Line speed
  - Modem features
- o CRT Terminal Display Station
  - Special Features
  - SLU Logon Methods
  - Local address
- o Printer
  - Pacing
  - Local address

The GROUP, LINE, PU and LU macros are used to describe the path to the PU-T2 device and its terminals.

GROUP MACRO

The GROUP macro describes the physical characteristics common to a group of communication lines. The following is a partial list of GROUP macro parameters and includes those which are most relevant to the PU-T2 example.

```
label     GROUP     DIAL=YES or NO,
                    LNCTL=SDLC or BSC or SS
                    REPLYTO=count or NONE
                    TYPE=NCP, EP or PEP
```

DIAL = YES or NO - specifies whether the lines are switched or dedicated. YES indicates switched. The default is NO.

LNCTL = SDLC or BSC or SS - specifies link protocol for the line or group of lines. SS is the default unless the previous group specified SDLC.

REPLYTO = count or NONE - specifies the reply timeout value in seconds for the lines in this group. If NCP does not receive a response to a poll or selection before the seconds expire, then appropriate error recovery procedures are initiated. Max value is 1632 seconds. If omitted, default is 1 second.

TYPE = NCP, EP or PEP - specifies whether all lines in this group are SNA or whether some may be pre-SNA. The default depends on what was coded in the BUILD macro.

LINE Macro

The LINE macro defines the characteristics of a single communications line attached to a communications controller. The following is a partial list of LINE macro parameters including those most relevant to the PU-T2 example.

```
label          LINE          ADDRESS=line addr,
                               SPEED=rate,
                               CALL=IN, OUT, or INOUT,
                               CLOCKNG=INT or EXT,
                               DUPLEX=HALF or FULL,
                               MAXPU=count,
                               NEWSYNC=YES or NO,
                               NRZI=YES or NO,
                               PAUSE=t or 0,
                               RETRIES=none or N,
                               SPDSEL=YES or NO.
```

ADDRESS = line addr - three digit hexadecimal communications port number to which the line being defined is attached. This is a required operand.

SPEED = rate - specifies the data rate of the communications line. This should match the modem speed. This is a required operand.

CALL = IN, OUT, or INOUT - If the link is switched specify whether the NCP, the PU_T2, or both can initiate the calls. Valid only if DIAL=YES on GROUP level. (switched only)

CLOCKNG = INT or EXT = specifies whether the modem or the communications controller (scanner) provides the clocking for this line. For SDLC line speeds over 2400 bits per second, clocking is usually done by the modem (EXT). For SDLC lines, EXT is default; INT if S/S line.

DUPLEX = HALF or FULL - specifies whether the communications line and modem constitute a half-duplex or full duplex facility. This should not be confused with data transfer mode. DUPLEX=operand specifies only the physical characteristics of the line and modem.

MAXPU count - specifies the maximum number of physical units associated with the link. Maximum is 255. If the line is switched the count must be 1. If the parameter is omitted, the default is the actual number of PUs on the line. (SDLC only)

NEWSYNC = YES or NO - This specifies whether the modem attached to this line has the NEWSYNC feature. NEWSYNC reduces the line turnaround. The default is NO unless the following parameters have these vaLues: (BSC & SDLC only)

DUPLEX=FULL, CLOCKNG=EXT, DIAL=NO

NRZI = YES or NO - Specifies whether the communications controller and the terminal connected by the line are operating in non-return-to-zero (NRZ) mode or Non-return-to-zero inverted (NRZI) mode. (SDLC only)

Generally, NRZI=YES is specified if no modems or asynchronous modems are used.

NRZI=NO is specified if synchronous modems are used.

PAUSE = t or .2 - Specifies the duration of the polling cycle in seconds or seconds and tenths of seconds. The polling cycle extends from the time NCP checks the first entry in the Service Order Table to the moment polling next begins at the same entry. If the polling cycle equals or exceeds the t value, the next polling cycle will be initiated immediately. However, if the polling time is less than t seconds, the full number of seconds are allowed to elapse before the next cycle begins. This is valid only for leased lines. The max t value may be 0 - 25.5 seconds. If operand is omitted, the default is .2 seconds. (NCP mode only)

RETRIES = none or m - Specifies the number of times the NCP will attempt to recover from any link errors. An error exits when NCP does not receive a positive indication that a frame it sent was received successfully. NCP will repeat the retransmission until frame was sent successfully or until max number of retries have been attempted. Values of m may be from 0 - 128. Default is 15. (NCP mode only)

SPDSEL = YES or NO - Specifies for an externally clocked modem capable of transmitting at either of two data rates, whether or not the host access method may request a data rate change. (NCP mode only)

SERVICE Macro

This macro defines the polling sequence for a non-switched line with multiple PUs and is required. The SERVICE macro is not needed when only one PU will be on a dedicated line.

```
label     SERVICE     ORDER=(PU name, PU name, ...),          (nonswitched only)
                      MAXLIST=M
```

- o **ORDER = (PU name,...)** - specifies the network name of the PUs in the sequence in which they should be polled. Each ORDER may be followed by a maximum of 255 characters including parentheses and commas. If more than 255 characters are needed, then additional SERVICE macros may follow the first.

- o **MAXLIST = n** - identifies the number of entries in the service order table. Max value is 256. If operand is omitted, default is number of entries in the ORDER operand as described.

PU Macro

The PU macro specifies a physical unit in the network that is connected by a switched or nonswitched SDLC link. The following is a partial list of PU macro parameters including those most relevant to the PU-T2 example.

```
label       PU       ADDR=chars,
                      ANS=STOP or CONTINUE
                      MAXDATA=size,
                      MAXLU=count,
                      MAXOUT=n,
                      PASSLIM=n,
                      PUDR=NO or YES,
                      PUTYPE=N,
                      SRT=(m,n)
```

ADDR = chars - specifies the hexadecimal value of the SDLC address of the physical unit. (nonswitched only)

ANS = STOP or CONTINUE - specifies whether or not the station represented by this PU and in session with an adjacent subarea is to continue its session if the NCP enters automatic network shutdown mode. If omitted, STOP is default for PU-T2; CONT default if PU-T4. STOP must be coded for switched links.

MAXDATA = size - specify the number of bytes that the PU can physically receive in one PIU segment. (nonswitched only)
Size = amount of RU data + 5 for PU-T1
Size = amount of RU data + 9 for PU-T2

MAXLU = count - Identifies the maximum number of LUs that may be on this PU. For a dedicated link, if omitted, the count defaults to the value of the number of LUs defined for this PU. (switched only)

MAXOUT = n - specifies the maximum number of PIUs or PIU segments to be sent by the NCP to the PU before requesting a response from the PU. This can be an integer value between 1 and 7. (nonswitched only)

PASSLIM = n - specifies the maximum number of PIUs or PIU segments NCP is to send to the PU for a given entry in the Service Order Table. Maximum value between 1 and 254 possible. If operand omitted, default is 1 for a PU-T2. (nonswitched only)

PUDR = NO or <u>**YES**</u> - specifies whether this PU can be deleted from the network by dynamic reconfiguration. Default is YES. (nonswitched only)

PUTYPE = n - specifies the PU type.

SRT = (m,n) specifies a threshold value for the total number of transmissions and total number of error retries for this PU. A RECFMS is sent to the SSCP when the thresholds are reached. Default is 32,766. (nonswitched only)

LU MACRO for NON-SWITCHED LINES

The LU macro specifies a logical unit for a **nonswitched** SDLC link that is associated with a type 1 or type 2 physical units. The following is a partial list of LU macro parameters including those most relevant to the PU-T2 example.

```
label      LU       LOCADDR=n,
                     BATCH=YES or NO
                     LUDR=NO or YES,
                     PACING=(n,m)
```

LOCADDR = n - specifies the local address in decimal notation. For PU-T1, the value in the range 0-63 may be specified. For PU-T2, the value can be in the range 2-255. Addresses must be in ascending order following the PU macro.

BATCH = NO or YES - If the LU is identified as a batch device it is given a lower priority for transmission.

LUDR = NO or YES - specifies whether the LU can be deleted from the network by dynamic reconfiguration. Default is the same as that specified for the PUDR macro.

PACING = (n,m) - specifies that the LU is to be paced and that N number of PIUs will be sent before NCP must receive a response from the LU. The second value, m, is the number of the PIU which will contain the pacing request indicator. If PACING is omitted, the LU is not paced.The minimum is 1; the maximum is 255.

SWITCHED DEVICES

If the GROUP macro says DIAL=YES, the LU macro is not coded in the NCP gen.

However, the GROUP, LINE, and PU macros are coded as defined above, but the LU will be coded in the VTAM gen only.

Coding Consideration

The coding of macro statements can be highly repetitive. A hierarchy exists between the GROUP, LINE, PU, and LU macros. Under this hierarchy, certain operands could be specified in more than one macro.

To take advantage of this **SIFT-DOWN** feature, an operand coded on a higher-level macro statement, automatically implies the same value for all subordinate level macros.

If an operand is coded on a subordinate level, that value overrides the value for the same operand on a higher level macro.

Changes made at the LU level do not support the **siftdown** feature. A change in operand value at the LU level will override only that value for that definition.

OPERAND	NCP GEN MACROS LEASED LINE				SWITCHED LINE	
	GROUP	LINE	PU	LU	PU	LU
BATCH-NO	X	X	X	R		
LOCADDR				R		
MAXDATA	X	X	R			
MAXLU	X	X	R		R	
MAXOUT	X	X	R			
PACING	X	X	X	R		
PASSLIM	X	X	R			
PUTYPE	X	X	R		R	

NOTE:

X = operand can be specified here to take advantage of sift-down.
R = operand applies to this macro and should be specified here, if not on a higher level macro.

SAMPLE NCP PARAMETERS

This is a sample of some parameters from a live NCP to demonstrate the relationship of some of the parameters.

This example is for a leased connection.

This info has to be generated on the Host And the FEP & they must match.
This configuration is done in VTAM on the Host & then downloaded to the FEP

	BUILD	TYPGEN=NCP,	THIS IS AN NCP GEN
		BFRS=84,	NCP BUFFER SIZE
		MAXSUBA=31,	ALLOW UP TO 2048 ELEMENTS
		SUBAREA=5,	SUBAREA OF THIS NCP
		NEWNAME=PRODNCP,	NAME OF THIS NCP
		•	
		•	
	HOST	SUBAREA=1,	VTAM SUBAREA FOR THIS NCP
		INBFRS=6,	INITIAL NCP ALLOCATION
		MAXBFRU=8,	VTAM BUFFER UNIT ALLOCATION
		UNITSZ=156	VTAM IO BUFFER SIZE
		•	
		•	
	GROUP	DIAL=NO,	NON-SWITCHED LINE
		LNCTL=SDLC,	LINE PROTOCOL
		REPLYTO=5,	NO-POLL-RESP TIME-OUT
		•	
Label	Macro	• keyword	
CTLN03F	LINE	ADDRESS=(03F),	XMT/RCV PORT ADDRESS
		SPEED=4800,	LINE SPEED
		CLOCKNG=EXT,	MODEM DOES CLOCKING
		•	
		•	
CTP3FP01	PU	ADDR=C2,	LOCAL ADDRESS
		MAXDATA=265,	BUFFER+9 FOR PU—T2
		MAXOUT=7,	MAX CONSECUTIVE PIUs SENT
		PUTYPE=2,	TYPE 2 PHYSICAL UNIT
		•	
		•	
CTP01L01	LU	LOCADDR=02,	7958 IN FIRST POSITION
		MODETAB=LM3276,	VTAM
		USSTAB=NCRUSSTB,	VTAM
		•	
		•	
CTP01L02	LU	LOCADDR=03,	7958 IN SECOND POSITION
		MODETAB=IM3276,	VTAM
		USSTAB=NCRUSSTB,	VTAM
		•	
		•	
CTP01L03	LU	LOCADDR=04,	7957 IN THIRD POSITION
		MODETAB=LM7957,	VTAM
		DLOGMOD=DSILGMOD,	VTAM
		PACING=(2,1),	PACING FOR SLOW DEVICE

REVIEW LESSON 14

1. Code the GROUP and subordinate MACROS (and required operands) necessary to connect your PU-T2/2.1 Cluster Controller to the Host network. The following information is given for the configuration:

   - o A dedicated line
   - o Two display terminals with local addresses, 03 and 04.
   - o Two printers with local addresses of 02 and 05.
   - o NCP will be instructed to send a group of 5 PIUs before expecting a response to the Pacing Request Indicator, located in the third PIU of each group. (for the printers only)
   - o 2400 bps link connected at NCP LIM address 0B6.
   - o Modem will do the clocking.
   - o TOWER's cluster controller address is C7.
   - o Maximum RU data acceptable by the PU-T2 buffer is 256 bytes.
   - o Synchronous modems

2. Using the same information as above, code the macros and operands for the PU-T2/2.1 Cluster Controller as though it were on a dial-up connection to the host.

LESSON 15: ACF/VTAM GENERATION

PURPOSE

This lesson identifies the information that must be provided to the ACF/VTAM Systems Programmer in order to prepare the entries for the ACF/VTAM gen. to define NCR SNA products.

OBJECTIVES

After completing this lesson, the student will be able to:

- o List the different elements in the ACF/VTAM gen.
- o Identify and define the ACF/VTAM unique operands in the ACF/NCP gen.
- o Given sample gen listings including:

  USSTAB table,
  LOGMODETAB table,
  VTAM switched major node definition,
  NCP definition, and
  a description of the PU-T2 device,

  modify the gen listings to match the device characteristics.

- o Given:

  a VTAM AND NCP gen,
  USSTAB table,
  LOGMODETAB table for certain LUs,

  identify the valid logon commands that can be used with those LUs to establish sessions with host applications.

REFERENCES

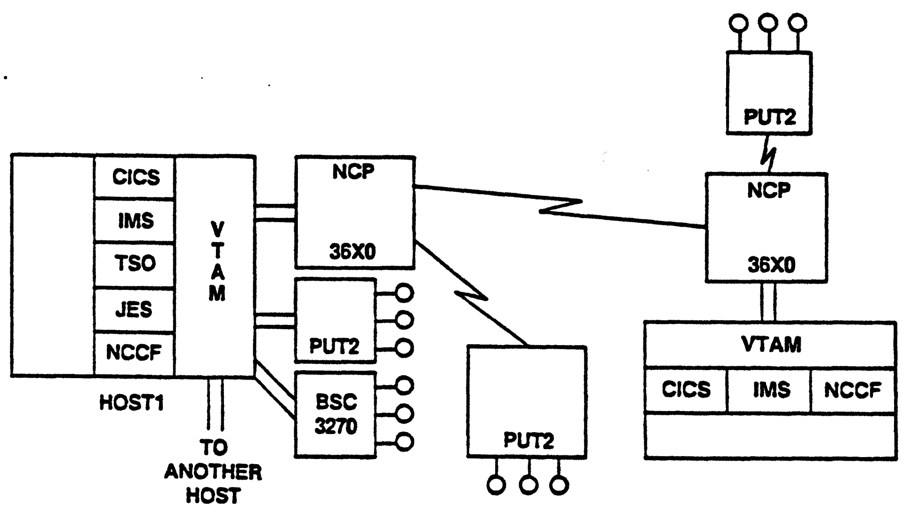
ACF/VTAM Planning and Installation Reference Rel. 3 IBM SC27-0584-1

ACF/VTAM INSTALLATION CONSIDERATIONS

VTAM is an access method of the operating system and must be identified to and incorporated in the system during system generation. Thus VTAM becomes a part of the operating system.

After generating the operating system with support for VTAM, installing VTAM and generating the NCP, the domain must be defined to VTAM. This includes:

- Information on application subsystems
- Descriptions and locations of channel-attached devices
- Information on switched devices
- Logon mode table (LOGMODETAB)
- Unformatted Systems Service table (USSTAB)
- Interpret Table
- Explicit/Virtual routing information
- Cross domain resource managers
- Exit routines



When running, VTAM creates SNA information tables about the following:

- o Domain Resources
- o Node Resources
- o Sessions
- o Cross domain resources

VTAM ROUTING

The **PATH** macro instructs VTAM how to transmit or route a message to any subarea in the network.

The **routes** are defined in terms of:

- o Transmission Groups
- o Explicit Routes
- o Virtual Routes

The **path** to take is defined in terms of:

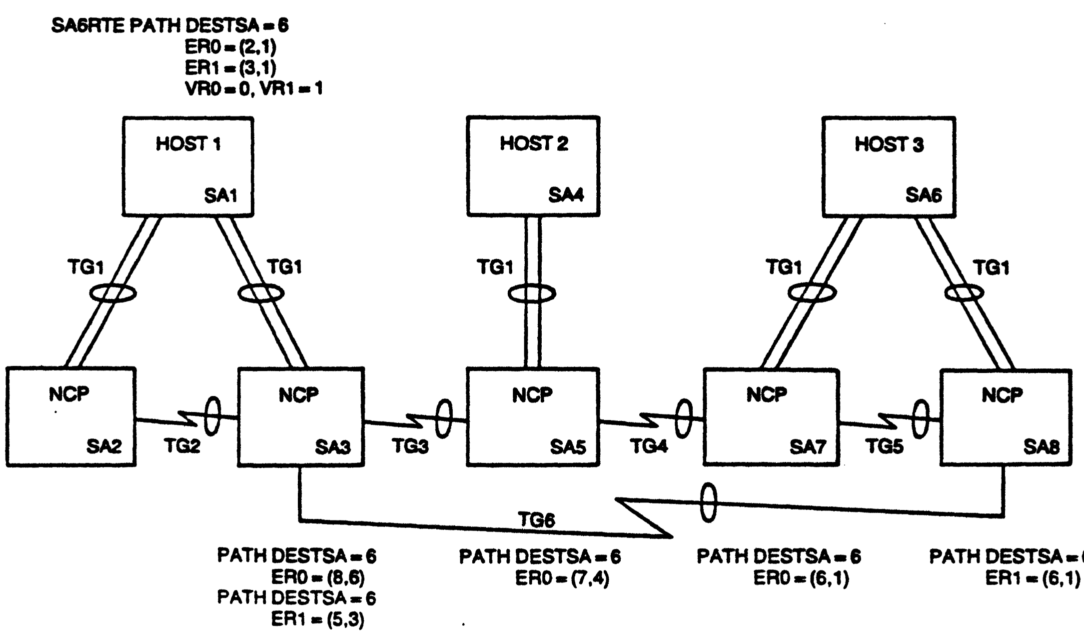
- o Destination subarea
- o Adjacent subarea
- o Explicit route

The VTAM systems programmer is responsible for defining all route names and all paths.

Format example: **PATH DESTSA=n or (n1,n2,n3,...)**
ER0=(Adjsuba,TG#)

VR0=ER#

*** EXPLICIT & VIRTUAL ROUTES ***



VTAM SESSION RELATED TABLES

Four tables are defined to describe the user's unique installation. They are:

- o Unformatted Systems Services Table (USSTAB)
- o Logon Mode Table (LOGMODETAB)
- o Class of Service Table (COS)
- o Interpret Table

Unformatted Systems Services Table

The USS Table is required if a PU-T2 device does not issue an INITSELF to establish LU-LU sessions. It also is used to simplify the logon and logoff procedures at the terminal. Thus, the operator may enter a single logon command instead of a long version.

VTAM will contain some IBM-supplied USSTABs, and optionally, the user may redefine the commands in these tables or create their own USSTABs.

Also, if VTAM needs to send a message, it may access one of these USS tables to extract a particular message.

USS Table entry format:

label	USSTAB	TABLE = name of translation table to use
name	USSCMD	CMD = name, FORMAT = BAL/PL1, REP = name
name	USSPARM	PARM = name/P#, DEFAULT = value, REP = name
name	USSMSG	MSG = #, BUFFER = address, TEXT = text of message
	USSEND	

DEFINITIONS

CMD - user-defined 'logon' character string. (command)

FORMAT - syntax of user-defined logon.

REP - specifies keyword that is to **replace** the user-defined command, or keyword to be **inserted** into the format.

PARM -specifies user-defined keyword, system keyword, or positional parameter.

- o PARM=name - keyword
- o PARM=P# - identifies positional parameter

DEFAULT - specifies default character-string value if one is not specifically entered.

MESSAGE - specifies USS message number.

Example of an entry in the USSTAB required to define a logon message:

```
CICS    USSCMD      CMD = CICS,FORMAT = BAL,REP = LOGON
        USSPARM     PARM = APPLID,DEFAULT = CICS
        USSPARM     PARM = LOGMODE,DEFAULT = S3270
        USSPARM     PARM = P1,REP = DATA
```

1. The operator keys in: CICS

The USS table converts that to:

2. If the operator keys in: CICS LOGMODE=RM3278

The USS Table converts that to:

3. If the operator keys in: CICS LOGMODE(RM3278)

The USS Table converts that to:

4. If the operator keys in: CICS ABC XY

The USS Table converts that to:

Another variation of the above entry in USSTAB :

```
CICS    USSCMD      CMD=LOGON,FORMAT=BAL
        USSPARM     PARM=P1,REP=APPLID
        USSPARM     PARM=ENTRY,REP=LOGMODE,DEFAULT=PCA
        USSPARM     PARM=P3,REP=DATA
```

5. If the operator keys in: LOGON CICS ENTRY=PCB PASSWORD

The USS Table converts that to:

USS MESSAGES

The USS messages are used by various modules of VTAM. VTAM would issue a command to send a certain message number to the destination logical unit. The USS table sends that message.

NOTE: The name of the USS table is specified in the JCL command instructions that causes the table to be assembled.

Example: FILE: NCRUSSTB Source

MSG=0 (user-defined; USS command successful)
MSG=1 INVALID COMMAND SYNTAX
MSG=2 COMMAND UNRECOGNIZED
MSG=3 PARAMETER UNRECOGNIZED
MSG=4 PARAMETER INVALID
MSG=5 UNSUPPORTED FUNCTION
MSG=6 SEQUENCE ERROR
MSG=7 SESSION NOT BOUND
MSG=8 INSUFFICIENT STORAGE
MSG=9 MAGNETIC CARD DATA ERROR
MSG=10 (Automatically sent to a logical unit whenever the logical unit is active or powered on, or whenever a user session ends.)
MSG=11 SESSION ENDED
MSG=12 REQUIRED PARAMETER OMITTED
MSG=13 IBMECHO

USSTAB EXERCISE

1. Given the following entry in the USSTAB, indicate the interpreted 'logons' by an operator at the terminal.

```
RJEX    USSCMD     CMD=RUN,REP=LOGON
        USSPARM    PARM=P1,REP=APPLID,DEFAULT=SYSRJE
        USSPARM    PARM=P2,REP=LOGMODE,DEFAULT=RM3278
        USSPARM    PARM=P3,REP=DATA
```

If the operator keys in:

(a) RUN

(b) RUN APR03 RES1 RM3278

(c) LOGON SYSRJE

2. Create an entry for the USSTAB table with the following conditions: Operator is to logon to NCCF subsystem. The majority of the time the operator will wish to use the logmode entry of **TESTC**. Occasionally, the logmode entry of **DSILGMOD** will be needed. The operator will also need to enter their cost control number of **GF5162** at logon time.

Logon Mode Table

The logon mode table provides information to VTAM that VTAM uses when preparing the BIND.

IBM provides a table with predefined entries for many IBM products. The name of this table is ISTINCLM and is required by VTAM. This table can be modified or replaced, but the name must not be deleted from VTAM. There may be more than one logon mode table defined. Each table should have a unique name.

Logon Mode Table format:

```
name     MODETAB
                                    [Byte and Default Setting]
name     MODEENT   TYPE=Value,      (byte 1 - 1)
                   FMPROF=Value,    (byte 2 - 0)
                   TSPROF=Value,    (byte 3 - 0)
                   PRIPROT=Value,   (byte 4 - 0)
                   SECPROT=Value,   (byte 5 - 0)
                   COMPROT=Value,   (bytes 6 & 7 - 0)
                   SSNDPAC=Value,   (byte 8 - 0)
                   SRCVPAC=Value,   (byte 9 - 0)
                   RUSIZES=Value,   (bytes 10 & 11 - 0)
                   PSNDPAC=Value,   (byte 12 - 0)
                   PRCVPAC=Value,   (byte 13 - 0)
                   PSERVIC=Value,   (bytes 14-25 - 0)
                   ENCR=Value,      (byte 26 - 0)
                   COS=Name
                   LOGMODE=Name

         MODEEND
```

Current Logon Mode Entry

```
DSILGMOD   MODEENT  LOGMODE=DSILGMOD, FMPROF=X'03', TSPROF=X'03'
                    PRIPROT=X'B1', SECPROT=X'A0', COMPROT=X'3080',
                    SSNDPAC=X'01', SRCVPAC=X'02', RUSIZES=X'8787',
                    PSNDPAC=X'02', PSERVIC=X'01000000B100000000000000'
```

```
ONLY ACCEPTABLE     31 01 02 03 B1 B0 30 80 00 02 85 85 02 00 02 00 00 00
BIND PARAMETERS
(i.e. command):   00 00 00 00 00 00 00 00 00
```

NCP DEFINITIONS

VTAM Macro

VTAM has one macro that it includes with each NCP gen. This is **PCCU (Programmed Communication Control Unit).**

This macro identifies the Communications Controller into which a specific NCP is to be loaded and defines the VTAM functions that are to be provided for a specific NCP.

For multiple VTAM hosts, there will be multiple PCCU statments.

Some parameters included with the PCCU macro define:

- o symbolic name of NCP node
- o whether NCP is to receive an IPL
- o the name of the SSCP controlling this NCP
- o the subarea number of the host

PCCU is not affected by the type of devices connected to the NCP.

VTAM Macros IN NCP GEN

Several of the NCP macros have operands that are used only by VTAM. The table below identifies these operands and the macros they may be used with.

OPERAND	GROUP	LINE	PU	LU
DISCNT	X	X	X	
DLOGMOD	X	X	X	X
ENCR	X	X	X	X
ISTATUS	X	X	X	X
LOGAPPL	X	X	X	X
LOGTAB	X	X	X	X
MODETAB	X	X	X	X
OWNER	X	X		
SESSION	X	X		
SSCPFN	X	X	X	X
USSTAB	X	X	X	X
VPACING	X	X	X	X

DISCNT (YES,NO) - Identifies whether or not the SSCP-PU and SSCP-LU sessions should be terminated when all LU-LU sessions are terminated.

DLOGMOD - Default logon mode table entry if one is not otherwise indicated. If this operand is omitted and no specific entry is provided, default is to first entry in the named or defaulted logon mode table.

ENCR (REQD, OPT, NONE) - Identifies whether the application program may use cryptography.

ISTATUS (ACTIVE, INACTIVE) - Identifies whether the device(s) will be activated when VTAM is initialized. (i.e., SSCP-PU; SSCP-LU)

LOGAPPL - Identifies the name of an application program which should be automatically logged on at initialization time. (i.e., LU-LU)

LOGTAB - Identifies the interpret table to use.

MODETAB - Identifies the logon mode table name to search. If this operand is omitted and no other name has been provided, the default will be to an IBM-supplied logon table.

OWNER - Identifies the name of the SSCP that owns this GROUP or LINE.

SESSION - Identifies the number of concurrent sessions on a link. Should equal number of terminals on the line.

SSCPFM (FSS, USSSCS) - Identifies whether the LUs can accept only formatted messages or character coded messages over the SSCP-LU session.

USSTAB - Identifies the USS table. If this operand is omitted, an IBM-supplied USSTAB will be used for unformatted logon requests.

VPACING - Identifies the number of messages to send to the NCP before requiring a pacing response. The default is 2.

SWITCHED MAJOR NODES

Switched connections to NCP are partially defined to NCP in the NCP and partially defined to VTAM.

NCP defines only the GROUP, LINE, and PU of switched nodes.

VTAM also has a PU macro that includes all of the NCP parameters that were invalid for switched devices on the NCP gen. VTAM then defines the LUs for that PU. The PU and LU definitions in VTAM are defined the same way for NCP.

VTAM has extra parameters for the PU macro that identify the **XID** of the PU. These are **IDBLK** and **IDNUM.**

- o **IDBLK** - identifies the device that this PU is emulating (switched linkks only)
- o **IDNUM** - unique number that identifies the PU to VTAM (switched links only)

The XID is an SDLC data link control command passed between adjacent nodes to identify themselves. link.

VTAM also has an extra macro called the PATH macro that identifies the telephone number that is being used for the connection if VTAM is to place the call.

Example:

<u>NCP GEN</u>

```
label GROUP ...
label LINE  ...
label PU    MAXLU=5,PUTYPE=2
```

VTAM SWITCHED MAJOR NODE

```
label PU  ADDR=C1,MAXDATA=265,MAXOUT=7,PASSLIM=7,
          PUTYPE=2,IDBLK=017,IDNUM=00111,MODETAB=LMCASE

label LU  LOCADDR=2

label LU  LOCADDR=3

label LU  LOCADDR=4,PACING=(3,2)
```

Coding Considerations

As with the coding of macros during the NCP gen, repetitious coding of macros may be reduced by taking advantage of the **SIFT-DOWN** feature.

Under this hierarchy, an operand described on a higher level macro (GROUP, LINE, PU) will be in effect on any lower or subordinate level macros, unless another operand value is entered on a lower level macro to specifically change a specific definition or override the "sift-down" value.

VTAM GEN MACROS
DIAL-UP LINES

OPERAND	PU	LU
DLOGMOD	X	R
IDNUM IDBLK	R	
ISTATUS	X	R
MODETAB	X	R
USSTAB	X	R

NOTE:

X = operand can be specified here to take advantage of sift-down
R = operand applies to this macro and should be specified here, if not on a high level macro.

SESSION ESTABLISHMENT

How the BIND is located -

1. Formatted system services INITSELF command with logmode entry issued by programmable controller.

2. Unformatted logon -- either long version or short version of user-defined logon is entered and the USS Table provides interpretation of entry.

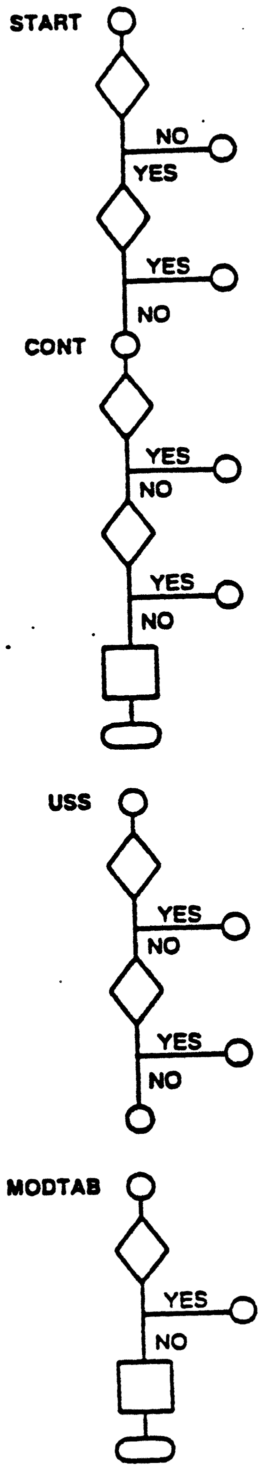
3. Logmode entry may be specified in VTAM gen **(DLOGMOD=)**

4. If no logmode entries are input or generated from USSTAB, then first entry in the logon mode table specified in VTAM gen **(MODETAB=)**

5. If no logmode entries are located AND no specific logon mode table mentioned, then defaults are to an IBM-supplied logon mode table and the first entry in that table.

6. **REMEMBER**, the BIND parameters may be overridden by the application subsystems.

HOW THE BIND IS LOCATED FLOWCHART



Did SSCP receive an INITSELF?

Go to USS

Was a specific LOGMODE ENTRY entered?

Go to MODTAB

Does the VTAM gen indicate a default LOGMODE ENTRY, such as DLOGMOD=

Go to MODTAB

Is there a specific VTAM gen LOGON MODE TABLE specified, such as MODETAB=

Use first ENTRY in the logmode table specified

Use first ENTRY in default LOGON MODE TABLE (Default table is ISTINCLM which is required by VTAM)

Did terminal operator enter a specific LOGMODE ENTRY, such as: logon applid(cics) logmode(S3270)

Go to MODTAB

Did USSTAB ENTRY specify particular LOGMODE ENTRY

Go to MODTAB

Go to CONT

Is LOGON MODE TABLE specified in VTAM gen, such as MODETAB=

Search LOGMODE TABLE specified

Search a default logon mode table which is required by VTAM: MODETAB=ISTINCLM

NOTE: If searches finds no entry - then search ends

PARAMETER CHECKLIST

The following information must be provided to the host systems programmers.

Logon Mode Table Entry

- o FM, TS, PS profiles (FMPROF, TSPROF, PSERVIC)
- o Chain rules (PRIPROT, SECPROT, COMPROT)
- o Bracket rules (PRIPROT, SECPROT, COMPROT)
- o Response rules (PRIPROT, SECPROT)
- o Compression/compaction support (PRIPROT, SECPROT)
- o FM headers used (COMPROT)
- o Codeset (COMPROT)
- o Communication mode (COMPROT)
- o Pacing requirements (SSNDPAC, SRCVPAC, PSNDPAC)
- o Max RU size (RUSIZE)
- o Encryption (ENCR)

VTAM Parameters (may be in the NCP gen)

- o default logon mode table (MODETAB)
- o default logon mode table entry (DLOGMOD)
- o pacing requirements (VPACING)
- o types of commands accepted (SSCPFM)
- o encryption (ENCR)
- o default USS table (USSTAB)
- o default interpret table (LOGTAB)

USS Table

- o format of terminal logon/logoff

Class of Service Table

The Class of Service Table (COS) assigns priorities to the Virtual Routes for the transmission of messages and associates groups of Virtual Routes together to form a single class of service. The format of a COS entry is:

Format:

```
Name        COS        VR=((VR#,PRI),VR#,PRI),........)
```

Example:

```
ISTSDCOS   COSTAB
IMS        COS         VR=((0,2),(1,1),(2,0).....)
CICS       COS         VR=((1,2),(3,0),(2,2),(0,0)....)
JES2       COS         VR=((1,0),(0,0).....)
ISTVTCOS   COS         VR=((1,2),(0,2),(2,2)....)
           COS         VR=((1,1),(2,1)......)
           COSEND
```

The COSTAB must have the name of ISTSDCOS.

The ISTVTCOS entry is used for all sessions with the SSCP.

The entry with no name is used if there was no COS operand in the logon mode table entry for a particular LU-LU session.

LOCATING THE EXPLICIT & VIRTUAL ROUTE USING THE COS TABLE

LU-LU session logon specifies log mode entry name:

LOGON MODE TABLE ENTRY

```
        MODETAB
IBMCICS MODEENT LOGMODE=S3270,COS=CICS,FMPROF=2....
```

Logmode entry specifies the COS entry that defines the possible virtual routes:

CLASS SERVICE TABLE ENTRY

```
        COSTAB
CICS    COS      VR=((0,2),(3,0)......)
```

COS table entry specifies virtual route number and the priority:

VTAM PATH STATEMENT

```
SA6RTE   PATH  DESTSA=6
               ER0=(2,1)
               ER1=(3,1)
                .
                .
               ER8=(3,1)
               VR0=0
               VR1=3
               VR2=1
                .
                .
                .
               VR8=1
```

Interpret Table

The Interpret Table was originally defined for use with an earlier version of VTAM.

It is still used; however, the unformatted systems services table (USSTAB) performs many of the same functions as the Interpret Table.

Since the USSTAB is most commonly encountered when installing new devices, the Interpret Table will not be discussed.

VTAM uses the Interpret Table at session establishment time to determine which application subsystem to notify.

REVIEW LESSON 15

1. The following are entries in the NCP and VTAM gens.

```
          GROUP      ...
          LINE       ...
SPU01      PU        ADDR=C1,MAXDATA=265,MAXOUT=7,PASSLIM=7,PUTYPE=2
SLU01      LU        LOCADDR=02,USSTAB=NCRUSS,MODETAB=LM3276
SLU02      LU        LOCADDR=03,USSTAB=NCRUSS,MODETAB=RB3770
    **************************************************

NCRUSS   USSTAB      TABLE=TRANS10
CICS     USSCMD      CMD=CICS,FORMAT=BAL,REP=LOGON
         USSPARM     PARM=APPLID,DEFAULT=CICS
         USSPARM     PARM=P1,REP=LOGMODE,DEFAULT=S3270

TSO      USSCMD      CMD=TSO,FORMAT=BAL,REP=LOGON
         USSPARM     PARM=APPLID,DEFAULT=TSO
         USSPARM     PARM=MODE, REP=LOGMODE

ANY      USSCMD      CMD=LOGON,FORMAT=PL1
         USSPARM     PARM=P1,REP=APPLID
         USSPARM     PARM=P2,REP=LOGMODE

JES      USSCMD      CMD=JES2,FORMAT=BAL,REP=LOGON
         USSPARM     PARM=APPLID,DEFAULT=JES2
         USSPARM     PARM=P1,REP=LOGMODE,DEFAULT=S3790

END      USSEND
*******************************************************
RB3770   MODETAB

JES2     MODEENT   LOGMODE=S3770

         MODEEND

*******************************************************
LM3276   MODETAB

TSO      MODEENT   LOGMODE=S3271,...

CICS     MODEENT   LOGMODE=S3270,...

NCCF     MODEENT   LOGMODE=DSILGMOD,...

IMS      MODEENT   LOGMODE=S3272,...

JES2     MODEENT   LOGMODE=S3790,...

         MODEEND
```

Interpret the following logon messages that will be generated and indicate (1) if the logon was successful (i.e. parameters from tables extracted) and (2), if the session was established (valid BIND received).

		+ LOGON?	SESSION EST?
1. terminal SLU01	LOGON TSO		
2. terminal SLU02	JES2		
3. terminal SLU01	LOGON NCCF		
4. terminal SLU02	CICS		
5. terminal SLU01	LOGON IMS S3272		
6. terminal SLU01	TSO MODE(S3271)		
7. terminal SLU01	CICS S3271		
8. terminal SLU01	NCCF		
9. terminal SLU01	LOGON CICS		
10. terminal SLU02	JES2 S3770		
11. terminal SLU01	LOGON NCCF DSILGMOD		
12. terminal SLU01	LOGON IMS		

2. Following is the GROUP, LINE, and PU macro from NCP and the switched major Node, USS Table and Logon Mode Table from VTAM. Based on the information below, modify those gen listings to match the system definitions below.

   The Cluster Controller emulates an IBM 3276 controller using IBM 3278 CRTs.

   The transmission speed is 2400 bps on a switched connection. The modems are ordinary synchronous modems with no special features.

   The controller's SDLC address is "C3". The XID is "01800454".

   The systems programmer said to logon using the command "TSO".

   The only acceptable BIND parameters (command) are:

   31 01 03 03 B1 B0 30 80 00 01 85 C7 02 00

   02 80 00 00 00 00 00 00 00 00 00 00 00

   The system consists of one PU-T2/2.1 and two LUs representing CRT terminals. The terminals have been defined as having local addresses of 02 and 03.

   The USSTABLE is called CASUSSTB.

   The Logon Mode Table is called LMCASE.

<u>NCP GEN</u>

```
MVSGPSW    GROUP   DIAL=YES,LNCTL=SDLC,NRZI=NO,
                   REPLYTO=5, TYPE=NCP

LN56       LINE    OWNER=SSCP01,ADDRESS=(056),SPEED=4800,
                   ISTATUS=ACTIVE, CLOCKNG=EXT, NEWSYNC=YES

SC56PU     PU      MAXLU=8, PUTYPE=2
```

***** VTAM Switched Major Node**

```
CASP2      PU    IDBLK=018,IDNUM=00455,DISCNT=NO,
                 MAXDATA=265,PUTYPE=2,MAXOUT=7,
                 MODETAB=LMCASE, USSTAB=CASUSSTB

CAS2L01    LU    LOCADDR=2

CAS2L02    LU    LOCADDR=3
```

***** CASUSSTB**

```
CASUSSTB   USSTAB    TABLE=C1OTRANS

LOGON      USSCMD    CMD=LOGON, FORMAT=PL1
           USSPARM   PARM=APPLID
           USSPARM   PARM=LOGMODE
           USSPARM   PARM=P1, REP=DATA

TSO        USSCMD    CMD=TSO, FORMAT=BAL, REP=LOGON
           USSPARM   PARM=APPLID, DEFAULT=TSO
           USSPARM   PARM=LOGMODE, DEFAULT=S3278
           USSPARM   PARM=P1, REP=DATA

CICS       USSCMD    CMD=CICS, FORMAT=BAL, REP=LOGON
           USSPARM   PARM=APPLID, DEFAULT=CICS
           USSPARM   PARM=LOGMODE, DEFAULT=RM3278
```

***** LOGON MODE TABLES**

```
LMCASE   MODETAB

TEST       MODEENT   LOGMODE=RM3278, FMPROF=X'03',TSPROF=X'03',
                     PRIPROT=X'B1', SECPROT=X'90', COMPROT=X'3080',
                     RUSIZES=X'8587',
                     PSERVIC=X'010000000000000000000200'

IBMS3278   MODEENT   LOGMODE=S3278,FMPROF=X'02'TSPROF=X'03',
                     PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',
                     RUSIZES=X'8585',
                     PSERVIC=X'020000000000000000000200'
```

LESSON 16: CICS GENERATION

PURPOSE

This lesson will teach the students about the specific sysgen macros and parameters needed to define the NCR PUT2 product to CICS.

OBJECTIVES

After completing this lesson the student will be able to:

- o List the CICS macros that define PUT2 products
- o Using the classroom materials, code an entry for the Terminal Control Table to define the NCR 7958
- o Given a description of an NCR product and a listing of a TCT, modify the TCT to match the characteristics of the NCR product.

REFERENCES

CICS/VS IBM 3270 Guide - IBM SC33-0096

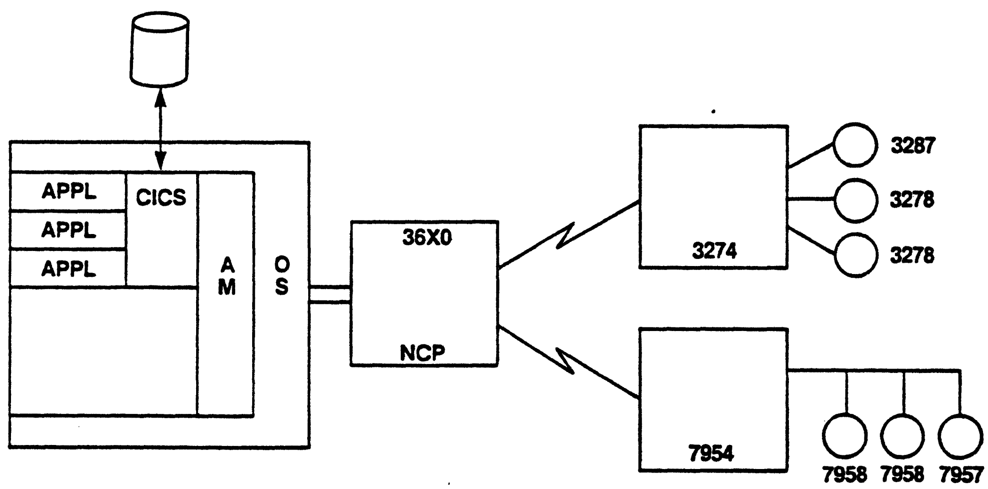
CICS/VS System Programmer's Guide - IBM SC33-0070

CICS/VS System Programmer's Reference Manual - IBM SC33-00069-4

INTRODUCTION

CICS is a transaction processing system. It was designed to support many different terminals running many different transactions and programs concurrently. To do this, all of the programs, files, terminals, and other elements must be defined to CICS.

These definitions are made using tables.



CICS TABLES

CICS is a table driven system. Part of the CICS definition procedure consists of providing the proper entries for the CICS tables. Following is a list of all of the CICS tables.

* System Initialization Table (SIT)

  Contains CICS nucleus module and table suffixes, system initialization program options, and recovery/restart parameters.

* Program Control Table (PCT)

  Governs the flow of control between application program in the CICS system; links user programs to another user's program; loads and erases program from memory.

* Processing Program Table (PPT)

  Contains location on disc of programs; where program resides in memory; resident or dynamic; source language used.

* Terminal Control Table (TCT)

  Interface between user application programs and the terminals; polls the terminals; handles code translation; validation of transaction.

Application Load Table	(ALT)
Destination Control Table	(DCT)
File Control Table	(FCT)
Journal Control Table	(JCT)
Monitoring Control Table	(MCT)
Nucleus Load Table	(NLT)
Program List Table	(PLT)
System Recovery Table	(SRT)
Terminal List Table	(TLT)
Temporary Storage Table	(TST)
Transaction List Table	(XLT)

TERMINAL CONTROL TABLE

- The TCT describes the logical units to CICS. It does not contain network configuration information.

- Some of the parameters include the same information as VTAM and NCP. These parameters must agree with the VTAM/NCP parameters.

- There are several different macro types in the TCT. The macro type that defines the SNA logical units is: **DFHTCT TYPE=TERMINAL**

  Other macro types are used, but these refer to the system in general or to non SNA elements in the network.

- A knowledge of terminal hardware is required for choosing some of the terminal values.

The following table includes the mandatory operands for the TYPE = TERMINAL macro as well as the operands that are dependent on the specific terminal. There are other operands that may also be used, but they refer to the applications being performed or to system unique characteristics.

```
label      DFHTCT        TYPE = TERMINAL,
                         TRMIDNT = name,
                         TRMTYPE = lutype-,
                         ACCMETH = VTAM,
                         BRACKET = yes or no,
                         BUFFER = size,
                         CHNASSY = yes or no,
                         CONNECT = auto,
                         DEFSCRN = (lines, columns),
                         FEATURES= (feature, feature),
                         FF = yes or no,
                         GMMSG= yes or no,
                         LOGMODE = name,
                         NETNAME = name,
                         PGESTAT = autopage or page,
                         RELREQ  = (yes or no,  yes or no),
                         RUSIZE = size,
                         TIOAL = (length1, length2),
                         TRMMODL = model number,
                         TRMSTAT = activities
                         PIPELN = last or pool,
                         TASKNO = number,
                         SESTYPE=type
                         ALTSCRN= (lines,columns)
```

TYPE = TERMINAL - This is mandatory and is used to indicate the beginning of a new terminal description.

TRMIDNT = name - This is a unique four character id for the terminal. This is the terminal's name as far as CICS is concerned.

TRMTYPE = type - This is mandatory. Informs CICS what values to place into the BIND RU. It identifies the LU type of this terminal or the specific terminal model. See Table 1 on page 16.8 of this lesson for specific values for this operand.

SESTYPE = type - This operand required for some TRMTYPES. Together they describe the LU session type. The SESTYPE operand is required by only certain parameters in the TRMTYPE operand. Table 1 shows the relationship between the two operands.

ACCMETH = VTAM - This identifies which access method will be used by the terminal. For SNA the access method will be VTAM

BRACKET = yes or no - This indicates whether bracket protocol will be used. The default is YES. 3614 logical units require NO; 3790 LUs require YES. For LU2 sessions, bracket protocol 'yes' is assumed.

BUFFER = size - This operand identifies the largest RU size (in bytes) outbound from the PLU to the SLU. The suggested value for LU2 devices is 1536. The suggested value for LU1 printers and LU3 devices is 256. This value is used by CICS for determining the use of chaining protocol.

CHNASSY = yes or no - this defines whether the elements of a chain will be assembled before being passed to the application work area or whether each element will be passed to the work area as it is received. For 3270 CRTs (LUTYPE2) CHNASSY must be YES.

CONNECT = (auto) - This defines that the terminal will be automatically logged on by CICS/VS at start of day. If an automatic logon is not required, the operand should not be included. This operand will cause CICS to attempt to establish an LU-LU session.

DEFSCRN = (#lines, #columns) - This defines the screen size. The number of lines is followed by the number of columns. This refers to both CRT size and printer page size. Default is 24 rows, 80 columns.

FEATURE = (feature, ...) This **optional** parameter identifies the capabil-ities of the LU device. Some of the more common are:

AUDALARM - audible alarm
PS - programmed symbols
Color - color CRT
HILIGHT - extended highlighting features

FF = (yes or no) - This defines whether the SCS printer (LU1) supports the form feed characters.

GMMSG = yes or no - This tells whether or not CICS should send a welcome message at session establishment time.

LOGMODE = name - This entry is required for LUs that will be acquired (ex: printers) or that will be automatically logged on.

NETNAME = name - VTAM gen label name identifying the logical name by which the device is known throughout the network.

PGESTAT = (autopage or page) - This identifies when output data will be sent to the terminal. Autopage causes all of the data to be sent to the terminal at once. PAGE causes data to be sent one page at a time. PAGE is the default.

RELREQ = (yes or no, yes or no) - The first position identifies whether CICS will release the LU when requested by another subsystem. The second position identifies whether CICS will release the LU when requested by the LU (logoff, signoff, etc.)

RUSIZE = size - This specifies the largest RU size (in bytes) outbound from the SLU to the PLU. 256 bytes is the default.

TIOAL = (length1, length2) - Length 1 specifies the normal chain size. Length 2 specifies the maximum chain size. If the CHNASSY operand is NO, only length 1 is needed. This indicates the amount of buffer space to allocate in the CICS work area.

TRMMODL = number - Optional parameter identifying the model number of the LU device.

TRMSTAT = This identifies the type of activities that may be performed by the device. The possibilities are

- TRANSACTION (input/output)
- INPUT (to CICS)
- RECEIVE (from CICS)
- TRANSCEIVE (input/output and CICS may start bracket)

PIPELN = (last or pool) - This is only used when SESTYPE =PIPELN and TRMTYPE =3600. POOL means the LU is one of a pool of pipeline LUs. LAST means this is the last in the pool of pipeline LUs.

TASKNO = number - This is required only if SESTYPE = PIPELN and PIPELN = LAST. It identifies the number of concurrent tasks that may run in the pipeline session.

ALTSCRN - (# lines, # columns) - this defines an alternate screen size (CRT LU2) and reserves an extra buffer.

CLUSTER CONTROLLER	LOGICAL UNIT	TRMTYPE=	SESTYP
3270	DISPLAY STATION-LU2	LUTYPE2	-
	3270 DS PRINTER-LU3	LUTYPE3	-
	SCS PRINTER	SCSPRT	-
3600	3601	3600	-
	3614	3614	-
3650	PIPELINE	3650	PIPELN
	HOST CONVERSATIONAL	3650	3270
	HOST CONVERSATIONAL	3650	3653
	INTERPRETER	3650	USERPROG
	HOST COMMAND PROCESSOR	3650	USERPROG
3770	INTERACTIVE FLIP-FLOP	3770I or INTLU	
	INTERACTIVE CONTENTION	3770C	
	BATCH FLIP-FLOP	3770, 3770B, or BCHLU	
	FULL FUNCTION	3770 or 3770B	USERPROG
	BATCH DATA INTERCHANGE	3770	BATCHDI
3790	FULL FUNCTION	3790	USERPROG
	INQUIRY	3790	-
	BATCH DATA INTERCHANGE	3790	BATCHDI
	3270 DISPLAY	3790, LUTYPE2	3277CM
	3270 PRINTER	3790, LUTYPE3	3284CM,3286C
	SCS PRINTER	3790, SCSPRT	SCSPRT

TABLE 1 TRMTYPE and SESTYPE

PARAMETER CATEGORIZATION

The TCT operands may be grouped according to their functions:

- **Identification** - TRMIDNT, TRMMODL, NETNAME, SESTYPE, TRMTYPE
- **Data Flow** - BRACKET, BUFFER, CONNECT, RUSIZE, RELREQ, GMMSG
- **Display** - FEATURES
- **Screen** - DEFSCRN, PGESTAT, FF, ALTSCRN
- **Transaction Processing** - TRMSTAT

Sample TCT Entries For A Worksaver

A typical terminal TCT entry emulating an IBM 3276 display workstation.

```
VLU2     DFHTCT     TYPE=TERMINAL,
                    TRMIDNT=VLU2,
                    TRMTYPE=LUTYPE2,
                    TRMMODL=2,
                    ACCMETH=VTAM,
                    TRMSTAT=TRANSCEIVE,
                    TIOAL=(1000,4000),
                    BUFFER=1536,
                    RUSIZE=256,
                    BRACKET=YES,
                    CHNASSY=YES,
                    RELREQ=(NO,YES),
                    DEFSCRN=(24,80)
                    NETNAME=LU2A
```

A typical terminal TCT entry emulating an IBM 3287 DSC printer.

```
VLU3     DFHTCT     TYPE=TERMINAL
                    TRMIDNT=VLU3,
                    TRMTYPE=LUTYPE3,
                    TRMMODL=2,
                    TIOAL=(2000,4000),
                    BUFFER=256,
                    RUSIZE=256,
                    CHNASSY=YES,
                    RELREQ=(NO,YES),
                    ACCMETH=VTAM,
                    NETNAME=LU3A
```

REVIEW LESSON 16

1. Prepare a CICS Terminal Control Table (TCT) entry for the follwoing terminal which is emulating an IBM 3278 terminal.

- Bracket and chaining protocol is required.
- The maximum outbound RU size of CICS is 1024 bytes.
- The normal chain size is 1000. The maximum chain size is 2000.
- The terminal screen is 24 lines with 80 columns per line.
- The terminal is to be automatically connected to CICS at start-of-day, using session parameters found in the logmode entry of **dsilymode**.
- The RU message size sent by the terminal cannot exceed 256 bytes.
- CICS should not release the logical unit when requested by another subsystem, but should release it when the SLU requests that the session with CICS be terminated.
- CICS refers to this logical unit as CLUA.
- VTAM refers to this logical unit as TSTCLUA.
- The CRT will be used for transactions and should be able to receive messages from CICS at any time.
- The CRT supports extended highlighting features and color.

2. The CICS TCT entry for CAS2L01 is below. Identify the changes that must be made so that the TCT entry will be correct. The maximum outbound RU size by either LU is 512. The normal screen size is 24 x 80, and the alternate screen size is 32 x 80.

```
CA11  DFHTCT  TYPE = TERMINAL
              ACCMETH = VTAM
              TRMTYPE = LUTYPE3
              NETNAME = CAS2LO1
              TIOAL = (1000, 4000)
              GMMSG = YES
              RELREQ = (NO, YES)
              TRMIDNT = CA11
              BRACKET = YES
              TRMMODL = 2
              PGESTAT = AUTOPAGE
              RUSIZE =256
              BUFFER = 256
              CHNASSY = YES
              TRMSTAT = TRANSCEIVE
```

LESSON 17: NCCF GENERATION

PURPOSE

This lesson identifies the information that must be provided to the systems programmer to define NCR products to NCCF in an SNA network.

OBJECTIVES

After completing this lesson, the student will be able to:

- o Identify the information necessary for the system programmer to properly describe NCR products in the network.

REFERENCES

- o Network Communications Control Facility: Installation, IBM SC27-0430
- o Network Communications Control Facility: Terminal Use, IBM SC27-0432

INTRODUCTION

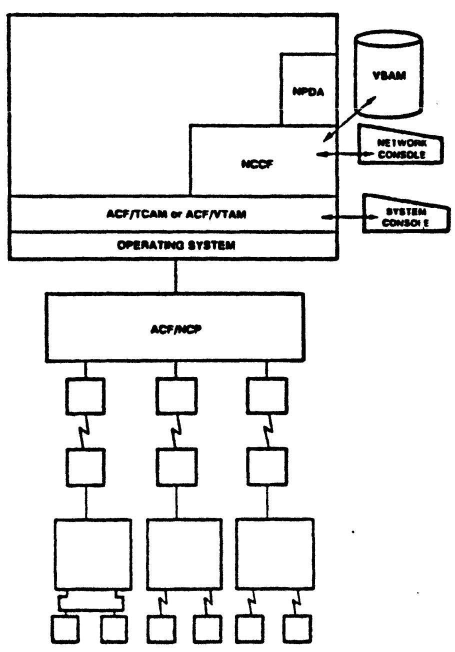
NCCF has three major functions. They are:

- o Providing **network management**
- o Providing an **interface** for a network console(s)
- o Providing a **base** for other network management software

NCCF has several areas that must be defined during the sysgen process in addition to defining the devices that will access it throughout the network.

These include:

- o **Operators** - identifies user of NCCF
- o **Profiles** - describes a network operator's control characteristics
- o **Commands** - limits operator's use of commands
- o **Command Processors** - program executed to perform an operation
- o **User Exit routines** - special purpose routines to handle processing for certain conditions in a program
- o **Other CNMAs** - network monitoring functions
- o **System Information** - information used by NCCF as a whole.



NCCF GEN STATEMENTS

Defining NCR PU-T2 Products

NCCF uses the VTAM information to determine what devices exist in the network. No extra coding is required for NCCF to define the PU-T2 products.

You may set an operand called **SPAN** in the VTAM or NCP gens to organize NAUs into logical groupings for network control purposes.

Defining OPERATORS:

Two macros are used to define the operators that may use NCCF.

```
opid      OPERATOR      PASSWORD=
          PROFILEN      profile name, ...
```

opid - 1-8 character value for operator identification.
password - 1-8 character value that serves as the operator's password.

Defining PROFILES:

Several macros may be used to define the **PROFILES.** The Profile identifies the scope of commands, the span of control, the device to output the hardcopy log to, and the NCCFs in different domains the operator may have sessions with.

The macros include:

PROFILE - defines profile name to the system
DOMAINS identifies NCCF(s) in other domains that an operator may have a session with.
AUTH -identifies the authority of an operator over the resources and message reception.
OPCLASS - defines which NCCF an operator may use
ISPAN -identifies the initial resources in the network an operator may access
SPAN -identifies the resources that can be effected after dynamically stopping the ISPAN and starting the SPAN
END

Defining CONSOLES to NCCF

The POS and POSPOOL macros are used to identify resources to NCCF, specifically which CRTs may be used to logon to NCCF.

- o POS -defines the terminals that may logon to NCCF
- o POSPOOL - identifies the maximum number of physical operators which may logon to NCCF at one time.

POS identifies specifically which terminals may be used to logon to NCCF.

label POS terminal name, terminal name, ...

The terminal name is the VTAM network name.

REMEMBER -- NCCF requires an LU2 session for CRT but an LU1 session for hardcopy log (printer).

CUSTOMIZING NCCF

CLISTs are coded using a special language and are stored in one of the NCCF libraries.

Command processors and User Exit Routines are coded in assembler and must be assembled and link edited with NCCF.

APPENDIX A

SYSGEN GENERATION LISTINGS

NCP LISTING .... PAGE A.3

VTAM LISTING .... PAGE A.9

VTAM TABLES .... PAGE A.13

CICS DEFINITIONS ...... PAGE A.17

NCCF DEFINITIONS ...... PAGE A.21

JES2 DEFINITIONS ...... PAGE A.25

NCP LISTINGS

HOST LISTING

SWITCHED NODE

LEASED NODE

```
DATASET: SYS1.VTAMLST                                                      DATE: 84/12/28              PRODEXT
MEMBER:  PRODEXT                                                           TIME: 10:19
                                                                           PAGE: 1
START
 COL   ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8

   1   HOST1    PCCU  CUADDR=031,                                         *
  16                  BACKUP=YES,                                          *
  16                  OWNER=SSCP40,                                        *
  16                  SUBAREA=40,                                          *
  16                  MAXDATA=2184
   1   *
   1   HOST2    PCCU  CUADDR=032,                                         *
  16                  BACKUP=YES,                                          *
  16                  OWNER=SSCP41,                                        *
  16                  SUBAREA=41,                                          *
  16                  MAXDATA=2184
   1   *
   1   HOST3    PCCU  CUADDR=034,                                         *
  16                  BACKUP=YES,                                          *
  16                  OWNER=SSCP42,                                        *
  16                  SUBAREA=42,                                          *
  16                  MAXDATA=2184
   1   *
   1   HOST4    PCCU  NCPLUB=SYS012,                                      *
  16                  CUADDR=035,                                          *
  16                  BACKUP=YES,                                          *
  16                  OWNER=SSCP43,                                        *
  16                  SUBAREA=43,                                          *
  16                  MAXDATA=2184
   1   *
   1   HOST5    PCCU  CUADDR=036,                                         *
  16                  BACKUP=YES,                                          *
  16                  OWNER=SSCP01,                                        *
  16                  SUBAREA=1,                                           *
  16                  MAXDATA=2184
   1   *
   1   *
  10            BUILD LOADLIB=LOADLIB,                                     *
  16                  ABEND=YES,                                           *
  16                  ENABLTO=120,                                         *
  16                  NEWNAME=PRODEXT,                                     *
  16                  QUALIFY=SYS2,                                        *
  16                  MAXSUBA=63,                                          *
  16                  MAXSSCP=1,                                           *
  16                  SUBAREA=21,                                          *
  16                  TYPGEN=NCP,                                          *
  16                  CA=(TYPE4),                                          *
  16                  CHANTYP=TYPE4,                                       *
  16                  TRANSFR=16,                                          *
  16                  BFRS=128 RRT=ACF,INTF=(2*36)
   1   *
  10            SYSCNTRL OPTIONS=(RIMM,RCOND,MODE,RECMD,BHSASSC,ENDCALL,  *
  16                  RCNTRL)
   1   *
   1   HOST5N   HOST  SUBAREA=(1),                                        *
  16                  INBFRS=7,                                            *
  16                  MAXBFRU=20,                                          *
  16                  UNITSZ=384,                                          *
  16                  BFRPAD=0,                                            *
```

```
        DATASET: SYS1.VTAMLST                                            DATE: [illegible]
        MEMBER:  PRODEXT                                                 TIME: 10:19
                                                                         PAGE: 2
 START
  COL   ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8

  16                  DELAY=2,                                                  *
  16                  STATMOD=YES,                                              *
  16                  TIMEOUT=840.0
   1    *
   1    SUB21    PATH ADJSUB=(20),                                              *
  16                  DESTSUB=(40,2,3)   .PATH TO FIND VS1(40),DAYREM(2) AND    *
   1    *                                                  .TORREM(3)
   1    *
  10             LUDRPOOL NUMTYP2=75
   1    *
   1    ************************************************************************
   1    *        SWITCHED  SDLC  LINES
   1    ************************************************************************
   1    *
   1    MVSGPSW  GROUP DIAL=YES,                                                *
  16                  LNCTL=SDLC,                                               *
  16                  LIDLE=MARKS,                                              *
  16                  NRZI=NO,                                                  *
  16                  REPLYTO=5,                                                *
  16                  TYPE=NCP
   1    *
   1    *
   1    LN47     LINE OWNER=SSCP01,                                             *
  16                  ADDRESS=(047),                                            *
  16                  SPEED=2400,                                               *
  16                  CLOCKNG=EXT,                                              *
  16                  NEWSYNC=NO         .DAYTON FIELD SERV--QUINLAN .PP 18/2/C
   1    *
   1    DAY47PU  PU   MAXLU=8,                                                  *
  16                  PUTYPE=(2)                       .SWNODE-SW7950
   1    *
   1    *
   1    LN4D     LINE OWNER=SSCP01,                                             *
  16                  ADDRESS=(04D),                                            *
  16                  SPEED=4800,                                               *
  16                  CLOCKNG=EXT,                                              *
  16                  NEWSYNC=NO      .NCR WATERLOO--NCR 5094'S (IBM 3770 RJE)
   1    *
   1    WAT4DPU  PU   MAXLU=8,                                                  *
  16                  PUTYPE=(2)                       .SWNODE-SWRJEPC
   1    *
   1    *
   1    LN4E     LINE OWNER=SSCP01,                                             *
  16                  ADDRESS=(04E),                                            *
  16                  SPEED=4800,                                               *
  16                  CLOCKNG=EXT,                                              *
  16                  NEWSYNC=NO      .NCR WATERLOO--NCR 5094'S (IBM 3770 RJE)
   1    *
   1    WAT4EPU  PU   MAXLU=8,                                                  *
  16                  PUTYPE=(2)                       .SWNODE-SWRJEPC
   1    *
   1    *
   1    LN50     LINE OWNER=SSCP01,                                             *
  16                  ADDRESS=(050),                                            *
```

```
         DATASET: SY61.VTAMLST                                          DATE: 84/12/28                     PRODEXT
         MEMBER:  PRODEXT                                               TIME: 10:19
                                                                        PAGE: 8
START
COL      ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8

 16                    MODETAB=LMTABL,USSTAB=JKTINCDT,ISTATUS=INACTIVE
  1      *
  1      *
  1      ***********************************************************************
  1      *  COMM ENGINEERING:  NCR TOWER AS PU.T2 -- B.PHIPPS (ADVANCED ENG)
  1      *  TSO ACCESS
  1      *  TO CIRCUITS IQ SEC17358 AND IQ SEC17357, RESPECTIVELY
  1      ***********************************************************************
  1      *
  1      LN58     LINE  OWNER=SSCPO1,ADDRESS=(058),SPEED=2400,CLOCKNG=EXT,        *
 16                    NEWSYNC=NO
  1      *
  1      SOT058   SERVICE ORDER=(CT58P1)
  1      *
  1      CT58P1   PU    ADDR=A1,PUTYPE=2,MAXDATA=265,MAXOUT=7,PASSLIM=7
  1      *                                    .NCR TOWER (IBM 3274)
  1      *
  1      CT581LO1 LU    LOCADDR=2,PACING=(2,1),     .NCR 7958 (IBM 3278 DISP)     *
 16                    MODETAB=LMTABL,USSTAB=JKTINCDT
  1      CT581LO2 LU    LOCADDR=3,PACING=(2,1),     .NCR 7958 (IBM 3278 DISP)     *
 16                    MODETAB=LMTABL,USSTAB=JKTINCDT
  1      CT581LO3 LU    LOCADDR=4,PACING=(2,1),     .NCR 7958 (IBM 3278 DISP)     *
 16                    MODETAB=LMTABL,USSTAB=JKTINCDT
  1      CT581LO4 LU    LOCADDR=5,PACING=(2,1),     .NCR 7958 (IBM 3278 DISP)     *
 16                    MODETAB=LMTABL,USSTAB=JKTINCDT
  1      CT581LO5 LU    LOCADDR=6,PACING=(2,1),     .NCR 7958 (IBM 3278 DISP)     *
 16                    MODETAB=LMTABL,USSTAB=JKTINCDT
  1      CT581LO6 LU    LOCADDR=7,PACING=(2,1),     .NCR 7958 (IBM 3278 DISP)     *
 16                    MODETAB=LMTABL,USSTAB=JKTINCDT
  1      CT581LO7 LU    LOCADDR=8,PACING=(2,1),     .NCR 7958 (IBM 3278 DISP)     *
 16                    MODETAB=LMTABL,USSTAB=JKTINCDT
  1      CT581LO8 LU    LOCADDR=9,PACING=(2,1),     .NCR 7958 (IBM 3278 DISP)     *
 16                    MODETAB=LMTABL,USSTAB=JKTINCDT
  1      *
  1      *
  1      ***********************************************************************
  1      *
  1      MVSGP2   GROUP DIAL=NO,LNCTL=SDLC,CLOCKNG=EXT,DUPLEX=FULL,SPEED=1200,    *
 16                    LIDLE=MARKS,TYPE=NCP
  1      *
  1      ***********************************************************************
  1      *          E & M DAYTON -- F. MILLER  XREF DAYLNO50 FOR NRZ SWITCH LINE
  1      *                                (LN 051 TO DSEC176237)
  1      ***********************************************************************
  1      *
  1      DA51     LINE  OWNER=SSCPO1,ADDRESS=(051),SPEED=1200,        ...NRZ GROUP  *
 16                    CLOCKNG=EXT,NRZI=NO
  1      *
  1      SOT51    SERVICE ORDER=(DA51P1,DA51P2,DA51P3,DA51P4)
  1      *
  1      DA51P1   PU    ADDR=C2,PUTYPE=(2),MAXDATA=265,MAXOUT=7,PASSLIM=7
  1      *
  1      DA511LO1 LU    LOCADDR=1
  1      DA511LO2 LU    LOCADDR=2
```

```
START
 COL  ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8

  1   DA511L03 LU     LOCADDR=3
  1   DA511L04 LU     LOCADDR=4,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA511L05 LU     LOCADDR=5,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA511L06 LU     LOCADDR=6,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA511L07 LU     LOCADDR=7,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA511L08 LU     LOCADDR=8,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA511L09 LU     LOCADDR=9,PACING=(2,1),            .IBM 3287 EMULATION PRT  *
 16                   MODETAB=LMTABL,DLOGMOD=S3287
  1   DA511L10 LU     LOCADDR=10                           .RJE IBM-LIKE 3770
  1   *
  1   DA51P2   PU     ADDR=C3,PUTYPE=(2),MAXDATA=265,MAXOUT=7,PASSLIM=7
  1   *
  1   DA512L01 LU     LOCADDR=1                               LU.TO WORK STA
  1   DA512L02 LU     LOCADDR=2                               LU.TO WORK STA
  1   DA512L03 LU     LOCADDR=3                               LU.TO WORK STA
  1   DA512L04 LU     LOCADDR=4,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA512L05 LU     LOCADDR=5,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA512L06 LU     LOCADDR=6,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA512L07 LU     LOCADDR=7,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA512L08 LU     LOCADDR=8,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA512L09 LU     LOCADDR=9,PACING=(1,1),VPACING=1,       LU.T3 IBM 3287 EM *
 16                   MODETAB=LMTABL,DLOGMOD=S3287
  1   DA512L10 LU     LOCADDR=10,PACING=(1,1),VPACING=1       LU.T1 RJE 3770 EM
  1   *
  1   DA51P3   PU     ADDR=C4,PUTYPE=(2),MAXDATA=265,MAXOUT=7,PASSLIM=7
  1   *
  1   DA513L01 LU     LOCADDR=1                               LU.TO WORK STA
  1   DA513L02 LU     LOCADDR=2                               LU.TO WORK STA
  1   DA513L03 LU     LOCADDR=3                               LU.TO WORK STA
  1   DA513L04 LU     LOCADDR=4,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA513L05 LU     LOCADDR=5,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA513L06 LU     LOCADDR=6,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA513L07 LU     LOCADDR=7,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA513L08 LU     LOCADDR=8,PACING=(1,1),VPACING=1,       LU.T2 IBM 3270 EM *
 16                   MODETAB=LMTABL,USSTAB=JKTINCDT
  1   DA513L09 LU     LOCADDR=9,PACING=(1,1),VPACING=1,       LU.T3 IBM 3287 EM *
 16                   MODETAB=LMTABL,DLOGMOD=S3287
  1   DA513L10 LU     LOCADDR=10,PACING=(1,1),VPACING=1       LU.T1 RJE 3770 EM
  1   *
  1   DA51P4   PU     ADDR=C5,PUTYPE=(2),MAXDATA=265,MAXOUT=7,PASSLIM=7
```

VTAM LISTINGS

SWITCHED NODE

```
**********************************************************************
*       CASE SWITCHED MAJOR NODE DEFINITIONS
*             CONTACT MEL MARSH
*             VALID 14OCT85
*
*
**********************************************************************
        VBUILD TYPE=SWNET
CASP1   PU    ADDR=C2,IDBLK=017,IDNUM=00453,DISCNT=NO,MAXDATA=265,     X
              PUTYPE=2,MAXOUT=7,PASSLIM=7,        .NCR 7954 (IBM3274)  X
              SPAN=(SPAN10)
CAS1LO1 LU    LOCADDR=2,SPAN=(SPAN10),                                 X
              MODETAB=LMCASE,USSTAB=CASUSSTB    .NCR 7958 (IBM3278)
CAS1LO2 LU    LOCADDR=3,SPAN=(SPAN10),                                 X
              MODETAB=LMCASE,USSTAB=CASUSSTB    .NCR 7958 (IBM3278)
CAS1LO3 LU    LOCADDR=4,SPAN=(SPAN10),                                 X
              MODETAB=LMCASE,USSTAB=CASUSSTB    .NCR 7958 (IBM3278)
CAS1LO4 LU    LOCADDR=5,SPAN=(SPAN10),PACING=(2,1),VPACING=2,          X
              MODETAB=LMCASE2                   .NCR 7957 (IBM3287)
CAS1LO5 LU    LOCADDR=6,SPAN=(SPAN10),                                 X
              MODETAB=LMCASE,USSTAB=CASUSSTB    .NCR 7958 (IBM3278)
CAS1LO6 LU    LOCADDR=7,SPAN=(SPAN10),PACING=(2,1),VPACING=2,          X
              MODETAB=LMCASE2                   .NCR 7957 (IBM3287)
*
CASP2   PU    ADDR=C3,IDBLK=018,IDNUM=00454,DISCNT=NO,MAXDATA=265,     X
              PUTYPE=2,MAXOUT=7,PASSLIM=7,SPAN=(SPAN10)
*                                    .NCR WORKSAVER (IBM3276)
CAS2LO1 LU    LOCADDR=2,SPAN=(SPAN10),MODETAB=LMCASE,                  X
              USSTAB=CASUSSTB                .NCR WORKSAVER (IBM3278)
CAS2LO2 LU    LOCADDR=3,SPAN=(SPAN10),MODETAB=LMCASE,                  X
              USSTAB=CASUSSTB                .NCR WORKSAVER (IBM3278)
CAS2LO3 LU    LOCADDR=4,SPAN=(SPAN10),MODETAB=LMCASE,                  X
              USSTAB=CASUSSTB                .NCR WORKSAVER (IBM3278)
CAS2LO4 LU    LOCADDR=5,SPAN=(SPAN10),MODETAB=LMCASE,PACING=(2,1),     X
              USSTAB=CASUSSTB,VPACING=2      .NCR WORKSAVER (IBM3287)
CAS2LO5 LU    LOCADDR=6,SPAN=(SPAN10),                                 X
              MODETAB=LMCASE,USSTAB=CASUSSTB    .NCR 7954 (IBM3278)
CAS2LO6 LU    LOCADDR=7,SPAN=(SPAN10),PACING=(2,1),VPACING=2,          X
              MODETAB=LMCASE                    .NCR 7957 (IBM3287)
*
CASP3   PU    ADDR=C4,IDBLK=018,IDNUM=00455,DISCNT=NO,MAXDATA=265,     X
              PUTYPE=2,MAXOUT=7,PASSLIM=7,SPAN=(SPAN10),               X
              MODETAB=LMCASE,USSTAB=CASUSSTB  .NCR ITX (IBM3276/3770)
CAS3LO2 LU    LOCADDR=2                       .NCR ITX (IBM3278)
CAS3LO3 LU    LOCADDR=3                       .NCR ITX (IBM3278)
CAS3LO4 LU    LOCADDR=4,PACING=(2,1),VPACING=2  .JES RMT8,IBM 3770 RJE
CAS3LO5 LU    LOCADDR=5                       .NCR ITX (IBM3278)
CAS3LO6 LU    LOCADDR=6                       .NCR ITX (IBM3278)
CAS3LO7 LU    LOCADDR=7                       .NCR ITX (IBM3278)
*
CASP4   PU    ADDR=C5,IDBLK=017,IDNUM=00456,DISCNT=NO,MAXDATA=512,     X
              PUTYPE=2,MAXOUT=7,PASSLIM=7         .NCR 7954 (IBM3274)
CAS4LO1 LU    LOCADDR=2,                                               X
              MODETAB=LMCASE,USSTAB=CASUSSTB    .NCR 7958 (IBM3278)
CAS4LO2 LU    LOCADDR=3,                                               X
              MODETAB=LMCASE,USSTAB=CASUSSTB    .NCR 7958 (IBM3278)
CAS4LO3 LU    LOCADDR=4,                                               X
              MODETAB=LMCASE,USSTAB=CASUSSTB    .NCR 7958 (IBM3278)
CAS4LO4 LU    LOCADDR=5,PACING=(2,1),VPACING=2,                        X
              MODETAB=LMCASE2                   .NCR 7957 (IBM3287)
CAS4LO5 LU    LOCADDR=6,                                               X
```

```
                 MODETAB=LMCASE,USSTAB=CASUSSTB      .NCR 7958 (IBM3278)
AS4L06   LU      LOCADDR=7,PACING=(2,1),VPACING=2,                          X
                 MODETAB=LMCASE2                     .NCR 7957 (IBM3287)

ASP5     PU      ADDR=C6,IDBLK=017,IDNUM=00457,DISCNT=NO,MAXDATA=265,       X
                 PUTYPE=2,MAXOUT=7,PASSLIM=7,SPAN=(SPAN10),                 X
                 MODETAB=LMCASE,USSTAB=CASUSSTB
AS5L01   LU      LOCADDR=2
AS5L02   LU      LOCADDR=3
AS5L03   LU      LOCADDR=4
AS5L04   LU      LOCADDR=5
AS5L05   LU      LOCADDR=6,PACING=(2,1),VPACING=2      .JES (RMT32)
AS5L06   LU      LOCADDR=7,MODETAB=LMCASE2
AS5L07   LU      LOCADDR=8,MODETAB=LMCASE2

ASP6     PU      ADDR=C7,IDBLK=017,IDNUM=00458,DISCNT=NO,MAXDATA=265,       X
                 PUTYPE=2,MAXOUT=7,PASSLIM=7,SPAN=(SPAN10),                 X
                 MODETAB=LMCASE,USSTAB=CASUSSTB
AS6L01   LU      LOCADDR=2
AS6L02   LU      LOCADDR=3
AS6L03   LU      LOCADDR=4
AS6L04   LU      LOCADDR=5
AS6L05   LU      LOCADDR=6,PACING=(2,1),VPACING=2      .JES (RMT33)
AS6L06   LU      LOCADDR=7,MODETAB=LMCASE2
AS6L07   LU      LOCADDR=8,MODETAB=LMCASE2

ASP7     PU      ADDR=C8,IDBLK=018,IDNUM=00459,DISCNT=NO,MAXDATA=265,       X
                 PUTYPE=2,MAXOUT=7,PASSLIM=7,SPAN=(SPAN10),                 X
                 MODETAB=LMCASE,USSTAB=CASUSSTB
AS7L01   LU      LOCADDR=2
AS7L02   LU      LOCADDR=3
AS7L03   LU      LOCADDR=4
AS7L04   LU      LOCADDR=5
AS7L05   LU      LOCADDR=6,PACING=(2,1),VPACING=2      .JES (RMT34)
AS7L06   LU      LOCADDR=7,MODETAB=LMCASE2
AS7L07   LU      LOCADDR=8,MODETAB=LMCASE2

ASP8     PU      ADDR=C9,IDBLK=018,IDNUM=00460,MAXDATA=265,MAXOUT=7,        X
                 PUTYPE=1,SPAN=(SPAN10),                                    X
                 MODETAB=LMCASE,USSTAB=CASUSSTB
AS8L01   LU      LOCADDR=2
AS8L02   LU      LOCADDR=3
```

VTAM TABLES

LMCASE

LMCASE2

CASUSSTAB

```
/SP38MODE JOB (0615,6196),'YAHN,N=SP38',NOTIFY=SP38,
/ TIME=99,CLASS=A,MSGCLASS=E,MSGLEVEL=(1,1),
/ USER=SP38,PASSWORD=SP38PW
/*THIS IS A TABLE CREATED ON 10 AUG 84 FOR CASE SNA CLASSES
/*IT WILL INCLUDE BAD LOGMODES FOR LEARNING PURPOSES  H NELSON
/*ADDED ENTRY FOR RJE ("RJE") 12/18/84.  (SPY)
*ROUTE PRINT MYRDR
/MODE  EXEC ASMFCL,
/  REGION.ASM=1024K,
/  PARM.ASM='LIST,NODECK,OBJECT,TERM,BUFSIZE(MAX)',  ¬ XREF(FULL),RENT
/  REGION.LKED=384K,
/  PARM.LKED='LIST,XREF,REFR,REUS,SIZE=(320K,12K)'  NOT RENT
/ASM.SYSTERM DD SYSOUT=E
/ASM.SYSPRINT DD SYSOUT=E
/ASM.SYSPUNCH DD DUMMY
/ASM.SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR
/*          DD DSN=SYS1.VTAMLIB,DISP=SHR
/ASM.SYSIN DD *
MCASE   MODETAB
BMS3270 MODEENT LOGMODE=S3270,FMPROF=X'02',TSPROF=X'02',                X
              PRIPROT=X'71',SECPROT=X'40',COMPROT=X'2000'
SILGMOD MODEENT LOGMODE=DSILGMOD,FMPROF=X'03',TSPROF=X'03',             X
              PRIPROT=X'B1',SECPROT=X'A0',COMPROT=X'3080',              X
              RUSIZES=X'8787',PSERVIC=X'020000000000000000000200'
BMS3278 MODEENT LOGMODE=S3278,FMPROF=X'03',TSPROF=X'03',                X
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',              X
              RUSIZES=X'8587',PSERVIC=X'020000000000000000000200'
M3278   MODEENT LOGMODE=RM3278,FMPROF=X'03',TSPROF=X'03',               X
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',              X
              RUSIZES=X'8800',PSERVIC=X'020000000000000000000000'
ESTA    MODEENT LOGMODE=TESTA,FMPROF=X'03',TSPROF=X'03',                X
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',              X
              RUSIZES=X'F8F8',PSERVIC=X'020000000000000000000200'
ESTB    MODEENT LOGMODE=TESTB,FMPROF=X'02',TSPROF=X'02',                X
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',              X
              RUSIZES=X'8587',PSERVIC=X'020000000000000000000200'
TESTC   MODEENT LOGMODE=TESTC,FMPROF=X'03',TSPROF=X'03',                X
              PRIPROT=X'71',SECPROT=X'40',COMPROT=X'3080',              X
              RUSIZES=X'8587',PSERVIC=X'020000000000000000000200'
TESTD   MODEENT LOGMODE=TESTD,FMPROF=X'03',TSPROF=X'03',                X
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',              X
              RUSIZES=X'8587',PSERVIC=X'010000000000000000000200'
PRT3287 MODEENT LOGMODE=PRT3287,FMPROF=X'03',TSPROF=X'03',              X
              PRIPROT=X'21',SECPROT=X'90',COMPROT=X'3080',              X
              RUSIZES=X'8587',PSERVIC=X'030000000000000000000000'
PRT7401 MODEENT LOGMODE=PRT7401,FMPROF=X'03',TSPROF=X'03',              X
              PRIPROT=X'B1',SECPROT=X'A0',COMPROT=X'3080',              X
              RUSIZES=X'8587',PSERVIC=X'01000000E100000000000000'
PCA     MODEENT LOGMODE=PCA,FMPROF=X'03',TSPROF=X'03',                  X
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',              X
              RUSIZES=X'87F8',PSERVIC=X'02C0000000000185000007E00'
PCB     MODEENT LOGMODE=PCB,FMPROF=X'03',TSPROF=X'03',                  X
              PRIPROT=X'A1',SECPROT=X'A1',COMPROT=X'7080',              X
              RUSIZES=X'8585',PSERVIC=X'01100000F100C00000010040'
RJE     MODEENT LOGMODE=RJE,FMPROF=X'03',TSPROF=X'03',                  X
              PRIPROT=X'A3',SECPROT=X'A3',COMPROT=X'7080',              X
              SSNDPAC=X'00',SRCVPAC=X'01',RUSIZES=X'8585',              X
              PSNDPAC=X'01',PSERVIC=X'01112000F100C00000010040',        X
              ENCR=X'00'
        MODEEND
```

```
//SP38MODE JOB (8615,6196),'YAHN,N=SP38',NOTIFY=SP38,
// TIME=99,CLASS=A,MSGCLASS=E,MSGLEVEL=(1,1),
// USER=SP38,PASSWORD=2954
//*THIS IS A TABLE CREATED ON 12/18/84 FOR CASE SNA CLASSES.  (SPY)
/*ROUTE PRINT MYRDR
//MODE  EXEC ASMFCL,
//  REGION.ASM=1024K,
//  PARM.ASM='LIST,NODECK,OBJECT,TERM,BUFSIZE(MAX)',   ¬ XREF(FULL),RENT
//  REGION.LKED=384K,
//  PARM.LKED='LIST,XREF,REFR,REUS,SIZE=(320K,12K)'  NOT RENT
//ASM.SYSTERM DD SYSOUT=E
//ASM.SYSPRINT DD SYSOUT=E
//ASM.SYSPUNCH DD DUMMY
//ASM.SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR                                00010001
//*            DD DSN=SYS1.VTAMLIB,DISP=SHR                             00020001
//ASM.SYSIN DD *                                                        00030001
LMCASE2  MODETAB                                                        00040000
DSILGMOD MODEENT LOGMODE=DSILGMOD,FMPROF=X'03',TSPROF=X'03',           X00050000
               PRIPROT=X'B1',SECPROT=X'A0',COMPROT=X'3080',            X00060000
               PSNDPAC=X'02',SSNDPAC=X'02',                            X00070000
               RUSIZES=X'8787',PSERVIC=X'01000000B1000000000000000'     00080000
RM3278   MODEENT LOGMODE=RM3278,FMPROF=X'03',TSPROF=X'03',             X00090000
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',            X00100000
               RUSIZES=X'8800',PSERVIC=X'020000000000000000000000'      00110000
RM3287   MODEENT LOGMODE=RM3287,FMPROF=X'03',TSPROF=X'03',             X00120000
               PRIPROT=X'71',SECPROT=X'40',COMPROT=X'2000'              00130000
         MODEEND                                                        00140000
```

```
//SP38USST JOB (8615,6196),'YAHN,N=SP38',REGION=1024K,
//      MSGLEVEL=(1,1),MSGCLASS=E,CLASS=A,TIME=4,
//      USER=SP38,PASSWORD=XXXX
/*JOBPARM  L=199,C=0
/*ROUTE  PRINT MYRDR
//USSTAB   EXEC  ASMFCL,
//   REGION.ASM=1024K,
//   PARM.ASM='LIST,NODECK,OBJECT,TERM,BUFSIZE(MAX)',   ¬ XREF(FULL),RENT
//   REGION.LKED=384K,
//   PARM.LKED='LIST,XREF,REFR,REUS,SIZE=(320K,12K)'  NOT RENT
//ASM.SYSUT1    DD  UNIT=VIO,SPACE=(CYL,(2,2))
//ASM.SYSTERM   DD  SYSOUT=E
//ASM.SYSPRINT  DD  SYSOUT=E
//ASM.SYSIN     DD  *
CASUSSTB USSTAB TABLE=CIOTRANS
LOGON    USSCMD CMD=LOGON,FORMAT=PL1
         USSPARM PARM=APPLID
         USSPARM PARM=LOGMODE
         USSPARM PARM=P1,REP=DATA
TSO      USSCMD CMD=TSO,FORMAT=BAL,REP=LOGON
         USSPARM PARM=APPLID,DEFAULT=TSO
         USSPARM PARM=LOGMODE,DEFAULT=S3278
         USSPARM PARM=P1,REP=DATA
TSOB     USSCMD CMD=TSOB,FORMAT=BAL,REP=LOGON
         USSPARM PARM=APPLID,DEFAULT=TSO
         USSPARM PARM=LOGMODE,DEFAULT=TESTB
         USSPARM PARM=P1,REP=DATA
CICS1    USSCMD CMD=CICS,FORMAT=BAL,REP=LOGON
         USSPARM PARM=APPLID,DEFAULT=CICS
         USSPARM PARM=LOGMODE,DEFAULT=RM3278
         USSPARM PARM=P1,REP=DATA
NCCF2    USSCMD CMD=NCCF,FORMAT=BAL,REP=LOGON
         USSPARM PARM=APPLID,DEFAULT=NCCF2
         USSPARM PARM=LOGMODE,DEFAULT=DSILGMOD
         USSPARM PARM=P1,REP=DATA
VCNA     USSCMD CMD=VCNA,FORMAT=BAL,REP=LOGON
         USSPARM PARM=APPLID,DEFAULT=VMVCNACB
         USSPARM PARM=LOGMODE,DEFAULT=RM3278
         USSPARM PARM=P1,REP=DATA
IBMTEST  USSCMD CMD=IBMTEST,FORMAT=BAL
         USSPARM PARM=P1,DEFAULT=10
         USSPARM PARM=P2,DEFAULT=ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
LOGOFF   USSCMD CMD=LOGOFF,FORMAT=PL1
         USSPARM PARM=APPLID
         USSPARM PARM=TYPE,DEFAULT=UNCOND
         USSPARM PARM=HOLD,DEFAULT=YES
MESSAGES USSMSG MSG=0,TEXT='                THANK YOU -- % WILL COMMENC*
               E MOMENTARILY.'
         USSMSG MSG=1,TEXT=' % INVALID COMMAND SYNTAX'
         USSMSG MSG=2,TEXT='?... % COMMAND UNRECOGNIZED'
         USSMSG MSG=3,TEXT='?... % PARAMETER UNRECOGNIZED'
         USSMSG MSG=4,TEXT='!... % PARAMETER INVALID ( % NOT ACTIVE)'
         USSMSG MSG=5,TEXT='!... % UNSUPPORTED FUNCTION'
         USSMSG MSG=6,TEXT='% SEQUENCE ERROR  (PLEASE BE PATIENT)'
         USSMSG MSG=7,TEXT='SESSION NOT BOUND  (TSO/APPLID NOT AVAIL.)'
         USSMSG MSG=8,TEXT='INSUFFICIENT STORAGE TO PROCESS REQUEST'
         USSMSG MSG=9,TEXT='MAGNETIC CARD DATA ERROR'
         USSMSG MSG=10,BUFFER=LOGBUF1  "WELCOME TO COMTEN" MESSAGE
         USSMSG MSG=11,TEXT='SESSION ENDED %'
         USSMSG MSG=12,TEXT='% REQUIRED PARAMETER OMITTED'
         USSMSG MSG=13,BUFFER=LOGBUF2 TEXT='IBMECHO %'
         USSMSG MSG=14,TEXT='USS MESSAGE % NOT DEFINED'
         EJECT .
*       @ATTREQU ,                   DEFINE 3270 FULLSCREEN EQUATES
         SPACE 1
*          DEFINE 3270 SCREEN CONTROL CHARACTER EQUATES
         SPACE 1
@IC      EQU   X'13'                 INSERT CURSOR (NO OPERANDS)
@SF      EQU   X'1D'                 START-OF-FIELD (2 OPERANDS)
@SBA     EQU   X'11'                 START BUFFER ADDRESS
@RA      EQU   X'3C'                 REPEAT TO ADDRESS (3 OPERAND
```

```
@ESC     EQU   X'C1'               3270 ESCAPE CHARACTER (1ST IN BUFFER)
@ESCBEEP EQU   X'C7'               3270 ESCAPE CHARACTER ( + ALARM )
         SPACE 1
*           DEFINE 3270 ATTRIBUTE CHARACTER EQUATES
         SPACE 1
@U       EQU   X'40'               UNPROT, NO-SHIFT, NORMAL INTENSITY
@UH      EQU   X'C8'               UNPROT, HIGH-INTENSITY
@P       EQU   X'60'               PROTECTED, NO-SHIFT, NORMAL INTENSITY
@PS      EQU   X'F0'               PROTECTED, SKIP, NORMAL INTENSITY
@PH      EQU   X'E8'               PROTECTED, HIGH-INTENSITY
@PNH     EQU   X'F8'               PROTECTED, NUMERIC, HIGH-INTENSITY
@INV     EQU   X'4C'               INVISIBLE
@INVS    EQU   X'7C'               INVISIBLE, SKIP  (UNUSUAL)
         SPACE 3
* THIS REPRESENTS THE SCREEN LAYOUT FOR THE USSMSG MSG=10,BUFFER=...
* IT WORKS FOR ACF/VTAM V1.R3 (UNDER MVS & VS1) AND ACF/VTAM V2.R1 .
LOGBUF1  DS    0F
         DC    Y(LLOGBUF1)
LOGBUF1X DC    X'F5'               ERASE-WRITE (SEE PART 2 OF INST. REF.)
         DC    X'C2'                 WCC (RESTORE KEYBOARD)
         DC    AL1(@SBA),X'4040'     SET BUFFER ADDRESS TO BUFFER START
         DC    AL1(@SF,@P)           PROTECTED NORMAL-INTENSITY
         DC    C'MVS/SP ACF/VTAM VERSION 2 RELEASE 1 ONLINE '
         DC    AL1(@SBA),X'C5D9'     SETUP 2ND LINE - ROW 5 COL 26
         DC    C'NN    NN    CCCCCC    RRRRRRR'
         DC    AL1(@SBA),X'C6E9'     SETUP 3RD LINE - ROW 6 COL 26
         DC    C'NNN   NN   CCCCCCCC   RRRRRRRR'
         DC    AL1(@SBA),X'C7F9'     SETUP 4TH LINE - ROW 7 COL 26
         DC    C'NNNN  NN   CC         RR    RR'
         DC    AL1(@SBA),X'C9C9'     SETUP 5TH LINE - ROW 8 COL 26
*        DC    C'   N           C           R '
         DC    C'NN NN NN   CC         RR    RR'
         DC    AL1(@SBA),X'4AD9'     SETUP 6TH LINE - ROW 9 COL 26
         DC    C'NN  NNNN   CC         RRRRRRR'
         DC    AL1(@SBA),X'4BE9'     SETUP 7TH LINE - ROW 10 COL 26
         DC    C'NN   NNN   CCCCCCCC   RR    RR'
         DC    AL1(@SBA),X'4CF9'     SETUP 8TH LINE - ROW 11 COL 26
         DC    C'NN    NN    CCCCCC    RR     RR'
         DC    AL1(@SBA),X'4EC2'     SETUP 9TH LINE - ROW 12 COL 19
         DC    C'CCCC   OOOO   M     M  TTTTT  EEEEEE  N     N'
         DC    AL1(@SBA),X'4FD1'     SETUP 10TH LINE - ROW 13 COL 18
         DC    C'C    C O    O MM   MM    T    E       NN    N'
         DC    AL1(@SBA),X'5061'     SETUP 11TH LINE - ROW 14 COL 18
         DC    C'C      O    O M M M M    T     EEEEE  N N   N'
         DC    AL1(@SBA),X'D1F1'     SETUP 12TH LINE - ROW 15 COL 18
         DC    C'C      O    O M  M  M    T    E       N  N N'
         DC    AL1(@SBA),X'D3C1'     SETUP 13TH LINE - ROW 16 COL 18
         DC    C'C    C O    O M     M    T    E       N    NN'
         DC    AL1(@SBA),X'D4D2'     SETUP 14TH LINE - ROW 17 COL 19
         DC    C'CCCC   OOOO   M     M   T    EEEEEE  N     N'
         DC    AL1(@SBA),X'D6F4'     SETUP 15TH LINE - ROW 19 COL 21
         DC    C'WELCOME TO THE NCR SNA PROBLEM DETERMINATION CLASS'
         DC    AL1(@SBA),X'D8C2'     SETUP 16TH LINE - ROW 20 COL 19
         DC    C'IBM OS/VS2 RELEASE 3.8 (SP1.3), SERVICE LEVEL "J"'
         DC    AL1(@SBA),X'5AE4'     SETUP 17TH LINE - ROW 22 COL 21
         DC    AL1(@SF,@PH)
         DC    C'PLEASE ENTER YOUR   VTAM   LOGON SEQUENCE'
         DC    AL1(@SBA),X'5B5F'     SETUP LOGON LINE - ROW 22 COL 80
         DC    AL1(@SF,@UH,@IC)      UNPROTECTED HIGH-INTENSITY CURSOR
         DC    AL1(@SBA),X'5CF0'     SETUP END OF LOGON - ROW 24 COL 1
         DC    AL1(@SF,@P)           PROTECT REMAINDER OF SCREEN
```

CICS DEFINITIONS

TERMINAL CONTROL TABLE

```
*************************************************************************
*
*        CICS 1.7  TERMINAL CONTROL TABLE  (MACRO DEFINITIONS)
*
*************************************************************************
         TITLE 'SNA 3270 NCR DAYTON - CASE'
*************************************************************************
*                    SNA 3270 - NCR DAYTON                             *
*                          VALID                                       *
*              TERMINAL TYPE          = 'LUTYPE2'                      *
*              CICS LOGICAL UNIT NAME = 'CA01'                         *
*              VTAM & ACF/NCP LU NAME = 'CAS1L01'                      *
*                                                                      *
*************************************************************************
CA01     DFHTCT TYPE=TERMINAL,                                         *
               ACCMETH=VTAM,                                           *
               TRMTYPE=LUTYPE2,                                        *
               NETNAME=CAS1L01,                                        *
               TIOAL=(1000,4000),                                      X
               GMMSG=YES,                                              *
               RELREQ=(NO,YES),                                        *
               TRMIDNT=CA01,                                           *
               BRACKET=YES,                                            *
               TRMMODL=2,                                              *
               PGESTAT=AUTOPAGE,                                       *
               RUSIZE=256,                                             *
               BUFFER=256,                                             *
               CHNASSY=YES,                                            *
               TRMSTAT=TRANSCEIVE
         TITLE 'SNA 3270 NCR DAYTON - CASE'
*************************************************************************
*                    SNA 3270 - NCR DAYTON                             *
*                          VALID                                       *
*              TERMINAL TYPE          = 'LUTYPE2'                      *
*              CICS LOGICAL UNIT NAME = 'CA02'                         *
*              VTAM & ACF/NCP LU NAME = 'CAS1L02'                      *
*                                                                      *
*************************************************************************
CA02     DFHTCT TYPE=TERMINAL,                                         *
               ACCMETH=VTAM,                                           *
               TRMTYPE=LUTYPE2,                                        *
               NETNAME=CAS1L02,                                        *
               TIOAL=(1000,4000),                                      X
               GMMSG=YES,                                              *
               RELREQ=(NO,YES),                                        *
               TRMIDNT=CA02,                                           *
               BRACKET=YES,                                            *
               TRMMODL=2,                                              *
               PGESTAT=AUTOPAGE,                                       *
               RUSIZE=256,                                             *
               BUFFER=256,                                             *
               CHNASSY=YES,                                            *
               TRMSTAT=TRANSCEIVE
         TITLE 'SNA 3270 NCR DAYTON - CASE'
*************************************************************************
*                    SNA 3270 - NCR DAYTON                             *
*                          VALID                                       *
*              TERMINAL TYPE          = 'LUTYPE2'                      *
*              CICS LOGICAL UNIT NAME = 'CA03'                         *
*              VTAM & ACF/NCP LU NAME = 'CAS1L03'                      *
*                                                                      *
```

```
         CHNASSY=YES,                                                  *
         TRMSTAT=TRANSCEIVE
   TITLE 'SNA 3270 PRINTER NCR DAYTON - CASE'
***********************************************************************
*                    SNA 3270 - NCR DAYTON                            *
*                          VALID                                      *
*              TERMINAL TYPE            = 'LUTYPE3'                   *
*              CICS LOGICAL UNIT NAME = 'CA06'                        *
*              VTAM & ACF/NCP LU NAME = 'CAS1L06'                     *
*                 LOGMODE MODIFIED ON 26AUG85  KRUG                   *
***********************************************************************
CA06     DFHTCT TYPE=TERMINAL,                                         X
               TRMIDNT=CA06,                                           X
               NETNAME=CAS1L06,                                        X
               RUSIZE=256,                                             *
               ACCMETH=VTAM,                                           X
               TRMTYPE=LUTYPE3,                                        X
               TRMMODL=2,                                              X
               FF=YES,                                                 X
               BUFFER=256,                                             X
               TCTUAL=255,                                             X
               RELREQ=(YES,YES),                                       X
               CHNASSY=YES,                                            X
               LOGMODE=DSILGMOD,                                       *
               TRMSTAT=(TRANSCEIVE,NOINTLOG),                          X
               PGESTAT=AUTOPAGE
   TITLE 'SNA 3270 NCR DAYTON - CASE'
***********************************************************************
*                    SNA 3270 - NCR DAYTON                            *
*                          VALID                                      *
*              TERMINAL TYPE            = 'LUTYPE2'                   *
*              CICS LOGICAL UNIT NAME = 'CA11'                        *
*              VTAM & ACF/NCP LU NAME = 'CAS2L01'                     *
*                                                                     *
***********************************************************************
CA11     DFHTCT TYPE=TERMINAL,                                         *
               ACCMETH=VTAM,                                           *
               TRMTYPE=LUTYPE2,                                        *
               NETNAME=CAS2L01,                                        *
               TIOAL=(1000,4000),                                      X
               GMMSG=YES,                                              *
               RELREQ=(NO,YES),                                        *
               TRMIDNT=CA11,                                           *
               BRACKET=YES,                                            *
               TRMMODL=2,                                              *
               PGESTAT=AUTOPAGE,                                       *
               RUSIZE=256,                                             *
               BUFFER=256,                                             *
               CHNASSY=YES,                                            *
               TRMSTAT=TRANSCEIVE
   TITLE 'SNA 3270 NCR DAYTON - CASE'
***********************************************************************
*                    SNA 3270 - NCR DAYTON                            *
*                          VALID                                      *
*              TERMINAL TYPE            = 'LUTYPE2'                   *
*              CICS LOGICAL UNIT NAME = 'CA12'                        *
*              VTAM & ACF/NCP LU NAME = 'CAS2L02'                     *
*                                                                     *
***********************************************************************
CA12     DFHTCT TYPE=TERMINAL,                                         *
               ACCMETH=VTAM,                                           *
```

NCCF DEFINITIONS

```
************************************************************************
*     (C) COPYRIGHT IBM CORP. 1986                                     *
*     LAST CHANGE:     05/13/86  17:25:17        SSI=62462036          *
*     IEBCOPY    SELECT MEMBER=((CNMS1007,DSIDMN,R))                   *
*     DESCRIPTION: SAMPLE DSIPARM - SYSTEM LEVEL PARAMETERS FOR SA=01  *
*     CNMS1007 CHANGED ACTIVITY:                                       *
*     CHANGE CODE  DATE      DESCRIPTION                               *
*     -----------  --------  ------------------------------------------*
*     DCR1263      05/15/87  ADDED TASK STATEMENT FOR CNMCSSIR         *
*     S01=OY11745,NETR2 XA,01/27/88,SL: APAR TO INCLUDE THE FOLLOWING  *
*                                     FIXES PO51265                    *
************************************************************************
       NCCFID   DOMAINID=NCCF2,DMNPSW=NCCF2,DROP=NO,SUPPCHAR=/
*      NCCFIC   IC=SETPPT
*****************************************************************
*  IF ALERT AND MESSAGE FORWARDING IS REQUIRED, COMMENT OUT     *
*  'NCCFIC   IC=CNME1034' AND UNCOMMENT ONE OF THE FOLLOWING:   *
*                                                               *
*  FOR A FOCAL POINT NODE, UNCOMMENT    'NCCFIC   IC=FPIC'      *
*  FOR AN INTERMEDIATE NODE, UNCOMMENT  'NCCFIC   IC=INIC'      *
*  FOR A DISTRIBUTED NODE, UNCOMMENT    'NCCFIC   IC=DNIC'      *
*                                                               *
*  ONLY ONE NCCFIC STATEMENT IS ALLOWED AT A TIME               *
*****************************************************************
       NCCFIC   IC=CNME1034
*      NCCFIC   IC=FPIC
*      NCCFIC   IC=INIC
*      NCCFIC   IC=DNIC
*****************************************************************
*  NOTE: A TRANSTBL STATEMENT IS NEEDED FOR A CHARACTER SET     *
*        THAT IS REQUIRED FOR INPUT/OUTPUT,                     *
*        WHERE DSIXXXXX IS THE NAME OF THE TRANSLATE TABLE.     *
*        DSIEBCDC IS USED FOR EBCDIC SUPPORT AND                *
*        IS THE PRECODED (DEFAULT) VALUE.                       *
*        DSIKTKNA IS USED FOR KATAKANA SUPPORT AND              *
*        DSIKANJI IS USED FOR KANJI SUPPORT.                    *
*        ONLY ONE TRANSTBL STATEMENT SHOULD BE CODED.           *
*****************************************************************
       TRANSTBL MOD=DSIEBCDC
*      TRANSTBL MOD=DSIKTKNA
*      TRANSTBL MOD=DSIKANJI
*****************************************************************
*  NOTE: THE FOLLOWING STATEMENT SHOULD BE CODED IF USING       *
*        THE VSAM LSR OPTION. SEE THE MEMBER CNMSJM01 TO        *
*        ASSEMBLE AND LINKEDIT DSIZVLSR.                        *
*****************************************************************
*      VSAMLSR  DSIZVLSR
*  SPECIFY LOGON CHECKING
       OPTIONS  VERIFY=RACF
       CDMNSESS  5
       MAXSPAN   8
       MAXABEND  5
       MAXLOGON  5
       STORPOOL  SIZE=1
       POSPOOL   10
RALNC  RRD
*  NAME THE NETWORK OPERATOR TERMINALS
       POS      CAS1L01
       POS      CAS1L02
       POS      CAS1L03
       POS      CAS1L05
```

```
         POS       CAS2L01
         POS       CAS2L02
         POS       CAS2L03
         POS       CAS2L05
         POS       CAS3L02
         POS       CAS3L03
         POS       CAS5L01
         POS       CAS5L02
         POS       CAS5L03
         POS       CAS6L01
         POS       CAS6L02
         POS       CAS6L03
         POS       CAS7L01
         POS       CAS7L02
         POS       CAS7L03
         HARDCOPY CAS1L04
         HARDCOPY CAS1L06
         HARDCOPY CAS2L04
         HARDCOPY CAS2L06
         HARDCOPY CAS5L06
         HARDCOPY CAS6L06
         HARDCOPY CAS7L06
***********************************************************************
*  NOTE: THE FOLLOWING TASK STATEMENT IS NECESSARY FOR THE            *
*        NETVIEW LOGGING FUNCTION.                                    *
***********************************************************************
         TASK      MOD=DSIZDST,TSKID=DSILOG,MEM=DSILOGBK,PRI=1,INIT=Y
***********************************************************************
*  NOTE: THE FOLLOWING TASK STATEMENT IS NECESSARY FOR THE            *
*        NETVIEW CNM ROUTER FUNCTION.                                 *
***********************************************************************
         TASK      MOD=DSIZDST,TSKID=DSICRTR,MEM=DSICRTTD,PRI=6,INIT=Y
***********************************************************************
*  NOTE: THE FOLLOWING TASK STATEMENT IS NECESSARY FOR THE            *
*        TRACE LOGGING FUNCTION.                                      *
***********************************************************************
         TASK      MOD=DSIZDST,TSKID=DSITRACE,MEM=DSITRCBK,PRI=1,INIT=N
***********************************************************************
*  NOTE: THE FOLLOWING TASK STATEMENT IS NECESSARY FOR THE            *
*        MVS/370 AND MVS/XA SUBSYSTEM INTERFACE (SSI) ROUTING.*
***********************************************************************
         TASK      MOD=CNMCSSIR,TSKID=CNMCSSIR,PRI=5,INIT=N
***********************************************************************
*  NOTE: THE FOLLOWING TASK STATEMENT IS NECESSARY FOR THE            *
*        ALIAS FUNCTION.                                              *
***********************************************************************
*        TASK      MOD=DSIZDST,TSKID=ALIASAPL,MEM=DSIALATD,PRI=5,INIT=N
***********************************************************************
*  NOTE: THE FOLLOWING TASK STATEMENT IS NECESSARY TO                 *
*        OBTAIN THE NETWORK PRODUCT SUPPORT FUNCTION                  *
***********************************************************************
         TASK      MOD=DSIZDST,TSKID=DSIGDS,MEM=DSICPINT,PRI=1,INIT=N
***********************************************************************
*  THE FOLLOWING TASK STATEMENT IS NECESSARY FOR USER EXIT            *
*  EXTERNAL LOGGING SUPPORT.                                          *
*  NOTE:  THE LOGSVC IS USED FOR MVS AND MVS/XA ONLY.  CHANGE *
*         THE NNN TO THE USER SVC NUMBER ASSIGNED TO DSIELSVC.*
*  NOTE:  FOR VM/SP: PRI=6 FOR THE TSKID=DSIELTSK.                    *
*  NOTE:  FOR MVS AND MVS/XA: PRI=2 FOR THE TSKID=DSIELTSK.           *
***********************************************************************
         TASK      MOD=DSIZDST,TSKID=DSIELTSK,MEM=DSIELMEM,PRI=2,INIT=Y
```

```
START
 COL  ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8  FLAGS

   1  AJ20           OPERATOR     PASSWORD=AJ20                                         00010006   *
  14                 PROFILEN     PROF3                                                 00020014   *
  14                 PROFILEN     PROF5                                                 00021014   *
   1  AJ21           OPERATOR     PASSWORD=AJ21                                         00030006   *
  14                 PROFILEN     PROF2                                                 00040006   *
   1  AJ24           OPERATOR     PASSWORD=AJ24                                         00050006   *
  14                 PROFILEN     PROF3                                                 00060006   *
   1  AJ27           OPERATOR     PASSWORD=AJ27                                         00070006   *
  14                 PROFILEN     PROF2                                                 00080006   *
   1  AJ33           OPERATOR     PASSWORD=AJ33                                         00090006   *
  14                 PROFILEN     PROF4                                                 00100006   *
   1  AJ34           OPERATOR     PASSWORD=AJ34                                         00101009   *
  14                 PROFILEN     PROF4                                                 00102009   *
   1  AJ35           OPERATOR     PASSWORD=AJ35                                         00103009   *
  14                 PROFILEN     PROF4                                                 00104009   *
   1  AJ36           OPERATOR     PASSWORD=AJ36                                         00105009   *
  14                 PROFILEN     PROF4                                                 00106009   *
   1  AJ37           OPERATOR     PASSWORD=AJ37                                         00107009   *
  14                 PROFILEN     PROF4                                                 00108009   *
   1  AJ38           OPERATOR     PASSWORD=AJ38                                         00109009   *
  14                 PROFILEN     PROF4                                                 00109109   *
   1  AJ40           OPERATOR     PASSWORD=AJ40                                         00109214   *
  14                 PROFILEN     PROF4                                                 00109314   *
  14                 PROFILEN     PROF5                                                 00109414   *
   1  AJ41           OPERATOR     PASSWORD=AJ41                                         00109514   *
  14                 PROFILEN     PROF4                                                 00109614   *
  14                 PROFILEN     PROF5                                                 00109714   *
   1  AJ42           OPERATOR     PASSWORD=AJ42                                         00109814   *
  14                 PROFILEN     PROF4                                                 00109914   *
  14                 PROFILEN     PROF5                                                 00110014   *
   1  AJ43           OPERATOR     PASSWORD=AJ43                                         00110114   *
  14                 PROFILEN     PROF4                                                 00110214   *
  14                 PROFILEN     PROF5                                                 00110314   *
   1  ANO3           OPERATOR     PASSWORD=ANO3                                         00110423   **
  14                 PROFILEN     PROF3                                                 00110523   **
   1  CAFO           OPERATOR     PASSWORD=CAFO                                         00111006   *
  14                 PROFILEN     PROF2                                                 00120006   *
   1  CAF1           OPERATOR     PASSWORD=CAF1                                         00130006   *
  14                 PROFILEN     PROF2                                                 00140006   *
   1  CAF2           OPERATOR     PASSWORD=CAF2                                         00150006   *
  14                 PROFILEN     PROF2                                                 00160006   *
   1  CA19           OPERATOR     PASSWORD=CA19                                         00161008   *
  14                 PROFILEN     PROF3                                                 00162010   *
   1  CA23           OPERATOR     PASSWORD=CA23                                         00170006   *
  14                 PROFILEN     PROF4                                                 00180006   *
   1  CA26           OPERATOR     PASSWORD=CA26                                         00190006   *
  14                 PROFILEN     PROF4                                                 00200006   *
   1  CA27           OPERATOR     PASSWORD=CA27                                         00210006   *
  14                 PROFILEN     PROF4                                                 00220006   *
   1  CA37           OPERATOR     PASSWORD=CA37                                         00221012   *
  14                 PROFILEN     PROF3                                                 00222012   *
   1  CCO3           OPERATOR     PASSWORD=CCO3                                         00223018   *
  14                 PROFILEN     PROF3                                                 00224018   *
   1  CS442          OPERATOR     PASSWORD=CS442                                        00225020   *
```

CASE NAME: RMT8

```
*
*         FULL DESCRIPTIONS OF JES2/NJE INITIALIZATION
*         PARAMETERS AND DEFAULTS ARE CONTAINED IN:
*          OS/VS2 SPL: JES2 INSTALLATION, INITIALIZATION,
*                      AND TUNING  SC23-0046
*
**********************************************************************
*
* NOTE: CHANGING THE VALUE OF THE FOLLOWING FORCES A JES2 COLD START.
*       &BUFSIZE     &MAXJOBS     &MINJOES     &NUMJOES     &NUMNODE
*       &NUMRJE      &NUMTG       &OWNNODE     &RECINCR     &SPOLMSG
*       &SPOOL       &TCELSIZ     &TGSIZE
*
**********************************************************************
&ESTLNCT=500        2       DEFAULT ESTIMATED PRINT OUTPUT          02AUG84
&ESTPUN=500000      100     DEFAULT ESTIMATED PUNCH OUTPUT          02AUG84
&OUTXS=5000         2000    MESSAGE INTERVAL FOR EXCEEDING EST. OUTPUT
&OUTPOPT=1          0       OPTION FOR EXCEEDING EST. JOB OUTPUT    02AUG84
&JCOPYLM=30         3       MAX NUMBER OF COPIES ALLOWED (JCL/JOBPARM)
&MAXJOBS=(2400,80) 100      MAX NUMBER OF JOBS ALLOWED IN SYSTEM    09AUG84
&MAXPART=21   18 / 3        MAX LOGICAL INITIATORS          23JUL84 28NOV84
&NUMCLAS=10         8       SYSOUT CLASS LIMIT FOR PRTR OR PUN      01JUN84
&NUMCMBS=(192,85) 15        JES2 CONSOLE BUFFERS
&NUMSMFB=(15,85)   (5,80)   MAX NUMBER OF SMF BUFFERS FOR JES2 USE
&NUMTPBF=(80,85)  80        NUMBER OF JES2 TP BUFFERS (SNA+NJE+BSC) JUN84
&NUMJOES=(1600,85) SEE SPL NUMBER OF JOB OUTPUT ELEMENTS            09AUG84
&TPBFSIZ=3976       400     RJE/NJE TP BUFFER SIZE                  03JUL84
&NUMINRS=15         2       NUMBER OF INTERNAL READERS
&NUMPRTS=5       3/ 2       MAX NUMBER OF PRINTERS                  30DEC84
&NUMPUNS=0          1       MAX NUMBER OF PUNCHES                   04SEP84
&NUMRDRS=1          1       MAX NUMBER OF READERS                   04SEP84
&NUMRJE=24                  NUMBER OF RJE LINES
LINE1     UNIT=SNA
LINE2     UNIT=SNA
LINE3     UNIT=44D,LOWSPEED  CNA OFF-SITE EP REMOTE (XEROX 2700) 02AUG84
LINE4     LOWSPEED,COMP,TRANSP,UNIT=0AB
*******   CTCA NJE  *******  CTCA NJE  *******  CTCA NJE  *******
LINE5     HISPEED,TRANSP,UNIT=F10,REST=0,NOADISC
LINE6     HISPEED,TRANSP,UNIT=039,REST=10,NOADISC
LINE7     UNIT=SNA
LINE8     UNIT=SNA
LINE9     UNIT=SNA
LINE10    UNIT=SNA
LINE11    UNIT=SNA
LINE12    UNIT=SNA
&NUMLNES=12                 NUMLNES = NUMRJE + NETLNES
************ NJE PARAMETERS ******************************************
*
&NUMNODE=15             MAX NUMBER OF NODES
&OWNNODE=1              WE ARE NUMBER 1
&NETLNES=3              NUMBER OF NJE LINES (INCLUDING CTCA'S)
&NUMNAT=105             MAX INTERCONNECTIONS OF 15 NODES
&NODREST=100            DEFAULT
&MAXREST=12000          DEFAULTS TO 800000                  08JUL83 JTS
* REMOTE 1 IS SOFTWARE TRAINING'S OFF-SITE 7957 CLUSTER PRINTER #1
RMT1      LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0
R1.PR1    CCTL,CKPTLNS=66,CKPTPGS=1,CLASS=AST,LIMIT=0-1000,
```

```
         NOSUSPND,LRECL=133                                             00545031
* REMOTE 2 IS SOFTWARE TRAINING'S OFF-SITE 7957 CLUSTER PRINTER #2      00545100
RMT2     LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0,             00546031
         ROUTECDE=1                                                     00547040
R2.PR1   CCTL,CKPTLNS=66,CKPTPGS=1,CLASS=AST,LIMIT=0-1000,              00548035
         NOSUSPND,LRECL=133                                             00549031
* REMOTE 3 IS NCR CORP. REMOTE PC WORKSTATION (W. BROOKS) FOR CPCS.     00549100
RMT3     LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=1,             00549300
         LUNAME=WAT4EL02                                                00549400
R3.PR1   LIMIT=0-10000,CLASS=AE                                         00549516
* REMOTE 4 IS FOR OFF-SITE CNA  <HAMCNTR>  (XEROX 2700 LASER PRINTER)   00549600
RMT4     3780,LINE=3,BUFSIZE=512,NOCON,NUMPR=1,NUMPU=0,NUMRD=0          00549700
R4.PR1   LIMIT=0-12500,CLASS=0AEST                                      00549828
* REMOTE 5 IS FOR NCR COMTEN (+ NCR) TORREY PINES                       00549900
RMT5     M20-2,MULTI,BUFSIZE=856,NUMPR=2,NUMPU=1,NUMRD=1,               00550038
         SETUPINF,CONSOLE,TRANSP,LINE=4                                 00550113
R5.RD1   CLASS=A,MSGCLASS=J                                     07NOV84 00550230
R5.PR1   LIMIT=0-250000,PRWIDTH=132,UCS=TN,CLASS=AENST          26OCT84 00550328
R5.PR2   LIMIT=0-250000,PRWIDTH=132,UCS=TN,CLASS=AENST          19NOV84 00550438
R5.PU1   LIMIT=0-50000,CLASS=BF                                         00550501
* REMOTE 6                                                              00550613
RMT6     3780,BUFSIZE=856,NOCON,NUMPR=1,NUMPU=1,NUMRD=1,TRANSP          00550712
R6.PR1   LIMIT=0-10000,CLASS=ATS                                        00550835
R6.PU1   LIMIT=0-50000,CLASS=BF                                         00550906
* REMOTE 7 IS FOR NCR CORP. DAYTON REMOTE FOR JES328X                   00551234
RMT7     LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0              00551341
R7.PR1   CCTL,CKPTLNS=66,CKPTPGS=1,CLASS=AST,LIMIT=0-1000,              00551535
         NOSUSPND,LRECL=133                                             00551632
* REMOTE 8 (NCR DAYTON -- CASE)                                 07NOV84 00551730
RMT8     LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=1,NUMRD=1,             00551830
         LUNAME=CAS3L04                                                 00551951
R8.RD1   START,NOHOLD,CLASS=A,MSGCLASS=J                                00552030
R8.PR1   LIMIT=0-50000,CLASS=AE                                         00552130
R8.PU1   LIMIT=0-50000,CLASS=BF                                         00552230
* REMOTE 9                                                              00552300
RMT9     LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=1              00552400
R9.PR1   LIMIT=0-10000,CLASS=A                                          00552535
* REMOTE 10                                                             00552600
RMT10    LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=1              00552700
R10.PR1  CCTL,CKPTLNS=66,CKPTPGS=1,CLASS=AST,LIMIT=0-1000,              00552835
         NOSUSPND,LRECL=133                                             00552935
* REMOTE 11 IS FOR CENTRAL SUPPORT / CENTRAL SUPPORT SERVICES (16NOV84)  00553137
RMT11    LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0              00553233
R11.PR1  CCTL,CKPTLNS=66,CKPTPGS=1,CLASS=AST,LIMIT=0-1000,              00553335
         NOSUSPND,LRECL=133                                             00553435
* REMOTE 12 IS FOR CENTRAL SUPPORT / CENTRAL SUPPORT SERVICES (16NOV84)  00553537
RMT12    LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0              00553733
R12.PR1  CCTL,CKPTLNS=66,CKPTPGS=1,CLASS=AST,LIMIT=0-1000,              00553835
         NOSUSPND,LRECL=133                                             00553935
* REMOTE 13                                                             00554135
RMT13    LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0              00554235
R13.PR1  LIMIT=0-1000,CLASS=AST                                         00554335
* REMOTE 14                                                             00554435
RMT14    LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0              00554535
R14.PR1  LIMIT=0-1000,CLASS=AST                                         00554635
* REMOTE 15                                                             00554735
RMT15    LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0              00554835
R15.PR1  LIMIT=0-1000,CLASS=AST                                         00554935
* REMOTE 16                                                             00555035
RMT16    LUTYPE1,BUFSIZE=256,NOCON,NUMPR=1,NUMPU=0,NUMRD=0              00555135
R16.PR1  LIMIT=0-1000,CLASS=AST                                               35
```

GLOSSARY

- A -

ACB - Access Method Control Block. A control block that links an application program to VTAM.

ACF - Advanced Communications Function. IBM's proprietary program products based on SNA Release 3 or higher.

ACTLINK - Activate Link

ACTLU - Activate Logical Unit

ACTPU - Activate Physical Unit

API - Application Program Interface

APL - a Programming Language

ASCII - American National Standard Code for Information Exchange. A standard code set consisting of control characters used for information exchange between data processing equipment.

Access Method - a method for facilitating input and output operations between application programs in the host and remote network

acquire - In VTAm, the operation in which an application program initiates and establishes a session with another logical unit; the application acting as primary.

adjacent nodes - In SNA, two nodes that are connected by one or more links wilth no intervening nodes.

Application Program - a user written program to solve a particular user related problem.

Application program exit routine - In VTAM, a user-written exit routine which performs functions for a particular application program.

Assembly - compilation of gen macros and parameters; a gen step.

asynchronous - a line protocol in which a group of signals representing a character are preceded by a start bit and followed by a stop bit. After the stop bit, the receiving device is idle pending the next start bit. Also called async or start-stop(S/S).

Automatic activation - In VTAM, the activation of links and link stations in adjacent subarea nodes as a result of an activation command.

Automatic deactivation - In VTAM, the oppposite of automatic activation.

Auxillary storage - data storage other than main storage.

- B -

BB - Begin Bracket

BC - Begin Chain

BIU - Basic Inforamtion Unit. Consists of RH and RU

BLU - Basic Link Unit. Consists of LH, PIU, LT

BMS - Basic Mapping Services. Provides screen formatting control and high level language interpretation.

BSC - Binary Synchronous Communication - a link protocol in which synchronization of characters is controlled by timing signals generated by the sending and receiving devices.

BTAM - Basic Telecommunication Access Method. A non-SNA, host-resident access method.

BTU - Basic Transmission Unit. Consists of two or more PIUs to form an extended message.

Basic Mapping Services - Provides screen formatting controls and high level language translation.

BID - an SNA command or technique used by a BIDDER requesting permission of the FIRST SPEAKER if it (the bidder) may begin transmitting messages. Used in HDX-FF protocol.

Bidder - in an LU-LU session, the half session that must ask permission of the other half session if it can have permission to begin transmission.

BIND - the SNA command used to activate an LU-LU session.

Boundary Function - a software component of subarea nodes that routes messages to devices belonging to the same subarea and for converting network addresses to local addresses and vice versa.

Bracket - a series of requests or multiple RUs that comprise a unit of work between two half-sessions.

- C -

CCITT - Consultataive Committee International Telegraph and Telelphone

CDRM - Cross Domain Resource Manager.

CICS - Customer Information Contro System. A general purpose communications monitor supporting terminal oriented transaction input by an operator.

CNM - Communication Network Management

CNMA - Communication Network Management Application.

CNMI - Communication Network Management Interface.

CNMS - Communication Network Management Services.

COS - Class of Service.

Chain - a series of related requests treated as forming a complete message.

Change Level Data - data pertaining to the release level of the hardware/software/firmware.

Change Management - is the process of defining the elements of an SNA network and implementing changes in that network.

Channel - control and data transfer operations on the S/360 and S/370 between the host processor and directly attached controllers.

Character-coded - pertaining to commands (such as LOGON or LOGOFF) entered by an end user and sent by a logical unit in character form.

Class of Service - A virtual route number and transmission priority value used to assign a priority of message transmission during LU-LU sessions.

Cluster Controller - device that controls the I/O operations of multiple terminals or devices attached to it. May be a PU_T2.0, PU_T2.1 or PU_T1.

Command List (CLIST) - is a command or sequence of commands defined through NCCF that can be executed by an operator, a network event, or another CLIST.

Command Processor - a software module or routine that processes commands sequentially.

Communications adapter - an optional hardware feature available on some processors that permits communication lines to be attached to the processor.

Communications Controller - a unit that supports the attachment and control of data transmission over telecommunicatin links.

Communications Network Management Application - a host resident application which processes only data concerned with network management.

Communications Network Management Interface (CNMI) - a VTAM interface which allows the passing of CNM RUs (data) from SSCP to the CNMA.

Communications Network Management Services - network components (PU Svs Mgr, counters, etc) that collect CNM data for a node, and transfer this data to the proper CNMA.

Compaction - packing of two characters in one byte. Only the most frequently sent characters are compacted.

Cross-domain - another term of operations occurring between two domains.

Cryptography - encoding of data during transmmission to conceal its real meaning.

- D -

DACTLINK - Deactivate Link

DACTLU - Deactivate Logical Unit.

DACTPU - Deactivate Physical Unit.

DAF - Destination Address Field

DASD - Direct Storage Device. A data storage device (usually disc) in which the access of data is independent of the location of the data.

DCA - Document Content Architecture

DCF - Data Count Field. A binary count of the number of bytes in the RH and Ru.

DIA - Document Interchange Architecture. Describes page protocols for office automation products, such as top of page and bottom of page margins, left margin, right margin, footings, etc.

DOS - Disk Operating System. Proprietary of IBM.

DOS/VS - a virtual storage operating system for small medium size processors.

DPPX - Distributed Processing Program Executive. Operating System for IBM 8100.

DPCX - Distributed Processing Control Executive. Operating System for IBM 8100.

Data Flow Control - the software layer responsible for chaining, bracket protocol, transmission mode, request and response modes, and assigning of sequence numbers.

Data Management - A major function of operating systems that involves organizing, cataloging, locating, storing, retrieving, and maintaining data.

Dataset - another name for library or file

Data stream - all data transmitted in a single read or write operation to a display station or printer.

Data Link Control layer - Path Control Network components responsible for transferring SNA messages between nodes via the SDLC link.

Data stream - a general term used to refer to data being transmitted using a defined format for presentation on a display terminal or printer.

dedicated line - a temporary physical connection, facilitated by dialing into a port via telephone lines.

Definite response - a positive or negative type response that must be issued by the receiver of a message.

Delayed-request mode - an operational mode whereby the sender continues to send request units on the normal flow after sending a definite response on thast flow, without waiting for a response to that chain.

Diagnostic modems - modems that have the added clpbilities of monitoring the line and themselves to evaluate the quality and to sense when problems have been encountered. They have improved problem determination capabilities of remote devices tremendously.

Domain - all subareas and associated resources under the control of a single SSCP.

Downstream Load - the capability of the host (PU-T5) node or the NCP (PU-T4) to IPL another node in the network. Typiclly PU-T2 node would be downstrem loded.

- E -

EBCDIC - Extended Binary Coded Decimal Interchange

EBI - End Bracket Indicator

EC - End Chain

EP - Emulation Processing - a software product which allows connection of non-SNA terminals by emulating the characteristics of various non-SNA terminals.

ER - Explicit Route or exception response

Element - that portion of the network address that uniquely identifies the NAU within a given subarea.

End-user - an application program, terminal user, or I/O device that makes use of the services that SNA offers.

Error Log - record thata is maintained of errors detected, usually by the PU Svs Mgr.

Exception response - a negatiave response issued by the receiver of a corrupted message.

Expedited flow - a data flow that permits messages to bypass other messages waiting to be transmitted. Pertains only to SNA commands. User data flow is excluded.

Explicit Route - a physical path between an originating subarea and the destination subarea consisting of a set of transmission groups.

FCS - Frame Check Sequence

FDX - Full Duplex. Two-way, bi-directional transmission simultaneously.

FF - Flip-Flop. Alternating direction of message flow between two session partners.

FI - Format Indicator

FID - Format Identification. The first four bits of all THs which specify the type of the TH.

FM - Function Management

FMH - Function Management Header. A header that allows a session partner to select a destination partner, control the way data is sent, change the destination or characteristics of the data during the session, and transmit user information.

First speaker - The half session that is designated at session establishment as having the priority to begin a bracket without seeking permission from the other half-session.

Fix - the solution to a software problem.

FM Headers - headers inserted into requests containing end-user data to convey control information to a device. Generally found in LU1 and LU6.2 sessions.

FM profiles - predefined rules governing the session protocols governing Data Flow exchanges between two half-sessions.

Full-duplex - a transmission mode whereby both half-sessions may transmit and receive normal-flow requests at the same time.

- G -

Generation - the process of making a software product executable.

- H -

HDLC - High-Level Data Link Control

HDX - Half-duplex

HDX-FF - Half-duplex flip-flop. Session partners alternate turns in transmitting data.

Half-duplex - transmission mode when either half session may transmit or receive normal-flow requests at any time. Simultaneous transmit and receive is not permitted.

Host - a computer controlling a total, or a part of a network environment.

Host node - general term for a Type 5 node.

IMS - Interactive Management Subsystem. A comprehensive database management system.

IPR - Isolated Pacing Response

ISO - International Standards Organization

Immediate-response mode - a method for regulating the order in which responses can be issued. Responses will be issued in the same order as the requests to which they reference.

Implementation - the modification of a software product to suit a particular site configuration.

Implied Bid - a technique used by session partner, asking the other partner's permission to begin transmitting by sending a request with "begin bracket" indicators turned on. Receiver may accept or reject the implied bid.

Input/Output Control - In an operating system, a group of routines provided with the operating system for handling the transfer of data between main storage and auxillary storage devices.

Installation - the loading of a new software product into the operating system libraries.

Intermediate node - a subarea whose path control component is responsible for routing messages to another subarea node.

Isolated pacing response - an indication that additional requests may be transmitted. It is issued by the receiving device to the sender as a specific request, rather than combining the pacing response with a response to data or a command.

- J -

JCL - Job Control Language. A language used to communicate with the operting system about resources needed to process a job.

JES - Job Entry Subsystem. Facility responsible for spooling, job queuing, I/O management and controlling the exchange of data with other computer systems.

- L -

LPDA - Link Problem Determination Application

LU - Logical Unit

LU-LU session - One of the six types of sessions, this one serving two end-users.

LU type 0 - a type of LU that uses SNA defined transmission and data flow protocols, but allows end-user to define presentation protocols.

LU type 1 - a type of LU for an application program that communicates with a single or multiple device(s) in an interactive, batch data transfer, or distributed processing environment.

LU type 2 - a type of LU for an application program and a single display terminal in an interactive environment using 3270 data stream (DSC).

LU type 3 - a type of LU for an application program that communicates with a single printer using 3270 data stream(DSC).

LU type 4 - a type of LU for an application program communicating with a single or multiple device(s) in an interactive, batch transfer, or distributed environment. May also support two display terminals communicating with each other. Uses SNA character string(SCS).

LU type 6 - a type of LU for an application subsystem that is to communicate with another application subsystem in a distributed processing environment.

LSID - Local Session Identification.

Library - a collection of data records related to a specific purpose.

Link - the combination of the link connection and the link station joining network nodes.

Link connectin - the physical equipment providing two-way communication between one link station and one or more other link stations.

Link edit - a gen stelp which resolves all pointers in the object program and translates to machine language, therelby creating a load library as output.

Link header - control information for data link control component of the Path Control Network, consisting of flag, address of secondary station, and SDLC control field.

Link station - the combination of hardware and software that allows a node to attach to and provide control for a link.

Link trailer - control information for data link control component of the Path Control Network, consisting of FCS(frame check sequence) and flag.

Load - the process of reading a mag tape containing code into the system.

Load library - output from the link edit step, in machine language.

Local - a device that is channel-attach to the processor.

Local Address - addressing scheme used between a subarea node and a peripheral node to identify the rosources within that peripheral node.

Logical Unit - One of three types of NAUs. A port through which an end user accesses the SNA network into order to communicate with another end user.

Logoff - an unformatted request that a session be terminated.

Logon - an unformatted request that a session be established between an application program and a logical unit.

Logmode - an entry in the Logon Mode Table defining the protocols to be used during the LU-LU session. Protocols are exchanged by means of the BIND command.

Logon Mode Table - a table containing sets of named predefined session characteristics and protocols.

MVS - Multiple Virtual Storage

Macro library - collection of assembler language program source statements and parameters.

Major node - dln VTAM, a set of minor nodes that can be activated and deactivated as a group.

Message unit - a general term used to refer to either a request or response unit.

Minor node - In VTAM, a uniquely-defined resource within a major node.

Modem - a device that modulates and demodulates signals transmitted over data communication facilities.

Multi-domain environment - an environment containing multiple SSCPs.

Multi-point link - shared communication link between a controlling device (primary) and two or more devices designated as tributary (secondary).

NAU - Network Addressable Unit.

NCCF - Network Communication Control Facility. An IBM supplied program product used as the basis for network management services and for the collection storage and retrieval of network errors.

NCP - Network Control Program. A control program that executes in a communications controller that provides the functions of Path Control. Generally referred to as a Type 4 node.

NOSP - Network Opertor Support Product

NLDM - Network Logical Data Manager.

NPA - Network Performance Analyzer.

NPDA - Network Problem Determination Application

NTO - Network Terminal Option. Enables certain non-SNA devices to exist in an SNA environment as though they were in fact SNA devices.

Negative response - a response indicating that request unit did not arrive successfully or was not processed properly by the receiver.

Negotiable BIND - ability that permits two LU-LU half sessions to negotiate the rules for the session when it is being initialized.

Network address - an address consisting of a subarea node identifier and an element number identifying a link, a link station or a network addressable unit.

Network Logical Data Manager (NLDM) - a host resident CNMA that solicits and analyzes data regarding network problems.

Network name - the symbolic identifier by which end users refer to a network addressable unit, a link station or a link.

Network operator - a person or program responsible for controlling the operation of a part of the network or the entire network.

Network Performance Anaalyzer (NPA) - a host resident CNMA that differs from other CNMA in that it collects its data using LU-LU sessions.

Network Problem Determination Application (NPDA) - a host resident CNMA that requires the existence of NCCF to operator.

No response - one of the three possible type of responses expected for a specified request.

Node - the end point for a single link or the convergence of multiple links.

Node operator - a person or program responsible for controlling the operation of a node.

Non-negotiable BIND - inability for the SLU to request any changes to the BIND command received from the PLU at the time the LU-LU session is being established.

Non-SNA device - a device that does not use SNA protocols.

Non-switched link - a leased or dedicated telecommunication link.

Normal flow - a data flow used primarily to carry only end-user data.

OAF - Origin Address Field.

OSI - Open Systems Interconnection

OS/VS - Operating System/Virtual Storage

Object library - the output from assembly, which must yet be put through the link edit steps.

Operating System - Software which controls the execution of computer programs and which may provide scheduling, debugging, input/output control, accounting, compilation, storage assignment, data management and related services.

- P -

PID .- Program Information Department. The department in IBM that distributes all machine readable information for IBM program products.

PSNDPAC - Primary Send Pacing Count. A logmode entry term defining maximum number of requests that may be sent by the PLU to the boundary Communications Controller before a response is anticipated and more requests sent.

PRCVPAC - Primary Receive Pacing Count. A logmode entry term defining maximum number of requests that may be sent by the boundary Communications Controller to the PLU before a response is anticipated and more requests sent.

PEP - Paritioned Emulation Processing. A function of NCP that enables a communication controller tto operate some lines in NCP mode wile concurrently operating others in emulation mode.

PIU - Path Information Unit. A combination of TH, RH and RU.

PLU - Primary Logical Unit

PU - Physical Unit

POWER - Priority Output Writers, Execution Processor and Input Readers. An office automation facility supported by DOS/VS systems. A batach job entry subsystem that allows both remote and local job entry.

Pacing - a technique permitting a receiving device to regulate the rate at which data is transmitted to it which prevents overflow conditions from occurring.

Pacing request - a mechanism used by a sender of requests to inform the receiver that it will not issuse any further requests until having detected some indication from the receiver.

Pacing response - a mechanism used by the receiver of requests to notify the sender that it is now capable of accepting additional requests.

Pacing window size - the maximum number of requests that can be accepted by the receiver at any one time.

Page - (1) in virtual storage systems, a fixed-length block of instructions, data, or both that can be transferred between real storage and external storage, (2) to transfer instructions, data, or both between real and external page storage.

Page Frame - An area of real storage that can store a page.

Page Data Set - in S/370 virtual storage systems, a file in external storage in which pages are stored.

Parallel links - two or more links between adjacent subarea nodes.

Parallel sessions - two or more concurrently active sessions between the same two logical units (LUs) using different pairs of network addressable units. Each session may be operting using a unique set of protocol parameters.

parallel transmission - in which data is transmitted one byte at a time over a host I/O channel

Path - overall route through the network that messages will follow as they travel from one NAU to another.

Path Control layer - component of Path Control Network responsible for routing messages between nodes, using the proper data link components.

Path Control Network - a set of path control and data link control components responsible for transmitting messages between NAUs.

Peripheral node - a general term for type 1, type 2 and type 2.1

Physical unite - a component within a physical unit that provides maintenance and control of operation of the nodes resources.

Point-to-point link - a non-shared data link with only one device on it.

Positive response - a indication that the associated request can be and is being successfully processed.

Presentation profile - a set of profiles that specify the various presentation services, either display or printed, used in an LU-LU session.

Presentation Services layer - that component responsible for converting and reformating data to be printed or displayed between two end-users.

Problem Determination - the process of determilning that a problem exists, and then having the capability to isolate it to the failing component(s).

Problem Management - includes problem determination and one additional step, problem resolution. This involves correcting or bypassing the problem once it has been detected and isolated.

Processing Management - facilitates the normal day to day operations of an SNA network. This is accomplished by Operator Interface Management, Unattended Operations, and Network Control Language.

Program function key - a key that passes a signal to a program, indicating a particular operation.

Primary link stations - the station responsible for controlling all data transfer over a .

Prime compression character - a character in a repetitive sequence that is represented as a single byte in the data stream.

Protocol - a set of conventions for achieving error-free, orderly and efficient data transfer between two components.

RES - Remote Entry Services. A batch job entry subsystem designed specifically for remote job entry.

RH - Request/Response Header

RPL - In VTAM, Request Parameter List

RU - Request/Response Unit

Real Memory - The storage from which the CPU can directly obtain instructions and data and to which it can directly return the results.

Request - a message that conveys data or initiates a data transfer or control operation.

Request Parameter List - In VTAM, a control block that contains the parameters necessary for processing a request for transfer, establishing or terminating a session, or some other operation.

Request Unit - a message unit that contains a request.

Resource Hierarchy - In VTAM, the relation among network resources in which some are subordinate to others as a result of their position in the overall network definition and architecture.

Response - a message that indicates that a request arrived at its destination and whether the receiver of that request can or cannot process the request.

Response Unit - a message unit that contains a response.

Request Header - a three byte prefix preceding all RUs.

Response Header - a three byte prefix preceding all RUs that indicates whether the response is positive or negative and may also contain a pacing response.

Route Extension - the portion of a path between a subarea node and the adjacent peripheral node.

Routing - the forwarding of a message along a particular path through the network, based on parameters in the message.

- S -

SCS - SNA character string. A device and product independent data stream based on EBCDIC control code.

SDLC - Synchronous Data Link Control. A synchronous, bit-oriented data link protocol.

SLU - Secondary Logical Unit. The logical unit that consists of one-half of the session partners and under the control of the primary logical unit.

SNA - Systems Network Architecture

SRCVPAC - Secondary Receive Pacing Count. A parameter in the logmode entry that defines the number of requests that may be received by the SLU before it will send a response indicating that it is now able to receive more requests.

S/S - (start-stop) see asynchronous

SSCP - Systems Service Control Point. The NAU that controls and manages the phycical configuration of all resources in a network.

SSCP-LU - session between SSCP and logical unit for purpose of enabling or disabling LU-LU sessions.

SSCP-PU - session between SSCP and a physical unit allowing SSCP to send requests to and receive status information from individual nodes for purposes of controlling the network.

SSCP-SSCP - sessions between SSCP in one domain and the SSCP in another domain for purpose of cross-domain LU-LU sessions.

SSNDPAC - Secondary Send Pacing Count. A parameter in the logmode entry that defines the number of requests that may be sent by the SLU to the boundary Communications Controller before a response is anticipated and more requests may be sent.

Schedule - The part of a control program that coordinates the use of resources and maintains the flow of CPU operations.

Scope of command - the capability of NCCF that allows a network operator or class of network operators to use certain commands. By restricting the scope of a operator, you restrict the impact that the operator can have on the network.

SDLC tests - These are tests that are performed at the link level to ensure the integrity of message transmission.

Segmentation - an option function of Path Control Network which will divide a Basic Information Unit into two or more BIU segments if the transmission of messages between nodes is required for overall transmission efficiency or due to buffer requirements.

Sequence numbers - a numeric identifier assigned to contiguous requests in a given direction.

Session - a temporary connection between end-users to permit the conveyance of data through the SNA network.

Session-level pacing - control technique that permits the receiving half-session to control the data transfer rate on normal flow requests. Used to prevent overflowing a receiver when the receiver performs at a slower rate than the sender.

Session partner - one of the two NAUs having a session.

serial transmission - in which data is transmitted one bit at a time between terminal and communications processor.

Simulated logon - a session intiation request generated by a VTAM application program specifying a particular LU; the requesting application program will act as the primary.

Single-domain network - a network with only one SSCP.

SNA Character String - a data stream composed of EBCDIC controls, intermixed with user data.

Solicited - specific requests for information (as opposed to unsolicited requests)

Span of control - this is a caplability of NCCF which allows certain resources to be controlled by one or more network operators. These resources may be an NCP, a link, a link stations, a PU or an LU.

Stage - a group of gen steps: some products require a single stage gen; others require two or more.

Storage dumps - this is a hardcopy output of certain areas of memory which can include main storage, counters, registers, etc.

Subarea - a subarea node and all the peripheral nodes attached to it.

Subarea address - the unique address assigned to each subarea in an SNA environment which is also found in the first part of the network address.

Subarea node - a general term referring to either a PU_T5 or PU_T4 node.

Switched link - a point-to-point telecommunciation link between a communications controller and another device using telephone dial connections.

- T -

TAF - Terminal Access Facility.

TCAM - Telecommunication Access Method

TCU - Transmission Control Unit. A non-programmable device, incapable of storing programs, and under the control of the host. (ex: IBM 2701,2702,2703)

TGN - Transmission Group Number

TH - Transmission Header

TSC - Transmission Subsystem Component. In VTAM, the component that comprises the transmission control, path control, and data link control layers of SNA.

TSO - Time Share Option. An interactive editor and job entry subsystem that is part of the MVS operating system.

Tally - a count maintained to record the number of times an event occurred.

Terminal - a device with an operator interface, such as a CRT, as opposed to a device such as a disc or magnetic tape unit.

Terminal Access Facility - a feature of NCCF versions 2 and 3. It allows a network operator to logon to several applications from the same network terminal concurrently. It eliminates continually having to log on and log off applications while monitoring network performance.

Terminal node - a peripheral node that is not user-programmable, having less processing capability than a programmable cluster controller. (ex: IBM 3277, 3767,3614, and 3624).

Threshold - a threshold is a preset value that when exceded violates the standard set for the system. In the case of network management, this could be when the quality of the line is degraded to a point when retransmissions reach an unacceptable level, and the retransmission counter exceeds the preset value that identifies what the user has defined as being unacceptable.

Transmission Control layer - component responsible that paces traffic, determines normal vs expedited data flow,validates sequence numbers of requests and enciphers/deciphers end-user data.

Transmission Group - logical connection between two subarea nodes, consisting of one or more links, but appearing as a single link.

Transmission Header - used by Path Control to route the message unit through the network.

Transmission Priority - a value used by Transmission Group control to determine the order in which to transmit messages to the next adjacent subarea.

- U -

USSTAB - Unformatted System Services Tables

unformatted - another word for 'character coded' or user data.

Unformatted system services - a set of functions within SSCP used for translating character-coded requests into a recognizable SNA format (field-formatted).

Uninterpreted name - In SNA, a character string that an SSCP is able to convert into a network name of an LU.

Unsolicited - used to describe a message that travels from a CNMS to a CNMA that the CNMA has not requested. This could be to alert the CNMA of somethiing that has happened that may require immediate attention.

USS tables - ACT/VTAM table used to convert character-coded logon requests from non-standard format to standard format.

- V -

VM - Virtual Machine

VPACING - a parameter in VTAM or NCP gen defining the PLU pacing count for an LU-LU session.

VR - Virtual Route

VSAM - Virtual Storage Access Method. An IBM program which allows users access to data files on direct access storage devices. It allows relative file access.

VSPC - Virtual Storage Personal Computing program

VTAM - Virtual Telecommunications Access Method

Virtural Route - a logical connection between two subarea nodes, imposed over an explicit route, which imposes the transmission priorities on the route.

Virtual Route pacing - a flow technique used by the Virtual Route components for traffic over the Virtual Route.

Virtual Storage - Addressable space that appears to the user as real storage from which instructions and data are mapped into real storage locations. The size of virtual storage is limited by the addressing of the computing system (or virtual machine) and by the amount of auxillary storage available, rather than by the actual number of real storage locations.

Window size - used with pacing and refers to the number of requests that may be forwarded by the sender before a pacing response indicator must be expected from the receiver.

- X -

XID - Exchange Station Identification. A data link control command and response passed between adjacent nodes that allows the nodes to exchange their unique identification and other information necessary for operations over the data link.